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Prof. Dr. Aytekin İŞMAN- TOJSAT, Editor in Chief Sakarya-Turkey

Message from the Editor-in-Chief

We are really happy to announce that we have published TOJSAT issue. In this issue we have 25 articles from different authors and different countries. I would like to thank all TOJSAT authors for their great effort and supporting our journal. In this respect, I would like to thank to editorial board, reviewers and the researchers for their valuable contributions to the journal current issue.

Prof. Dr. Aytekin İŞMAN

Editor-in-Chief of TOJSAT

July 2013

Message from the Editor

After 3rd International Science, Technology and Engineering Conference 2012 hold in Dubai, United Arab Emirates, we have reached to 3rd volumes of journal since its first publication in 2010. In this issue of on line journal, selected papers such as Enhancing organizational learning in the implementation company with enterprise social software; Evaluating the Role of Joint Venture for Technology Transfer in Petrochemicals Industry at Jubail, KSA; Factors affecting the effective implementation of e-learning in educational institutions; Water Urbanism: A Prospective Study on Dhaka; An optimal control problem by controlling heat source of the surface of tissue will be published.

I will thank to the readers for supports by sending their valuable scientific works to publish in this journal.

Prof. Dr. M. Şahin DÜNDAR

Editor, TOJSAT
July 2013

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An integrated approach to supplier selection using AHP and FUZZY PROMETHEE

Gülçin ÇÖL, Servet HASGÜL

Industrial Engineering Department, Eskişehir Osmangazi University, Eskişehir, Turkey

gcol@ogu.edu.tr

Abstract: Supplier selection has become an important decision problem due to today's competitive environment. The company gets a competitive advantage in long-term relationships with the right suppliers. In the evaluation process both quantitative and qualitative multiple conflicting criteria should be utilized. This requires a systematic multi-criteria decision-making approach to evaluation process. Due to uncertainty in the process and verbal assessment of the decision maker's fuzzy sets are used. In this study, supplier selection carried out via the integrated use of the multi criteria decision making methods, AHP and the Fuzzy-PROMETHEE. Thus, the advantages of both methods were used. Criteria, weighted using AHP, and evaluation of suppliers are carried out by using Fuzzy PROMETHEE. The method is implemented in a company producing medical devices in Ankara. As a result, the most suitable supplier identified for the company.

KeyWords: Supplier Selection, Multi-Criteria Decision Making, AHP, Fuzzy-PROMETHEE

Introduction

As a result of competitive business environment supplier selection became an important multi criteria decision making problem. Working with the right supplier reduces production cost, amount of inventory, and increases production quality. Companies tend to benefit from scientific techniques for supplier selection. Criterias used in determining the supplier selection may vary from company to company (Kahraman et al., 2003).The most widely used criteria such as quality, delivery, price, production capability, service, management, technology, research and development, finance, flexibility, reputation, relationship, risk, safety and environment (Ho et al., 2010).There are several approaches to the problem of supplier selection in the literature, the cluster analysis, case based reasoning systems, statistical models, decision support systems, DEA, a multi-criteria decision-making techniques, activity based costing, artificial intelligence, mathematical programming (Gencer, Gürpınar, 2007). In the scope of work the studies examined that approaches the problem with MCDD techniques. Kılınccı and Önal examined supplier selection problem in a dishwasher factory with Fuzzy AHP. According to various criteria and sub-criteria evaluations was carried out with the help of excel. Amin and Razmi carried out supplier selection with the help of fuzzy SWOT analysis. In addition, how much purchased from each supplier decided by using fuzzy linear programming model. Gencer and Gürpınar studied the problem of supplier selection in an electronic company with the help of ANP. Lin used fuzzy ANP and fuzzy multi-objective linear programming as an integrated model. The supplier and the amount of the order were determined by using the model. Araz and Özkarahan have proposed a new MCDM based on PROMETHEE. In addition, the applicability of the method was showed. Soner and Önüt used ELECTRE and AHP methods. Criterias weighted by using AHP, and the sorting operation carried out using ELECTREE. Dağdeviren and Eraslan used PROEMETHEE method. Özçakar and Demir, determined the supplier by fuzzy-topsis.

In this study, supplier selection was carried out using a combination of AHP and fuzzy PROMETHEE methods. Model implemented in a company that produces medical devices. Criterias weighted using AHP and rank of the alternatives determined by Fuzzy- PROMETHEE.

Methods

AHP

AHP is one of the multi-criteria decision-making techniques developed by Thomas L. Saaty in 1977. AHP is widely studied especially in the last 20 years, and used in almost all MCDM problems due to effectiveness of it (Kahraman et al., 2003).

AHP is applicable for several areas, such as business strategy formulation, customer complaints analysis, product evaluation, supplier selection, choice of location as well as many business decisions, military defence decisions, individual decisions (Ünal, 2010).The study of Saaty, 1980 can be referenced for more information.

PROMETHEE, FUZYY- PROMETHEE

Compared with other MCDM methods PROMETHEE method can be expressed with the actual values and applicable when a large number of criteria available (Ballı, Karasulu, 2007). For the implementation of the method importance of criteria, the values of alternatives according to the criteria must be known (Albadvi et al., 2007).

PROMETHEE steps are as follows:

1. i $(i=1,2,\ldots, m$ and $i \in A)$ alternatives, j $(j=1,2, .., n$ and $j \in C)$ the set of criteria and $g_j(i)$ is the preferred value of alternative i for the criteria j. The value of $g_j(i)$ calculated in the first step, then $F_j(i,i')=g_j(i)-g_j(i')=x_j$ is determined as one of the six different types of generalized functions. (The study of Tuzkaya et al. (2011) can be referenced for generalized functions.) $F_j(i,i')$ indicating the degree of the preference function for alternative i to alternative i'.
2. After the calculation of the preferred values of each alternative, by using these values combined preference functions are calculated for each alternatives pairs. Then $\pi(i, i')$ calculated for all criterias, $\pi(i, i')$ indicated the choice index.
$$\pi(i, i') = \left(\sum_{j=1}^{n} w_j P(x_j)\right) / \left(\sum_{j=1}^{n} w_j\right) \quad (3)$$
3. Positive and negative superlative values for each alternative calculated as in equations 4 and 5.
$$\Phi^{+} = \frac{1}{m-1} \sum_{\substack{i'=1 \\ i' \neq i}}^{m} \pi(i, i') \quad \forall i \in A \quad (4)$$
$$\Phi^{-} = \frac{1}{m-1} \sum_{\substack{i'=1 \\ i' \neq i}}^{m} \pi(i, i') \quad \forall i \in A \quad (5)$$

PROMETHEE I compare the degree of positive and negative superiority values, makes a preliminary ranking of weak and incomparable preferences. Alternative i superior to alternative i', if one of the following equations from (6), (7), and (8), is provided.

$$\Phi^{+}(i) > \Phi^{+}(i') \text{ and } \Phi^{-}(i) < \Phi^{-}(i') \quad (6)$$

$$\Phi^{+}(i) > \Phi^{+}(i') \text{ and } \Phi^{-}(i) = \Phi^{-}(i') \quad (7)$$

$$\Phi^{+}(i) = \Phi^{+}(i') \text{ and } \Phi^{-}(i) < \Phi^{-}(i') \quad (8)$$

If equation (9) is provided, the alternatives are at the same level.

$$\Phi^{+}(i) = \Phi^{+}(i') \text{ and } \Phi^{-}(i) = \Phi^{-}(i') \quad (9)$$

If the equations (10) and (11) provided, the comparison cannot be made.

$$\Phi^{+}(i) > \Phi^{+}(i') \text{ and } \Phi^{-}(i) > \Phi^{-}(i') \quad (10)$$

$$\Phi^{+}(i) < \Phi^{+}(i') \text{ and } \Phi^{-}(i) < \Phi^{-}(i') \quad (11)$$

From the difference of negative and positive flows, the net flow obtained. For the net flow values;

$$\Phi^{net}(i) = \Phi^{+}(i) - \Phi^{-}(i') \quad (12)$$

The rank of the alternatives can be obtained from the comparison of the net flow values.

PROMETHEE method, was developed by Brans et al. (1986), and Fuzzy- PROMETHEE approach was proposed by Wang et al (2008). Verbal expressions were used by the decision makers for assessing alternatives according to the criterias. PROMETHEE is suitable to use with AHP. In generally AHP is used the stage of the weighting the criteria.

Comparison of fuzzy numbers in fuzzy- PROMETHEE is necessary. Center of gravity method that represents the membership functions was proposed by Yager (1981) for the comparison of fuzzy numbers. According to Yager index, a triangular fuzzy number size expressed by the formula *YI=(3*n-a+b)/3*. The notation *F(n, a, b)* is fuzzy triangular number (Tuzkaya et al., 2011).

Evaluation function can be expressed in the following equation for fuzzy- PROMETHEE.

$$\Omega(\alpha,\beta) = \Omega_j(d_j) = \begin{cases} 0 & n-c > q \\ \frac{((n,c,d)-q))}{(p-q)} & q \le n-c \; and \; n+d \le p \\ 1 & n+d > p \end{cases} \qquad (13)$$

In the equation the values of q and p are not fuzzy numbers. The membership functions of fuzzy number c modified to $n\text{-}a \ge 0$ and $n+b \ge 1$. PROMETHEE approach uses the fuzzy PROMETHEE stages. Fuzzy number operators are used for operations on fuzzy numbers.

Application

In a medical device company, due to the difficulties in the supply process, company decided to change the supplier. The supplier is to be decided in a systematic way. Criterias weighted by AHP, and the suitable supplier determined using Fuzzy-PROMETHEE.

In practice, a decision-making team of engineers in the company was first established. Suppliers with a strong set of references were determined. As a result of investigations the number of suppliers reduced to four Criteria, respectively is determined as, the “Cost (C)”, “Quality (Q)”, “Delivery" (D)”, “Technical Support (T)”, “Flexibility (F)”.

The decision hierarchy is as in Figure 1. The hierarchy consists of three levels. First level represents the purpose, second level criterias, and the final level is alternatives.

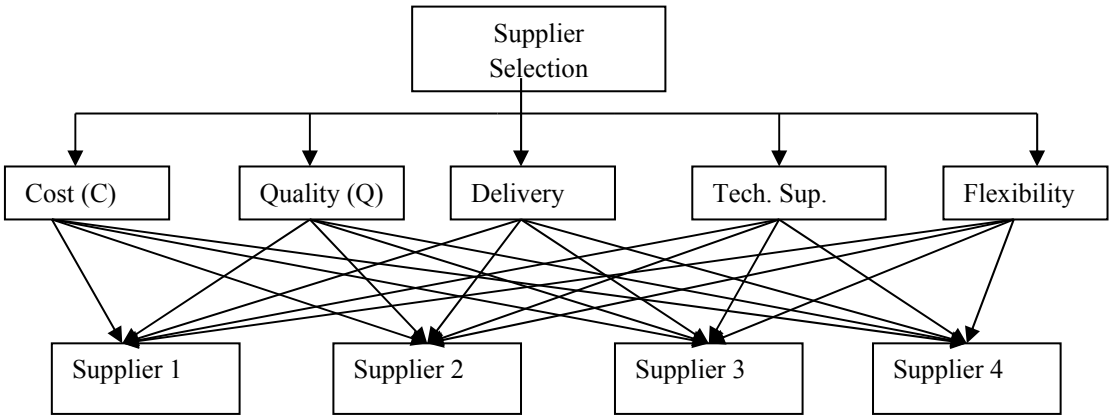

Figure 1. AHP Hierarchy

AHP Calculations

The weights of the each criterias were determined by AHP. 1-9 scale that is proposed by Saaty and pairwise comparison matrices was used (Saaty, 1980). The geometric average of the comparison matrices determined. Pairwise comparison matrix of the criteria established. Table 1shows the pairwise comparison matrices. Table 2 shows the results of AHP.

Table 1. Pairwise Comparison Matrice

Criteria	C	Q	D	T	F
C	1,00	0,28	0,23	0,33	0,23
Q	3,50	1,00	3,55	4,21	3,55
D	4,30	0,28	1,00	1,00	1,44
T	3,03	0,23	1,00	1,00	0,33
F	4,30	0,28	0,69	3,03	1

Table 2. Results of AHP

Criteria	Weights
C	0,09
Q	0,44
D	0,17
T	0,11
F	0,19

The value of λ and CR is respectively 5.5 and 0.08.

F- PROMETHEE Calculations

After weighting the criteria by AHP, for the selection procedure F-PROMETHEE used. Due to the uncertainty of the verbal assessments fuzzy sets were used. Decision makers evaluated the alternatives using verbal statements (Table 3).

Table 3. Evaluation of Alternative Suppliers with Verbal Expressions

	C	Q	D	T	F
Supplier 1	SL	L	VH	E	VH
Supplier 2	VH	L	H	SL	SL
Supplier 3	SH	SL	H	SL	SL
Supplier 4	VL	VH	H	VH	VL

(E: Equal, SL: Slightly Lower, L: Lower, VL: Very Low, SH: Slightly Higher, H: Higher, VH: Very High)

Verbal assessments transformed to triangular fuzzy- numbers (Table–4).

Table4. Verbal Assessments Transformed To Triangular Fuzzy- Numbers

	C			Q			D			T			F		
Supplier 1	0,30	0,15	0,20	0,15	0,15	0,20	1,00	0,20	0,00	0,50	0,20	0,15	1,00	0,20	0,00
Supplier 2	1,00	0,20	0,00	0,15	0,15	0,20	0,80	0,15	0,20	0,30	0,15	0,20	0,30	0,15	0,20
Supplier 3	0,65	0,15	0,15	0,30	0,15	0,20	0,80	0,15	0,20	0,30	0,15	0,20	0,30	0,15	0,20
Supplier 4	0,00	0,00	0,15	1,00	0,20	0,00	0,80	0,15	0,20	1,00	0,20	0,00	0,00	0,00	0,15

The types of preference function determined. There are six type of preference function available. In this study, as a result of interviews with decision makers the third preference function selected. As a result of various experiments function parameters were determined (q = 0 and p = 0.6). Pairwise comparisons of alternatives carried out. In this step, the basic fuzzy operations are used. The results were converted to the comparison values (Table 5)

Table 5. Unweighted Comparison Matrix

	C	Q	D	T	F
1-1	0	0	0	0	0
1-2	0	0	0	0	1
1-3	0	0	0	0	1
1-4	1	0	0	0	1
2-1	1	0	0	0	0
2-2	0	0	0	0	0
2-3	0	0	0	0	0
2-4	1	0	0	0	1
3-1	1	0	0	0	0
3-2	0	0	0	0	0
3-3	0	0	0	0	0
3-4	1	0	0	0	1
4-1	0	1	0	1	0
4-2	0	1	0	1	0
4-3	0	1	0	1	0
4-4	0	0	0	0	0

Matrice, converted to weighted comparison matrice using criteria weights (Table 6).

Table6. Weighted Comparison Matrice

	C	Q	D	T	F
1-1	0,00	0,00	0,00	0,00	0,00
1-2	0,00	0,00	0,00	0,00	0,19
1-3	0,00	0,00	0,00	0,00	0,19
1-4	0,09	0,00	0,00	0,00	0,19
2-1	0,09	0,00	0,00	0,00	0,00
2-2	0,00	0,00	0,00	0,00	0,00
2-3	0,00	0,00	0,00	0,00	0,00
2-4	0,09	0,00	0,00	0,00	0,19
3-1	0,09	0,00	0,00	0,00	0,00
3-2	0,00	0,00	0,00	0,00	0,00
3-3	0,00	0,00	0,00	0,00	0,00
3-4	0,09	0,00	0,00	0,00	0,19
4-1	0,00	0,44	0,00	0,11	0,00
4-2	0,00	0,44	0,00	0,11	0,00
4-3	0,00	0,44	0,00	0,11	0,00
4-4	0,00	0,00	0,00	0,00	0,00

Datas and equation (4) and (5) were used for the calculation of ϕ+ and ϕ- values (Table 7).

Table7. :ϕ^+ and ϕ^-Values

	Sup. 1	Sup. 2	Sup. 3	Sup. 4	ϕ+	ϕnet
Supplier 1	0,00	0,19	0,19	0,28	0,22	-0,02
Supplier 2	0,09	0,00	0,00	0,28	0,12	-0,11
Supplier 3	0,09	0,00	0,00	0,28	0,12	-0,11
Supplier 4	0,55	0,55	0,55	0,00	0,55	0,27
ϕ-	0,24	0,24	0,24	0,28		

From equations 6-7-8-9-10-11 PROMETHEE I calculations was made. As a result, first supplier is better than the second and the third supplier. There was no difference among second supplier and third supplier. Any comparison made with the supplier 4. For the supplier 4 the value of $\phi^-$is bigger than the others but the value of ϕ^+ also bigger than other suppliers' value.

For PROMETHE II the value of the ϕ^{net} was calculated. According to the calculations the Supplier 4 is the best, Supplier 1 is the second, and the Supplier 2 and Supplier 3 the lasted has a same level.

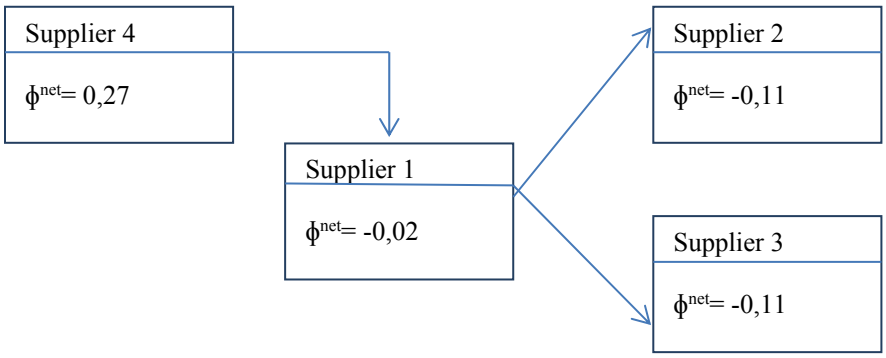

Figure2. PROMETHEE II Assessments

Conclusions

If supplier selection is performed correctly, the efficiency of production systems significantly increased. Decline in product quality, insufficient time for orders, increasing inventories, long durations for supply process may be the results of working with the wrong supplier. As a result, there is a loss of customers, increased cost and waste of time. Long- term relationship with the small number of supplier is possible by working with the right supplier. Multiple conflicting criterias are available for the process of supplier selection. This situation necessitates the use of multi-criteria decision making techniques. In addition verbal assessments that are used for evaluation of alternatives leads to uncertainty. Handling with the uncertainty an integrated method that includes AHP and FUZZY PROMETHEE was used. There has been a lot of studies assigned the weights of the criteria intuitively, we used AHP for the weighting criterias. PROMETHEE was used for the selection of supplier. In addition, the model illustrated with an application. The results of the application were taken into consideration by the authorities.

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An optimal control problem by controlling heat source of the surface of tissue

[1]Rikhiya Dhar, [2]Ranajit Dhar, [3]Piyanka Dhar

[1]Department of Mathematics, B.P. Poddar Institute of Management and Technology, Kolkata, India
rikhiya_dhar@yahoo.com

[2]Registrar, Vidyasagar University, Midnapur, West Bengal, India.

[3]Department of Mathematics, Sikkim Manipal Institute of Technology, Majhitar, East Sikkim, India

Abstract: A distributed optimal control problem for a system described by bio-heat equation for a homogeneous plane tissue is analytically investigated such that a desired temperature of the tissue at a particular point of location of tumour in hyperthermia can be attained at the end of a total time of operation of the process due to induced microwave on the surface of the tissue which is taken as control. Here the temperature of the tissue along the length of the tissue at different times of operation of the process are numerically calculated which display the rise of the desired temperature of the tumour.

Keywords: Bio-heat equation, hyperthermia, optimization, microwave, tumour, control.

Introduction

Computer simulation plays a vital role in treating rise of temperature of tumour to it's therapeutic value by means of optimal distributions of the applied heat source and surface cooling temperature. In this respect, the consideration of physiological responses of the patient at the time of hyperthermia treatment, the region of the tissue affected by tumour, the anatomial feature of the treated patient and blood flow rates of the tissue should be taken into account with much importance for achieving the temperature of the tumour to it's therapeutic value avoiding the damage of healthy tissue due to overheating.

Deng and Liu (2002) investigated analytical solutions described by bio-heat transfer equation due to transient heating on the skin surface with the aid of Green's function . Dhar and Sinha (1989) carried out analytically a distributed optimal control problem in a multilayered tissue to attain desired rise of temperature of the tumour by controlling surface cooling temperature . Wagter (1986) made an important contribution on optimization in plane tissue by multiple electro – magnetic applicaitors. Butkovasky (1969) had studied the fundamentals of optimal control problems in distributed parameter system. Dhar and Sinha (1988) developed an optimal control problem analytically to attain desired temperature of the tumour by induced heat source at least possible time.

An analytical investigation was developed on computations for optimization problems in hyperthermia by finite difference method (Das et. al., 1999). Kowalski and Jin (2003) carried out analytically on optimization in hyperthermia by electro – magnetic annular phased arryays. In Loulou and Scott (2002) investigated a study on thermal dose optimization in hyperthermia using conjugate gradient method. Bagaria and Johnson (2005) studied analytically optimal control problem in bio-heat equation to achieve ideal hyperthermia condition using expliicit

finite difference method. An analytical investigation was performed on optimization of radio – immunotherapy interations with hyperthermia in Kinuya et. al. (2004). In course of investigation on empirical dose construciton for oncological hyperthermia Szasz and Vincze (2006) developed Pennes equation by inducing the entire energy balance. Rapoport et. al. (2009) studied on chemotherapeutic intervention on tumours by ultrasound. Liu and Chen (2009) studied analytically the prediction of temperature in tissues described by bio-heat transfer problem in a bi-layered spherical tissue by considering blood perfusion and metabolism. Shih et. al. (2008) investigated the feasibility of heating on tumour by high intensity focussed ultrasound in thermal surgery.

Kuznetsov (2006) investigated optimal control problem to maximize temperature in the tumour at the end of time of the process due to spatial volumetric heat generation by assuming fixed total volumetric heat generation over the duration of the process. With the aid of conjugate gradient method, a distributed optimal control problem for a system described by bioheat equation in a homogeneous plane tissue due to induced microwave was investigated by Dhar and Dhar (2010) and Dhar et. al. (2012).

In this paper, a distributed optimal control problem described by bio-heat equation for a homogeneous tissue is analytically investigated such that a desired temperature of the tissue at a particular point of location of tumour can be attained at the end of total time of operation of the process by means of controlling induced microwave on the surface of the tissue when the surface cooling temperature is constant. Here the switching time during which the microwave power is operative has been obtained by using conjugate gradient method under calculus of variation.

A numerical temperature distributions of the tissue at different times on various values of total time of operation have been obtained which displays the rise of desired temperature of the tumour.

Mathematical Analysis

The one dimensional bio-heat equation (Deng 2002, Dhar 1989) can be written as,

$$\rho c \frac{\partial \chi}{\partial t} = k \frac{\partial^2 \chi}{\partial x^2} + \omega(\chi_a - \chi) + Q(t) + Q_m \tag{1}$$

Boundary condition :

$$k \frac{\partial \chi}{\partial x} = h\{\chi - u(t)\} \quad on \quad x = 0$$
$$\chi = \chi_a \quad \text{on} \quad x = L \tag{2}$$

Initial Condition:

$$\chi(x, o) = \chi_0 \tag{3}$$

We would like to attain the desired temperature χ^* at the point $x = x_1$, where the tumour is located at the end of the total time T of the process by controlling optimally Q(t).

Thus the functional (Butkovasky 1969, Loulou 2002)

$$\frac{1}{2}\int_0^L \left\{\chi^* - \chi(x,T)\right\}^2 \delta(x-x_1)dx \tag{4}$$

is to be minimized.

The first term designates the square deviation of the temperature χ^* from $\chi(x,t)$ at $x = x_1$.

Let us write a functional J, given by (Butkovasky 1969, Loulou 2002)

$$\begin{aligned} J = &-\frac{1}{2}\int_0^L \left\{\chi^* - \chi(x,T)\right\}^2 \delta(x-x_1)\, dx \\ &+\int_0^L\int_o^T \psi(x,t)\left\{\frac{k}{\rho c}\frac{\partial^2\chi}{\partial x^2}+\frac{\omega}{\rho c}(\chi_a-\chi)+\frac{1}{\rho c}Q(t)+\frac{Q_m}{\rho c}-\frac{\partial}{\partial t}\chi\right\}dxdt \end{aligned} \tag{5}$$

where $\psi(x,t)$ is the auxiliary function.

By considering Q_m as constant, the first variation of the function J can be written as,

$$\begin{aligned} \delta J = &\int_0^L \left\{\chi^* - \chi(x,T)\right\}\delta(x-x_1)\,\delta\chi(x,T)\,dx \\ &+\frac{k}{\rho c}\int_o^T \psi(L,t)\,\delta\chi_x(L,t)\,dt + \frac{1}{\rho c}\int_o^T \left\{k\frac{\partial\psi}{\partial x}(o,t) - h\psi(o,t)\right\}\delta\chi(o,t)\,dt \\ &+\frac{h}{\rho c}\int_o^T \psi(o,t)\,\delta u(t)dt - \frac{k}{\rho c}\int_o^T \frac{\partial}{\partial x}\psi(L,t)\,\delta\chi(L,t)dt + \frac{k}{\rho c}\int_o^T\int_o^L \frac{\partial^2}{\partial x^2}\psi(x,t)\,\delta\chi(x,t)\,dxdt \\ &-\frac{\omega}{\rho c}\int_o^L\int_o^T \psi(x,t)\,\delta\chi(x,t)\,dxdt + \frac{1}{\rho c}\int_o^T\int_o^L \psi(x,t)\,\delta Q(t)\,dxdt \\ &+\int_0^L\int_o^T \frac{\partial\psi(x,t)}{\partial t}\,\delta\chi(x,t)\,dxdt - \int_o^L \psi(x,T)\,\delta\chi(x,T)\,dx \\ &+\int_0^L \psi(x,o)\,\delta\chi(x,o)\,dx \end{aligned} \tag{6}$$

with the help of equations (2) and (3). By assuming δJ to vanish for any $\delta\chi_x(L,t)$, $\delta\chi(x,t)$, $\delta\chi(o,t)$, $\delta\chi(x,T)$, $\delta Q(t)$, $\delta u(t)$ and taking $\delta\chi(x,o)$, $\delta\chi(L,t)$ both equal to zero, a system of auxiliary function $\psi(x,t)$ is obtained as,

$$\frac{\partial\psi}{\partial t} + \frac{k}{\rho c}\frac{\partial^2\psi}{\partial x^2} = \frac{\omega}{\rho c}\psi. \tag{7}$$

$$k\frac{\partial\psi}{\partial x} = h\psi \quad \text{on} \quad x = 0 \tag{8}$$

$$\psi(x,t) = 0 \quad on \quad x = L$$

$$\psi(x,T) = \{\chi^* - \chi(x,T)\}\,\delta(x - x_1) \tag{9}$$

and the optimal values of the controls Q(t) and u(t) stand,

$$\begin{aligned} Q(t) &= Sign\,\frac{1}{\rho c}\int_0^L \psi(x,t)\,dx \\ u(t) &= Sign\ \psi(0,t), \end{aligned} \tag{10}$$

Here the conjugate gradient method with the aid of calculus of variation has been used (Butkovasky 1969, Loulou 2002). Considering $\chi_1(x,t) = \chi\ (x,t) - \chi_a$ and expressing $\chi_1(x,t)$ in Finite Sine Transform, given by,

$$\bar{\chi}_{1n}(t) = \int_0^L \chi_1(x,t)\sin p_n(L-x)\,dx \tag{11}$$

and

$$\chi_1\,(x,t) = \sum_{n=1}^{\infty} \bar{\chi}_{1n}(t) \times \frac{2\sin p_n(L-x)}{L - \dfrac{\sin 2p_n L}{2p_n}} \tag{12}$$

where p_n are positive, real roots of the equation,

$$p\cot(pL) = \frac{-h}{k} \tag{13}$$

the equation (1) with the help of equations (2), (3) and (13) stands,

$$\frac{d}{dt}\bar{\chi}_{1n}(t) + \alpha_{1n}\bar{\chi}_{1n}(t) = \alpha_{3n}Q(t) + \alpha_{4n} + \alpha_{5n}; \quad n = 1,2,3,\cdots \tag{14}$$

where,

$$\begin{aligned} \alpha_{1n} &= \frac{1}{\rho c}\left\{k\,p_n^2 + \omega\right\}, \\ \alpha_{4n} &= \frac{h}{\rho c}\left\{u(t) - \chi_a\right\}\sin p_n L, \\ \alpha_{3n} &= \frac{1}{\rho c}\left(\frac{1-\cos p_n L}{p_n}\right) \\ \alpha_{5n} &= \frac{1}{\rho c}\left(\frac{1-\cos p_n L}{p_n}\right)Q_m \end{aligned} \tag{15}$$

Finally we get,

$$\chi(x,t) = \chi_a + \sum_{n=1}^{\infty}\bar{\chi}_{1n}(t) \times R_n(x) \tag{16}$$

The solution of equation (14) with the help of equation (15) stands,

$$\bar{\chi}_{1n}(t) = [(\chi_o - \chi_a)\left(\frac{1-\cos p_n L}{p_n}\right) + \frac{h}{\rho c}\sin p_n L \int_0^t \{u(\xi) - \chi_a\} e^{\alpha_{1n}\xi} d\xi$$
$$+ \left(\frac{1-Cosp_n L}{p_n}\right)\frac{1}{\rho c} Q_m \int_0^t e^{\alpha_{1n}\xi} d\xi \qquad (17)$$
$$+ \frac{(1-\cos p_n L)}{p_n}\frac{1}{\rho c}\int_0^t Q(\xi) e^{\alpha_{1n}\xi} d\xi] \times e^{-\alpha_{1n}t}; \quad n = 1,2,3,\cdots$$

where

$$R_n(x) = \frac{2\sin p_n(L-x)}{L - \frac{\sin 2p_n L}{2p_n}} \qquad (18)$$

The corresponding solution of equation (7) with the help of equations (8) and (9) can be written as, with the help of earlier Finite Transform,

$$\psi(x,t) = \sum_{m=1}^{\infty} \bar{\psi}_m(t)\, R_m(x) \qquad (19)$$

where

$$\bar{\psi}_m(t) = \{(\chi^* - \chi_a) - \sum_{n=1}^{\infty} \bar{\chi}_{1n}(T) \times R_n(x_1)\} Sin\, p_m(L - x_1) \times e^{-\alpha_{1m}(T-t)} \qquad (20)$$

for p_m are roots of the equation (13).

Considering u(t) as constant, the value of optimal control Q(t) can be obtained from equation (10) with the help of equations (17) , (18) , (19) and (20).

Here we have assumed that the time dependent Q(t) (Wm^{-3}) is only controllable input variable which is piecewise constant function of time that changes value at certain specified discrete instants considered as switching times (Wagter, 1986).

For the sake of simplicity we consider only one specified switching time $t = t_1$. Thus, according to equation (10) one can write

$$Q(t_1) = \int_0^L \psi(x,t_1)dx = 0 \qquad (21)$$

where Q(t) assumes two extreme values in $(0,t_1)$ and (T,t_1), as one considers Q(t) a singular control, which can be obtained with the help of equations (16) - (21) by means of simulation.

Results and Discussions

Data used in computation are given as follows :

c	=	3770 J kg^{-1} $^0C^{-1}$
ρ	=	998 kgm^{-3}
k	=	.5 Wm^{-1} $^0C^{-1}$
h	=	6 Wm^{-2} $^0C^{-1}$
χ_a	=	37^0C
χ^*	=	43^0C
L	=	.01 m,
x_1	=	.006m
ω	=	3000 Wm^{-3} $^0C^{-1}$
Q_m	=	33800 Wm^{-3}
χ_0	=	25^0C
T	=	600s, 800s, 1000s
u(t)	=	20^oC

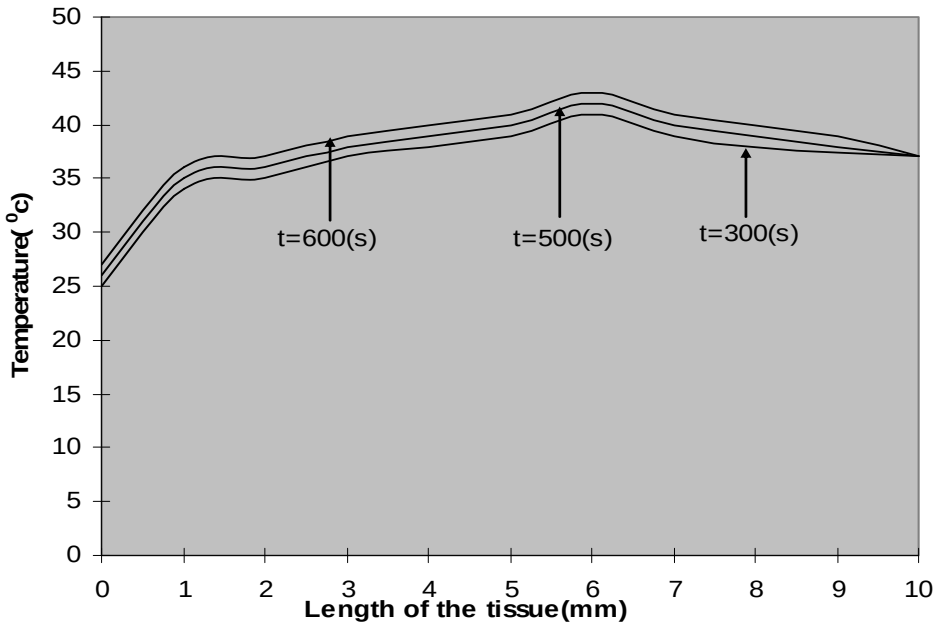

Fig 1 : Temperature(^{0}c) distribution of the tissue along the length of the tissue(mm) for Q(t)=338083 wm^{-3}, 0<=t<=500; Q(t)=9857 wm^{-3} , 500< =t<=600;

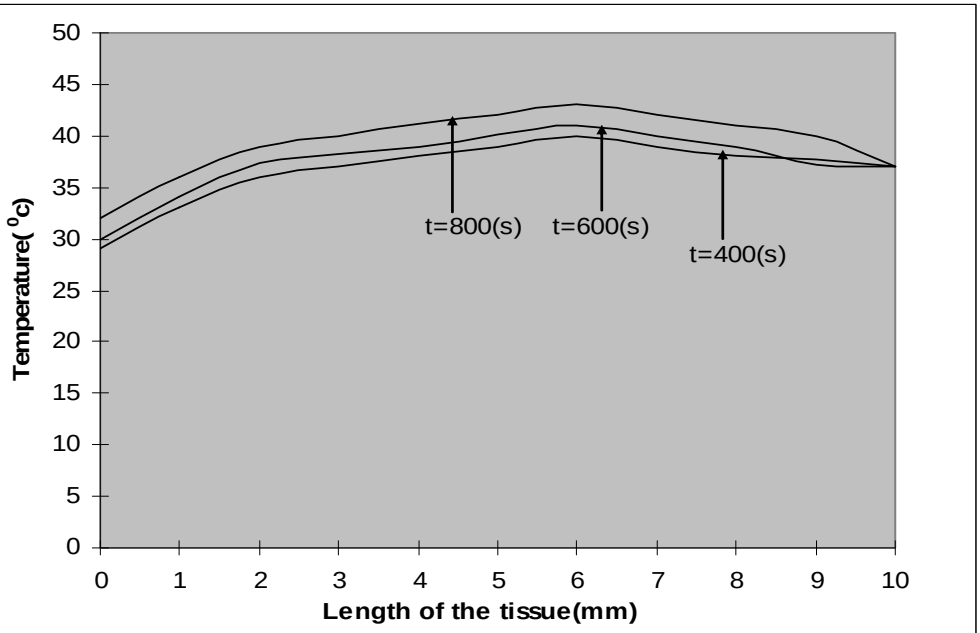

Fig 2 : Temperature(0c) distribution of the tissue along the length of the tissue(mm) for Q(t)=316053 wm^{-3}, 0<=t<=700; Q(t)=10512 wm-3 , 700< =t<=800;

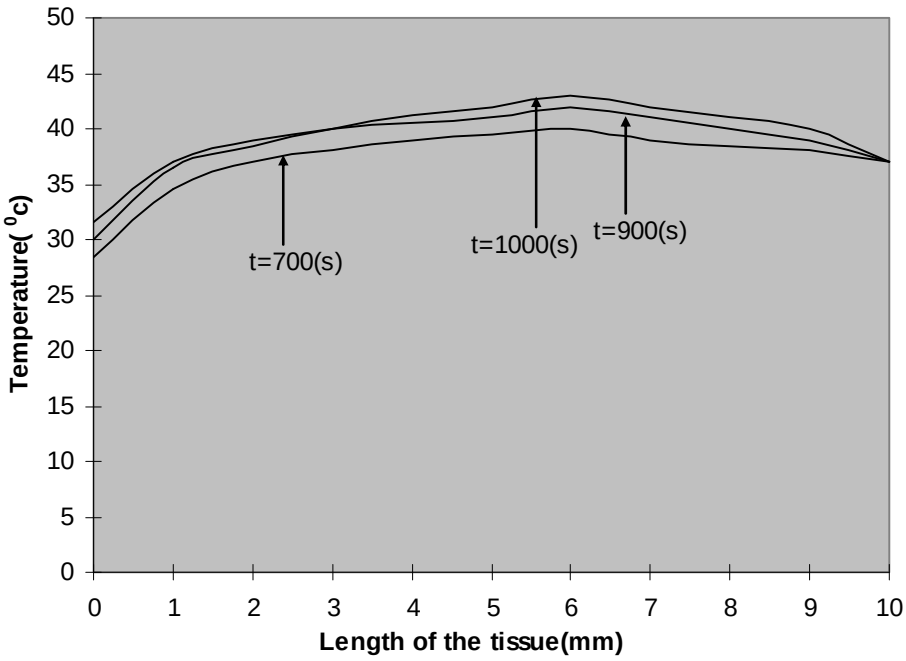

Fig 3 : Temperature(^{0}c) distribution of the tissue along the length of the tissue(mm) for Q(t)=305144 wm^{-3}, 0<=t<=900; Q(t)=10823 wm^{-3}, 900< =t<=1000;

Fig 1 displays the temperature of the tissue along the length of the tissue for Q(t) = 338083 Wm^{-3} , $0 \le t \le 500$; Q(t) = 9857 Wm^{-3} , $500 \le t \le 600$. Fig 2 depicts the temperature of the tissue along the length of the tissue subject to Q (t) = 316053 Wm^{-3} , $0 \le t \le 700$; Q (t) = 10512 Wm^{-3} , $700 \le t \le 800$. In Fig 3 the temperature of the tissue along it's length due to the application of optimal volumetric heat generation rate Q (t) = 305144 Wm^{-3} , $0 \le t \le 900$; Q(t) = 10823, $900 \le t \le 1000$. It is observed that desired temperature 43^{0}C at the particular tumour point x_1 = .006m is attained at the end of operation of the process T = 600s , 800s and 1000s in Fig 1 , Fig 2 and Fig 3 respectively.

Further it requires mentioning that as the total time of operation of the process increases from T =600s to 1000s, the switching time increases with the decrease of Q(t) in the first time segment of operation and corresponding increase of Q(t) in the second time segment of operation. Again the temperature of the tissue on left side of the tumour steadily increases and attains the desired temperature 43^{o}C on the point of tumour at the end of the process. On the right side of the tumour, the temperature rapidly decreases to arterial temperature 37^{0}C till the end of the process as we consider the cases at T = 600s , T = 800s and T = 1000s displayed in Fig 1, Fig 2 and Fig 3 respectively. Thus the temperature of the healthy tissue is not been overheated above 43^{o}C.

Conclusion

This analytical study may be extended for further developments considering different times of operation and also different locations of the tumour having various lengths of the tissue.

It is to note that in the paper [Dhar and Dhar, 2010] the desired tumour temperature is attained within the total time

of the operation of the process (switching time t_1 (say)). Here, the microwave is switched off during the second time segment (t_1, T) . But, in this paper the desired temperature of the tumour is attained at the end of operation of the process at time T. In this case the microwave is not switched off but its intensity is substantially reduced in the second time segment (t_1, T).

Acknowledgement

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Nomenclature:

c	=	specific heat of tissue, J/kg ^oC
h	=	heat transfer coefficient between the skin and the ambient air, $Wm^{-2}/^0C$
k	=	thermal conductivity of tissue, $W\,m^{-1}/^0C$
L	=	length of the tissue, m
x_1	=	location of the tumour, m
χ	=	temperature, ^{0}C
χ_a	=	arterial temperature, ^{0}C
χ_0	=	initial temperature, ^{0}C
u(t)	=	temperature of the surrounding medium, ^{0}C
χ^*	=	desired temperature to be attained, ^{0}C
T	=	Total time of the process, s
t_1	=	switching time, s
Q(t)	=	optimal heat generation rate due to volumetric heating, Wm^{-3}
ρ	=	density of tissue, kg m^{-3}
δ	=	dirac – delta function.
ω	=	product of flow and heat capacity of blood, W m^{-3} / ^{0}C
Q_m	=	rate of metabolic heat generation, Wm^{-3}

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Analysis of vegetation assemblage in the salted plain of the lower Chelif, Algeria

A. Ababou[1], M. Chouieb[2], A. Bouthiba[3], D. Saidi[4], M. M'hamedi Bouzina[3], and K. Mederbal[5]

[1]Department of Biology, Faculty of Sciences, University Hassiba Ben Bouali, Chlef, Algeria.
[2]Department of Agronomy, Faculty of Science and Engineering, University Abd El Hamid Ibn Badis, Mostaganem, Algeria.
[3]Department of Agronomy, Institute of Agronomical Sciences, University Hassiba Ben Bouali, Chlef, Algeria.
[4]Department of Biology, Faculty of Sciences, University Hassiba Ben Bouali, Chlef, Algeria.
[5]Department of Biology, Faculty of Science and earth Sciences, University Mustapha Stambouli, Mascara, Algeria.

E-mail: ab_adda@yahoo.fr

Abstract: In order to establish the relationships between the plants communities and environmental gradients that prevail in the arid plain of the lower Cheliff, one of the largest salted alluvial plain in North Africa, we examined vegetation composition and the environmental variables, using 20 species sampled in 111 stands, followed by a direct gradient analysis. Classification of the vegetation using modified TWINSPAN classification resulted in the recognition of four vegetation units, each of these four units with a definite floristic composition, highly significantly different according to ANOSIM test, was linked to a specific habitat. Multivariate analyses including detrended correspondence analysis (DCA) and correspondence analysis (CCA) showed that vegetation distribution pattern was mainly related to conductivity and soil structure. CCA axis 1 (45.7% of variance explained) was mainly positively correlated to conductivity, Na^+, clay and Ca^{++}, with an exclusive appearance of halophilous species characteristic of the extreme salinity conditions. While it was negatively correlated mainly with soil structure and pH, these conditions were accompanied by the highest plant diversity in the study area, with the appearance of two vegetation units, adding up 13 species belonging to 8 families. CCA axis 2 (20.1% of variance explained) was positively correlated with soil structure and Na^+, while it is negatively correlated mainly with Ca^{++}, with the occurrence of three species indicating the worst soil structure conditions.

Keywords: Anosim, Conductivity, Correspondence analysis, Twinspan, Vegetation units.

Introduction

The vegetal association is a plant community, characterized by definite floristic and sociological features and grows in uniform habitat conditions (Flahault & Schroter, 1910). As defined by (Westhoff & van der Maarel, 1973), these plant communities are recognized by diagnostic species, with a distinct concentration in a particular vegetation unit (Chytry & Tichy, 2003). Their presence or abundance is considered to indicate certain site conditions. Indeed, vegetation presence or absence is controlled by environmental variables such as soil, topography, and climate (McDonald et al., 1996). Among these different environmental factors, soil is normally of great importance. Using vegetal species as bio-indicators can be the most important tool to assess soil conditions (Wang, 1995). Our study was carried out along the lower Chelif plain, one of the largest salted alluvial plains in North Africa, characterized by particular edaphic constraints, harsh climatic adversities, and suffering from serious soil degradation. The apparent structural simplicity of plant communities in this area provides an ideal model to study the relationship between edaphic factors and plant species. The main purpose of this research was to determine, the strongest edaphic factors affecting the occurrence of vegetal species, to extract the main vegetation units independently to the site conditions, and confront them to the edaphic factors characterizing the lower-Cheliff. Understanding relationship between ecological variables and plant species in this harsh ecosystem helps us to apply these findings in management, reclamation, and development of similar regions.

Material and methods

Study area

Covering approximately 500 km2 the lower-Cheliff is one of the largest salted alluvial plains of north-western Algeria (Figure 1), it's about 35 km inland from the Mediterranean Sea, with an average altitude of 70 m. The plain is a syncline framed by salted marls hills (MC Donald & B.N.E.D.E.R 1990). These geological characteristics, accentuated by an arid climate with an

average annual temperature of 20° C, a dry period of 7 months, frequent droughts, and minimal precipitation (approximately 250 mm/yr), explain the high salinity conditions of the plain.

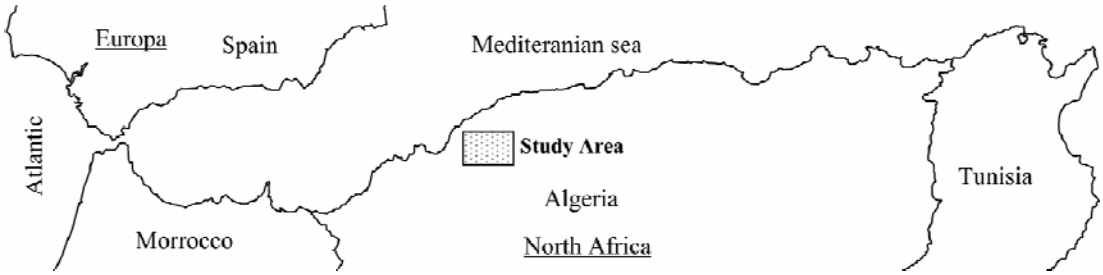

Figure 1. Location of the study area in northern Algeria.

Soil and vegetation sampling

Phytosociological sampling was recorded during spring 2010 and 2011, by using the Braun-Blanquet seven degree scale (Van der Maarel, 1979). A total of 111 relevés were recorded adding up 30 species among which 10 rare species were excluded from analysis. For constrained ordination methods, a total of 111 soil samples were also collected, soil variables analysed were texture, soil structure (MWD), pH, electrical conductivity (ECe), calcium carbonate (CaCO3), Ca^{++}, Cl^{-}, and Na^{+}. Each sampling unit location (latitude, longitude, and altitude) were recorded using a GPS receiver.

Data analysis

To simplify the continuum of species composition present in the study area and to aid our understanding of species–environment relationships, relevés were classified into a few groups by modified two-way indicator species analysis (TWINSPAN) classification (Rolecek et al., 2009). Thus, by using this algorithm, homogenous groups are formed; the characteristic species of each group were identified by using the phi coefficient of association (Chytry et al., 2002). This coefficient is a statistical measure of association which can be used as a measure of fidelity. It is defined as:

$$\Phi = \frac{N.n_p - n.N_p}{\sqrt{n.N_p\left(N-n\right).\left(N-N_p\right)}}$$

N = number of relevés in the data set; Np = number of relevés in the particular vegetation unit; n = number ofoccurrences of the species in the data set; np = number of occurrences of the species in the particular vegetation unit.

To examine variation in vegetation assemblage structure among groups, we performed an ANOSIM (Legendre & Legendre, 1998) by using Bray-Curtis similarity. Finally, in order to establish the main links between environmental variables and vegetation, first, a co-linearity test showed a strong correlation coefficient between sands and silt, Na^{+} and Cl^{-}. Therefore, we chose to eliminate Cl^{-} and silt. Then, the remaining variables were log-transformed. The most significant variables according to the individual preselection were, ECe, MWD, pH highly significant ($P < 0.01$), and clay significant ($P < 0.05$), the remaining variables (Na^{+}, sand, CaCO3, Ca^{++}) were not significant. In order to perform a direct gradient analysis, a detrended correspondence analysis (DCA) (Hill & Gauch, 1980) showed that the longest gradient was 5.78, thus, the best results are shown by canonical correspondence analysis CCA (ter Braak, 1986 ; Leps & Smilauer, 2003). However, CCA is useful technique strongly affected by double zeros (Zuur et al., 2007). In this case, according to reference (Legendre & Gallagher, 2001), the best option is to apply a special Chord (Orloci, 1967) or Hellinger (Rao, 1995) transformation.

Results and discussion

Classification of vegetation

The application of modified TWINSPAN classification on the 20 species enabled us to distinguish four vegetation units (Table 1, Figure 2). These groups were named according to their leading dominant species (those with the highest phi coefficient value) as follows: (A) *Spergularia marina*, (B) *Erodium cicutarium*, (C) *Melilotus officinalis*, and (D) *Bellis perennis*. Each of these four vegetation units could easily be linked to a habitat type.

Vegetation unit A: The 29 samples belonging to this community were characterized by the highest conductivity, Na^{+}, Ca^{++}, and clay, the lowest pH and relatively low soil structure. The phi coefficient classification showed that this vegetation unit was composed of four diagnostic species, belonging exclusively to Chenopodiaceae and Caryophyllaceae, characteristic of the extreme salinity conditions.

Vegetation unit B: In contrast to the previous vegetation unit, this group of 7 samples presented the best soil structure, the highest pH and sand percentage, the lowest conductivity, Ca^{++}, and clay.

Vegetation unit C: This community included 41 samples moderately salty, with alkaline soil reaction, good soil structure, and the lowest Na^{+} quantity. This vegetation unit includes the largest number of diagnostic species belonging to 5 different families (Fabaceae, Asteraceae, Bromeliaceae, Primulaceae, Plantaginaceae).

Vegetation unit D: This community was represented in 34 samples, characterized by the worst soil structure, the lowest CaCO3 percentage, high clay percentage, high Na^+ quantity, and moderate salinity.

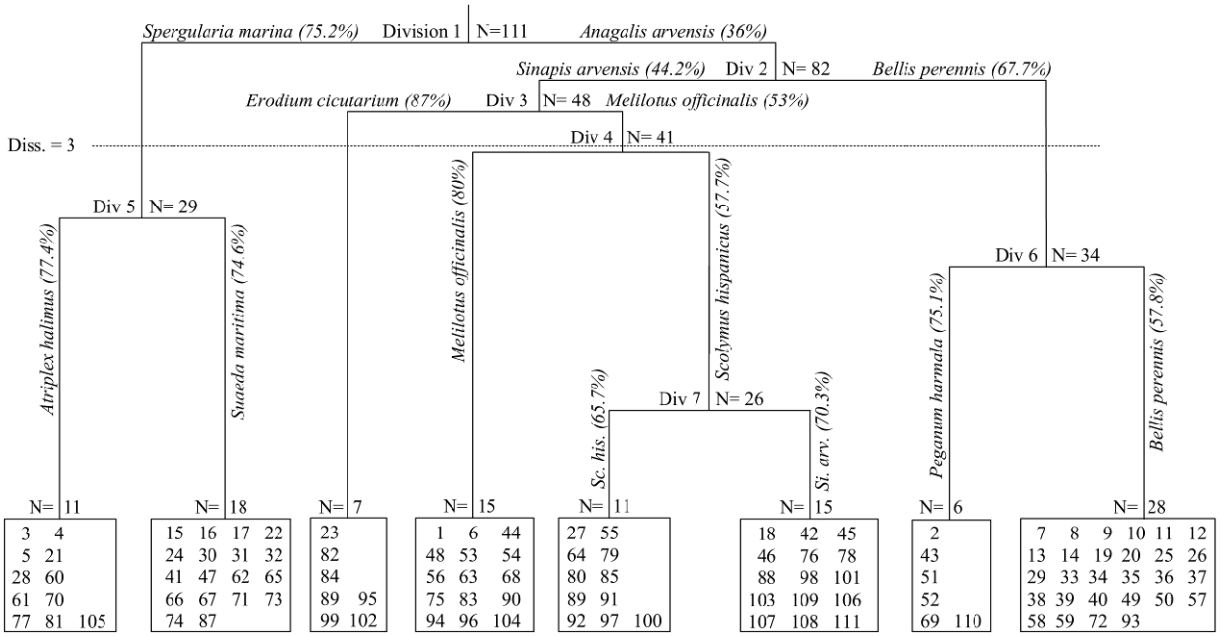

Figure 2. TWINSPAN classification of 111 plots. N indicates the number of plots and the value between brackets represent the phi coefficient value in percent.

Table 1: Table of 111 relevés and 20 species, based on fidelity coefficient. Diagnostic species (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) are those with significant φ value according to Fisher's test.

Vegetation unit A *(29 Relevés)*	*Vegetation unit B* *(7 Relevés)*	*Vegetation unit C* *(41 Relevés)*	*Vegetation unit D* *(34 Relevés)*
Spergularia marina (71.9***)	*Erodium cicutarium* (87***)	*Melilotus officinalis* (53***)	*Bellis perennis* (70.5***)
Suaeda maritima (59.8***)	*Onopordum acanthium* (75.1***)	*Scolymus hispanicus* (44.1***)	*Phalaris arundinacea* (51.4***)
Atriplex halimus (46.7***)	*Foeniculum vulgare* (42.1*)	*Sinapsis arvensis* (36.8***)	*Peganum harmala* (31*)
Arthrocnemum macrostachyum (28.2*)	*Torilis nodosa* (33.1*)	*Calendula arvensis* (36.2***)	
	Lolium multiflorum (24.3*)	*Anagallis arvensis* (33.3**)	
	Cirsium vulgare (17.1)	*Scorpiurus muricatus* (17.4)	
		Plantago lanceolata (15.4)	

Soil characteristics of each of the four vegetation units were analysed through ANOVA (Table 2). Results indicated that among all measured soil parameters, conductivity and pH showed highly significant differences between groups ($P < 0.01$), Na^+ and soil structure (MWD) showed significant differences ($P < 0.05$), meaning that vegetation composition and distribution in the lower Chelif was highly related to conductivity, pH, soil structure, and Na^+.

Table 2 : Mean values with mean standard error and ANOVA F-values of the environmental variables in the sites representing the four groups obtained by TWINSPAN.

	Group A	Group B	Group C	Group D	F	P
ECe	16.5 ± 1.6	3.3 ± 1	6.5 ± 1.13	8.5 ± 0.94	14.57	0.0001
pH	7.8 ± 0.03	8.1 ± 0.1	8.0 ± 0.05	7.9 ± 0.04	10.23	0.0001
Na^+	4 ± 0.47	2.8 ± 0.6	2.8 ± 0.16	3.2 ± 0.27	3.07	0.03
MWD	0.8 ± 0.04	1.0 ± 0.1	0.9 ± 0.05	0.8 ± 0.03	2.87	0.04
CaCO3	17.7 ± 0.5	19.1 ± 2	18.1 ± 0.5	16.6 ± 0.4	2.11	0.103
Ca^{++}	0.5 ± 0.1	0.3 ± 0.1	0.4 ± 0.04	0.5 ± 0.04	1.88	0.137
Clay	5.9 ± 0.5	4.7 ± 0.7	4.9 ± 0.33	5.7 ± 0.19	1.63	0.186
Sand	23.5 ± 1.2	26.6 ± 3	25 ± 1.2	24.2 ± 0.86	0.56	0.642

Similarity analysis

Similarity analysis test (ANOSIM) (Table 3) showed highly significant differences ($P < 0.01$) in taxonomical composition between (A, B), (A, C), (B, C), (C, D), and significant differences ($P < 0.05$) between (A, D) and (B, D), these significant differences indicate the total absence of overlap between vegetation assemblages. These results were supported by high significant R values, indicating that similarities between relevés within groups are higher than those between relevés from different groups. Thus the result of similarity analysis (ANOSIM) showed clear differences in taxonomical composition among the different groups.

Table 3: Results of similarity analysis according to Bray-Curtis similarity with p-value (higher matrix) and R-value (lower matrix).

Bray-Curtis similarity		P values (** p < 0.01; * p < 0.05)			
		A	B	C	D
R values	A		0.005**	0.003**	0.03*
	B	0.788		0.005**	0.01*
	C	0.859	0.395		0.008**
	D	0.694	0.836	0.486	

Canonical correspondence Analysis

The marginal effects indicated that conductivity was the best explanatory variables, followed by soil structure, Na^+, pH, Ca^{++}, and clay, whereas CaCO3 and sand plays a secondary role. The variance of species occurrence data explained by each variable according to the partial CCA was in the following order: ECe = 5.3%, soil structure = 3.3%, pH = 3.1%, Na^+ = 2.8%, Clay = 2.3 %, Ca^{++} = 2.2%, CaCO3 = 1.1%, and Sand = 1%. This means that the distribution of vegetal species in the lower-Cheliff plain is strongly correlated to conductivity, soil structure and pH.

The variance of species-environment relationship, explained by the first two canonical axes of the correspondence analysis was 65.8%. The first axis with 45.7% of variance explained, was mainly positively correlated to conductivity, and then to Na^+, clay, and Ca^{++}, with the occurrence of vegetation unit A composed exclusively of Chenopodiaceae and Caryophyllaceae, while it was negatively correlated mainly with pH and subsequently to soil structure, these conditions were accompanied with the highest plant diversity in the study area (Figure 3), with the appearance of vegetation units B and C. The second axis with 20.1% of variance explained was positively correlated with soil structure and Na^+, while it was negatively correlated mainly with Ca^{++}, with the occurrence of vegetation unit D, indicating the worst soil structure.

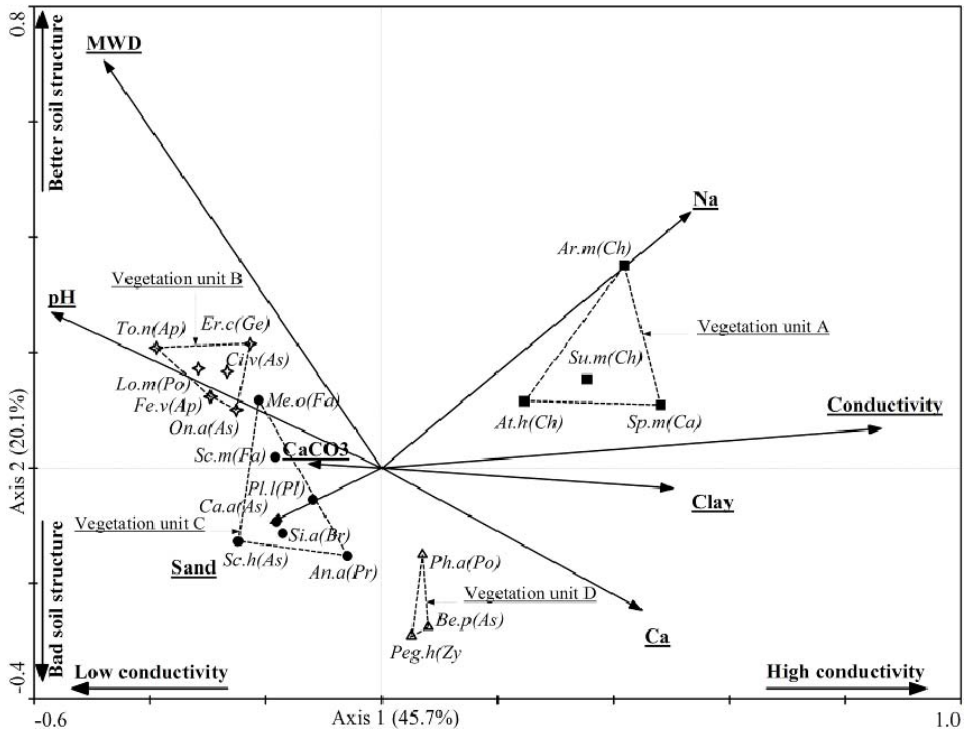

Figure 3. CCA biplot showing edaphic variables and vegetation units derived from TWINSPAN.

Predicting vegetation occurrence according to edaphic variables

A Gauss model (Jongman et al., 1995) was used to examine the relationships between the different vegetation units occurrence, and abiotic habitat variables, especially the most influencing variables. Electrical conductivity, pH, Na^+, and soil texture were all statistically significant predictors of species occurrence ($P < 0.01$) according to chi-square approximation. Gauss results (Figure 4) showed that the optimum of vegetation unit A, with respect to electrical conductivity was greater than 35 mmhos. Vegetation unit B was highly sensitive to conductivity with an optimum of only 1 mmhos, whereas the occurrence of vegetation unit C and D increased to an optimum, respectively of 5.8 and 10.5 mmhos followed by declining occurrence, the same behavior towards conductivity was shown towards Na^+, the highest optimums were shown respectively by vegetation unit A and D, and the lowest optimums respectively by vegetation unit C and B. The best soil structure was indicated by vegetation unit B and C with an optimum of 2 mm each, and the worst soil structure was indicated respectively by vegetation unit A (0.45 mm) and unit D (0.65 mm). Slightly alkaline soil reactions were shown by vegetation unit B and C (8.78), whereas vegetation unit A and D prefer neutral pH.

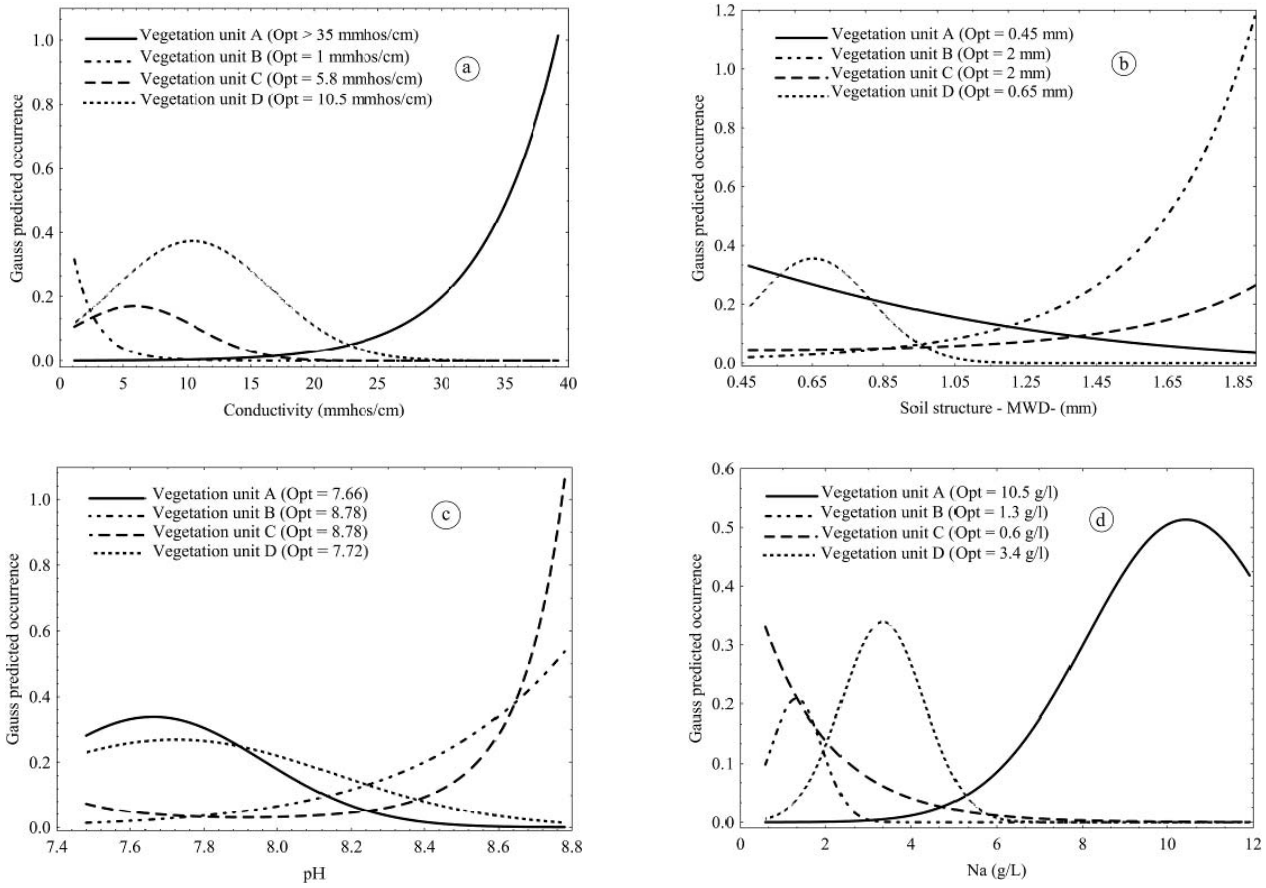

Figure 4. Predicted occurrence of the four vegetation units as obtained by Gauss model according to a. conductivity, b. soil structure, c. Na^+, d. pH

Conclusion

The lower Chelif represents a weakened ecosystem, characterized by particular edaphic constraints and harsh climatic adversities. Traditional methods of evaluation of site conditions are expensive and time consuming, especially in areas as large as the Lower-Cheliff; thus, recognition of vegetation ecology is the easiest way of decreasing cost and saving time in the assessment of environmental conditions. The present study provides fundamental information on the edaphic factors affecting vegetation assemblage and distribution in one of the largest arid area in North Africa. We distinguished vegetation units composed of halophilous species, distributed throughout the salty grounds and more diverse vegetation units, very sensitive to salinity, occupying unsalty to slightly salty grounds. Thus, the assessment of plant communities was a useful tool to classify salinity, especially in terms of revealing the spatio-temporal changes of this variable. Understanding relationships between environmental variables and vegetation distribution in this area helps us to apply these findings in management, reclamation, and development of arid and semi-arid ecosystems.

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Anti fungal effect of some plant oils against some oral clinical isolates of *Candida albicans* in Lebanese community

Zakia Olama, H. Holail and S. Makki

Department of Biological and Environmental Sciences-Faculty of Science-Beirut Arab University-Lebanon

zakia.olama@bau.edu.lb

Abstract: Oils extracted from different medicinal plants (volatile and fixed) were screened for their activity against oral pathogen *Candida albicans* by agar well diffusion method. Minimum inhibitory concentrations (MICs) of oils against *Candida albicans* done by agar dilution method and minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFCs) data obtained by the broth micro dilution method. The results showed that the maximum antifungal activity was demonstrated by pine, tea tree, oreganum, thyme and clary sage oil as compared to nystatin as a control. While clove,eucalyptus ,cinnamon , lemon and lavender oil exhibited moderate inhibitory activity. Cotton ,aniseed and rose oil demonstrated low activity as compared to control. Mustard ,linseed, peppermint, sesame, fennel, caraway, cumin, cactus, castor, blackseed and almond oil did not show any antifungal activity. More over Time-Kill assay shows that *Candida albicans* will be almost killed after 6 hours of treatment with the promising oils. These results support the plant oils can be used to cure fungal infections and plant oils may have role as pharmaceutical.

Key words: plant essential oils, *Candida albicans*, antifungal activity, in-vitro studies.

Introduction

Many essential oils have been advocated for use in complementary medicine for bacterial and fungal infections including acne, vaginal candidiasis and oral thrush. However, few of the many claims of therapeutic efficacy have been validated adequately by either in-vitro testing or in-vivo clinical trials. (Citak et al, 2005)

Candida albicans is a yeast that occurs naturally in the body. The body's natural defenses normally keep yeast in check but, if there is an imbalance, the yeast can grow out of control .*Candida* thrives in warm, moist places such as the vagina, the mouth and between the folds of the skin. Infections occur when competing bacterial flora are eliminated by antibacterial antibiotics allowing this yeast to overgrow leading to various manifestation depending on the site such as oral candidiasis(thrush) and vaginal candidiasis**.** *Candida albicans* are less susceptible to azoles derivatives with increasing frequency. Nystatin and Ketoconazole, two important agents against human pathogenic fungi, have side effects as well as toxic effects. Thus there is the need for better, novel antifungal agents against infections by some fungi, especially Candida species.(Devkatte et al, 2005 and Mahdavi et al, 2009)

In the last two decades, some research has focused on using herbal components, which have fewer side effects. Meanwhile, extracting effective drug components from these herbs, such as herbal essential oils, which are used as antimicrobial, antiviral, and antifungal agents, is increasing. Plant-derived essential oils are natural, cheaper, and safer, thus; plant extracts are preferred in the cure of fungal infections. Some of these plants' essential oils are used as a remedy for headaches, arthritis, and also to treat skin discoloration, infectious, and parasitic diseases.(Chaieb et al.(2007). Antifungal in vitro susceptibility testing should provide useful information for selecting the most active drug against etiological agents. Several oils of plant origin have been used in ancient medicine against some infections in the world many years age. These compounds play essential roles in traditional medicine especially in developing countries. The present investigation examines the in-vitro susceptibility to *Candida spp* to a range of essentail oils. They will then be compared with anti-fungal drugs to find out their efficacy in the prevention and treatment of the diseases (Motsei et al.,2003)

Materials and Methods

Test organism : Five different strains of *Candida albicans* were used throughout the present work. They were isolated from oral samples of patients from Lebanese community and obtained from Elias Hrawi Governmental Hospital and were further identified as *Candida albicans* using the simplified identification method SIM key proposed by Deak (1986). They showed a wide variation in sensitivity towards the oils and nystatin. Therefore they were identified as different strains of *C.albicans* (n_1, n_2, n_3, n_4 and n_5). All the fungal isolates used throughout the present investigation were maintained on Sabouraud Dextrose agar slants folded with 25 % glycerol, and stored at 4^0C with regular transfer at monthly intervals.

Inoculum preparation for antifungal susceptibility tests

Inocula were prepared directly by suspending colonies grown for 3 days on an SDA slopes directly in sterile saline solution. Slopes were flooded with 0.85% saline containing 0.5% Tween 20. Fungal growth was gently probed and the resulting suspension was removed and mixed thoroughly with the use of a vortex mixer. After the settling of the larger particles, suspensions were adjusted by using the Macfarland method and diluted as necessary to correspond to final inoculum concentrations 1.5 x 10^6 CFU/ml (National Committee for clinical laboratory standard, 1998).

