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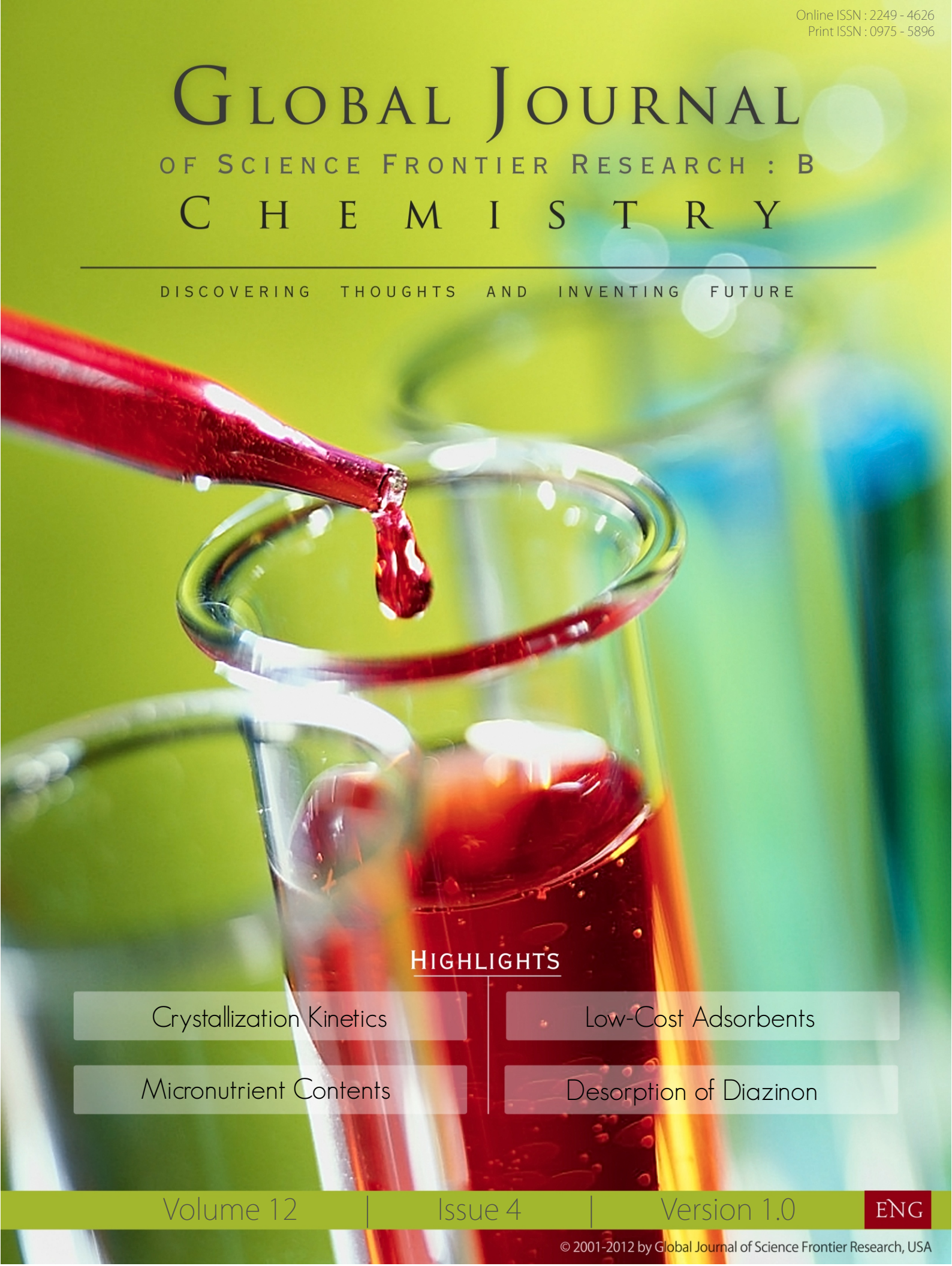

HIGHLIGHTS

- Crystallization Kinetics
- Low-Cost Adsorbents
- Micronutrient Contents
- Desorption of Diazinon

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Directional Crystallization Kinetics of Coconut Oil Under Temperature Gradient

By Jie Peng, Xue Bai, Yunzhu Zhang & Xingpeng Bai
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Abstract - The directional crystallization kinetics of coconut oil was studied under the temperature gradient from 13℃ to 15℃. During the crystallization of coconut oil, the overall crystal growth rate Rg decreased over time, but it increased with the growth of temperature difference. While the change of crystallization yields Y first increased then decreased to constant. And the variation trend of crystallization yield with temperature difference was the same with crystal growth rate. The Avrami equation was basically fit for the analysis of coconut oil's crystallization. Some deviations also existed during the last stage of crystallization. What's more, the crystalline form and the methods of crystal growth both changed with different temperature.

Keywords : *Coconut oil, temperature gradient, Avrami, crystallization kinetics.*

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Keywords : *Coconut oil, temperature gradient, Avrami, crystallization kinetics.*

I. Introduction

Fats have many physical and chemical characteristics, such as the melt point, the crystallization behavior and the crystalline form. These special characteristics played an important role in the food quality control and food processing[1]. For some oil and fat food, such as cakes, chocolates, candies, ice creams, margarines, shortening, cocoa butter; the unique plastic grease can extend their shelf-life, enhance their quality and stability, and provide special mouth-feel[2, 3].In order to improve the characters of oil and fat food, acquire some special products, making some studies about oil fractionation and crystallization is really essential.