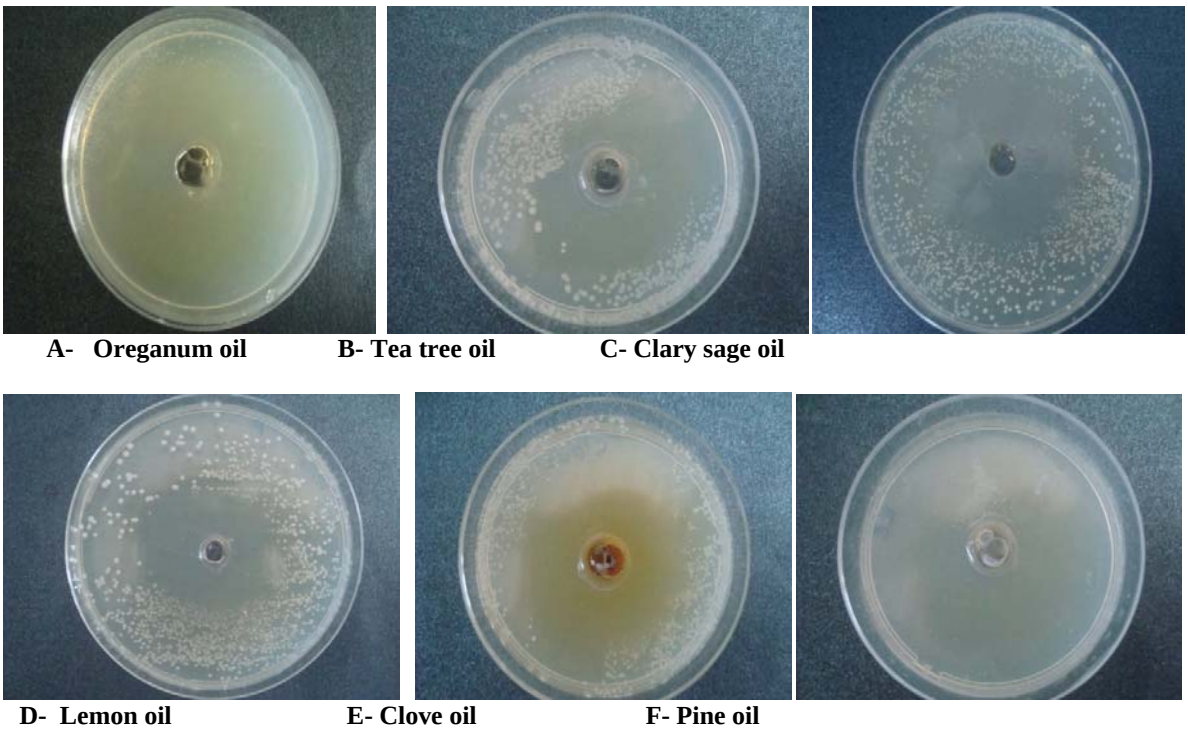


Figure 1: Antifungal activity of some essential and fixed oils on the growth of *Candida abicans* (n5)

Agar-well diffusion susceptibility test

The antifungal activity of essential oils was evaluated against *C. albicans* (n 5), by the agar-well diffusion method. Petri dishes with a diameter of 15 cm were prepared with Saboraud dextrose agar (SDA). The wells (6 mm in diameter) were then cut from the agar by the use of a cork borer and 0.100 mL of essential oil or drugs was delivered to them. The oil was dissolved in tween 80% to obtain the test concentrations of 20 mg/mL. Stock solutions of Nystatin(0.005 mg/ml) was prepared in distilled water and tested as positive controls for *Candida* spp. Each fungal suspension was

inoculated onto the surface of the agar. After incubation, for 3–5 days for *Candida* spp.. at 28°C , all dishes were examined for zones of growth inhibition and the diameters of these zones were measured in millimetres. Each experiment was repeated at least twice.(Brito et al.,2006)

Table 1. Antifungal activity of some essential oils against the growth of different strains of *Candida albicans* spp.

Oil used (25µl/well)	Average inhibition zone (mm)				
	Candida albicans n_1	*Candida albicans* n_2	*Candida albicans* n_3	*Candida albicans* n_4	*Candida albicans* n_5
Pine	47.0^{d}	55.1^{d}	41.2^{d}	45.1^{d}	50.0^{d}
Oreganum	72.2^{f}	74.2^{f}	71.4^{f}	70.2^{f}	75.2^{f}
Clary Sage	50.0^{d}	51.4^{d}	59.0^{d}	55.2^{d}	59.0^{d}
Tea Tree	38.1^{c}	40.1^{c}	35.1^{c}	40.4^{c}	41.3^{c}
Thyme	37.3^{c}	31.0^{c}	32.3^{c}	32.3^{c}	35.2^{c}
Clove	30.1^{c}	22.6^{b}	28.2^{b}	30.2^{c}	28.1^{b}
Rose	13.0^{a}	12.0^{a}	10.0^{a}	10.0^{a}	11.0^{a}
Eucalyptus	23.2^{b}	21.2^{b}	28.2^{b}	17.6^{b}	19.0^{ab}
Lemon grass	21.4^{b}	20.1^{b}	18.4^{ab}	16.4^{b}	14.0^{a}
Lavender	11.0^{a}	10.0^{a}	12.0^{a}	10.0^{a}	10.0^{a}

Means in each column having the same subscript letters are not significantly different at $P \leq 0.05$.

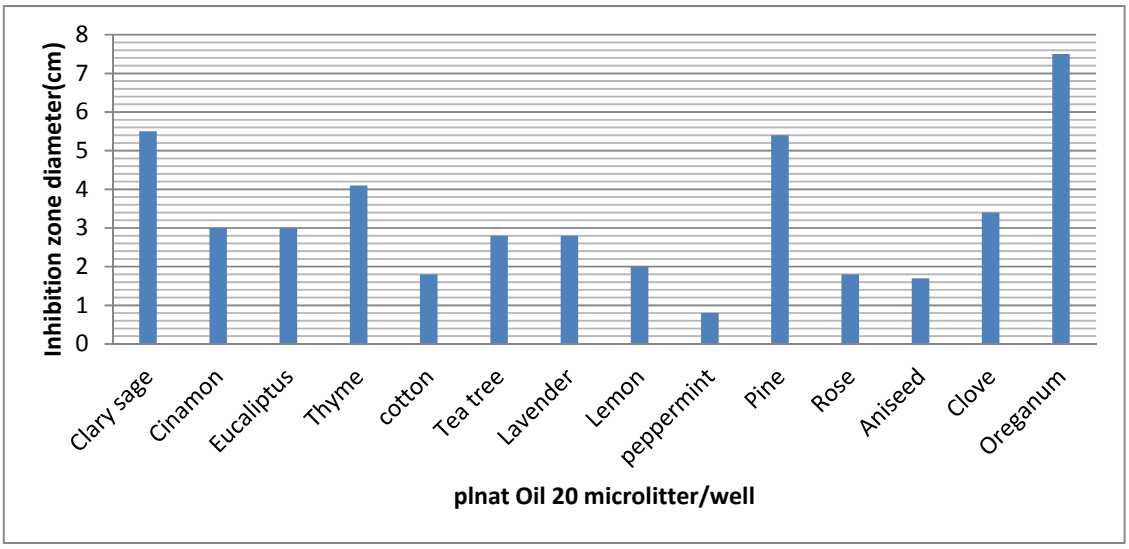


Figure 2: The inhibition zone measurements of some essential and fixed oils against the growth of *Candida albicans*(n5)

Broth microdilution method

The MIC and minimum fungicidal concentration (MFC) for *C. albicans* were determined by the broth microdilution method. The microdilution assay was performed in 96-well microdilution plates. Growth and sterile control wells were included for each isolate tested. The microplates were incubated at 37° C and read visually after 2 days for *Candida* spp . All isolates were run in duplicate and repeated at least twice. The MIC was defined as the lowest oil concentration that caused 80% inhibition of visible fungal growth. The results were read visually, The MFC was determined by subculturing 100 mL of solution from wells without turbidity, on potato dextrose, at 28^0 C. The MFCs were determined as the lowest
concentration resulting in no growth on the subculture after 2 days for *Candida* spp. (Brito et al.,2006)

Table2: Minimal inhibitory concentration (MIC) of selected oils against different strains of *Candida albicans* (ungerminted cells).

Oil used (25µl/ml)	Minimum Inhibitory Concentration (µl/ml)				
	Candida albicans n_1	*Candida albicans* n_2	*Candida albicans* n_3	*Candida albicans* n_4	*Candida albicans* n_5
Pine	1.95^a	1.95^a	1.95^a	1.95^a	7.81^b
Oreganum	0.12^a	0.48^a	0.12^a	0.48^a	0.48^a
Clary Sage	7.81^b	1.95^a	7.812^b	31.25^b	1.95^a
Tea Tree	7.81^b	31.25^b	125.00^c	31.35^b	31.25^c
Thyme	31.25^c	31.25^b	125.00^c	125.00^c	31.25^c
Clove	125.00^d	31.25^b	125.00^c	125.00^c	125.00^d
Rose	500.00^f	500.00^d	500.00^d	500.00^d	500.00^f
Eucalyptus	125.00^d	31.25^b	500.00^d	125.00^c	125.00^d
Lemon grass	125.00^d	125.00^c	500.00^d	500.00^d	500.00^f
Lavender	500.00^f	500.00^d	500.00^d	500.00^d	500.00^f

Means in each column having the same subscript letters are not significantly different

at $P \leq 0.05$.

Time- kill curve procedure

Time- kill studies were carried out against *candida albicans* (n_1, n_2, n_3, n_4 and n_5) germinated and ungerminated cells. Starting inoculums concentration of 1.5×10^5CFU/ml. Based on the data obtained from MIC and MFC for the most effective oils, concentration was chosen that corresponds to 2×MIC. Germinated and ungerminated cells were incubated in 1 ml of PYG broth at 35 °C for 24 hrs in the presence and absence (control) of various chosen oils. Further samples were taken at time intervals (2, 4, 6, 8 and 24hrs) for viable counts which were carried out by serial dilution of samples by 10 fold in sterile distilled water and plating on SDA(p. 24) and the results were estimated according to log values (Hammer et al., 2002).

Table 3. Minimal fungicidal concentration (MFC) of selected oils against different strains of *Candida albicans* (ungerminated cells).

Oil used (25µl/ml)	Minimum Fungicidal Concentration (µl/ml)				
	Candida albicans n_1	*Candida albicans* n_2	*Candida albicans* n_3	*Candida albicans* n_4	*Candida albicans* n_5
Pine	7.81^{b}	31.25^{b}	7.81^{b}	1.95^{a}	7.81^{b}
Oreganum	1.95^{a}	1.95^{a}	0.48^{a}	0.48^{a}	0.48^{a}
Clary Sage	31.25^{c}	1.95^{a}	1.95^{a}	31.25^{b}	1.95^{a}
Tea Tree	31.25^{c}	125.00^{c}	31.25^{c}	125.00^{c}	31.25^{c}
Thyme	31.25^{c}	125.00^{c}	125.00^{d}	125.00^{c}	31.25^{c}
Clove	125.00^{d}	125.00^{c}	125.00^{d}	500.00^{f}	125.00^{d}
Rose	500.00^{f}	500.00^{d}	500.00^{f}	500.00^{f}	500.00^{f}
Eucalyptus	125.00^{d}	125.00^{c}	500.00^{f}	500.00^{f}	500.00^{f}
Lemon grass	500.00^{f}	500.00^{d}	500.00^{f}	500.00^{f}	500.00^{f}
Lavender	500.00^{f}	500.00^{d}	500.00^{f}	500.00^{f}	500.00^{f}

Means in each column having the same subscript letters are not significantly different

at $P \leq 0.05$.

Transmission Electron microscope (TEM)

On the basis of MIC, MFC values and time-kill curve data. *Candida albicans* (n_1) germinated and ungerminated cells were treated with pine oil (7.81µl/ml), clary sage oil (31.25µl/ml), oregano oil (1.95µl/ml) and tea tree oil (31.25µl/ml) for 24 hrs (MFC endpoint). Freshly taken samples were fixed using a universal electron microscope fixative as described by McDowell & Trump (1967). Series dehydration steps were followed using ethyl alcohol and propylene oxide. The samples was then embedded in labeled beam capsules and polymerized. Thin sections of cells exposed to oils were cut using LKB 2209-180 ultramicrotome and stained with a saturated solution of urinyl acetate for half hour and lead acetate for 2 min (McDowell &Trump, 1967). The procedure was applied to control cells not exposed to oils and to oil-exposed cells. Electron Micrographs were taken using a Transmission electron microscope (JEM-100 CX Joel), at the Electron Microscope Unit, Faculty of Science, Alexandria University.

Statistical analysis

Statistical analysis were performed using SPSS 17-0 soft ware for windows (Statistical Product and Services Solutions,Inc,Chicago,IL,USA).A *p* of 0.05 was set as the significant threshold for all statistical analysis.

Results & Discussion:

Screening for the Antifungal Activity of the Essential (Volatile) and Fixed oils
Measurments of in vitro activity of plant essential oil against *Candida* spp.

Data listed in Table 1 pesents the antifungal activity of 18 essential and fixed oils on the growth of *Candida albicans* spp (n1-n5). Oregano oil was found to be the most effective and significant antifungal agent on the growth of *Candida albicans* (n_1, n_2, n_3, n_4 &n_5) as compared to the other oils tested showing an average inhibition zone of 72 mm followed by several oils in the order of clary sage oil (55 mm) > pine oil (47 mm) > tea tree oil (39 mm) > thyme oil (33 mm) > clove oil (27 mm) > eucalyptus oil (21 mm) > lemon grass oil (18 mm). Whereas rose and lavender oil (11 mm) showed the least and the same antifungal effect $P \leq 0.05$. Otherwise all the *Candida albicans* strains under test were found to be resistant to almond, sesame, fennel, linseed, castor, cactus, cumin and black seed oils. Devkatte et al. (2005) revealed that oregano, tea tree, thyme, clary sage, clove, eucalyptus, lemongrass, rose and lavender exhibited a broad spectrum of antifungal activity with an average inhibition zones of (47±3, 36±4, 35±1.2, 34.3±1.2, 23±1, 9±1, 27, 10 mm respectively) against *Candida albicans* strains SRTCC I, SRTCC II and SRTCC III (Devkatte et al., 2005; Amit & Shailendra, 2006; Rusenova, 2009 and Agarwal et al., 2010).

Oregano oil exhibited a significant variation of MIC values (7.5×10-3-0.03µl/ml) against all *Candida albicans* strains under investigation, followed by pine oil (0.12-0.48µl/ml), clary sage (0.48-1.95µl/ml) and tea tree oil (1.95-7.81µl/ml). Whereas thyme and clove oil showed moderate antifungal property with MIC values between 7.81 and 31.25 µl/ml, eucalyptus and lemon grass oil showed MIC values between 31.25 and 125 µl/ml, while lavender and rose oil showed the least MIC value between 125 and 500 µl/ml against *Candida albicans* strains under investigation $P \leq 0.05$. On the basis of the previous data, the most promising oils that proved to have the most powerful inhibitory effect on the growth of Candida albicans strains under investigation were selected for the detection of the minimal inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) of the selected essential oils (oregano, lavender, clove, rose, clary sage, eucalyptus, lemongrass, thyme, pine and tea tree oils) that proved to be strong and moderate inhibitors for the growth of *Candida albicans* under test with MIC values ≤ 500µl/ml. However, germinated *Candida albicans* reveal efficient MIC & MFC more than ungerminated. Data of the The present work is in agreement with the study done by Rosenova et al. (2009) which found that oregano oil was the most effective antifungal agent against *Candida albicans* isolates at a low concentration of 0.06%(v/v) followed by thyme and clary sage of MIC value equal to 0.5 %(v/v); tea tree oil 1%(v/v) and clove oil 0.25%(v/v). Moreover, the present work is not in conformity with Agarwal et al. (2010) who found that eucalyptus oil was the most effective oil against *Candida albicans* isolates with MIC value equal to 0.05%(v/v) followed by clove 0.33%(v/v) and tea tree oil 0.33%(v/v) (table 2&3). Fungicidal activity of the tested oils was ranging from 7.5×10^{-3}-125 µl/ml for germinated and 0.48-500 µl/ml for ungerminated cells of *Candida albicans* strains (n_1, n_2, n_3, n_4 &n_5) under test. The best MFC value was observed for clary sage, pine, oregano and tea tree oil with germinated and ungerminated cells(table 3) . The antimicrobial activities of these plant oils may possibly be due to the presence of carvacrol and p-Cymene (Manohar et al., 2001 ; Baser, 2002 and Curillo-Munoz et al.(2006). According to Rusenova (2009) oreganum oil was effective against *P. vulgaris, B. licheniformis, M. pachydermatis, S. aureus* and *C. albicans* isolates.

Time- kill assay demonstrated that *Candida albicans* (n5) was highly susceptible to tested oils. showed that the number of colonies for germinated cells was significantly reduced after 12 hrs of incubation and the total fungicidal effect was observed within 24 hrs of contact for all tested oils. The oils under test exerted a rapid fungicidal effect under shaken conditions.While the number of colonies for ungerminated cells was significantly reduced after 24 hrs of incubation and the total fungicidal effect was observed within 48 hrs of contact for all the tested oils. The oils under test, showed a slower fungicidal effect under static conditions (48 hrs) than under shaken conditions (24 hrs)(fig.3&4).

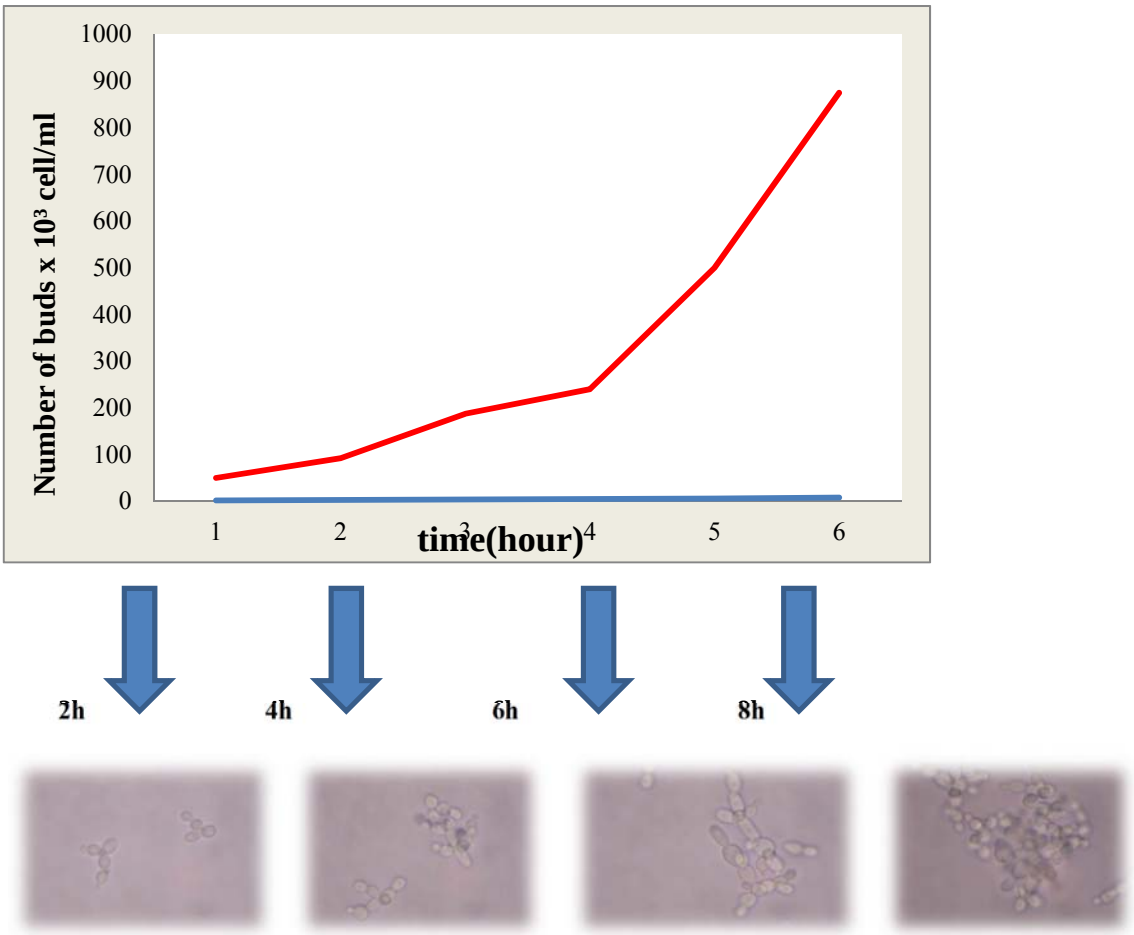


Figure 3: Budding growth curve of *Candida albicans* (n5)growing on peptone yeast glucose (PYG) medium

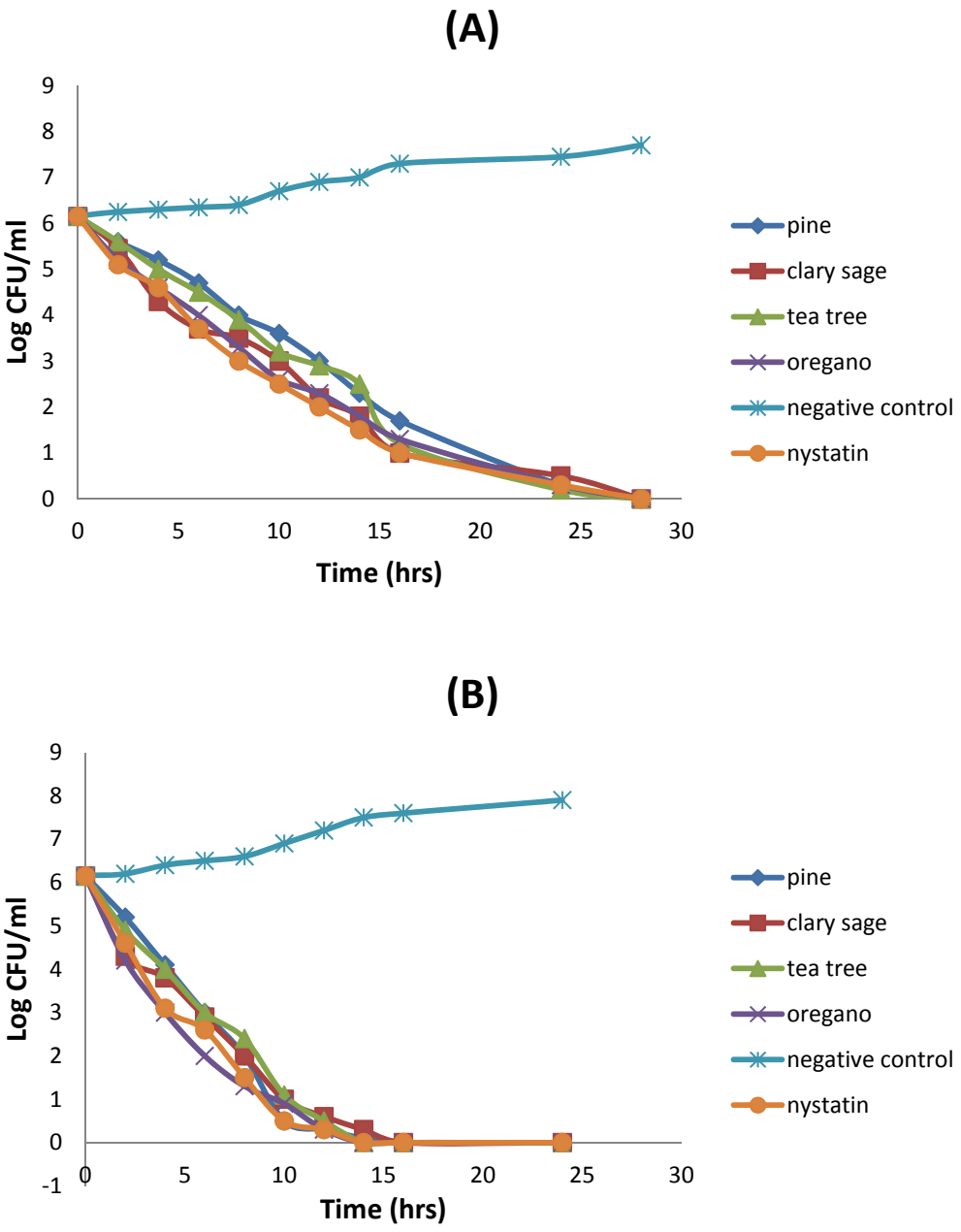
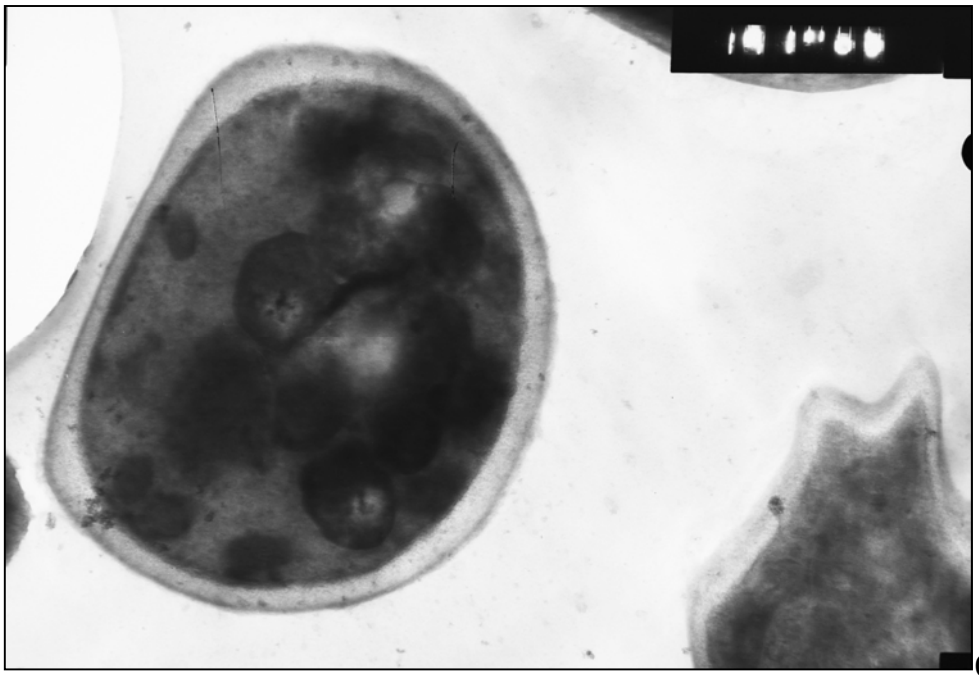
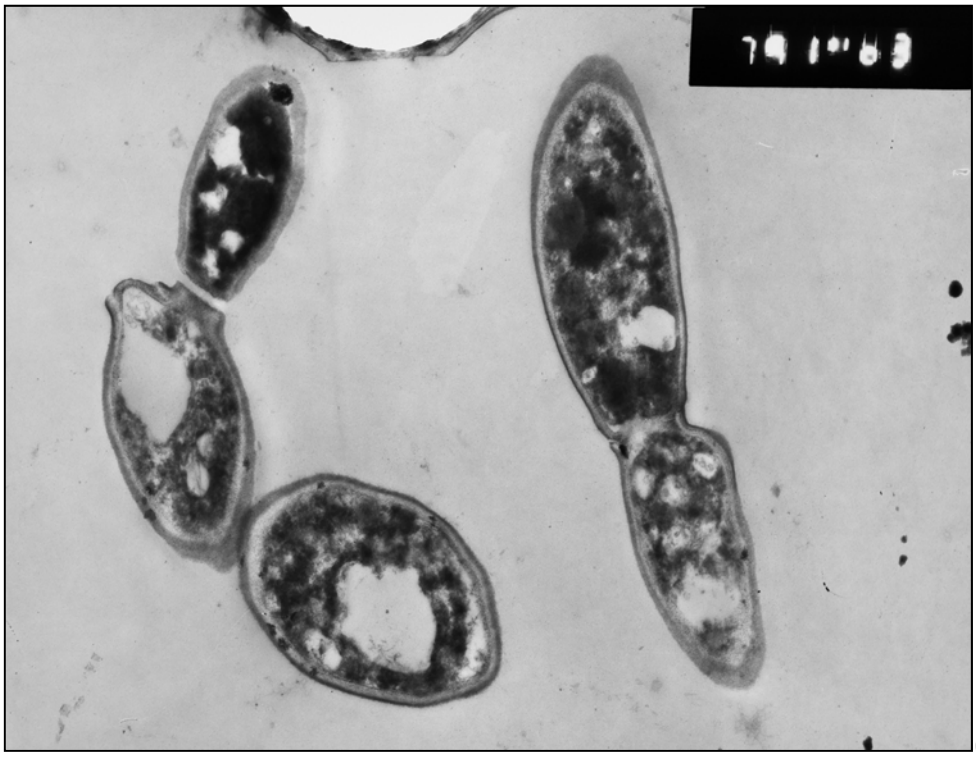


Figure 4: Time-Kill curve of the selected oils against *Candida albicans*(n_5)germinated cells under static (A) and shaken (B) conditions

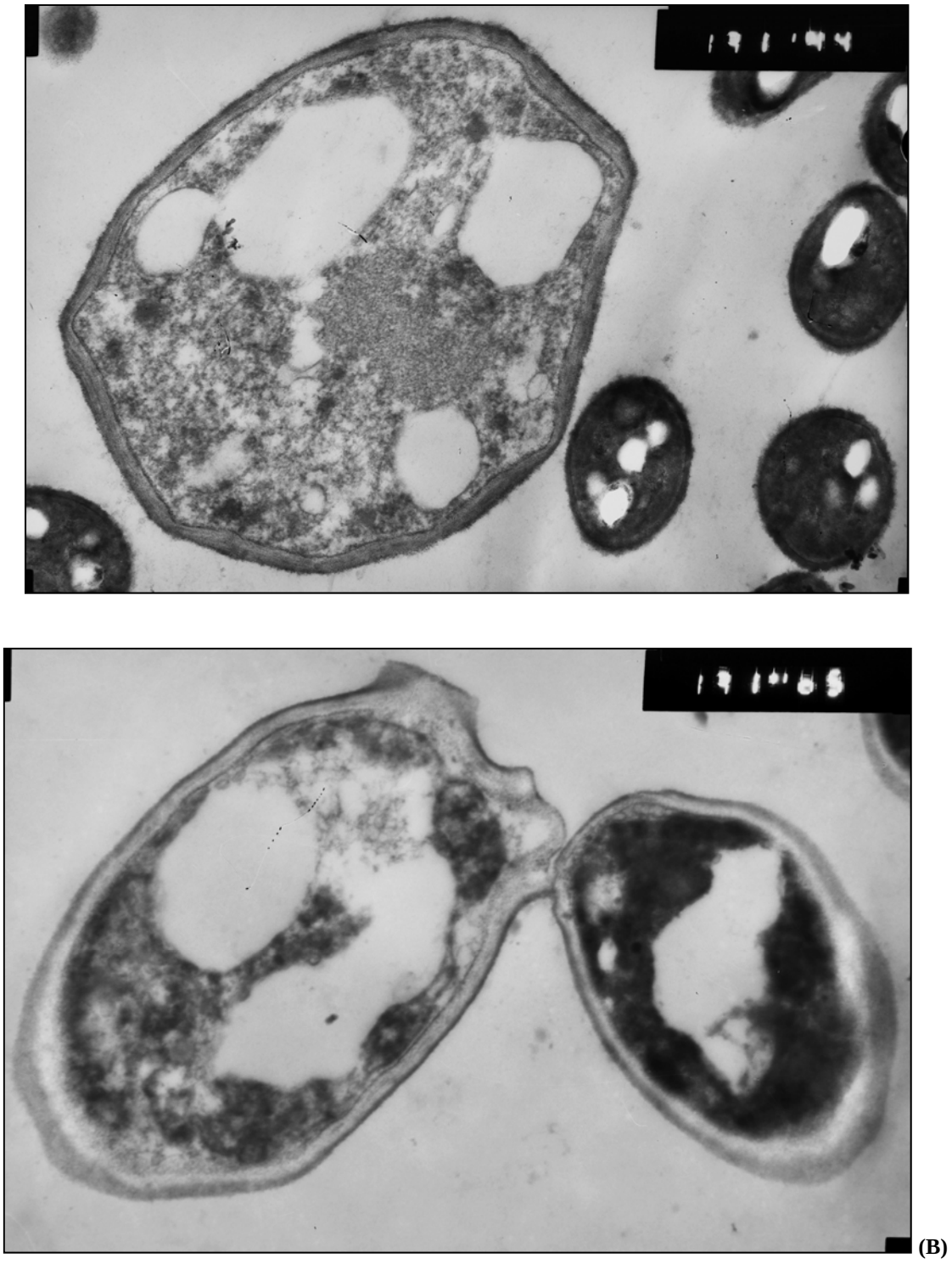


(A)



(B

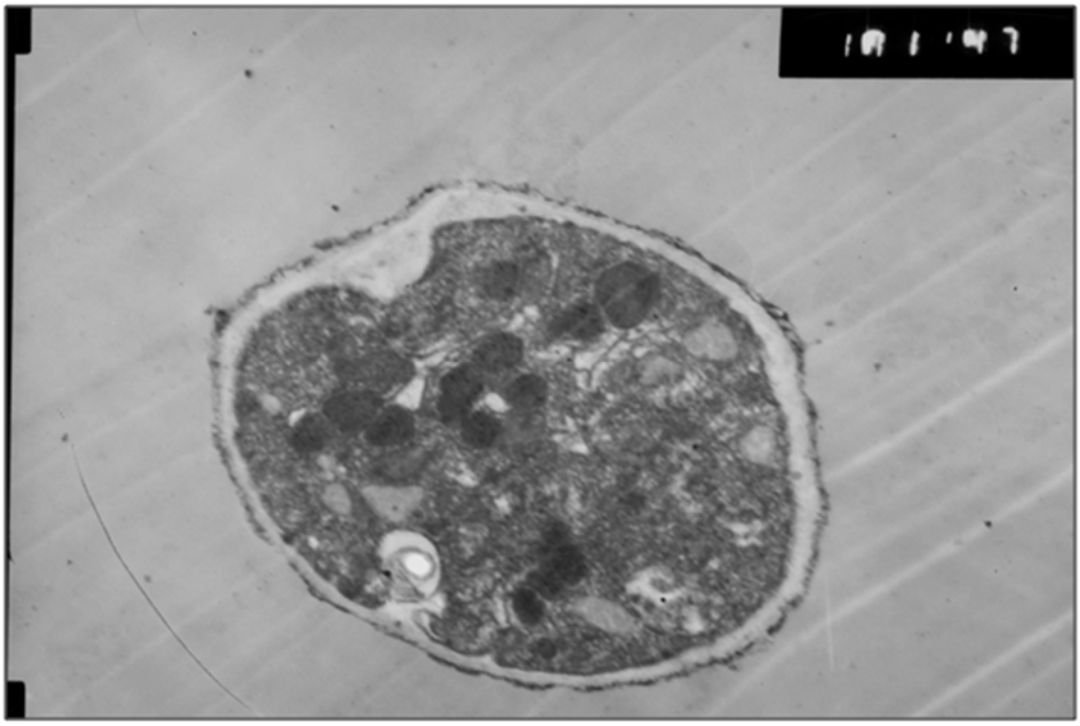
Figure 5. Transmission electron micrographs of *Candida albicans* (n_5) ungerminated (A) and germinated control (B) {*cm*: cytoplasmic membrane, *cw*: cell wall and *v*: vacuoles}



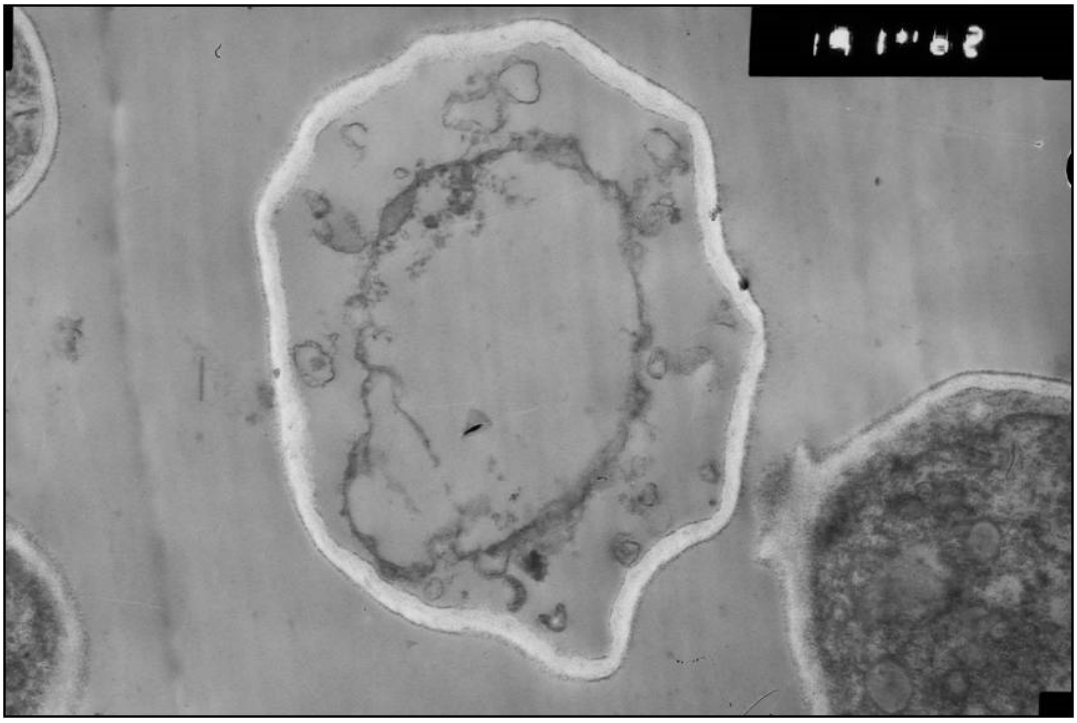
(A)

(B)

Figure 6. Transmission electron micrographs of *Candida albicans* (n_5) treated with pine oil ungerminated cells (A) and germinated cells (B)



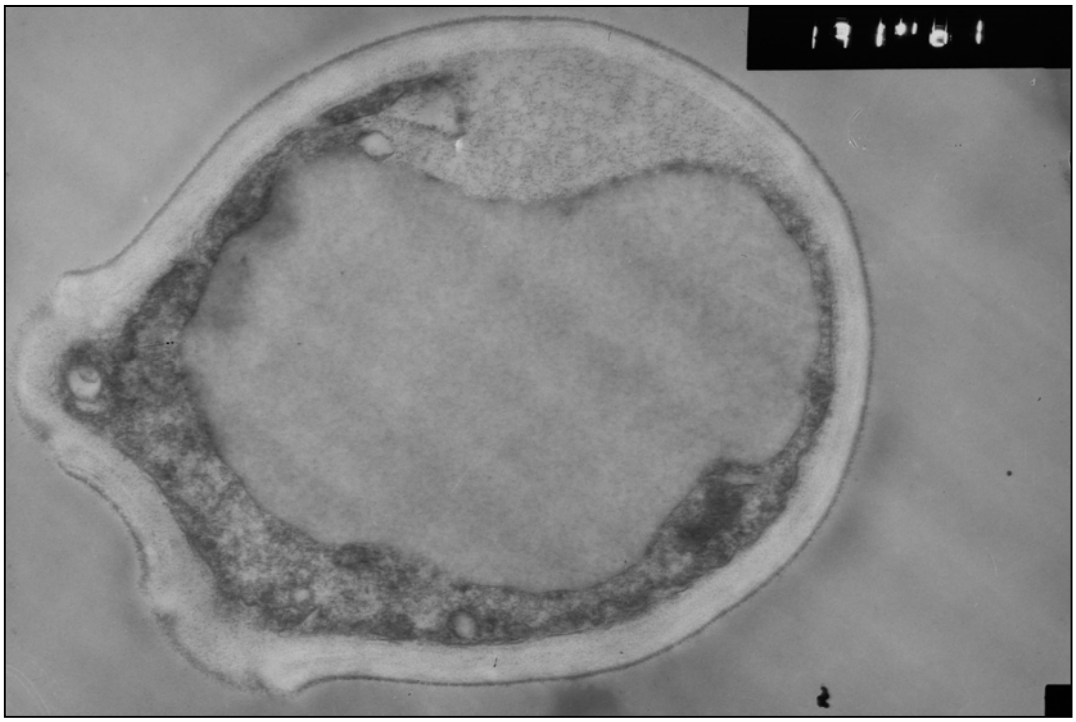
(A)



(B)

Figure 7. Transmission electron micrographs of *Candida albicans* (n_5) treated with tea tree oil ungerminated cells (A) and germinated cells (B)

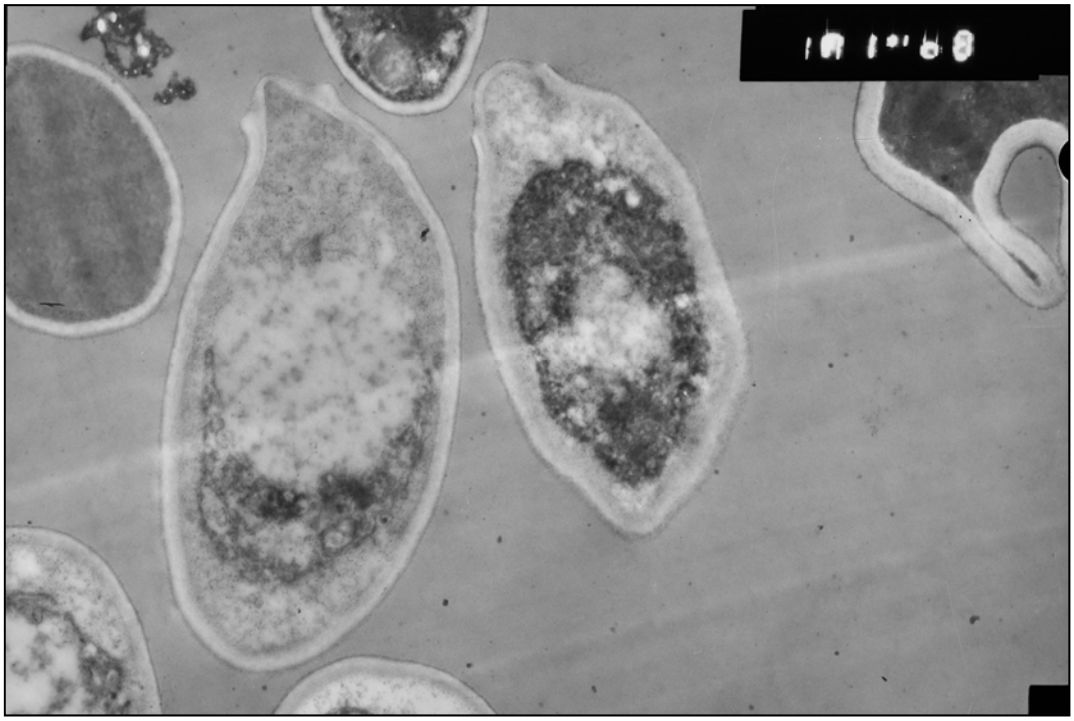
(A)



(B)

Figure 8. Transmission electron micrographs of *Candida albicans* (n_5) treated with clary sage oil ungerminated cells (A)and germinated cells (B)

(A)



(B)

Figure 9. Transmission electron micrographs of *Candida albicans* (n_5) treated with oregano oil ungerminated cells (A)and germinated cells (B).

The oil toxicity against *Candida albicans* cell was tested by transmission electron microscopy. The untreated cells (Control) showed a typical morphology of *Candida* cells with a uniform central density, with intact intracellular structures and envelope and intact cell wall for germinated cells and ungerminated cells.
The cytoplasm of ungerminated cells treated with pine oil did not appear to be homogeneous. Whereas, germinated cells underwent pronounced morphological alterations and loss of integrity of the cell wall. Tea tree oil caused notable alterations in the ultrastructure of the germinated and ungerminated cells as compared to control. Increased granulation of the cytoplasm and diminished cell membrane clarity noticed in germinated than ungerminated cells in comparison with the control.Moreover, ungerminated cells treated with clary sage oil, underwent a partial destruction in the internal membranes, with complete destruction of the cell wall and cell lysis in germinated cells. However, ungerminated cell treated with oregano oil showed very dense with vesicles dispositioned within the cell. The cells exhibited notable alterations in the cell membrane and the cell wall forming structural disorganization within the cell cytoplasm(fig. 5-9).

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Anti-inflammatory activity of acetonic extract of *Pistacia lentiscus fruits*

Hammama Bouriche*; Safia Khalfaoui; Hichem Meziti and Abderrahmane Senotor

Department of Biochemistry, Faculty of Natural Sciences and Life, University Ferhat Abass, Sétif, Algeria

*bouriche_ha@yahoo.fr

Abstract : ***Pistacia lentiscus* L. (*P. lentiscus*) has traditionally been used as a stimulant, for its diuretic properties, and to treat hypertension, coughs, sore throats, eczema, stomach aches, kidney stones and jaundice. In the present study, the anti-inflammatory effect of acetonic extract of P. lentiscus fruits was evaluated. The quantitative estimation of total phenolic compounds showed that the acetonic extract is rich in polyphenols (250.6 ± 14 µg GAE/mg of extract) and flavonoïds (20.6 ± 5.8µg QE/mg of extract). The anti-inflammatory activity of *P. lentiscus* was evaluated *in vivo* using the ear edema model induced by Croton oil and the air pouch model induced by Lambda carrageenan. Three treatments were used. The simultaneously use *of* the extract (3mg of extract/ear) with the irritant agent, the topic use of 3mg of extract/ear and oral administration of 300mg of extract/kg 1hour before the induction of the inflammation. Results obtained showed that *P. lentiscus* extract inhibited significantly the ear edema by the percentages of 68%, 72% and 80%, respectively. These inhibitions were statistically similar to the effect of indomethacin used as a standard anti-inflammatory agent. On the other hand, an inhibitory activity of leukocytes migration was observed in the murine air pouch exudate. The treatment by acetonic extract (1mg/pouch) decreased significantly the number of leucocytes in the air-pouch (34%). This inhibition was statistically similar to the effect of indomethacin. Finally, we can conclude that the acetonic extract of *P. lentiscus* fruits have a considerable anti-inflammatory activity, which support the use of this plant specially their fruits in folkloric medicine.**

Keywords: Inflammation, anti-inflammatory, *Pistacia lentiscus*, polyphenols, flavonoids

Introduction

Medicinal plants have received great interest in biomedical research. They are considered to be an important source of therapeutic compounds and the therapeutic benefit of many medicinal plants is often attributed to their anti-inflammatory and antioxidant properties (Shahidi, et al., 1992; Tunón et al., 1995). The preservative effect of many plant species and herbs suggests the presence of bioactive compounds such as flavonoids, phenolic acids, and phenolic diterpenes (Shahidi et al., 1992; Dutra et al., 2008). *Pistacia lentiscus* (*P. lentiscus*) Linn. (Family - Anacardiaceae), commonly known as mastic tree or mastagi, one of the many evergreen bushes found in the eastern Mediterranean region has a long tradition in folk medicine dating from the times of the ancient. *P. lentiscus* has traditionally been used as a stimulant, for its diuretic properties, and to treat hypertension, coughs, sore throats, eczema, kidney stones and jaundice (Palevitch and Yaniv, 2000). *P. lenticus* gum had a great effect in healing of mucosa, and its current use is limited to treating stomach aches, heartburn and respiratory problems (Ali-Shtayeh et al., 2000; Lev and Amar, 2002). Also, anti-*Helicobacter pylori* activity has been reported (Serafino et al., 2001). The extract of the different parts of the plant shows various activities like anti-atherogenic, anti-inflammatory, antioxidant, antimicrobial, hypotensive, anticancer, anti-arthritis and anti-gout and in treatment of wound, antiasthmatic and anthelmitic activity (Ansari and Siddiqui, 2012). Polyphenols from the leaves are gallic acid and galloylderivatives (Abdewahab et al., 2007), flavonol glycoside and anthocyanins (Romani et al., 2002). Traces amount of myrcetine derivative and catechin are also present (Kıvcak and Akay, 2005). Some reports

available in the literature, studying the antioxidant properties of extract from this plant (Baratto et al., 2003), as well as the total flavonoids content. A little additional research exists on *P. lenticus* anti-inflammatory effects. Therefore, the present study was designed to investigate and evaluate the pharmacological basis for the use of *P. lentiscus* fruits extract in folklore medicine for the treatment of inflammatory disorders. Thus, the anti-inflammatory activity of acetonic extracts of *P. lentiscus* fruits were evaluated on two models of acute inflammation, ear edema and air pouch.

Materials and Method

Chemicals and all reagents were purchased from fluka and Sigma (Germany) and were of analytical grade. The plant material, *P. lentiscus* fruits were collected in November 2010 from Skikda, Algeria. The plant material was identified and voucher specimen was deposited at the laboratory of botany in the University of Sétif, Algeria. The fruits were cleaned and frozen at -32 ° C until use. Swiss albino mice weighing 30–40 g were purchased from the Pasteur Institute of Algiers, Algeria. All animals were divided into different groups each consisting of 7 animals, and were allowed to acclimatize to the animal room conditions for 1 week and had free access to food and water *ad libitum*. Animals were fasted overnight prior the experiments.

The acetonic extract from *P.lentiscus* fruits was prepared by maceration of 150 g of crushed fruits with 100 ml of acidified acetone/eau (7:3 V/V) at 4°C for 24 h with frequent agitation. After filtration, the filtrate was concentrated under reduced preressure at 40°C. The residue was lyophilized using a lyophilizator (PHYWE chrisa) to give a dark purple powder.

Total polyphenol contents were estimated by Follin-Ciocalteu method (Li et al. 2007). Practically, 0.5µl of Folin (10%) was added to 100 µl of extract (0-0.5 mg ml) or gallic acid (used as standard), after 4 min, 400 µl of sodium carbonate Na_2CO_3 solution (7.5%) are added to the reaction medium. After 2 h of incubation in darkness at room temperature, the absorbance was measured at 765nm. Results were expressed as µg of Gallic acid equivalent/mg of extract (µg AGE/mg of extract).

The flavonoid contents were estimated by $AlCl_3$ method (Bahorun et al., 1996). One ml of the extract (0-0.5 mg/ml) was added to 1 ml of 2% methanolic $AlCl_3$. After 10 min of incubation, the absorbance was read at 430 nm. Results were expressed as µg of quercetin equivalent/mg of extract (µg QE/mg of extract).

The anti-inflammatory effect of acetonic extract from *P.lentiscus* fruits was studied using two models of acute inflammation, Croton oil-induced ear edema and ear pouch in mice.

Croton oil-induced ear edema mice was conducted in three ways:

1. Simultaneously use of the treatment with the irritant agent: croton oil-induced ear edema was performed according to the method of Manga et al. (2004). Cutaneous inflammation was induced to the inner surface of the right ear of mice (7 mice each group) by application of 15 µL of acetone containing 80 µg of Croton oil as irritant. Treated animals received topically 3 mg/ear of acetonic extract of *P. lentiscus* fuits. Indomethacin as reference drug was applied topically (0.5 mg/ear). The control group received topically Croton oil alone. The thickness of ears was measured before and 6 h after induction of inflammation using a digital micrometer. The micrometer was applied near the tip of the ear just distal to the cartilaginous ridges, and the thickness was recorded in micrometers. To minimize technique variations, a single investigator performed the measurements throughout each experiment. The edema was expressed as an increase in the ear thickness due to Croton oil application. The inhibition of the inflammation was calculated using the following equation:

Inhibition = ($\Delta T - \Delta E / \Delta T$) x 100, were ΔT: edema size of the control and ΔE: edema size of the treated group by the extract.

2. Topical pretreatment 1 hour before the induction of inflammation: A volume of 15 µl of acetone-water solution (1:1) containing 3 mg of extract or 0.5 mg of indomethacin were applied topically on the inner surface of the right ear of mice. One hour after application of the treatment, 15 µl l of acetone-water solution (1:1) containing 80 mg of Croton oil was applied locally on the inner surface of the right ear of each mouse. The control mice received only 15 µl of the solution of Croton oil. The ear thickness was measured before the treatment and then 4h and 6h after the induction of inflammation.

3. Oral pretreatment 1 hour before the induction of inflammation: Three groups of mice were respectively received orally 0.2 ml of saline solution (control group), 300 mg/kg of acetonic extract of *P. lentiscus* fruits and 50

mg/kg of indomethacin. One hour after, 15µl of acetone-water solution (1:1) containing 80 mg of Croton oil was applied locally on the inner surface of the right ear of each mouse. The ear thickness was measured before treatment and 4 h and 6 h after the induction of inflammation.

The air pouches were raised on the dorsum by subcutaneous injection of 3 ml of sterile air, as previously described (Colville-Nash and Lawrence, 2003). After 4 days, the pouches were re-inflated with 1,5 ml of sterile air. On day 7, inflammation was induced by injection of 0.1ml of Lambda carrageenan suspension 1% (w/v, in saline) into the air pouch under light chloroform anesthesia (Gambero, 2003). One hour after, 0.1 ml of the extract (1mg/pouch) or 0.1 ml of Indomethacin (0.15 mg/pouch) was injected. The control group received only 0.1 ml of Lambda carrageenan suspension. Four hours after the treatment, the mice were sacrificed by cervical dislocation. The pouches were flushed by 0.1 ml of PBS, pH=7.4, and vigorously massage for 30 sec. The pouches were opened with a small incision and the exudates were collected. The leukocytes in the fluid were counted using hemocytometer coulter (MINDRAY Auto Hematology Analyser).

All results were expressed as mean ± SEM. The statistical significant of the results as analyzed by the Student t-test with a value of <0.05 are considered significant.

Results

Results showed that the the acetonic extract of *P. lentiscus* fruits is rich in polyphenols (250.6 ± 14 µg GAE/mg of extract) and flavonoïds (20.6 ± 5.8µg QE/mg of extract).

In air edema model, the mice in the control group that received the solution of Croton oil alone developed after 4 h and 6 h an ear edema characterized by increased thickness of 81 ± 9 µm and 95 ± 6 µm, respectively. Mice treated group simultaneously with the irritant agent by local application of 3 mg/ear of the acetonic extract of *P. lentiscus* fruits induced highly significant reduction ($p < 0.001$) of inflammation compared to control mice. The thickness of the edema 4h and 6h after the induction of inflammation was 26 ± 2 µm after 4 and 23 ± 3 µm after 6h (Figure 1), which correspond to an inhibition of 68% and 76%, respectively. These values are statistically very close to those obtained with Indomethacin. Indeed, mice treated by Indomethacin showed a highly significant reduction ($p < 0.001$) in the inflammation. Edema thickness of the 4h and 6h after the induction of inflammation were 17 ± 6 µm and 15 ± 4 µm, respectively, which corresponds to an inhibition of 79% and 84%, respectively.

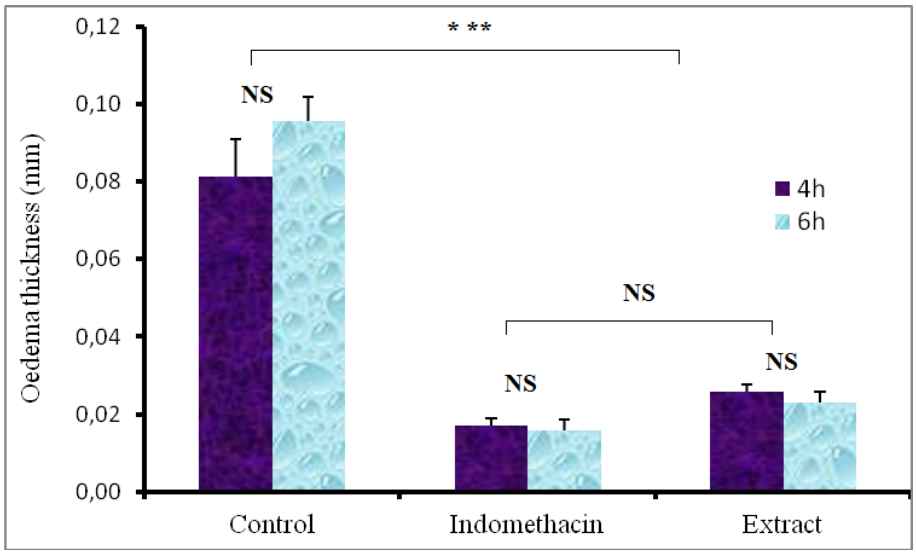

Figure 1. Effect of the acetonic extract of *P.lentiscus* fruits applied topically and simultaneously with the irritant agent on ear edema in mice. The edema was induced by topical application of 80 µg of Croton oil on the inner surface of the right ear of mice. Groups of mice were treated locally and simultaneously with croton oil by 3mg/ear of the extract or 0.5mg/ear of Indomethacin. The control group received the solution of Croton oil alone. Edema is expressed as the mean thickness increase of ears after 4h and 6 h of Croton oil application. Values are expressed as means ± SEM (n = 7). ***P < 0.001. NS: not significant versus the control.

A highly significant reduction (p <0.001) in ear edema is observed in mice locally treated by 3 mg/ear extract 1 hour before the induction of inflammation compared to control mice. The thickness of the edema was 23 ± 3 µm after 4 h and 21 ± 5 µm after 6 h, which correspond to an inhibition of 72% and 76%, respectively. These rates are statistically similar to those obtained with Indomethacin (Figure 2). In fact, a highly significant reduction (p <0.001) in ear edema is observed in mice treated locally by 0.5 mg/ear of Indomethacin 1 h before the induction of inflammation. The thickness of the edema was 11 ± 5 µm after 4 h and 10 ± 4 µm after 6, which correspond to an inhibition of 86% and 89%, respectively.

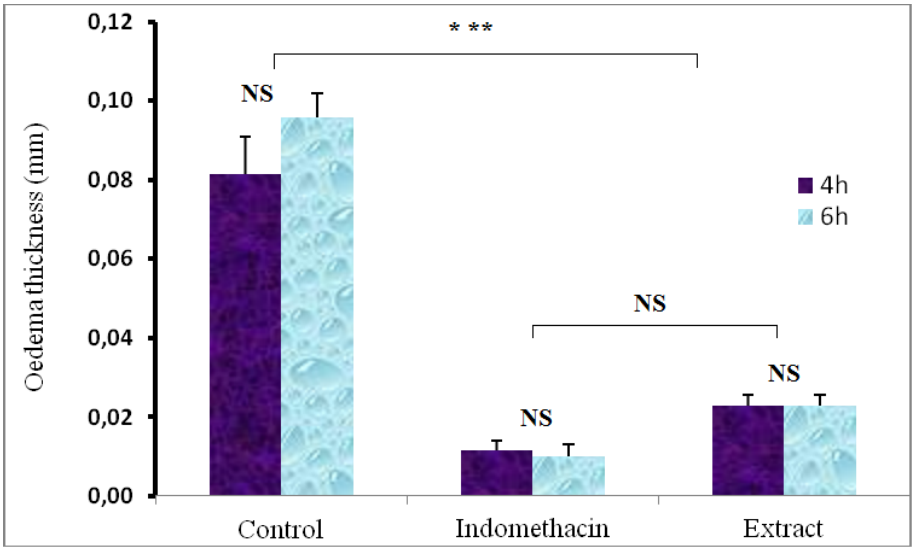

Figure 2. Effect of the acetonic extract of *P. Lentiscus* fruits applied topically 1 hour before induction of the ear edema in mice. The edema was induced by topical application of 80µg of Croton oil on the inner surface of the right ear of mice. Groups of mice were treated locally by 3 mg/ear of the extract or 0.5 mg/ear of Indomethacin 1 hour before the application of the irritant. The control group received the solution of Croton oil alone. Edema is expressed as mean thickness increase of ears after 4h and 6 h of the irritant agent application. Values are expressed as means ± SEM (n = 7). ***P < 0.001. NS: not significant versus the control.

In the oral pretreatment 1 hour before the induction of inflammation, treated mice by 300 mg/kg of acetonic extract *of P. Lentiscus* fruits induced a highly significant reduction (p <0.001) of ear edema compared with mice in the control group. The size of the edema was 16 ± 3 µm after 4 h and 14 ± 2 µm after 6h, which correspond to an inhibition of 80% and 82%. These rates are statistically similar to those obtained with Indomethacin (Figure 3). Indeed, treated mice with 50 mg/kg of Indomethacin 1 hour before the induction of inflammation showed a significant reduction (p <0.001) compared with the control group. The edema 4 h after induction of inflammation was 14 ± 4 µm and 13 ± 3 µm after 6 h, corresponding to an inhibition of 82% and 86%, respectively.

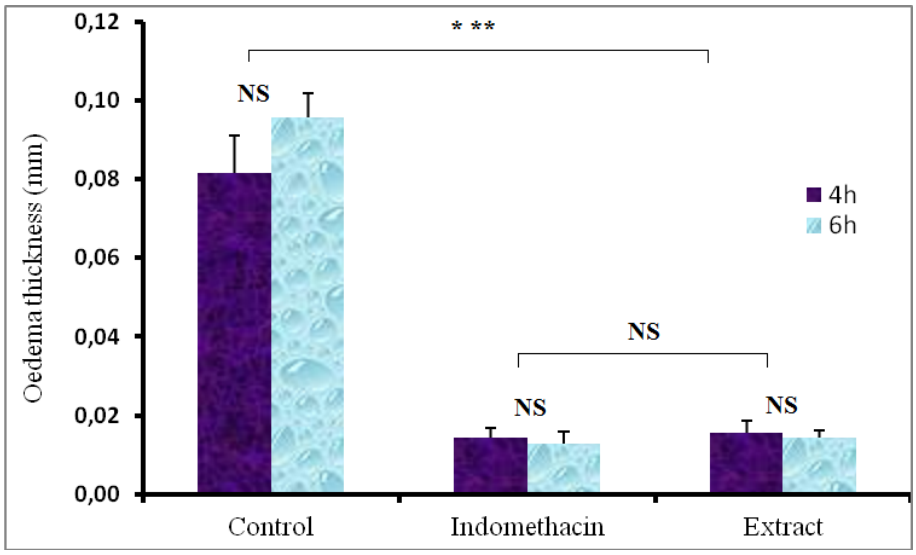

Figure 3. Effect of the acetonic extract of *P. Lentiscus* fruits applied orally 1 hour before induction of the ear edema in mice. The edema was induced by topical application of 80µg of Croton oil on the inner surface of the right ear of mice. Groups of mice are treated by oral administration of the extract (300 mg/kg) or Indomethacin (50mg/kg) 1 hour before the application of the irritant. The control group received the solution of Croton oil alone. Edema is expressed as mean thickness increase of ears after 4 h and 6 h of the irritant agent application. Values are expressed as means ± SEM (n = 7). ***P < 0.001. NS: not significant versus the control.

In air Pouch model, the mice of the control group developed after 4 h an inflammation with infiltration of leukocyte by 7.91 x 10^6 cells/ml of exudate. Treatment by 1 mg/pouch of acetonic extract of *P. Lentiscus* fruits induced a significant (P <0.01) reduction in the number of infiltrating leukocytes (5.24 x 106 cells/ml of exudates) compared to control mice. This value corresponds to an inhibition of 34%, which is similar to that of Indomethacin. Indeed, the number of leukocytes in mice treated by Indomethacin was 5.36 x 106 cells/ml of exudates after 4 h of induction of inflammation, which corresponds to an inhibition of 32% (Figure 4).

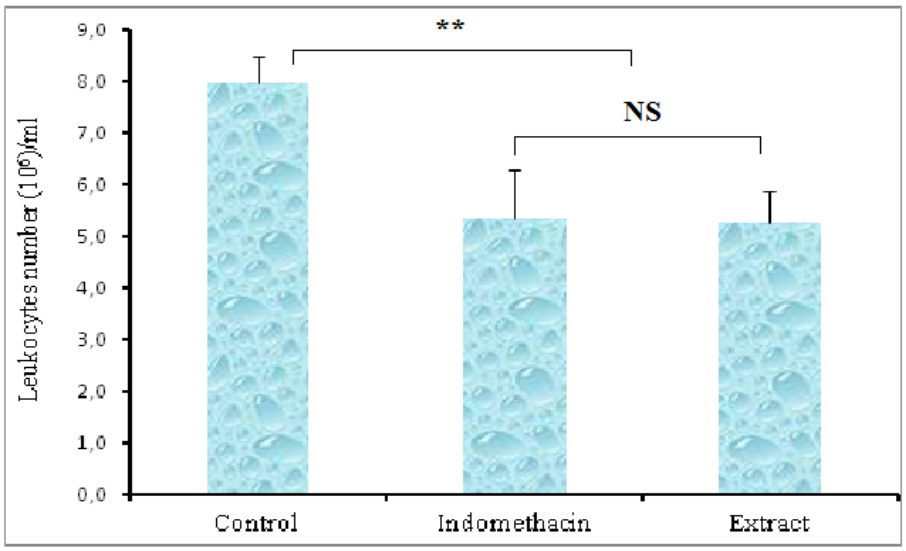

Figure 4. Effect of the acetonic extract of *P. Lentiscus* fruits on the number of infiltrating leukocytes in the exudates. The pouch inflammation was induced by carrageenan (1%). One hour after the induction of inflammation, mice were treated by injection of 1mg/Pouch of the extract or 0.15 mg/Pouch of Indomethacin. The control group of mice received only the solution of carrageenan. The comparison is made with respect to the control group. Values represent the mean ± SEM (n = 7). : ** P <0.01, NS: not significant (Student's t test).

Discussion

Acute inflammation is characterized by classical symptoms, such as heat, redness, swelling and pain. Edema is therefore a good measure of inflammation and is useful for the quantification inflammation induced by phlogistic agents such as croton oil. The Croton oil induced ear edema model has certain advantages for natural product testing and has a good predictive value for screening anti-inflammatory agents that could be useful in the treatment inflammatory disorders (Tunón et al., 1995). The effect of the irritant agent, croton oil, is due to the active 12-O-tetradecanoyl phorbol acetate (TPA) it contains. TPA induces an inflammatory response characterized by high production of pro-inflammatory mediators, increased vascular permeability, edema and neutrophil infiltration (Delaporte et al., 2004). These changes are triggered by protein kinase C, which promotes an increase in the activity of phospholipase A_2 (PLA_2) (Oskarsson et al., 1999). PLA_2 catalyzes the hydrolysis of membrane phospholipids archidonic acid, which is involved in the synthesis of eicosanoïdes, prostaglandins and leukotrienes, which constitute the first step in the inflammatory response (Serhan, 2009).

In the present study, the thickness of the edema is measured 4h and 6 h after topical application of croton oil to assess the anti-edematous effect of the acetonic extract of *P. lentiscus* fruits. Simultaneous treatment of mice with topical application of croton oil and the acetonic extract inhibited the edema formation similarly to the pretreatment by the extract topically or orally 1 h before the induction of the inflammation. This result indicates that there is no interaction between the irritant and the anti-inflammatory agent. The ear edema thickness (68-86%) measured 4h and 6h after induction of inflammation is not statistically significant. This means that 4 hours are sufficient to induce inflammation with croton oil. These results are in agreement with those obtained by Giner-Larza et al. (2002) who reported that the ethanolic extract of the fruits of *Pistacia vera* (a species of the same genus as *P. lentiscus*) inhibited edema induced by carrageenan in mice by a rate of 63%. The anti-inflammatory effect of the acetonic extract of the fruit of *P. lentiscus* is probably attributed to lipophilic soluble substances that are able to penetrate through the skin barrier (Okoli et al., 2007) and exerted its anti-inflammatory activity. Likely candidates for these anti-inflammatory substances are flavonoids, polyphenols, which were isolated from *P. lentuscus*. Indeed, the quantitative estimation of total phenolic compounds showed that the acetonic extract is rich in polyphenols (250.6 ± 14 µg GAE/mg of extract) and flavonoïds (20.6 ± 5.8µg QE/mg of extract), respectively. Phenolic compounds are known to interact with and penetrate through lipid bilayers (Rice-Evans, 2004). The anti-inflammatory effect of the acetonic extract of the fruit of *P. lentiscus* was similar to that of Indomethacin, used as standard anti-inflammatory agent. The mechanism of action of indomethacin on inflammation is based on inhibition of the synthesis of pro-inflammatory prostaglandins (Hull et al., 2003). The anti-inflammatory effect observed is also probably due to the presence of antioxidant compounds in the extract. Abdelwahed et al. (2007) reported that that gallic acid and 1, 2, 3, 4, 6-pentagalloylglucose, two polyphenols isolated from the fruits of *P. lentiscus* fruits exhibit antioxidant activity which is an additional advantage for the anti-inflammatory activity. In fact, Ying et al. (2010) reported that the content of flavonoids in plant extracts, allows them to act at several levels of the inflammatory response.

Leukocyte recruitment in inflamed tissues is essential to the inflammatory response to cleaning the home lesion and thereby adequate tissue repair. In contrast, the excessive leukocyte migration leads to inflammatory disorders. That is why we are interested in counting the cells in a household of acute inflammation, created by carrageenan in an air pouch in mice. The mice in the control group developed after 4h an inflammation at the pouch characterized by a high number of leukocytes 7.91 x 10^6 leukocytes/ml in the exudate. Carrageenan stimulates the release of histamine and serotonin from mast cells, initiating a cascade of events that produce other mediators that contribute to the development of the acute inflammatory reaction (Cuzzocrea et al., 1998). Mice treated by acetonic extract of *P. lentuscus* showed significant reduction (34%) in the number of leukocytes. This inhibition is similar to that of

Indomethacin, used as standard anti-inflammatory agent. Secondary metabolites in fruits of *P.lentiscus* inhibit leukocyte recruitment into the cavity of the air pouch probably by inhibiting the expression of adhesion molecules on endothelial cell as reported before (Anné et al., 1994). Moreover, it reported that anthocyanins and gallic acid inhibit leukocyte migration to inflammatory sites by inhibiting the adhesion molecules ICAM-1 and VCAM-1 and E-selectin in the vascular endothelial cells, this inhibition is due to inhibition of IL-1, TNF-α and NF-κB (Takatoshi et al., 1999; Calixto et al., 2003).

Conclusions

The acetonic extract of the *P. lentiscus* applied topically or administered orally has a good anti-inflammatory effect by inhibiting the development of ear edema and the recruitment of immune cells into the inflammatory site. The anti-inflammatory properties of *P. lentiscus* may be explained in part by the activity of the polyphenols and flavonoids present in its extract. This activities assign a potential role of *P. lentiscus* extracts in human health care and support the traditional uses of this plant in the treatment of inflammatory disorders.

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Applying Blended Learning with Creative Project-Based Learning: A Case Study of Wrapping Design Course for Vocational High School Students

[1]Hua-Yun Hsieh, [2]Shi-Jer Lou, [3]Ru-Chu Shih

[1]Sansin High School of Commerce and Home Economics, Kaohsiung, Taiwan

[2]Graduate Institute of Vocational and Technical education National Pingtung University of Science and Technology, Taiwan

[3]Department of Modern Languages, National Pingtung University of Science and Technology, Taiwan

vincent@npust.edu.tw

Abstract: This study aims to investigate vocational high school students' learning effects and learning satisfaction toward the Wrapping Design course with a combination of blended learning and creative project-based learning. A total of 44 students from the Advertising and Design Course participated in this study and they were divided into 11 teams to conduct gift wrapping design activity. The blended learning in this study combined the traditional in-class instruction and a self-designed online learning platform for the students to discuss and share their ideas and related information. The learning process included teamwork, project-based learning, the inquiring-thinking-doing-evaluating, and the 12 creativity tactics. Data collected from the self-developed satisfaction survey questionnaire, online learning platform, classroom observation, learning portfolio, and finished products were analyzed. The findings of this study reveal that the ideal teaching model for applying blended learning with creative project-based learning should contain seven stages. Additionally, key factors such as the teacher's guidance, the practice of creativity teaching methods, teamwork, and online resources can influence learners' performance and learning effects. Finally, this blended learning approach not only can make up the shortcomings of the traditional in-class learning, but also enhance the learners' skills in independent learning, problem solving, and communication.