Oil fractionation aims at separating solid lipid and liquid oil according to the temperature. Three main methods can be taken: fractional crystallization, liquid-liquid extraction and distillation[4]. Dry fractionation, which belongs to fraction crystallization, is the simplest and the most economic method among oil fractionation.

Different types of triglycerides have different melting points under different temperature, so we can achieve the purpose of solid-liquid separation by cooling[4, 5].

Dry fractionation is a physical modification process, it can avoid the produce of trans fatty acid and decrease vanadium pollution. Low temperature brings the directional suspended crystal separation, which decreased the separating efficiency and purity of the products, mixed the crystal with a large number of low-melting compositions. Dry fractionation contains three main stages: the produce of crystal nucleus, the growth of crystal and the separation and purification of crystal. In order to give an exact description of grease crystallization behavior, some relevant parameters should be determined.

Coconut oil is one of the Laurel acids grease, which contains about 90% saturated fatty acid. It's main compositions are lauric acid(C12:0,45.9%~50.3%) and myristic acid(C14:0,16.8%~19.2%). This fatty acid makes coconut oil much easier to oxidize, then provide energy to the body in a short time. What's more, it can also reduce the risk of atherosclerosis and heart disease, benefit to our health [6].

In order to acquire the solid lipid with the same characters of butter, a series of temperature gradients were built to give a step-by-step separation of coconut oil in this study. The experimental data was simulated by means of molecular diffusion Fick's Law and the Avrami equation. The fundamental crystallization parameters such as the crystal morphology (n), the crystallization rate (k) were obtained and the mathematical model was established. The purpose was to get the improved mathematical model of the crystallization behavior of coconut oil under the temperature gradient, and this model would be used to guide the experimental to get the ideal value of the crystallization parameters. The results will lay the foundation for exploring the effect of the temperature gradient on the nucleation mechanism and molecular orientation aggregation structure.

II. Experimental

a) Materials

Refined, bleached and deodorized coconut oil was used in this work. It was a kind of clear liquids and presented full-bodied coconut taste at room temperature(25℃).

b) Mpparatus

Fig.1 illustrates the apparatus used in this study. A cylindrical container (15cm in the typical radius) was put on the magnetic stirring apparatus (5).The container was double-layered and its temperature was controlled by the heating and temperature controlled system (4). Another temperature controlled cylinder (condenser pipe (6), 7cm in the typical radius) was put into the middle of double-wall beaker. It was refrigerated by the refrigeration and temperature controlling system (7).

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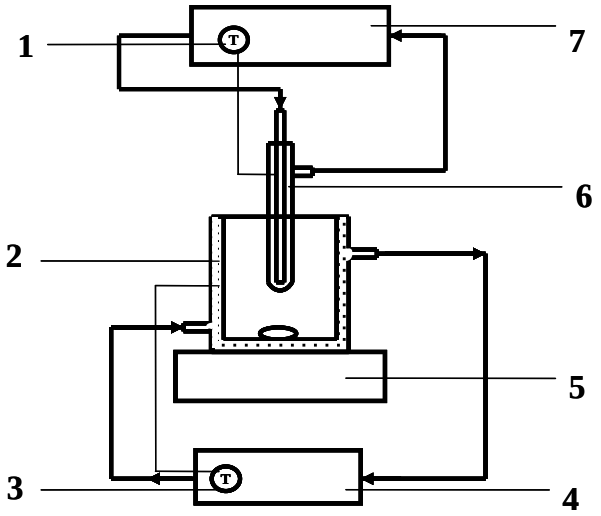


Figure 1 : Schematic of the apparatus used: 1.Temperature controller 2.Container's interlayer 3.Temperature controller 4.Heating and temperaturecontrolling system5.Magnetic stirring apparatus 6.Condenser pipe 7.Refrigeration and temperature controlling systemFig

c) Methods

Two of the above apparatus were used to decrease the error and shorten the repetitive experimental period. The coconut oil (about 100-120g) was conditioned at 60℃ for 10 to 20 min to destroy the crystal structures and subsequently poured into the double-wall breaker, the temperatures of condenser pipe and double-wall breaker were set according to the desired crystallization temperature. When the system was stable, the condenser pipe was dipped into the melt, which was agitated by a magnetic stirrer. The examined process parameters are summarized in Table1. Weight the crystal of condenser every 2 hours until 22hours.

Table 1: Experimental conditions

Groups	Temperature of condenser pipe/℃	Temperature of double-wall breaker/℃	stirring rate	Indoor temperature/℃
1	19			
2	17	32	minimum	25-27
3	15			

All the data we obtained were the mean values of six times' experiments. So the accuracy of the data was much higher. The data were simulated by means of the Avrami equation, with the help of Microsoft Excel Solver, some fundamental crystallization parameters were obtained, and a mathematical model of directional solidification was also established.

i. *Determination of crystal growth rate*

The overall crystal growth rate was calculated via Eq. (1) [6]:

$$Rg=\frac{dMc}{Adt}[gcm^{-2}h^{-1}] \quad (1)$$

Where Rg is the crystal growth rate (assumed as a constant crystal growth rate), Mc is the mass of crystal deposited on the surface of the condenser pipe [g], A is the surface area of the condenser pipe [cm2] ($A=2\pi rL+\pi r^2$) and t is the crystallization time [*h*].

ii. *Yield of crystallization*

The crystallization yield was calculated via the following Eq.(2) [6]:

$$Yield=\frac{M_{solid}}{M_{melt}}\times 100\% \quad (2)$$

Where Msolid is the mass of the solid fraction crystallized on the condenser pipe's surface[g] and Mmelt is the mass of the melt[g].

iii. *Crystallization kinetics*

Avrami equation (Eq.3) was used to simulate the course of crystallization[7]. The half period of the crystallization was measured by Eq.4:

$$Xt=1-\exp(-kt^n) \quad (3)$$

Where Xt is the relative crystallinity, k is the crystallization rate, n is the Avrami index.

$$t_{1/2}=(0.693/k)^{1/n} \quad (4)$$

III. Results and Discussion

a) Analyses of crystal growth rate and crystallization yield

Fig.2 shows the changes of crystal growth rate (Rg) under different temperature. The overall trend was decreasing. The greater the difference in temperature was, the more obvious of the downtrend, and the greater the crystal growth rate was. At the beginning of crystallization (about 2 hours), the crystal growth rate in 15℃ was about 0.0224, while in 19℃ was about 0.0449. 12hours later, the downtrend became mild. Fig.3 shows the change of crystallization yield(Y). Its main trend was first increasing then declining. The value of Y reached the maximum between 10 hours to 15 hours.

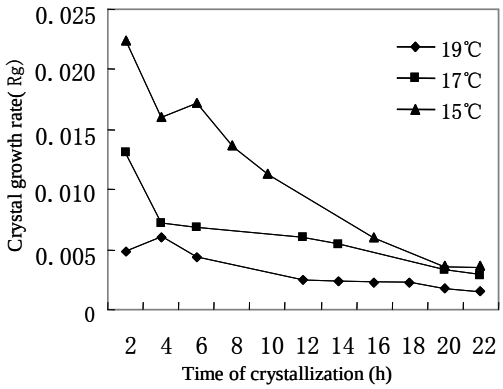
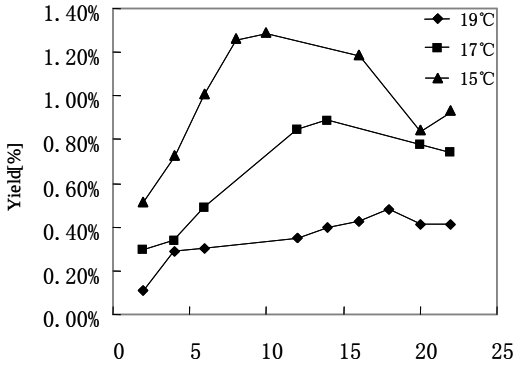


Figure 2 : Curves of coconut oil 's crystal growth rate under different temperatures. The temperatures in the figure stand for the temperatures of the condenser pipe.



Figuer 3 : Curves of coconut oil's crystallization yield under different temperatures. The temperatures in the figure stand for the temperatures of the condenser pipe.

The degree of the saturation in solid fat changed with the temperature. That is to say, per unit of volume of the maximum dissolved solid fats varied with the change of temperature, Stable temperature gradient was built during the experiments, and then the concentration gradient of solid fats formed, because of the molecular diffusion, when the solid fats contacted with the cold wall, crystal formed. The higher the temperature was, the greater the degree of the saturation was and the more crystal we got, so both Rg and Y became bigger. After a long time of crystallization, the coconut oil trended to the saturated state, then Rg declined. When the oil reached the saturated state, some crystal would be dissolved again until it became stable, so at later stage of crystallization, Y dropped to stable.

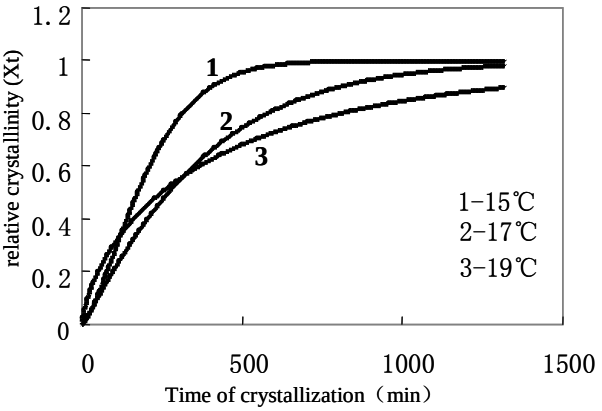


Figure 4 : Fitting curves of crystallization about coconut oil under different temperatures. The temparatures in the figure stand for the temperature of condenser pipe.

b) Analysis of crystallization kinetics

Avrami equation was used to stimulated the data we got.Fig.4 shows the fitting curves of the crystallization. Three curves were similar to S type, that suggested the crystallization were heterogeneous nucleation. At the beginning, the relative crystallinity (Xt) in 19℃ was the biggest, and 15℃ was the smallest; 8 hours later, the condition was just the reverse. All curves' variation trend was similar, slopes of the curves and Rg both increased with the increasing of temperature gradient, which was agree with the change in Fig.2. The greater the temperature gradient was, the shorter time was needed to reach the stable state during the crystallization. The time of 15℃ was about 500min, but the times of 17℃ and 19℃ were much longer than 22hours. Fig.5 can be used to examine the fitness of the Avrami equation. t0 means the initial moments of the crystallization, it's equal to 0 in this experiment. The curves were straight line, so the Avrami equation was basically fit for the crystallization of coconut oil. And the curves also told us that the crystallization rate in 19℃ was the max, but it was similar in 15℃ and in 17℃, which could be examined by comparing the values of k in Tab.2.