Keywords: blended learning, creative teaching, project-based learning, vocational high school students, wrapping design

Introduction

In the past years, creative and cultural industry has gradually become one of important global industries. In order to catch up this new trend, Taiwan government has been actively promoting cultural creative industry. However, a successful cultural creative industry heavily relies on high quality creative talents and the teaching mode and quality are the two fundamental factors for cultivating such talents (Lu & Lin, 2005). Thus, one of the best ways to educate students to possess problem solving skills is to design a student-centered environment connecting with various subjects. When

students focus on solving problems, their learning motives increased (Brab & Landa, 1997; Zhi & Chuang, 2003). Lou, Chung, Dzan & Shih (2012) mentioned that if school can actually provide students hands-on experience and sense creativity, their creativity can be inspired. In today's increasingly competitive market, wrapping design plays an important role in the enterprise development, and the demand for packaging design talent is also increasing. On the other hand, in terms of the design industry's talent needs, Lu and Lin (2005) pointed out that the design talents' design expertise is the most important factor, followed by the ability to solve problems, and teamwork, and professional and technical ability. Therefore, this study aims to (1) explore students' learning effectiveness and satisfaction; (2) develop the blended creative project-based teaching model; and (3) providing useful suggestions for the implementation of vocational high school packaging and design course.

Literature Review

With the vigorous development of information technology and the advents of various forms of digital learning tools, teaching methods need to be in response to different teaching environments or mixed medium of instruction. Blended learning integrates formal and informal learning, face-to-face and online learning, self-directed learning, and digital reference resources and connecting with group members (Lou et al, 2010; Shih, 2010; Shih; 2011; Shih; 2012; Rossett & Frazee, 2006). Past studies show that blended learning has the following characteristics: (1) pedagogical richness, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost effectiveness, and (6) ease of reversion. From the above mentioned, blended learning not only integrates the benefits of face-to-face and online teaching environments, but also the teachers can identify the most suitable teaching mode in a blended learning environment (Osguthorpe & Graham, 2003; Kose, 2010).

Project-based learning (PBL) is a systematic teaching approach, which emphasizing on students learn knowledge and practical skills through exploring complex life issues and well-planned learning tasks (BIE, 2007). Through living and learning project to integrate different disciplines of curriculum and carefully arrange complex, and real tasks to design motivation enhancement and cognitive strategies to create a peer cooperative learning environment and conduct inquiry-based learning activities, so that the students can acquire problem-solving knowledge and skills (Li, Lou, Chu, & Liu, 2009). Through project-based learning, students will be able to find their own interests and thus to trigger their independent learning motivation (Nastu, 2009; Kose, 2010).

Creative teaching refers to teachers can adopt diverse, active, and rich content to stimulate students intrinsic learning interest to cultivate their attitude of willing to learn and thus to enhance their learning ability (Wu, 2002). In this study, creative teaching was integrated with blended creative project learning, and its teaching process included Chen's (1990) ATDE (Asking-Thinking-Doing-Evaluation) create thinking teaching model, Lin's (2004) creative teaching model, and the 12 "creative tactics." expect to allow students willing to think and learn, and to further enhance its ability to create and creative thinking teaching strategies.

To summarize the above-mentioned literature review, this study aims to apply blended creative project-based learning to the Wrapping Design course of a vocational high school. During the teaching process, creative teaching, project-based teamwork learning, and strategies for blended learning and digital learning system will be merged into the curriculum to further enhance students' performance and creativity to achieve the teaching goals.

Research Method

Case study, observation, and questionnaire survey were administered in this study. The seven phrases, including preparation, situation observation and raising questions, guiding discussion and confirming questions, generating creative proposal, implementing creative proposal, outcome presentation, and evaluation from the blended creative project-based learning model were introduced to the teaching sessions. The implementation of the study included blended teaching combining digital learning and traditional in-class instruction, teamwork and situated guidance project-based learning, ATDE, and the 12 creative tactics.

Participants

A total of 44 students enrolled in the Wrapping Design course rom a vocational high school in southern Taiwan were divided into 11 teams and participated in this study. The teaching experiment lasted for 12 weeks.

Research Instruments

The research instruments contained the Learning Effectiveness Checklist, the Learning Satisfaction Survey Questionnaire, Student's Learning Observation Record, and the Online Learning Platform. The

1. Learning Effectiveness Checklist: design creativity, box structure, and visual perception were evaluated.
2. Learning Satisfaction Survey Questionnaire: it contains four domains, including teaching and course arrangement, online learning platform, learning attitude, and learning fulfillment. A total of 27 questions in a five point Likert scale and 3 open-ended questions in the questionnaire.
3. Student's Learning Observation Record: includes in-class observation and learning platform observation.
4. Online Learning Platform: contains course information, discussion forum, message board, blogs, bulletin board, downloads, and small group discussion areas, etc. Figure 1 shows the entry page of the online learning platform.

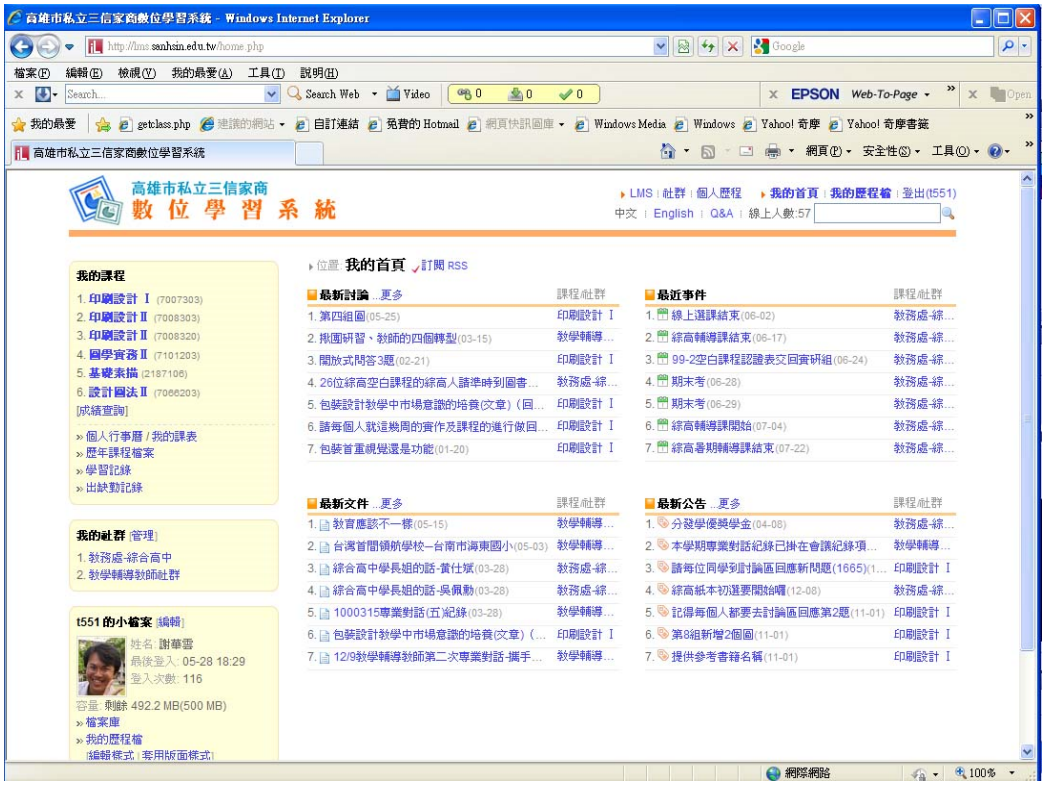

Fig. 1 The entry page of the online learning platform

Data Analysis

All quantitative data collected from the survey questionnaires were analyzed by SPSS 12.0 descriptive statistics, t-test, and One-way ANOVA

Results and Discussions

The following section depicts the top three students' works, the three teachers' assessments on the top three products of the students work, and the analysis of students' responses to the survey.

1. The descriptions of the top three student s' works

Table 1 shows the descriptions of the top three students' works. After the completion of the works, the three teachers' assessed and scored all the 11 teams' works. Finally, Teams 5, 3, and 10 ranked the top three prizes.

Table 1 The descriptions of the top three students' works

Team	Name of Work	Description	Photo
Team 3	Candy Box	This box is designed for candy. It also can be used for cookies and chocolate. The special feature of this box is a bear with two arms holding up the box. The inner box is a 3 layer design. The color of the box is light yellow.	
Team 5	Canned Food Box	This box is designed for canned food. The inner box is a 2 layer design. The color of the box uses read and purple colors to represent luck and joy.	 
Team 10	Cake Box	This box is designed for rectangle-shaped honey cake. The major box contains 4 small boxes. Each box is a 2 layer design. The four boxes represents the four seasons decorated with the seasonal flowers.	 

2. The three teachers' assessments on the students' works

Table 2 The Statistical results of the three raters' scores

N	Kendall's W (a)	Chi Square	df	Sig.
3	.964	28.911	10	.001

Table 2 shows the three teachers' scores on the students' works obtained a .963 of Kendall ω coefficient correlation, chi-square=28.894, p=.001<.05, indicating the three teachers' scores are significantly related and consistent. That is, Team 5 ranked top one, followed by Team 3 and Team 10.

3. Analysis of students' responses to the survey questionnaire

Tables 3 to 6 show the statistical results of the four domains of the students' responses to the survey.

Table 3 Statistical results of the teaching and course arrangement domain

Item	Statement	Mean	SD	t value	Sig.
a1	In the beginning, the situated guidance and description can enhance my learning motivation.	3.93	.73	8.49	.000
a2	The teaching materials and samples can help me learn faster and easily.	3.98	.72	8.63	.000
a3	The instructor's guidance and assistance can help me stay on the right track for learning.	4.29	.60	13.75	.000
a4	The course design and assignments are appropriate.	3.66	.82	5.11	.000
a5	Teamwork can help carry out the project smoothly.	4.09	.92	7.67	.000
a6	Creative thinking approach and strategies can help me solve problems.	3.92	.75	7.86	.000
a7	I have learned a lot from observing other teams' works and presentations. ◦	4.00	.707	9.06	.000
a8	The teaching methods enable me to think critically.	3.93	.69	8.66	.000
a9	The teaching methods enable me to learn actively and aggressively.	3.63	.73	5.53	.000
a10	I am satisfied with this course.	3.64	.81	5.21	.000

Test value=3

According to Table 3, a1 to a10 are the questions from the teaching and curriculum domain, which obtained means greater than 3 with p=.000<.01. Particularly Item a3 “The instructor’s guidance and assistance can help me stay on the right track for learning” obtained the highest mean of 4.29 and item a9 “The teaching methods enable me to learn actively and aggressively” obtained the lowest mean of 3.63. These results suggest that the instructor’s proper guidance and assistance to students are necessary and helpful to the students’ learning. Meanwhile, it could be because this typed blended creative teaching is new to the students, which was contrary to the traditional in-class instruction, the students need more time to get used to and adjusted to this new type of instruction.

Table 4 Statistical results of the online learning platform domain

Item	Statement	Mean	SD	t value	Sig.
b1	I like to share ideas on the platform or discussion forum.	3.66	.68	6.43	.000
b2	Through online learning platform, my learning interest is enhanced.	3.66	.64	6.78	.000
b3	Interacting with others in the discussion forum can inspire my creative thinking.	3.84	.64	8.65	.000
b4	Through online learning platform, I like to explore more issues and topics.	3.75	.58	8.64	.000
b5	Online learning platform can assist our team learning.	3.72	.85	5.71	.000
b6	I am satisfied with learning through online learning platform.	3.89	.69	8.53	.000

Test value=3

According to Table 4, b1 to b6 are the questions from the online learning platform domain, which obtained means ranging from 3.66 to 3..89 (p=.000<.01), indicating the students are satisfied with learning through the online learning platform. Although the mean scores of the 6 items are close, showing that the students are moderately satisfied with the platform. In the future, more effective and interesting teaching approaches and materials can be added to the online learning platform to increase the students’ satisfaction if use.

Table 5 Statistical results of the students’ learning attitude domain

Item	Statement	Mean	SD	t value	Sig.
c1	I can communicate well with my team members and work harmoniously.	4.18	.87	9.01	.000
c2	I can actively participate in small group discussions and knowledge sharing.	4.27	.54	15.52	.000
c3	I always actively seek for teacher or classmates help while designing wrapping box.	3.89	.69	8.53	.000
c4	I am willing to spend more time and efforts to collect and	3.86	.73	7.80	.000

	analyze data and work in order to solve encountered problems.				
c5	I am more serious and diligent in learning this course than other courses.	3.77	.83	6.17	.000

Test value=3

According to Table 5, c1 to c5 are the questions from the students' learning attitude domain, obtained means ranging from 3.77 to 4.27 (p=.000<.01), indicating the students possess positive and active learning attitude toward this blended creative learning. Particularly, item c2 "I can actively participate in small group discussions and knowledge sharing" obtained a high mean of 4.27, indicating the students were able to actively participate in the group discussions and sharing knowledge.

Table 6 Statistical results of the students' learning fulfillment domain

Item	Statement	Mean	SD	t value	Sig.
d1	Combining traditional in-class instruction with blended learning and online learning platform can increase my understanding to wrapping design practice.	4.00	.75	8.88	.000
d2	This blended creative project-based learning can help groups design and produce their works nicely.	3.84	.68	8.20	.000
d3	Through teamwork to complete the task brought to me the sense of fulfillment.	3.82	.79	6.91	.000
d4	I will be very capable and confident about collecting wrapping design related information in the future. ◦	4.00	.68	9.73	.000
d5	I will be able to analyze and solve wrapping design related problems in the future.	3.82	.62	8.75	.000
d6	I am very confident in creative design practice after taking this class.	3.98	.59	10.98	000

Test value=3

According to Table 6, d1 to d6 are the questions from students' learning fulfillment domain, obtained means ranging from 3.82 to 4.00 (p=.000<.01), indicating the students possess high fulfillment toward this blended creative learning. Particularly, items d1 "Combining traditional in-class instruction with blended learning and online learning platform can increase my understanding to wrapping design practice" and d4 "I will be very capable and confident about collecting wrapping design related information in the future" obtained the highest mean score of 4.00, revealing that the students feel confident and capable about doing wrapping design through this blended creative project-based learning.

To conclude, all the students possess positive and active learning attitude toward this blended creative project-based learning. Through the online learning platform, the students were able to discuss and share ideas and knowledge with others, which enabled the students become more confident and capable in making wrapping design.

Conclusion

The findings of the study show that the students are satisfied with this new learning approach for wrapping design course through blended learning. The students not only can access and obtain various resources in-class instruction but also from online learning platform. Also, project-based learning provides the students teamwork opportunity to stimulate creativity and design ideas as well as to solve problems. Through the online learning platform, the students became more independent and confident. Additionally, the students' learning motivation is enhanced through this blended creative project-based learning. Finally, the creative teaching approach brings different aspects to the wrapping design course and makes the course more joyful and effective.

Suggestions

The following are the suggestions for improving the wrapping design course. First of all, group member's teamwork should be emphasized and balanced, and their feedback and comments should be fully discussed and responded in order to run the course effectively. Second, the students' drawing ability should be reinforced before the class. If the teacher can provide at least two to three weeks for drawing, the teaching would be more effective. Finally, the blended creative project-based teaching and the online learning platform can be applied to various instructions of subjects to enrich the teaching content and enhance the students' creativity.

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Changes of Microbial Population and Some Components in Carrot Juice During Fermentation with Selected Autochthonous Lactobacillus Plantarum Strains

Tayeb Idoui

University of Jijel, Laboratory of Biotechnology, Environment and Health, (18000) Algeria

tay_idoui@yahoo.fr

Abstract: Since the great age, lactic acid bacteria (LAB) have taken a part in the human feeding. They participate in many food fermentations. The fermented vegetable products are the base of our study. The use of three starters of *Lactobacillus plantarum* locally isolated for lacto fermented carrot juices elaboration, allowed us to stir up the following results: the lactic acid content of juices is varying, pH values decrease from 6,5 to 3,55 – 3,57. We got a solution to the jellification problem thanks to the lacto fermentation of carrot juice as it was confirmed by the viscosity results. After three days of fermentation, microbiological analysis of juice revealed an average number of *Lb plantarum,* which reach 3 to 6× 10^4 cfu / mL. Finally, the sensory quality of the juices is acceptable.

Keywords: *Lactic acid bacteria, Lb. plantarum, Carrot juice, Lactic fermentation*

Introduction

The single most important development permitting the formation of civilization was the ability to produce and store large quantities of food. A solution of this dilemma is the use of fermentative microorganisms. In fermentation, the raw materials are converted by microorganisms to products that have acceptable qualities of food. In fermented products, lactic acid is produced by the starter culture bacteria to prevent the growth of undesirable microorganisms (Ray and Daeschel, 1993)**.** Microorganisms of genera *Lactococcus, Lactobacillus, Leuconostoc, Streptococcus* and *Pediococcus* are involved in these fermentations (Daly and Davis, 1998)**.** Among, vegetables of industrial interest, the carrot can provide juices that could be preserved by lactic acid fermentation (Salih and Drilleau, 1992)**.** They present advantages of order dietary since the final juice contains little sugar, its content in carotene is identical to the one of the final juice and its content in nitrate is decreased (Andersson, 1985)**.** *Lb. plantarum* is probably the most advantageous of the more commonly used bacteria for the conversion of lactose, sucrose, glucose and fructose to lactic acid because it not only utilizes the sugars with high conversion rates but also utilizes other compounds such as pectin present in plant products. *Lb.plantarum* is often used as a starter culture in the production of fermented commodities such as sausage, cucumber pickles and silage (Fu and Mathews, 1999).

Factors affecting microbial growth are mainly temperature, degree of exposure to air, properties of carrots such as fermentable sugar level, buffer capacity, pH, acidity, natural inhibitory compounds and produced lactic acid amount. These factors affect maximum specific growth (mm) of *Lb. plantarum* in carrot mash fermentation process (Passos et al., 1993). The growth yield is directly related to kinetic parameters of the product formation in the fermentation process. There are very few kinetic studies related to complex natural vegetable medium.

Many lacto fermented products have the reputation to be beneficial for health, because the lactic acid bacteria play a primordial role in the digestive microbial ecosystem.

The aims of this research were in the first; to include tests of manufacture of the fermented carrot juices using the locally strains of *Lactobacillus plantarum* BJ0021, BJ041 and BJ052. In second, it consists in testing pectinolytic activity of the strains in the carrot juices and lastly, to study the effect of the lactofermentation on the stability and the composition of the carrot juices.

Materials and Methods

Carrot

Carrots of variety Muscad of Algeria used in our experimentation were from the region of Mostaganem located in western Algeria. The production of carrot juice was performed according to the method described by Salih and Drilleau (1992)**.** The carrots were washed, peeled, ground and pressed. Carrot juice is pasteurized to 85 °C during 5minutes then cooled and is centrifuged at 30 000 g for 5 minutes. After filtration and distribution into bottles the carrot juice was heated to 80 °C during 2 minutes and stored at -2 °C.

Preparation of inocula and development of fermentation

Strains of *Lactobacillus plantarum* BJ0021, BJ041 and BJ052 used for the controlled fermentation of carrot juice were isolated from traditional Jijelian butter at the Laboratory of Molecular Biology and Genetics, University of Oran, Algeria (Idoui and Karam, 2008).

Mother cultures were applied for the fermentation experiments. By putting the dried starter culture in carrot juice and using the acidified juice as an inoculum, pH 4.6 was reached in approximately 18 hours. The carrots juices were sowed by their inoculums starters and incubated at 35 °C. The lactofermented juices were processed according to the flow diagram shown in Figure 1.

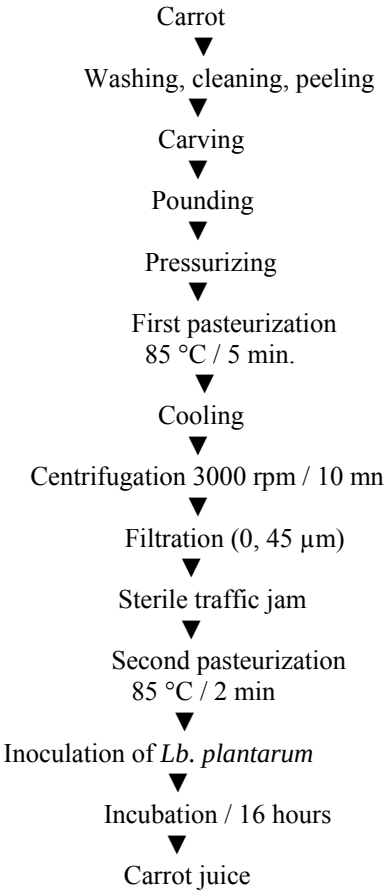

Figure1. Flow diagram of carrot juice production

Analytical methods

The gotten products were submitted to an analysis physicochemical at the first day, the third day and the sixth day. The pH measurement was obtained with a pH meter (HANNA), calibrated with two standard solutions buffered at pH 4.00 and pH 7.00. The total acid values were obtained by titration a volume of juice with a 0.02 N NaOH to pH 8.3. Total dry matter weight was evaluated after evaporation and desiccation of carrot juice for 04 hours at least under steams at 105 °C. Determination of minerals Na^+ K^+ and Ca^{2+} was done as follows. The samples were lyophilized separately. Then 0.8 g of lyophilized samples was mineralized in a microwave oven with concentrated HNO_3. The concentrations of all elements were estimated by a Perkin-Elmer 5100 ZL atomic absorption spectrometer using the flame method (Gorinstein et al., 2001).

The determination of the viscosity was obtained as follows: a glass ball of density 2.2 was introduced in a small cylinder filled of carrot juice. This ball browses a distance (x) during the time (t); the hold of time (t) is done with the help of a chronometer. This operation takes place in adequate conditions (20 to 25 °C - Pressure 1 atm). The viscosity is determined by the following formula:

$$\eta = K(\tau_1 - \tau_2)t$$

[K is a constant according to the density of the ball (mpa.s. cm^3 / g. s), τ_1 and τ_2 are respectively the ratio mass: volume (g /cm^3) of the glass ball and of the carrot juice. t: The time browsed by the ball between two points].

Microbiological Quality of carrot juice

The numbering of the lactic acid bacteria and the yeasts-moulds has been achieved. *Lb. plantarum* was enumerated on MRS agar. Plates were incubated under anaerobic conditions at 35 °C for 24 Hours (Idoui and Karam, 2008). Total yeasts and moulds were counted on oxytetracycline glucose agar (OGA); the plates were incubated at 25 °C for 3 days to 5 days.

Sensorial evaluation

The carrot juices have been submitted to the appreciation of a jury composed of eight judges. Sensorial evaluation was performed by describing the odor, flavor and appearance of samples. Taste, odor and total effect were evaluated out of 5 points, and color was evaluated out of 3 points. Results were classified as preferable (total points: 15–18), barely acceptable (total points: 11–14), needs modification (total points: 8–10) and not acceptable (total points <7) (Schobinger, 1985).

Statistical Analysis

The results were summed to variance analysis (Newman Keuils at 5 % and 1 %).

Results and Discussion

Physicochemical parameters evolution

According to results of the table1, the total dry matter of the lactofermented carrot juices increases from 61.43 ± 0.12 % to 68.90 ± 0.09 %, 67.50 ± 0.18 % and 65.50 ± 0.09 % with +7.47 %, + 6.07 % and + 4.07 % to the profit of juice fermented by the strains BJ052, BJ0021 and BJ041 respectively, in comparison to the witness juice ($P < 0.05$). With regard to the pH, there is a reduction of this last of pH6.5 to about pH3.55 in juices fermented, whereas it reaches pH 3.86 in the witness's case during period of conservation. Otherwise, the total acidity initially oscillate between 5.85 g / L to 15.50 g / L with *Lb. plantarum* BJ052, 5.95 to 13.70 g / L with BJ0021strain and 6.65 to 13.90 g / L with the BJ041 strain during the manufacture and the conservation. The raw juice knew a fluctuation with a maximum of 6.06 g / L at the third day. There is heterogeneity within the same species ($P < 0.05$), of the point of view of the acidification of the medium. Indeed *Lactobacillus* is a heterogeneous kind in which one can note very appreciable differences of acidifying properties between strains. BJ0021 and BJ052 are good acidifying strains compared to BJ041. The sowed juices presented some superior quantities in lactic acid in comparison to the raw juice. We noticed a decrease of the acidity from the sixth day that can be explained by a contamination by oxidative yeasts that consume the lactic acid, leading to a better growth of contamination micro organisms.

The lactic acid fermentation permitted to have some edible products but with an acidic flavour. On the other hand, after 24 hours of manufacture, the raw juice showed a viscous aspect.

The use of the three *Lb. plantarum* strains permitted to solve the problem of jellification observed with raw juice. The thus gotten fermented products, rich enough in lactic acid, can present several nutritional and therapeutic interests (Aubert, 1981). Within the nutritional aspect, the deterioration of the pectin's carrot juice due to versatile activities led to the enrichment of the carrot juice in simple sugars that may easily been absorbable. In the production of vegetable juices, lactofermentation may also facilitate juice yield. Lactic starters such as *Lb. plantarum* can produce pectolytic enzymes such as polygalacturonase, pectinlyase and pectinesterase (Karam and Belarbi, 1995).

Otherwise, *Lb. plantarum* BJ0021 lowered the pH to 3.81 at the end of three days, ideal pH permitting to offer juice a pleasant, acidic and flawless flavour of odour .Our observations were also about the speed of lowering of the pH, *Lb plantarum* BJ0021 manages to lower the pH of the carrot juice to pH 3.81 at the end of three days. This value is very interesting on the technological plan because according to Salih and Drilleau (1992) the ideal pH that permits to offer the carrot juice a pleasant acidic and flawless flavour of odour is pH3.7. To improve the flavour of juice fermented it is necessary to search for other heterofermentative strains (Salih and Drilleau, 1992), in the same way the addition of salts or spices improves the flavour of vegetables lactofermented juice.

The table 2 shows that the viscosity of the raw juice increases to reach 1848 Cps. In industry of fruit juice and vegetables this kind of defect prevents the commercialization of the product. On the other hand, the inverse effect ($P < 0.01$) is observed with juices fermented with –30.8, -23.1 and-3.85 Cp to the profit of products fermented respectively by *Lb.plantarum* BJ052, BJ0021 and BJ041 and compared to the juice witness. The cellular partition of carrot understands more of 80 % of polysaccharides composed of pectin (45 %) highly methyl to fast jellification. The final phase of the jellification is characterized by a system biphasic. This result is in agreement with the works of Salih and Drilleau (1992). In the other although pectin of carrot become a jell in presence of

sucrose, and in acidic environment, the results show an absence of the jellification in small bottles of juice fermented it is related probably to a pectinolytic activity of these bacteria.

Table 1. Evolution of some physicochemical parameters of the lactofermented carrot juice and witness

Carrot juice		Dry matter (%)	pH	Lactic acid (g/ L)
Raw Juice	-	61.43 ± 0.12	6.50 ± 0.00	0.30 ± 0.00
	16 hours	61.60 ± 0.12	5.10 ± 0.00	0.71 ± 0.07
	1 day	62.43± 0.20	5.04 ± 0.00	1.31 ± 0.07
Witness	3 days	62.30± 0.10	4.24 ± 0.00	6.06 ± 0.02
	6 days	62.13± 0.20	3.86 ± 0.01	2.90 ± 0.00
	16 hours	63.80 ± 0.24	4.42 ± 0.00	5.75 ± 0.01
	1 day	64.90 ± 0.24	4.32 ± 0.00	5.80 ± 0.01
Lb.plantarum	3 days	67.90 ± 0.23	3.70 ± 0.00	14.00 ± 0.05
BJ052	6 days	68.90 ± 0.09	3.60 ± 0.00	15.50 ± 0.04
	16 hours	62.80 ± 0.24	3.91 ± 0.02	5.85 ± 0.02
	1 day	62.90 ± 0.15	3.81 ± 0.02	5.95 ± 0.02
Lb.plantarum	3 days	63.20 ± 0.08	3.52 ± 0.00	13.57 ± 0.04
BJ0021	6 days	67.50 ± 0.18	3.50 ± 0.01	13.70 ± 0.00
	16 hours	61.80 ± 0.24	4.65 ± 0.00	5.65 ± 0.00
	1 day	61.90 ± 0.21	4.35 ± 0.00	6.65 ± 0.00
Lb.plantarum	3 days	65.80 ± 0.23	3.76 ± 0.00	7.40 ± 0.00
BJ041	6 days	65.50 ± 0.09	3.57± 0.00	13.90 ± 0.04

Table 2. Evolution of viscosity, some mineral content in carrot juice samples

Carrot juice		Viscosity (Centipoises)	Elements (mg/ 100 mL) Na^+	K^+	Ca^{++}
Raw Juice	/	192.50	100 ± 1.21	180 ± 1.21	46 ± 1.21
	1 day	192.50	ND	ND	ND
Witness	3 days	261.03	ND	ND	ND
	6 days	1848.00	ND	ND	ND
	1 day	161.70	93 ± 1.21	103 ± 1.21	32 ± 1.21
Lb.plantarum	3 days	145.53	92 ± 1.21	103 ± 1.21	30 ± 1.21
BJ052	6 days	134.75	84 ± 1.21	98 ± 1.21	10 ± 1.21
	1day	169.40	100 ± 1.21	114 ± 1.21	32 ± 1.21
Lb.plantarum	3 days	147.84	95 ± 1.21	104 ± 1.21	30 ± 1.21
BJ0021	6 days	146.30	63 ± 1.21	84 ± 1.21	10 ± 00
	1 day	188.65	96 ± 1.21	111 ± 1.21	36 ± 1.21
Lb.plantarum	3 days	154.00	92 ± 1.21	103 ± 1.21	34 ± 1.21
BJ041	6 days	134.75	68 ± 1.21	85 ± 1.21	10 ± 00

ND: not determined

Evolution of microbial parameters

The middle number of cells *Lb plantarum* BJ0021, BJ041 and BJ052 reaches $3.7 \cdot 10^6$ CFU / mL of juice at the third day (table 3). This number is lower than the one found by Salih and Drilleau *(3)* with species of *Lb. plantarum* after 48 hours of incubation of carrot juice ($1.2 \cdot 10^9$ to $8 \cdot 10^8$ CFU/ mL) and it is also lower than reported by Demir et al. (2006). At the sixth day, the number of cells for the strains decreased, due to an inhibitory effect of the acidity on bacterial growth. This growth inhibition was primarily attributed to the protonated lactic acid form. Yabannavar and Wang (1991) showed that the growth inhibitory effect by lactate is small when compared with that by

uncharged lactic acid. Mc Donald et al**.** (1990) showed that the internal pH of *Lb. plantarum* is lowered when the cells are exposed to acid conditions.

The research of yeasts and moulds in the juices of fruits and the juices of vegetables proved to be necessary, because they may cause accidents of manufacture, deterioration of taste, inflation and bad presentation. The juices from raw or lactofermented carrot were unscathed of all fungal contamination at the beginning of manufacture. Nevertheless a contamination by reddish colored yeasts appeared in the juice witness after 24 hours. The use of lactic acid bacteria or « lactic starter » is interesting because it assures the fast and complete conversion of sugars in lactic acid and therefore prevents increase of bacterial contamination that often produce some undesirable substances (Salih and Drilleau, 1992)**.**

The sensory quality

The colour of the raw juice begins to deteriorate after the second day of fermentation. It may be explained by the formation of biphasic system related to the apparition of two layers, the serum and the frost. The three fermented juices took the same pace, and therefore the fermentation process permitted to offer juices a good colour. Really the colour of the carrot juice fermented by *Lb. plantarum* BJ0021 was more appreciated. A bad odour was recorded of the raw juice from the second day; it gets worse at the third day where it reaches a middle value of answers of 2 (table 4). The carrot juices fermented gave a better odour; the one fermented by the BJ052 got the best score. It can be explained by the synthesis of aromas by this bacterium.

Table 3. Growth of *Lb. plantarum* strains and numeration of yeasts and moulds in carrot juice samples

Carrot Juice		**Lactic acid bacteria (cfu / mL)**	**Yeasts and Moulds(cfu/ mL)**
Witness	-	00	00
Raw Juice	1 day	00	6.0×10^{2} (Red colour yeast)
	3 days	00	7.8×10^{3} (Red colour yeast)
	6 days	00	9.0×10^{4} (Red colour yeast)
	0 hours	2.0×10^{4}	00
	16 hours	3.0×10^{5}	00
	1 day	6.0×10^{5}	00
Lb.plantarum	3 days	6.1×10^{6}	00
BJ052	6 days	3.9×10^{6}	00
	0 hours	2.1×10^{4}	00
	16 hours	2.0×10^{5}	00
Lb.plantarum	1 day	3.0×10^{5}	00
BJ0021	3 days	5.5×10^{6}	00
	6 days	4.2×10^{6}	00
	0 hours	2.4×10^{4}	00
	16 hours	3.0×10^{5}	00
Lb.plantarum	1 day	4.0×10^{5}	00
BJ 041	3 days	5.4×10^{6}	00
	6 days	2.7×10^{6}	00

Table 4. Evolution of organoleptic quality of the carrot juice samples

Carrot juice		**Organoleptic aspect**
Raw Juice	-	Odour of carrot, sweetened flavour, good colour.
	1 day	Odour of carrot, sweetened flavour, good colour.
Witness	3 days	Viscous aspect, deterioration of these qualities after days with formation of frost.
	6 days	Viscous aspect. deterioration of the quality

	1 day	Pleasant odour, lightly acidic flavour, good colour.
Lb.plantarum	3 days	Acceptable flavour.
BJ052	6 days	Unpleasant odour, too acidic flavour, altered colour.
	1 day	Odour with bottom milkman, lightly acidic flavour
Lb.plantarum	3 days	Pleasant odour, flavour little acidic, change of colour
BJ0021	6 days	Change of the three aspects.
	1 day	Good odour and flavour, acceptable colour.
Lb.plantarum	3 days	Good odour, flavour lightly acidic, colour acceptable.
BJ041	6 days	Acidic odour, acidic flavour, altered colour.

Conclusions

The use of the lactofermentation process permitted to solve the problem of the jellification observed in raw carrot juice. The use of lactic acid bacteria as starter culture has also been found to be effective on yield of lactofermented carrot juice. *Lb. plantarum* as a starter culture produces pectolytic enzymes, and these can cause the softening of vegetable tissues and can increase the juice yield.
Under the experimental condition chosen, it was assumed that a fermentation time of 16 h can be recommended for a pH value under 4.5. From the point of total acidity, soluble solids and viscosity, the produced carrot juice was acceptable.

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Characterization and Antibiotic Susceptibility of Lactobacilli, Pathogenic and Spoilage Bacteria Isolated from Meats

ABDI Akila[1;2)*] ; BENHADJ Mabrouka[(1)] ; ALIOUA Souad[(1;2)] ; GACEMI-KIRANE Djamila[(1)]

1*-Departement of Biochemistry, Faculty of Sciences, University BADJI Mokhtar Annaba
Annaba B.P. 12 ALGERIA
2*-Laboratory of Applied Biochemistry and Microbiology, University BADJI Mokhtar Annaba
Annaba B.P. 12 ALGERIA

akila.abdi@yahoo.com

Abstract: The meat very rich on nutritive elements constitutes an excellent culture medium, which offers a wide spectrum of microbial contamination. This microflora of contamination is very heterogeneous constituted by pathogenic, spoilage, and protective (lactic acid bacteria) microorganisms. Our investigation is about the choice of specific cultures medium in order to isolate some group of bacteria (Lactobacillus, Staphylococcus, Pseudomonas and Enterobacteria) in detriment of others. Those bacteria were isolated from 19 samples of red meat (beef and sheep) under different conditionings. Their phenotypical characterization based on morphological, physiological, biochemical characters and their susceptibility to the antibiotic has been determined. The 29 strains of isolated lactobacilli were attributed to group II and III of Kandler and Weiss. The strains of Staphylococcus, Pseudomonas and Enterobacteria have been also identified until species by Api identification systems. The 29 strains of isolated lactobacilli present resisting to the majority of antibiotics used. The other bacteria (pathogenic and spoilage) have variable profiles according to the antibiotics.

Keywords: red meat - different conditionings – lactobacilli - pathogenic and spoilage bacteria – identification - antibiogram.

Introduction

Meat and in general meat products because of their nutrient richness (Bourgeois, 1996) are media of choice for different microbial species. Among which bacterial pathogens should be avoided because dangerous to health; spoilage bacteria which are to be avoided because if they do not present a health hazard, they can cause significant economic loss (Jacotot, 1999) and lactic acid bacteria that are part of the microflora of fresh meat, but are predominant in meat vacuum packaged (Sutra, 1998; Sakala, 2002). Fermented meat products are processed through the development of lactic acid bacteria involved in their processing, conservation and stabilization of their organoleptic quality. Many studies have shown that lactic acid bacteria have properties that could be used to better preservation of fresh meat, as they offer activities that allow them to antagonists inhibit undesirable microflora (Dembele et al., 1998). Meat lactobacilli have original properties to adapt to this biotope complex that they confer a role bioprotectant, which can extend the shelf life and thus ensure safety of meat (Schillinger and Luke, 1989; Marceau et al., 2004).
Lactic acid bacteria used in the transformation and improvement of meat products are not yet used in Algeria in the meat industry and red meat, which is a field for innovation and research development.
The interest is to isolate lactic acid bacteria of meat sold in our markets, to determine their antagonistic properties.
This first part of our study focuses on the isolation of lactobacilli and other bacteria in the presence (pathogens and spoilage) from red meat (beef and sheep) fresh or packaged in different ways, it is clearly established that packaging under vacuum or modified atmosphere promote lactic acid bacteria that have become the majority.
Collection strains of lactobacilli identified will be subject to further research which will focus on the identification of antibacterial activity and characterization of the molecules involved. Character search technology interesting for diversification and proper preservation of fermented meat products is also considered.

Materials and Methods

Nineteen (19) samples of red meat (beef and sheep) from local markets in the region of Annaba (Algeria-East) were collected and placed in sterile bags stomachers (4°C). These samples were packaged in various forms: fresh meat , ached meat, and meat packaged under vacuum or CO_2 (packaging done in the laboratory or in the conditioning-center) stored at 4°C, dried and salted meat traditionally "Guedid" kept at room temperature and meat frozen at -20°C.

25 g of meat were ground aseptically and homogenized with 225 ml of saline-peptone water (NaCl 8.5g/l ; bactopeptone 1g/l), and the mixture was incubated for 24 hours at room temperature according to the method of Najjari and al. (2008). From this stock solution, serial dilutions were then made in saline-peptone water (Bonnefoy et al., 2002). The isolation of lactobacilli was carried out on two agar media: (i) MRS (De Man, Rogosa and Sharpe, 1960) containing bromocresol green (25mg/l), the pH is adjusted to 6.4 (Bonnefoy et al., 2002). 0.2 ml of dilutions (10^{-5} to 10^{-9}) was plated on the surface of the medium in Petri dishes, which were incubated at 30°C for 24 to 48 hours under anaerobic conditions; (ii) LAMVAB (Lactobacillus Anaerobic MRS with Vanconmycin Bromocresol green), the pH is adjusted to 5 ± 0.5 (Hartemink et al., 1997) is a selective medium for the isolation of lactobacilli. Gram negative bacteria are inhibited by the acidity of the medium, and other Gram-positive bacteria that no lactobacilli are inhibited by vancomycin (20mg/l); this medium also contains a reducing agent cysteine (0.5g/l) increasing the anaerobic conditions and bromocresol green as an indicator of pH. 0.2 ml of dilutions (10^{-1} to 10^{-4}) was plated on the surface of the medium in Petri dishes, which were incubated at 37°C for 24 to 72 hours under anaerobic conditions.

The isolation of other pathogens and spoilage microorganisms is done on different media and under different conditions specific bacterial type to sought (Larpent, 2000). 0.2 ml of the 10^{-1} dilution was spread on different media respectively specific bacteria investigated.

Staphylococci were isolated in two media: (i) on Chapman agar, after incubation 24h-48h at 37°C; pigmented colonies appear yellow and/or pink; (ii) on Baird Parker agar, colonies of *S. aureus* have a characteristic appearance after 24 hours of incubation at 37°C: shiny black colonies surrounded by a clear halo 2 to 5 mm in diameter, most other species are inhibited or produce no characteristic colonies after 24 hours.

Enterobacteria are isolated on Hectoen agar, after incubation 24-48h at 37°C; by fermentation of at least three sugars (salicin, saccharose, lactose) and production of hydrogen sulfide, which guides to genus or species bacteria.

Pseudomonas: are isolated on agar media with cetrimide, after incubation for 24h at 30°C, the presence of blue-green colonies moving towards *Pseudomonas aeruginosa*, the presence of green fluorescent colonies moving towards *Pseudomonas fluorescens*.

The purified isolates were differentiated by Gram stain, the search for catalase and oxidase activity according to the protocols described by Prescott et al. (2003).

Purified isolates of media MRS and LAMVAB represented by Gram positive, catalase and oxidase negative were considered as potential lactic acid bacteria and were stored at -30°C in MRS broth and in skim milk (reconstituted 10%) to 20% glycerol and on MRS solid tube at 4°C (Accolas et al., 1972).

Other isolates purified of specific media for pathogenic and spoilage bacteria are seeded with bite in the central conservation agar, after 18h at 37°C, the cultures were stored at 4°C. Conservation at -30°C in liquid medium specific added glycerol is also possible.

Characterization of the isolates was performed by testing physiological, biochemical and identification systems API. Identification is established based on morphological characters of colonies and cells and the type of Gram, and various physiological and biochemical specific characters to genus and/or species (Larpent, 2000) such as catalase, oxidase, growth at different temperatures (10°C, 15°C, 45°C), carbon dioxide production by fermentation of glucose, fermentation of various sugars, growth at different pH, different levels of NaCl, looking for specific enzymes and highlighting pigments.

The bacilli Gram positive, catalase and oxidase negative, that other test results meet to the Lactobacillus's characteristics have been a biochemical analysis using a range of sugars provided in the API 50CHL (Bio Merieux sa: in Leyral and Joffin , 1998).

The identification of other bacteria was complemented by systems API Staph, API 20E and API 20 NE (Bio Merieux sa: in Leyral and Joffin 1998). Seeding and reading galleries were performed according to the manufacturer's instructions (Bio Merieux, France). Biochemical profiles obtained are read using software API Plus (Bio Merieux, France) and identification charts (Leyral and Joffin, 1998).

The antibiogram can keep a record of the characters of sensitivity or resistance to add at identification, is a real identity card microorganism. The method used is that of Kirby-Bauer in Qin et al. (2004), recommended by the NCCLS (Nationnal Commitee For Clinical Laboratory Standard). The disk diffusion method on agar is described in the release of the 2007 Antibiogram Committee of the French Society for Microbiology (CASFM) Cavallo et al. (2007). The media used are MRS for lactobacilli (Aniewska-Moroz et *al.*, 2001; Ammor et *al.*, 2007) and Muller Hinton (MH) for other bacteria (Cavallo et *al.*, 2007). Antibiotics are used in the form of discs (Oxoid) impregnated with pure antibiotic at a level defined Cavallo et al. (2007).

RESULTS:

Different contaminating bacteria were isolated from 19 samples of meat.

Selective media were chosen to target specific pathogens and spoilage bacteria at the expense of others. Lactobacilli were isolated on two selective media MRS medium supplemented with bromocresol green and LAMVAB medium.

The results of the cultivation, of Gram stain, catalase and oxidase allowed us to divide the different bacterial groups for 19 samples of all types of meat analyzed (Figure 1).The results of identify tests physiological, biochemical, systems Api, compared with bibliographic data allowed us to bring in different genus and species.

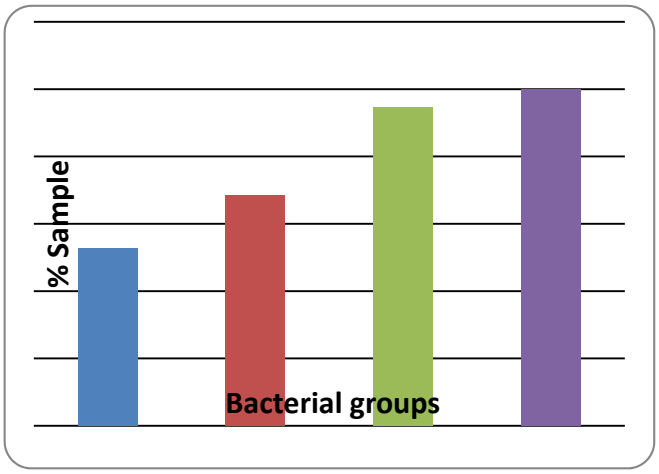


Figure 1: Distribution of different bacterial groups isolated from different types of meat.
C: cocci; **B**: bacilli; **NE**: Non enterobacteria; **E**: Enterobacteria ; **+** : positive ; **-** : negative

Distribution and identification of pathogenic and / or spoilage bacteria:

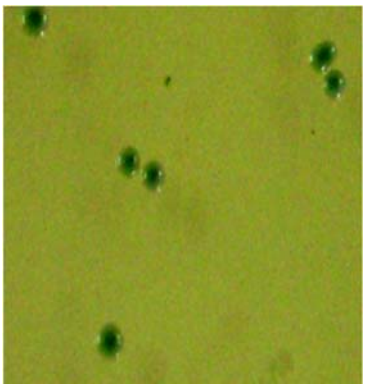
The cocci Gram positive are represented in 52.63% of samples. The absence of this group in three samples packaged under vacuum shows that the vacuum exerts an inhibitory effect on the development of the aerobic bacterial flora. Cultures in the Chapman medium have different aspects: small and large colonies to smooth contour, color is yellow due to the fermentation of mannitol or pink due to non mannitol fermentation. The results of preliminary tests (catalase and coagulase-free) and identification by the API Staph shows that all Gram positive cocci were identified to the genus Staphylococcus: *Staphylococcus aureus* (50%), *Staphylococcus xylosus* (30%) and *Staphylococcus epidermidis* (20%).

The bacilli non-Enterobacteria Gram negative are represented in 68.42% of the samples, macroscopic observation on Cetrimide agar show whitish colonies and pigmented colonies. The results of preliminary tests and API 20 NE show that these Gram negative non-Enterobacteria were identified and divided into two genera: the genus Chromobacterium represented by single species *Chromobacterium violaceum*, the genus Pseudomonas represented by *Pseudomonas fluorescens* (61.53%) and *Pseudomonas putida* (30.76%). Pseudomonas is the main agent responsible for the spoilage of the meat. We note its absence in two samples packaged under vacuum, the absence of oxygen resulted in the inhibition of the growth of Pseudomonas (strict aerobic bacteria).

The bacilli Enterobacteria Gram negative represented in 94.73% of the samples, macroscopic observation of cultures in the Hectoen medium show colorless colonies are lactose negative, colonies salmon-colored are lactose positive, colorless colonies with black center that are lactose negative but produce H_2S and salmon-colored colonies with black center are lactose positive and H_2S positive. The results of the API 20 E and other tests show the presence of different species. The species *Hafnia alvei*1 (26.31%), *Serratia liquifasciens* (15.78%), *Escherichia coli* (10.52%), *Enterobacter cloacae* (10.52%) and other species such as *Escherichia fergusonii*, *Klebsiella pneumoniae*, *Enterobacter intermedius*, *Enterobacter asburiae*, *Proteus vulgaris*, *Salmonella arizonae* and *Edwarsiella hoshinae*, each representing 5.26% of Enterobacteriaceae identified. The diversity of species isolated in this family confirms that contamination of meat is due to several causes. This group includes species causing spoilage such as *Hafnia alvei*1 and pathogenic species such as *Klebsiella pneumoniae* and *Salmonella arizonae*.

Distribution and identification of lactobacilli

The bacilli Gram positive was isolated from all samples. Macroscopic observation of the cultures on two media: MRS with bromocresol green and LAMVAB shows different types of colony (colonies dark green, bright green colonies, transparent colonies green center, green colonies dark center and gray colonies) small or large sizes, these correspond to different aspect colonies of different species of lactobacilli and can guide the identification of the strains (Figure 2). The use of LAMVAB media highly selective for the genus Lactobacillus has allowed us to avoid the excesses of subcultures which can lead to mutations.



Lactobacillus sakei

Lactobacillus plantarum

Lactobacillus rhamnosus

Lactobacillus divergens

Figure 2: Appearance of colonies of Lactobacillus species on the medium LAMVAB.
(LAMVAB : Lactobacillus Anaerobic MRS with Vanconmycin Bromocresol and green).

The preliminary test results show that these are Gram positive, catalase and cytochrome oxidase negatives, motionless, non spore-forming, which are characteristic of the genus Lactobacillus (Axelsson, 1998). The results of tests of differentiation in groups, compared with bibliographic data (Kandler and Weiss, 1986; Schillinger and Luck, 1987; Larpent, 2000) allowed us to divide the 29 strains of lactobacilli between only two groups: 65.51% belong to group II and 34.49% belong to the group III, against any strain was identified to belong to group I. All strains can grow at 4°C and 15°C but not at 45°C.

The results also show that the majority of these bacteria tolerate a concentration of 7% NaCl five strains tolerate up to 10% NaCl, where their presence in salted meats. All strains grow well on MRS at pH 3.9 ; highlighting an arginine deaminase in all strains of lactobacilli, show their ability to degrade arginine what they confer an advantage, it is to grow on media without or with small quantities of glucose, hydrolysis of this amino acid allows them to synthesize ATP and compete with undesirable bacteria.

Strains of lactobacilli pre-identified on the basis of morphological, physiological and biochemical to data as reference (Kandler and Weiss, 1986; Schillinger and Luck, 1987), and those given by Holt et al. (1994) in Bergey's Manual of Determinative Bacteriology 9th edition). According to the identification criteria given by Leyral and Joffin (1998) and to data from Brossard et al. (2008), these strains were attributed only between groups II and III of Kandler and Weiss (1986). The approximation to species for all these strains is given through their fermentation profiles of the 26

sugars tested (present in the system Api 50CHL). The results for some sugars have been used as key comparison of profiles between species identified.
Nineteen strains of lactobacilli were assigned to group II which are optional heterofermentative, all these strains do not produce CO_2 by fermentation of glucose, except *L. plantarum* $14_{(4)}$; ferment pentose (mainly ribose) do not grow at 45°C, are mesophilic, except *L. casei* $19_{(2)}$. These strains were close to the following species:
Two *Lactobacillus casei*: do not ferment rhamnose and xylose, but ferment mannitol, sorbitol and.amygdalin
Four *Lactobacillus rhamnosus*: ferment rhamnose, mannitol, sorbitol and amygdalin, do not ferment xylose.
Four *Lactobacillus sakei*: do not ferment rhamnose, mannitol, sorbitol, and xylose. These strains were isolated mainly meat samples packaged under vacuum or CO_2.
Two *Lactobacillus curvatus*: which are a closely related to *L. sakei*, but do not ferment amygdalin and arabinose.
One *Lactobacillus alimentarus*: does not ferment rhamnose, mannitol, sorbitol, and xylose, it is a closely related to *Lactobacillus curvatus*, but does not ferment lactose.
Five *Lactobacillus plantarum*: do not ferment rhamnose but ferment mannitol, sorbitol and amygdalin.
One *Lactobacillus murinus*: This is close to *L. rhamnosus*, but does not ferment rhamnose.
Ten strains of lactobacilli were assigned to group III, are strict heterofermentative, CO_2 produced by fermentation of glucose, ferment pentose (mainly ribose), and are for the vast majority of mesophilic. These strains were close to the following species:
Two *Lactobacillus bifermentans*: ferment fructose, galactose, glucose, maltose, mannitol, mannose and rhamnose.
One *Lactobacillus fermentum*, near *L. bifermentans* ferments more gluconate and lactose, does not ferment mannitol and rhamnose.
Two *Lactobacillus fructivorans*: ferment fructose, glucose, maltose, saccharose and gluconate.
One *Lactobacillus sanfrancisco*, near *L. fructivorans*, ferments more galactose, but not fructose and ribose.
Three *Lactobacillus divergens*: ferment amygdalin cellobiose and have profile which brings them closer to or L. bifermentans, or L. fermentum respectively.
One *Lactobacillus confusus*: ferment xylose, esculine, this is close to *L. divergens*, but does not ferment trehalose.

Characteristics of pathogenic and spoilage bacteria against antibiotics
The susceptibility of staphylococci was determined for all strains identified.
The results show a significant sensitivity for 100% of strains to penicillin, 90% to Vancomycin (VA) and Rifampicin (RA), 80% to Lincomycin (L) and Oxaciline (OX) ; resistance for 50% of strains to tetracycline (TE).
Strain *S. aureus* (12) has a resistance to four antibiotics (VA, RA, L, and OX).
Strains of the same species *S. aureus* (4) and *S. aureus* (11) from different samples have the same sensitivity profile.
Strains of different species *S. aureus* (11) and *S. epidermidis* (11) from the same sample have the same sensitivity profile.
The susceptibility of Pseudomonas has been established for some strains identified.
All strains tested were resistant to trimethoprim (TM), amoxicillin + clavulanic acid (AMC),
ampicillin (AM) and Imipenem (IMI) by cons they are susceptible to amikacin (AN). 66.6% of the strains showed an intermediate profile for pipemidic acid (PI).
The susceptibility of Enterobacteriaceae has been established for some strains identified. All strains were sensitive to chloramphenicol (C), cefotaxime (CTX) and 83.3% to Cotrimoxazole (CO) by cons 83.3% are resistant to amoxicillin (AMX), to ampicillin (AM) and colistin (CT) profiles vary from one strain to another.

Characteristics of lactobacilli towards antibiotics.
The results of susceptibility testing of lactobacilli (Figure 3), showed that 100% of strains were resistant to Kanamycin (K) and Streptomycin (S), 96.55% of the strains were resistant to Gentamicin (G) against 65.51 % are sensitive to Trimethoprim (TM), and 79.31% of the strains have an intermediate profile for the Rifampicin (RA).

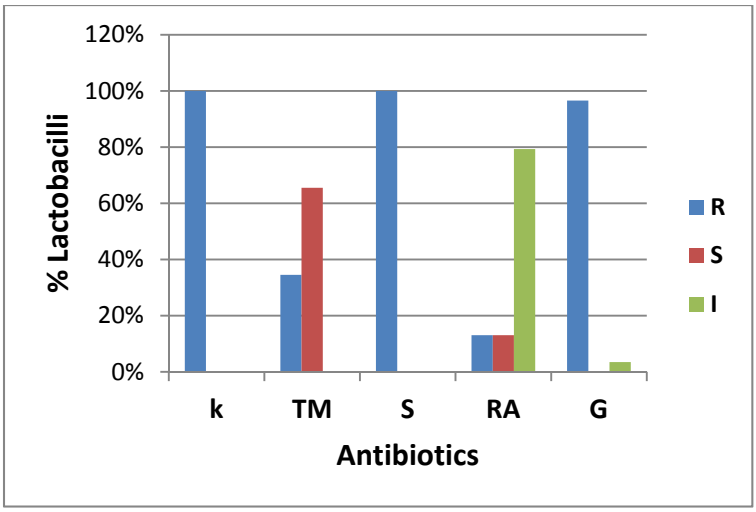


Figure 3: Profile of Lactobacillus strains against antibiotics.
K: Kanamycin, TM: Trimethoprim, S: Streptomycin, RA: Rifampicin, G: Gentamicin.
R (resistant), S (susceptible), I (intermediate).

Discussion

Characteristics and identification of lactobacilli.

The results found in this work are similar to those found by Gancel et al. (1997), who isolated lactobacilli herring fillet (fresh, salted, smoked, packaged under vacuum and CO_2), they found that lactobacilli belong only to groups II and III of Kandler and Weiss(1986), and are resistant to conditions hostile (NaCl, bile salts, smoke, pH 3.3) and grown at 5°C and 20°C ; Kacem et al. (2003) found that the Lactobacillus's species isolated from sheep and cows milk grown at 15°C, but not at 45°C, and in media with 6.5% NaCl.

Marceau et al. (2004), by a proteomic study to determine the N-terminal sequence by the technique of two-dimensional electrophoresis coupled to mass spectrometry showed that six proteins of *Lactobacillus sakei* are involved in the mechanism of adaptation at low temperature and high level of NaCl. They showed that two of these proteins are involved in the general metabolism of carbohydrates and other proteins called "stress proteins" are induced during hostile conditions, so they play a protective role.

Low temperature and salinity are two conditions often used in meat preservation, these lactic acid bacteria are therefore an adaptation to these conditions.

The strains identified have the general characteristics of the genus Lactobacillus, they grow under anaerobic and aerobic because it is facultative anaerobes, Champomier et al. (2002) found that *Lactobacillus sakei* which represents the original species of meat and meat products can grow aerobically and anaerobically. This confirms our results that these bacteria are present in meat vacuum packed or not.

Lactobacillus sakei is one of the most important lactic acid bacteria of meat and fermented meat products. She produced from arginine, ammonia, CO_2 and ATP through a chain of degradation arginine deiminase (ADI). This chain is composed of three catabolic enzymes: arginine deiminase, ornithine transcarbamoylase and carbamate kinase, and a transport system for arginine (Manca and Presce 1982; Montel and Champomier, 1987).

All lactobacilli strains isolated in this work degrade arginine, these results are consistent with those found by Gancel et al. (1997) and Gacem et al. (2003).

Susceptibility of lactobacilli

Lactobacilli is very beneficial microorganisms to humans, considered not involved in infections is why very little research is available on their susceptibility to antibiotics. Nevertheless the work of Charteris et al. (1998) carried out on 46 strains of Lactobacillus isolated from milk and human origin, were tested for their susceptibility to 44 antibiotics. The results showed that all strains were resistant to 14 antibiotics including Gentamicin, Kanamycin, Streptomycin, and Trimethoprim, antibiotics tested in our work, where we found the same results except for Trimethoprim which 65.5% strains were susceptible.

They also found that all strains were sensitive to Tetracyclin, Chloramphenicol, and Rifampicin for the latter we found 79.31% of susceptible strains.

For the remaining antibiotics tested they found mixed results, explained by the fact that the resistance observed is dependent on the origin of strains or are acquired in vivo exposure to antibiotics. Their work has been done to find consensus therapeutic antibiotics / probiotics to prevent and / or cure digestive infections, urogenital, and endocarditis. Aniewska-Moroz et al. (2001) determined the level of resistance to antibiotics of different strains of lactic acid bacteria isolated from naturally pickled vegetables. The results show that the resistance of lactobacilli depends on the strain and its origin. They found that all strains of *L. plantarum* and *L. brevis* are resistant to nalidixic acid, 41.3% to kanamycin and for neomycin 3.4%.
All strains of lactic acid bacteria are susceptible to antibiotics studied β-lactams, Rifamycins, Furan derivatives, and chloramphenicol.

Conclusions

Lactobacilli are naturally present in meat products are mainly represented by *L. casei*, *L. sakei*, *L. curvatus*, *L. brevis*, *L. plantarum*, *Carnobacterium pisicola*, but other species of various origins may be present as contaminants. These species are adapted to meat (low glucose, rich of glycogen, ribose and arginine) and at different packaging. They are characterized by a broad spectrum of fermentation. The heterofermentative represent the dominant microflora of meat packaged under modified atmospheres due to their resistance to CO_2, growth at low temperatures, and the production of inhibitory substances (organic acids and bacteriocins) Lebert al. (2006a).
Strains isolated in this work shown these characteristics of adaptation: they tolerate concentrations of NaCl at 7% or even 10% (e.g. *L. divergens* isolated from a salt meat) they grow at low temperatures, and degrade arginine and ribose. This work was continued by other research (by the same team), the results show that the identified strains of lactobacilli produce substances inhibitory (H_2O_2, acids, bacteriocins) against pathogenic and spoilage bacteria isolated from the same habitat.
The long-term challenge, especially for agric-alimentary is to select strains or species most successful in these properties, possibly in order to use as starter in processed meat products or as natural preservatives for fresh meat products.

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Determination of corrosion rate under various corrosive environments using image analysis.

Alexis Tejedor De León

Department of Materials and Metallurgy, Centro Regional de Veraguas, Universidad Tecnológica de Panamá, Panamá

Alexis.tejedor@utp.ac.pa

Abstract In a humid tropical atmosphere, different corrosive media, to which a metal is exposed in working conditions and given the chemical, the rate of corrosion of the metal is not the same. In this sense, the objective of this study was to analyse the corrosion rate by analysing photographic images from welded metal-exposed to eight (8) different liquids environments with potential corrosive. The paper shows some numerical calculations based on changes in shades of grey or darkened images. This photograph was taken through a camera of 12.1 MP (Lumix Panasonic model FP1) of the metal samples surfaces immersed in various media for certain periods of time. Subsequently, each of the images obtained were edited to standard size 2000x2000 pixels (Microsoft® Office 2010) and brought into a grid (Scale 1:1 cm) in AutoCAD® 2008 wherein the surface was interpreted as a dark area of corrosion and its value determined. Finally it is concluded that the analysis of photographic images constitutes a basic tool for determining corrosion rate. In this study, the metals in contact with tap water from the public network presented a corrosion rate of $83.09 \pm 20.57 mm^2 * h^{-1}$.

Key words: Corrosion rate, corrosive environments, image analysis, metallic corrosion.

Introduction

There are many structures that are buried in the ground, such as water pipes, gas, oil and oil products, electrical cables, anchors, poles, tanks, among others. In all, most of these structures are constructed of metallic materials, so that corrosion is a problem which is faced regularly (Calderón *et al*, 2005).

Therefore maintaining an industrial metallic installation costs can be reduced when using corrosion resistant metals (Carvalho *et al*, 2006). However, industrial systems, metals often have to be welded before there are being put into operation, which at times involves contact of metallic materials with gases, solids and liquids within operating system. Depending on the environment where the metals are exposed, thin films on the metal welded surface arise, this circumstance generates a highly corrosive condition, which is maximized in many cases in tropical humid environment (Marulanda, 2007).

For example, in certain occasions the corrosive attack is accelerated when system components reach the melting temperature of the film formed salts, which exerts a flux on the protective oxide layer, deteriorating by dissolution and transport of oxidizing species to the metal surface and the metal ion salt into the reservoir, thereby triggering the step of propagating or accelerated attack (Tristancho *et al*, 2007).

That is why appropriate inspection and monitoring activities, to detect and characterize the degradation of metals. Once degradation characterized by corrosion of a metal component, structural integrity and/or function may be evaluated and decisions may be taken, for the purposes of repairing or replacing the damaged component (Mendoça *et al*, 2009).

In Panama, do not have the expertise to analyse the progress of corrosion of metal parts exposed to different liquid media, as there are no publications that indicate the degree of metal's weldability and the resulting levels of corrosivity. Theory indicates that care must be taken to weld these steels, where the selection of the welding process and to use consumable part of performing a defect-free welds (Cortés *et al*, 2004).

The corrosion rate of a metal in a corrosive environment is usually assessed by performing weight loss trials. This technique is time consuming and does not allow obtaining an instantaneous corrosion rate (Valcare *et al*, 2004). This is why the aim of this project is to determine the feed rate of corrosion of metal welded surfaces in abutting

contact with various liquids in tropical environments, by images analysing. The corrosion feed rate was determined by analysing photographic images

Materials and Method.

Welding: The materials used in this research were those common to the metalworking industry in the region. Two metal parts (hypoeutectoid steel SAE 60xx) of dimensions 64x70x6.4mm were jointed by electric welding (220V and 125A) using commercial coated electrodes AWS E6011.

In total 8 samples of welded metals were used in this study. The weld beads have a width of 7 ±0.1mm and a length of 8.25±1.09mm is brought to an energy welding system was about 1.55KJ*mm-1

Each welded piece was sectioned transversely, manually, and the welded surface was subsequently sanded progressively until specular surface sanding. Each of the eight samples sanded was identified with consecutive Roman numerals (I to VIII).

Corrosive Liquid Environments: In the present research eight liquid solutions was used, namely: (i) caustic soda, (ii) hydrochloric acid, (iii) sea water, (iv) glucose, (v) mineral, (vi) tap water, (vii) river water and (viii) ethyl alcohol.

The initial volume of each corrosive liquid was placed into 100mL glass containers. Once metal samples were submerged into each eight liquid, the containers were sealed during the reaction time studied. Each of the eight metal containers containing the samples was placed in controlled conditions of temperature and humidity. 23.5±1°C and 45±2%, respectively.

The cross section of the weld beads in each sample were photographed every two day, for seven consecutive days. To remove samples from the solutions was used a forceps devices. The sample was cleaned with a soft cloth before photographing.

Image Analysis: After the contact time the welded sample with the respective corrosive liquid, polished surface of each sample was placed on a microscope mark Zeiss model, KF2-ICS using the 10X objective. We used a 12.1-megapixel Panasonic Lumix camera, model FP1. The lens remained in 1X.

The welded joints were photographed before being submerged in the solutions, and subsequently every two days. Each of the images obtained were edited to standard size 2000x2000 pixels (Microsoft® Office 2010) and brought into a grid (Scale 1:1 cm) in AutoCAD® 2008. Any dark surfaces images were interpreted as corrosion surfaces. To each sample was determined by the increase in the dark surface photographed. The feed rate of corrosion (mm^2*h^{-1}) at the welded joint was calculated by dividing the area of the darkness area between the time of submerged in corrosive solution.

Results

As mentioned above, we used as liquid solutions, eight corrosive environments. The table below shows the results in the change in pH of the solutions during development of the research.

Table 1. Measurements of pH variability (initial, final) of each eight liquid solutions used in the corrosion studies.

Sample	*Solution*	*Conc.(v/v)*	*Initial pH*	*Final pH*
I	Caustic soda (CS)	75	12	13
II	Hydrochloric acid (HC)	75	4	4.5
III	Sea water (SW)	75	8.3	6
IV	Glucosa (GL)	75	5.4	4.5
V	Mineral water (MW)	100	7	5
VI	Tap water (TW)	100	6.7	4.5
VII	River water (RW)	100	7.1	6
VIII	Ethyl alcohol (EA)	96	6.2	5.5

Given the differences of the various behaviours observed in images obtained, the analysis of surface states obtained by manual photography was not simple, being therefore necessary to obtain a greater amount of information to determine the size of the surface "tainted" by effect of impairment and correlate the measured wear variables, and possibly corrosion parameters of the corresponding immersion tests.

For this purpose the images in "jpg" were inserted into a template at 1:1cm square in Autocad®, for subsequent determination of darkened surface size in area units (mm2). In the figure below shows one of the images transported.

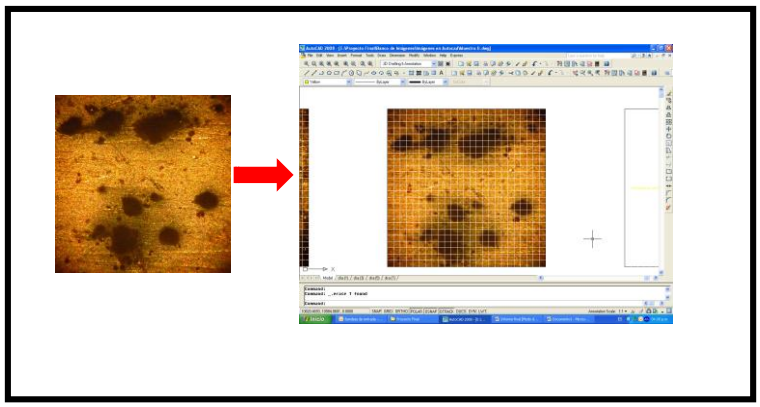

Figure 1. Image "jpg" transported to Autocad® for determining the size of the darkened surfaces.

Every 24 hours, the samples were removed from the respective solutions and their surfaces were photographed.

For each of the images captured and transported to Autocad®, we proceeded to determine the size of the darkened surfaces and the calculation of the corrosion rate, since their immersion times were recorded for each of the samples.

In the table below shows the average values such as the corroded surface and the corrosion rate of metal for each eight solutions studied.

Table 2. Values of the corroded surface and corrosion rate in welded metal surfaces for different liquids studied.

Solution	*Corroded surface (mm²)*	*Corrosion rate (mm²/h)*
CS	0	0
HC	1533±694	16.20±2.68
SW	7600±1202	23.08±2.24
GL	1233±613	11.460±1.04
MW	7033±5213	59.26±37.66
TW	8633±4582	83.10±20.57
RW	900±756	7.87±3.86
EA	133±125	1.04±0.85

To understand the behaviour of the corrosion rate of metal parts, the calculated data were plotted and the results are presented in Figure 2

As seen in the above table so as in the figure in question, the corrosion on metal surfaces welded differ significantly from one liquid environment to the other.

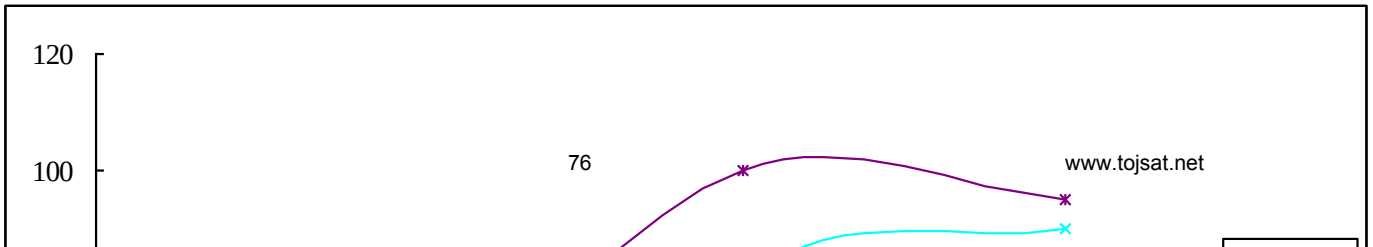

Figure 2. Variation of the corrosion rate depending on the corrosive medium.

In our case, in particular, the corrosion rate seems to behave by the following pattern of aggressive corrosive (from high to low):

TW>MW>SW>HC>GL>RW>EA<CS

In the case of tap water it contains some salts; certain amount of dissolved oxygen and the presence of chloride ions, by the effect of its treatment sterilization as potable water, which results in the appearance of greater corroded surface by the effect of the oxidation reactions. Specifically, the half-reactions which occur are the oxidation of the iron is:

$$Fe \rightarrow Fe^{2+} + 2e^{-}$$

$$\tfrac{1}{2}\, O_2 + H_2O + 2e^{-} \rightarrow 2OH^{-},$$

$$2H_2O + 2e^{-} \rightarrow H_2{}^{+}\, 2OH^{-}.$$

The relative importance of these two half-reactions of reduction is determined by the concentration of oxygen in solution and the pH [12], which as can be seen in Table 1, to this solution was studied in a reduction of the pH thereof.

Discussion

As seen in the table 1, it is verified that there were significant changes in the pH of the etching solutions. The medium pH variability appears to be associated with the corrosion products, due to a particular process. In this regard, in the caustic soda solution and the hydrochloric acid was an increase in the pH of the medium, unlike the other six solutions wherein the pH decreased.

In these latter substances, the fact that the pH has been decreased, this means in a more severe corrosion conditions, because the instability of the protective passive film on the metal surface as a results in the risk of

disappearing (Duffó *et al*, 2010)

Several studies have found that the main parameter that is taken as a criterion of corrosive aggressiveness of the solutions is the pH (Escoda *et al*, 2003). For acidic media, such as HCl our case, take into consideration possible oxidizing character. In this regard, studies on the behaviour of steel in the presence of acid pH solutions have shown that the steel undergoes a greater and more rapid deterioration due to the formation of soluble salts.

In this case, the action will depend on the acid concentration and the total amount thereof acting on the metal, since in some circumstances the weakening that is produced can end the total disintegration of the material (Vera *et al*, 2005)]

In terms of variability of pH corrosive environments, it has been shown that passive loses iron ions generating compounds and becoming extremely complex and it has been found that the iron oxidation rate depends on the composition and stability of the intermediary species, the pH and temperature, all these factors determine the type of species to be formed (Villarroel *et al*, 2007).

Given the features found on the aggressive behaviour of the tap water in the corrosion rate, it is necessary to recommend detailed studies to determine qualitatively and qualitatively the trend corrosive or scale (Trujillo et al, 2008) of this water

In the case of mineral water and sea water, the presence of dissolved salts increases the conductivity of the liquid medium, favouring also the charge transport in the solution.

This cargo is necessary for the process of corrosion is evidenced, for example, if the solution is slightly conductive accumulates excess positive charge, which would oppose to the formation of new positive ions Fe2+ and the corrosion is slowed (Heredia, 2011)], as was evident in the experiment carried out.

Although the literature refers to acidic solutions (HCl) are highly corrosive by nature, in our experience was not possible to determine, via photography image analysis.

This was due to the fact that the surface oxides formed were quickly dissolved by the acid solution in preventing their attachment to the metal surface.

However if it was verified that the corrosion was much more aggressive by the decrease in the metal section and by the change in the colour of the final solution.

Unlike what was observed in the other corrosive media employed in the case of hydrochloric acid solution and as mentioned earlier, there was no occurrence of hydrated ferric oxide brown on the metal surface.

This is because in acid iron oxides are soluble, so that the Fe3+ cation is in solution form complexes with water and / or chloride ions, which provide an intense yellow colour in the solution after a couple of days.

In the solution containing sodium hydroxide is not observed significant corrosion of the metal. The decrease of the oxidizing ability of the dissolution due to the increased concentration of OH- ions, since it implies a decrease in the oxygen reduction potential and / or water.

However, the literature refers to the need for a concentrated sodium hydroxide hot solution to the iron corrosion is observed more quickly (Marulanda et al, 2009).

Like any chemical reaction, the iron corrosion reaction depends on thermodynamic and kinetic factors, and due to the latter there is an increase of the reaction rate associated with increased temperature (García & Salinas, 1993).

Conclusions

Importantly, in this study were not characterized neither the corrosion products on the metallic surface nor the oxide volume formed, instead we determined the level of progress of the surface oxidation of welded metal pieces and immersed in different solutions liquid.

The photographic image analysis by determining the darkened surface area is a useful and acceptable accuracy tool to determine the corrosion rate of metal parts.

The rate of corrosion of steel hypoeutectoid surfaces joined via arc welding and submerged in different liquid media was evaluated according to the photographic images taken at a certain time interval.

A very good agreement was found between the results of the corrosion rate for the different media studied, yielding behaviour that conforms to the following pattern:

TW>MW>SW>HC>GL>RW>EA<CS

Acknowledgements

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Effects of ball-to-mass ratio during mechanical activation on the structure and thermal behavior of Turkish lateritic nickel ore

Tuğba Tunç and Kenan Yıldız

Metallurgy and Materials Engineering, Engineering Faculty, Sakarya University-Turkey

kenyil@sakarya.edu.tr

Abstract: In this study, lateritic nickel ore was activated mechanically in a planetary mill for different ball-to-mass ratios and the changes in the ore structure and thermal behavior of the ore were investigated by means of X-ray diffraction (XRD), scanning electron microscopy (SEM), particle size analysis and thermal analysis (TG-DTA). The results showed that particle size decreased and amorphization in the ore structure was occured with increment of the ball-to-mass ratio. The transformation of goethite to hematite in thermal behavior of laterite started to occur during mechanical activation.

Key words: Lateritic nickel ore, mechanical activation, thermal behavior.

Introduction

Nickel oxides (laterites) and nickel sulphides comprise the two types of ores used in industrial practice for nickel production. Today world nickel supply is covered predominantly by sulphide ores (60% against 40% by laterites. By taking into consideration that any additional nickel demand is expected to be mainly satisfied by mining of laterite deposits, the optimization of the metallurgical laterite processing methods constitutes a great challenge for the nickel industry and there is an increasing focus on the processing of the huge reserves of nickel-rich laterite ores due to declining global reserves of nickel sulphides (Zevgolis et al., 2000; King, 2005; Tunç et al., 2012a)

Nickel laterites are derived from ultramafic rocks and contain economically exploitable reserves of nickel and commonly cobalt. The deposits are developed on olivine-bearing ultramafic rocks, mainly dunite and olivine-pyroxene peridotite and their serpentinezed equivalents [Brant, 1998]. The oxidic ores of nickel are formed by a chemical concentration process that occurs as a result of the lateritic weathering of peridotite rock. Peridotite consists mainly of olivine, a magnesium iron silicate containing up to 0.3% nickel. In many rocks the peridotite has been altered to serpentine, a hydrated magnesium silicate, prior to exposure to weathering. Olivine and serpentine are decomposed by groundwater containing carbon dioxide to form soluble magnesium, iron and nickel. The iron rapidly oxidizes in contact with air and precipitates by hydrolysis to form goethite and hematite, which remain near the surface of the deposit (Roorda et al., 1973).

Extractive metallurgy of nickel is dependent on the type of ore body. Although recovery of nickel from sulfide ores is based on only pyrometallurgical methods, flow-sheets of nickel extraction from laterites are based on both pyrometallurgical and hydrometallurgical methods. Hydrometallurgical or combination of pyrometallurgical and hydrometallurgical treatments of lateritic ores rely on the homogeneous chemical and mineralogical distributions within the laterites. In laterites, nickel is mainly present in goethite, serpentine, smectite and in manganese oxides together with cobalt. Since cobalt is associated with nickel, processes to extract nickel are also applicable to extract cobalt. Therefore hydrometallurgical treatments are based on extracting nickel and cobalt from iron, magnesium and manganese oxides, based on leaching procedures (Büyükakıncı, 2008).

The mechanical activation of minerals makes it possible to reduce their decomposition temperature or causes such a degree of disordering that the thermal activation may be omitted entirely. In this process, the complex influence of surface and bulk properties occurs. The mineral activation leads to a positive influence on the reaction kinetics, an increase in surface area and further phenomena. Mechanical activation by high energy milling is an innovative procedure that improves the efficiency of mineral processing because of several factors, most importantly the formation of new surfaces and the creation of lattice defects. High energy ball milling can induce, at room temperature, some chemical reactions that normally occur at very high temperatures (Balaz, 2008; Tromans et al., 2001; Apaydin et al., 2011).

In this study, the effects of ball-to-mass ratio during mechanical activation on the structure and thermal behavior of a Turkish lateritic nickel ore were investigated with X-ray diffraction (XRD), particle size analysis, scanning electron microscopy (SEM) and thermal analysis (TG/DTA).

Materials and Method

Lateritic nickel ore was obtained from Manisa-Gördes (Turkey). The ore was ground to a size of <100 μm. The mechanical activation of lateritic nickel ore was performed in a Planetary Mono Mill Pulverisette 6 under the following conditions: the weight and diameter of tungsten carbide (WC) balls were 200 g and 10 mm respectively; the grinding bowl was 250 mL WC; the grinding times was 30 min; the speed of the main disk was 600 rev.min-1; the grinding process was dry. Ball-to-mass ratios during mechanical activation were 10, 20, 30 and 40.

X-ray diffraction analysis was performed using a Rigaku Ultima X-ray diffractometer and Cu Kα radiation. A JEOL 6060 LV scanning electron microscope (SEM) was used for morphological analysis of the non-activated and activated samples. DTA was performed using TA Instruments SDTQ 600 at heating rate of 10°C.min-1 under atmospheric conditions and Mikrotrac S3500 was used for particle size distribution analysis.

Results and Discussion

X-ray diffraction patterns of non-activated laterite and activated with different ball-to-mass ratios are given in Figure 1. Quartz and goethite are the major phases while hematite presents as minor phase. When laterite was subjected to mechanical activation for different ball-to-mass ratios during milling, peak broadening and decreasing of intensity occurred. This fact is the result of crystal lattice imperfections and disorderings. Crystalline size becomes smaller than about one micron by mechanical activation. During high-energy milling, the size of crystals decreased to some critical values. Further energy supply to these crystals of limiting size causes further deformation of crystals, energy accumulation in the volume or at the surface of crystals and subsequently amorphization. There is not only one effect occurring during the milling process. Because of the contact between powder – ball and attrition between powder-ball-bowl, local temperatures may be increase for higher rev (Tunç et al., 2012a; Balaz, 2000; Tunç et al., 2012b).

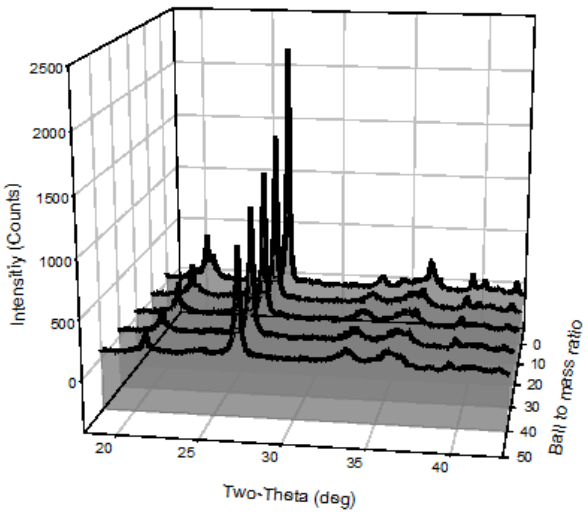

Figure 1. X-ray diffraction patterns of non-activated and activated laterite ore with different ball-to-mass ratios

Scanning electron micrographs (SEM) and particles size analysis of the samples were given in Figure 2-4. It was clear that the particle size decreased during mechanical activation. SEM analysis is in good agreement with particle size distribution data, given in Table 1. Defining of particle size distribution by using three percentiles is common practice. These are the cumulative distributions of particle size correspond to 10%, 50%, 90% and specified as d_{10}, d_{50}, d_{90}. They are taken directly from mass-based cumulative particle size distribution (German, 2007). Mechanical activation results in smaller particle than the non-activated one when focused on d_{90} cumulative distribution, but when d_{50} column is taken into account, the particles become larger. Increases in the particle size with mechanical activation may be due to the agglomeration of the particles. When the particle is milled, its surface area increased because of the crushing and forming new surfaces become more reactive.

Table 1. Particle size analysis of non-activated and activated laterite samples

Ball-to-mass ratio	d_{10} (µm)	d_{50}(µm)	d_{90} (µm)
Non-activated	1,103	35,65	120,20
10	0,635	2,711	36,67
20	0,646	3,320	33,49
30	0,644	3,600	30,80
40	0,668	5,781	32,68

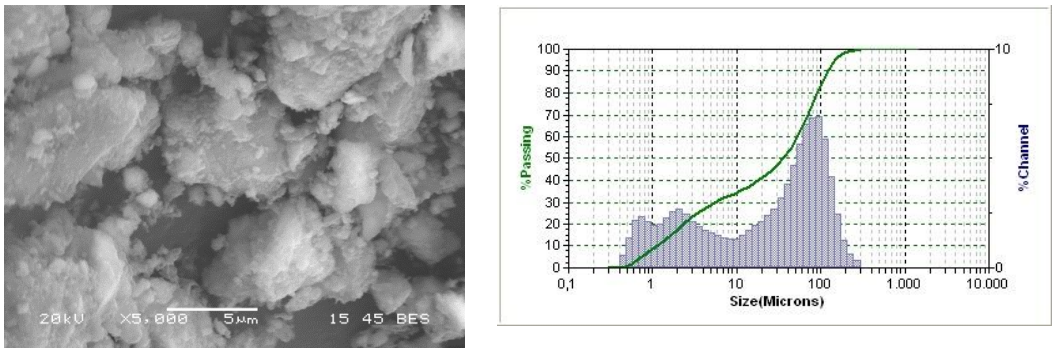

Figure 2. SEM micrograph and particle size analysis of non-activated ore

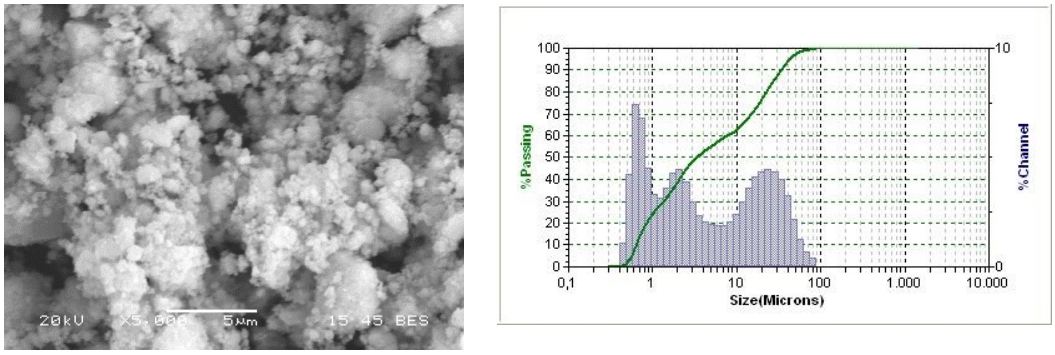

Figure 3. SEM micrograph and particle size analysis of activated ore (ball-to-mass ratio: 20)

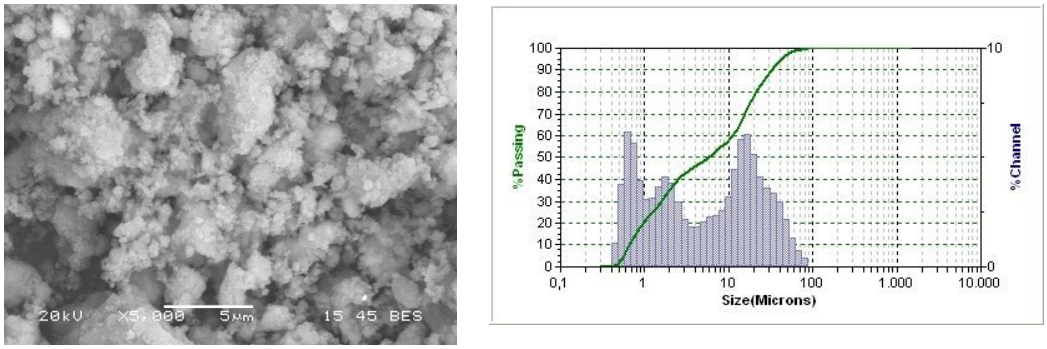

Figure 4. SEM micrograph and particle size analysis of activated (ball-to-mass ratio: 40)

Thermal analysis (TG/DTA) of the non-activated and activated laterite with different ball-to-mass ratios are given in Figure 5 and 6. For the non-activated lateritic nickel ore, the weight losses in two steps exist at 120°C and 280°C, belonging to evaporation of humadity and dehydroxylation of goethite into hematite respectively. The temperature of dehydroxylation for pure goethite varied between 274 and 305°C, depending on particle size and crystallinity. O'Connor et al.(2006) stated that the transformation of goethite to hematite occurred between 210 and 370°C in limonitic laterite. Pickles (2004) also stated that the goethite – hematite transformation occurred after 250°C in limonitic laterite. Mechanical activation resulted in disappearing the second endothermic peak corresponding to transformation. From these results it can be said that goethite transformation into hematite needs lower energy than the original one for activated samples because of the accumulated energy from mechanical activation and there is a probability for transformation which occur during milling.

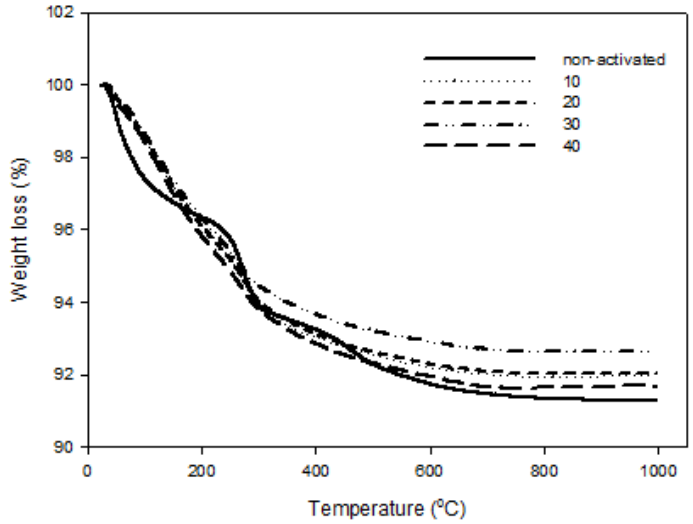

Figure 5. Thermogravimetric analysis (TG) of the samples

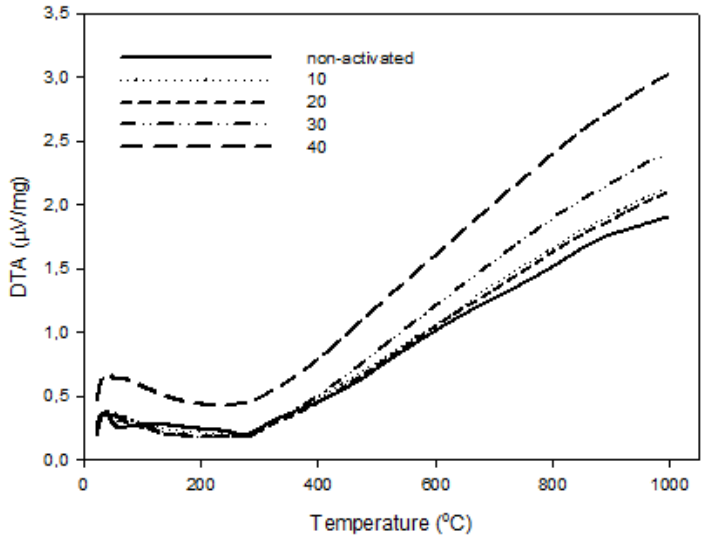

Figure 6. Differantial thermal analysis (DTA) of the samples

Conclusions

Increasing in ball-to-mass ratio during mechanical activation caused amorphization and structural disordering in laterite. Particle size of the ore was decreased. Dehydroxylation reaction, which is transformation of goethite to hematite, occurred during milling and the peak of dehydroxylation in thermal analysis (DTA) disappeared, due to the structural disordering in laterite.

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Enhancing organizational learning in the implementation company with enterprise social software

Radosław Kowal, Mariusz Żytniewski

University of Economics in Katowice, Department of Information Systems, Poland

e-mail: radoslaw.kowal@ue.katowice.pl

Abstract: The paper contains a description of a social software platform prepared especially to address the need for supporting the processes of organizational learning. Different kinds of social software were used and their suitability in business environment was discussed. According to the SLATES paradigm formulated by McAfee (McAfee, 2006) social software can be used to achieve many different goals, many of them related to organizational learning. Finding the right tool to support the social part of learning in organizations seems to be very important nowadays, when many companies have to bear with global competition and build their competitive advantage on effective human capital management. We believe that there is a need for establishing a clear insight into advantages of using social software within knowledge-based organization.

Key words: organizational learning, wikis, blogs, RSS, tags, Enterprise 2.0, social networking

Introduction

During the last years we were witnessing a huge change in the way people exchange different kind of resources. This change comes from the proliferation of the Internet as a medium. In the first phase Internet was just another medium of mass-communication. The websites were rather static and there existed relatively small number of content providers. After some time the situation begin to change and previous content receivers were becoming content providers. Also the number of services emerged which primary goal was to enable communication and resource exchange between people. Among such services there are social networking websites, wikis, blogs, RSS, social bookmarking, tags.

When Internet gained on popularity companies realized that boundaries that were protected them from competitors from other parts of the world had disappeared. The exchange of digitalized resources like codified knowledge, information and multimedia contributed to knowledge diffusion and make it easier to gain competence in chosen area for barely anyone. It occurred that at the same time the phenomenon of globalization took place and connectivity between previously separated markets caused that exchange of goods became much easier.

One of the most noticeable result of these changes for the companies was the need to adjust to the changing environment much faster than ever before. That fact forced companies to look for a solutions that could help them to manage a change more effectively.

Because of the key role of knowledge in today's economy it is said that this is a knowledge-based economy (Ziemba, 2009). In 1996 OECD (OECD, 1996) defined knowledge-based economy as an economy which is "directly based on the production, distribution and use of knowledge and information". Different definitions of the knowledge-based economy point to the key role of knowledge in creating added value by the company and as a competitive advantage. Often exhibited is also the link between the use of the knowledge and the use of information technology. Contemporary enterprises have to deal with the situation, in which the success of the enterprise depends not solely on the amount of the traditional forms of capital, above all, on the quality and quantity of knowledge held by the organization.

The relationship between the usage of knowledge and the usage of information and communication technology (ICT) is often mentioned. It is based on the fact that ICT is very effective in gathering, creating, transforming and transferring explicit knowledge (Roberts, 2000).

In the knowledge-based economy there are many companies which do business with knowledge and competences of their employees as a key assets. One of the most widespread kind of such enterprises are the companies that offer consulting services. The growing need for management information systems (MIS) and especially Enterprise Resource Planning (ERP) systems resulted in establishing many consulting companies that specialize in implementing MIS according to the specific requirements of their customers. Those companies build their competitive advantage on the base of the knowledge about the best practices applied to the certain line of business and the knowledge about adjusting ERP system to the requirements. The significant amount of creativity is often needed to find the right solution of the emergent problems.

Implementing companies seek the tools which can help them in managing organizational knowledge Probably the most important feature of such a solution would be the ability to gather and preserve organizational knowledge. The organization has to be prepared for the situation of losing their employees. It is also important because knowledge in the knowledge base can be sought which means that the preserved knowledge can be reusable and can be used for teaching purposes. Usually the employees of the implementation company form teams in which they work together during the implementation projects. They have to be able to communicate and collaborate effectively (Bajenaru, 2010).

This paper aims to provide an insight on how social software can be used in business environment. We concentrate on implementation company which is a good example of knowledge-based organization. First paragraph contains the state-of-art in the researches in the field of organizational learning with strong emphasis put on the social aspect of learning. The second depicts how social software affects the processes of organizational learning. In the third paragraph we decided to provide a description of how a platform of enterprise social software for implementation company has been designed and how different kinds of social software were used. The last paragraph contains a conclusion remarks.

Organizational Learning

The above mentioned factors caused that organizational learning (OL) plays important role in the contemporary enterprises. Many of them decided to pay closer attention to the processes that comprise organizational learning. Researchers underlines its potential to increase organizations' overall performance (Lopez, Montes Peon, & Vasquez Ordas, 2005).

Organizational learning can be defined as: "The process of improving actions through better knowledge and understanding" (Fiol & Lyles, 1985). Although relatively old this definition can useful because it is an example of one of the most popular approach towards OL that stresses the importance of improving quality of organizational behavior. Other definitions or explanations what are the characteristics of OL emphasize the fact that learning does not necessarily lead to improved quality of organizations' actions and occurs in an iterative manner. For example Rowe and Boyle define OL as: "An iterative process of action and reflection that results in the modification of an organization's actions". This definition underlines the fact that learning is an outcome of the enterprise experience processing in which in order to learn it is necessary to reflect on the results of the organizations' actions. Many researches come to the conclusion that learning in the organizations depends heavily on the exchange of knowledge between members of this organization and emphasize the social aspect of learning in the organizations(Brown & Duguid, 1991), (Lave & Wenger, 1991), (Schwandt & Marquardt, 2000), (Sanchez, 2001).

Easterby-Smith and Araujo (Easterby-Smith & Araujo, 1999) argue that organizational learning process can be perceived from two distinct perspectives: technical and social. Those researchers who put more attention to the technical perspective concentrate on the effectiveness of information processing, information interpretation and response to information which comes from both inside and outside of the organization. The other emphasize the role that plays experience obtained in the workplace and how this experience can be derived from different sources, both tacit and explicit.

There are certain characteristics that affect the way people learn at the group level. Among them we can distinguish interpretation, knowledge sharing and storing. That corresponds to Huber's (Huber, 1991) findings on four main constructs of OL: knowledge acquisition, information distribution, information interpretation, and organizational memory. Knowledge acquisition refers to the process of collecting knowledge from different sources. It means that we assume that the knowledge is some kind of resource that can be gathered.

One of the main assumption is that a group, be it small group of close friends or colleagues from the same department affects the processes of learning which occur at the individual level. It means that an individual, who

learns within organization is forced to customize his or hers cognitive processes to those imposed by a group. Hence interacting with other members of the organization causes the changes in the way an individual interprets situation, experience and information. Besides changes on the cognition level there are also changes at the behavioural level what means that an individual changes its behavior according to group. Wenger and Lave (Lave & Wenger, 1991) argue that group of people working together on the same tasks form communities of practice. The appropriate conditions for organizational learning are obtained by participating in these communities. Collective learning comes from the effort to achieve the common goal and from shaping social relations within the group.

Similar view is presented by Weick and Roberts (Weick & Roberts, 1993) who state that the behavior of units is ruled by the knowledge obtained from the relations with other people and shared ideas on the group in which these relations take place.

Enterprise 2.0 in enhancing processes of organizational learning

Enterprise 2.0 is a term first coined by Andrew McAfee from MIT (McAfee, 2006). Enterprise 2.0 refers to applying technics encompassed in the term Web 2.0 in supporting internal communication within corporate environment. Web 2.0 refers to the changes in the usage of Internet towards greater participation of users in the process of content creation and towards amplified collaboration among Internet users. Such effect is achieved thanks to the new functionalities of websites and new applications that ease content sharing in the Internet. Among them we can mention: comments published to the content on the websites, feedback in the form of content evaluation, subscription to the chosen content, greater involvement to the content creation through widespread of wiki approach and blogs.

Enterprise 2.0 enhances the communication within organization. It helps with conveying by the management information on the goals of the enterprise and methods that are going to be applied to reach them. On the other side, thanks to E2.0 an average member of the organization can easily express his or hers own opinion and evaluation of the management's plans and activities. E2.0 provides a platform for knowledge creation, both in personal dimension and on the level of the whole enterprise. It can be also used to disseminate information and to enhance collaboration (Zhang A. M. Hildebrandt H., 2009).

There are several technologies that the term Enterprise 2.0 refers to:

- Blogs,
- Wiki,
- Tags,
- RSS,
- Social ranking.

All above-mentioned technologies have one characteristic in common: they are really simple to use. They don't resemble other groupware technologies, nor tools for organizational knowledge management. They operate on the basis of the Web and users don't need anything to use them but internet browser (except for RSS, in case of which browser must support RSS feeds). In addition their specification are freely available and because the simplicity of the concept they are easy to implement for software providers.

In contrast to the traditional understanding of creating personal Web pages one of the main technologies of Web 2.0 – blogs – allow for definitely more frequent and more regular updates of the page content and for easier interaction between page creator and his or hers readers. The tools like trackback and pingbacks allow the blog authors for an almost immediate notification about the fact of publication of links to their blog posts on the other Web sites (Lennon, 2009).

Blogs can be used very effectively for publication of the employees' opinions on management decisions and current situation of the company. They can also trigger discussion about subjects important for the company. In the business environment Kolari et al. (Kolari et al., 2007) indicate that blogs can be used to present and discuss the product portfolio of the company and to publish information and opinions useful for the members of the organization.

Really Simple Syndication – serves to inform users (here referred to as subscribers) of the changes being made to the content of the specific web page. In the corporate environment RSS can be used to inform subscribers about the new content appearing on the blog of the member of the board. One of the main issue with using RSS is

the proper composition of the headline that is received by subscribers. It is important to formulate a headline in such way that it attracts a potential reader.

Enterprise 2.0 assumes is user's freedom in development of links between the elements of organizational knowledge. Before there were always somebody (knowledge engineer or webmaster) who provided a classification (taxonomy) of organizational knowledge. However, the taxonomy does not verify well in terms of the classification of content on Web pages. In the report cited by the McAfee (McAfee, 2006), developed by Forrester Research, the second most frequently pointed by experienced users problem in the use of corporate intranets was inappropriate content classification. In the framework of Enterprise 2.0 users apply so-called tags to categorize the content. Such a classification system began to be called folksonomy. In practice, this means that people (users) provide a classification scheme for themselves.

In the enterprise tags allow employees to classify the content gathered in the corporate intranet. From the end user's point of view of they ensure an easier search for information. However, from the knowledge engineer's point of view they allow for a very easy check, what types of information are considered by users as the most desirable. Thanks to such solution content creators for the intranet are gaining knowledge of the habits of users regarding searching through the content. In addition, using the web analytics tools it is possible to determine the path, users move through the intranet, which further increases the resource info on their demands for the organizational knowledge.

The Wiki definition taken from the Wikipedia (a web encyclopedia, created using wiki technology) describes wiki as a "website which allows its users to add, modify, or delete its content via a web browser usually using a simplified markup language or a rich-text editor" ("Wiki," n.d.). One of the biggest advantages of wiki usage is its simplicity – it doesn't require a user to learn anything to be able to edit a content of the webpage.

Wikis are attractive to companies because of the low cost of implementation. Actually no specialists are needed for this task. Virtually everyone, regardless of their skills can become the provider of the content. In accordance with the rules of the Wiki a software gives the user the ability to record changes, and if user has administrative permissions Wiki gives him or her also the privilege of the approval of modifications made by other users, or their withdrawal. Creating Wiki pages is easier than creating pages using HTML, because the Wiki software offers the user an editor and a simplified syntax.

Among different purposes for which wikis are applied in the corporate environment we can introduce:

- Knowledge management,
- Documentation management,
- Project management,
- Notetaking,
- Building intranets.

2.2.5. Głosowanie społecznościowe

Social ranking refers to providing evaluations of the content of the website. The members of community gives grades to the content thus providing their opinions on how the content is perceived in terms of usefulness, readability, clarity and completeness. On the other hand when the content author repeatedly receives high grades it can him or her with building social capital and higher social rank.

In the case of corporate's content social ranking allows to achieve the following purposes: check the quality of the knowledge stored in the knowledge base, evaluating knowledge vendors (authors). On the basis of these opinions, it is possible to identify people, being the source of knowledge in the topic, as well as people endowed with a special skill for knowledge transfer. The height of the grades can be used also for tuning of search algorithm and to create a better recommendation. Using the data collected in the server logs and analysis of the data from ratings issued by users, it is possible to better match the search results to the person's needs.

According to Huber (Huber, 1991) there are four main processes (constructs) of OL: knowledge acquisition, information distribution, information interpretation, and organizational memory. Knowledge acquisition refers to the process of collecting knowledge from different sources. It means that we assume that the knowledge is some kind of resource that can be gathered.

We suggest that to support the processes of the organizational learning a platform comprised of social software can be used. We designed and created such platform with respect for the strength of each considered types of social software.

Knowledge acquisition is a process which is a base for any other constructs / processes defined by Huber.

Knowledge acquisition has been always problematic because of the necessity to extract knowledge from experts who frequently don't know exactly what they know or don't know how to codify the knowledge in their possession. Employees can be a great source of knowledge. Tools like blogs and wikis can be of great help in such case because the simplicity and promptness of use lies in the very nature of these tools. Even very busy experts can find time to publish status or provide short comment expressing their view on specific topic. Through the ability to publish a question on one's wall the speed of propagation of information within organization can be noticeably higher.

Information distribution refers to the methods used to convey from one source of content to the other. Thanks to the effective knowledge distribution organization provides itself the increase the efficiency of their activities. It is a common problem for knowledge based organization that different pieces of information are stored in different parts, departments of organization. Thus the solution proposed in this paper is based on the assumption that we should provide means for ensuring easy access to organizational knowledge to every organization's member.

There is a number of tools encompassed in the term ESS that can be used to address this issue. First of all RSS is a tool that can be used to simplify the process of notifying content receivers about the novelties in the organization's knowledge base. Through the subscription service users can easily stay in touch with the changes made to the specific topic. Such subscription can be made for the topic created in wiki. Wikis can be used to gather and store organizational knowledge. Blogs alike can be used to disseminate knowledge within corporate environment. Through the publication of the blog post its author offers a piece of knowledge to the public.

Information interpretation is important to learning because even when we gain some knowledge and we share it with others it's not always enough for organizational learning to occur. Very often it is necessary to build a shared mental model for the proper knowledge incorporation and usage. To achieve such common understanding it is necessary to provide a proper interpretation. According to the findings of Cress and Kimmerle (Cress & Kimmerle, 2008) wikis can support learning through enabling processes of assimilation and accommodation. Each user that reads wiki topic can also edit it or/and comment on it. Through the joint collaboration on that specific topic a community is able to gain common interpretation and understanding. We should also take into account that blog authors usually let readers to comment on their work. This can also led users to obtain common interpretation. Using social networking tools like commenting on other users' statuses people can enhance shared understanding.

Before organizational knowledge can be used it needs to be gathered first. Then it has to be accessible for its potential users. Organizational memory refers to the solutions that provide an ability for the organizational knowledge to be stored and effectively searched. In terms of ESS wikis are a great tool to fulfill that need. One of their main characteristic is built-in versioning. In typical wiki implementation it is easy to track the changes being made to the content of the topics.

Enterprise social software platform for an implementation company

Based on presented characteristics of enterprise social software a platform supporting the processes of organizational learning has been prepared. In order to simplify the process of its creation an existing wiki engine has been used – namely Foswiki. Foswiki is an open source project that is a so-called fork of much older an popular wiki engine called TWiki. Both engines are written in Perl programming language. Foswiki is offered to the public at no cost under the rules of GPL license ("Foswiki - FAQGnuGeneralPublicLicence," 2012). Thanks to that everyone is allowed to use it and to modify its source code. It also worth to note that Foswiki's base functionality can be easily extended with the usage of many ready-to-use add-ons.

The ESS platform has been designed to enhance organizational learning and one of the most important aspects of OL is collaboration and knowledge sharing. Hence the platform design has to take into account the information needs of different organizational members. Because of scarcity of space we don't provide here the whole analysis but only the most important facts. Eight main groups of employees have been identified:

1. Board of directors – their needs in terms of information concentrate on the results of implementation projects and problems with its realization which can affect financials of the organization
2. Implementation consultants – they need every information that can help them to end an implementation project within the deadline and budget.
3. Customer service consultants – they need every information that is connected with the details of implementation for the specific customer.
4. Programmers, IT consultants – they focus on gathering requirements for specific solutions and developing it as well as maintaining IT solutions being implemented within the information system.

5. Process support (assistants, office workers) – mainly they need to know who is working where and when.
6. Project managers – information that can help to plan and monitor the implementation project.
7. Sales department – they must know what are the features of the IS and previously applied solutions.
8. Customers – need to know what are the options in terms of functionality of the IS and how to use it – user's manuals.

There are different goals for which people prescribed to the above mentioned roles use a wiki. Everybody is going to use it in the search for knowledge but some of them will write down knowledge to the system as well. Project manager can use a wiki system to oversee the outcomes of the projects he or she manages.

The core technology of the platform is wiki. Information are stored in the platform in the form of so-called topics. Every topic is one wiki page, with its own unique URL. Topic consist of its content, template which describes how the content should be displayed and data form, containing structured information about the content of the topic. Hence it is possible to treat topic as a unique typed knowledge object – the name of the data form becomes an object identifier and form itself, along with the template describes the details of implementation (Harvey, 2010). Every employee is entitled to create new topics, comment on the content of the existing topics and modify its content. Thus the main paradigm of the wiki technology is here directly implemented.

The whole knowledge base was divided into several namespaces, containing knowledge related to different subjects. In the terminology used in the Foswiki project those namespace are called webs. The under-lying assumption says that knowledge related to projects, customers, business processes and IT solutions should be described with different metadata. This kind of partition reflects the actual needs of the particular organizational roles . On the other hand it helps with the creation of separated semantic namespaces for different realms of organizational knowledge. Consequently it helps with searching for information since everyone who wants to find information about, for instance, projects, will go to the namespace 'Projects'. Foswiki itself doesn't restrict users to look for topics within one web.

For the implementation company there were following webs defined: Projects, Solutions, Customers, Best Practices and Tasks. Projects is the web designed to gather knowledge related to the projects being realized by the implementation company. Solution is a web designed to gather knowledge related to the IT solutions prepared by the company in order to realize specific customer's requirement. Customer contains basic information about customers and contact data. Best Practices is devoted to gather knowledge about typical implementation and service problems and, of course, how to solve these problems. Tasks is the web for managing workflow - assigning and monitoring execution of tasks during implementation projects.

Because part of Foswiki is an inner macro language it is also possible to create applications within each topic. An example of such application, inspired by Peter Theony, founder of TWiki, is presented below – figure 1. This application makes it easier to search through the wiki topics.

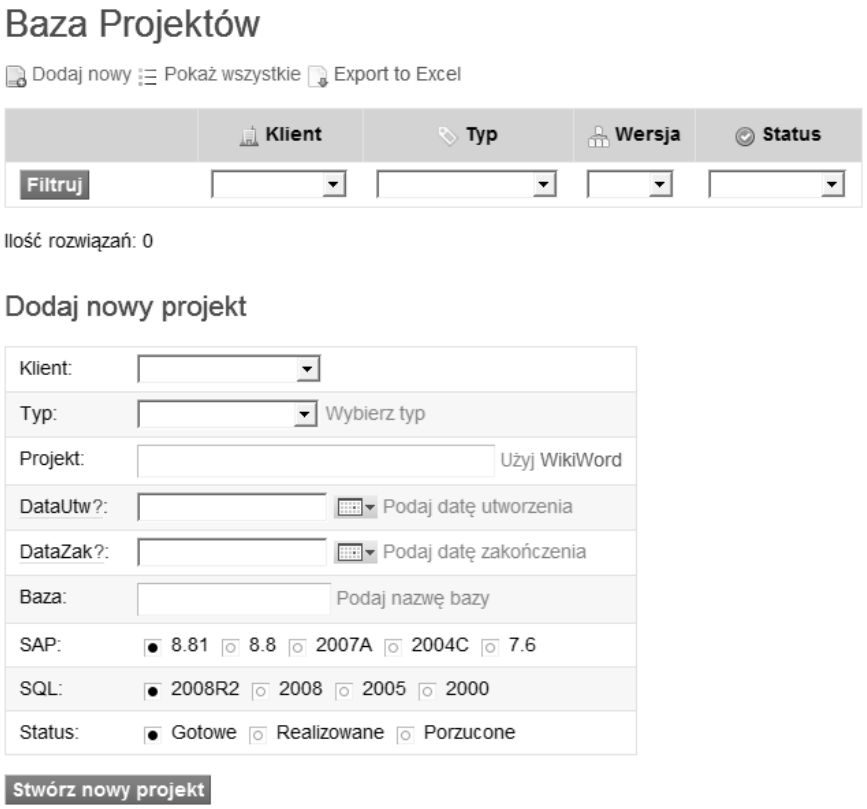

Figure 1 An example of application in Foswiki

The data contained in the data forms can be used do define knowledge domains. By defining the domain of knowledge it becomes possible to create knowledge networks, built on the basis of the content contained in the individual topics. For example: for the topic associated with the category 'Service', containing information related to the installation of additional solutions, where service consultants are the target audience it is possible to define the competence of the author of this specific topic. In turn, on the basis of information about the competence of the individual authors of entries it is easy to point to areas where you can expect expert advice from a specific person. In the case of a large organization identifying the source of competence can be laborious. In order to minimize the costs of acquiring knowledge we must provide a simple and effective way of creating knowledge networks. The network allows for the exchange of information in the domain, mainly between people who sets it up. At the same time, thanks to the model of knowledge creation and knowledge access in wiki the free movement of knowledge is provided. Also outside of the network it was created by organizational members with similar competence.

Tags have been implemented in the platform using the add-on called 'TagMe'. It allows to attach to selected pages (or to all) a part of the page, in which it is possible to choose one or more tags from the set of previously created. It is also possible to create new tags or to modify existing. Users can check how many times different tags were used to provide description to the topic's content. This allows you to gain knowledge about the popularity of different thematic spheres in the knowledge base. Figure 2 shows the browsing view for all tags created for the topic describing an IT solution.

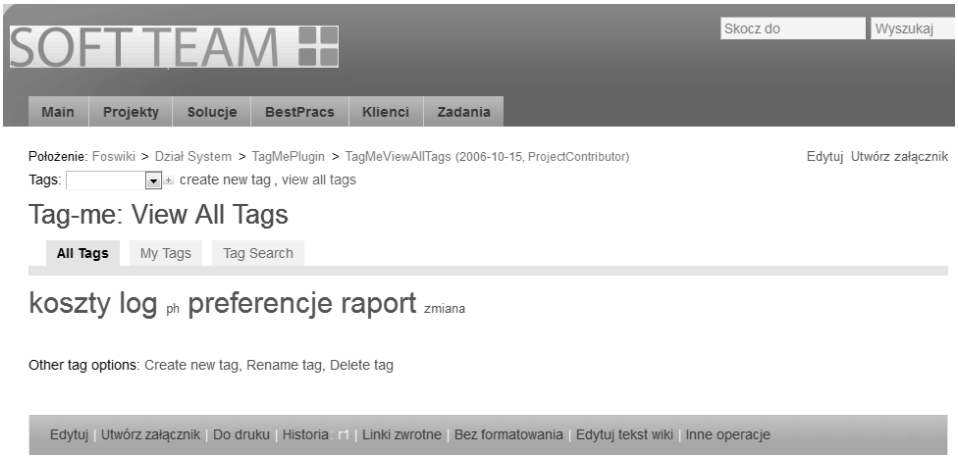

Figure 2 Browsing tags

Users can also use tags to search within knowledge base. It is possible to browse through topics using tags applied to the content by other users, thus taking advantage of folksonomy (Tosic & Nejkovic, 2009). The classification we obtain this way allows for better fit to the content gathered in the organizational knowledgebase.
One of the technics especially useful for establishing and controlling the quality of the knowledge gathered in the knowledge base is social ranking. In the enterprise social software platform users can evaluate the topics in wiki. The topics are evaluated according to three categories – tab 1.

Table 1 Categories for topics evaluation

Category	**Goal**
Usability	To gather information evaluating the usefulness of the topic
Completeness	To evaluate the completeness of the knowledge in the topic
Clarity	To evaluate if the knowledge in the topic is presented in the form easy to comprehend

Data gathered from ranks provided by users can be used to determine the best sources of knowledge. Such employees can be offered a special to bonus what can be motivated for others. The other possible area for utilization for that data is social networks analysis. We can find out who is learning from whom analyzing the grades provided by content readers to content authors.

One of the unmet information needs, revealed during the initial audit was the need of easy access to the news coming both from inside of the organization and from the outside. RSS seems to fit perfectly to address this need. We decided to utilize RSS to present information from the SAP's world and from inner 'Best Practices' webspace.

The blog functionality has been added to the platform in order to provide a better insight into the solutions prepared by employees. Also the management has a chance to speak up. Using blogs is feasible in explaining the reasoning staying behind business decisions. From an average employee point of view it exposes a chance to comment on the blog thus expressing his or hers attitude towards the management's posts.

Future research

The organizations faced a number of obstacles in use of social solutions to support identified learning methods. One of the most important is the lack of support for knowledge distribution outside the organization. Such knowledge is available at the user level, group level and organizational level, however, is not distributed further. For knowledge-based organizations and any other innovation-centric organizations it is important to share and acquire knowledge from the environment. Therefore, it is necessary to undertake studies on the use of innovative solutions in this area.

Problem of knowledge exchange is also visible in virtual organizations where the dynamics of changes in the connections among business partners is also high. It is particularly important in the case of an application of heterogeneous IT systems of business partners. The challenges that occur in B2B interactions include (Li, 2010):

- an organization's autonomy, which means that activities, tasks and decisions taking place in an organization should be hidden from the environment,
- an integration of various business processes taking place in the environment as part of own processes,
- a direct integration of management IT systems without the use of intermediary solutions that can impact the exchange of data.

These solutions include semantic ontologies to support a codified, explicit knowledge representation and software agents to support the distribution of so-encoded knowledge resources. Its use allows for easier searching and classifying knowledge contained in the system, provides a better understanding of the information content and improves the development process, usability, maintenance and interoperability of such knowledge resources. Ontologies also support the possibility of using modern IT solutions such as software agents in multi-agent systems. Is such systems an ontology can be seen as a representation of a software agent knowledge resource or can be use in agents communication process. In this case, ontologies support "understanding" of the message and increase software agents cooperation abilities. Semantic knowledge representation allows understanding of concepts and terms, which are also understandable for humans. It includes a set of vocabulary, semantic relationships of terms, and some simple inference rules and logic for business processes. For example a software agent can use ontology to transform the new term into the one used in the database. This contextual search ability, give an agent opportunity to acquire a better information which can be use in an agent goal realization.

The use of agent technologies will make it easier to integrate distributed devices as part of business processes in which a human being participates, dynamically specify processes with their participation, codify such processes as part of the concept of composite software and obtain new knowledge about processes and entities that participate in them.

In order to ensure interoperability in such systems, it is necessary to move from a business model which aim is to define the significance of connection of devices in the context of the resulting business objective to a technical model that allows using appropriate IT solutions supporting a given business process and ensuring that individual technical solutions work together.

Conclusions

With the growing interest in Web 2.0 technologies comes a significant increase in interest in their use in the field of knowledge management and organizational learning. This is so for several reasons among them the most important are those related to increase in meaning of knowledge in creation of value added (knowledge-based economy) and the phenomenon of prosumption. The use of social software helps in enhancing the social aspect of organizational learning. Such software has been used in support of many OL related processes: knowledge gathering, storing and sharing. But the subject of orchestration of different kinds of social software in the purpose of enhancing organizational learning hasn't drawn a lot of researcher's attention so far.

This paper aims to address the need for effective use of social software merged in one collaboration platform. The approach we applied corresponds to the SLATES paradigm proposed by one of the pioneers of Enterprise 2.0 - Andrew McAfee. The study of the literature and the analysis of weaknesses and strengths of existing social software

platforms has resulted in the social software platform prepared with clear goal of supporting organizational learning within knowledge-based organization. We presented the reasoning that stood behind that initiative. The platform has been built based on the experiences gathered in the course of participatory observation and analysis of information needs of different groups of implementation company's employees.

The use of social software gives a social aspect to the processes of organizational learning. In turn, the social nature of the collection and sharing knowledge is commonly perceived as a key factor in effective managing of organizational learning. Employees in companies where such software is being used become prosumers, what means that they are both the authors and the consumers of organizational knowledge. Hence the knowledge they provide fits better their needs and expectations.

Although there are critical comments regarding the difficulties with introduction social software to the business practice the advantages coming from ease of use, reduced cost of implementation and the benefits associated with increased productivity decide on the growing interest in social technologies by enterprises.

Social software turns out to be particularly useful for companies, which are known as knowledge-based. Because most of the added value produced by this type of company results from the application of the knowledge and skills of workers, the assistive technologies in a simple and efficient knowledge management are relevant here.

Not without significance for the assessment of this type of solution is the fact of their universal use by almost all young people to communicate and exchange knowledge in the private sphere. Familiarity with various elements of Enterprise 2.0 is beneficial for acceptance of this type of software for professional applications

The social software platform in the middle of a pilot implementation in an existing company. The data gathered in the course of exploitation will serve to create an assessment of real value of this tool for supporting the processes of organizational learning.

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Evaluating the Role of Joint Venture for Technology Transfer in Petrochemicals Industry at Jubail, KSA

Noor Iskanadarani[1], Mansour E. Abou Gamila[2] and Ali Shash[3]

[1]Arabian Gulf University, Kingdom of Bahrain, noor.iskandarani@gmail.com
[2]Arabian Gulf University, Manama, Kingdom of Bahrain
[3]King Fahad University for Petroleum and Minerals, Kingdom of Saudi Arabia

Abstract: In the petrochemical's sector, where the market evolves incessantly around new processes and functions, companies are forced to be continuously innovative by acquiring or developing technologies. This is a crucial element in the competitive strategy of any enterprise. The ongoing integration between the Saudi market and the international market liberalizes and enhances the competitive pressure within companies, in particular joint ventures and alliances. As well as, it increases technological development needs. This study was conducted to evaluate the role of Joint Venture for technology transfer in petrochemicals at Jubail Industrial City, Saudi Arabia. A questionnaire was developed to collect the necessary data from joint-ventures companies. Seventeenth companies completed and returned the questionnaire. The obtained data were analyzed using SPSS package. The results indicate that several Technologies including product, process, marketing, organizational, strategic, and systematic have been successfully transferred to the Petrochemical industry in Saudi Arabia. The majority of these technologies have been transferred mainly through joint venture companies. Joint venture companies consider and control many internal and external aspects to assure a successful technology transfer. Association with suitable partner, commitment of the top management, education and training, flexible organizational culture, intra-organization coordination and use of information and communication technology are essential ingredients of any technology transfer process. Also, the results show that patents play a main role in increasing profits for the joint venture companies. Language is considered as the major factor in creating a gap toward success in Joint Venture.

Key words: Product technology transfer, process technology transfer, strategic technology transfer, marketing technology transfer, top management, education and training, flexible organizational culture and barriers to technology transfer.

Introduction

Transfer of technology is more than just the moving of high-tech equipment from the developed to the developing world, or within the developing world. Moreover, it encompasses far more than equipment and other so-called “hard” technologies. It also includes total systems and their component parts, including know-how, goods and services, equipment, and organizational and managerial procedures. Thus, technology transfer is the suite of processes encompassing all dimensions of the origins, flows and uptake of know-how, experience and equipment amongst, across and within countries, stakeholder organizations and institutions (Gately, 2011). Multinational enterprises have a number of options for technology transfer. These include contractual arrangements, such as technology licensing agreements, joint ventures, technical assistance and management contracts, turnkey projects and direct foreign investment in wholly-owned subsidiaries or affiliates. Transfers also occur, for example, through education of students abroad and through trade in capital goods between unrelated parties. Technology transfer can be understood as the process by which technology moves from one physical or geographic location to another for the purpose of application towards an end product (Simon and Herman, 2001). Nevertheless, the transfer process can take place either domestically from one sector to another or from one country to another covering the required knowledge, experiences and skills.

Technology transfer may comprise some or all of the following: fabricated materials and capital goods such as machines, instruments, equipment and the rest of the technology and its necessities such as design and execution works; preparation of feasibility studies for projects, including technological experiences and skills

comprising knowledge relating to production, patents, documents, drawings, operation programs, maintenance instructions, training and education activities (Bresman, Birkinshaw, and Nobel, 2010).

A joint venture is a strategic alliance where two or more parties, usually businesses, form a partnership to share markets, intellectual property, assets, knowledge, and of course, profits (Patton and Rayan, 2009). This partnership can develop between two big parties in an industry. It can also occur between two small businesses, which believe partnering will help them successfully compete against their bigger competitors. Likewise, companies with identical products and services can also join forces, to penetrate markets they otherwise would not take on, without investing tremendous resources. Furthermore, due to local regulations, some markets can only be penetrated via joint venturing with other local businesses. In some cases, a large company will form a joint venture with a smaller business, empowering it to quickly acquire critical intellectual property, technology, or resources otherwise hard to obtain, despite adequate cash at their disposal (Raff and others, 2009).

Saudi Arabia is a pioneer in the field of petrochemicals in the Middle East region. Over the last two decades it has built itself from a modest beginning into a position of strength (Al Dabibi, 2003). One of the unique characteristics of the petrochemical industry is the great interaction between feedstock, technologies, products and by products. For the production of many petrochemicals, there may be more than one process of technology involving different combinations of feedstock and by products. To date, out of the distribution of foreign direct investment by major foreign companies in Saudi Arabia, it is mainly chemicals and petrochemical companies which have contributed 60% of the total. Wilson (2004) and others concluded that ExxonMobil is the largest foreign investor in Saudi Arabia, accounting for 23% of the total foreign direct investment, with a total cumulative investment exceeding $14 billion. There exist giants such as the state owned Saudi Aramco and Saudi Basic Industries Corporation, ranking among the world's largest petrochemical products.

Literature Review

Technology transfer framework attempts to incorporate economic, social, and political influences that affect the ability of different corporations to both create new knowledge and deploy that knowledge in economically useful ways and thereby contribute to economic growth and prosperity. The objective mostly is to build a more general understanding of firm–industry relationships and their role in knowledge-based innovation systems (Bercovitz and Feldman, 2006). Olayan (2004) said that understanding technology may only be acquired by training, education, experimentation, research and previous experience. There are two main approaches with regard to the types of technology that need to be transferred: vertical and horizontal transfer. Vertical technology transfer is transference from general to specialized levels, or transference from the scientific level to the final product form. Whereas, horizontal technology transfer is transference from one country to another, or from one application to another, e. g. uses of warfare technology to the civilian sector.

Kogut (2006) said that joint ventures can be summarized as an instrument of organizational learning and movement of knowledge. In light of this, Muller and Schnitzer (2006) examined why multinational firms would prefer to enter joint venture agreements albeit the fear of spillovers. It was summarized with one phrase only: Knowledge Movement. Thus, the clear direct policies like taxation have always been taken into consideration, particularly for the new born international joint ventures companies. Furthermore, a joint venture company is set when a host country influences an international one to share its knowledge, development, objectives and existing technologies towards the achievement of both parties' benefits and success. (Roy and Oliver, 2009). An overlooked factor affecting the success or failure of international joint ventures is the effectiveness of the leadership. Obviously, the main feature of leadership teams in a joint venture, are in its demand to identify ways to improve the manpower's effectiveness. Blalock and Gerlter (2008) had identified five key elements of the joint venture leadership - team composition, process, structure, incentives, and the leader's behaviour which has important implications toward joint venture success. Their analysis was based on the literature regarding top management teams, cross-cultural behaviour, international joint ventures, and their own in-depth interviews with leadership teams, from international joint ventures. Hagedoorn and Schkaenraad (2006) studied the strategic technology partnering between firms, and it has become a growing subject of interest, to both companies experimenting with this mode of economic organization and researchers from a wide variety of academic disciplines. Also, the effort was made to measure the effect of strategic technology partnering on companies engaged in such joint efforts.

High-technology industries have led the way in the globalization of international business in recent years. Success often depends on how well a firm transfers technology to another firm or market in a foreign country (Keller, 2008). Abdul Wahab and others (2010) stated that the inter-firm technology transfers through international joint ventures, have significantly contributed to a higher degree of local innovation

performance/capabilities, technological capabilities, competitive advantage, organizational learning effectiveness, productivity, technological development of local industry, and the economic growth of the host country. Since the focus of inter-firm in developing countries has shifted to the degree of technology transfer, organizations in developing countries are attempting to assess not only the significant role of technology transfer in strengthening their corporate and human resource performance, but also to influence other critical variables. These variables include the size of the multinational company, age of joint ventures, country of origin, and the multinational company type of industries. Contractor and Woodly (2010) proved that the effective knowledge transfer process, monitoring the opportunity, maximizing the joint venture synergetic values, technology providers, and the share is equal with the net benefits; all these elements can be controlled systematically and implemented successfully, based on how tight or loose the relationship is between the joint venture's partners according to their own decision and the global and/or local market status.

Al Ghamdi (2008) said that the transfer of technology process aims to: reduce the country's dependence on oil and to utilize national resources more efficiently, and to investigate the factors affecting the transfer and the conditions related to the technology in question - the receiving entities are also analyzed. Keller (2008) stated that many of the important factors are ambiguous by nature and difficult to measure. For instance, the technology to be transferred and the target markets may be changing, estimating costs and prices can be difficult, and the competition may consist of only a small number of firms or governments. Several critical factors may be external to the firms involved, such as political, cultural, and economic conditions. It is important, under these conditions, for management to have a good understanding of the international technology transfer process and the barriers and bonds that determine success. The success of the technology transfer among joint venture companies is always been measured by the degree of the technology transferred to the local party. Furthermore, a joint venture is the most efficient mechanism to insert any new technologies, skills, or knowledge. However, to make this process occur smoothly and easily, the parties need to conform to the relationship quality and mutual trust and the degree of tacit explicit knowledge (Abdul-Wahab et al., 2011). Henrik and others (2010) concluded in their case study that the success of technological know-how occurs when it is facilitated by excellent communication, visits and meetings between the partners on a regular basis.

Caves (2003) stated that one way of viewing a multinational enterprise in Saudi Arabia, is as an economic institution that owns, in whole or in part, controls and manages income-generating assets in more than one country. However, normally multinational corporations (MNCs) possess some advantages enabling them to produce and compete successfully in an unfamiliar foreign environment. A number of technologies have been imported into the Kingdom of Saudi Arabia. This experience has affirmed the conviction that technology can make an invaluable contribution to the growth of the Kingdom of Saudi Arabia. However, in doing so the Kingdom of Saudi Arabia, like other nations, faces some questions of possible obstacles, trials and errors during the course of industrial development and technology transfer. These can be addressed by utilizing science and technology efficiently to develop many sectors, improving output of industry, developing standards and status of national manpower and its utilization. (Al Ankari, 2004)

Gately and others (2011) analyzed Saudi Arabia's growth in oil consumption, and they found that the oil consumption domestically is nearly 3 million barrels/day, which is one-fourth of the total production. Moreover, they concluded the rapid growth in consumption is 57% annually, which is 50% faster than the income growth, which in turn will challenge Saudi Arabia's abilities to increase its oil exports. Additionally, Jinagl and Chao (2010) supported the above statements by examining the Sahara oil reservoir in B Block of Saudi Arabia, and came up and said that it has very low porosity and permeability. However, Saudi is forming a three-way joint venture as a n-butnol plant in Jubail industrial city in the east of Saudi Arabia, as well as another JV between Saudi Aramco and Dow Chemicals being formed in the near future, in order to build the largest petrochemicals complex in the Middle East – this, will also be located in Jubail industrial city (Young, 2011). The Gulf Petrochemicals and Chemicals Association's annual report which was published in 2008, aimed to provide a comprehensive information source, which would cover developments in all countries of the Gulf. The report assured that Saudi Arabia continues to lead capacity development in the region with activity. As the Saudi government encourages economic diversification, the kingdom is now moving firmly upstream into refining and downstream to industrial development (Tracy and others, 2011). Over the past 10 years, there was a huge expansion of petrochemical production in the Middle East - two essential factors were responsible: (1) the availability of feedstock at low prices as a consequence of the large oil production, (2) the strategic location of the Middle East enabled the area to supply the Atlantic and Far East needs of petrochemicals, in particular the enormous demands from China. (Seddon and Duncan, 2010).

Saudi Arabia was the first country of the Gulf Cooperation Council, to implement an offset related investment program with foreign contractors, to help build its technological and human capital through technology transfer. Ramady (2005) examined the various offset programs undertaken and compares these with

private sector non-offset joint venture investments, to assess the effectiveness of technology transfer in the petrochemical sector using a model of technology transfer "packaging comprehensiveness". The results indicated a greater degree of technology transfer for the offset related programs, but the current Saudi educational structure needs to be directed towards science based subjects in order for such technology transfers to become self sustaining and high value job generating in the future. (Mathews, 2003).

Research Problem

With the exception of Saudi Basic Industries Corporation projects, about 70% of all the current petrochemical projects in Saudi Arabia are joint ventures with major chemical companies. Literature review based assessments of joint ventures in Saudi Arabia, indicated that these businesses are enjoying comfortable monetary benefits from economic endeavours in Saudi Arabia. Nevertheless, there seems to be insufficient information available on the impact of these joint ventures on technology transfer in terms of know-how, employment, and adoption. Lack of incentive or mandatory clauses may also act as an obstacle to joint venture agreements.

Research Significance

- The government desires to build strong and lasting industrial sectors to benefit from the country's available capital plants, which are considered major assets for the country. Assessing the problems facing this industry will help in eliminating them and syncing industrialization with advanced technology attainable through technology transfer.
- The success of the petrochemicals industry in the Kingdom of Saudi Arabia is very important to achieve the government's plan of diversifying the country's revenues.
- Transferring the petrochemicals technology into the Kingdom of Saudi Arabia is an attempt to promote Saudi development and training in this sector, as well as, the indigenous petrochemicals industry in the Kingdom. The creation of such a sector would give a boost to the Saudi economy as it would bring high value and high technology jobs to the region.
- Study the open door policy to further foreign direct investment into Saudi Arabia, from established global energy and petrochemicals firms. Examining joint ventures should allow considerable technology transfer, though their sheer size will also necessitate more diversified and imaginative financing solutions.

Research Objectives

The main objective of this research is to evaluate the role of joint venture for technology transfer in petrochemicals at Jubail industrial city, Saudi Arabia. To accomplish the main objectives, the following sub-objectives are to be met:

- Go over the current situation for technology transfer through joint venture in petrochemicals at Jubail industrial city, Saudi Arabia,
- Determine the causes and effects facing technology transfer processes within petrochemical joint venture companies in the Kingdom

Research Methodology

Based to the objectives of this work, the research methodology was descriptive using comprehensive survey of the literature. A quantitative research methodology was also used, with a questionnaire presented to and completed from top management, such as CEO's and whoever is involved in the decision-making process.

Tools for Data Collection and Statistical Analysis

Based on several previous studies related to the study area, a first draft of survey tool "Questionnaire" was developed. The questionnaire was e-mailed to a number of academics and experts with experience in technology

management. They were asked to evaluate the relevant contents of the questionnaire, its language, accuracy, completeness, clarity and reliability. The final form of questionnaires was distributed via E-mails in order to collect data from the respondents. The data were be collected from top management, such as CEO's and whoever is involved in the decision-making process of both representative of joint venture through a structured questionnaire and direct interviews as appropriate, whereas no significant difference between the two parties. The collected data were then analyzed and conclusions were delivered. Statistical Product and Service Solution (SPSS) version 16.0 for windows was used for the statistical analysis of the data collected by questionnaires. Microsoft Excel 2007 software was used to manage, process, and present the data.

Research Population

The population in this research consists of petrochemicals companies located in Jubail Industrial City in Saudi Arabia, which are listed on the Saudi Arabian General Investment Authority and Chamber of Commerce and Industry. The population was taken as companies located in Jubail Industrial City, which are 31 companies, and some of them operate in different locations yet they have representative and/or support office at Jubail Industrial City.

Research Sample

28 questionnaires were sent via E-mails to CEO's and planning directors, who were representing their joint ventures companies in Saudi Arabia. They were requested to participate by completing the questionnaire. However, the final retrieved number of responses was 17 out of 28 with percentage of (60.7%).

Statistical Test for the Tool

Reliability Analysis for Cause and Effect of Technology Transfer

A reliability analysis procedure was applied to make sure that the implemented tool was reliable in measuring the underlying elements. The reliability criterion (Cronbach alpha) of each section was calculated and presented in table (1). The analysis indicates that all factors have coefficients alpha ranged from (0.75) to (0.92). Therefore, values of calculated alpha in this research work indicate high levels of reliability.

Statistical Validity Analysis for Cause and Effect of Technology Transfer

To verify the validity of the study tool, the Pearson's Coefficient of Correlation between the main scale and the subscales are calculated as shown in table (2). Table (2) shows that the calculated Pearson's coefficient of correlation for the ten sub sections of this scale are between (0.499) for the fifth section and (0.910) for the ninth section. Since the correlation coefficient is ($r > 0$), it shows that correlation coefficient is positive and significantly different from zero. These results show that there is a statistically linear significant relation between the variables. This indicates that the study tool has the validity to meet the research objectives.

Table (1) Values of Cronbach's alpha for Cause and Effect of Technology Transfer

Number	Sub Scale	Cronbach's alpha
1	Technology(s) that the company has transferred to Saudi Arabia	0.75
2	How the company attained technology transfer	0.79
3	Abandoning or delaying projects due to non feasibility or lack of resources and information	0.78
6	Potential aspects that facilitate easiness in acceptance of Technology Transfer	0.87
7	Potential aspects that facilitate easiness in implementation of Technology Transfer	0.92
8	Potential sources of information which contribute in Technology Transfer process	0.86
9	Factors influencing the Technology Transfer success within the firm	0.85
10	Incentives that play a main role to increase the profit for the company	0.88

Table (2) Pearson's Coefficient Correlation for "Cause and Effect of Technology Transfer Process" and its subscales

Number	Sub Scale	Pearson's Correlation
1	Technology(s) that the company has transferred to Saudi Arabia	0.936(**)
2	How the company attained technology transfer	0.708(**)
3	Abandoning or delaying projects due to non feasibility or lack of resources and information	0.818(**)
4	Effectiveness in receiving transfer technology	0.508(*)
5	Saudi government policies revolving around joint venture agreements favour technology transfer	0.499(*)
6	Potential aspects that facilitate easiness in acceptance of Technology Transfer	0.710(**)
7	Potential aspects that facilitate easiness in implementation of Technology Transfer	0.596(*)
8	Potential sources of information which contribute in Technology Transfer process flow	0.673(**)
9	Factors influencing the Technology Transfer success within the firm	0.910(**)
10	Incentives that play a main role to increase the profit for the company	0.695(**)

Results and Discussion

Cause and Effect of Technology Transfer Process

Types of technologies that the joint venture company has transferred to Saudi Arabia

To determine the technologies that the joint venture company has transferred to Saudi Arabia, the frequencies and percentages for the responses of the sample on the question "What is (are) the technology(s) that the joint venture company has transferred to Saudi Arabia" are calculated as shown in table (3).

Table (3) Technologies that the Joint Venture Company has transferred to Saudi Arabia

No	Technology	Yes		No		Chi-Square	Df	Sig.
		Freq.	Percent	Freq.	Percent			
1	Product Technology Transfer	5	29.4%	12	70.6%	2.882	1	0.090
2	Process Technology Transfer	7	41.2%	10	58.8%	.529	1	0.467
3	Marketing Technology Transfer	9	52.9%	8	47.1%	.059	1	0.808
4	Organizational Technology Transfer	11	64.7%	6	35.3%	1.471	1	0.225
5	Strategic Technology Transfer	12	70.6%	5	29.4%	2.882	1	0.090
6	Systematic Technology Transfer	11	64.7%	6	35.3%	1.471	1	0.225

The results in table (3) show that the "Strategic Technology Transfer" is the most kind of technology that has been transferred to Saudi Arabia through the surveyed companies with a percentage of (70.6%) of the sample. Jabar and other (2011), said that this element usually get the highest percentage due to the direction that the companies have adopted, that help to modify the way of thinking from technology transfer philosophy into

organizational learning philosophy, which is an antecedent of technology transfer and new product development. This is followed by "Organizational Technology Transfer" and "Systematic Technology Transfer" with the same percentage (64.7%) of the sample. The researchers think that Joint Ventures companies are clearly targeting to transfer new management methods more than transferring processes, products or else, and that might be for the weakness in the training programs, research and development, or the ability to start producing new products and new processes.

The Mechanism of Attaining Technology Transfer in the Joint Venture Company

To define the mechanism of attaining technology transfer in the Joint Venture Company, the researchers calculated frequencies and percentages for the responses of the sample as shown in table (4). It can be concluded from the table that most of the companies investigated in the study have attained technology transfer in collaboration with another enterprise with a percentage of (70.6%). Lichtenthaler (2010), justified that most of the companies, especially who are in industrial market, always tend to head for open innovation and inter-organizational technology transfer, in other words alliances and licensing with technological firms. The results show significant differences at (α=0.05) in the responses for the benefit of the companies who attained technology transfer by themselves as shown in table (4).

Table (4) Methods of technology transfer

No	Phrase	Yes		No		Chi-Square	df	Sig.
		Freq.	Percent	Freq.	Percent			
1	Mainly by your Organization	1	5.9%	16	94.1%	13.235	1	0.000
2	In collaboration with another enterprise	12	70.6%	5	29.4%	2.882	1	0.090
3	Mainly by another Organization	5	29.4%	12	70.6%	2.882	1	0.090

Effectiveness of Saudi Manpower in Receiving Technology Transfer

The results show that six companies of the respondents said they are strongly agree that the Saudi technical manpower are effective in receiving transfer technology with the highest percentage (35.3%) and (23.5%) of the sample agreed with the statement. Ahmad (2007) said that the oil companies worldwide are looking for ways to improve operations in order to stimulating production increasing and costs reduction. Therefore, companies focused on addressing the technical quality of the local manpower and started to improve it through several English, American, Canadian, and Australian expertise. Then, by the end of 2004, the technical manpower efficiency in Saudi Aramco was improved up to 64% while the costs were reduced to 39%. Table (5) shows the results.

Table (5) The effectiveness of Saudi technical manpower in technology ransfer

Strongly Disagree		Disagree		Uncertain		Agree		Strongly Agree		Chi-Square	df	Sig.
Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent	Freq.	Percent			
0	0	2	11.8	5	29.4	4	23.5	6	35.3	2.059	3	.560

The Saudi Government policies around Joint Venture Agreements favor Technology Transfer

The results show that six companies said that the Saudi Government policies revolving around joint venture agreements favor technology transfer with a percentage of (35.3%) of the sample, whereas eleven companies (64.7%) didn't agree with this statement, as shown in table (6). Aldridge and Audrestch (2010) said that, several references since the 21st century began, Saudi Arabia had set many policies that concerning technology transfer mechanisms and processes, but it was obviously that those policies are not even closely related to oil, gas, and petrochemicals sectors. In addition, there were policies that control and confined the foreign investment in Saudi, which makes the Kingdom unhealthy environment to attract the investors to deploy new technologies and develop them.

Table (6) The Saudi Government's policies revolving around joint venture agreements

Yes		No		Chi-Square	df	Sig.
Freq.	Percent	Freq.	Percent			
6	35.3	11	64.7	1.471	1	.225

The Potential Aspects that Facilitate Acceptance of Technology Transfer

To determine the potential aspects that facilitate acceptance of technology transfer, the means and standard deviations for the responses of sample on the question: "What are the potential aspects that facilitate acceptance of technology transfer?" are calculated as shown in table (7). The results revealed that the first potential aspect that facilitate acceptance of technology transfer is collaborating with suitable external partners (Means=4.824, SD=0.393). In fact, this factor came in the beginning due to the partnership parties most likely tend to understand each business philosophy and cultural perspectives, and these could be considered essential elements to achieve a successful cooperation, especially if both parties are from different cultural background; then the trust and transparency are playing very important role to make technology transfer process done successfully. In the second place came the aspect "Management Commitment and Support" (Means=4.353, SD=0.606) followed by the aspect "Education and training" (Means=4.235, SD=1.201). "Flexible Organizational Culture" came in the fourth potential aspect that facilitate acceptance of technology transfer (Means=4.176, SD=0.529).