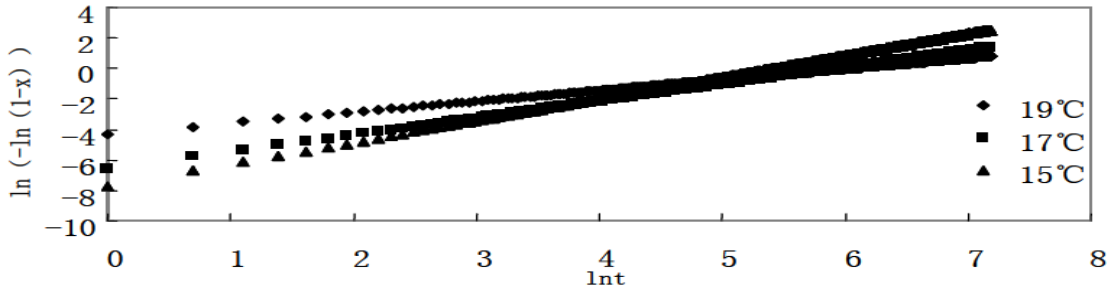


Figure 5 : The relationship between ln（-ln（1-x）） and ln（t-t0）

Table 2 : The parameters of Avramiequation during the crystallization of coconut oil

Temperature of condenser pipe（T）	Crystal morphology (n)	Crystallization rate (k)	Half period of crystallization($t_{1/2}$)
292	0.714	0.252	4.130
290	1.105	0.131	4.509
288	1.425	0.152	2.901

Table 3 : The relationship between Avramiparameters and crystallization behavior[10]

The mechanism of crystal growth \ Nucleation method	Homogeneous nucleation	Heterogeneous nucleation
One-dimensional growth (acicular crystal)	n=1+1=2	n=1+0=1
Two-dimensional growth (flat crystal)	n=2+1=3	n=2+0=2
Three-dimensional growth (spherical crystal)	n=3+1=4	n=3+0=3

Generally, the value of n varied with the temperature. It is the function of the number and the size of crystal, which reflects the mechanism of nucleation. Relevant data shows the value of n is generally integer, between 1 to 4.But in this experiment, the data we got were non-integer and all less than 2. There were following reasons suggested: (1) The production of fractal geometry during the crystallization; (2) Different crystallization mechanism exited at the same time; (3) The existence of secondary crystallization [9].

The non-integer value also showed the existence of heterogeneous nucleation, it also predicted the fitness of the Avrami equation was not perfect.. Especially in the later stage of crystallization, some deviations existed. According to the data in Tab.3, we could find that in 17℃ and 15℃, the mechanism of crystal growth was heterogeneous nucleation and one-dimensional growth, the crystal was acicular crystal. But in 19℃, the mechanism were not sure, and the crystal morphology was also different. The half period of crystallization is some contribution of both k and n.. In 19℃ and 17℃, the value of t1/2 was much higher than in 15℃, that is, at this temperature (15℃), the time to produce 50% crystal was the shortest.

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By Ibtissam Maghri, Fatiha Amegrissi, Mohamed Elkouali, Abdelkbir Kenz , Omar Tanane, Mohamed Talbi & M. Salouhi

Hassan II Mohamedia-Casablanca University, Morocco

Abstract - The adsorption of methylene blue onto Mytilus Edulis shells and corn stalks was studied under various conditions such as concentration of adsorbate, adsorbent dosage and granulometry. Batch adsorption experiments were conducted and the result showed that the adsorption was dependent to granulometry and adsorbate concentration, but was partly dependent on the adsorbent dosage. It was rapid, stable and occurs in less than 60 minutes. The objectives of this work were to compare the process of adsorption of methylene blue with two types of absorbents (Mytilus Edulis shells and Corn stalks) and to use isotherms (Langmuir and Freundlich) for modeling adsorption process. Results showed that Mytilus Edulis shells and Corn stalks are suitable for the adsorption of methylene blue dye and could be used as a low cost effective adsorbent in the treatment of the industrial wastewater.

Keywords : *Adsorption, Methylene Blue, Mytilus Edulis shells, Corn Stalks, Modeling, isotherms, Langmuir model, Freundlich model, low cost adsorbent, treatment of industrial wastewater.*

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Keywords : Adsorption, Methylene Blue, Mytilus Edulis shells, Corn Stalks, Modeling, isotherms, Langmuir model, Freundlich model, low cost adsorbent, treatment of industrial wastewater.

I. Introduction

Water pollution is beginning to take alarming proportions for both terrestrial waters and seacoast. Several physicochemical methods have been proposed to treat contaminated waters. At the high cost of certain techniques, it seems appropriate to direct the activities of the national scientific research in the field of environment, to the development of economic techniques. Among these techniques, there is adsorption on activated carbon. This treatment was effective but in most cases expensive [1]. Severalworkers have reported on the potential use of maritime and agricultural by–products as good substrates for the removal of dyes from aqueous solutions and wastewaters such as bacteria [2], sawdust [3], algae [4], shells [5], clay minerals [6,7], china [8], bauxite [9], bagasse [10], molasses [11] and coconut [12]. This process attempts to put into use of waste to treat waste and become even more efficient because these maritime and agricultural by products are readily available and often pose waste disposal problems. Hence, they are available at little or no cost. This makes the process of treating wastewaters with maritime and agricultural by–product adsorbents more cost effective than the use of conventional adsorbents like activated carbon.

This work aims to study elimination of methylene blue using as adsorbent two materials: Corn stalks and Mytilus Edulis shells.