Table (7) The potential aspects that facilitate acceptance of technology transfer

No	Phrase	Means (5)	SD	Sort
1	Management Commitment and Support	4.353	0.606	2
2	Flexible Organizational Culture	4.176	0.529	4
3	Focus on long term gains when compared to short term profits	4.125	0.719	5r
4	Collaborating with suitable external partners.	4.824	0.393	1
5	Intra-Organization Coordination	3.625	0.619	9
6	Use of Information and Communication Technology 'ICT'	3.438	1.031	10
7	Having clear objectives and criteria for technology transfer.	4.118	1.111	7
8	Recruiting compatible talent and securing the required competencies.	4.125	1.204	5r
9	Education and training.	4.235	1.201	3
10	Competitors and other Organizations in your sector.	3.882	1.166	8
	Total	4.090		

The Potential Aspects that Facilitate Implementation of Technology Transfer

To determine the potential aspects that facilitate implementation of Technology Transfer, the means and standard deviations for the response of sample are calculated as shown in table (8). The results show that three potential aspects "Focus on long term gains when compared to short term profits", "Flexible Organizational Culture" and "Collaborating with suitable external partners" are chosen as the first aspect that facilitate implementation of technology transfer, and here we can see that both partners of the Joint Venture are looking for their long and short term benefits, considering that the culture they are going to deal with as a major factor, too. Where choosing the convenient partner is an essential factor to make the success for this process. These three aspects had the same means (M=4.353). In the fourth place came the aspect "Management Commitment and Support".

Table (8) The potential aspects that facilitate implementation of technology transfer

No	Phrase	Means (5)	SD	Sort
1	Management Commitment and Support	4.294	0.470	4
2	Flexible Organizational Culture	4.353	0.702	1r
3	Focus on long term gains when compared to short term profits.	4.353	0.702	1r
4	Collaborating with suitable external partners.	4.353	0.862	1r
5	Intra Organization Coordination	3.588	1.004	5r
6	Use of Information and Communication Technology 'ICT'	3.588	0.795	5r
	Total	4.088		

The Sources of Information which Contribute in Technology Transfer Process

Means and standard deviations for the responses of the sample are calculated to determine their opinion about the potential sources of information which contribute in technology transfer process as shown in table (9). The results show that the study sample thinks that the first potential source of information which contributes in Technology Transfer process is "Market sources such as Suppliers, Customers, Competitors, Consultants and Commercial lab/R&D canters" (M= 4.353. SD=0.862). This is followed by two statements in the second place which are "Intra Organizational information and use of 'ICT'" and "Government or public research institutes" (M=4.235). The fourth source was "Universities and Higher education and institutions" (M=3.938, SD=1.237).

Table (9) The sources of information which contribute in technology transfer

No	Phrase	Means (5)	SD	Sort
1	Intra Organizational information and use of 'ICT'.	4.235	0.437	2r
2	arket sources such as Suppliers, Customers, Competitors, Consultants d Commercial lab/R&D canters.	4.353	0.862	1
3	Universities and Higher education and institutions.	3.938	1.237	4
4	Government or public research institutes.	4.235	1.348	2r
5	Professional Conferences, Journals and Meetings.	3.529	0.875	5
6	Fairs and Exhibitions.	3.412	0.939	6r
7	Professional or Industry Associations.	3.412	0.939	6r
	Total	3.873		

The Factors Influencing the technology transfer success within the Joint Venture Company

To identify the level of the respondents agreement on some potential factors influencing the technology transfer success within the firm, means and standard deviations for the responses of the sample are calculated. As shown in table (10), "Training and development programs" is the first potential factor influencing the technology transfer success (M=4.235, SD=0.903). The training might be the most important element that influences technology transfer positively, only if it is been conducted continuously for constant improvement to the manpower and ongoing technology development opportunities. The second factor is "Market awareness of Technology Transfer" (M=4.188, SD=0.911). Two factors came in the third place with the same Means (4.176) and SD (0.883 and 1.015). These factors are "Inclination towards creative behaviour and idea generation." and "Improvement of decision-making, communication, working environment, frame work". This was followed by the factors "Value of the product and productivity efficiency" and "Emphasis on in-house and extramural research and development" with means of (4.133 and 4.059) respectively.

Table (10) The factors influencing the technology transfer success within the joint venture

No	Phrase	Means (5)	SD	Sort
1	Entrepreneur's commitment.	3.882	0.858	7
2	Inclination towards creative behaviour and idea generation.	4.176	0.883	3r
3	Improvement of decision-making/communication/working environment/tram work.	4.176	1.015	3r
4	Competitive advantage.	3.625	1.088	10
5	Training and development programs.	4.235	0.903	1
6	Emphasis on in-house and extramural research and development.	4.059	1.088	6
7	Market awareness of Technology Transfer.	4.188	0.911	2
8	High sale potential.	3.250	1.065	12
9	Value of the product and productivity efficiency.	4.133	0.990	5
10	Effecting the development of the economy	3.647	0.996	9
11	Create new industries or expand the existing.	3.706	0.772	8
12	Investment returns increment.	3.294	1.047	11
13	Product quality increment.	2.941	1.029	16
14	Customer satisfaction increment.	3.000	1.061	15
15	Potential of learning.	3.176	0.883	14
16	Overcomes ownership restrictions and cultural distance.	3.235	0.903	13
	Total	3.670		

The Incentives for Increasing the Profit of the Joint Venture Company.

To determine these incentives, the means and standard deviations for the responses of the sample on the question about the role of these incentives in increasing the profit for the joint venture company are calculated as shown in table (11). The results show that "patents" came in the first place (M=4.353, SD=0.606) as an incentive that can play a main role in increasing the profit for the joint venture company. Ramady (2010) said that Saudi government is funding and supporting all the concerned institutions that have research and development or strategic alliances with technological providers. The government is also playing an essential role to commercialize new patents within the Kingdom, as this was one of the requirements for Saudi Arabia to join the trade world organization (WTO). The second place was taken by the incentive "Design Registration" (M=3.882, SD=0.993). "Trade Marks" came in the third place with a means of (3.875) and SD (1.204).

Table (11) The incentives for increasing the profit for the joint venture company

No	Phrase	Means (5)	SD	Sort
1	Patents	4.353	0.606	1
2	Design Registration	3.882	0.993	2
3	Trade Marks	3.875	1.204	3
4	Copy Right	2.400	0.986	7
5	Secrecy/Confidentiality Agreements	3.412	1.326	6
6	First Mover Advantage	3.588	0.795	4r
7	Complexity of Design	3.588	0.795	4r
	Total	3.585		

Technology Transfer Barriers in The Kingdom of Saudi Arabia

The respondents were asked to indicate the level of their agreement on some factors that are considered barriers to technology transfer to Saudi Arabia. The means and standard deviations for the responses of the sample are calculated as shown in the table (12). The results show that amongst sixteen chosen factors, the respondents thought that the culture and language factors are the first potential factors that considered barriers to technology transfer to Saudi Arabia (Means= 4.647 SD= 0.606). The second factor is the "Differences in policies and procedures" with a means of (4.235) and SD (1.252). The factor "Lack of appropriate contractual terms and conditions" is categorized as the third barrier (M=4.118, SD=1.166). The two factors "Absence of National Plans for Science and Technology Development" and "Governmental Policies" came in the fourth place with the same means (4.059). This was followed by "Market Domination by Established Enterprises" and "Lack of Communications and Coordination" with the same means (M=4.000).

Table (12) Technology Transfer Barriers in The Kingdom of Saudi Arabia

No	Phrase	Means (5)	SD	Sort
1	Culture/Language Barriers	4.647	0.606	1
2	Lack of time	3.353	1.057	13
3	Inadequate training	3.471	1.231	12
4	Lack of funding provisions	3.250	1.183	14
5	Differences in policies and procedures	4.235	1.252	2
6	Market Domination by Established Enterprises	4.000	1.323	6r
7	Geographical differences	3.941	1.144	8
8	Lack of appropriate contractual terms and conditions	4.118	1.166	3
9	Lack of Information and Technology	3.235	1.252	15
10	Weak and/or Lack of Infrastructure	2.471	0.943	16
11	Lack of Qualified Personnel	3.500	1.095	11
12	Lack of Communications and Coordination	4.000	0.791	6r
13	Difficulty in Finding Suitable Partner for JV	3.765	0.970	9
14	Lack of Market Information	3.529	1.125	10
15	Absence of National Plans for Science And Technology Development	4.059	0.966	4r
16	Governmental Policies	4.059	1.249	4r
	Total	3.727		

Analysis of Variance and T-Test

Analysis of variance was carried out to identify any significant differences at (α=0.05) in the role the role of joint venture for technology transfer in petrochemicals industry at Jubail Industrial City, Kingdom Of Saudi Arabia considering the six independent variables namely: the nature of business, the joint venture company's market, the capital of the company, the annual revenue, the total number of employees and the percentage of Saudi nationals working in the company.

The Nature of Business

According to the nature of business whether it is manufacturing or trading, the results show that there are significant differences at (α=0.05) in the effectiveness in receiving technology transfer and in favouring technology transfer by the Saudi government policies revolving around joint venture agreements. It could be that the policies which facilitate transferring technologies need to be more discussed in terms of technology transfer in petrochemical sector. However, results didn't reveal any significant differences (α=0.05) in the other causes that are assumed to affect the technology transfer process.

The Joint Venture Company's Market

The results show that there are significant differences at (α=0.05) in the incentives that play a main role to increase the profit for the company ascribed to the joint venture company's market, and this might be because the patent is always an attractive factor to the investors for joint venture and to commercialize it into the international market. But there are no significant differences in the cause and effect of technology transfer process according to the other subscales.

The Capital of the Company

The results show that there are no significant differences at (α=0.05) in the cause and effect of technology transfer process according to the capital of the company.

The annual revenue of the company.

The results show that there are no significant differences at (α=0.05) in the cause and effect of technology transfer process according to the annual revenue of the company.

The Total Number of Employees

The results show that there are no significant differences at (α=0.05) in the cause and effect of technology transfer process according to the total number of employees in the company.

The Percentage of Saudi Nationals Working in the Company

The results show that there are significant differences at (α=0.05) in the potential aspects that facilitate implementation of technology transfer according to the percentage of Saudi Nationals working in the company, and this might be because setting plans and procedures is mostly more easier than executing them. But there are no significant differences in the cause and effect of technology transfer process according to the other subscales.

Conclusions

Technology transfer is a crucial and a dynamic factor in social and economic development. The industry's adopted business model, therefore, has entailed setting up joint ventures with leading global players. Al-Ghamdi (1987) illustrated that joint venture transfers more technology than direct foreign investment. With the exception of SABIC projects, almost all the current petrochemical projects in Saudi Arabia about 70% are joint ventures with major chemical companies (Al-Sa'doun, 2006). The technology transfer, as much as it seems to be simple in words, as much as it is quite complex and full of much opposition such as advantages, impacts, income, barriers, knowledge and difficulties. It might be because it is a rapidly changing process and may face several factors that block it or slow it down.

In the Petrochemical industry, several technologies including product, process, marketing, organizational, strategic, and systematic have been successfully transferred to Saudi Arabia mainly through joint venture companies. Joint venture companies consider and control many internal and external aspects to assure a successful technology transfer. The conclusion can be summarized in:

1. “Strategic Technology Transfer” is the most kind of technology that has been transferred to Saudi Arabia.
2. The majority of the petrochemical companies in Saudi Arabia have attained technology transfer in collaboration with another enterprise.
3. “Collaborating with suitable external partners”, “Management Commitment and Support”, “Education and training”, “Flexible Organizational Culture”, “Competitors and other organizations”, “Intra-Organization Coordination” and “Use of Information and Communication Technology” sequentially ordered as the factors that facilitate in acceptance of technology transfer.
4. “Focus on long term gains when compared to short term profits”, “Flexible Organizational Culture” and “Collaborating with suitable external partners”, “Management Commitment and Support”, “Organization Coordination” and “Use of Information and Communication Technology” are major factors that facilitate in implementation of technology transfer.
5. “Market sources such as Suppliers, Customers, Competitors, Consultants and Commercial lab/R&D centers”, “Intra Organizational information and use of 'ICT'”, “Government or public research institutes”, “Universities and Higher education and institutions” and “Professional Conferences, Journals and Meetings” are major sources of information which contribute to technology transfer process.
6. “Training and development programs”, “Market awareness of Technology Transfer”, “Inclination towards creative behavior and idea generation”, “Improvement of decision-making, communication, working environment, frame work” and “Value of the product and productivity efficiency” are major factors in influencing the technology transfer success within a firm.
7. Patents, as an incentive, play a main role in increasing profits for the joint venture companies.
8. The majority of the joint ventures consider “Culture” “Language”, “Differences in policies and procedures”, “Lack of appropriate contractual terms and conditions”, “Absence of National Plans for Science and Technology Development” as the top barriers to technology transfer to Saudi Arabia.

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Factors affecting the effective implementation of e-learning in educational institutions

Mojgan Afshari, Husaina Banu Kenayathulla, Abdul Rahman Idris, Muhammad Sani Ibrahim, Ahmad Zabidi Abdul Razak

Department of Educational Management, Planning and Policy Faculty of Education, University of Malaya

afsharimojgan@gmail.com

Abstract: E-learning is an essential trend in education for the 21st century. In fact, students need the ability to use knowledge to communicate, collaborate, analyze, create, innovate, and solve problems in order to be successful in a global economy. The implementation of electronic learning (e-learning) systems impact on the educational environments and offer learners great flexibility, encourage risk taking, help students to be active learners and enhance their higher order thinking. This paper reviews the literature as it pertains to factors affecting effective implementation of e-learning for instructors andstudents in educational institutions. It is concluded that e-learning practice needs a good ICT infrastructure and active and collaborative involvement of a number of other people. Access to the technologies and pedagogical issues and institutional support services are important in the successful e-learning practice.

Key words: E-learning, educational institutions, students, lecturers, administrators

Introduction

The Internet is considered as a pivotal tool in world communications. According to Kozma (2005), Internet and other Information and Communication Technology (ICT) accelerate the emergence of an information society and knowledge economy. "The rates of proliferation of network, access to the system, and advances in Internet/Web technology have increased the rapid growth of the e-learning approach" (Karaali, Gumussoy, & Calisir, 2011, p.343). Using a web-based learning system (online learning) has significant impact on the educational environments. E-learning provides students with an anytime/any place independent learning environment. Resources which are found at home, libraries, and universities are woven together to connect learners in distinctive and new ways to form a community of learners. In addition, online learning offers new possibilities to integrate various types of learning content according to the learners' need and is additionally compatible with the learners' preferred learning styles (Little, 2001).

The use of Internet or ICT has revolutionized higher educational organizations and has affected teaching and learning contexts in universities and educational institutions all over the world (Salmon & Jones, 2004). Broadbent (2003) pointed out that e-learning changes the way learner learn, lecturers teach, designers develop, and administrators manage. Adams and Seagren (2004) also stated that e-learning can increase institutional reputations, enhance teaching and learning quality, and offer more flexibility in student learning. In fact, cultivating student's creativity and critical thinking abilities is a major goal of most of the educational systems (Roth, 2010). These skills are critical for students while engaged in academic learning because they help students " to generate novel and useful ideas, evaluate the arguments of others and their own, resolve conflicts, and come to well-reasoned resolutions to complex problems" (Behar-Horenstein & Niu, 2011, p.25). Effective use of online learning can help students to achieve this goal.

On the other hand, Spender (2002) pointed out that lecturers who use e-learning system face some challenges such as heavy teaching and learning loads, time constraints, lack of easy access to necessary equipment, irreversible pedagogical consciousness-raising and patience with new media, and lack of personal technical skills. These challenges could lead to resistance to participate in e-learning. Traditionally, technical issues such as technical infrastructure have been considered as an important element in e-learning implementation. However, nowadays, the

human element has been recognized as a critical factor of any technology innovation. In other words, successful e-learning practice in higher education depends on the individuals who use it (Geisman, 2001). The engagement, endeavors, good interpersonal relationships and cooperation among instructors, students, technical support people, and institutional administrators is very important.

Palloff and Pratt in 2001, pointed out that:

"… the more typical online student is seeking an active approach to learning and more involvement in the learning process…. [They are] not content with being taught to, the online student seeks to engage with faculty in a more collaborative learning partnership". (p. 2)

If online courses cannot satisfy students' needs, they are likely to withdraw from the course. According to Willging and Johnson (2004), "it is estimated that dropout rates for distance education are higher than those for on-campus programs and courses" (p. 106). In line with this idea, Frankola (2001) pointed out that "although there is significant variation among institutions … several administrators concur that course-completion rates are often 10 to 20 percentage points higher in traditional courses than in distance offerings" (p. 2). This represents a large amount of lost investment for educational institutions. Therefore, it is important to explain and understand the factors that affect the use of online learning systems because these systems aim at improving the performances of both the University and students as complements of each other. Several research studies and change theories introduced factors contributing to the successful implementation of educational technologies. We can categorize them into two broad categories (organizational factors and individual factors) that should be assessed before and during designing and developing the e-learning practices. In the following section, these factors will be reviewed and a model for successful implementation of instructional innovations will be highlighted. In fact, understanding the pedagogical, psychological and cognitive factors to the successful use of information technology is a vital precondition for improving the utilization of computers and other technological aids in the educational process (Benzie, 1995). Also, the detection of these factors provides information that is helpful in supplementing existing training programs. So, this paper is aimed at educators and policymakers who would like to learn from the research and experiences of others. It is hoped that the knowledge gained from this paper would be useful to these people in making wise decision in relation to their technology investment.

Factors Contributing to the Successful Implementation of e-learning

Organizational Factors

Effective Leadership

Many scholars believe that effective leadership is critical to the successful integration of technology into the schools (e.g., Anderson & Dexter, 2005). According to Flanagan and Jacobsen (2003), effective leaders encourage teachers to use technology as a tool to support the educational objectives such as skills for searching and assessing information, cooperation, communication and problem solving which are important for the preparation of children for the knowledge society. Branigan (2004) stated that an effective leader needs to have the ability to develop and articulate a clear and common vision for technology use in schools; and the ability to change and manage change. Without a shared vision for e-learning and a clear strategic plan, implementation programs can be slow and difficult. A leader should be knowledgeable, competent and supportive about e-learning in order to implement an e-learning program effectively (Branigan, 2004).

Anderson and Dexter (2005) believed that leaders not only should learn how to operate technology and use it, they also should ensure that other staff in the school receive learning opportunities. Furthermore, they added that leaders should assess and evaluate academic and administrative uses of technology and make decision from those data. Therefore, it would seem that educational institutions should define clearly their e-learning policy and goals, have a detailed development plan and strategy to motivate teachers and students to utilize e-learning in their teaching and learning process.

Organizational Culture

Organizational culture is a critical factor in the success of any organizational innovation. According to Tushman and O'Reilly (1997, Cited in Martine & Terblanche, 2003), the basic elements of organisational culture (shared values, beliefs and behaviour expected of members of an organisation) influence innovation through socialisation processes in organisations. During this process, individuals learn what behaviour is acceptable and how they should perform activities. In this way, norms develop and are accepted and shared by individuals. "The basic values, assumptions and beliefs become enacted in established forms of behaviours and activity and are reflected as structures, policy, practices, management practices and procedures". (Tushman & O'Reilly, 1997, Cited in Martine & Terblanche, 2003, p.68).

Based on above explanations, it can be concluded that leaders should use strategies to develop a culture that values e-learning and improve the effectiveness of e-learning practice. Leaders should build e-learning into regular employee milestones; promote the e-learning initiative in e-mails, newsletters, etc.; use a familiar interface and focus on the desired result, and acknowledge employees who complete significant courses and rewarding them publicly or privately (Stuart, 2004).

Martine and Terblanche (2003) introduced a model and identified five dimensions of organizational culture (strategy, structure, support mechanisms, behaviour that encourages innovation and communication) that have an influence on the degree to which innovation take place. Each of these determinants is discussed to describe their influence in promoting or hindering e-learning practices in educational institutions.

Strategy (vision & Mission, Purposefulness)

According to Masoumi and Lindström (2012), effective implementation of e-learning is influenced by explicit institutional visions and goals (long-term aims that guide current practice) and a well-defined mission and strategy that describes technology's place in education. In other words, a vision gives us a place to start, a goal to reach for, as well as a guidepost along the way" (Ertmer, 1999, p. 54). "This factor concerns how well the virtual institutions pursue their mission and goals, and to what extent they take advantage of their diverse resources in terms of managing and organizing various recourses including physical, human resources, etc" (Masoumi & Lindström, 2012,p.31).

Kotter (1996) introduced several strategy for producing successful change in organization and categorized them in three groups: The first group (i.e., establishing urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision) is designed to create a change environment and to overcome the existing status quo. The second group (i.e., empowering broad based action, generating short term wins, consolidating gains and producing more change) is designed to generate new methods of operating to support the implementation. The final group involves the process of institutionalising the change and making it a part of the organisational culture.Therefore, development, articulation, and implementation of a school vision of e-learning that promotes maximum knowledge, skills, and dispositions for every student is very important. Goals, daily activities and strategies, resources, budgets, curriculum, instruction, assessment, and staff development should be align with the e-learning vision. Leaders should develop specific and targeted plans to enhance their skills in working with and motivating teachers to use e-learning effectively in their teaching.

Structure (flexibility; freedom; cooperative teams and group interaction)

"Organizational culture has an influence on the organizational structure and operational systems in an organization" (Martine & Terblanche, 2003, p.70). In fact, the transition from traditional university structure (lecture based mode of delivery) into technology assisted learning, there is a need for lecturers, students, managers, policy makers to accept need for the changing landscape of higher education (O'Neill et al., 2004). If an organization believe that e-learning can surge institutional reputations, improve teaching and learning quality, and provide more flexibility in student learning, these beliefs will influence and change the organization structure and role of university and goals of graduates (Adams & Seagren ,2004).

According to Fleron (1977), implementation of a new technology is not finished with installation of the technology and explanation of how to use it. In fact, the new technology should be accepted by the receiving society

(Asemi, 2006). Lecturers, students, managers' cultural perceptions toward e-learning program are key factors related to both the initial acceptance of this program as well as future behavior regarding their usage (Afshari et al., 2010). Therefore, schools, universities should understand difficulties associated with changing structure of the institution fundamentally.

Support Mechanisms (reward, availability of resources)

According to Brzycki and Dudt (2005), administrative support is a critical factor in a successful implementation of e-learning. A systematic review on the use of Information and Communication Technology within an educational context was conducted by Bosley and Moon (2003) and reported that support at senior management level for implementing new practices and addressing financial implications where appropriate; involvement of several members of staff; fostering culture within schools of collaboration and mutual support; and willingness to take risks are crucial factors for technology integration in schools. Moreover, Gilbert (2000) found that adequate time for users to learn and practice the new skills; administrative support, technical support and incentives can be predictors of effective technology use in teaching and learning. Similarly, Brzycki and Dudt (2005) emphasized on the crucial role of leaders in the successful implementation of educational innovations and added that leaders should provide multiple forms of support , rewards and incentives; tie incentives to desired outcomes; supplement technical support with peer support and well trained student assistants, cultivate strong administrative support; involve faculty in decision-making to secure buy-in, and use faculty models to increase the rate of technology adoption in schools.

In addition, Buchan and Swann (2007) identified resources as an important part of technology implementation. In fact, adequate resources refer to the availability and accessibility of resources needed to implement the innovation. Resources comprise the existing infrastructure as well as an organisation's finances, hardware, software, materials, personnel, and support structures (Ely, 1999). Ali and Ferdig (2002) found that many institutions still struggled with the cost of keeping technology up-to-date such as for lab updates, improved networks, web-based course software, and video/data projection. Nearly half of the respondents in Adams' (2002) study still perceived availability of educational software, instructor computers, and student computers as barriers to integrating technology into teaching.

According to past research, Rogers (2003) stated that characteristic of an innovation as perceived by individual in a social system affect on the rate of adoption. Also, he identified five innovation attributes that may contribute to the adoption or acceptance of an innovation: relative advantage, compatibility, complexity, observability, and trialibility. The relationship between an innovation's attributes and adoption has been examined in a number of diffusion studies. For example, Afshari et al. (2009) found that the computer attributes were significantly correlated to principals' level of computer use. Afshari's study accentuated the importance of computer attributes in the process of computer adoption in developing countries. Also, Dillon and Morris (1996) stated that "innovations that offer advantages, compatibility with existing practices and beliefs, low complexity, potential triablity, and observability will have a more widespread and rapid rate of diffusion" (p. 6). Therefore, if managers and lecturers perceive e-learning as a beneficial tool, compatible with their current activities, and easy to use, they will demonstrate positive attitudes towards e-learning and use it.

Individual Factors

According to Salmon and Jones (2004), personal, university policy and practices, technological, pedagogical factors influence instructors' attitude to use e-learning. Similarly, Matuga (2001) stated that the successful design and teaching of any course hinges on the personality, educational philosophy and pedagogical style of the instructor. In fact, teacher personal will and teacher attitude towards the use of technology in teaching are a crucial element of the involvement in e-learning (Campbell, 2001). Hence, teachers should change their attitude to adopt an online mode of teaching (Mehlinger, 1995). Moreover, Rogers (2003) stated that teachers' personality traits are an indicator of their attitude to change. Those who are proactive in solving their own problems, independent, risk taker, confident and adventurous are more likely to be self-motivated, and respond quickly and positively to the e-learning innovation than those who are more cautious, conservative instructors (Mehlinger, 1995).

According to Murray and Campbell (2000), the most important reasons behind active resistance to computer

integration into teaching practices are anxiety, and incompetence (lack of skill and knowledge). In fact, teachers who have not trained to teach in non-traditional classrooms, they are unfamiliar with interactive and individualized nature of e-learning; they will not have the required skills to confidently create an exciting and challenging online learning environment. It would seem that this lack of competence and confidence in using new technology for teaching will create a certain level of anxiety. Furthermore, online education changes instructors' roles and responsibilities (Yang & Cornelious, 2005). In an online learning environment, they should play as a facilitator and a learning catalyst. They should help students to select and filter information, to provide thought-provoking questions, and to facilitate well-considered discussion (Yang & Cornelious, 2005). Moreover, Murihead(2000) stated that instructors in an online learning environment should provide instructional, emotional, and technological support to students. According to Fox and Mackeogh (2003), lecturers pedagogical approaches such as debates; simulations or games; role plays; case studies; discussion groups; transcript based assignments; brainstorming; Delphi techniques; nominal group techniques; forums; and research projects can give all participants an opportunity to take part in the interaction and can enhance students' learning outcome in an online learning environment. Rosie (2000) reported that when students learn collaboratively or under problem-based scenarios in an online environment, their critical thinking skills will increase and they will learn deeply the concepts. This is supported by Ronteltap and Eureling's (2002) who conducted an experimental study in an electronic learning environment and found that when students are learning in a problem-based practical learning; collaborate more effectively and learn more actively. Hence, integrating collaborative learning, reflective learning, deep learning, problem-based learning, and project based learning methods into instruction is crucial for instructors to improve the quality of online education.

In addition, many researchers argued that student learning attitude (independence autonomy, and self-direction), personality traits (student's will to achieve, being responsible, trusting, tolerant and self-controlled) and competency in e-learning may affect their participation and performance in e-learning (e.g. Ellis & Llewellyn, 2004). Similarly, Daugherty and Funke (1998) stated that student motivation to learn, self-disciplined, accountability, and good time management skills are important factors in the successful use of e-learning. Therefore, students benefit most when they have a positive and active learning attitude and take responsibility for their own learning. Students' lack of technical knowledge and skills can hinder their use of e-learning (Jones, Packham, Miller, & Jones, 2004). Therefore, teachers and students' competency in using new technologies, their attitudes towards e-learning systems and their personality traits play an important role in successful implementation of an e-learning program.

Conclusion

Research studies indicated that online learning can be as effective as face-to-face environments in delivering instruction (Piccoli et al., 2001). "Yet, evidence has suggested that as many as 80% of the employees drop out of these programs before completion because they are inherently isolating" (Johnson, Hornik & Salas, 2008, p.356). Therefore, before designing and developing online learning program, having knowledge of the elements that influence teachers and students effective use of e-learning practice is vital. An examination of past research studies and reports on e-learning implementation in schools show that there are two main factors that affect e-learning practices in schools which are organizational and individual factors. Research on the implementation of technology in schools has also shown that these factors are interrelated. The effective e-learning implementation is not dependent of the availability or absence of one individual factor, but is determined through a dynamic process involving a set of interrelated factors (Ten Brummelhuis, 1995).

Generally, most scholars in the field of change consider change as a process instead of an outcome and emphasize on the effective leadership for the success of any change initiated (Cheung & Wong, 2011). According to Fullan (1991), the process of change consists of the three phases which are initiation (mobilization or adoption), implementation (initial use) and continuation (incorporation, routinization or institutionalization). Moreover, he stated that there are factors affecting each phase of the change process. In fact, these factors do not have equal impact during all stages of the innovation process of e-learning use in education. Hence, researchers must identify influencing factors at different stages of development. Based on this information, barriers to the successful use of e-learning can be identified. An awareness of any barrier that teachers and students face could lead to the development of solutions for overcoming these barriers.

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On Horizontal Beams and Sound Radiation due to a Moving Load

[1]Nitin Agarwala, [2]E M Somashekharan Nair

[1]Hull Inspection and Trials Unit, Vishakhapatnam - 530 014, India
[2]Mechanical Engineering Department, SCMS School of Engineering and Technology, Palissery, Karukutty, Kochi, India

nitindu@yahoo.com

Abstract: Effect of loss factor, rotatory inertia and shear effect on sound radiation by horizontal beams subject to moving loads at subsonic speeds is analysed. Although the contribution of these factors may yield results only a few percentages more accurate and their effect is quite profound when dynamic response analysis is undertaken, it may be an overestimate for slender bodies. The problem is formulated for *Timoshenko beam*, *Rayleigh beam*, *Shear beam* and *Bernoulli-Euler beam* with complex shear and elastic modulus. Taking Fourier transform of the governing equation the non-dimensional sound radiation is obtained and compared to analyse the contributions of loss factor, rotatory inertia and shear effect on sound radiation. The results show that a Timoshenko beam gives the least sound radiation power when compared with other beam types. The magnitude of sound radiation limited to a maximum of 4-5 % increases as one moves from the Shear beam to the Rayleigh beam to the Bernoulli beam. The effect of structural damping exhibits a relation inversely proportional to the vibration levels. The shift of curves due to damping variation is however found to be proportional to the change in the loss factor.

Keywords: Moving Load; Bernoulli-Euler Beam; Rayleigh Beam; Shear Beam; Timoshenko Beam; Loss Factor; Heavy fluid-loading; Sound radiation.

Introduction

A ship at sea or an aircraft in flight vibrate due to surface forces applied by the relative motion of the fluid they are traveling in. Larger the magnitude of the moving load, higher the vibration. High vibration levels generate noise or cause material failure, thus degrading the structure's performance. In case of a floating airport, a bridge, guideway, overhead crane, cableways, rails or roadways the structure is static while being subject to moving loads; unlike the case of a ship or an aircraft wherein the structure is moving and the surface force is at rest. May it be a moving structure in static fluid; a moving force over a static structure or both the force and the structure moving; the resultant effect is vibrations, which cause degradation of the structure.

Moving loads on structures have been analyzed ever since the first railway bridge was built in the early19th century. Over the years, such studies have been the subject of various investigations, and hence an extensive bibliography is available. A comprehensive treatment of the subject of vibrations of structures due to moving loads which contains a large number of related cases is given by Fryba (1999). Theoretically, the problem of moving load was first tackled for a case in which the beam mass was considered small against the mass of a single, constant load. The original approximate solution is due to R. Willis et. al. (1851) one of the early experimenters in the field. Since then these problems has become more dynamic in character mainly due to the increased vehicle speed and structural flexibility. What remains however common in these is the idealization of the structure as a string, a beam or a plate. This is done not only due to the frequent occurrences of these structures in several engineering disciplines, but also to simplify the mathematical structure of the governing equations compared with a full three-dimensional equation. Ever since the Classical Beam Theory was used to construct the Eiffel Tower and the Ferris wheel in the late 19th century, the Bernoulli-Euler beam theory has become a cornerstone of engineering for use in the analysis of structures. By neglecting the terms of shear effect and rotatory inertia, one arrives at the Bernoulli-Euler Beam from the Timoshenko beam. The contribution of these terms changes the accuracy of the results by a very small percentage; however, for dynamic analysis these components cannot be neglected.

The phenomenon of acoustics of vibrating structures caught the attention of Lord Rayleigh (1896). Techniques for dealing with fully coupled motions of elastic plates and shells immersed in air or water were simply not available in Rayleigh's time, but have become available in the past three decades or so. A standard reference on the analytical modeling is the book of Junger and Feit (1986). Early investigations of sound radiation from a force excited, elastic,

fluid-loaded plate by Gutin (1965), Maidanik and Kerwin (1967) and Feit (1967) were primarily for the far field pressure and power radiated into the acoustic medium. Nayak (1970), using the Fourier integral representation of the solution evaluated the velocity response numerically to determine the drive line admittance for a line-driven plate. Crighton in a series of papers Crighton (1972, 1977, 1979 and 1983) analyzed both the near-and far field responses of locally excited plates. Crighton's results although probably the most complete to date in this field, are somewhat difficult to visualize due to the complexity of the problem and that they have not been displayed in a graphical form.

The sound radiation from a moving force excited, elastic structure is a relatively newer area of interest. Keltie and Peng (1989) investigated the sound radiation from a fluid-loaded Timoshenko beam subject to a moving harmonic line force. Results show that for beams under light fluid loading, the coincidence sound radiation peak for a stationary force gets split into two coincidence peaks due to the effects of the Doppler shift, while for beams under heavy fluid loading there are no pronounced sound radiation peaks. Following the study of Keltie, Cheng and Chui (1999) formulated the vibration response of periodically simply supported beam on the whole structure in wave-number domain through Fourier transform. This problem was an advance on traditional substructure methods. For an air-loaded beam subjected to a stationary line force, they showed that the radiated sound power exhibited peaks at certain wave-number ratios. The wave-number ratios at which radiation peaks occur nearly coincide with the lower bounding wave-number ratios of the odd number of propagation zones. However, Cheng's formulation did not include the presence of numerous wave-number components induced from the elastic supports and is subject to the restriction that the external force is located on one of the elastic supports. Cheng et al. (2000, 2001) introduced a "wave-number harmonic series" to discuss the vibro-acoustic response of a fluid-loaded beam on periodic elastic supports subjected to a moving load. Results show that the response of a beam on an elastic foundation can be approximated using a periodically, elastically supported beam when the support spacing is small compared with the flexural wavelength. For such beams when the force is stationary a single radiation peak occurs which splits into two peaks due to Doppler shift when the force becomes traveling.

The above mentioned studies of elastic beams excited by a moving force, have considered a Timoshenko beam with complex shear modulus and elastic modulus to cater for structural damping and dynamic response. However for long slender beams such as a floating airport, the Timoshenko beam may be an overkill. Similarly, assuming the presence of a loss factor, introduces a natural structural damping which needs to be ignored as there is no resonance mechanism for these floating structures. It is hence considered essential that the effect of the shear deformation and rotatory inertia on sound radiation from beams be studied to understand the best model for analysis. One needs to understand the effect of loss factor on sound radiation for these structures before disregarding their contribution. It is in this regard that the present study has been undertaken which provides a simple yet effective methodology in calculating the component of acoustic signature generated due to the relative motion (modeled as a moving load) of the ship (modeled as a beam) and the water when the ship is underway.

In this paper, damping characterized by the loss factor, often denoted by η, has been considered using a "constant loss factor" model. Including complex shear modulus and Elastic modulus (hence the loss factor); the problem has been formulated for the four beam types following the approach described by Keltie. Using Fourier transformation the total sound power is calculated and results presented at a range of frequencies both below and above coincidence for heavy fluid-loaded elastic beams. The acoustic power due to loss factor variation is additionally studied for a heavy fluid-loaded Timoshenko beam.

Formulation

The motion of an infinite beam excited by a force of length 2L moving at a subsonic speed V is formulated. The problem is considered in two-dimensional Cartesian co-ordinate system with x-axis being in the horizontal direction and y-axis in the vertically upward positive direction, as seen in Figure 1. The beam occupies the plane $y = 0$. The space *y>0* is filled with an acoustic medium (water, air etc). The moving force may be assumed to be a uniform distributed line force given by $f(x,t) = \frac{f_0}{2L}[H(x-Vt+L)-H(x-Vt-L)]e^{j\omega t}$ or a point force given by $f(x,t) = f_0 e^{j\omega t}\delta(x-Vt)$

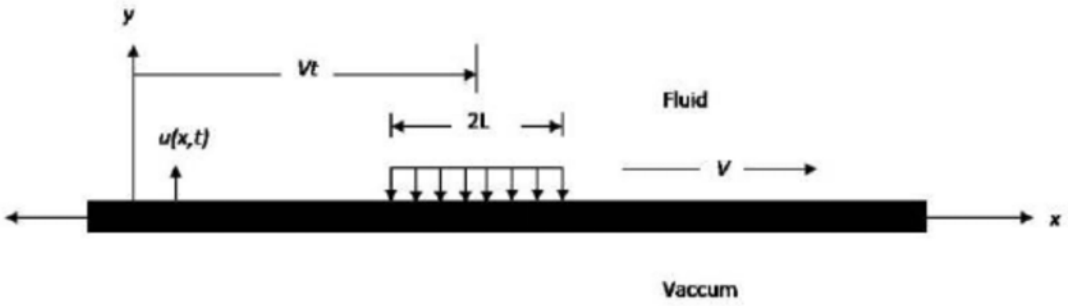


Figure 1: Schematic representation of the problem geometry

The vibration equation for the elastic beam, including rotational inertia and transverse shear effects, is given by Junger and Feit (1986) as

$$\bar{E}I\frac{\partial^4 u(x,t)}{\partial x^4}+\rho_v h\frac{\partial^2 u(x,t)}{\partial t^2}-\rho_v I\left(1+\frac{\bar{E}\rho_v}{\kappa^2\bar{G}}\right)\frac{\partial^4 u(x,t)}{\partial x^2\partial t^2}+\rho_v I\frac{\rho_v}{\kappa^2\bar{G}}\frac{\partial^4 u(x,t)}{\partial t^4}$$
$$=\left(1-\frac{\bar{E}I}{\kappa^2\bar{G}h}\frac{\partial^2}{\partial x^2}+\frac{\rho_v h^2}{12\kappa^2\bar{G}}\frac{\partial^2}{\partial t^2}\right)[f(x,t)-p(x,y=0,t)] \quad (1a)$$

From this equation follow three special cases:

(a) *Rayleigh beam*: If the effect of rotary inertia is considered and the effect of shear is neglected, the so called Rayleigh beam model results and equation (1a) reduces to

$$\bar{E}I\frac{\partial^4 u(x,t)}{\partial x^4}+\rho_v h\frac{\partial^2 u(x,t)}{\partial t^2}-\rho_v I\frac{\partial^4 u(x,t)}{\partial x^2\partial t^2}=[f(x,t)-p(x,y=0,t)] \quad (1b)$$

(b) *Shear Beam*: If the effect of rotatory inertia is neglected and effect of shear on the dynamic deflection of beam is considered, equation (1a) reduces to

$$\bar{E}I\frac{\partial^4 u(x,t)}{\partial x^4}+\rho_v h\frac{\partial^2 u(x,t)}{\partial t^2}-\frac{\bar{E}I\rho_v}{\kappa^2\bar{G}}\frac{\partial^4 u(x,t)}{\partial x^2\partial t^2}=(1-\frac{\bar{E}I}{\kappa^2\bar{G}h}\frac{\partial^2}{\partial x^2})[f(x,t)-p(x,y=0,t)] \quad (1c)$$

(c) *Bernoulli-Euler beam*: If we neglect the effect of both shear and rotatory inertia we obtain the classical Bernoulli-Euler beam model.

$$\bar{E}I\frac{\partial^4 u(x,t)}{\partial x^4}+\rho_v h\frac{\partial^2 u(x,t)}{\partial t^2}=[f(x,t)-p(x,y=0,t)] \quad (1d)$$

The pressure distribution induced by the vibrating beam in the acoustic medium is denoted by $p(x,y,t)$ and satisfies the wave equation in two-dimensional space, give by

$$(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}-\frac{1}{C_0^2}\frac{\partial^2}{\partial t^2})\,p(x,y,t)=0 \quad (2)$$

The boundary condition at $y=0$ is given by

$$\rho_0\frac{\partial^2 u}{\partial t^2}=-\frac{\partial p}{\partial y}\Big|_{y=0} \quad (3)$$

By applying the spatial Fourier transformation $FT()=\int_{-\infty}^{\infty}()e^{i\xi x}dx$, with ξ as the wave number variable, the force function for a harmonic line force in wave number domain may be written as

$$\tilde{f}(\xi,t) = f_0 \frac{\sin(\xi L)}{\xi L} e^{j(\omega+\xi V)t} = F(\xi) e^{j(\omega+\xi V)t} \quad (4a)(i)$$

and for a point force as

$$\tilde{f}(\xi,t) = f_0 e^{j(\omega+\xi V)t} = F(\xi) e^{j(\omega+\xi V)t} \quad (4a)(ii)$$

the transformed displacement as

$$\tilde{U}(\xi,t) = U(\xi) e^{j(\omega+\xi V)t} \quad (4b)$$

and the transformed pressure as

$$\tilde{P}(\xi,y,t) = P(\xi,y) e^{j(\omega+\xi V)t} \quad (4c)$$

Upon substitution of equation (4a), (4b) and (4c) in the relevant beam equation and the acoustic equation, we get

$$U(\xi) = \frac{Z_F F(\xi)}{Z_m + Z_F Z_a} \quad (5)$$

and

$$P(\xi, y=0) = \frac{j\rho_0(\omega+\xi V)^2}{K_y} U(\xi) \quad (6)$$

where the acoustic impedance operator (Z_a) for the *Timoshenko beam*, *Rayleigh beam*, *Shear beam* and *Bernoulli-Euler beam* is given by

$$Z_a = \frac{j\rho_0(\omega+\xi V)^2}{K_y} \quad (7)$$

the beam impedance operator (Z_m) as

$$Z_m = \bar{E}I\xi^4 - \rho_v h(\omega+\xi V)^2 - \xi^2 \rho_v I\left(1+\frac{\bar{E}\rho_v}{\kappa^2\bar{G}}\right)(\omega+\xi V)^2 + \rho_v I \frac{\rho_v}{\kappa^2\bar{G}}(\omega+\xi V)^2 \quad \text{Timoshenko beam} \quad (8a)$$

$$Z_m = \bar{E}I\xi^4 - \rho_v h(\omega+\xi V)^2 - \xi^2 \rho_v I(\omega+\xi V)^2 \quad \text{Rayleigh beam} \quad (8b)$$

$$Z_m = \bar{E}I\xi^4 - \rho_v h(\omega+\xi V)^2 - \xi^2 \frac{\bar{E}I\rho_v}{\kappa^2\bar{G}}(\omega+\xi V)^2 \quad \text{Shear beam} \quad (8c)$$

$$Z_m = \bar{E}I\xi^4 - \rho_v h(\omega+\xi V)^2 \quad \text{Bernoulli-Euler beam} \quad (8d)$$

the Z_F by

$$Z_F = 1 + \frac{\bar{E}I}{\kappa^2\bar{G}h}\xi^2 - \frac{\rho_v h^2}{12\kappa^2\bar{G}}(\omega+\xi V)^2 \quad \text{Timoshenko beam} \quad (9a)$$

$$Z_F = 1 \quad \text{Rayleigh beam} \quad (9b)$$

$$Z_F = 1 + \frac{\bar{E}I}{\kappa^2\bar{G}h}\xi^2 \quad \text{Shear beam} \quad (9c)$$

$$Z_F = 1 \quad \text{Bernoulli-Euler beam} \quad (9d)$$

and K_y is given by

$$K_y = \begin{cases} -j\sqrt{\xi^2 - (K_0 + M\xi)^2} & for \quad \xi^2 > (K_0 + M\xi)^2 \\ \sqrt{(K_0 + M\xi)^2 - \xi^2} & for \quad \xi^2 < (K_0 + M\xi)^2 \end{cases} \quad (10)$$

We shall now discuss the methodology of finding the total acoustic power.

Total Acoustic Power

The time averaged sound intensity is given by Morse and Ingrad (1986) as

$$\bar{I} = \frac{1}{T}\int_0^T \overline{PV}\,dt \quad or \quad \bar{I} = \frac{1}{2}Re[P\dot{U}^*]$$

In order to find the total acoustic power (Π), the surface acoustic intensity distribution needs to be integrated over the infinite length of the beam as

$$\Pi = \int_{-\infty}^{\infty} \frac{1}{2}Re[P(x, y=0, t)\dot{U}^*(x,t)]dx$$

Upon substituting the sound pressure (6) and calculating the surface velocity using (5), the sound power radiated per unit width of the beam can be simplified as

$$\Pi = \frac{\rho_0}{4\pi} Re\Big[\int_{-\infty}^{\infty} \frac{(\omega+\xi V)^3}{K_y} |U(\xi)|^2\, d\xi\Big] \tag{11}$$

Limiting the study to subsonic motion of the moving load, the limits within which K_y is real is given by

$$\xi_1 = \frac{-K_0}{1+M} \le \xi \le \xi_2 = \frac{K_0}{1-M}$$

This allows us to rewrite the expression for the sound power as

$$\Pi = \frac{\rho_0}{4\pi} Re\Big[\int_{\xi_1}^{\xi_2} \frac{(\omega+\xi V)^3}{K_y} |U(\xi)|^2\, d\xi\Big] \tag{12}$$

This completes the formulation of an expression for the total acoustic power for varying beam types subjected to a moving load.

Non-Dimensionalization

In order to present the numerical results, the concept of non-dimensional parameters defined in Keltie and Peng (1989) is used. Hence the dimensionless radiated sound power per unit width for a uniform distributed line force is given as

$$W = \int_{\zeta_1}^{\zeta_2} \alpha^3 \beta \Big| Z_F \frac{sin(\zeta K_0 L)}{\zeta K_0 L}\Big|^2 |D|^{-2} \tag{13}$$

where

$$\zeta_1 = \frac{-1}{1+M} \le \zeta \le \zeta_2 = \frac{1}{1-M}$$

$$\alpha = 1 + M\zeta \;\$\$\; \beta = \sqrt{\alpha^2 - \zeta^2}$$

$$D = \beta(D_1 - D_2 + D_3) + jD_4$$

The expression for D_1, D_2, D_3, D_4 and Z_F vary based on the type of the beam as under

(a) *Timoshenko beam*:

$$Z_F = 1 + \frac{2(1+\nu)\gamma^4}{\kappa^2}\Big(\frac{C_0}{C_L}\Big)^2\Big[\zeta^2 - \frac{1}{1+\eta j}\Big(\frac{C_0}{C_L}\Big)^2\alpha^2\Big]$$

$$D_1 = \gamma^4\zeta^4(1+\eta j)$$

$$D_2 = \alpha^2\Big[1 + [1 + \frac{2(1+\nu)}{\kappa^2}]\gamma^4\zeta^2\Big(\frac{C_0}{C_L}\Big)^2\Big]$$

$$D_3 = \frac{2(1+\nu)}{\kappa^2(1+\eta j)}\alpha^4\gamma^4\Big(\frac{C_0}{C_L}\Big)^4$$

$$D_4 = Z_F \frac{\alpha_0 \alpha^2}{\gamma^2}$$

(b) *Rayleigh beam*:

$$Z_F = 1$$
$$D_1 = \gamma^4 \zeta^4 (1 + \eta j)$$
$$D_2 = \alpha^2 \left[1 + \gamma^4 \zeta^2 \left(\frac{C_0}{C_L}\right)^2\right]$$
$$D_3 = 0$$
$$D_4 = Z_F \frac{\alpha_0 \alpha^2}{\gamma^2}$$

(c) *Shear beam*:

$$Z_F = 1 + \frac{2(1+\nu)\gamma^4}{\kappa^2} \left(\frac{C_0}{C_L}\right)^2 \zeta^2$$
$$D_1 = \gamma^4 \zeta^4 (1 + \eta j)$$
$$D_2 = \alpha^2 \left[1 + \frac{2(1+\nu)}{\kappa^2} \gamma^4 \zeta^2 \left(\frac{C_0}{C_L}\right)^2\right]$$
$$D_3 = 0$$
$$D_4 = Z_F \frac{\alpha_0 \alpha^2}{\gamma^2}$$

(d) *Bernoulli-Euler beam*

$$Z_F = 1$$
$$D_1 = \gamma^4 \zeta^4 (1 + \eta j)$$
$$D_2 = \alpha^2$$
$$D_3 = 0$$
$$D_4 = Z_F \frac{\alpha_0 \alpha^2}{\gamma^2}$$

Analysis

The investigation of the problem is covered in two parts:

(a) Effect of the shear effect and rotatory inertia on the total radiated sound power by different beam types.

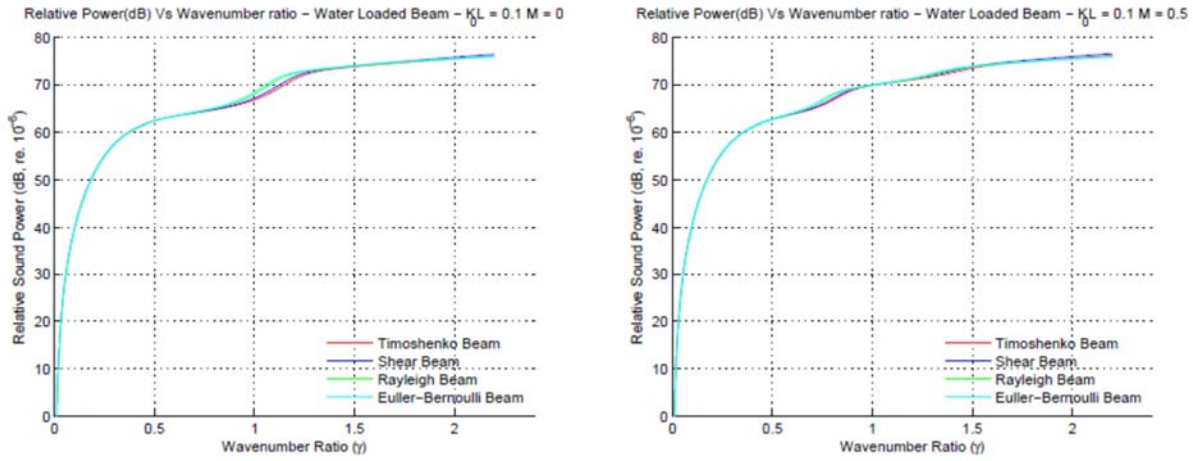
(b) Effect of the loss factor (η) on the total radiated sound power.

In order to undertake the required investigation equation (13) needs to be numerically evaluated for the case of a steel beam immersed in water. The properties of the beam model analyzed are $E = 20 \times 10^{10}\ N/m^2$, $\rho_v = 7800\ kg/m^3$, $h = 2.54 \times 10^{-2}\ m$, $\nu = 0.3$, $\kappa^2 = 0.85$, $C_0 = 1481\ m/s$ and $\rho_0 = 1000\ kg/m$. The external force strength (f_0) is assumed to be of unit magnitude. By varying the values of parameters M and $K_0 L$, the sound power is computed and then plotted against the wave number ratio (γ) or non-dimensional frequency. The value of η is taken as 0.01 as found in the literature Ungar (1988). However to study the effect of the loss factor, the value of η is varied over 0.9, 0.1, 0.01, 0.001, 0. The effect of η is discussed using a Timoshenko beam. The sound power has been calculated for a variety of combinations of M and $K_0 L$ for the

variable beam type and variable loss factor in the frequency range $0.01 < \gamma < 2.2$. The results so obtained are shown. Figures 2 to 4 show the effect of various beam types while Figures 9 and 10 show the effect of various loss factors. For variable beam type, calculations have been done for all the four beams and combined results plotted. For variable loss factor however, these calculations have been undertaken for Timoshenko beam. All calculations have been undertaken using MATLAB.

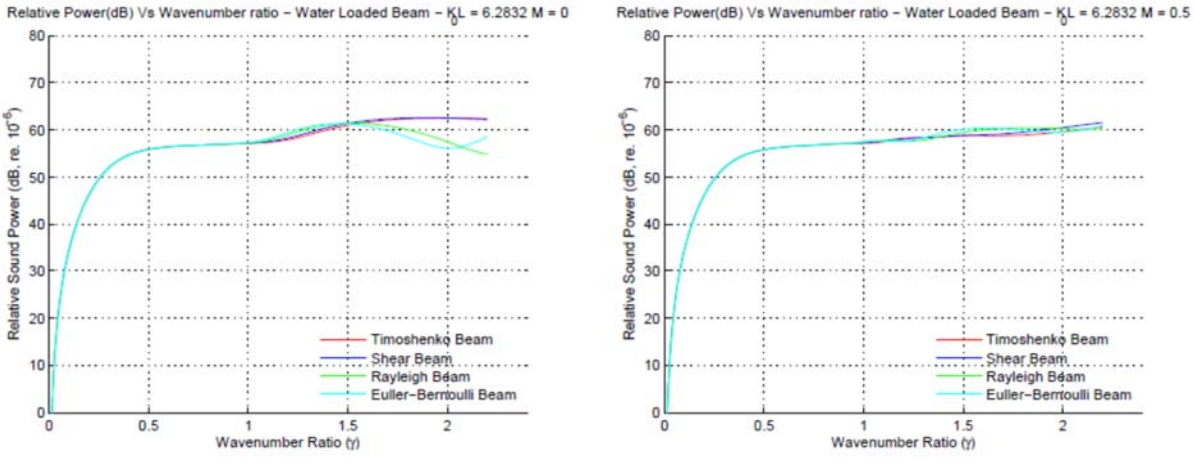
Discussion

In the Figures shown below, one can see four distinct frequency ranges: the very low frequency region $(\gamma < 0.1)$; the low frequency region $(0.1 < \gamma < 1.0)$; the frequency region near coincidence $(\gamma \sim 1.0)$; and the frequency region above coincidence $(\gamma > 1.0)$ In the low frequency region and in the region above coincidence frequency, the sound powers radiated show no discernible difference. It is the low frequency region and the region near coincidence which is hence of concern to us and needs to be discussed.



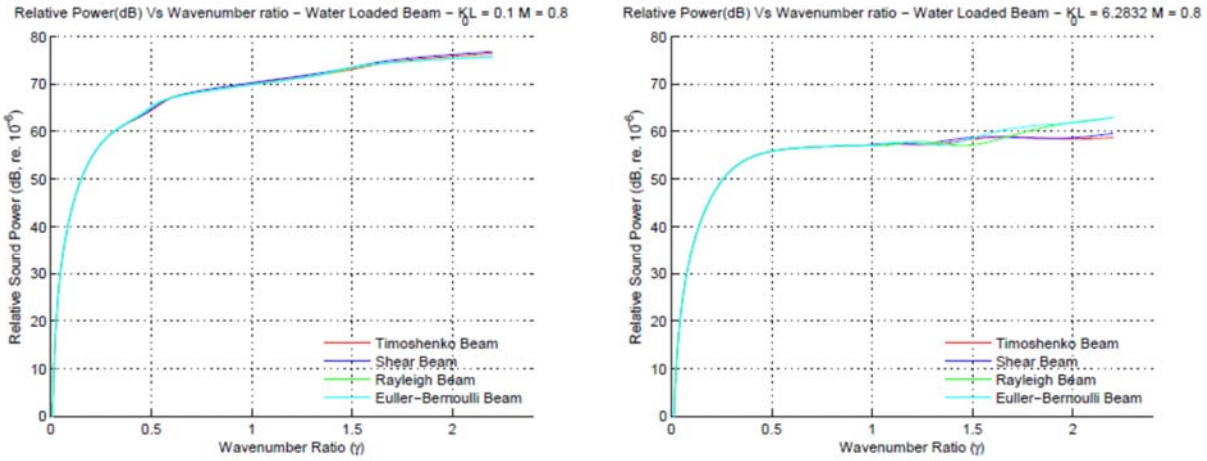
(a) $M = 0$ (b) $M = 0.5$

Figure 2: Relative sound power v/s wave-number ratio for various beam types



(a) $M = 0$ (b) $M = 0.5$

Figure 3: Relative sound power v/s wave-number ratio for various beam types



(a) $K_0L = 0.1$ (b) $K_0L = 2\pi$

Figure 4: Relative sound power v/s wave-number ratio for various beam types

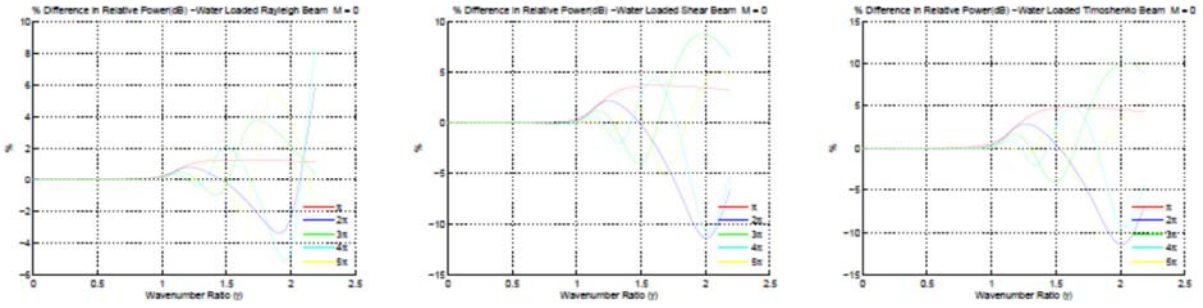
Various Beam Type

It is interesting to note that there are no peaks in the sound power curves. The essential lack of peaks for a dense medium like water is due to the proportion of the structural energy converted to acoustic energy. This is larger for dense media, leading to the draining of the radiation energy faster from the structure thus disallowing peak formation. This results in larger effective damping.

Figure 2a and 3a for acoustic length 0.1 and 2π respectively are for Mach number, $M = 0$, which indicates a condition of static load. As expected, the sound radiation from the Timoshenko beam is the least while that of the Bernoulli-Euler beam is a maximum. The effect of Shear beam is greater than Rayleigh beam though within the bounds of Timoshenko Beam and Bernoulli-Euler beam. This effect is as expected view terms of contribution involved in the beams. One notices that for the shear beam, the contributing element is $-\frac{\bar{E}I\rho_v}{\kappa^2\bar{G}}\frac{\partial^4 u(x,t)}{\partial x^2\partial t^2}$ which is added to the Bernoulli-Euler beam on the LHS and $-\frac{\bar{E}I}{\kappa^2\bar{G}h}\frac{\partial^2}{\partial x^2}$ on the RHS. With the values of κ^2 limited to 0.85 for beams, the contribution of the term shall be greater than 1 thus reducing the net magnitude of the beam impedance Z_m while increasing the acoustic impedance Z_a. This results in a reduced sound output when compared to the sound produced by a Bernoulli-Euler beam. On the other hand for the Rayleigh beam, the contribution is by the term $-\rho_v I\frac{\partial^4 u(x,t)}{\partial x^2\partial t^2}$ which reduces the structural impedance Z_m. The Rayleigh beam has no effect on the acoustic impedance but since the magnitude of the lowering term on Z_m is large, the net acoustic output is lesser than both the Bernoulli-Euler and the Shear beam. This effect is reversed for frequency regime above coincidence. If we see equation (14), $W \propto \frac{Z_F}{D^2}$, while $D \propto -D_2$. For higher values of γ, for the shear beam, Z_F increases, while D reduces because of increase in D_2. Thus W reduces. Similarly for the Rayleigh beam Z_F remains unchanged while D reduces due to increase of D_2. However $D_{2SE} > D_{2RE}$ and $Z_{FSE} > Z_{FRE}$ thus $W_{SE} < W_{RE}$. $D_{BE} > D_{RE}$ since $D_{2BE} < D_{2RE}$ and $Z_{FBE} = Z_{FRE} = 1$ thus $W_{BE} < W_{RE}$.

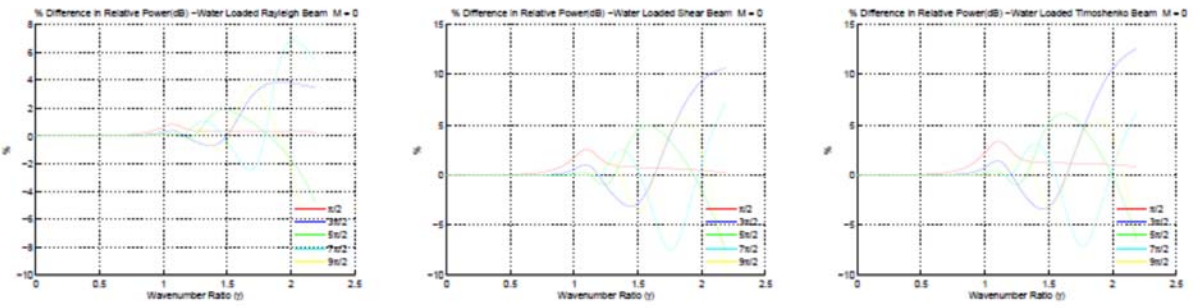
With the load moving i.e *M > 0*, and acoustic length being the same, an overall increase in the sound power is observed. Mathematically, as M increases α increases, thus increasing D_2 which leads to reduced D and hence

increased W. Physically this is as expected, since with increased speed, the resulting sound is known to increase. However this trend is seen to be reversed for increased frequency the logic being the same as discussed for $M = 0$. It is clear that the increased acoustic length ($K_0 L$) reduces the sound power level over the entire frequency range. This can be attributed to the fact that the total applied force strength is kept constant.



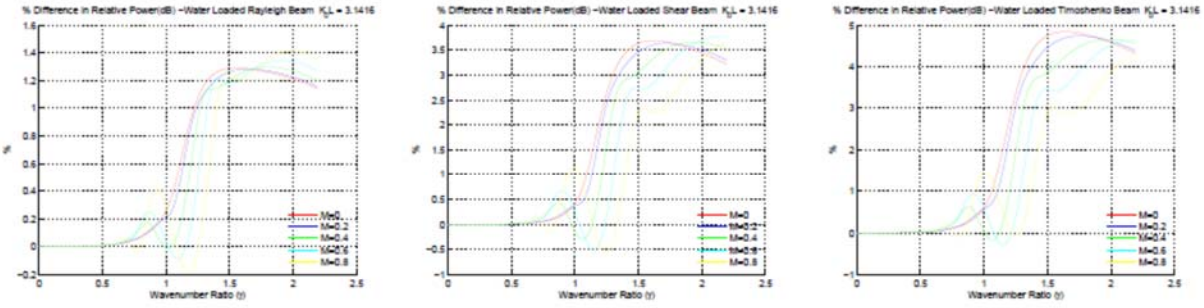
(a) Rayleigh Beam (b) Shear Beam (c) Timoshenko Beam

Figure 5: % Difference in Relative sound power for beams; $K_0 L = n\pi$; $M = 0$



(a) Rayleigh Beam (b) Shear Beam (c) Timoshenko Beam

Figure 6: % Difference in Relative sound power for beams; $K_0 L = (2n-1)\frac{\pi}{2}$; $M = 0$



(a) Rayleigh Beam (b) Shear Beam (c) Timoshenko Beam

Figure 7: % Difference in Relative sound power for beams; $K_0 L = n\pi$, various $M

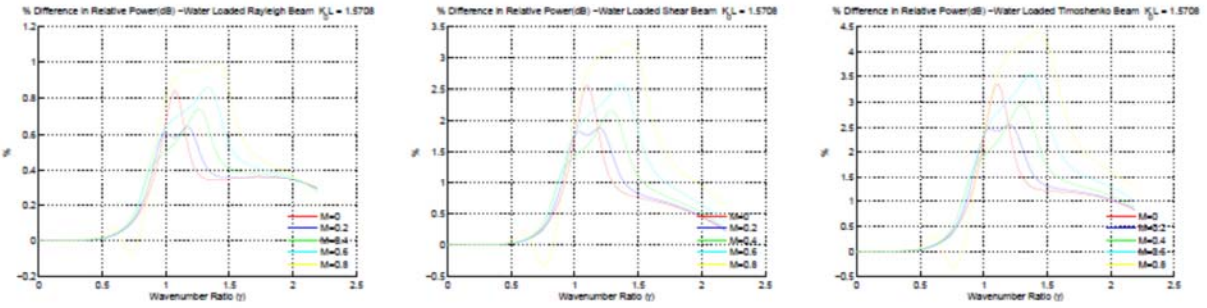
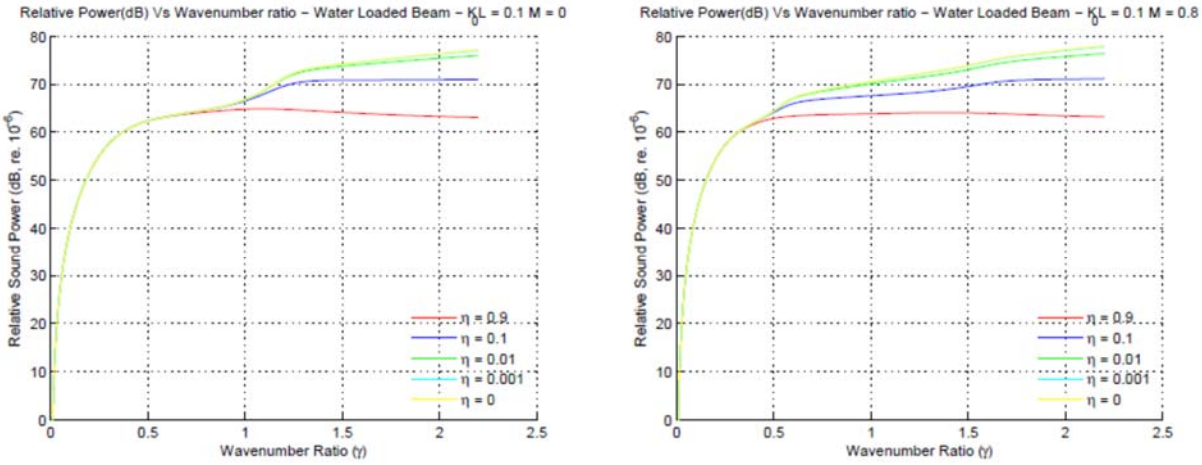


Figure 8: % Difference in Relative sound power for beams; $K_0L = (2n-1)\frac{\pi}{2}$, varying M

In order to analyze the nature of the change in power of various beam types, we reorganize the results as a percentage difference. Since the Bernoulli-Euler beam gives maximum values, we use it as a base value and differences with respect to the values of sound power for Bernoulli-Euler beam are plotted for various beam types. It may be noticed that we have two varying parameters namely M and K_0L. We shall try and understand the contribution of each while varying the other variable. It is interesting to note that if incase K_0L is an integer multiple of π, then the trend of the difference of the total sound power is different than that observed for K_0L being otherwise. The variations are observed for the beam types are shown in Figures 5 and 6 for Rayleigh beam, Shear beam and Timoshenko beam respectively. It is observed that the difference of sound power commences after coincidence if K_0L is an integral multiple of π and at half of coincidence when it is otherwise. The variation of the percentage difference is consistence in trend. For K_0L being an integral multiple of π, $(n-1)$ half modes are visible, where n is the integral multiple of π. However n number of half modes is seen when K_0L is a non integral multiple of π. The reasoning for this is that the beam responds preferentially at $\zeta = K_B$, the free bending wave-number, which is the spatial scale of the propagating or the energy bearing portion of the beam's response at frequency ω. Height of the peak is controlled by the damping present in the structure. Physically, the amount of power radiated is determined by how much energy is available in the force spectrum at the structural / acoustic response wave-number. When this wave number corresponds to an integral multiple of $\frac{n\pi}{L}$, there is no energy available in the free spectrum for the conversion to acoustic radiation. These wave-numbers of vanishing energy may be related to wavelength as

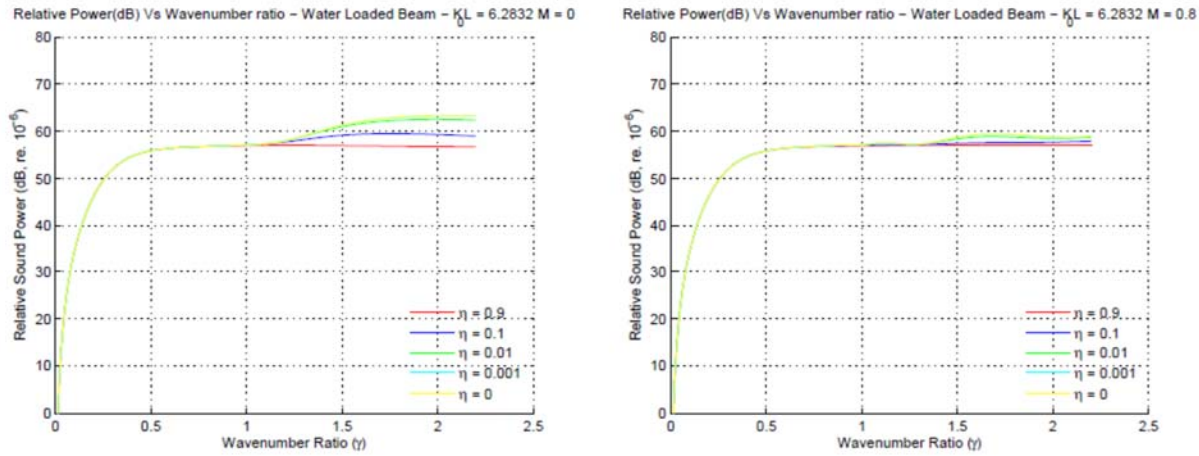
$$\zeta = \frac{2\pi}{\lambda} = \frac{n\pi}{L} \Rightarrow \lambda = \frac{2L}{n} \ .$$

The effect of varying M displays the Doppler shift of the difference curves as the speed increases. The overall pattern that emerges when K_0L is an integral multiple of π and when the value of K_0L is not an integral multiple of π is worth noticing. Special attention may be given to the packing of the values at the critical frequency and the convergence of the data at high wave number ratios.



(a) $M = 0$ (b) $M = 0.8$

Figure 9: Relative sound power v/s wave-number ratio for varying η



(a) $M = 0$ (b) $M = 0.8$

Figure 10: Relative sound power v/s wave-number ratio for varying η

Loss Factor

Increased vibrational levels due to reduced damping (hence reduced loss factor) lead directly to increased sound radiation as seen in the Figures 9 and 10. It is interesting to note that the curves appear to have the same basic shape. As the structural damping decreases, the amount of steady-state vibrational energy in the beam increases. What is most interesting is that the curves shift up by an amount which is directly proportional to the change in the loss factor. Near the coincidence frequency, if the structural loss is large enough $(\eta \sim 0.1)$, the damping provided by the material exceeds the damping provided by the fluid loading and there is significant difference between the two power curves. If the loss factor is small, then the damping effects reduce and the sound power level significantly increases thus showing that the radiation losses cannot be neglected in this frequency region.

Conclusion

Effect of loss factor, shear effect and rotatory inertia on radiated sound power from beams subjected to moving loads has been investigated. It is concluded that a Timoshenko beam gives the least sound radiation power when compared to the other beam types. The correction for shear effect and rotatory inertia yield results within 4-5 \% more accurate than classical beam theory. The nature of the curves with varying K_0L is dependent on K_0L being an integral

multiple of π or otherwise. For varying M , the Doppler shift of the curves is observed for increasing M . The overall pattern that emerges when K_0L is an integral multiple of π and when the value of K_0L is not an integral multiple of π is worth noticing. Special attention may be given to the packing of the values at the critical frequency and the convergence of the data at high wave number ratios. It is observed that as the structural damping decreases, vibrational levels increase thus causing an increase in the sound vibrations. The shift of the curves is however found to be proportional to the change in the loss factor.

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APPENDIX: LIST OF SYMBOLS

ξ	Wave number variable
$\gamma = \frac{K_0}{K_B}$	Wave number ratio
ν	Poisson's ratio
ρ_v	Mass density of the material
ρ_0	Mass density of the acoustic medium
$\kappa^2 = \frac{\pi^2}{12}$	Cross sectional shape factor or the shear correction factor
η	Loss factor
ζ	Non dimensional wave number variable
$\alpha_0 = \frac{\rho_0 C_L}{\sqrt{12}\ \rho_v C_0}$	Fluid loading parameter
$\delta(x - Vt)$	Delta function
Π	Total acoustic power
h	Height of the beam
$p(x, y = 0, t)$	Acoustic pressure acting on the beam's surface
$u(x,t)$	Transverse displacement of the beam
f_0	Strength of external force per unit width
C_0	Sound speed in the acoustic medium
$C_L = \sqrt{\frac{E}{\rho_v}}$	Longitudinal wave speed
$\bar{E} = E(1 + \eta j)$	Complex elastic modulus
E	Elastic modulus
$\bar{G} = \frac{\bar{E}}{2(1+\nu)}$	Complex shear modulus
$H(x)$	Heavyside step function
$I = \frac{h^3}{12}$	The cross sectional moment of inertia per unit width
$\bar{I}$	Time averaged sound intensity
$M (= \frac{V}{C_0})$	Mach number
$K_0 (= \frac{\omega}{C_0})$	Acoustic wave number
$K_B = [\frac{12\rho_v \omega^2}{Eh^2}]^{\frac{1}{4}}$	Free bending wave number
P	Sound pressure on the beam surface
$\dot{U}^*$	Beam surface velocity of conjugation

$\dot{U}\ (=\frac{dU(\xi)}{dt})(=j(\omega+\xi V)U(\xi))$

V	Subsonic speed of moving force of length 2L
Z_a	Acoustic impedance operator
Z_m	Beam impedance operator
$W=\frac{4\pi\omega(\rho_v h)^2}{\rho_0 f_0^2}\Pi$	Power per unit width

Other quantities and scaled variables are defined as they occur in the text.

On Scalar Quark Leakage through the Power-Law and Logarithmic Confining Potentials in the Klein-Gordon Equation

L.K Sharma & P.V.C Luhanga

Department of Physics, University of Botswana, Gaborone, Botswana

sharmalk@mopipi.ub.bw

Abstract: Motivated from a phenomenological viewpoint, three confining potentials have been studied in the Klein-Gordon equation framework. In particular we study the phenomena of quark leakage for these potentials. The transmission coefficient values have been obtained for all the potentials, using WKB [Wentzel, Kramers & Brillouin] method and compared with potentials already discussed by previous authors. We observe that one of the potentials considered by us strongly supports the existence of free quarks because of the comparatively large values of transmission coefficients, as predicted by our model.

Keywords: Confining potentials; tunnelling phenomenon; quark leakage; transmission coefficients.

Introduction

Mankind has sought the elementary building blocks of matter ever since the days of the Greek philosophers. Over time, the quest has been successively refined from the original notion of indivisible "atoms" as the fundamental elements to the present idea that objects like quarks lie at the heart of all matter.

With the new discoveries being made at the Large Hadron Collider at CERN, interest in hadron spectroscopy has still not waned. Many attempts have been made in the past as well in the present to study the hadron spectroscopy, using both the non-relativistic Schrödinger equation and the relativistic wave equations viz., the Klein-Gordon and the Dirac equations.

It may be noted that the model involving fractionally charged quarks was proposed by Gell-Mann (1964) and Zweig (1964) to account for the explosion of subatomic particles discovered in accelerator and cosmic ray experiments during 1950s and early 1960s. Their model won acceptance because of a few semiquantative tests e.g., a large weight of circumstantial evidence and many quantitative facts about strong interactions which it apparently explains. Since then, however, there have been many unsuccessful attempts to find quarks at accelerators, in sea water, in rocks and in cosmic rays. Though La Rue et al (1977) have claimed that they have found some evidence for quarks in their super-conducting levitation experiment involving niobium pellets.

There have been many attempts to understand the physical mechanism of quark confinement. However, none of them is completely convincing and satisfactory. Even the most ambitious attempts based on quantum chromodynamics (QCD) provide rather vague explanations of the mechanism of confinement. The problem was earlier attacked also with the help of less ambitious but more plausible models like naïve strings, bags, suitable potentials *etc*. The problem of confinement was also tried, treating hadrons as systems of quark solitons with some suitable non-linear interactions (Werle, 1993).

Kang and Schnitzer (1975) have calculated meson spectra, using a potential function $ar + b$ as the fourth component of a four-vector in the Klein-Gordon equation. The quark-antiquark bound-state energy values (which correspond to meson masses) were calculated using WKB approximation. Gunion and Li (1975) have studied the same potential as a Lorentz scalar in the Klein-Gordon and Dirac equations. The motivation of their using the linear potential came from field-theoretic arguments. Sharma with his collaborators (2008, 2007, 2004, 2003, 1998, 1988, 1984, 1983, 1982, 1982, 1980) has extensively studied quark confinement and have calculated bound-state spectra for both the light and heavy mesons e.g., the bound-states for $c\bar{c}$, $b\bar{b}$, $s\bar{s}$ etc., spectra have been calculated by them. Recently Sharma et al (2000, 2003) have also evaluated the spectra of $t\bar{t}$, the so called toponium

meson which has yet to be observed. The heavy top quark was detected by two teams working at Fermi National Laboratory, the first one the so called CDF team (Abe et al. 1995) reported its mass as $176\pm13GeV$ and the other team the Dø collaboration (Abachi et al. 1995) estimated its mass as $199\pm30GeV$. The top quark appears to be a point-like particle: it has no internal structure that one can discern.

In the above context it is always interesting to study the phenomenon of quark leakage, using different potential models. The application of linear (Kang & Schintzer, 1975) and the oscillator potentials (Ram & Halasa, 1979) in a relativistic framework such as the Klein-Gordon equation gives rise to the phenomenon of tunnelling and hence to the leakage of quarks. Ram (1978) has discussed numerically the tunnelling phenomenon for a linear potential and also Kajwadkar & Sharma (1983) have obtained transmission coefficients for two potentials viz., logarithmic and cubic power potentials.

To get a deeper insight into the phenomena of quark leakage, we deal in this paper numerically, with the quark leakage for three different potential models. It may be interesting to note that all the three potentials have already been successfully applied in explaining the meson spectroscopy.

Potentials considered by us here are:

(I)– A fractional power potential (Martin, 1980) given by

$$V_1(r) = g_1 r^{0.1} - V_{0,} \qquad (1)$$

(II)- A power law potential (Sharma &Sharma, 1984) of the form

$$V_{II}(r) = g_1 (r)^{\frac{m_0}{2m_q}} - V_0 , \qquad (2)$$

with $m_0 = 1GeV$ and m_q being the quark mass.

(III)- A logarithmic potential of the type (Jena, 1983)

$$V_{III}(r) = g_1 \log(1+r) - V_0 \qquad (3)$$

Here in all the three potentials (I), (II) and (III), $g_{1,} V_0 > 0$.

In the following section 2, we study the tunnelling phenomenon for all the three above mentioned potentials by evaluating expressions for their corresponding transmission coefficients.

Finally, in section 3, we give a brief discussion on the results obtained by us in section 2.

Theory

The motion of a quark in one-body central potential $V(r)$ is governed by the following relativistic Klein-Gordon equation $(c = \hbar = 1)$:

$$\left(-\nabla^2 + m^2\right)\psi(r) = \left[E - V(r)\right]^2 \psi(r). \qquad (4)$$

The radial part of this equation can be simplified to the form

$$\frac{d^2U(r)}{dr^2} + 2m\left[\overline{E} - V^{eff}(r)\right]U(r) = 0. \qquad (5)$$

Where

$U(r) = rR(r),$

$\psi(r) = R(r)Y_l^m \ (\theta, \phi)$

$$\overline{E} = \frac{E^2 - m^2}{2m}, \qquad (6) \quad \text{and}$$

$$V_{eff} = \frac{1}{2m}\left[\frac{l(l+1)}{r^2} + 2EV - V^2\right]$$

Following Merzbacher (1970), we use the WKB approximation and obtain the following expression for the transmission coefficients of s-states $(l = 0)$

$$T = \frac{4}{\left(2\theta + \frac{1}{2\theta}\right)^2}. \qquad (7)$$

Here

$$\theta = \exp\left[\int_{r_1}^{r_2} k(r)dr\right] \qquad (8)$$

With

$$k(r) = \left[2m\left(V^{eff} - \overline{E}\right)\right]^{\frac{1}{2}}, \qquad (9)$$

where r_1 and r_2 are the roots of the equation $k(r) = 0.$

Results and Discussion

The values of these transmission coefficients obtained for different values of m and g_1 are depicted in Tables 1 and 2. For the purpose of comparison, the transmission coefficients for linear (Kang & Schnitzer, 1975); cubic and logarithmic potentials [of the type $g \ln \frac{r}{r_0}$] (Kajwadkar & Sharma, 1983) have also been shown in Table 1. It may be noted that our equations (4), (5) and (6) can also be used in the calculations of transmission coefficients for a system consisting of quark and anti-quark but with the following substitutions (Kang &Schnitzer, 1975; Ram & Halasa, 1979; Iyer &Sharma, 1982; Sharma & Iyer, 1982):

$$V^{eff} = \frac{1}{2m}\left[\frac{l(l+1)}{r^2} + \frac{1}{2}EV - \frac{1}{4}V^2\right] \qquad (10)$$

and

$$\overline{E} = \frac{\frac{1}{4}E^2 - m^2}{2m} \qquad (11)$$

The values of these transmission coefficients for different mesons along with parameters actually used in obtaining the meson spectra, are shown in Table 3.

Principal observations made in this paper are:

(A) The smaller the effective power of the potential, the lower is the value of the transmission coefficient. Consequently the probability of leakage of quark is higher for the potential with larger effective power (Table 1).

(B) For potential (3), the transmission coefficients are comparable with those obtained for the logarithmic potential (Kajwadkar & Sharma, 1983), see- Table 1.

(C) The fall in the value of transmission coefficient with increasing mass is steeper for smaller values of effective power (Fig. 1). From Fig. 1 and Table 3, it is also evident that the transmission coefficients for potential (1) are very small while for the potential (2) they are much higher.

(D) The effect of the variation in g_1 is perceptibly larger for potential (1). For this potential, there is a sharp rise in the value of transmission coefficient with increasing value of g_1 (Fig. 2). For large values of g_1, however, the transmission coefficient for potential (1) attains almost a constant value. While for potential (2), it is nearly constant for all values of g_1. For potential (3), the variation in the values of the transmission coefficients with the values of g_1 lies in between those obtained for potentials (1) and (2) within the range considered.

(E) Potential (2) supports strongly the existence of free quarks because of comparatively large values of transmission coefficients predicted by this model. Potential (1) on the other hand, gives rise to a very small possibility of quark leakage. Particularly, as can be seen from Table 3, leakage of quarks for all the three mesons are practically zero for potential (1). For ρ meson, values of transmission coefficients predicted for potential (2) are higher than those obtained for linear and oscillator potentials. For $\phi(s\bar{s})$ mesons, transmission coefficients predicted by potential (2) are independent of energy [since m_s has been chosen to be equal to 0.5 GeV, consequently potential (2) becomes a linear potential]. Similar observations were found by Kang and Schnitzer (1975) and Ram and Halasa (1979) for the linear potential.

(F) It may be of interest to note that the potential (2) for meson state ρ with the parameters chosen gets transformed to an oscillator potential. The calculated values of T are in agreement with the corresponding values for the oscillator potential calculated by Ram & Halasa (1979) [see Table 3]. Similarly, for ϕ meson states, the parameters chosen transform potential (2) to a linear potential and the values of calculated T drop and agree with the values calculated by Kang &Schnitzer (1975).

(G) From Fig. 1, we see that as the mesons get heavier, it becomes harder for them to leak through the confining potential barrier. From Fig. 2 we observe that at low g_1 values, the transmission coefficient associated with potential (1) decreases more rapidly as the meson mass increases, followed by those associated with the third and lastly the second potentials. However, at higher g_1 values, the transmission coefficient that decreases the greatest is for the third potential, with the first being the least decreasing with increasing meson mass.

(H) From Fig. 2, we observe that the value of transmission coefficient increases as g_1 increases. For potential (2), the transmission coefficient rises from low values of g_1, approaching some asymptotic value as g_1 increases. For the first and the third potentials, the transmission coefficient remains very close to zero as g_1 increases, after which it jumps to the common asymptotic value. This “jump” occurs at greater values for the first potential than for the third. For heavier mesons, the transmission coefficient increases much more slowly to attain the common asymptotic value.

Table 1: Transmission coefficients T for the three potentials (I), (III) and (III).
For potential (I) $g_1 = 1.0(GeV)^{1.1}$, $V_0 = 0$ and $E = 1.0\,GeV$
For potential (II) $g_1 = 1.0(GeV)^{\frac{(1+2m)}{2m}}$, $V_0 = 0$, and $E = 1.0\,GeV$
For potential (III) $g_1 = 1.0\,GeV$, $V_0 = 0$, and $E = 1.0\,GeV$

Quark mass m (GeV)	T for potential (I) $V_I = r^{0.1}$	T for potential (II) $V_{II} = r^{m_o/2m}$ $m_0 = 1GeV$	T for potential (III) $V_{III} = \log(1+r)$	T for Linear potential (Ram, 1978) $\alpha = 1$	T for cubic potential (Kajwadkar, et al, 1983)	T for logarithmic potential (Kajwadkar *et al*, 1983)
0.1	0.520	0.638	0.609	0.63	0.63	0.61
0.2	0.190	0.622	0.518		0.62	0.53
0.3	8.555×10^{-3}	0.578	0.382	0.53	0.60	0.40
0.4	4.622×10^{-6}	0.498	0.235	--	--	--
0.5	3.292×10^{-13}	0.380	0.118	0.37	0.55	0.14
0.75	3.042×10^{-79}	0.0834	8.008×10^{-3}	--	--	--
1	≈ 0	3.346×10^{-3}	1.285×10^{-4}	0.04	0.27	$4.6\text{x}10^{-4}$
1.25	≈ 0	1.047×10^{-6}	3.731×10^{-7}	--	--	
1.5	≈ 0	5.647×10^{-15}	1.249×10^{-10}	--	--	
2	≈ 0	1.027×10^{-85}	1.313×10^{-21}	--	--	

Table 2: Transmission coefficients T for potentials (I), (II) and (III) for different values g_1. Other parameters are:
$E = 1.0\,GeV$, $m = 1.0\,GeV$, and $V_0 = 0$. Units of g_1 for different potentials are same as used in Table I.

Quark mass (GeV)	$g_1 = 0.9$			$g_1 = 2.0$			$g_1 = 3.0$		
	T for potential $V_I = r^{0.1}$	T for potential $V_{II} = r^{m_o/2m}$	T for potential $V_{III} = \log(1+r)$	T for potential $V_I = r^{0.1}$	T for potential $V_{II} = r^{m_o/2m}$	T for potential $V_{III} = \log(1+r)$	T for potential $V_I = r^{0.1}$	T for potential $V_{II} = r^{m_o/2m}$	T for potential $V_{III} = \log(1+r)$
0.1	0.3307	0.6377	0.6016	0.6399	0.6380	0.6306	0.6400	0.6382	0.6347
0.2	0.01146	0.6209	0.4903	0.6394	0.6261	0.6025	0.6400	0.6282	0.6188
0.3	1.1883×10^{-6}	0.5745	0.3310	0.6382	0.5992	0.5562	0.6400	0.6080	0.5924
0.4	4.9984×10^{-16}	0.4860	0.1763	0.6354	0.5567	0.4937	0.6399	0.5795	0.5560
0.5	1.5854×10^{-36}	0.3555	0.0720	0.6292	0.5016	0.4188	0.6398	0.5464	0.5104
0.75	≈ 0	0.0557	2.310×10^{-3}	0.5729	0.3452	0.2187	0.6388	0.4675	0.3678
1	≈ 0	8.8124×10^{-4}	1.134×10^{-5}	0.3529	0.2141	0.07743	0.6344	0.4138	0.2186
1.25	≈ 0	1.6490×10^{-8}	5.3099×10^{-9}	0.0227	0.0840	0.01828	0.6149	0.3396	0.1046
1.5	≈ 0	2.5034×10^{-20}	1.124×10^{-13}	2.399×10^{-6}	0.0168	2.8730×10^{-3}	0.5551	0.2587	0.04003
2	≈ 0	≈ 0	4.142×10^{-29}	8.9564×10^{-46}	4.8777×10^{-6}	1.9045×10^{-5}	0.1526	0.0854	3.0234×10^{-3}

Table 3: Transmission coefficients T for different Mesons. Parameters used are:
For potential $V_I(r)$:
$5.996(GeV)^{1.1}, V_0 = 7.01GeV, m_u = 0.39GeV, m_s = 0.52GeV$ and $m_c = 1.806GeV$.
For potential $V_{II}(r)$:

(i) **For ψ mesons-**

$m = 2.0GeV, m_0 = 1.0GeV, g_1 = 2.365(GeV)^{1.25}$ and $V_0 = 3.8833GeV$.

(ii) **For ϕ mesons-**

$m = 0.5GeV, m_0 = 1GeV$, $g_1 = 0.2725(GeV)^2$ and $V_0 = 1.089GeV$.

(iii) For $\rho-$ mesons-

$m = 0.25GeV, m_0 = 1.0GeV, g_1 = 0.037(GeV)^3$ and $V_0 = 0.761GeV$.

.

$V_I = r^{0.1} - V_0$		$V_{II} = r^{m_o/2m} - V_0$		Linear potential (Kang & Schnitzer, 1975)		Oscillator potential (Ram & Halasa, 1979)	
Meson State (Energy GeV)	T	Meson State (Energy GeV)	T	Meson state (Energy GeV)	T	Meson state (Energy GeV)	T
ρ(1s) (0.77) ρ(2s) (1.60)	2.12×10^{-6} 1.92×10^{-15}	ρ(1s) (0.767) ρ(2s) (1.60) ρ(3s) (2.2825)	0.4175 0.4580 0.4789	ρ(1s) (0.767) ρ (2s) (1.60) ρ(3s) (2.228) ρ(4s) (2.754)	0.22 0.22 0.22 0.22	ρ(1s) (0.776) ρ(4s) (2.911)	 0.40 0.49
Φ (1s) (1.80)	2.65×10^{-34}	Φ (1s) (0.767) Φ (2s) (1.60) Φ (3s) (2.2825)	0.134 0.134 0.134	Φ (1s) (1.019) Φ (2s) (1.806) Φ (3s) (2.410) Φ (4s) (2.92)	9×10^{-13} 9×10^{-13} 9×10^{-13} 9×10^{-13}	Φ(1s) (1.022) Φ(4s) (3.065)	0.12 0.24
$\psi(1s)$(3.095)	0	ψ (1s) (0.767) ψ (2s) (1.60) ψ (3s) (2.2825)	0	ψ (1s) (0.767) ψ (2s) (1.60) ψ (3s) (2.2825) ψ (4s) (2.754)	4×10^{-37} 4×10^{-37} 4×10^{-37} 4×10^{-37}	Ψ (1s) (3.179) Ψ(4s) (4.656)	4×10^{-1} 10^{-9}

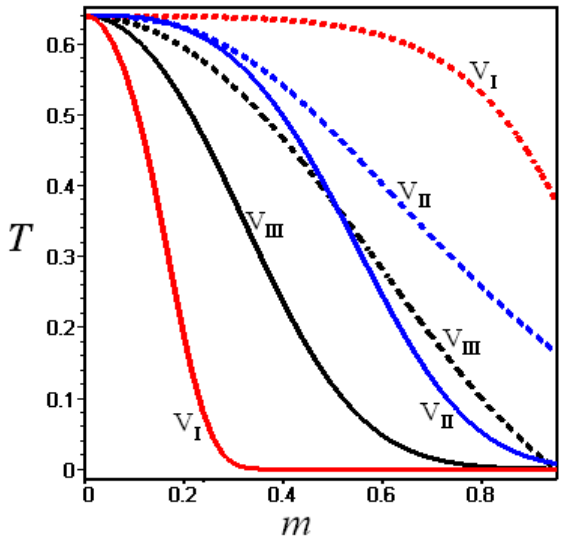

Figure 1: The variation of transmission coefficient T with the quark mass. The solid plots correspond to $g_1 = 1.0GeV$ while the dashed curves are for $g_1 = 2.0GeV$.

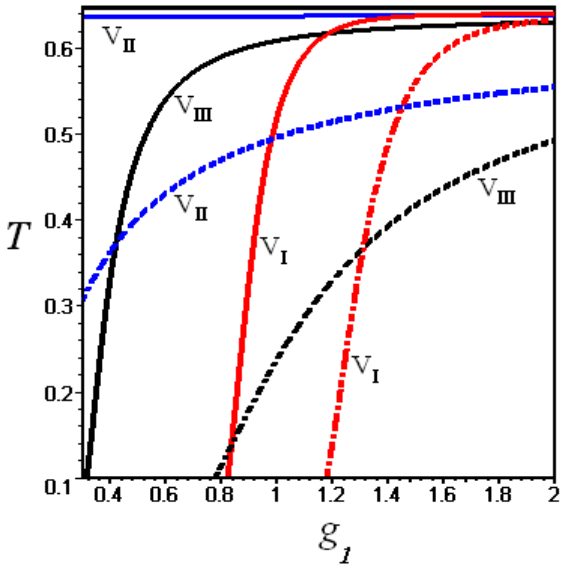

Figure 2: The variation of transmission coefficient T with g_1 . The solid plots correspond to $m = 0.1GeV$ while the dashed curves are for $m = 0.4GeV$.

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Optimalization of transport and logistic processes by simulation

Martin Kendra, Jana Lalinská, Juraj Čamaj

Faculty of Operation and Economics of Transport and Communications, University of Žilina
Slovakia
martin.kendra@fpedas.uniza.sk

Abstract: Logistic centres are a necessary part of the transport and logistics processes. They are beneficial in the entire scale of their importance, ranging from the economical, ecological up to the social benefits. The costs for the construction of the logistics centres are very high. It is therefore important to set up sufficient capacity for all partial parts of the logistic centre. One possibility is to use the simulation processes to verify the expected future operations in the logistics centre. This article deals with the benefits of the simulation processes and their possible use in the design of new logistics centres.

Key words: logistic centre, simulation process, optimization.

Introduction

Transport and logistics is a part of every developing society. The amount of the transported goods increases every year. There is an increasing demand for the quality services. Besides the positive effects of goods transport is growing its negative impact on the environment. They are primarily:

- *exhaust emissions* – accruing from combustion of fuel in a gasoline and a diesel engines. It's all about carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen oxides, ketones, aldehydes, hydrocarbons and soot.
- *occupation of the arable land* – it´s represent mainly the surface consumption on the traffic construction building and parking.
- *noise* – it´s characterized as an unwanted noise, which acts to disturb a man. A traffic noise is caused by the running engine, the rolling of wheels in motion on the road, the airflow and the audible warning devices.
- *vibration* – is caused by vibrating of elastic bodies or environment which certain points mechanically vibrate. Dynamic forces are the main causes of inaccuracies in the manufacturing of parts and components. Vibrations may be cause by the technical condition of the vehicle, vehicle construction, traffic road construction, contiguous constructions, etc.
- *congestion* – is especially characterized for larger cities. They arise from the continuous increase in the number and use of cars and trucks. This trend is not enough to adjust the capacity of road and rail infrastructure, resulting in solving down traffic, increase noise and emissions in the air.
- *accidents* – characterized by the exact material claims which are caused on the vehicles or contiguous constructions. It is more difficult to calculate the injuries by hurting or man´s death. The most serious influence on the traffic accident are – psychological factors, technical factors, meteorological factors (Lábaj, J., Patsch, M., Barta, D., 2009).

It is necessary to find out a compromise between the demand for the transport and the requirement of the environment protection.

Each mode of transport has its own strengths and weaknesses. It is necessary to do the transport of goods with a combination of such modes of transport where the negative impact on the environment is as low as possible. A combination of different transport modes requires the good places for the transshipment, the storage and the beneficiation of the goods. The modern logistic centres meet these requirements.

The construction of the logistics centres is very expensive. It is very difficult to properly design the capacity and number of the handling areas and equipments.

Statement of a problem

The logistical centres are inseparable part of forward market economy. Logistical centres not only serve commodity with clients but sustain of useful reserves of products and accelerate international market. The term "logistic centre" has been used to describe centres performing a broad spectrum of logistical functions and business processes. The term combines logistics, which refers to all operations required to deliver products or services excluding produce of the goods or performing the services, which stands for a place where a particular activity is concentrated (American Heritage Dictionary of the English Language, 1992; External Costs of Transport, 2004).

The foremost tasks of logistical centres can be summarized as follows:

- the integration of the different kinds of the transport to the traffic chains,
- projection and realization complex logistical chains between suppliers and subscribers,
- practice different logistical tasks for clients,
- preparing, realization and repairs of needed infrastructure for partners,
- preparing, realization and repairs of needed informative, managing and communication system (Dolinayová, A., Čamaj, J., Průša, P., 2008).

Every logistic centre should be connected to road, rail and water infrastructure. Therefore besides the storehouse, the railway classification yard and intermodal terminal are the important parts of large modern logistic centres. Every part (storehouse, railway classification yard, intermodal terminal) can operate independently and it is possible to monitor all the processes in these partial components. It is necessary to follow the accouplements and the flows between storehouses, railway classification yard and intermodal terminal to optimize logistic processes of the entire logistic centre. Optimizing of the processes in partial parts of the logistics centre and between them can achieve the great synergies.

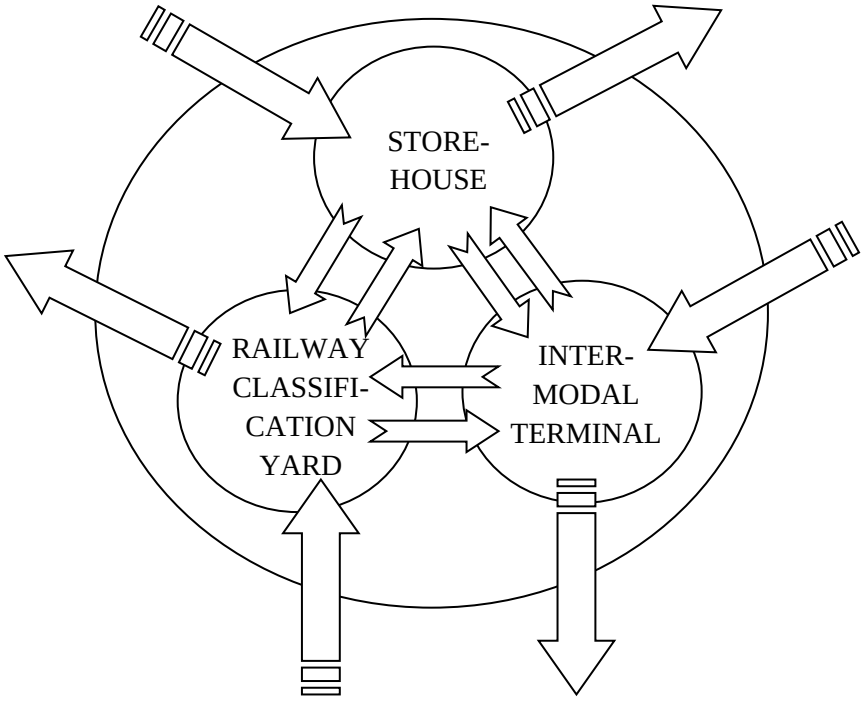

Figure 1: A simplified scheme of the logistics centre

All activities in the logistic centre are carried out gradually in the partial parts of the logistic centre. The service in the next section can be realized only after using the service in the previous section. The logistics centre can be seen as a complicated system of queuing. Every queuing system can be characterized by:

- the input current requirements,
- the queue,
- the time operation,
- the line services,
- the output current requirements.

The method of troubleshooting

A sufficiently accurate mathematical scheme (model) must be done to be able to predict the activities of the queuing system. Modelling expected build the model, which has characteristics derived from the real system. It displays all or only those facts that are important for the process. The model is thus a simplified picture of the reality.

In simple the models can be divided into:

- *mathematical models* - are formulated as a set of the equations, describing the studied system, including the restrictions and requirements on the input and output variables,
- *analytical models* - providing results in the form of the general functions for a various values of the input data,
- *simulation models* - in terms of computer they are the algorithms, by which it is possible to simulate the events and processes (Flodr, F., 1990).

Simulation method currently seems to be practically available method suitable for the examination of the complex technological problems. Its importance is increasing, especially in the design and upgrade of the technology units. The labour input and material resources necessary to implement the simulation models are now insignificant compared to the costs associated with the experimentation in the practice.

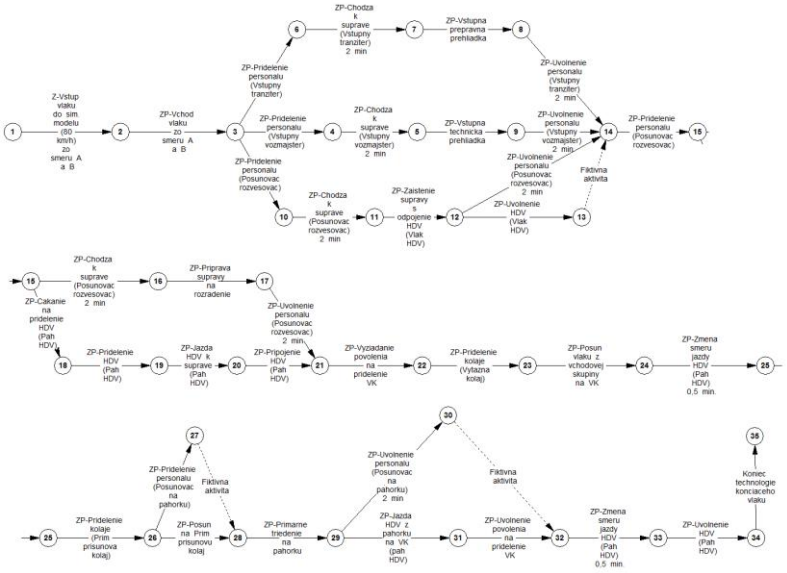

Figure 2: Example of the technological diagram – railway classification yard

The use of the simulation model can verify the plans and intentions. They can be accordingly changed before the system is placed in the realistic conditions. The simulation modelling use is convenient for the design of large and modern logistic centres, too.

Key stages of the work in the simulation modelling are:
- analyzing of the problem,
- selecting a solution method,
- modelling of the task,
- selection of the means for the model implementing,
- programming,
- experiment preparation,
- conduct of the trial,
- evaluation.

The analysis of the outcomes achieved

The processes which take place in the logistics centre are stochastic, not deterministic (Welterová, M., Lovíšek, M., Bariak, M., 2009). Therefore, the entry requirements into the system, the time of the handling and output current requirements can be described only by using of various probability distributions, for example normal, Poisson, Erlanger, exponential, gamma,... The disadvantage is that it is necessary to know the expected course of the input variables. They may be inferred from the statistical data obtained from the previous periods. It can be used for example $\chi 2$ test of good compliance to verify the input data.

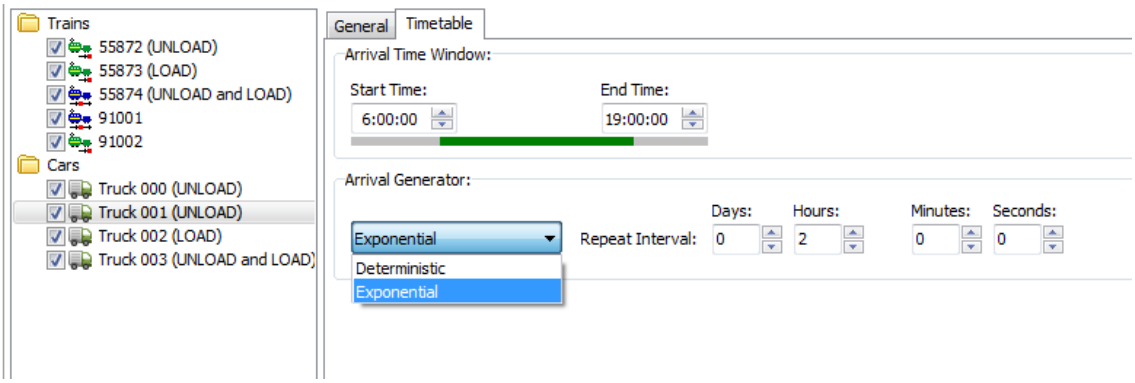

Figure 3: Example of the data entry to simulation model – store house

The basic output characteristics obtained from the simulation modelling could be:
- likelihood of the entry requirements refusal,
- average queue length of the requirements in the systems,
- maximum queue length of the requirements in the systems,
- average waiting time of the requirements in the systems,
- maximum waiting time of the requirements in the systems,
- average time which spent requirements in the systems,
- maximum time which spent requirements in the systems,

- utilization rate of the operating lines in different systems,
- limiting spaces in the systems,
- average number of the requirements contained in the systems,
- variance of the requirements contained in the systems,
- etc.

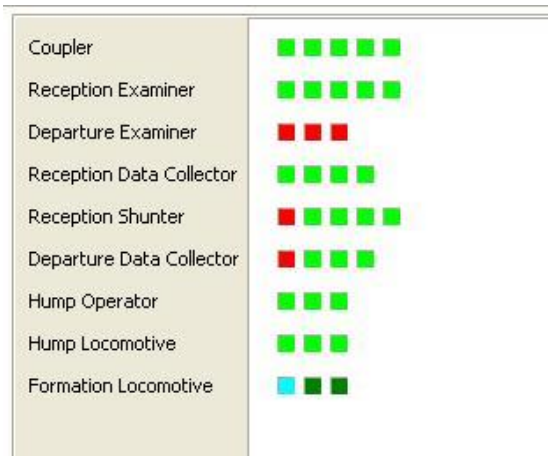

Figure 4: Example of the on-line data output – employers utilization

What can be suggested based on the results obtained during the simulation model:

- number of the operation lines,
- deployment of the operation lines,
- required capacity of the operation lines,
- technological process works,
- desired area for the entire system,
- financial budget of the implementation,
- required reserve funds,
- etc.

The practical application of the results

Simulation modelling can verify before the construction of logistic centre:

- for the storehouses:
  - number and capacity,
  - type and number of the handling equipment,
  - size of the handling areas,
  - storage technology,
  - staffing demand,
  - process times,
  - load carrying capacity,

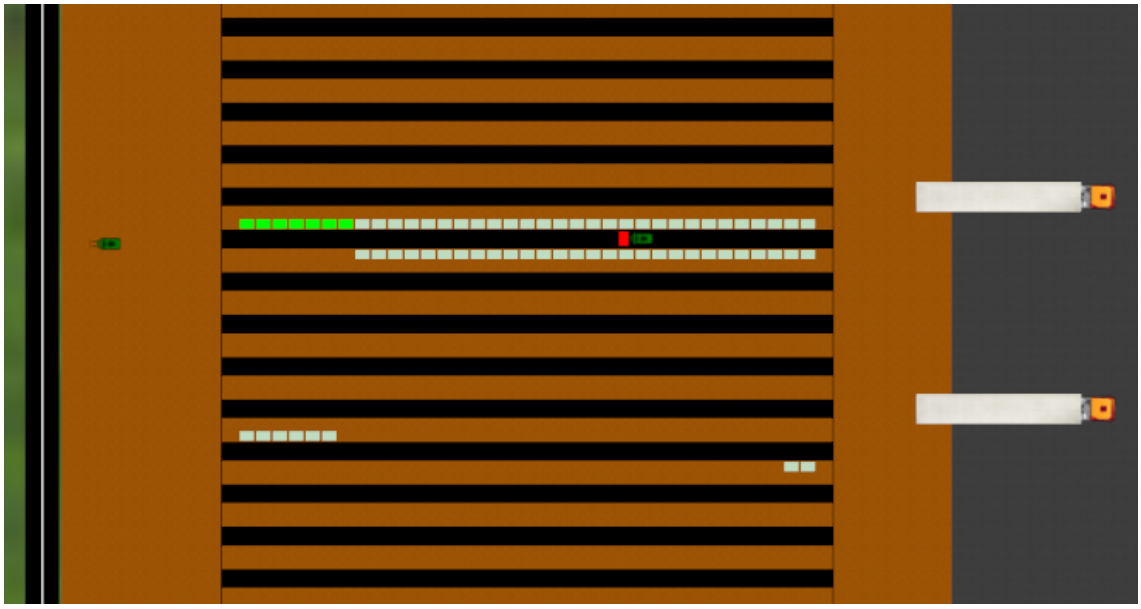

Figure 5: Example of the storehouse simulation model

- for the railway classification yard:
  - structure of the rail-yard,
  - number of the tracks in the rail-yard groups,
  - number of employees and locomotives,
  - technology of the primary and secondary splitting,
  - normative times,
  - operating efficiency,

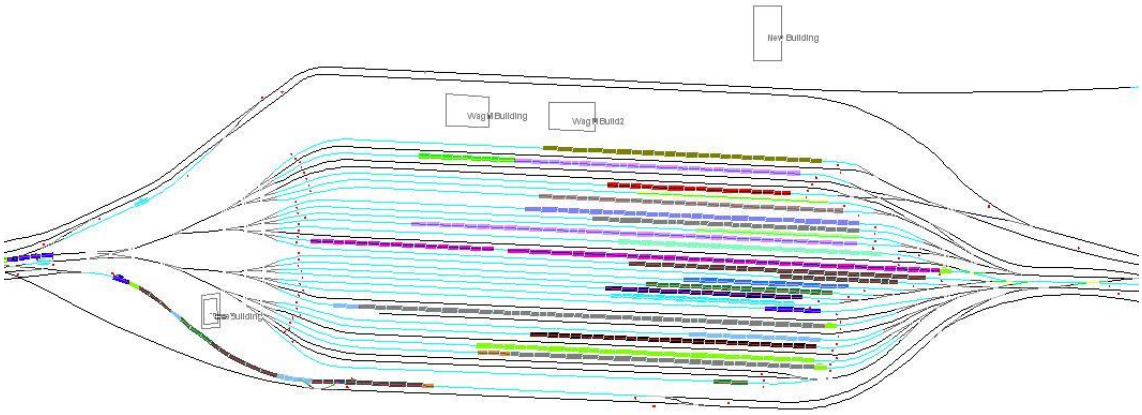

Figure 6: Example of the railway classification yard simulation model

- for the intermodal terminal:
    - type and number of handling equipment,
    - size of the handling areas,
    - technology of the trans-shipment cargo units,
    - staffing demand,
    - process times,
    - load carrying capacity.

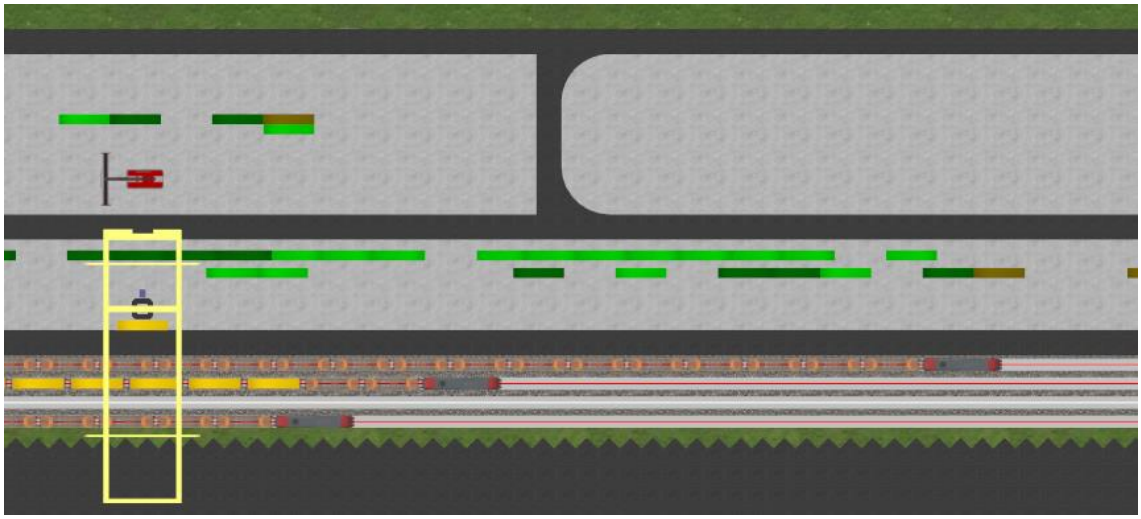

Figure 7: Example of the intermodal terminal simulation model

Conclusion

Simulation modeling provides a comprehensive and dynamic view on the whole technological process and can provide the necessary information about its behaviour. Simulation modelling is advocated as a suitable method for the verification of strategies for the construction and management of the modern logistic centres.

In second place, utilizing simulation modelling can optimize the number of handling equipment, the handling area size, the number of transport, the range of transport infrastructure. Using designated conditions eliminate any negative impact on the environment.

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Performance of Distant Education System in Turkey

Deniz Guney

Yildiz Technical University, Faculty of Architecture, Department of Structure Istanbul-Turkey
deguney@yildiz.edu.tr

Abstract: Developing communication technologies have an important power and effect on the field of education in Turkey. These electronic technologies have been increasingly used in education and training for many years. Distance education is one of the newest forms of education that basically depends on these communication and information technologies. As a new and modern approach to deliver instruction, many corporations and organizations for both formal and non-formal educational settings in Turkey and all around the world have increasingly used distance education. This paper investigates the performance of the Distant Education System, explains how the Distant Education Faculty performs and transforms education in Turkey.

Key words: Distant, education, performance, Turkey.

Introduction

Distance education programs worldwide use a variety of technologies that include print materials, audio and videocassettes, audio and video teleconferencing, one-way and two way television, computer-mediated communication (e.g., electronic mail, computer conferencing), and more recently, the Internet. Technologies that deliver instruction to distance learners are often classified as two-way interactive or one-way non-interactive (Bates, A. W., 1995). Two-way interactive technologies can be listed as audio conferencing, audio graphic conferencing, bulletin board system, and computer conferencing via e-mail, computer conferencing via conferencing software, desktop videoconferencing, and internet based desktop videoconferencing, internet-based synchronous text conference, one-way videoconference with response keypads, two-way videoconference and voice mail. Similarly, one-way technologies can be listed as audiotape, CD-ROM, computer-based training (CBT) - computer disk, internet-based gopher, telnet, ftp, laserdisc, one-way videoconference, e.g., satellite, printed materials, radio, television, videotape, virtual reality and Web-based interactive multimedia, e.g., Java scripts, World Wide Web. Turkey has used the European model for its economic, political and educational development while maintaining its cultural ties with the East. Many Turkish art forms; shadow theater, music, dance and literature have their roots in Asia. Similar to its Asian neighbors, Turkey, with a large population of over 70 million people, is a developing country. Institutions of higher education in Turkey have traditionally modeled their programs after their British, German and American counterparts. However the educational problems facing Turkey more closely resemble those of their Asian than their European neighbors (McIsaac, M.S., et al, 1988). Distance Education has been actually applied in Turkey since 1982. When the past of distance education is examined, though it can go back to 50-60 years ago, it seems it appeared in 1970s, closer to its meaning of today. The distance education issue first expressed in 1927 at a meeting where the education problems were discussed and it was discussed that distance education could be used to make the people literate (Alkan, C., 1987).

Turkish Education System

A.General View: Turkish education system is ruled by the Ministry of National Education. Ministry of National Education consists of central, provincial, overseas organizations and affiliated establishments. According to the Basic Law of National Education no 1739, The Turkish Education System consists of two main divisions:

a. Formal Education

Formal Education, in other words school system, is divided into four levels:
- Pre-school Education (0-72 mounts)
- Primary Education (Primary Education, which is free at all state schools, is for the education of children between the ages of 6 and 14, and it is compulsory for all.)
- Secondary Education (Secondary Education covers general high schools, and vocational and technical high schools which provide at least three-year education for the graduates of primary education.)
- Tertiary Education (The aims of these schools are to bring up students as individuals who are acquainted with the problems of the society and who contribute to economic, social and cultural development of the country and to prepare them for tertiary education as well)

b. Non-formal Education (Non-formal education aims to teach adults how to read and write, to provide basic knowledge, to develop further knowledge and skills already acquired and to create new opportunities for improving their standard of living.)

In addition to this, based on qualifying exam, students can continue higher education system (two years/pre-undergrad, min. four years undergrad). Higher education system can be seen in Figure 1. General numbers belongs to Turkish education system is given in Table 1.

Table 1: Number of Schools, Students, Number of Teachers

Levels of Education	Number of Schools/Institution	Number of Student			Number of Teachers
		Total	Boys	Girls	
Pre-School Education	**3.600**	**701.762**	**366.209**	**335.553**	**10.819**
Primary Education	**34.093**	**10.870.570**	**5.676.872**	**5.193.698**	**445.452**
Secondary Education	**8.280**	**3.245.322**	**1.789.238**	**1.456.084**	**191.041**
General Secondary Education	3.830	1.980.452	1.044.607	935.845	106.270
Vocational and Technical Secondary Education	4.450	1.264.870	744.631	520.239	84.771
Non-Formal Education	**11.864**	**5.117.623**	**2.942.086**	**2.175.537**	**87.285**
Higher Education	**114**	**2.497.473**	**1.411.485**	**1.085.988**	**96.105**
Total	**57.951**	**22.432.750**	**12.185.890**	**10.246.860**	**830.702**

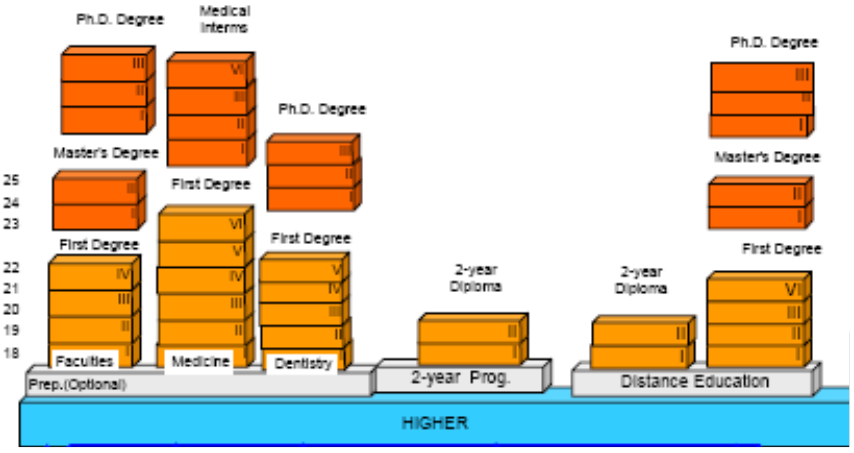

Figure 1: General structure of Turkish higher education system

Higher education institutions are autonomous for purpose of teaching and research. Higher Education institutions includes faculties, institutes, faculties, institutes of technology, higher education schools, conservatories, higher vocational education schools, and application and research centers. However, they have to submit annual reports to Higher Education Council which is responsible for the planning and coordination of higher education. Higher Education covers all post-secondary programs with duration of at least two years. The total number of universities is about 160 (according to 2012 data). The schooling rate in higher education is about 38.6%. Almost 1.2 million students take university entrance exam in every year. However 100.000 of them (state and private university) can enter classic university departments. The rest of the students should search an alternative education method for higher education. That's why distant education tools are one of the best alternatives for higher education. In addition to this distant education can be used for each stage of education system.

B. Distant Education in Turkey: Distant education is provided to ensure equal opportunities for all Turkish citizens, to support the primary, secondary and higher education system and to render lifelong learning opportunities.

The distant education system was initiated in Turkey in 1974. At primary and secondary education level s distance education is provided through Open Primary School, Open High School, Open Vocational and Technical High School while at tertiary level through open universities. In addition Vocational certificate programs are offered for all though Open Vocational and Technical School on condition that they are at least primary school graduates. In the 2004/2005 academic year, a total of 1 342 375 students received education through distance education, 581 516 in open primary and secondary schools and 760 859 in open higher education.

Open Education in Turkey

The first and the most successful example of distant education in Turkey is Anadolu University. It is very successful example and mile stone for Turkish education system. Eskişehir Anadolu University has been providing open higher education services since 1982. The Open Education Faculty began training with Economics and Business Administration curricula. The Economics and Business Administration Departments of the Open Education Faculty were reorganized as Faculty of Economics and Faculty of Business Management in the year of 1993. The Open Education Faculty is also extending services to faculties of Economics and Business Management through its Turkey-wide distributed offices as well as the training and education services extended by the faculty itself. This service is also available for Turkish citizens living in foreign countries. The total number of students registered to Open Higher Education was 760 859 for the academic year 2003/2004. The student numbers of the Open Education Faculty, Faculty of Economics and Faculty of Business Management are 289 659, 213 835 and 257 365 respectively. The details can be seen in Table 2.

Table 2: Number Of Students In Distance Education (2004/2005)

EDUCATIONAL LEVEL	**TOTAL**	**BOYS**	**GIRLS**
OPEN PRIMARY EDUCATION	266.742	147.117	119.626
OPEN EDUCATION HIGH SCHOOL	314.773	185.302	129.471
General Programs	252.030	149.873	102.157
Vocational and Technical Programs	62.743	35429	2.7314
Industrial Vocational H.Sc.	26.845	23.928	2.917
Girls' Vocational H. Sc.	16.378	292	16.086
Trade Vocational H. Sc.	12.583	7.229	5.354
Imam and Preachers H Sc.	6.397	3.980	2.597
OPEN HIGHER EDUCATION	695.591	387.413	308.178
TOTAL	1.277.107	719.832	557.275

Today, its Open Education System not only serves students in Turkey but Turkish communities in the European Union and Northern Cyprus. It has one of the world's largest student bodies. It currently has 24,300 on-

campus students and almost 1,050,000 off-campus students enrolled in the Open Education System. Over 2000 of these are taking graduate programs. The 336,000 distance students who enrolled in 2005/06 constitute over 40% of all university students and 99% of all distance education students in Turkey. By the end of the 2004/05 academic year, 870,000 pre-bachelor and bachelor degree students had graduated through the Open Education System, and at the end of 2006 a further 110,000 graduates are expected. The average Anadolu University distance learning student is in his/her mid-twenties; 65% of the students are metropolitan-based, 70% have jobs, 40% are married, 42% are female and 1.5% has some disability. Anadolu University comprises 12 faculties, three of which—Open Education, Business Administration and Economics—constitute the Open Education System, 10 vocational schools, 6 graduate schools, 26 research centers and a State Conservatory of Music and Drama. It has 1811 full-time teaching staff.

Open Education Faculty Performance

The OEF offers academic, technical and administrative support for the Open Education System through its various centers and units. The Distance Education Design Unit provides the instructional design for the 4.2 million copies of the 400 self-directed learning textbooks plus many test booklets and other course materials that are needed annually and that are co-developed by more than 750 writers and editors from Anadolu and other universities. The Printing Unit designs and produces the textbooks using the latest computer technology and dispatches these to the OEF centers in Turkey, the European Union and Northern Cyprus for student collection upon registering. They are also increasingly made available as web-based PDF files (e-books). The Television Centre produces or revises some 300 20-minute television programs annually. Most of the 5000 banked programs are studio-based and 'talking head', but there are also dramatizations, documentaries and computer animations. Throughout the year, these programmers are aired nationwide six hours a day on weekdays and three hours a day at weekends on the Turkish Radio and Television Corporation's Channel 4 (TRT4). Prior to the mid-term and final examinations, these pre-recorded programs are replaced with week-long live interactive programs with toll-free telephone, fax and email access to help the students in Turkey prepare for their examinations. Over 1100 programs are also available as streaming video over the Internet and students may purchase videocassettes or VCD/DVDs at minimal cost. Copies are free for students in the European Union unable to receive TRT4.

The Centre also operates a 384-kbs videoconferencing system for teaching within Turkey and Northern Cyprus, and produces hundreds of radio programs and a large number of audiobooks for the visually impaired, employing professional actors to read aloud the texts and self-tests. The Computer-Based Learning Centre collaborates with subject experts in developing the multimedia courseware for CD-Rom or Internet distribution. It employs 12 servers with 34 processors, using 100-Mbit bandwidth on the National Academic Network (ULAK-NET) developed by the Scientific and Technological Research Institution of Turkey (TÜBITAK) with the support of Turk Telekom (TT) (used mainly by students with computer access in public agencies or other universities) and 200-Mbit bandwidth on TT-NET (for other students accessing the multimedia materials). Although there are critics of the system, with so many students the OEF has found no alternative but to use multiple-choice tests and computerized assessment and evaluation. The tests are developed at the Test Research Centre by teams of teachers; the question books and optically readable answer sheets are dispatched under strictest security to the examination centers and, on their return, the Computing Centre assesses the answer sheets while the Test Research Centre monitors the appropriateness and effectiveness of both the instruction and the questions. The Open Education System is fairly generously funded, with 76% of its income coming from the student fees and 24% from the state. In 1996, Daniel estimated that the Open Education System cost the government 2% of the higher education budget (Daniel, J. S., 1996). Today, the state contribution per Open Education System student is 5% of that of a student at a conventional university. Bayrak and Kesim (2005) estimate that further investment in e-learning will yield further cost benefits (Bayrak, C., Kesim E, 2005). For most of the courses, the annual tuition fee is about US$250. Repeating students pay around US$200. Courses involving practical work cost slightly more. The annual fees for the Information Management and English Language Teaching programs are about US$1000 and US$600, respectively; the total for the e-MBA is US$12,600, and the other online graduate programs cost US$5,000.

E-Transformation

Like all distance teaching institutions in emerging economies, Anadolu University must balance technological benefits against equitable provision. e-Transformation can improve the infrastructure, provide richer and more interactive programs and enhance learner support. But recent findings (DPT, 2006) show that only 13.9% of the Turkish population can access the Internet, and only two per cent can access broadband. Only 5.9% own computers with an Internet connection. The majority access the Internet at work (41.1%) or at Internet cafes (41.2%). Internet access is primarily in the urban and advantaged regions and 62% of the populations still have no understanding of the Internet. The main reasons for the low adoption rates are the high cost of an Internet connection and a lack of basic Internet/computer skills. For those on the average monthly income of US$300–500, US$20 a month for a 512-kpbs digital subscriber line (ADSL) or US$10 for 15 hours of dial-up is prohibitively costly. But, interestingly, students constitute the largest group (53.8%) using the Internet. Turkey ranked 45th in the Economist Intelligence Unit's 2006 e-readiness rankings. However, the imperatives of the knowledge economy, globalization, candidacy for the European Union and Turkey's inclusion in the European Council's e-Europe Program Action Plan have led the government to initiate the Turkish e-transformation better, faster and more participative and transparent Information and Communications Technology public services. Universities, research organizations, libraries and documentation centers are linked through the high-speed ULAK-NET, and the rapid expansion of the Internet has led to student demand for online programs and services. In 1999 The Council of Higher Education legislated for Turkish universities to move into e-learning. The Computer-Based Learning Centre had already been developing courseware for use in conjunction with the print materials, and Anadolu University responded readily to this opportunity. The original intention was to install computer laboratories in all of the OEF centers but this proved to be too problematic and costly so the OEF is now setting its sights on supporting home ownership of computers, enhancing Internet connection and working with Turkish Telecom to increase the bandwidth and provide access for those in rural and underdeveloped regions of the country. Deploying WiMax technology is part of this project. The pursuit of these goals is seen as important because it is shown that, regardless of region, age or gender, Open Education System students making regular and sustained use of e-learning perform better than those who do not make use of the technology (Mutlu, M. E., 2004). However, it is still the case that many students lack the requisite computing and self-study skills, quiet, private environments for learning, and confidence to use computers for their learning, that server and bandwidth problems occur during peak hours, and that many faculties are still unfamiliar with technology-based teaching and learning. So there are many issues to be addressed as well as the cell phone, PDA and other m-learning options.

Strategic Planning and Management

Anadolu University and the OEF realize that they have reached a stage where they need to re-examine trends, needs, obligations and their strengths, advantages and opportunities, re-define their strategic goals and priorities, re-align their management and quality assurance procedures and resources accordingly, and mainstream those innovations that are shown to be working well. They also need to guard against becoming over-extended and/or failing to achieve impact and leverage in politically and educationally significant areas. The Higher Education Council (HEC) has suggested that Anadolu University should increase the range of courses and offer programs in technical fields, science and medicine. At the same time, the Turkish branches of large international firms are asking the OEF to provide nationwide online training for their employees. In August 2006, Ford established an e-learning portal to train its service personnel using materials designed and produced by the OEF. Anadolu University also needs to consider the threats posed by international and for profit online providers and the other socio-economic, political and technological changes that undoubtedly lie ahead for the country. Yılmaz (2005) suggests that universities with an e-transformation mission need to market themselves as providing easily accessed, well-designed, learner-centered, affordable, efficient and flexible services, sound return-on-investment, greater learner satisfaction and higher retention (Yılmaz, R. A., 2005). Özkul (2005) observes that achieving this at Anadolu University will require significant changes in structures and work practices, and Ulukan (2005) suggests that the requisite shifts in institutional values and staff attitudes and behaviors will require multiple points of inertia and resistance to be addressed systemically. Anadolu University's original positioning as the national center for distance learning in Turkey was attributable to the vision and leadership of its inaugural Rector in the 1970s and 1980s. The

new senior management team needs to exercise similar prescience and leadership and to encourage all faculties and staff to align their goals and activities to a new vision. The recent Higher Education Strategy for Turkey (Higher Education Council, 2006) stresses the need for just this form of review and envisioning. While at this stage the report is a draft open to comment, it flags some important issues. It observes that the higher education age group will decline but that the participation rate needs to be increased to match that of other OECD countries; that there is need for more postgraduate study and lifelong learning opportunities; that the university system needs to be more open and flexible; that management, quality assurance measures and resource efficiency need to be improved; and that there is a call for more student centered approaches, greater use of e-learning and increased research activity and international publication. It also suggests that while the participation rate should rise to 65% by 2025, the proportion studying through open learning should be progressively reduced from 35% to 11.2%, which it claims is the norm for developed countries. Anadolu University is already taking steps to respond to this changing environment. A Strategic Planning Task Force representative of the different departments of the university has been charged with developing a strategic plan by the end of the first quarter of 2007. In another major step development, a new Open and Distance Learning Research and Development Office (ARGE) has been established to undertake and commission qualitative and quantitative research studies that will help administrators and faculty improve their services and gain better national and international recognition of the university. On the developmental side, ARGE will encourage and support new forms of online programs, especially in the technical fields, using advanced technologies and more flexible and personalized learning systems. These e-certificate programs will be so designed as to remove the barriers to continuing professional development, including distance, time, qualifications and cost.

Conclusion

Turkish distance education already provides learner-content interaction through one-way technologies. By applying instructional strategies and interactive technologies that are inspired by cultural context, distance education can also enhance learner-instructor, and learner-learner interaction. Cultural context is a critical ingredient in the development of any distance education program. Because distance education reflects traditional face-to face education, distance education programs must be based on cultural context. In Turkey, patronage and an oral tradition are part of this cultural context. The instructional designer should select technologies that will encourage interaction and cooperation while supporting the cultural context.

As an important social and educational development the Open Education Faculty's significance lies not only in making University education available to adults who can only obtain it through study in their spare time, but also in the variety of teaching methods used. By the way of distance education in Turkey, students who failed to win places at conventional universities as well as those who for economic, geographic or other reasons could not study on university campuses found a chance to be educated. It was felt that distance education would not only benefit the students themselves but, in larger sense, would help to eliminate the student unrest and civil disobedience, which had marked the 1970's.

Anadolu University has successfully provided distance education for Turkish people in Turkey, across Europe and in Northern Cyprus since the early 1980s. The size, diversity and distribution of the student body and associated technological, logistical, legal and political issues present enormous challenges to the Open Education System. Anadolu is now improving its educational products and services through e-transformation and by employing new instructional models in its undergraduate, graduate and e-certificate programs. However, there are still many issues to consider; how to prepare the learners for self-managed, collaborative, technology-based learning; how to train faculty in the new technologies, methodologies and research practices; how to persuade politicians and administrators to write legislation and bills that will support open education; and how to improve the technological infrastructure and services. Senior and middle management and the recently established Strategic Planning Task Force are committed to finding ways of resolving these issues.

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Physico-Chemical Properties, Fatty Acid Composition and Total Phenol Contents of Olive Oil Extracts by Traditional Method in East Algeria

Tayeb Idoui

University of Jijel, Laboratory of Biotechnology, Environment and Health, (18000) Algeria

tay_idoui@yahoo.fr

Abstract: The purpose of this study was to evaluate the microbiological characteristics of olives then evaluated the physical and chemical characteristics of their oils. Ten olives samples were used in this study, and then aliquots were used for microbiological analysis. The olives oils obtained by traditional method from the same samples were examined for physical and chemical properties (acidity (%), peroxide values, saponification number, pH, moisture and impurities), fatty acids composition and total phenols content.
Results indicate that olives samples reveal a diversity of microflora (mesophilic bacteria, enterobacteria, lactic acid bacteria, yeast and moulds); the physical and chemical characteristics of their olive oils were altered and were not favourable for Algerian Official Journal limits. Oleic acid was found in highest percentage, followed by palmitic, linoleic, stearic and linolinic. Total phenols contents expressed as gallic acid of olive oils values ranged from 60.1 and 97.1mg /kg.

Keywords: Olive, Olive Oils, Composition, Fatty acids, Total Phenols.

Introduction

The Mediterranean coastal areas have a mild, warm climate that fully meets the climatic requirements of *Olea europaea* trees, and they are thus considered an ideal habitat for their growth and development (Boggia et al., 2005). The olive tree grows in a subtropical climate as a traditional main crop, familiar in Mediterranean countries. It probably originates from Mesopotamia and has been cultivated from many centuries in southern European countries bordering the Mediterranean and in North Africa (Murkovic et al., 2004 and Tanilgan et al., 2007).
The olive tree is one of the major agricultural trees in Jijel (Algeria), with an area of 14000 hectares distributed essentially in mountainous areas (Anonymous, 2006). The major part of production is generated in the production of olive oil.
Olive oil has a unique position among edible oils due to its delicate flavour, stability and health benefits (Vekiari et al., 2007). The Mediterranean people considered olive oil not only an excellent food but also a healing agent. During the past four decades a renewed interest in the nutritional and health aspects of olive oil has been generated. Olive oil is a key component of the traditional Mediterranean diet, which is believed to be associated with a relatively long life in good health (Visioli and Galli, 1998 and Tanilgan et al., 2007).
An abundance of oleic acid, a monounsaturated fatty acid, is the feature that sets olive oil apart from other vegetable oils. The Mediterranean diet includes the consumption of large amounts of olive oil, which contains high amounts of phenolic substances (Garcia et al., 2003).
The quality of the olive oil may depend on the composition of the fresh fruits, environmental conditions during the transformation process and the production technology. Spontaneous olive fermentation has shown some problems concerning the acidity of the final product (olive oil) (Poiana and Romeo, 2006). Fermentation is a spontaneous phenomenon in a traditional way, including several stages, depending on spontaneous colonisation by microbial strains, associated with the raw materials and local environmental conditions, which still takes place in olive then the quality of oil olive would be affected.
The annual olive oil production in Jijel (Eastern Algeria) was estimated to 34. 10^3 hectolitres, (Anonymous, 2006), but the quality of this product is affected because before processing extraction, olives are stored at environmental temperature for every week for what the spontaneous fermentation take place. Much work has been done on the effect of storage conditions and packaging materials on olive oil quality but a few works has been done on the effect of olive storage conditions on olive oil quality (Vekiari et al., 2007).
The objective of this study was to evaluate the microbiological quality of olives and then evaluated the physical characteristics and chemical composition of their oils extracted by traditional methods in East Algeria.

Materials and Methods

Olives and olive oil samples

Ten (10) olives fruits samples were collected from different location (Texenna, Tassoust, Kaous, El Emir, Taher and Beni-Ahmed) in East and South-East Jijel (Algeria). Samples were collected during the period when olives are usually harvested for oil production. For each sample aliquots of olives were used for microbiological analysis. From each sample, olive oil is extracted by traditional method and final products were submitted to physical and chemical characteristics determination, fatty acid composition and total phenols contents.

Microbiological analysis

Twenty g (20g) of olives of each sample was diluted in physiologic water (180 ml 0.9% NaCl), homogenized and the dilutions were plated in duplicate onto appropriate media.

The media and the conditions using for microbial numeration were the following: Plate count agar (PCA) incubated at 37°C for 48h for mesophilic bacteria; violet red bile glucose agar (VRBG), incubated at 37°C for 24h for enterobacteria; Baird-Parker agar base, incubated at 37°C for 48h for staphylococci; MRS agar, incubated at 32°C for 48h to 72h in anaerobiosis for lactic acid bacteria; Oxytetracyclin glucose agar (OGA), incubated at 25°C for 3-7 days for yeasts and moulds (Campaniello et al., 2005; Idoui et al., 2009).

Physical and chemical analysis

The pH measurements of olive oils were obtained with a pH meter (HANNA), calibrated with two standard solutions buffered at pH= 4.00 and pH= 7.00. The impurities and moisture were determined according to the method described by Tafalo et al. (2012)

Chemical analysis (Free oil acidity, peroxide value) was performed according to AOAC (1990). Saponification number was determined using the method described by Tafalo et al. (2012).

For the free oil acidity, a known weight of olive oil was dissolved in a mixture of diethyl ether / ethanol (1:1 v/v). The mixture was titrated with potassium hydroxide in methanol (0.05M) in the presence of phenolphthalein as indicator. For peroxide value, about 5g of olive oil was dissolved in a mixture of acetic acid/ chloroform (3:2 v/v), and saturated solution of KI (1ml) was then added. The liberation iodine was titrated with sodium thiosulphate solution (0.05M) in the presence of starch as indicator. For saponification number, a known weight of olive oil (1g) was dissolved in alcoholic potassium hydroxide (25 ml) then evaporated for 30mn. The sample was titrated with chlorydric acid (0.5N) in the presence of phenolphthalein as indicator.

Analysis of fatty acids composition

The analyses of fatty acids were performed according to the official method of the European Community Regulation (1991). The olive oil samples were esterified in a methanol solution of 2N KOH for 30minutes at 50°C. The gaschromatographic analyses of fatty acid methyl esters were performed on a Perkin Elmer gas chromatograph, equipped with a flame ionisation detector (Shimadzu QP2010): The column was a fused silica capillary SE30 length 25meters, diameter 0.25 µm. Helium was the carrier gas. The column temperature program was: initially isotherm at 140°C for 10min, an initial programmed rate of 1°C/min up to 160°C, then a second rate of 2°C/min up to 220°C and a final isotherm for 15min. Samples were injected into the split mode. The apparatus itself carried out recording and integration.

The gas-chromatographic peaks were identified as corresponding fatty acid methyl esters by check of the elution order on the column and compared the retention times with those of pure standards.

Determination of total phenols content

The total phenol content was determined according to the methods described by Tsimidou (1999). 100g of oil was extracted three times with 500ml of methanol (methanol / Water: 40v/60v). The total phenols in the oil extracts were measured by the Folin-Ciocalteu assay. The measurement was carried out at 765nm via UV-spectrophotometer. Results were expressed as mg of gallic acid equivalent in one kg oil.

Statistical Analysis

Significant differences between the results were calculated by analysis of variance (ANOVA). Differences at $p < 0.05$ were considered to be significant. Where there were differences, a Duncan test was applied to indicate the samples between which there were differences.

Results and Discussion

Microbiological analysis of olives

The results of microbiological characteristics of the olives samples are summarized in table 1. Results indicate that olives samples reveal a diversity of microflora. This diversity could be linked to environmental conditions, specially the spontaneous fermentation. Count of mesophilic bacteria is between 2.40 to 9.76 log cfu/g. Samples 01 and 03 contained the highest count of mesophilic bacteria. This result is in agreement with those reported on Sicily olives samples by Poiana and Romeo (2006). The enterobacteria counts ranged from a count of 1.01 log cfu/g to 5 log cfu /g. Staphylococci were not detected in 6 out of 10 samples. Also, counts of lactic acid bacteria

and yeast and moulds were between 1.20 to 8.00 log cfu/g and 1.25 to 8.00 log cfu/g respectively. These results show the changes in the lactic acid bacteria and yeast and mould populations, which grew in all olives samples. The counts of lactic acid bacteria are higher than yeast and moulds. Poiana and Romeo (2006) reported that in general, yeasts coexisted with lactic acid bacteria throughout the whole fermentation period. Their counts were lower than those of the lactic acid bacteria through the most active fermentation period and their presence was stable. These results are in agreement with those reported on Algerian table olives samples by Kacem and Karam (2006). In the same way, Sousa et al. (2006) reported that the fermentation of table olives involves a complex microflora of lactic acid bacteria, yeasts, Gram-positive and Gram-negative bacteria.

Table 1. Counts of microflora olives samples**.**

Sample	Mesophilic bacteria (log cfu/ g)	Enterobacteria (log cfu/ g)	Staphylococci (log cfu/ g)	Lactic acid bacteria (log cfu/ g)	Yeasts and moulds (log cfu/ g)
01	6.40	4.00	0.00	3.24	ND
02	3.24	4.01	ND	3.82	6.80
03	9.76	2.96	0.00	4.40	ND
04	4.00	1.01	0.00	8.00	4.80
05	3.40	1.20	1.40	5.00	3.70
06	2.80	4.00	0.00	3.24	2.20
07	2.40	5.00	ND	5.20	5.00
08	4.00	1.01	1.20	1.20	1.25
09	ND	1.02	0.00	6.00	1.30
10	ND	1.40	0.00	5.20	8.00

ND: Non determined

In the study of Campaniello et al. (2005), microbiological analyses of lactic acid bacteria and yeasts in olives showed that their cell load was higher on the raw material and during the first fermentation phase and increased during the storage of products. The same authors found that staphylococci were undetectable in samples and Enterobacteriaceae remained constant in all samples of analyzed olives, during the 80 days of fermentation.
As reported in literature, the predominant microorganisms in Spanish style treated table olives are lactic acid bacteria; yeasts, instead, are the organisms responsible for fermentation of olives in natural processing (Garrido-Fernandez et al., 1997). In Algerian table olives, lactic acid bacteria and yeasts are also the predominant microorganisms (Kacem and Karam, 2006; Idoui et al., 2009).
Many studies have been conducted regarding the microbial characterization of table olives and results showed the beneficial effects of microflora to maintained the quality of the final product. In contrary, spontaneous olive fermentation used for oil production has shown some problems concerning the acidity of the final product (Poiana and Romeo, 2006). Then it is recommended that olive oil should be extracted just after olives gathering.