II. Theoretical and Experimental Part

a) Adsorption parameters

In order to optimize process conditions for adsorption of methylene blue on Corn Stalks and Mytilus Edulis shells, we studied the influence of some factors which may be involved in the process of this phenomenon such as concentration of adsorbate, adsorbent dosage and granulometry.

b) Modeling of adsorption isotherms

Freundlich model (van Bemmelen, 1988 [13] Freundlich, 1909 [14]) is the most commonly used. We consider that it applies to many cases, especially in the case of multilayer adsorption with possible interactions between the adsorbed molecules [15]:

$$q_e = K_F.C_e$$

The most common form used is the plot in logarithmic scale variations qe according to Ce:

$$\text{Log } q_e = \log K_F + \log C_e$$

The constant n (adimentionelle) gives an indication of the intensity of adsorption. It is generally accepted that:

- $0.1<n<0.5$ characteristic of a good adsorption.
- $0.5<n<1$ characteristic of a moderate adsorption.
- $n>1$ characteristic of a weak adsorption.

Langmuir model is based on assumptions well known. The initial assumptions are that the solid adsorbent has a limited adsorption capacity (qm), all active sites are identical, they can only complex solute molecule (monolayer adsorption) and there are no interactions between adsorbed molecules. This model can be expressed by equation (1):

$$q_e/q_m = \theta = KL.C_e / (1 + K\ C) \qquad (1)$$

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K_L, equilibrium constant of Langmuir, θ, recovery rate The development of equation (1) leads to the linear form of Langmuir isotherm. The ratio RL = 1 / (1 + KL.C0), unitless magnitude, indicates that:

- The adsorption more favorable if R_L tends to 0.
- Adsorption much worse if R_L tends to 1.

Figure 2 : Principal equilibrum models.

Isotherms	Non linear expression	Linear expression
Langmuir	$q_e/q_m = \theta = K_L .C_e / (1 + K_L.C_e)$	$1/q_e = 1/ (C_e. K_L .q_m) + 1/q_m$
Freundlich	$q_e = K_F .C_e .n$	$\text{Log } (q_e) = \log (K_F) + n \log (C_e)$

III. Results and Discussions

a) Adsorbate concentration effect

The figure 1 shows the adsorption kinetics of methylene blue onto Mytilus Edulis (A) and Corn Stalks (B) at different initial concentrations. We notify a decrease in the residual concentration. After sixty minutes, it reaches a constant value whatever the initial concentration; this shows that the equilibrium time is independent of the initial concentration of the dye.

b) Effect of adsorbent dosage

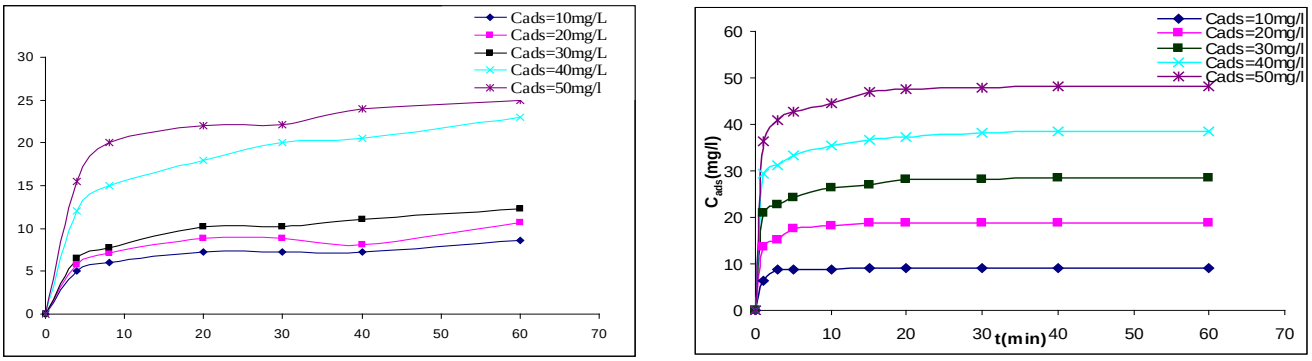
The adsorption kinetics of methylene blue with three different masses of adsorbents is shown in figure 2. From these results, the biosorption is important for a mass of 4g.l-1 of adsorbent.

c) Adsorbent particle size effect

In this study we used different size fractions. The adsorption kinetics of methylene blue is shown in 3. The adsorption capacity is better for a size range between 0.08 and 0.2mm for Corn Stalks and for a size range 0,056mm for Mytilus Edulis Shells because the adsorption depends on the external surface of the adsorbent material increases with the fineness of its particles.