Chemical composition and physical properties of olive oils

The characteristics of chemical and physiological properties of olive oils extracted from all samples are shown in table 2. As is shown, important differences were found in chemical values (free fatty acid, peroxide value) among olive oils samples. These properties especially depend on the initial quality of the olives samples.
Acidity (% oleic acid) was in the range of 1.57% and 9.11%. It was higher in all samples excepted in samples 05 and 08. According to Algerian Official Journal and C.O.I (2003), olive oils should have acidity (%) ≤ 3.3% and the acidity contents of 8 out of 10 samples were higher than this limit. These results are not in agreement with those reported on Turkish olive oils samples (Acidity: 0.5%- 1.7%) by Tanilgan et al. (2007). Moussa et al. (1995) established free fatty acid in olive oil as 0.55%- 0.62%.
The results obtained also indicated that peroxide values were higher and ranged between 19 meq O_2/kg – 27.05 meq O_2/kg. It is clear that peroxide values of 80% olive oils samples exceed the value of 20 meq O_2/kg of olive oil, which is the maximum established by the Council for International Olive Oil and Algerian Official Journal. Our results are not in agreement with those found in a study conducted by Vekiari et al. (2007) on the effects of processing methods and commercial storage conditions on the extra virgin olive oil quality indexes, peroxide values in all cases did not exceed 20 meq O_2/kg of olive oil. Similar results are found by Kiritsakis and Dugan (1984), the peroxide values of olive oils obtained from olive fruits collected with different methods in Greece were found between 6.0- 47.7 meq O_2/kg.
Saponification number of all olive oils samples ranged from 102.85 mg KOH/ g to 162.82 mg KOH/ g. All samples were above the limits established by C.O.I (2003) and Algerian Official Journal (184- 196 mg KOH/ g).

In table 2, pH, moisture and impurities values of all olive oils samples are ranged from pH4.65- pH5.73, 0.95% - 3.33% and 0.06% -10.00% respectively. According to C.O.I and Algerian Official Journal, the moisture and impurities of all olives oils samples were higher than the limits. These results are not in agreement with those obtained by Vekiari et al. (2007), impurities values were between 0.21% and 0.43%.
Our observations and results confirmed the negative effect of microbial quality of olives on the final products. Authors reported that during storage, the growth of cellulolytic yeasts and contaminant microorganisms can cause the softening of olives (Lanciotti et al., 1999), and then olive oil quality is affected. In the same way, the significant factor affecting the oxidative reactions was present, water activity and high fatty acids (table2). The increase in oxidation was confirmed by the increase of peroxide values.

Table 2. Chemical and physical properties of olive oils (Mean ± SD).

Sample	Free fatty acid (% oleic cid)	Peroxide value (meq O_2/ kg)	Saponification number (mg KOH/ g)	pH	Moisture (%)	Impurities (%)
01	7.00 ± 0.5	23.00 ± 1.23	146.97 ± 2.75	ND	2.00 ± 0.10	3.75 ± 0.17
02	9.11 ± 1.5	27.05 ± 1.19	147.96 ± 3.35	4.72 ± 0.63	3.00 ± 0.50	4.60 ± 0.13
03	4.51 ± 1.2	26.90 ± 1.50	162.82 ± 2.10	5.63 ± 0.60	2.00 ± 0.45	2.00 ± 0.14
04	6.25 ± 0.9	27.00 ± 1.20	137.92 ± 1.40	4.96 ± 0.53	0.95 ± 0.52	0.06 ± 0.21
05	1.57 ± 1.3	19.00 ± 1.95	128.05 ± 2.50	5.73 ± 0.50	3.33 ± 0.60	3.00 ± 0.19
06	5.12 ± 0.7	23.00 ± 1.25	108.69 ± 1.20	5.63 ± 0.49	2.00 ± 0.35	4.60 ± 0.23
07	6.21 ± 0.5	ND	102.85 ± 1.35	4.74 ± 0.58	3.13 ± 0.44	3.30 ± 0.20
08	3.12 ± 1.4	18.4 ± 0.80	134.77 ± 2.50	ND	2.00 ± 0.34	10.00 ± 0.18
09	3.67 ± 0.3	23.50 ± 0.55	132.73 ± 2.20	4.65 ± 0.55	1.00 ± 0.10	3.75 ± 0.15
10	6.13 ± 0.7	25.00 ± 1.15	157.42 ± 2.30	4.94 ± 0.45	ND	1.19 ± 0.12

ND: Non determined

Fatty acid composition of olive oils

The fatty acid compositions of the ten olive oils samples were determined by gas chromatography and the results are shown in table 3. When examining the fatty acid composition, differences among the samples were observed. It is clear that oleic acid was present in the highest concentration; the values were ranged between 64.62% and 80.60%. It was followed by palmitic acid (10%- 17.30%), linoleic acid (5.45% - 14.26%), stearic acid (3.06% - 7.00%) and linolenic acid (0.82% -2.24%). Sample coded 02 contained the highest concentration of oleic acid (80.60%) but sample coded 05 has a lowest percentage of the same fatty acid (64.62%). These results showed that the total unsaturated fatty acid contents such as oleic, linoleic and linolenic acids were in high levels. Unsaturated fatty acid values were between 76.68% and 86.94%. Differences in these values can be due to species, genetics, variety, growing conditions, locality, climatic conditions and postharvest treatment (Kiritsakis and Markakis, 1984; Aparicio et al., 1994). To our knowledge there is still no information about the fatty acid composition of our local olive oils (Olive oils produced in Jijel's area) and there is not any studies carried out to determine this chemical parameter. The results found in this study were in agreement with those reported by several authors. Tanilgan et al. (2007) determined that the contents of the main fatty acid of olive oils from five Turkish olive varieties ranged between 65.7-81.1%oleic, 3.5-15.5% linoleic, 0.1-3.0% linolenic, 8.1-15.2% palmitic and 2.0-5.6% stearic acids. Ollivier et al. (2005) reviewed 8.49-13.72% palmitic, 2.11-2.6%stearic, 66.36-79.39%oleic, 5.82-11.85%linoleic and 0.61-0.65% linolenic acids. In a study conducted by Aparicio and Luna (2002), the main fatty acids of monovarietal virgin olive oils was ranged between 9.17-11.6% palmitic, 2.2-2.4% stearic, 78.1-80.3% oleic, 4.8-5.7%linoleic and 0.4-0.8% linolenic acid respectively.

Table 3. Fatty acid composition (%) and total phenol contents (mg/kg) of olive oils (Mean ± SD).

Sample	Fatty acid composition (%)					Gallic acid equivalent
	Palmitic	Stearic	Oleic	Linoleic	Linolenic	(Mg /kg)
01	13.50	5.02	71.98	6.25	1.25	65.3 ± 1.2 $^{(bc)}$
02	10.00	3.06	80.60	5.45	0.89	60.1 ± 1.8 $^{(bc)}$
03	17.30	6.02	68.42	7.36	0.90	63.2 ± 1.6 $^{(bc)}$
04	15.70	4.00	73.52	5.83	0.95	61.0 ± 1.3 $^{(bc)}$
05	11.80	7.08	64.62	14.26	2.24	85.2 ± 1.7$^{(b)}$
06	12.74	5.00	73.12	8.14	1.00	64.2 ± 1.9 $^{(bc)}$
07	15.50	4.01	70.45	9.12	0.92	75.0 ± 1.8 $^{(c)}$
08	15.50	5.00	69.21	9.40	0.89	97.1 ± 1.9 $^{(a)}$

09	14.01	5.00	72.24	7.65	1.10	$69.4 \pm 1.5^{(c)}$
10	12.08	3.30	74.85	8.95	0.82	$63.0 \pm 1.6^{(bc)}$

Total phenols contents of olive oils

The results of total phenol contents of olive oils samples are shown in table 3. Total phenol contents expressed as gallic acid of olive oils values ranged from 60.1 and 97.1mg /kg. Total phenol content as gallic acid equivalent in sample coded 08 was the highest (97.1 mg/kg) but sample coded 02 has a lowest percentage of these components (60.1%). These results showed a difference in total phenol contents of olive oils samples. These differences may be due to maturation state and nature of cultivar. The phenol contents of olive oils were found higher than reported by Tanilgan et al. (2007). these authors determined that the contents of the total phenol of olive oils from five Turkish olive varieties ranged between 22.5-97.1mg/kg. The results of study conducted by Garcia et al. (2003) showed that the total phenol content of commercial olive oil is about 400mg/kg as caffeic acid equivalent**.**

Conclusions

To our knowledge, no information existed on physical characteristics and chemical composition of olive oil produced in East Algeria and especially in regions of Jijel. The physical and chemical characteristics of samples collected from different regions in Jijel showed considerable differences. The fatty acid compositions are useful for distinguishing the monovarietial olive oils belonging to particular cultivars. Our results showed that samples of olive oils are extracted from different cultivars.

The concept of total antioxidant capacity of processed foods is gaining momentum and emerging as an important parameter to assess the quality of the product. Our results showed that the analysed samples contained height concentration of phenols. Further studies about the total antioxidant capacity of these samples in vitro and in-vivo were needed.

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Potency of Aqueous White Grubs Extract Against CCl_4 Induced Liver Diseases in Rats

[1]M. S. Sule, [2]A. J. Alhassan, [3]Y. Abdulmumuni

[1]Hussaini Adamu Federal Polytechnic Kazaure, Jigawa State- Nigeria.
[2]Department of Biochemistry, Faculty of Science, Bayero University, Kano, PMB 3011 Kano - Nigeria
[3]Department of science Laboratory Technology, College of science ,Engineering And Technology

yabdulmumin@yahoo.com

Abstract: The potency of aqueous white grubs extract was assessed in the cure of carbon tetrachloride (CCl_4) – induced lipoperoxidation in rats. The three different dosages were administered (1g/kg, 2g/kg and 8g/kg) daily to different groups of rats for up to 9 days after induced with lipoperoxidation using CCl_4 at a dose of 120mg/kg. the serum aspartate aminotransferase (AST), alanine aminotransferase (ALT), and alkaline phosphatase (ALP) activities as well as levels of serum malondialdehyde (MDA), total protein (TP) and albumin (ALB) of the rats after 9 days of white grubs administration were found to be similar to those of control rats (not CCl_4 – treated). This shows possible curative effects of the white grubs extract, which was found to be depend on both the dose administered and the duration of treatment.

Key words: White grubs, Potency, carbon tetrachloride and liver disease.

Introduction

Unlike insects and related species, the uses of herbs to treat disease is almost universal among non industrialized societies and in most part of the world 70 - 90% of the people rely on plant for medication (Farnsworth and Soejarto, 1985; Hostettmann et al., 2000). The values of medicinal plants to mankind is very well proven and form the basis of health care world wide, and have roles in international trade (Ahmed et al., 2006). The use of, and research for, drugs and dietary supplements derived from plants have accelerated in recent years. Pharmacologists, microbiologists, botanists, and natural product chemists are perfecting phytochemicals for treatment of various diseases. At least 7,000 medical compounds in the modern pharmacopoeia are derived from plant (Tapsell, 2006). It is timely to venture into search for insects that have medicinal properties in addition to their nutritional roles.

White grubs are the larval stage of beetles' metamorphosis commonly found in dump refuse and animal dung, feeding on plants and animal remains (Alhassan et al., 2009a). In Africa, the species is widely distributed, it is found in Nigeria, Niger Republic, Uganda, etc. Though, white grub is seen and / or presented in the world's field of science as more or less a pest, with less or no positive economic importance, recent research and discoveries indicates white grubs are rich in protein, fats and mineral elements (Alhassan et al., 2009a). It is used among communities as food and as medicine among the Hausa/ Fulani in Northern Nigerian (Alhassan et al., 2009a). In South Western Nigeria, edible insects are conceived as food and source of nutrients and among the traditions and the customs that persist, are the consumption of various insects and usage of insects for rituals and medicinal purposes. From the foregoing discussion, white grub, like any other food item and medicinal specimen, may contain one or more nutrients, elements or compounds necessary for body system up-keeping.

Liver is a discrete largest organ in human body that has many interrelated functions and it may be damaged due to one or more of the following: injury from metabolic disturbances, injury from toxins, drugs, chemicals and poisons, lesion of biliary tract, certain viral' infections, hypoxia, tumours (MacSwean, 1980; Roderick et al., 1998). Carbon tetrachloride (CCl_4) induces lipid peroxidation and liver damage (Robbins and Cotran, 2006) and high dose of CCl_4 generates an ideal hepatotoxicity model organism that allows for evaluating the curative effects of medicinal rather than reporting natural healing (Alhassan et al., 2009b).

In a survey carried out, seven out of ten individuals contacted around Kano and its environs are in one way or the other aware of using white grubs to cure jaundice i.e. "shawara". Hausa/ Fulani perception of jaundice "shawara" includes among others, general body weakness, tiredness, general body pain and even lose of appetite, without obvious sign of jaundice. This reported work was carried out to investigate the potency of white grubs extract against CCl_4 induced liver damage.

Materials and Methods

White grubs (WG) found in public wastes of Darmanawa quarters, Tarauni Local Government, Kano State were collected in the months of July and August, 2008. The WG were cleaned of dirt and blot, and was squeezed to release the extract (grubs' extract). The extract was filtered using cheesecloth and adjusted to concentration of 1.0g/ cm^3. Commercially prepared reagent kits for alanine aminotransferase (ALT), aspartate aminotransferase (AST) alkaline phosphatase (ALP) and total bilirubin (TB) obtained from Randox Laboratories, Antrim, UK, were used to assay the enzymes. Thiobarbiturate, biuret and bromocresol green were used for serum malondialdehyde (MDA), total protein and albumin determination respectively.

Experimental Animals

Eighty five (85) rats were obtained and divided into five (5) groups of twenty (20) rats each for groups I and II, and fifteen (15) rats each for groups III, IV and V. The rats in the first group (group I) were not induced with lipid peroxidation and liver damage, they served as positive control, whereas rats in groups II, III, IV and V were induced with lipid peroxidation and liver damage using 120mg/Kg CCl_4 according to Alhassan et al. (2009b). Rats in group II were not administered with white grub extract, they served as negative control. Rats in groups III, IV and V were administered with a daily dose of 1.0, 2.0 and 8.0g/kg body weight of white grub extract. Five (5) rats were removed from each group after 3, 6 and 9 days of white grub extract treatment respectively and sacrificed by decapitation.

Biochemical Analysis

Serum was separated and analyzed for alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities by the method of Reitman and Frankel (1957), serum alkaline phosphatase (ALP) activity by the method of Rec (1972), serum malondialdehyde (MDA) concentration by the method of Hunter et al (1963) modified by Gutteridge and Wilkins (1982), total bilirubin (TB) (Malloy and Evolyn, 1937) and serum total protein and albumin by the method of Chawla (1999).

Results

Table 1 summarizes the results for serum activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) and levels of total bilirubin (TB), malondialdehyde (MDA), total protein (TP) and albumin (ALB) for a group of rats 48hrs after intramuscularly injected with 120mg/Kg CCl_4. Tables 2, 3 and 4 present the results for groups of rats injected with CCl_4 and administered with various doses of aqueous extract of white grubs daily for 3, 6 and 9 days respectively. There was significant difference ($p<0.05$) between group I and II in the parameters analyzed except for TP. The groups

that received the white grubs' aqueous extract showed significant decrease ($p<0.05$) in ALT, AST and ALP activities compared to group II.

Table 1: Serum ALT, AST and ALP activities and TB, MDA, TP and ALB levels in rats 48 hours after intramuscular administration of CCl_4

GROUP	ALT (U/L)	AST (U/L)	ALP (U/L)	TB (µmol/L)	MDA (µM)	TP (g/L)	ALB (g/L)
I No CCl_4 administered	8.39 ± 0.48 [a]	21.06 ± 1.23 [b]	32.50 ± 2.13 [c]	4.86 ± 0.71 [d]	0.08 ± 0.01	59.99 ± 1.30	32.39 ± 1.84 [f]
II 120mg/Kg CCl_4 administered	36.00 ± 4.41 [a]	110.01 ± 4.39 [b]	68.17 ± 3.01 [c]	10.40 ± 1.12 [d]	0.52 ± 0.02	60.41 ± 2.47	34.87 ± 1.32 [f]

Values in the same column bearing similar superscript are significantly different at $p < 0.05$, $n = 5$

Table 2: Serum ALT, AST and ALP activities and TB, MDA, TP and ALB levels in rats after oral administration of white grub extract for 3 days.

GROUP	ALT (U/L)	AST (U/L)	ALP (U/L)	TB (µmol/L)	MDA (µM)	TP (g/L)	ALB (g/L)
I No CCl_4 administered	8.21 ± 0.53	2.16 ± 1.32	30.89 ± 2.25	4.85 ± 0.80	0.091 ± 0.012	57.36 ± 1.32	32.13 ± 1.44
II No white grub extract administered	30.45 ± 2.05 [a, b, c]	72.81 ± 5.17 [d, e, f]	66.18 ± 2.27 [g, h, i]	10.37 ± 0.90 [j, k, l]	0.37 ± 0.01 [m, n, o]	64.46 ± 0.07 [p, q, r]	33.24 ± 0.86 [s, t, u]
III 1.0g/Kg white grub extract administered	29.86 ± 1.06 [a]	70.56 ± 4.44 [d]	67.46 ± 0.49 [g]	11.46 ± 0.65 [j]	0.33 ± 0.01 [m]	56.62 ± 0.71 [p]	30.95 ± 0.29 [s]
IV 2.0g/Kg white grub extract administered	25.29 ± 1.54 [b]	52.21 ± 1.32 [e]	58.20 ± 1.24 [h]	9.71 ± 1.66 [k]	0.29 ± 0.01 [n]	63.97 ± 1.72 [q]	31.85 ± 1.82 [t]
V 4.0g/Kg white grub extract administered	21.57 ± 2.04 [c]	51.13 ± 0.85 [f]	63.79 ± 3.34 [i]	10.50 ± 0.98 [l]	0.26 ± 0.01 [o]	64.82 ± 1.55 [r]	32.21 ± 0.27 [u]

Values in the same column bearing similar superscript are significantly different at $p < 0.05$, n = 5

Table 3: Serum ALT, AST and ALP activities and TB, MDA, TP and ALB levels in rats after oral administration of white grub extract for 6 days.

GROUP	ALT (U/L)	AST (U/L)	ALP (U/L)	TB (µmol/L)	MDA (µM)	TP (g/L)	ALB (g/L)
I No CCl_4 administered	8.19 ± 0.48	2.06 ± 1.23	32.50 ± 2.13	4.96 ± 0.70	0.082 ± 0.011	58.36 ± 1.31	33.18 ± 1.54
II No white grub extract administered	28.08 ± 0.07 a, b, c	71.31 ± 2.12 d, e, f	63.51 ± 1.86 g, h, i	14.06 ± 1.73 j, k, l	0.28 ± 0.01 m, n, o	62.54 ± 1.44 p, q, r	30.91 ± 0.01 s, t, u
III 1.0g/Kg white grub extract administered	20.29 ± 1.90 [a]	56.16 ± 6.42 [d]	71.03± 0.76 [g]	13.01 ± 0.51 [j]	0.21 ± 0.01 [m]	63.86 ± 1.09 [p]	31.57 ± 0.23 [s]
IV 2.0g/Kg white grub extract administered	16.47 ± 1.81 [b]	31.28 ± 0.81 [e]	58.90± 2.01 [h]	9.01 ± 0.06 [k]	0.18 ± 0.01 [n]	65.13 ± 0.31 [q]	30.99 ± 0.39 [t]
V 4.0g/Kg white grub extract administered	15.28 ± 0.22 [c]	28.94 ± 0.57 [f]	66.81± 0.41 [i]	11.94 ± 0.46 [l]	0.09 ± 0.02 [o]	62.32 ± 0.75 [r]	30.08 ± 0.42 [u]

Values in the same column bearing similar superscript are significantly different at $p < 0.05$, n = 5

Table 4: Serum ALT, AST and ALP activities and TB, MDA, TP and ALB levels in rats after oral administration of white grub extract for 9 days

GROUP	ALT (U/L)	AST (U/L)	ALP (U/L)	TB (µmol/L)	MDA (µM)	TP (g/L)	ALB (g/L)
I No CCl_4 administered	8.16 ± 0.59	2.16 ± 1.33	32.60 ± 4.13	4.96 ± 0.90	0.082 ± 0.011	59.56 ± 1.42	34.18 ± 1.53
II No white grub extract administered	25.88 ± 1.59 a, b, c	62.04 ± 0.77 d, e, f	60.72± 0.56 g, h, i	10.26 ± 1.36 j, k, l	0.18 ± 0.03 m, n, o	58.66 ± 0.72 p, q, r	28.67 ± 0.67 s, t, u

III 1.0g/Kg white grub extract administered	18.87 ± 0.36 [a]	49.84 ± 1.56 [d]	61.72± 1.93 [g]	12.07 ± 0.07 [j]	0.09 ± 0.021 [m]	63.92 ± 0.97 [p]	31.91 ± 0.59 [s]
IV 2.0g/Kg white grub extract administered	14.76 ± 0.29 [b]	27.62 ± 0.48 [e]	60.95± 1.16 [h]	10.15 ± 1.04 [k]	0.08 ± 0.01 [n]	64.03 ± 0.31 [q]	32.41 ± 0.36 [t]
V 4.0g/Kg white grub extract administered	14.36 ± 1.74 [c]	25.94 ± 0.75 [f]	62.11± 1.36 [i]	11.09 ± 0.01 [l]	0.03 ± 0.02 [o]	60.05 ± 0.05 [r]	31.37 ± 0.41 [u]

Values in the same column bearing similar superscript are significantly different at $p < 0.05$, $n = 5$.

Discussion

Rats injected with 120 mg/kg CCl_4 had significantly higher ($p<0.05$) serum AST, ALT, ALP, TB MDA and ALB than the normal rats (Table1). It is therefore, indicating inducement of acute liver toxicity in the injected rats, it agrees with the report by Price and Stevens (2003) and work of Alhassan et al (2009b).

In phase I of this work (Table 2) rats treated with daily dose of 1g/kg, 2g/kg and 8g/kg aqueous white grubs extract for 3 days showed serum ALT, AST, MDA and ALB not significantly higher ($p>0.05$) than the control group. This is an indication of possible fibrosis, the initial repair mechanism of liver injury, as indicated by Burtis et al. (2001) that all cellular damage induces fibrosis as a healing response. However, the healing effect is more pronounced in groups that received daily doses of 8g/kg and 2g/kg for 3 days compared to group III rats which received a daily dose of 1g/kg; this may be possibly due to low serum bioavailability of the extract. It may be inferred that the extract facilitates the fibrosis.

In phase II (Table 3) rats in group V, IV and III, treated with different concentration of the white grubs' extract for six days had mean serum activities of ALT and AST and levels of TB and MDA significantly lower ($p<0.05$) than the control. This shows possible hepatocytes curative effect of the white grubs' extract on the damaged due to CCl_4, possibly by influencing fibrosis and collagen synthesis as indicated by Keith and Robert (2001) that the liver response to injury is hepatocytes regeneration and collagen formation. The observed hepatocurative effect of the white grubs' extract could be associated with proteins, fats, and mineral elements especially iron (Fe) and copper (Cu) (Alhassan et al., 2009a) and humic substances contents of white grubs (Alhassan, 2010).

From Table 4 (phase III), rats treated with daily doses of 1.0g/kg, 2.0g/kg and 8.0g/kg for nine days, had serum activity of ALT and AST and levels of MDA not significantly higher ($P<0.05$) than the control, and the improvement in the liver was more in group IV and V compared to group III.

The possible hepatocurative effects of white grubs extract could be attributed to the chemical composition of white grub. White grub (WG) is rich in fats, protein, some mineral elements (Alhassan et al., 2009a) and humic substances (fulvic and humic acids) (Alhassan, 2010). WG fats may contain phosphatidyl choline, vitamins A and E which are good natural antioxidants, which may role in hepatocurative effect of the grubs. The protein of white grub may contain some amino acids (glycine, lysine, proline and methionine) that favour collagen biosynthesis which is critical in healing response by the hepatocytes. Collagen consists of a dextrorotatory triple helix made up of three polypeptides (α-chains). The triplet Gly-X-Y is constantly repeated in the sequence of the triple-helical regions— i. e., every third amino acid in such sequences is a glycine. Proline (Pro) is frequently found in positions X or Y; the Y position is often occupied by 4-hydroxyproline (4Hyp), although 3-hydroxyproline (3Hyp) and 5-hydroxylysine (5Hyl) also occur. These

hydroxylated amino acids are characteristic components of collagen. The hydroxyproline residues stabilize the triple helix by forming hydrogen bonds between the α-chains, while the hydroxyl groups of hydroxylysine are partly glycosylated with a disaccharide (–Glc–Gal) (Koolman and Roehm. 2005). Choline dihydrogen citrate and DL- methionine are used in pharmaceutical preparation indicated for hepatitis, alcoholic hepatitis and drug induced hepatotoxicity. The presence of Fe and Cu also have roles in hepatic healing being required by lysine and proline hydroxylase respectively, the activities of these enzymes are required for maturation of collagen.

Humic acids seem to accelerate cell metabolism, the rate of breakdown of glucose, leucine and uridine. Humic acids seem to retard the rate of incorporation of these organic molecules into the liver, but once they are absorbed, humic acids appear to accelerate their metabolism (Visser, 1973), thereby reducing metabolic burden on the hepatocytes. That may encourage healing of the injured hepatocytes as it has been part of management of hepatitis to reduce fatty and protein rich diet. Humic acids can apparently stimulate respiration and increase the efficiency of oxidative phosphorylation in rat liver mitochondria (Visser, 1987). Cellular respiration, occurring only in the presence of oxygen, results in the breakdown of nutrient molecules to generate ATP. Cells such as the liver and muscle use this ATP for energy to fuel various processes like stimulating the uptake of nutrients, repair of dead of damage tissue (Nelson and Cox 2006)). This may be due to their acidic functional groups, primarily carboxylic acid and phenolic hydroxyl groups, which give them the capacity to react with various species such as free radicals, minerals and biological enzyme systems (Frimmel and Christman, 1988; Aiken et al., 1985; Shils and Shike, 1994). Both non-enzymatic and enzymatic antioxidants serve as defense to cope with oxygen-free radicals. The former includes a wide variety of such compounds as alfa-tocopherol (vitamin E), betacarotene, and ascorbic acid (vitamin C), whereas the latter includes the scavenging enzymes; superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GSH-Px). They form an important defense system to ensure that cytotoxic oxygen species are degraded to less harmful compounds so that extensive cell damage does not occur (De La Torre et al., 1999). White grubs being rich in fats and proteins, may contain some of these antioxidants and its hepatocurative effects may be via some of them.

Conclusion

The study has shown that white grubs extract has hepato curative effect even at the dose of 1.0 g/Kg body weight in six days of administration. This may be attributed to chemical composition of white grubs, especially the high fats, protein (rich in proline and lysine), humic acids, fulvic acids, and Fe and Cu contents. The presence of proline and lysine that are very important components of collagen may have played significant role. The contents of humic and fulvic acid may also have roles in the hepato curative effects of white grubs extract, because of their antioxidant property, metabolic roles, decreasing loads on hepatocytes.

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Putting Customer in Charge of Design: Opportunities and Challenges

Risdi yono

Department of Mechanical Engineering, Islamic University of Indonesia, Yogyakarta, Indonesia
risdiyono@uii.ac.id

Abstract: Involving customer in value creation to fulfill individual requirements has been popular for several years under the domain of mass customization and personalization. Not all manufacturers adopted the concept succeeded in its execution process. It is possibly because the value generated by manufacturer does not meet the value demanded by customers. Discussed in this paper is the identification of several important additional values that can be generated by incorporating customers in product creation in order to help designers to have better understanding on current trend of personalization. New roles of the designers due to paradigm shift about customers from one market to market of one are also discussed to get some idea about future directions.

Key words: design by customer, value creation, customer involvement, personalization.

Introduction

Customer satisfaction has been identified as the most important factor determines the long-term success of a company. It can be achieved when customers perceive that the value of products and/or services they received is as (or exceed) what they expected. In order to create a premium value for customers, manufacturers should focus on the total customer experience, related to (1) superior solution to the need, (2) fair price, (3) treatment with respect, (4) emotional connection and (5) convenience (Berry, 2002).

While the last three deal with the quality of services (customer experience in transaction processes), the first two are more related to the quality of product (customer experience in using the product). Focus on superior solution to the customer need may sound simple but in fact it is very complicated. Manufacturer must understand what people need and how to fulfill the need better than competitors. A key challenge will be how to ensure that the need manufacturer perceived is the real need customers demanded because it will differentiate between a successful product and a fail one. It is important to note that understanding customer need is not a trivial task especially in this era of personalization where the extent of market-of-one has been foreseen as a prospective driving force for the next transformation of global economy (Pine, 2009).

The difficulty in understanding customer need is due to the large range of individual, cultural and physical difference among people. In the past, when competition is still low, the concept of "voice of majority" could be successfully adopted to define product specifications in order to fulfill mass market need. Later on, in order to face the increased competition due to technology advancement, the concept of "market segmentation" was adopted. The manufacturer must know the audience for whom the product is intended. A mobile phone manufacturer, for example, might produce many models and series for different target (segment) to acquire wider market share. Manufacturers tried to use technology to generate variety in products and to manage the way the products evolve. The concept of platforms, family, generation, add-on, version, models, option, etc. have been well recognized and in turn, these are becoming the bases of mass customization.

Under the system of mass customization, the market is re-segmented further into smaller group of customers with similar preference (market niches). Hence, in product development process, not only "voice of majority" but also "voice of minority" is taken into account. Product variety is not predefined by final product in terms of model, version and series, but instead it is handed over to customer preference. Customers can involve themselves to specify their own variety by choosing predefined components and assembly them to get the final configuration.

Furthermore, in this inevitably high competitive environment, where companies are trying to focus more on customer satisfaction to win in the market place, treating customer as a personal (so-called personalization) is

becoming a trend. Its adoption in service industry faces less challenge than in manufacturing sector due to their different natures. While it is not difficult for a mobile phone services provider, for example, to offer personalized phone number (where customers can choose their own unique number) or to offer personalized ring tone, it will be a very hard task for a mobile phone manufacturer to personalize the phone itself. Mass production is still the best way in this regard.

Personalization means treating all customers individually based on each personal preference. For designers, it results in a very big challenge to define product specification since the well-established general procedure in product design and development could not be directly employed. This is because the customers as one market have evolved gradually into segment market, niche market and finally into market of one (figure 1).

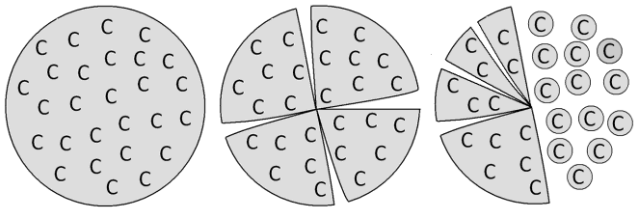

Figure 1. From one-market to market-of-one

It is important therefore to discuss how companies offer their customers a personalization experience and then to characterize some of its values which are considered significantly able to improve customer satisfaction. Those will be comprehensively discussed in this paper.

Putting Customer in Charge of Design

It is a nature that customers usually purchase products (goods or services) for a reason; they have a problem (a need) and expect manufacturer or service provider to come up with a solution (to fulfill their need). Their utmost satisfaction will be achieved when they get exactly what they want without compromising any requirement. As each customer may have her/his own preference, a rigid predictive-based product specification will be difficult to compete. As an alternative, a flexible responsive-based one should be adopted. Involving customers in value creation is believed as a way to achieve this purpose

Design

There is no generally-accepted definition of "design" exists (Ralph and Wand, 2009) and the term has different connotations in different fields. In this discussion, design refers to a process of establishing the basic parameters of a product. It comprises activity to initiate, to select, to combine, to arrange, to modify and to manipulate things in order to meet intended requirements. Sketching, where the lines (including straight line, arc, circle, curve, etc.) are selected, arranged and combined together with the colors, is an example of design form. In practice, the term design is often used by manufacturers engaged in mass customization, for example "design your own watch", "design your special shoes", "design your own shirt", etc. However, when customers come to utilize the offered option, they will know that the meaning of design here is "to mix and match" predefined available components to get final desired configuration. Hence the activity of selecting and combining things to make a new form in practice is also known as design activity.

Design and Value

Basically, customers spend their money not simply because of the product itself, but more likely because of the value within it. The value may come from many sources, including physical value and emotional value. While physical value is related to the experience of using the product and usually obtained from the quality of behavioral (functional and kinesthetic) or visceral design, emotional value is about the feeling of satisfaction resulting from emotion rather than realism when owning or displaying the product (Norman, 2004).

Depended upon customer's individual preference, the important level of the value may differ from one

customer to others. Some might place physical value higher so that they will be satisfied enough to own a good quality product from general brand, while others might put their interest on emotional value so that they prefer to spend more money to own the branded product even though the quality does not differ much.
Many companies are competing in the area of physical value as it is easy to evaluate. However, it is worthy to note that the successful product should excel in both values. Involving customers in value creation has potential to improve those values as it can result in better product fitness (physical value) as well as in emotional bond between the product and the customer (emotional value).

Customer in Design

There is a paradigm shift of customer's role in design; from passive audience in the era of mass production (Design for Customer) into active player in current age of mass customization and personalization (Design by Customer). The paradigm of "closed innovation" (in which the innovation is taking place just within the boundary of manufacturer) has shifted to "open innovation" (cooperation between manufacturer and customers or users). As a result, designers' task is shifted from designing a final product to designing a system that enables customer involvement in value creation. Customers are then placed as designers (or sometimes called as co-creators) of their own final product specifications by using design tool provided by manufacturer. Table 1 exhibits these fundamental changes. This trend should be anticipated by manufacturer in order for them to survive in the business competition.

Table 1. Fundamental changes in product design

	Design for Customer	Design by Customer
○ Source of design	voice of majority	voice of niches or individual customers
○ Customer's role	as object (passive)	as subject or co-creator (active)
○ Product development task	to design a final product	to design a system that enables customer involvement
○ Supply for demand	anticipative (forecast-based demand)	responsive (real demand)
○ Type of innovation	closed innovation	open innovation
○ Assessment	focus on quality and low cost	focus on quality and personal emotion
○ Value creation	manufacturer oriented	customer oriented

Point Of Customer Involvement

Putting customer in charge of design does not mean that customers are given free hand to design in a blank space. Instead, they are guided to define the fittest alternative that meet the cost, schedule and the product requirements through the capabilities of a company. Depended mainly on the type of product, the point where customer can involve in production chain may vary, from simple involvement of skinning personalization to total design by customer (figure 2).

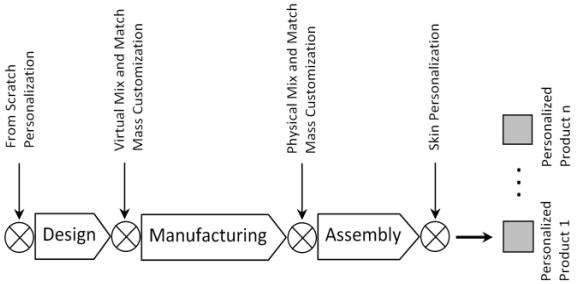

Figure 2. Points of customer involvement

Skin Personalization

This type of personalization is the simplest one in term of manufacturing complexity. In this system, the general product has been manufactured while the differentiation is postponed by letting customer to personalize final skin of product (skinning process). In other word, customers are allowed to design "the skin" of a predefined standard product to add emotional value on it. The offered personalization is usually in terms of selecting color, adding self-elected name, word, number or picture.

Skinning personalization can be considered as a successful example of current implementation of customer involvement in value creation. It improves product uniqueness and creates emotional value of self expression without significantly increases production cost and time. Mugs, tissue box, t-shirt, hat, jacket, shoes, paper folder, photo frame, etc. are examples of its products while printing, embroidering and engraving are the technologies typically used for this application. In addition, the advancement of internet technology makes the process becoming easy and efficient. Figure 3 shows an example of personalized mug designed by using online design tool provided by www.yourdesign.co.uk. Customers are guided to personalize the product by selecting one of predefined standard mugs and then to add picture and text either on the front, back or full wrap.

Personalized packaging which is adopted by many food and beverage industries is also in this category. Customers, for example, are now able to have personalized label on a wine bottle or on a cereal package based on their design. The product is then becoming unique and personal, even though the contents do not differ from others. Customers are willing to pay additional cost for the emotional feeling resulted from this personalization experience.

Figure 3. Skin personalization example

Mix and Match Mass Customization

Mass customization aims to provide products or services that serve individual customers' personal needs with near mass production efficiency (Pine, 1993; Tseng and Jiao, 1996). The popular one is by configuration design where a wide variety of components are provided and customers are allowed to mix and match different components to configure final product according to their preference.

Based on the state of its components, mass customization can be categorized into two types; physical and virtual, which both can be done by using online or offline system. Physical mix and match happens when all components have been pre-designed and physically pre-produced to provide fast response. No inventory for final product but for components is needed as assembly process is postponed until customers complete their selection. However, since the components are made according to forecast demands, this method is very risky as not all components will be selected by customers. Hence, setting its optimum solution space will determine the success of the company. The example of this customization can be found easily in personal computer industry, automobiles, food, etc. Figure 4 shows the implementation of this concept by Harley Davidson Company using its H-D1 Bike Builder application.

On the other hand, virtual mix and match happens when manufacturer only provide virtual components for customers to select and the physical ones will be made after the order is confirmed. This replaces the limited physical inventory by unlimited virtual inventory which will significantly reduce the cost. As a consequence, the response time will be longer due to its made-by-order system. In customized clothing industry, for example, customers are allowed to select the style (collar, cuff, pocket, placket, button, etc) change the fabric (material, color, and motif), to personalize brand, and to adjust the size. When customers have finished the customization process,

manufacturer will start to cut raw material and then stitch the shirt accordingly. Hence, there is no risk of overstock finished product but managing the response time will be the most challenging task in this system. The other examples can also be found in jewelry industry, furniture, cake decoration, etc.

Figure 4. H-D1 Bike Builder by Harley Davidson

From Scratch Personalization

This type of personalization places the point of customer involvement in the most upstream of the value chain in which customers will have full control to define their product specification at earlier stages. Based on its characteristic, the adoption of this concept in real business is mainly for products that by their nature are individually crafted under made-to-order system. The advancement of internet and manufacturing technology are becoming enabler to make the interaction between customers and manufacturer easier and to produce the products much faster. EGO3D, for example, allows customers to upload their designs in the form of photograph to make personalized bust (sculpture in 3D) or in the forms of CAD model or graphic designs for personalized vases, cups, picture frames, bookends, money boxes, pen stand, 3D medallion, etc. Additive layer manufacturing is employed to create the physical products in which artificial stone is used as raw material. To improve the quality, a hardener liquid is utilized to imbue the products so that they become later hard as chinaware but not as fragile. Figure 5 shows the example of a photograph-based personalized bust from EGO3D. Personalized ceramic mosaic decoration is also categorized in this group.

Figure 5. Example of a photograph-based personalized bust from EGO3D

Discussion 1 : Gaining Value by Customer Involvement

A study by Hippel showed that for mass produced products, about 10-40 percent of the customers engage in modifying their products to meet their specific requirements after purchasing (Hippel, 2005). This group of customers is willing to pay additional cost and to wait for a while to get their product modified (Blecker and Abdelkafi, 2006). Hence, it can be seen as good opportunity for manufacturer to offer before-purchase modification by involving customers in production stage.

In order to adopt the concept of customer involvement in specifying their own personalized product, it is important for manufacturers to analyze the significant of additional values that will be generated. The higher the value gained the higher the possibility to success will be. Based on a comprehensive observation on successful story of customer involvement in value creation, there are several additional values that customers look for, including: (1) better product fitness, (2) feeling of accomplishment, (3) uniqueness, (4) self expression of personal identity, and (5) source of memory. The first is related to physical value, while the rest are all related to the emotional value.

Value of better product fitness

As aforementioned, the concept of one-size-fits-all in mass production is difficult to fulfill the need of all customers. Customers only have "take it all or leave it" option. Modification after purchase is commonly adopted by customer when they could not get the product that fit to their requirements. Therefore, the first value that customer will gain when they are involved in production stage is the better product fitness. Personalized sizing for clothing, ring, shoes, hats, furniture, apartment, etc and personalized dietary food and beverage are example of this value creation. Coke Freestyle from Coca-cola, for example, offers personalized service where customers are freely design their own coke by using a zesty touch-screen system to mix selections from over 100 choices into a custom beverage to meet their individual requirement.

Value of feeling of accomplishment

Consider the booming of electronic kits in the early of 1980s, where built your own radio, your own audio system, your own tape recorder, and your own television set were becoming a trend. People constructed the kits and they felt immense pride in their accomplishment as well as a common bond with other kits builders. The experience of building kits is a personal feat; the less skilled the kit builder, the more the special feeling. The experts did not feel pride in their kits; it was those who have no expertise felt so satisfied. It is important to note that the kits were not much cheaper than the finished one. People bought the kits for the feeling of accomplishment, not to save money. The similar case can be found in the current cook-your-self restaurant, personalized cake decoration, built your own robot, etc.

Value of uniqueness

Everyone, by nature is unique and psychologically has tendency to differ from others. According to a study by Risdiyono and Koomsap (2009), for several types of products, uniqueness plays a significant role in customer buying decision. Souvenir and gift were identified as common products demanded by customers to be unique. The aforesaid photograph-based personalized bust from EGO3D can be considered as a good example of personalized unique gift in this matter.

Value of self expression of personal identity

Rooke and Ouadi (2009) stated that the true luxury is when we are able to express ourselves as we like. Self expression is a need for most of people with different ways of fulfillment. The Wall Street Journal, for example, reported that the personalized license plates for automobile in the US is now becoming a trend and during this budget crunches, states are raising surcharges or proposing annual fee hikes for custom plates due to its potential market is indicated very huge. Based on the investigation, thing that drives people to take a personalized license plate is a self expression of personal identity. This value has been becoming a starting point to offer personalization for many other products, including personalized car's audio system, t-shirt, stickers, tattoos, etc.

Value of source of memory

Based on a study by Norman (2004), when people are asked about what the most valuable things they own, their answer will not always refer to the most expensive thing. Many refer to a simple thing but having emotional value of memory. Based on this value the product is then considered as "a token of remembrance". Self-experience in a process of making things can be a source of memory that boosts high value for customers.

Discussion 2: New Roles of Designers

Based on the previous discussion, it appears that there are big opportunities to create additional product value by involving customers in the creation process. However, there are also big challenges faced by manufacturer and designers interested in this area, including their new roles in:

1. Value added identification.
   Identifying what values of the products that demanded by customers will be the most crucial initial step to take. Inaccurate justification in this step will results in unwanted product failure. Type of products and customer preference should be characterized properly.
2. Value added generation.
   Designers should analyze whether the demanded value can be generated by involving customers in product creation. If yes, where the best position for the point of their involvement is should be.
3. System development and optimization.
   Developing products based on individual customer preference means developing a complicated system that does not only be able to respond to customer's personal need individually, but also has a stability to provide a dynamic flow of products. Value creation for personalization should be within a system that is able to stably deliver high variety of goods. Analyzing product attribute to define solution space is very crucial in the system optimization. Identifying factors to classify which parts customers are allowed or not allowed to involve in the creation is another important thing to handle.

As the roles of designers are becoming more complicated, a new comprehensive method in product design and development process is needed. It will be one of important challenges for the future work.

Conclusion

The opportunity and challenge to add value on products by putting customer in charge of design have been discussed in this paper. Putting customer in charge of design does not mean that customers are given free hand to design in a blank space. Instead, they are guided to define the fittest alternative that meet the cost, schedule and the product requirements through the capabilities of a company. This means the new roles of designers will be more complicated in the future competitive market. New method to develop personalization-based product and system is needed to help designers accomplishing their new task.

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Sakarya University Academic Evaluation and Quality Development Applications

Muzaffer ELMAS

Sakarya University, Engineering Faculty, Department of Civil Engineering, Serdivan-Sakarya
elmas@sakarya.edu.tr

Abstract: In this study, to explain Sakarya University academic evaluation and quality development applications is the main purpose. Within the framework of this objective The Chronology of Sakarya University Quality Steps and Awards, Sakarya University Academic Evaluation and Quality Improvement Committee, Sakarya University Strategic Management, Sakarya University Business Process Management, Sakarya University Enterprise Risk Management are expressed.

Keywords: Quality, Strategic Management, Process Management, Enterprise Risk Management

Introduction

Sakarya University has the purpose of the "Give your future direction" principle from its establishment. Sakarya University is always progressive for social, cultural and sporting activities addition to scientific progress. For this characteristic, with the web page studies started in 1996, the quality work and policy were being set up. Now Sakarya University has TS-EN-ISO 9001:2000 certificate of quality in all administrative units.

SAU, inspired by EFQM Excellence Model, received "3 and 4 Star Competence in Excellence" award rewarded by KALDER in 2006 and 2008, respectively. All administrative units of SAU hold "ISO 9001-2000 Quality Management System Certificate". National Quality Award in Educational Services Category was given to SAU in 2010. Bachelor's Degree Programmes in Faculty of Engineering holds EUR-ACE (European Accreditation of Engineering Programmes) Label. SAU uses ECTS as a credit transfer system especially for the Student's Mobility Programmes.

Diploma Supplement, which includes courses and their ECTS credits, is being issued in English, and it is given automatically and free of charge to every student of SAU upon graduation since 2004. Prestigious awards of "Diploma Supplement Label" and "ECTS Label" were given to SAU by the European Commission in 2009 and 2010, respectively.

Within the framework of this development, Sakarya University created its quality policy. The main quality policy items are below:

- Increase motivation and raise performance in management by participatory and collaborative management approach,
- Provide faster service to staff and students by using IT technology, Perform the desired goals during the process with an effective and efficient use of time,
- Raise in fulfilment of the beneficiaries by measuring their satisfaction, Maintain the quality, comply with the terms of service and continue to improve in activities and services and be a leader in quality following the Quality Management System.

In this innovation of Sakarya University, the terms of quality, strategic management, process management, enterprise risk management come forward. Quality is defined differently for different purpose. According to Chowdhury(), quality is a characteristic for combining people power and process power. In an another definition by American Society for Quality, quality is a subjective term which can have two meanings in technical usage. When quality is described as "The characteristics of a product or service that bear on its ability to satisfy stated or implied needs" in one of the definition, another definition characterizes the quality is "A product or service free of deficiencies". Moreover quality is qualified as "value to some person" (Weinberg, 1991).

Institutions have different quality management techniques for provide quality. Strategic management, process management, enterprise risk management are some quality management techniques. In this study, these quality management techniques used by Sakarya University and development of this process is explained.

1. The Chronology of Sakarya University Quality Steps and Awards

Year	Quality Steps/Award
2001	At the level of General Secretary and Head Of Departments TS-EN-ISO 9002:1994 Quality Assurance Certificate
2003	Total Quality Management Works started from all academic and administrative units.
	At the level of General Secretary and Head Of Departments TS EN ISO 9001-2000 Quality Management System Certificate
2004	Institutional Self-Assessment and Strategic Plan studies; 2004,2005, 2007- 2011, 2009-2013
2005	Academic Evaluation and Quality Improvement in Higher Education (YÖDEK)'s works started.
2006	Extending the scope of the TS EN ISO 9001-2000 Quality Management System Certificate
	The cooperation with KALDER and participation to National Quality Movement
	Recognized for Excellence with 3*
2007	The integration of YÖDEK and Strategic Planning approach by reviewing the effectiveness
2008	Recognized for Excellence with 4*
2009	All administrative units TS EN ISO 9001-2008 Quality Management System Certificate
	Diploma Supplement (DS) Label
	SAÜ Foreign Languages Department 2009 European Language Label Award
	Association for Evaluation and Accreditation of Engineering Programs (MÜDEK) Accreditation Certificate
2010	EUR-ACE LABEL
	ECTS Label Excellence Award
	2010 EFQM National Excellence Award in Public Sector Organizations Education Category
2011	Awarded 3rd place in Informatics Service Award in the Category of Best Educational Web site

2. Sakarya University Academic Evaluation and Quality Improvement Committee

On March 2003 Sakarya University with all staff has decided to execute on a regular basis to Total Quality Management movement and for the conduct of these works Sakarya University Academic Evaluation and Quality Improvement Committee (SAUDEK) was established. To co-ordinate and carry out the work SAUDEK Executive Board was established and Quality Ambassadors were assigned to all faculties, colleges and vocational schools.

Nowadays within the SAUDEK Coordinatorship studies carried out under the following four commission;

1. Strategic Planning and Monitoring Commission,
2. Quality Improvement Committee,
3. Management Process Commission,
4. Survey Development and Evaluation Commission.

3. Sakarya University Strategic Management

Institutions, under various constraints in order to use resources efficiently in accordance with their objectives, need Strategic Management approach. Therefore, Strategic Management was the first application of the Total Quality Management works launched in March 2003. As an approach of Sakarya University Strategic Management Figure 1 is expressed as follows YÖDEK process.

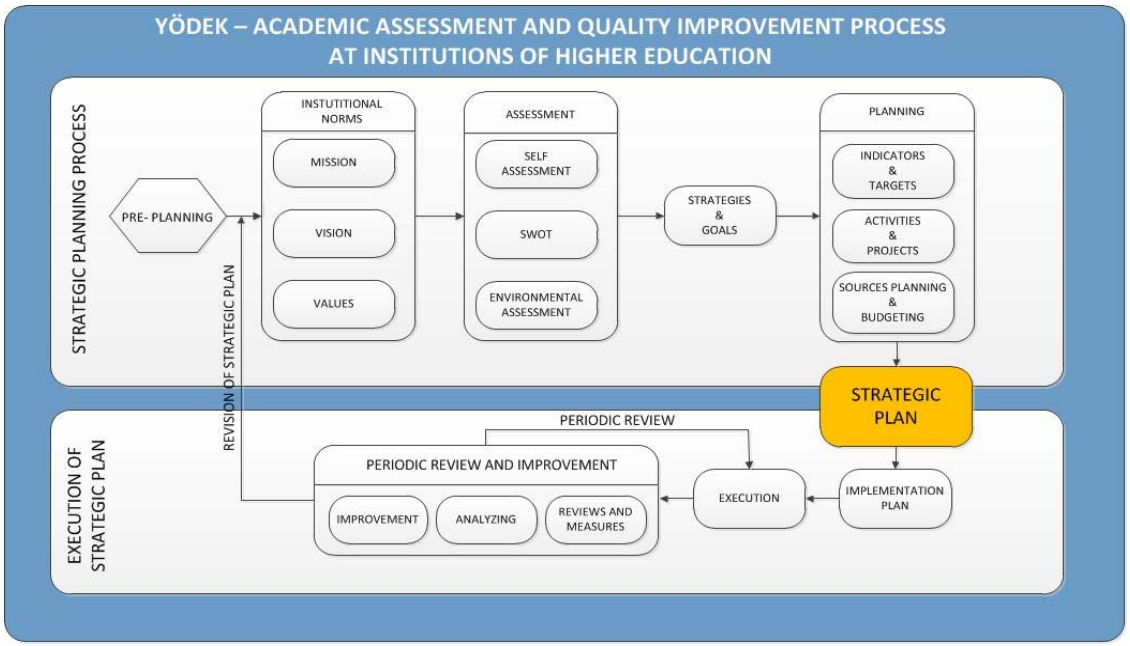

Figure 1. The Process of Academic Assessment and Quality Improvements at Institutions of Higher Education (YÖDEK, 2007)

This process firstly started by determining the organization's reason for being and the point of wants to reach, in order to get to this point which principles and policies organization will follow. For this purpose, Sakarya University's **Mission**, **Vision**, **Policies** and **Fundamental/Core Values** were determined with the participation of all employees. The **Mission** of Sakarya University is

"to create a participatory and a contemporary learning/teaching and academic environment equipped with aesthetic values which encourages lecturers to produce a universal knowledge and technology and to educate students to be competent professionals who respect social values."

The **Vision** of Sakarya University is to

- *be of the first rank in Turkey and the world in terms of the quality of the education offered and research activities conducted;*
- *have a participatory and a cooperative administrative board which encourage team work;*
- *try to solve the regional and national problems and play a leading role in the realization of collaboration of university, industry and community;*

- *extensively to carry out and provide service for the Internet based teaching at the associate degree, graduate and post graduate levels;*
- *create permanent, modern and unique works of arts while preserving the core of our traditional arts;*
- *respect national values, internalize the principles of Total Quality Management and improve its processes continuously.*

Core values of Sakarya University are

- to be committed to the principles of Ataturk,
- to obey universal laws and regulations,
- to believe in the universality of science,
- to encourage innovation and creativeness,
- to make no concessions to be honest and accurate,
- to pay importance to harmony and cooperation in the university,
- to strive to achieve excellence,
- to value the time,
- to do unique research,
- to love our job.

Sakarya University has set policies in the following areas;

1. Quality Policy,
2. Education and Research Policy,
3. Human Resources Policy,
4. Environmental Policy,
5. Promotion Policy,
6. Community Oriented Policy,

It is also within the scope of the Strategic Management university identified and prioritized stakeholders as follows;

- Students
- Private Sector Organizations
- Civil Society Organizations
- Graduates
- Academic and Administrative staff
- Council of Higher Education
- Interuniversity Council
- The national and international universities to be agreed
- National and International Universities
- Governor's office and other public institutions in the region
- National Official Institutions (DPT, Ministry of Finance, MEB, Development Agency, TÜBİTAK and so on)
- Member of the current domestic and international organizations
- National and International Other Education and Research Institutions

The next stage of self-assessment work to be done within the scope of Strategic Management was firstly built in Sakarya University in 2004 and is repeated every year. **Self-assessment** works, is repeated every year for the YÖDEK directory represented by Figure 2.

Figure 2. YÖDEK Self-Assessment Model.

Thus, with the approach applied in this Strategic Management targets are set and performance is monitored from Institutional Basis to individual (Figure 3).

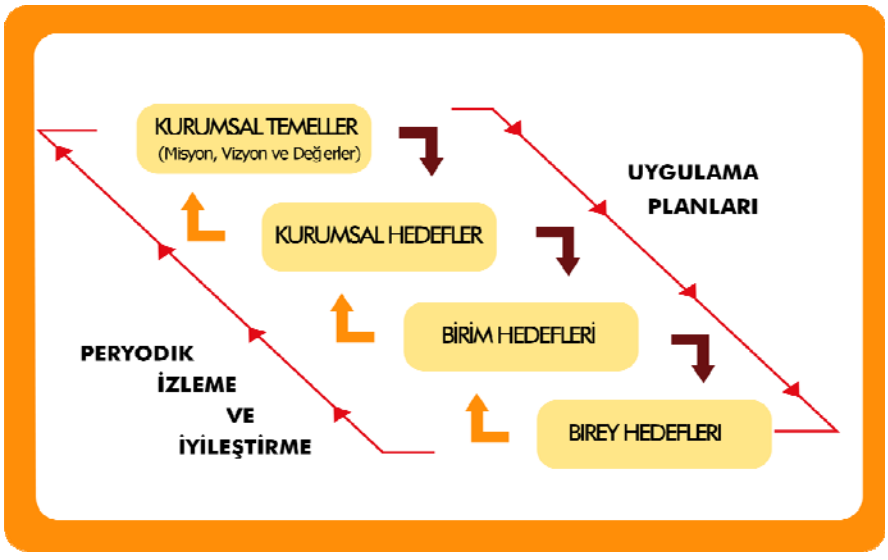

Figure 3. YÖDEK Strategic Planning Approach.

At the end of all these studies, Sakarya University, was prepared the first Strategic Plan in 2004. The latest Sakarya University's Strategic Plan, in accordance with the regulations and related guidance of YÖDEK published by the Council of Higher Education will be revised and has been published as 2007-2013 Strategic Plan. This strategic plan consists the university's 10 pieces strategy, , 61 pieces objectives and 107 sub-target for setting in order to realize these strategies. These targets are monitored by 180 pieces performance indicators. However, the scope of the strategic plan for achieving strategies there are 236 units planned activity.

At Sakarya University, in order to provide the spread and participation of the Strategic Management activities to units, in 2009 Strategic Management Information System (Figure 4) has been developed. Strategic Management Information System consists 10 main themes (Strategies, Objectives, Sub-Objectives and Performance Indicators, Activity-Projects) in accordance with the model of YÖDEK. Performance of the units and the university is monitored by Red Area Charts (Figure 5) produced by this system. By units, performances are evaluated with the performance reports to the Senate at the end of the year.

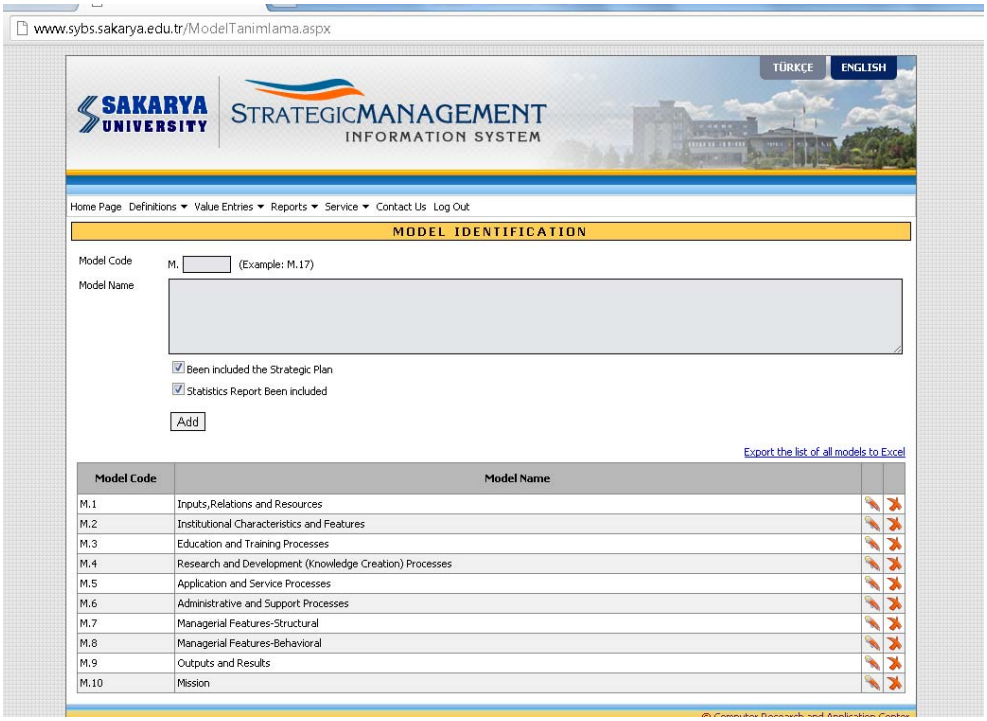

Figure 4. Sakarya University Strategic Management Information System.

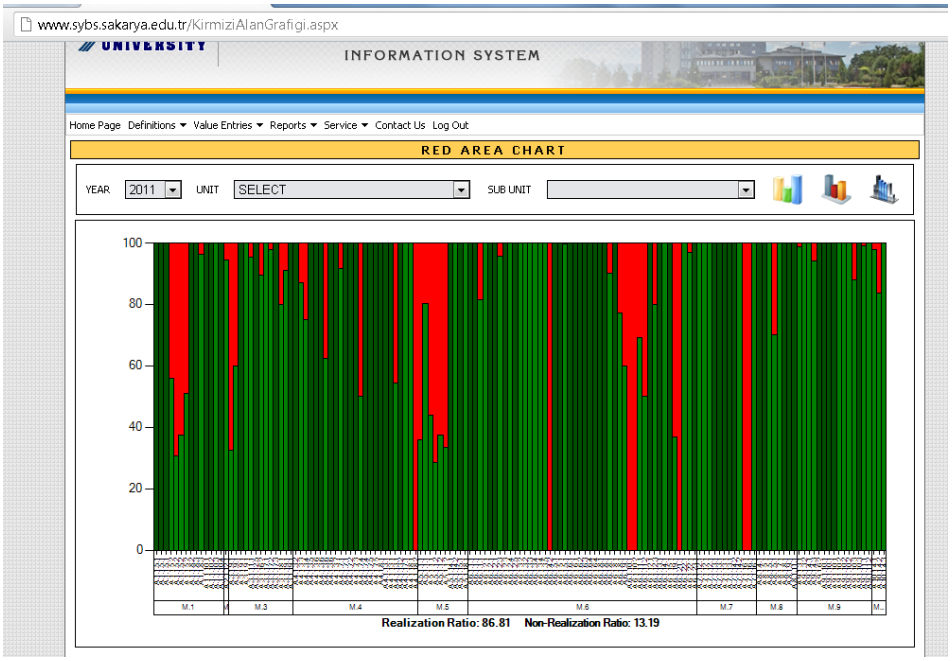

Figure 5. Red Area Chart.

In 2006, in collaboration with KALDER, Sakarya University, participating in the national quality movement, was passed to External Assessment according to the EFQM Excellence Model in 2006 and 2008 by KALDER. After these assessments respectively 3 * and 4 * were taken for Excellence. Self-assessment studies within the scope of the strategic management process are integrated with the results of EFQM External Assessment for 2006 and 2008 and the results of EFQM Self-Assessment for 2010. At the end of progress made with a view to Continuous Improvement, in 2010, Sakarya University has been awarded the National Quality Award in the category of public.

4. Sakarya University Business Process Management

In order to successfully implement the Strategic Management, Sakarya University Stratejik Yönetimi başarılı şekilde uygulayabilmek amacıyla adopted management approach with processes. For this purpose, all the processes described in 2004 and the first handbook of Process Management has published. Later in parallel with improvements in processes, includes university's 5 Main Process and 38 sub-process.

Sakarya University, 5 Main Process is;

- Education and Training,
- Research and Development,
- Applications and Services,
- Administrative and Support,
- Managerial.

In accordance with this approach, the principals also is designed on the basis of each major process units (Figure 6).

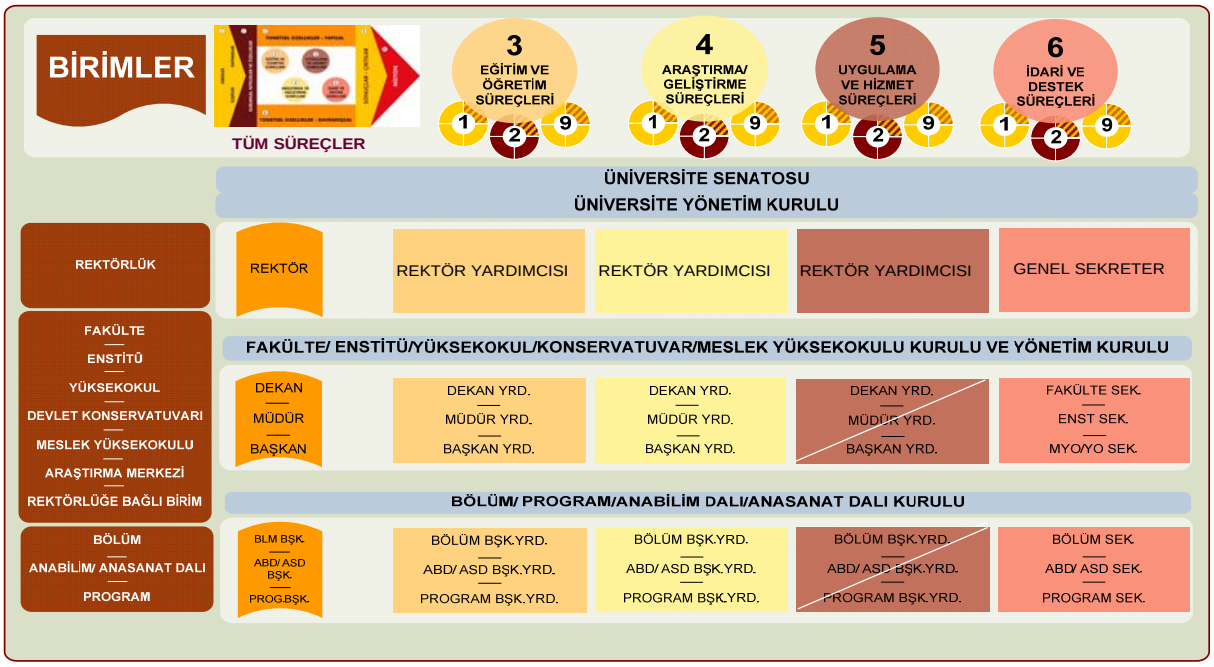

Figure 6. Sakarya University Management with Processes Approach.

All these processes at Sakarya University are measured and monitored in relation to the objectives in the strategic plan.

5. Sakarya University Enterprise Risk Management

Sakarya University implements Enterprise Risk Management in order to, to identify, analyze and manage risks, faced or may face in the future periods of the university's day to day activities, to prevent realizing its goals or to create opportunities in order to ensure to minimize the negative effects of risks. Enterprise Risk Management process is summarized in the figure below applies Sakarya University.

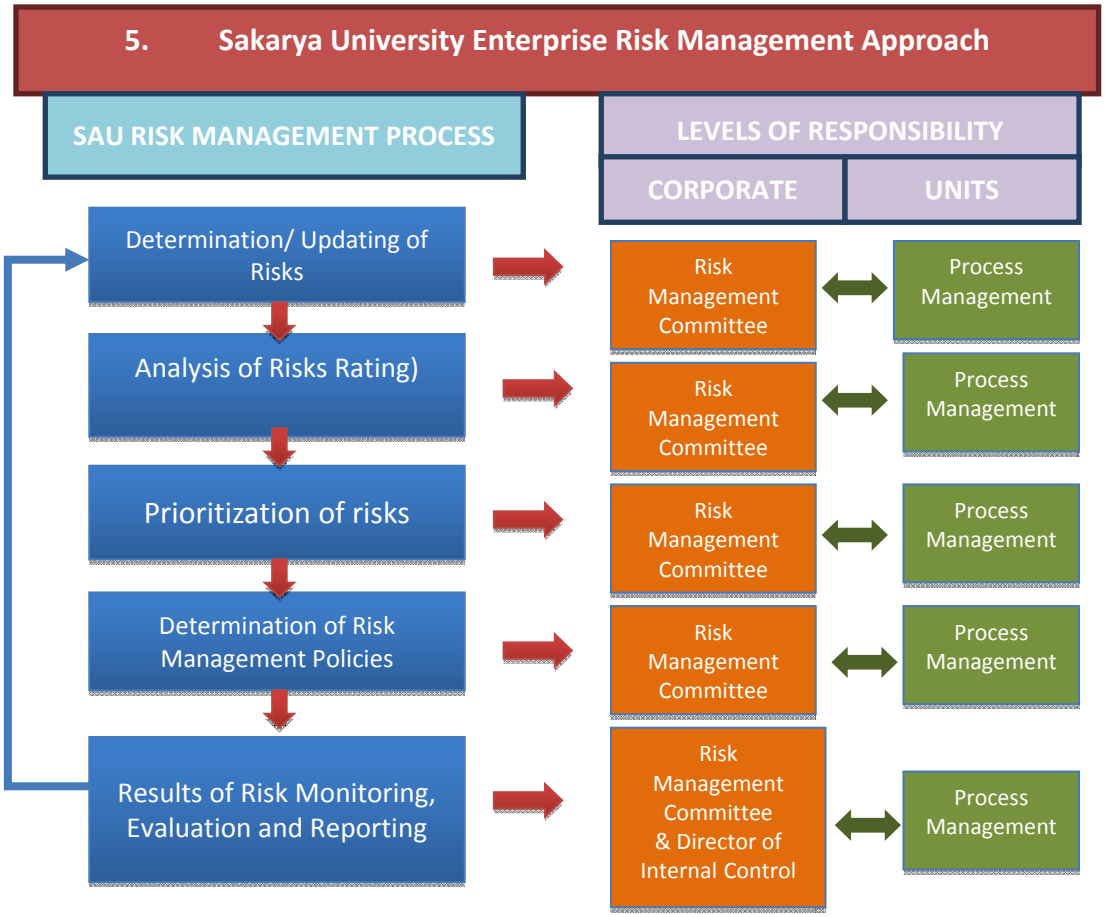

Figure 7. Sakarya University Enterprise Risk Management Approach.

Within the scope of Enterprise Risk Management, Sakarya University, identified the risks under the following main headings;

a. Corporate risks,
b. Risks related to education and to teaching,
c. Risks associated with research and development,
d. Risks associated with the application and the service,
e. Risks associated with administrative and support.

Conclusion

Quality is increasingly important term for institutions. Sakarya University has been aware of this since 1996 with the study of web page. Since that time, Sakarya University developed itself and founded quality management services and give quality awards. This study aims to give the information of this innovation, development and progress of process and revealed them.

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Study of Xanthane (KAX) Adsorption on Galena : Separation by Flotation

Zohir NEDJAR, Djamel BARKAT

Engineering laboratory of Chemical Molecular and Environnement.Sciences and Technology Faculty, Industrial Chemistry Department, Mohamed Khider University. Biskra 07000 Algeria.

zohirnedjar@gmail.com

Abstract: The adsorption of anionic collectors (xanthate) on the surface of galena was studied using diffuse reflectance FTIR (DRIFT) and scanning electron micrograph (SEM) techniques. The effect of sulphite interaction with galena on the mechanism of potassium amyl xanthate (KAX) adsorption onto galena surfaces has been studied in situ using electrochemical potential, FTIR spectra and SEM have been used to identify the mechanism of interaction between sulphite and galena surfaces.
Activated galena with copper sulfate (10^{-4}M) has been investigated at pH 9.5 and potassium amyl xanthate (3.10^{-2}M) concentration.
Potential (E_{opt} (PbS) = +55mV); Adsorbed colloidal (Pb-AX, 1109-1384Cm^{-1}) is found even at high xanthate concentration, colloidal lead oxide/hydroxide particles have been imaged after 10^{-4}M lead sulfate addition at pH 9.5.
The behaviour of this system is consistent with ion exchange between xanthate and hydroxide followed by oxidation to dixanthogen (X_2, 1276Cm^{-1}) and diffusion of this species across the surface.

Key words: Galena, Xanthate (KAX), Adsorption, SEM, FTIR.

Introduction

Separation of minerals from ores is a very important industrial process. The commonly applied separation method is flotation, which ensures the required relation between the hydrophobic and hydrophilic properties on the surface of the mineral particles.
Much of the research was focused on the action of hydrophobic xanthate type surfactants on sulphide minerals. Different possibilities have been suggested in literature to explain how xanthates can render hydrophobic the surface of minerals G.W. Poling *et al*. (1963), M.C. Fuerstenau *et al*. (1982), J. Leppinen *et al*. (1995), N.P Finkelstain *et al*. (1997), and E. Mielezarski *et al* (2003).
A distinct progress in identifying the structure of the surface products formed on the mineral surface after the sorption of the collector has been achieved with the aid of the spectroscopic methods, especially infrared (IR) spectroscopy correlated with scanning electron micrograph (SEM).Z. Nedjar *et al*. (2009).
The most commonly used thiol collectors are xanthates, which are alkali metal (e.g. Na^+,K^+) salts of mono alkyl esters of dithiocarbonic acid(e.g. Potassium amyl xanthate : $C_5H_{11}OCS_2K$). They are used as flotation agents in the recovery of metal sulphids (e.g. MeS: PbS galena). P.J. Harris *et al*. (1988).
The efficiency of xanthates as mineral collectors increases with the length of the carbon chain but results in a decrease in the selective flotation of minerals.
The activating effect of sodium sulphide is strongly time dependent. An increase in sulphidisation leads to an increase in the hydrophobicity of the mineral surface. Excess of copper sulfate acts as a depressant for oxidized lead and metal minerals because the adsorption of divalent sulphide ion on the surface of lead oxide minerals increases the negative charge which prevents the adsorption of collector. SEM and FTIR have been found to be useful techniques for elucidating the surface properties of solids, which may berelevant in applied aspects of mineral processing G.Ozbayoglu *et al* (1994).
In the present investigation, the adsorption behavior effects of various amounts of anionic collectors on pure galena surfaces was verified using diffuse reflectance FT-IR,SEM and electrochemical potential studies.