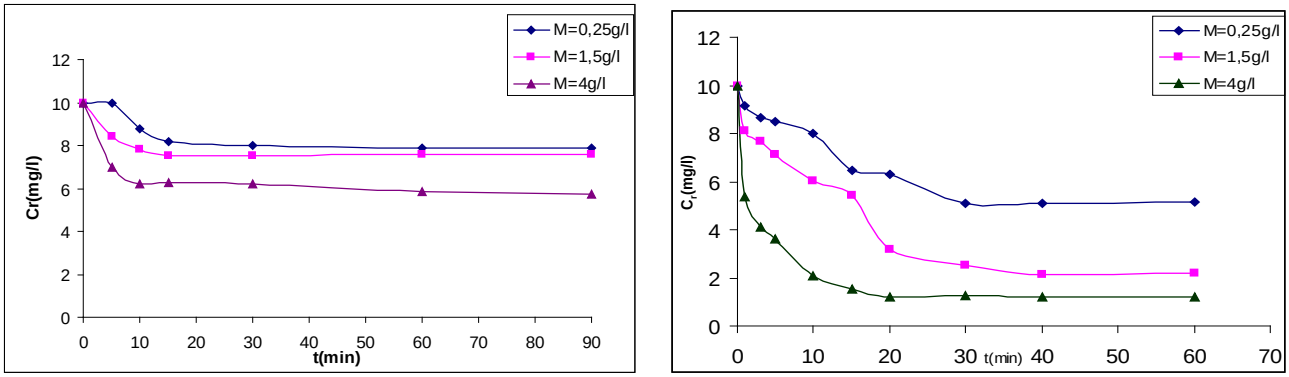
d) Modeling adsorption isotherms

The experimental isotherms of adsorption equilibrium and maximum adsorption capacity have been validated in detail by the Langmuir model (Corn stalks (Table 2), Mytilus Edulis shells (Table 3)) and Freundlich model (Corn Stalks (Table 4), Mytilus Edulis (Table 5)). The isotherms obtained were L-type according to the classification of Giles [16], which promotes a monolayer adsorption and the interaction between the adsorbate and the adsorbent is important.



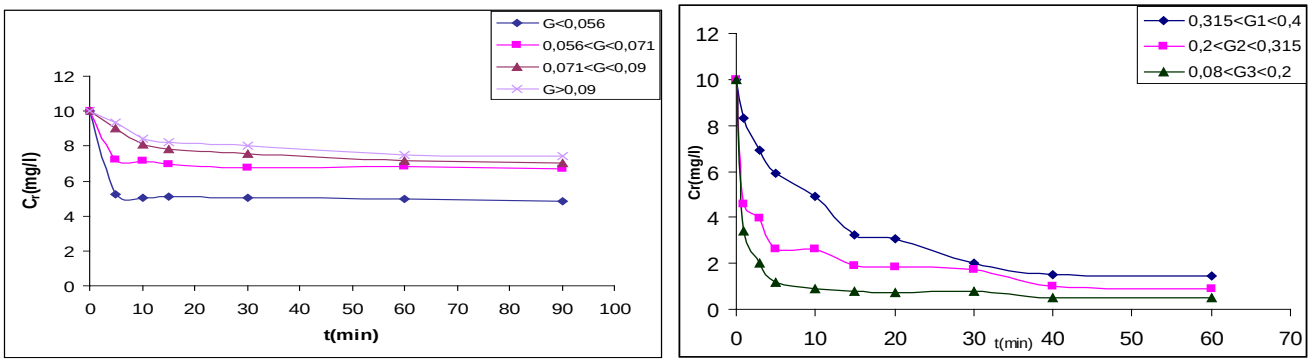
(A) Mytilus edulis shells (B) Corn Stalks

Figure 1 : Effect of Methylene Blue concentration, pH = 6,8; g <0,056 mm; adsorbent dosage 4 g.l-1; ambient temperature.



(A) Mytilus edulis shells (B) Corn Stalks

Figure 2 : Effect of adsorbent dosage, pH = 6,8; initial concentration 10 mg.l 1; G <0,056 mm; ambient temperature.



(A) Mytilus edulis shells (B) Corn Stalks

Figure 3 : Effect of adsorbent particle size, pH = 6,8; initial concentration 10 mg.l-1; adsorbent dosage 4 g.l-1 ; ambient temperature.

Table 2 : Parameters of Langmuir adsorption of methylene blue onto Corn Stalks.

C_0 (mg.l^{-1})	K_L(l.mg^{-1})	q_m (mg.g^{-1})	r^2	R_L
20	0,023	500	0,9858	0,684
40	0,1429	58,479	0,9718	0,149
50	0,313	29,154	0,9692	0,050

Table 3 : Parameters of Langmuir adsorption of methylene blue onto Mytilus Edulis Shells.

C_0 (mg.l^{-1})	K_L(l.mg^{-1})	q_m (mg.g^{-1})	r^2	R_L
20	0,149	95,23	0,8271	0,251
40	0,91	5,66	0,8316	0,027
50	0,81	3,43	0,9083	0,024

Table 4 : Parameters of Freundlich adsorption of methylene blue onto Corn Stalks.

C_0 (mg.l^{-1})	K_F (mg$^{(1-n)}$l ^{n}g^{-1})	n	r^2	q_m(mg.g^{-1})
20	2,867	0,901	0,985	42,624
40	2,50	0,617	0,9706	24,336
50	3,389	0,134	0,889	5,866

Table 5 : Parameters of Freundlich adsorption of methylene blue onto Mytilus Edulis Shells.

C_0 (mg.l^{-1})	K_F (mg$^{(1-n)}$l ^{n}g^{-1})	n	r^2	q_m(mg.g^{-1})
20	1,258	0,4586	0,8057	40,969
40	2,474	0,5245	0,844	17,12
50	1,845	0,4867	0,9758	12,38

The results show that the maximum adsorption capacity (q_m) obtained from Langmuir model decreases with increasing the concentration value of the Methylene Blue (C_0). It reaches its maximum value at C_0 = 20 mg. l^{-1}. The adsorption is favorable (R_L tends to 0) and moderate (0.5< n <1).

The low values of maximum adsorption capacities obtained from the Freundlich model, confirm that the molecule of Methylene Blue is not strongly adsorbed inside the pores because of its size.

IV. Conclusion

This review highlighted the capacities of Corn Stalks and Mytilus Edulis shells to pretreat raw wastewaters. The extent of dye removal increased with decrease in the initial concentration of dye and particle size of the adsorbents and also increased with increase in contact time and the adsorbents doses used. The equilibrium adsorption is practically achieved in 60 min. Adsorption data were modelled using the Freundlich and Langmuir adsorption isotherms. The adsorption capacities of Corn stalks and Mytilus Edulis shells reaches a maximum at C0=20 mg.l-1. We can say that Mytilus Edulis shells adsorb dyes better than Corn stalks with a high maximum adsorption capacity in comparison with corn stalks. The results indicate that both Corn stalks and Mytilus Edulis shells could be employed as low-cost alternative to commercial activated carbon in methylene blue wastewater treatment.

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Micronutrient Contents of Under-Utilized Spices Common in Nigeria

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Abstract - Vitamin and Mineral contents of five indigenous spices common in Nigeria were investigated. The spices include: 'bailo' (Uapaca guineense); 'atarko' (Zanthoxyllus zanthoxyloides); 'amilo' (Parinari excelsa); 'uburo' (Afromomum danelli) and 'clove' (Syzygium aromaticum). These samples are processed into fine flour, ashed at 5500c and later subjected to wet digestion using nitric sulphuric and perchloric acid. The mineral contents in mg/1 for iron, ranged from 0.99 (S.aromaticum) to 4.42 (U.guineense); zinc 1.24 (P.excelsa) to 3.81 (Uguineense); calcium 12.45 (Z.Zanthoxyloides) to 20.60 (A.danelli); magnesium 16.91 (P.excelsa) to 44.78 (A.danelli); potassium 48.97 (P.excelsa) to 153.66 (A.danelli); Sodium 64.77 (Z.Zanthoxyloides) to 155.70 (P.excelsa). The phosphorus contents for all the samples studied was insignificant. The data obtained for vitamin A showed that Z.Zanthoxyloides had the highest value (3.84 IU) and S.aromaticum the least (0.26 IU); while no value was detected for U.guineense and P.excelsa. Vitamin C contents also was highest for S.aromaticum (31.73/100g) and least for A.danelli (5.55mg/100g). These spices however can serve as mineral and vitamin supplements. The samples studied had good storage properties since they exhibited moisture content below 20%.

Keywords : *Indigenous spices, Vitamin, Mineral, Dry matter.*

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I. Introduction

Spices are condiments of plant origin consisting of parts of trees, seeds shrubs and grass which abound in the tropical rainforest and savannah grass land zones (Pearson, 1976). They are often referred to as food accessories or adjuncts because of their ability to stimulate appetite and increase the flow of gastric juice (Diezak, 1989). Some common examples are garlic, ginger, piper nigrum etc. They are used principally to spice foods, drinks and as medication for various ailments (Achinewhu, 1996; Nwiruka et al 2005).

Indigenous spices and herbs in Nigeria are mostly obtained from the wild (Abib 1994) and little attempt has been made to domesticate and cultivate them despite the fact that they constitute a large proportion of the daily diets of rural dwellers (Achinewhu, 1996). Although, they are used nutritionally in insignificant quantities, some researchers have argued that they can also contribute to the nutrient content of the food (Ranjith and Rosabalch, 1995).

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Studies have been carried out on spices mostly on their flavours and aroma (Agooha, 1981., Iwu, 1989), medicinal values (Gammaniel and Akalu, 1986); antinutrients (Nwinuka et al 2005., Nwachukwu and Ukoha, 2006, Ogunka-Nnoka and Mepba, 2008); as well as in drinks and beverages and in the production of perfumes (Aldelany and Bavrakat, 1970., Purseglove, 1991).

Spices cannot be recognized as major sources of macronutrients, but they can be potential sources of some micronutrients (Ranjith and Rosabalch, 1995; Achinewhu, 1996). Some under-utilized spices in Nigeria namely 'bafilo' (Uapaca guineense); 'atako' (Zanthoxyllus zanthoxyloides); 'amilo' (Parinari excelsia); 'uburo' (Afromonum danielli) and 'clove' (syzygium aromaticum) have been studied for their proximate and antinutritional factors and were found to contain antinutrients in low toxicity levels (Ogunka-Nnoka and Mepba, 2008). It will be necessary to expand the nutritional contribution towards knowing the amount of mineral and vitamin contents present visa vis their importance to health.

II. Materials and Methods

a) Sample source

Samples of 'Vapaca guineense, zanthoxyllus zanthoxyloides, Parinari excelsa, Afromum danelli and syzygium aromaticum were purchased from local farmers from Ughelli at the fruit garden market in Port Harcourt, Rivers State Nigeria.

b) Sample preparation

Samples (300g each) were sorted and cleaned to remove rotten seeds and debris. The seeds were dehulled and oven dried at 600c for 12 hours. Dried samples were separately ground in a kenwood food processor, Model 967 England, then sieved to 300 min mesh. The processed spices were packaged in sealed low density polythene bags and stored in a desiccators for subsequent analysis.

III. Chemical Analysis

a) Mineral analysis

Metals such as sodium (Na) potassium (k) calcium (Ca), Magnessium (mg), 'iron (fe) and zinc (zn) were of analysed from the indigenous spices. Samples were digested following the procedure described by Salami and Non, (2002). Briefly, samples (1.0g each of

oven dried flour were digested with 5ml concentrated nitric acid ($HN0_3$) and 1ml each of concentrated sulphuric acid ($H2SO_4$) and 60-62% *perchloric* acid ($HCLO_4$) and heated until white fumes of perchloric acid formed. The volume of the digest was reduced by heating but not to dryness. The flask was set aside to cool, after which the content was diluted with distilled deionized water and then filtered into a 50ml volumetric flask. The content was made up to mark with deionized water and stored until analyzed for mineral contents using Atomic Absorption spectrophotometer (AAS), phosphorous content of the digest was determined spectrophoto metrically according to method described by Nahapetain and Bassiri (1975).

b) Vitamin A and C analysis

Vitamin A content was determined using antimony trichloride as described by Kefford et al, 1974, while vitamin C content was determined using the EDTA/TCA extraction method as described by Baraket et al, 1973.