Experimental

Materials and reagents

The galena sample was obtained from the Cheabet Elhamra mine, Algeria. The elemental composition of galena, see [Table 1].

Table 1. Chemical analysis of galena from Cheabet Elhamra mine

Mineral	Chemical elements present (wt. %)			
	Pb	*S*	*Fe*	*Cu*
Galena	83.32	9.97	2.39	0.74

The galena sample was crushed and the selected grains ground in an agate mortar. The galena fraction of -208+108µm was used in adsorption tests. The final grinding product (- 208 +108µm) was used for the SEM microscopy examination. The pH was adjusted using HCl and NaOH. Potassium amyl xanthate (KAX) solution prepared by dissolving the chemical grade KAX collector in purified water. The purification of xanthate includes dissolving commercial grade xanthate in acetone and its crystallization. Copper sulfate was used to introduce copper ions during the conditioning time. Galena was activated by copper at pH basic).

Methods

Mineral suspensions of 3g galena 0.37 mm in size Z. Nedjar *et al* (1994). in 100 cm^3 of the solution were conditioned at the desired pH for 5 min after each reagent addition in the presence of various activators. 100 cm^3 of copper sulfate (10^{-4} M) were used in potassium amyl xanthate (KAX 3.10^{-2} M). It was conditioned in distilled water for 10 min at pH 9.5 and then electrophoretic mobility was measured. Electrochemical study was conducted using carbon matrix composite (CMC) electrode. Conditioned in copper solution at pH 9.5, pH was regulated with NaOH (10^{-1} M) and HCl (10^{-1}M).

The scanning electron micrograph (SEM) type JSM-6390 is a high-performance device with a resolution of 3.0 nm. The customized GUI interface allows the instrument to be intuitively operated, and Smile Shot™ software ensures optimum operation settings. The JSM-6390 specimen chamber can accommodate a specimen of up to 152 mm in diameter. Standard automated features include auto focus/auto stigmator, autogun (saturation, bias and alignment), and automatic contrast and brightness.

FT-IR measurements were recorded on a SHIMADZU 8400S FTIR spectrometer in the region of 400-4000 Cm^{-1} supplied with OMNIC software. The tablets were prepared by grinding 2mg of the solid sample with 50 mg of KBr. Before every analysis, the background was collected and subtracted from the spectrum of the sample. Two hundred scans at a resolution of 4 Cm^{-1} were recorded for each sample.

Results and discussion

Studies of activation of galena by copper

Rest Potential Measurement

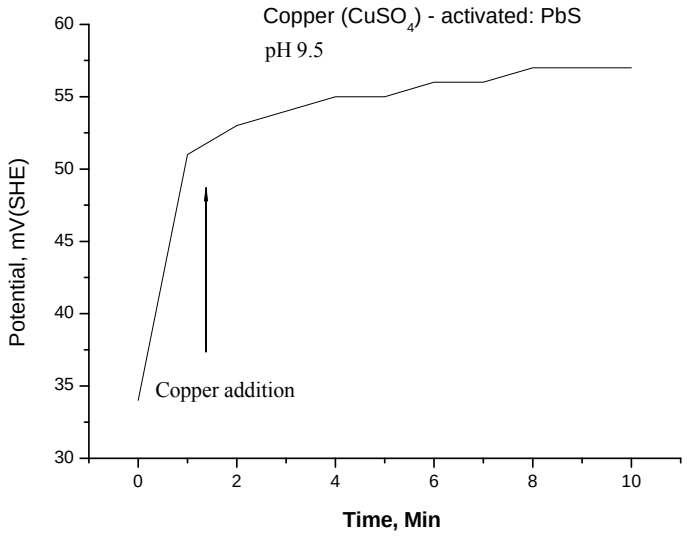


Fig. 1. Rest potential measurement of galena in a 10^{-4} M $CuSO_4$ solution at pH 9.5

Figure 1 show the rest potential measurements of the galena in a 10^{-4} M $CuSO_4$ solution at pH 9.5 as a function of the activating time. It can be seen that the rest potential of the galena increases sharply upon the addition the copper solution, indicating that a new phase (copper (II) sulfide) is formed on the surface of galena. The potential reaches a plateau value of +55 mV; see [Figure 1], after approximately 10 minutes. The new phase (activation product) is probably CuS.

The initial positive potential can be attributed to the adsorption of $Cu(OH)^+$ on PbS surface. Some of $Cu(OH)^+$ is transferred into CuS via reaction:

$$PbS + Cu(OH)^+ \rightarrow CuS + Pb(OH)^+ \quad (1)$$

Xanthate adsorption on copper-activated galena

The interaction between collectors and surfaces plays an important role in understanding of interaction mechanisms of different reagents with the mineral surface. It is now widely accepted that there are two separate mechanisms by which collectors adsorb on the sulfide minerals. Firstly, there is the chemisorption mechanism were the adsorbed xanthate molecule forms chemical bond with metal atoms (Pb) at the sulfide (PbS) surface. The other mechanism is electrochemical and involves electrochemical oxidation of the adsorbed collector molecules to give oxidation product species, which renders the galena surface hydrophobic J.D. Miller *et al* (1999). Results of galena surface oxidation to form hydrophobic and hydrophilic species depends strongly on potential. The rest potential measurement of galena activated with $CuSO_4 10^{-4}$M in 3.10^{-2}M KAX at pH 9.5 are shown in Fig.2.

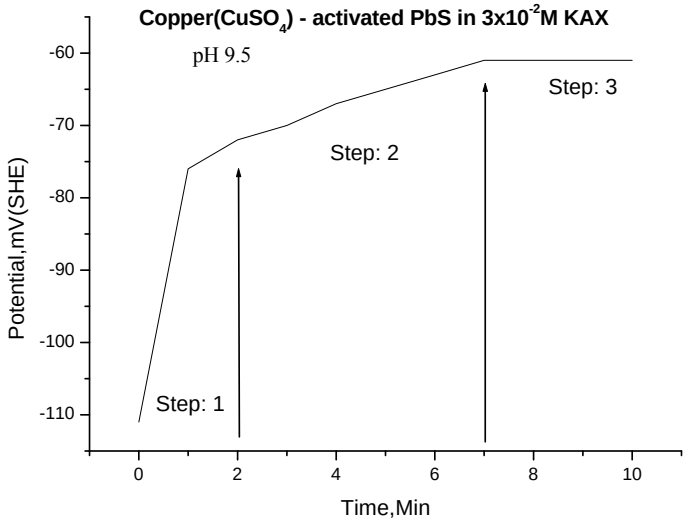


Fig. 2. Rest potential measurement of the galena activated with $CuSO_4$ 10^{-4}M in $3\cdot10^{-2}$ M KAX solution at pH 9.5

The rest potential measurement changes from: -111 mV to -61mV see [Figure 2].

As is known the solubility of Pb-AX (K_s = $1.20\cdot10^{-11}$) is considerably higher than that of $Pb(OH)_2$ (K_s = $1.35\cdot10^{-19}$) and therefore xanthate (KAX) is not adsorbed on sphalerite S.L. Chryssoulis *et al* (1994). Therefore, copper activation is essential for flotation of galena. As is shown in Fig 2 galena can easily be activated with copper ions at pH 9.5. Addition of $3\cdot10^{-2}$ M KAX resulted in formation of strongly hydrophobic CuAX, and very high adsorption R. Woods *et al* (1976).

The mechanism is:

(step1: 0 -2min) $X^- \rightarrow X_{ads} + e^-$ (2)

(step2: 2 -7min) $PbS + 2X^- \rightarrow PbX_2 + S^o + 2e^-$ (3)

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ (4)

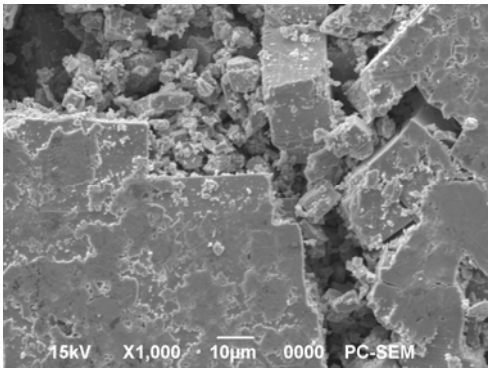
(step3: 7 -10min) $2X^- \rightarrow X_2 + 2e^-$ (5)

The expectation is that any of these species (X_{ads}, PbX_2, S^o, X_2) constitutes entities contributing to the hydrophobicity of the surface.

Studies of xanthate (KAX) adsorption on copper activated galena using FTIR technique and SEM: Characterization of pure galena and xanthate (KAX) using FTIR technique and SEM

Several surface sensitive techniques, capable of analyzing the first few atomic layers of the mineral surface, have been used for more than ten years in a variety of studies related to the mechanisms of oxidation and adsorption in sulfide mineral flotation. The significance of these techniques is that they provide not only a compositional analysis of the surface but also information on chemical states (oxidation, bonding) and spatial distribution of adsorbed species on individual particles and complex mixtures of minerals as a function of depth through the surface layers Amira *et al* (1992).

- **Characterization of galena by SEM:**



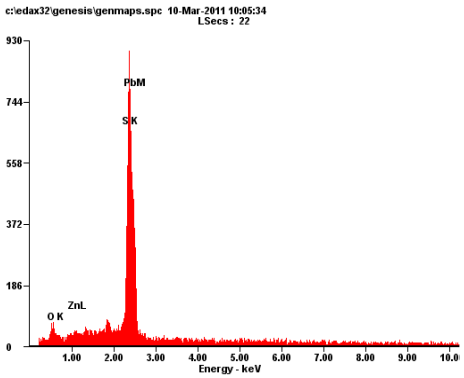


Fig.3. Field emission scanning electron micrograph of ground galena surface.

The characteristics and operating condition of the SEM technique have been fully described in other publications. It is well established that all metal sulfide minerals exhibit oxide and hydroxide species on their surface after exposure to air or aqueous solution. They have been observed in studies of galena. The surface oxidation of galena has been less systematically studied than those of other sulfide minerals but the pattern of reaction appears to be similar. It has been suggested that galena oxidizes considerably more slowly than the other sulfide minerals under these conditions. Further studies of PbS oxidation using SEM are still required. The physical nature of the oxidized layer formed initially on these surfaces can be seen in see [Figure 3], where a galena sample, ground initially in distilled water and allowed to condition for 10 minutes, was reground at that time and examined immediately using high resolution field emission SEM without coating at 15 KV.

Characterization of galena by RX

This method is used to identify the nature and structure of the crystallized products.
See [Figure 4]. There is the diameter d_1=3.31 and d_2=4.23; the angle $(°2\theta)_1$=26.94 and $(°2\theta)_2$=20.94.

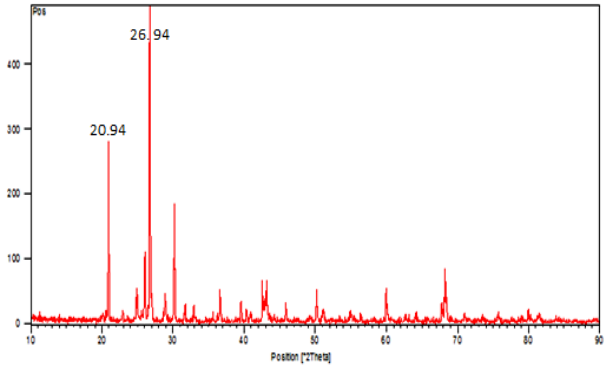


Fig.4. RX spectra of galena

Characterization of galena by FTIR

FTIR spectroscopic studies were carried out on galena samples both before and after adsorption.
The assignments of the various bands and peaks made in this study are in reasonable agreement with those reported in the literature for similar functional groups.
The FTIR spectra see [Figure 5]. A show the characteristic bands of galena in 669.058-842.885Cm^{-1} and 1616.06-1637.27 Cm^{-1}corresponding to the carbonate CO_3^{2-} ion group are found to be active.
The strong bands related to the presence of bound water (-OH) stretching is around 3552.24Cm^{-1}.

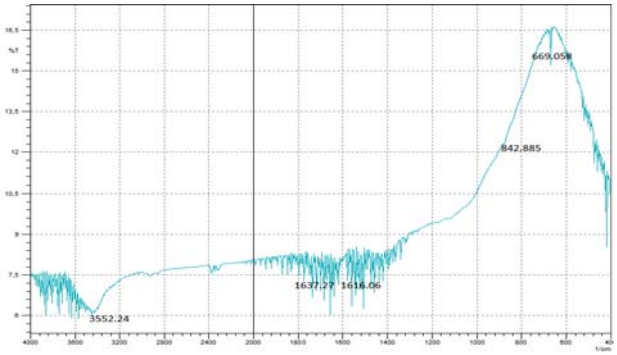


Fig.5. IR spectra of galena

Characterization of potassium amyl xanthate (KAX) by FTIR:

The FTIR spectra of potassium amyl xanthate (KAX), see [Figure 6], the absorption band at 1080 $Cm^{-1}$is related to (C=S) bands and two bands at 1457 and 1638 Cm^{-1} is assigned to the bending vibration of (O-CS), the band at 2950 Cm^{-1} which are characteristic of the hydrocarbon chain, the band at 3450 Cm^{-1} is characteristic of (O-H) stretching S.L. Chryssoulis *et al* (1994).

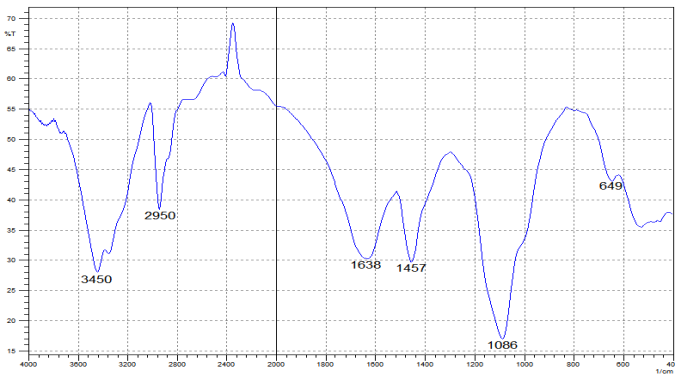


Fig.6. IR spectra of KAX

Characterization of potassium amyl xanthate (KAX) by SEM:

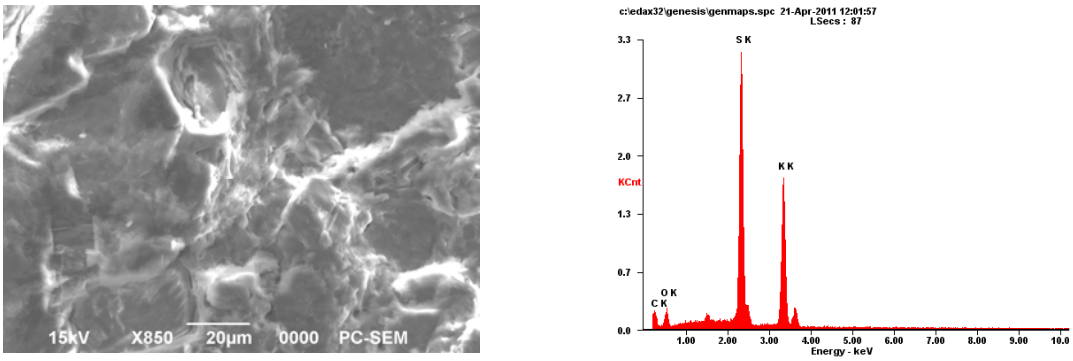


Fig.7. Field emission scanning electron micrograph of ground xanthate KAX surface

The characteristics and operating condition of the SEM technique have been fully described in other publications. It is well established that all xanthate KAX exhibit oxide and hydroxide species on their surface after exposure to air or aqueous solution. They have been observed in studies of xanthate (KAX) see [Figure7].

Improving of xanthate adsorption on galena

On copper-activated galena surfaces C.A Prestidje *et al* (1994), at low copper (II) additions and high affinity adsorption behavior, copper (I) amyl xanthate is the predominant surface species. The rate and extent of amyl xanthate adsorption are, however, decreased by extended conditioning periods apparently due to penetration of copper ions into the plomb sulfide lattice confirmed by SEM. Time dependence of $3 \cdot 10^{-2}$ M KAX adsorption is then related to the subsequent back diffusion to the galena aqueous solution interface. At high copper sulfate (10^{-4} M) addition at pH 9.5, both dixanthogen and copper (I) amyl xanthate are detected on the galena surface.

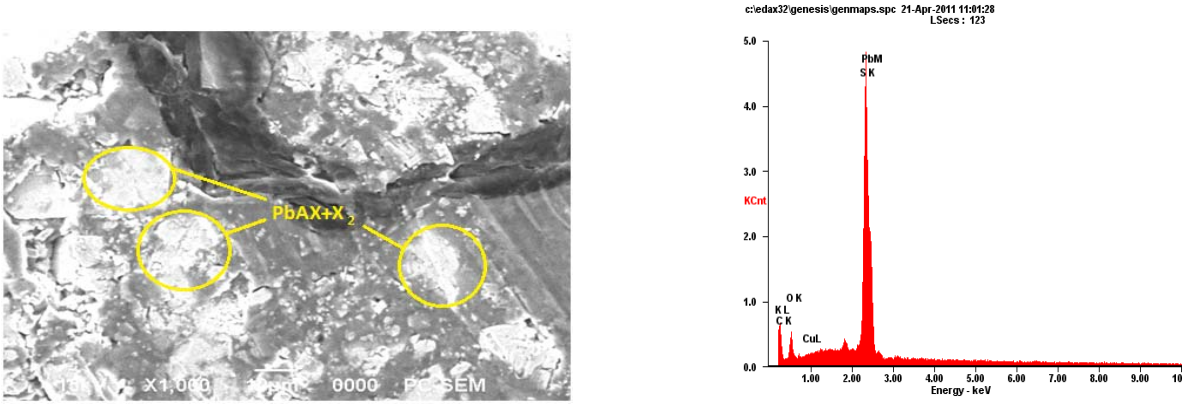


Fig.8. Field emission scanning electron micrograph of ground galena surface activated by copper sulfate 10^{-4} M treated with KAX $3 \cdot 10^{-2}$M at pH 9.5 conditioned in water for 10 min

Table 2. Chemical analysis of galena activated by copper sulfate 10^{-4} M treated with KAX $3{\cdot}10^{-2}$M at pH 9.5 conditioned in water for 10 min. (At: Atomic Percent, Wt: Weight Percent)

Elements	*C*	*O*	*Cu*	*S*	*Pb*
Wt. %	00.00	04.37	00.21	19.51	75.91
At %	00.00	21.82	00.27	48.63	29.28

Figure 8 display SEM of typical galena particle surface after pH 9.5 oxidation for 10 min in the presence of $3{\cdot}10^{-2}$M KAX. There appears to be evidence of the colloidal precipitates observed before copper sulfate and copper nitrate is present. The surface compositional information , see [Table 2]. (wt. Cu: 00.21 %).

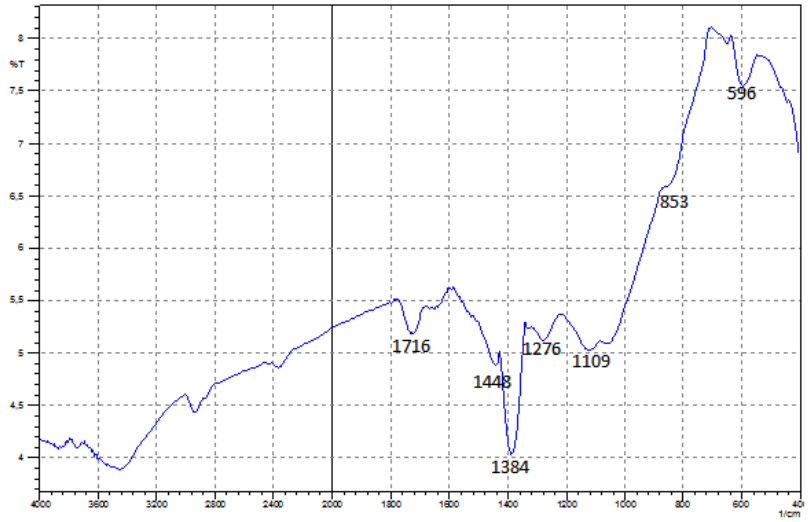


Fig.9. IR spectra of galena activated by copper sulfate 10^{-4} M treated with KAX $3{\cdot}10^{-2}$M at pH 9.5 conditioned in water for 10 min.

The infrared bands observed see [Figure 9], at 1109Cm^{-1} are characteristic of (Pb-AX) and 1276Cm^{-1} are characteristic of dixanthogene (X_2 forms oxidized with the molecule of amyl xanthate) Z. Nedjar *et al* (2011).

Conclusions

1. The potassium amyl xanthate (KAX) has good collector ability on a sulphide mineral galena.
2. Activation of galena at lower potentials increases the copper uptake by the mineral.
3. Oxidation of galena at potential of +55 mV forms CuS product on galena in water for 10 min.
4. Using the SEM technique action of $3{\cdot}10^{-2}$M potassium amyl xanthate has been identified (adsorption to specific surface sites and colloidal precipitation from solution)
5. The FTIR spectra revealed the presence of copper on the surface of galena and this is confirmed the adsorption of KAX onto surface (Pb-AX,1109-1384Cm^{-1},X_2,1276Cm^{-1}).

It is suggested that copper cations exchange with those of plomb during copper activation of galena.

This study is ongoing and the results obtained will be discussed in a future work.

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Study on the Requirement of Clay for Islamic Cleansing in *Halal* Food Industry

Puziah Hashim[a*], Norrahimah Kassim[a], Dzulkifly Mat Hashim[a], Hamdan Jol[b]

[a]Halal Products Research Institute, University Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
[b]Soil Management Department, Faculty of Agriculture, University Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.
puziah_h@putra.upm.edu.my

Abstract: Islam is "*Ad-din*" or a way of life. It covers all aspects of human activities including matters related to food and drinks. For Muslims, food must not only nutritious and safe but must also be *halal*. *Halal* is an Arabic word from the Quran which means permissible or lawful. *Halal* food products can become non-halal (haram) if they are contaminated or have direct contact with *najis al-mughallazah* (extreme *najis*). According to Islamic law, *najis al-mughallazah* is an extreme najis derived from dogs and pigs, including any liquid or discharge from their orifices, descendants and derivatives. In cleansing of extreme *najis,* Islam required the use of Islamic cleansing method called *samak (*in Malay*)* or *dibagh (*in Arabic*)*. Thus, in compliance with the *halal* food industry requirement, three (3) clay soil samples and 1 standard were chosen to determine the clay requirements for Islamic cleansing. The basic physico-chemical properties of clays such as pH, particle size distribution (PSD) and moisture content were determined. In addition, the mineralogical content and safety aspects of the clay such as toxic metals and total bacteria content were included. The study on clay requirements for Islamic cleansing is important criteria for its usage in the *halal* food supply chain as it will enhance the consumers' confidence and integrity in halal products.

Keywords: halalan toyibbanl, Islamic cleansing, clay, food, safety

Introduction

The market for halal industry has increased from USD580 billion in 2008 to USD2.3 trillion in 2012 (Hooi, 2012). This significant increase is due to global demand for halal products and services which give consumers more variety to guide them in their choices. Meanwhile, globally there are about 1.8 billion Muslims spread out in 100 countries, which required them to consume and use halal products (anonymous, 2012). As a result, halal certification is increasing in demand worldwide. Halal Certification is recognition that the products are permissible under Islamic law. These products are thus edible, drinkable or usable by Muslims.

Islam is "*Ad-din*" or a way of life. It covers all aspects of human activities including matters related to food and drinks. For Muslims, food must not only nutritious and safe but must also be *halal*. *Halal* is an Arabic word from the Quran which means permissible or lawful, meanwhile haram is anything that is prohibited or unlawful (Al-Qaradawi, 2001). It refers to things or actions permitted by *Shariah* law (Islamic law) without punishment imposed on the doer. It is usually used to describe something that a Muslim is permitted to engage in, e.g. eat, drink or use. Beside halal, the word toyyib is always used together with halal which means it shall meet the quality, safety (not hamful) and wholesomeness (Che man et al., 2005). This statement is clearly stated in the Holy Quran: Surah Al Mā-idah 5:88, which means *Allah* commands Muslims and all mankind to eat and live on *halal* and *toyyib* products (Din-Al-Hafiz, 2008). In addition, halal is not only cover religious aspects but it complies strictly to quality and hygiene in the production of foods, drinks, pharmaceutical, cosmetics, personal care products and other consumer products. *Halal* food products can become non-halal (haram) if they are contaminated or have direct

contact with *najis al-mughallazah*. According to Islamic law, *najis al-mughallazah* is an extreme najis derived from dogs and pigs, including any liquid or discharge from their orifices, descendants and derivatives (SM, 2009). To comply with the halal requirement, plant processing food, pharmaceutical and cosmetic products shall be dedicated to halal production only. Meanwhile, converting production lines, equipment or apparatus containing najis al-mughallazah into halal production line requires the procedure of Islamic cleansing, which is called samak or sertu in Malay or *dibagh* in Arabic. In general, cleaning process using detergent and water does not fulfilling the requirement of Islamic law in the cleansing of extreme najis. In halal perspective, the use of clay to clean extreme najis from dogs and pigs has been the practice in Islam. In order to comply with halal requirements, Islam requires proper cleaning through seven steps of washings, whereby the first step of washing must be water mixed with soil or clay, followed by the subsequent 6 steps of washings with clean water (SM, 2009; Ab-Rahman & Masran, 2008).

In the traditional practice of Islamic cleansing in one's ordinary life, there is no restriction on the amount of clay or soil used and no specific requirements needed as long as one follows the Islamic requirement. Likewise, cleansing extreme najis for industrial application requires some modifications from this traditional practice. Since, the halal compliance covers from raw material production and delivery to consumer, there shall be no contamination from najis during preparation, manufacturing, processing, storage or distribution (SM, 2009). Therefore, if they are contaminated with extreme najis, the equipment, devices and apparatus used in the processing lines, packaging, labeling, handling, storage, transportation and distribution as well as the contaminated area need to be cleaned by Islamic cleansing process. As some of this equipment is expensive, delicate, sophisticated and may be precise, the modification of clay or soil for Islamic cleansing is required and important not to cause any damage and scratch on the specific equipment. As such, a specific clay standard with certain requirements for halal industrial application is needed as well as meeting the equipment or machines specifications.

Materials and Method

Three clay soil samples and standard clay were chosen for the Islamic cleansing study (Table 1). The clays were oven dried, cooled and kept in clean container. The pH of clay was determined using a ratio of 1 clay to 2.5 deionized water (Rayment and Higginson, 1992). The moisture content of clay samples was analyzed using gravimetric method (Walter, 1986), whereas the particle size distribution (PSD) and texture analysis were identified using sedimentation pipette method (Gee and Bauder, 1986; Day, 1965). Toxic metals (lead, arsenic, mercury) content was detected by inductively couple plasma-mass spectrophotometry (ICP-MS) technique (Falciani *et al*., 2000). The total microbial content of clay samples were determined by the total plate count (TPC) method (Cappuccino and Sherman, 2005).

Table 1. Source and code of clay samples

Clay Samples	Source	Code of Sample
Bercham	Perak, Malaysia	A
Sayong	Perak, Malaysia	B
Kaolinite	Commercial, USA	C
Standard	Commercial, Malaysia	D

Results

The pH values of clay samples were in the range of 5.01-6.71 (Table 2). Clay D (standard) exhibited the neutral condition (pH 6.71), whereas, clay A, B and C were slightly in the acidic group. The PSD study showed that clay C possessed the highest clay content (89.00%) as compared to clay A (42.31%), B (53.95%) and D (36.00%). The particle size of clay is < 2 µm, silt and sand are 2-20 µm and >20 µm, respectively. The texture class of clays was determined by USDA textural triangle (Figure 1). All the clay samples were in dry condition as their moisture contents were in the range of (1.79-3.45%), whereby, clay D gave the lowest water content (1.79%). Toxic metals such as arsenic (As), antimony (Sb), cadmium (Cd) and lead (Pb) were determined for safety assessment. The results of clay samples (Table 3) were compared with the Malaysian Food Regulation 1985 which stated the maximum permitted level of metal contaminants for As (0.7 ppm), Sb (0.7 ppm), Cd (0.7 ppm) and Pb (7 ppm). All of the clay samples did not exceed the levels specified in the Malaysian Food Regulation 1985. As shown in Table 4, clay C had the lowest microbial load ($<1.0x10^1$ cfu g^{-1}). The highest microbial load was found in clay A from Bercham, Perak ($<2.0x10^6$ cfu g^{-1}). However, most of the clay samples in this study except clay A had lower microbial count compared to the legal limit set by DKS 129:2009 and Turkish Food codex.

Table 2. Physico-chemical properties of clays

Clay Sample	PSD*		Soil Texture	Moisture	pH
	Clay (<2 µm)	S (2-2			
A	42.31	29			5.28
B	53.95	45			5.01
C	89.00	10			5.28
D	36.00	54			6.71

*PSD=Particle size distribution

Figure 1. USDA textural triangle (Image source: www.soilsensor.com)

Table 3. Toxic metal content in clay samples and limit permitted by Malaysian Food Regulation (1985)

	Toxic metal (ppm)			
	As*	Sb*	Cd*	Pb*
Malaysian Food Regulation 1985	0.7	0.7	0.7	7.0
Clay Sample				
A	0.02	0.01	0.02	0.11
B	0.06	0.01	0.02	0.36
C	ND	0.01	0.01	0.03

D	0.02	0.01	0.02	0.31

*As=Arsenic, *Sb=Antimony, *Cd=Cadmium, Pb=Lead, **ND=not detected

Table 4. Total microbial load of clay

	Microbial load (cfu g^{-1})
Kenya Standard (DKS 169:2009)	$< 1.0x10^5$
Turkish Food Codex	$< 1.0x10^5$
Clay Samples	
A	$<2.0x10^6$
B	$<2.0x10^3$
C	$<1.0x10^1$
D	$<8.0x10^3$

Discussion

Since clay is used to clean severe najis from dogs and pigs in Islamic cleansing, it is important to check the pH of the clay. All of the clay samples were in a slightly acidic to neutral range (pH 5.01–6.71). As compared to most of commercial detergent products, their pH values are above 8.5, which is in the alkaline range (Patterson, 2009). The pH value is a very important criterion in cleaning process because the high alkaline pH water may harm the environment and natural surface when it is being discharged. Furthermore, pH plays a part in rust development in the machinery or equipment. Corrosion can occur even at the minimum level at pH range of 6-12, and rust can develop outside this range (Llewellyn & Hudd, 1998). Under very acidic or alkaline conditions rust would develop rapidly because of the reduction of hydrogen ions, even though not all metals have the same level of corrosion resistance (David, 2005). Hence, the pH of clay samples determined in this study are important and appropriate in conserving the natural environmental when they used clay as a cleansing material for *halal* compliance in the industries. In addition, clay is better than the regular detergents as it has a safe pH range.

From the PSD results, all of the clays have fine particle sizes (Table 2). The textures of the clays are mostly clay. The best clay in this study is sample C (kaolinite), which contained 89.00% clay and 10.00% silt. The smaller particle size of clay contributes to the large surface area of the clay and this would increase the ability of clay to absorb and carry impurities (Parolo *et al*., 2010). In addition, clay has unique characteristic that can be used as an ingredient in developing products for cleaning. For example, in cleaning products, clay has been used as an additive to increase viscosity in order to control the flow of a product on the target surface, as well as adding shine on

products. In cleaning process, the small particle size of clay facilitates the sample to pass through the manufacturing equipment and processing lines, hence reduce the possibility of the surfaces of the equipment from being damaged, scratched, and clogged. All the clay samples in this study can be used for Islamic cleansing products.

To date, there is no standard or guideline established for Islamic cleansing clay. According to Patterson (2009), the standard moisture content for most of the powder detergents is in the range of 1.4-28.7%. Therefore, the standard moisture content of detergent powder is used in the development of clay for Islamic cleansing requirements. The study demonstrated that all the clays are in dried condition, range of moisture between 1.79-3.51%, therefore, they are stable during storage and able to prevent microbial growth.

All of the clay samples had lower toxic metals (As, Sn, Cd, Pb) content and met the allowable limit specified in the Malaysian Food Regulation 1985 (MOH, 2011). This Regulation ensures products are safe for consumers. Toxic metals are dangerous because they form bioaccumulation in the body (Collins & Stotzky, 1991). Bioaccumulation is defined as an increase in chemical's concentration in a biological organism over time compared to the chemical's concentration in the environment. These compounds are accumulated in living things when they are consumed and stored faster than they are metabolized or excreted. Toxic metals cannot be degraded or destroyed. As such, the toxic metal contaminants in the clay used for Islamic cleansing should be identified to ensure it is safe for use.

Another criterion of safety is the microbial load in the sample. Microbial load were determined to ensure the clay for Islamic cleansing are safe to use for halal food industries. This study can minimize the probability of product contamination by microorganism which can be either from raw materials or during manufacturing, processing, damaged of the container or during application of Islamic cleansing process. The safety aspects also fulfill the halal and thoyyib requirement under Islamic law (Hashim *et al*., 2009). To date, there is no standard or guideline of total microbial load for Islamic cleansing clay. As such, the limit in wheat flour and flour products are the closest to compare and bear in mind the wheat flour is used for cooking. The allowable limit of microbes in wheat flour specified by Draft of Kenya Standard and Turkish Codex is $<10^5$ cfu g^{-1} (DKS, 2009; Aydin et al., 2009). However, the study showed that the microbial load of the clay samples (except clay A) after heat treatment at 160ºC was lower than the standards allowable limits (Table 4). The commercial practice use 2% clay for Islamic cleansing, followed by 6 times of washing with water, normally warm or hot water is used. Since the contamination from microbes is low, the clay samples are safe to use.

Conclusions

The pH, PSD, moisture, microbial load and toxic metal contaminants are important requirements for the clay used for Islamic cleansing of extreme najis in halal food industries. All clay samples including the standard clay (clay D) in the study met the required criteria. The development of clay requirements for Islamic cleansing can significantly contribute to the overall growth of the *halal* industry and enhance the level of confidence of the consumers in *halal* products. In addition, this product can be conveniently and economically produced.

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Water Urbanism: A Prospective Study on Dhaka

Qazi Azizul Mowla
Department of Architecture, Bangladesh University of Engineering and Technology (BUET), Dhaka
Bangladesh

qamawla@arch.buet.ac.bd

Abstract: Bangladesh is located in the largest active delta in the world besides receiving high amount of rainfalls, mighty rives flow through it. Still there is a water crisis. Dhaka, its capital, was once crisscrossed by numerous water channels draining the city as well as serving as a main source of service and communication line and naturally water bodies and Rivers had played an important role in the spatial development, life and liveability of Dhaka. The physiographic effect of water and land can be seen on the settlement pattern, which sited on available high ground or on artificial mounds created on the flood plains. The traditional system was of dig-elevate-dwell whereby ensuring water retention during floods and reservoir for lean period. Contemporary urban planning and design in Dhaka has its roots in the colonial period which ignored the traditional pattern of settlement planning resulting in the settlements to turn its back to the water bodies whereby causing health, sanitation and water logging problems.

This calls for an urgent attention to integrate the water bodies with the existing city fabric. The study is an attempt to explore the physiographic dynamics of Dhaka along with its socio spatial context and propose guide lines which would respond well to the water based context of Dhaka.

Key words: Geo-morphology; Water bodies; Historical Context; Dhaka; Urban Fabric.

Introduction

Dhaka metropolis, the capital city of Bangladesh, has developed on a strategic central place in the great 'Ganges-Brahmaputra' delta called Bengal. The geo-morphology of the place has always played a significant role in the formation and growth of this settlement. Almost whole of Bangladesh is formed by the alluvial deposits brought down by the mighty rivers – the Ganges, the Brahmaputra and their tributaries. One of the important hydrological aspects of the rivers of Bangladesh is that the rise and fall of the river stages are only very weakly dependent on the local rainfall, because 92% of the catchments of these rivers lie outside the country (IWM, 2003). Siltation process is simultaneously going on for ages in both water channels as well as in the flood plains thereby their relative depth remains almost constant and the shore line moves south ward with the accretion of new lands. Embankments and insensitive land fillings disrupts natural process of hydrological and geological dynamics resulting in the rise of the water channel beds above the surrounding land and make the local gravity drainage difficult.

Historically Dhaka's urban life and living was interwoven with the system of rivers, canals, lakes and ponds scattered and crisscrossing the city (Mowla,2008). In the earlier days, a network of natural canals within the city served as the means of drainage of the rain runoff and water during the events of flood, besides these canals served as a good means of transportation. Water bodies also offered highly valuable environmental and recreational asset for the area. But gradually in course of time this natural drainage system is being almost destroyed. Destruction of these water channels and depressions has resulted in the disruption and alteration of the natural process of land accretion, land formation and ecosystems. It is observed that, Traditional Architecture, Urban Design and planning in this region

offers the best and integrated solutions towards human needs, in their relation with the nature, ecosystems and the community but contemporary development ignored living with nature. Because of uncontrolled urbanization and lack of holistic planning, water logging is an inherent problem of most urban sites in Bangladesh.

Urbanization, without considering the geo-morphology of Dhaka during recent times has left a deep scar in the city's environment. Dhaka is now at crossroads. It needs some strategic decisions and quick actions to remain liveable. Water logging, pollution, changes in hydro-geological system, land subsidence and building collapse are some of the severe consequences of these environmental changes. In this paper, geo-morphological and hydrological features were explored to ascertain an appropriate role for them for their rejuvenation and integration into the city fabric. This paper takes a queue from a study conducted in the Department of Architecture, BUET (2009) to explore the physiographic dynamics of Dhaka along with its socio spatial context and propose design parameters following which spatial development could be achieved befitting the traditional system that was more sustainable. However, proposal for detailed urban design guidelines for Dhaka is not the intention of this paper.

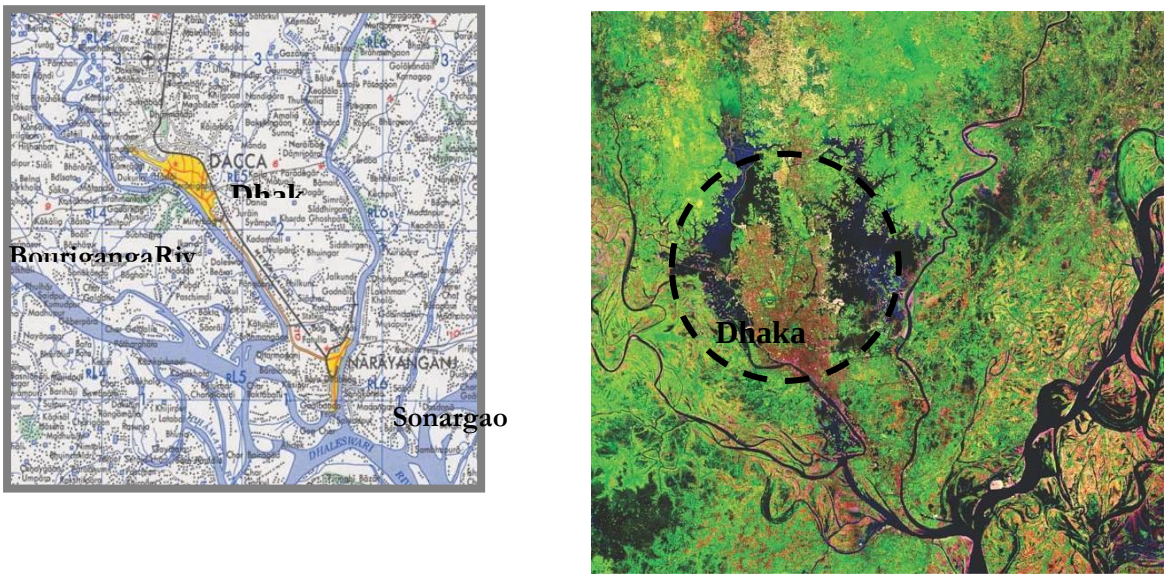

Figure 1. Physiographic Setting of Dhaka and its growth: Recent image show wetlands on its east and west.

Contextual Brief

Geo-Morphology of Dhaka: Dhaka has grown from a small settlement within the confines of River Bouriganga and the Dholai *Khal* (canal) to a sprawling metropolis of about thirteen million people. The spatial development followed the prong of flood free terrace originating from the old nucleus along Bouriganga River towards north as a part of Madhupur terrace of pre-ostacian age (Fig.1 & 2). This terrace was also crisscrossed by numerous water channels that drained the city as well as served as a main source of service and communication line (Figs. 3 & 4). The Madhupur terrace, on which Dhaka has developed, slopes towards eastern and western flood plains, marshes and Rivers. The physiographic effect of water and land can be seen on the settlement pattern, which sited on available ground or on artificial mounds created on the flood plains (Mowla,2005).

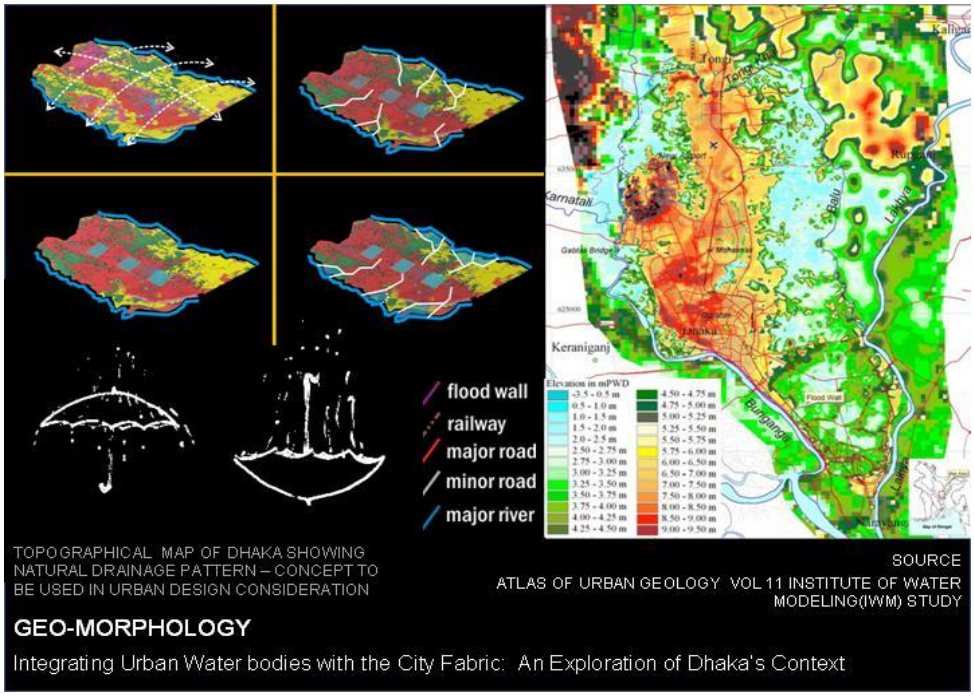

Figure 2. Geomorphology Context of Dhaka – showing natural drainage pattern based on IWM,2003.

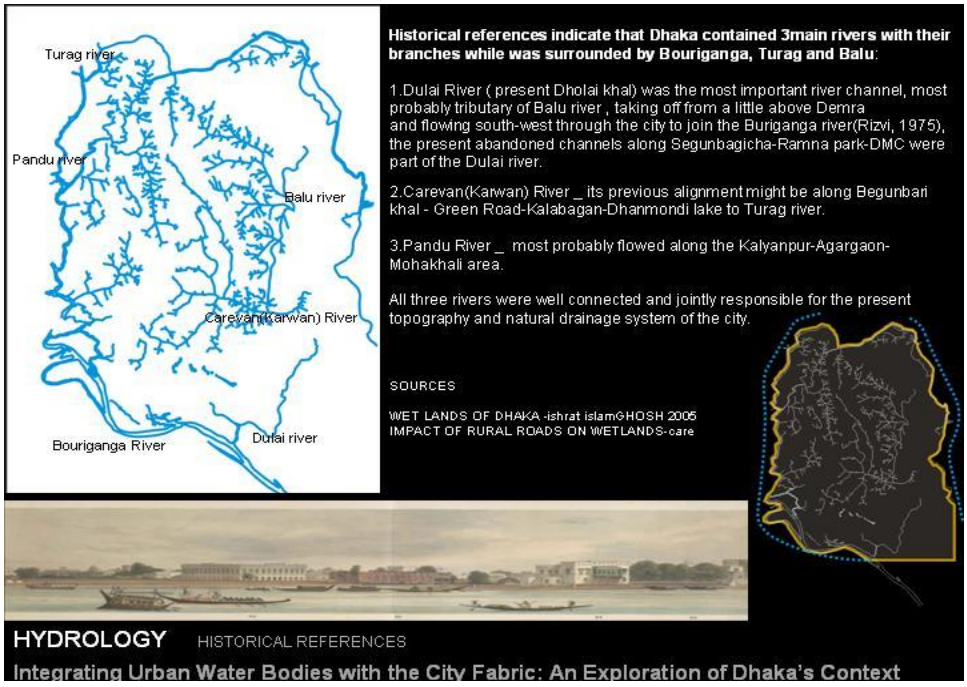

Figure 3. Historic Water body system in Dhaka (Source: Mr Emaduddin, IWM,2003).

Water Retention and Drainage: Due to the urban development pressure in Dhaka there is a tendency of filling of water bodies and flood plains resulting in the reduction of water retention capacity, diminishing public spaces

and increasing water logging or flooding. Manmade drainage systems are not sufficient enough for this growing metropolis. Flood visits the city almost every year victimizing millions of people in and around. In this respect the localities situated inside the city suffers most, especially the inhabitants of old town. Degradation, obstruction and demolition of natural drainage systems are causes of floods severity in some parts of the city (Fig.4).

Given the fact that Dhaka is subject to frequent flooding, an appropriate plan for flood control is needed. Such a plan is not evident in Detailed Area Plan (DAP, 2007), which rather than setting aside adequate space for water retention ponds and for permeable surfaces (including parks and other unpaved surfaces), focuses instead on roads and buildings, embankment and pump oriented flood control approach which will further intensify the suffering of Dhaka residents due to flooding. Interestingly, water retention / detention areas in the DAP are not being located in the natural depressions. Considering the geo-morphology of Dhaka, contrary to the embankment- and pump-oriented flood control and drainage management approach of DAP, flood management and a detention reservoir-based gravity drainage system is expected to be more reliable and appropriate for storm water drainage system in a floodplain landscape like Dhaka with rivers encircling the city.

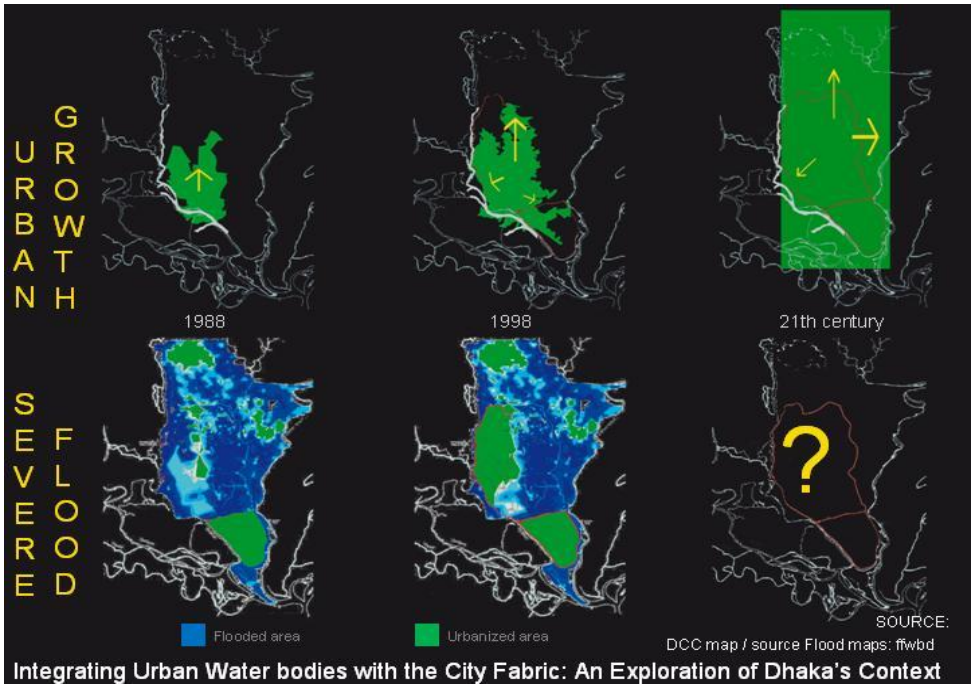

Figure 4. Dhaka's Urbanization Trend and Flooding Propensity (BUET,2009)

Ground water extraction: Due to over extraction and reduced percolation, water table in Dhaka has currently dropped to below 1200 feet, which was about 10 to 20 feet. Being one of the largest mega cities in the world and without any hydrological planning and remaining surface water being excessively polluted or destroyed, Dhaka is facing continues potable water-related problems over the last few decades. Many ponds that worked as runoff reservoir and meeting the domestic water needs are filled up to create land for housing and roads. Ground water extraction poses a great threat to the sustainability of the city itself. Dhaka Water and Sewerage Authority (WASA) mainly depend on ground water extraction to continue its supply to increasing number of inhabitants in the city. Due to increasing population and industrial growth the demand for fresh drinking water is rising rapidly. There is no strategy for planned replenishment of ground water, and that is in a place that receives one of the highest rates of rain fall in the world. Considering this context, development and integration of surface water sources into the settlement fabric seems a logical planning imperative.

Traditional Response to Water Based Urbanization

As mentioned before Dhaka grew on a wedge shaped land mass crisscrossed by numerous water channels connected to the surrounding river system (Fig.-01). Fringe areas were generally low, flood plains, depressions etc. Water bodies developed generally on tectonic faults. Filling up of those water bodies posses two prong problem of unsuitability of construction and reduced water retention capacity. Other than surrounding river system, depending upon the nature of filling, excavation, natural status etc Dhaka's water bodies can be categorized into six types – ditch, pond, lake, natural depression / lowland, Khal/canal, swamp/wetland. (Fig. 5).

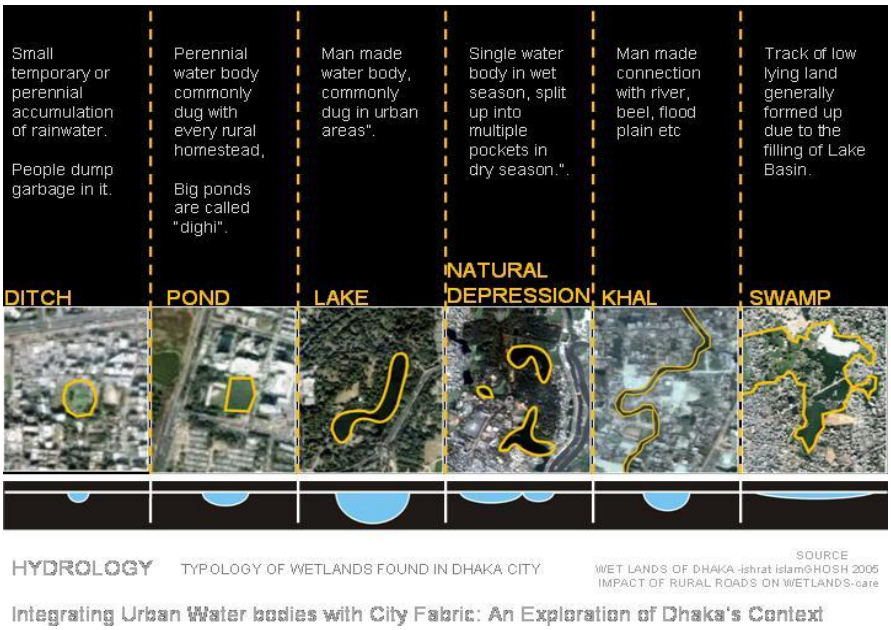

Figure 5. Categorization of in land water bodies in Dhaka (BUET,2009).

Figure 6. Glimpses of Water Urbanization: Pasr and Present.

Contemporary Scenario over Traditional

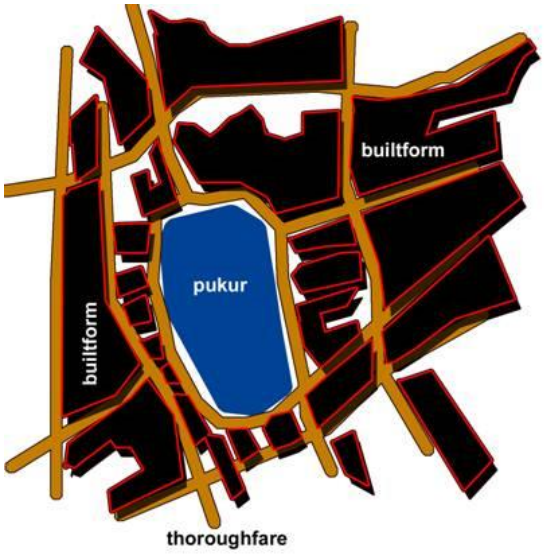

Figure 7. Settlement Pattern Evolving out of traditional needs in response to water bodies.

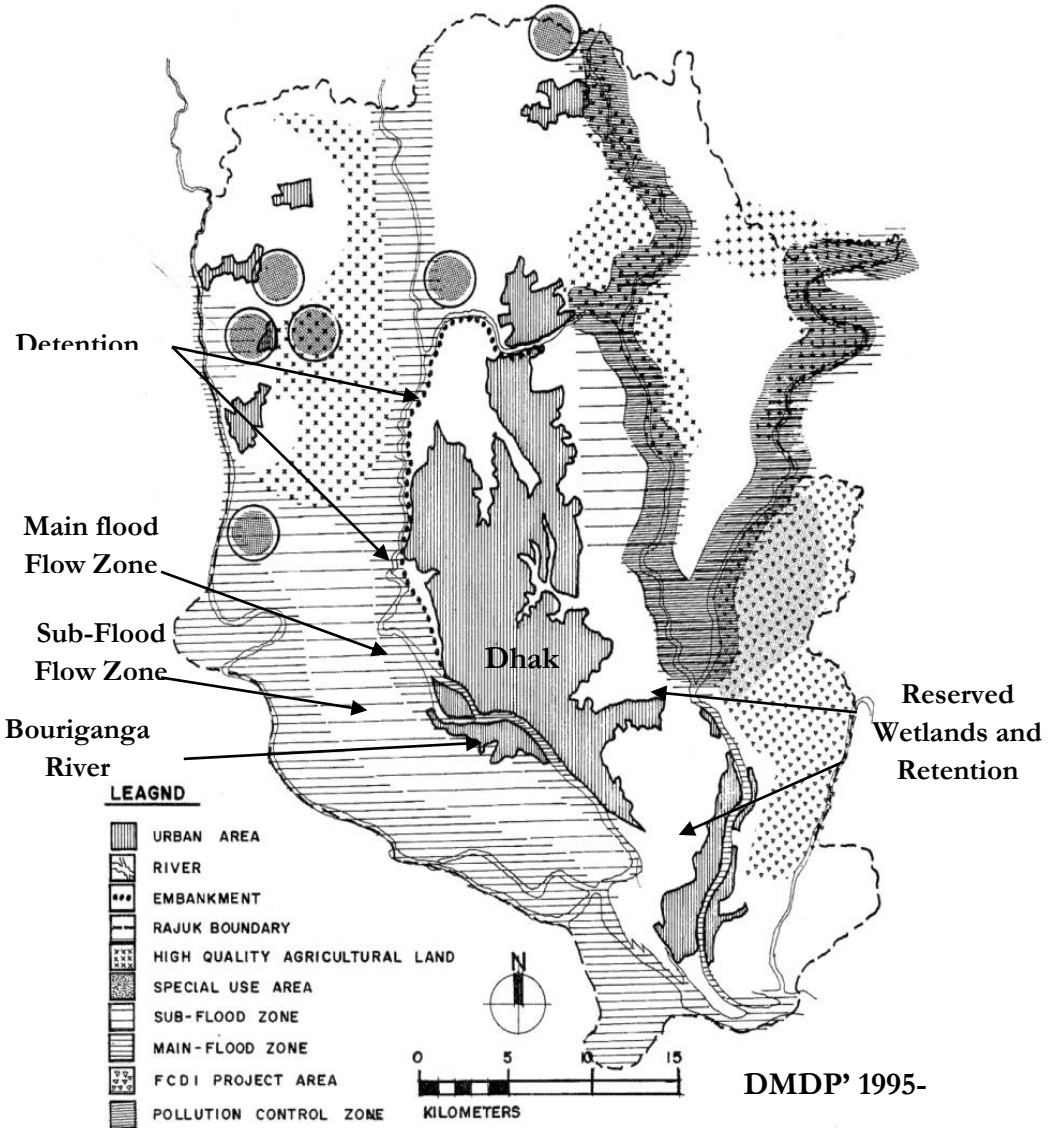

Figure 8. DMDP' 95 - Proposed Plan Policy Areas i.e. built and natural areas for Dhaka.

Traditional Response Water Bodies in Dhaka; The settlement pattern of the earlier period in comparison to the contemporary one presents a richly woven urban fabric at the human scale. The rivers spilling over the flood plains and into canals / khals or connecting inland depressions or lakes together provided a hierarchy and network of water bodies and navigation routes giving rise to settlements alongside. There were flights of steps, locally known as ghats at intervals rising up to the lanes or community spaces. The ghats on the bigger water bodies or rivers were major community spaces where the daily activities took place such as bathing, washing or religious or commercial activities. Historic pattern reveal that the relationship of urbanization and water bodies was positive and for the people. Ghats were community spaces as well and provided a hydraulic character to the settlements in the area (Figs. 6, 7 & 8).

The traditional system was of dig-elevate-dwell whereby ensuring water retention during floods and reservoir for lean period. The system protecting the homesteads above flood levels with crop fields around helped create adequate biomass was a time tested approach of the settlement pattern for sustainability in the area (Mowla,2005 & 2008). In Dhaka traditionally the settlement structure evolved in consonance with water bodies. The water bodies were

the main transport corridors, streets being secondary to it. Planning deep inland together with European planning principles changed the development pattern giving emphasis on automobiles. Contemporary urban planning and design in Dhaka has its roots in the colonial period which ignored the traditional pattern resulting in the settlements to turn its back to the water bodies.

Prospects of Water Urbanism in Dhaka

Bangladesh is a deltaic country and has abundant rainfall, but due to the absence of clear policy-guidelines, useable water quantity is declining fast. Most countries have water policy and regulatory laws for water use. Wetland Protection Act, 2000 in Bangladesh restricts change in the wetland areas but doesn't regulate the use of water. Neither the building construction rules, or building code or any planning regulation nor wetland act calls for integrating natural water bodies or channels into the urban planning and design frame work.

In Dhaka, for example, as Dhanmondi is located on a higher ground and developed around a water basin, it is much less prone to flooding and water logging. Being located in original depressions, the Amlapara area or BUET campus and Siddheswari area are affected by moderate to severe flood and water logging during the monsoon (September- November) seasons. Siddheswari, was initially part of a floodplain and had numerous drainage channels and water bodies within the site. Now the excess runoff and floodwater cannot be drained out as the channels have been filled up without arranging for adequate alternate way for discharge. The topography or the problem of flooding and water logging has not been taken into account in the planning of either BUET or Siddheswari or elsewhere – and is the main cause of flooding.

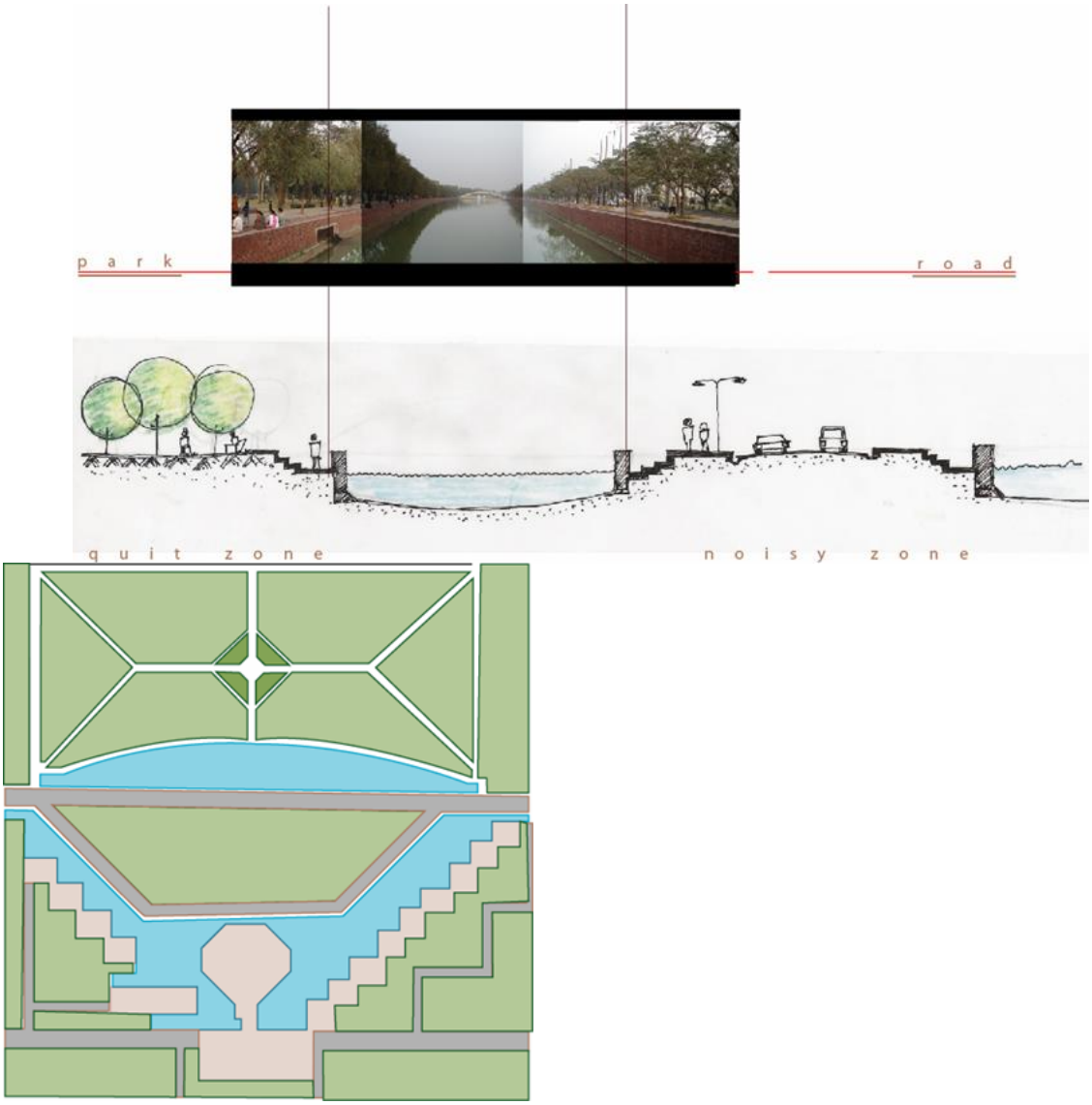

Figure 9. Shangshad Bhaban Precinct design considering water bodies as its integral part.

Some sporadic attempts to integrate water bodies with the settlement pattern are observed in Dhaka without any link with upper and lower level planning and design framework (Fig.08-10). Considering the geo-morphology of Dhaka, it seems essential that if and when needed the earth cutting to fill / raise lands must be judiciously planned and invariably done on the channel ward side that would get rapidly filled up by the natural process of siltation / accretion. The western embankment of Dhaka is a response to the floods of 1988. The attitude of zero tolerance for floods amounts to demanding equal protection from floods along different stretches of rivers irrespective of the geographical difference found there, which in practice is not possible.

Learning from the past wisdom and taking lessons from contemporary failures, an exercise was carried in the studio (BUET, 2009), many proposals submitted by the students (Fig.11) suggest that traditional approach of planning and design of living with nature is still valid without sacrificing contemporary needs and that natural areas should be strictly controlled by regulations (Mowla, 2010).

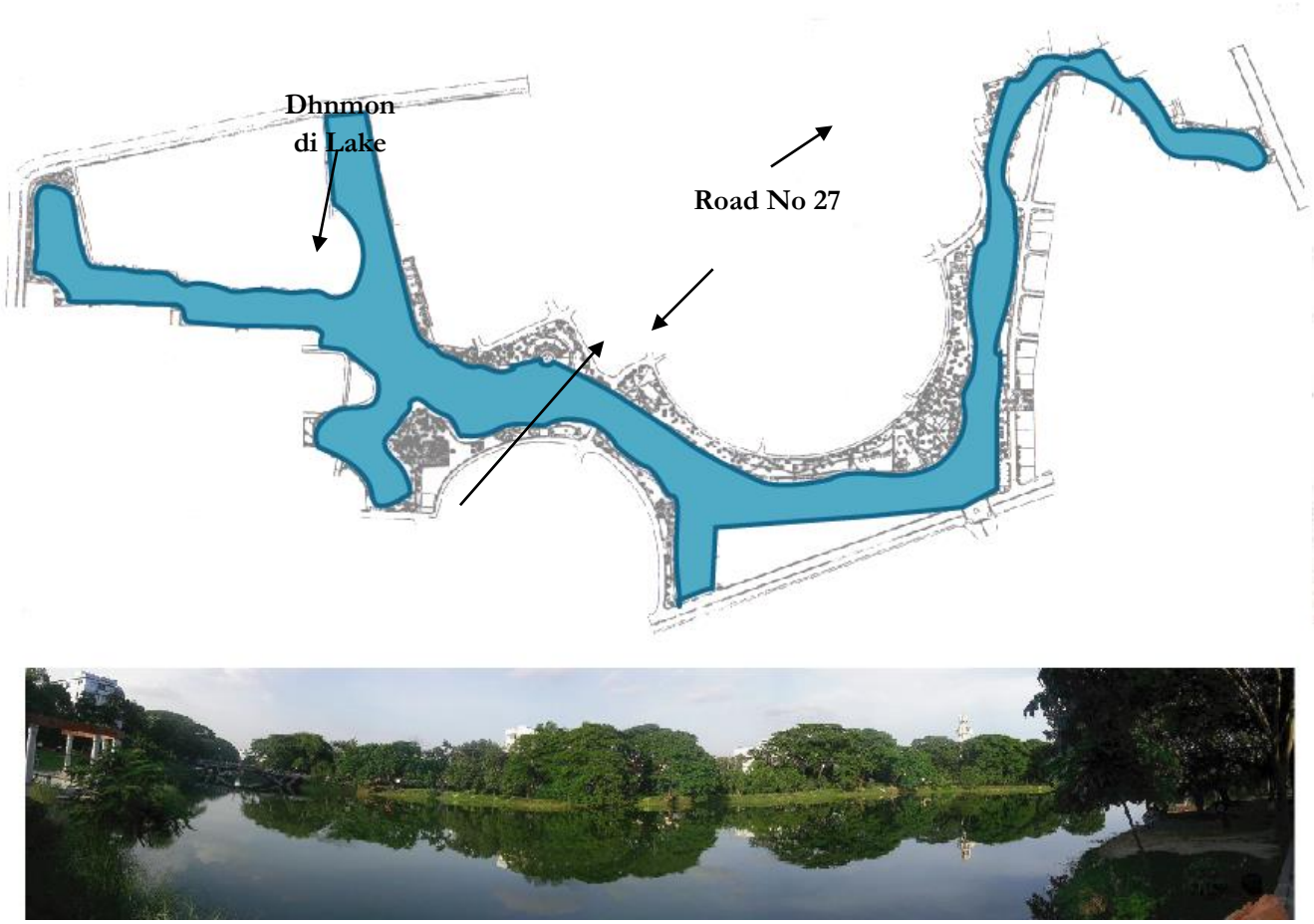

Figure 10. Dhanmondi R/A Designed with water-bodies but not integrated.

Discussions and Recommendations

Studies show that much greater environmental as well as socio-economic success can be achieved through design with ecological principles in mind than without it. Settlement design and planning in Dhaka revolving around geomorphology and hydrological behaviour of the place would result in water responsive urban design (Mowla,2000). Considering Dhaka's geomorphology and hydrological profile, finger shaped open ended dykes may be constructed for settlements, particularly in the fringe areas to allow free flow of flood water in and out of the urban areas. Lower plains may be used as vegetation areas (parks or open spaces) during lean seasons. Restoration of natural (gravity) drainage system and creation of adequate water bodies is needed for a sustainable ecosystem in Dhaka. Urban drainage system that take care of water quality, water quantity, amenities and environment, may be called sustainable drainage system.

Existing situation

Proposed development

3-D

Figure 11. Badda retention pond development area students' vision of development without sacrificing density or contemporary needs but integrating nature with the development.

Houses with elevated floors built on earth mounds created by adjacent excavation thus having similar storage capacity and evacuation boats kept available for emergency were the traditional concept of settlements in the flood plains. It is considered a highly developed form of culture born out of necessity to live with hydraulic dynamics. The concept of sustainable architecture, urban design and planning successfully reconciling hydrological laws, geological profile and economic interest while providing additional benefits like the inclusion of water bodies (rivers, flood plains, cannels, ponds etc.) into the city's footprint and enhanced landscape aesthetics.

Planning and design, sympathetic to many forces of nature and human activity pattern, result in a sustainable development. Therefore, Water bodies of the city must be recognized as a valuable natural resource requiring protection, conservation and recycling and the water resources of the city needs to be incorporated in the physical planning process, the early the better. In nutshell, the major ingredient for sustainable development in a city like Dhaka is sensitivity, flexibility and adaptability of development approach and process encompassing Clean, Green, connected, open, accessible, useable practice to suit local conditions and that planning must be holistic in nature.

Conclusions

Historically Dhaka's development responded well with the hydro-geological realities of the place. Traditional Architecture, Urban Design and planning in this region offered the best and integrated solutions towards human needs, in their relation with the nature, ecosystems and the community but contemporary development ignored living with nature. After abusing urban water bodies through the years of hard use and neglect, when it has retaliated with

unthinkable magnitude, there is a realization on the stake holders that they are valuable natural assets / resource for the community. The fact is that the contemporary planning process never took water systems as the driving force in any physical planning in this delta.

Urban development with water bodies as focus was never given a trial during the rapid urbanization over the last 100 years. Review of Dhaka's geomorphology reveals that for the sake of ecological, hydrological integrity and development sustainability, natural systems must be protected and can be protected. DAP,2007, though quite conservative, if strictly followed is expected to improve this situation. Fragmented approach of planning must be avoided. Studies show that much greater environmental as well as socio-economic success or advantages can be achieved through design with ecological principles in mind than without it.

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