IV. Dry Matter Content

Dry matter content of the sample were determined by the AOAC, 1995 method.

a) Statistical analysis

The data obtained were subjected to analysis of variance (ANOVA) to determine any significant difference at 5% level using steel and Tornic (1980) method. Means were separated by Duncan's New multiple range test to establish if there were significant differences between the samples (Wahua, 1999).

V. Results and Discussion

Table 1 shows the moisture contents of the spices studied. The moisture contents obtained were 13.56, 12.16, 12.01, 11.83 and 10.67% for S.aromaticum, A.danielli U.guineese, P.excelsia and Z.zanthoxylloides, while the corresponding values of dry matter are 86.44, 87.84, 87.99, 88.17 and 89.33% respectively. The values shows that almost 90% of the spices consist of dry matter content although S.aromaticum had a significant moisture compared to the other samples.

The moisture obtained in this result slightly varied from the previous reports (Ogunka-Nnoka and Mepba, 2008). This may be attributed to seasonal variation or processing methods. The result generally corroborates the reports of Nwachukwu and Ukoha, 2006 for other indigenous spices.

Table 1 : Moisture and dry matter contents of the spices.

Sample	Moisture contest(%)	Dry matter contents
U.guineense	12.01^{b}	87.99^{ab}
Z. zanthoxylloides	10.67^{c}	89.33^{a}
P.excelsia	11.83^{b}	88.17^{a}
A.danelli	12.11^{b}	87.84^{ab}
S. aromaticum	13.56^{a}	86.44^{c}

Values are means of triplicate determination. Means in the column not followed by the same superscripts differ significantly.

The results of mineral contents of the spices are shown in table 2. the Fe (4.42mg/1), and Zn (3.81mg/l) levels were significantly ($p \leq 0.05$) high in U.guineese while S.aromaticum and P.excelsia were relatively low in Fe (0.99mg/l) and Zn (1.24mg/l) contents respectively. Ca (20.60mg/l) and Mg (44.78mg/l) were significantly ($P \leq 0.05$) high in Adanielli; while Na (155.70mg/l) and K (153.66mg/l) were significantly high in P.excelsia and A.danielli respectively. Relatively low values of Ca (12.45mg/l) and Na (64.77mg/l) were obtained for Z.zanthoxylloides. P.excelsia had low values of Mg (16.91mg/l) and K (48.97mg/l). Phosphorus level was insignificant in all samples studied.

Potassium plays a large role in supporting the nervous system and natural heart rhythm. It stabilizes blood pressure and help in electrochemical transmission and has been shown to prevent strokes. It also works with sodium to maintain a proper water balance in the body (Jennifer, 2009). These spices, especially *P.excelsia* and *A.danielli* being highly rich in Na and K respectively may be used therapeutically in the area of medicine and to meet the RDA in infants and adults (Bamishaiye et al., 2011). However the high levels of Na in these samples will not favour their incorporation in the diet of obese and hypertensive patients; based on the fact that the effect of high sodium intake on cardiac failure is well known (Sofola, 1981; Olowoyeye, 1981). The moderate level of iron and the relatively low Zn contents could still serve for medicinal purpose. Since iron is vital for the production of haemoglobin, formation of red blood cells and the oxygenation of red blood cells. Iron also improves circulation, digestion, elimination and respiration Zinc promotes a healthy immune system, taste, smell, joint, and connective tissue, cell division, repair and growth and helps in the proper functioning of insulin (Jennifer,

2009). The recommended daily intake is between 8-15 mg/ and dose larger than 25mg may cause anaemia and copper deficiency (Lenntech water treatment and B.V. purification, Holdings, 2005). The level of Zn in these samples meets the recommended dietary requirements and agrees with the result obtained by Bamishaiye et al., 2011 for Zobo drink. The concentration of Ca and Mg in these samples are moderate. Calcium is quantitatively most abundant mineral in the body and in ionic form it regulates transport across the cell wall. Also, the cells need calcium such that 99% of calcium in the body is used for healthy teeth, bones and muscles growth, while magnesium has a vital role in a varying range of biochemical and physiological process including binding to ATP to form active ATP, contributing to DNA and RNA synthesis, nerve and heart function as it brings about decrease in blood pressure. It has been reported that mg and Ca serve as cofactors in a number of enzyme systems and are involved in neurochemical transmission and muscular excitability. Severe deficiency of Mg causes, tetany just like when calcium level falls (Ukoha, 2006). Consuming these species will definitely contribute to the required daily allowance (RDA) of infants and adults. The amount of mineral content reported in this study may vary based on factors like the time of harvest, method of processing and the type of planting soil. It is also possible that most of the moisture lost during processing may contain some mineral. These spices contain low toxic levels of antinutrients making it possible for the minerals to be easily absorped without any interference.

Table 2 : Mineral contents of the spices.

Minerals (mg/l)	SAMPLES				
	U.guineense	Z. zanthoxylloides	P. excelsia	A. danielli	S. aromaticum
Fe	4.42^{a}	2.22^{b}	1.14^{b}	3.92^{a}	0.99^{bc}
Zn	3.81^{a}	1.61^{b}	1.24^{b}	1.84^{b}	1.62^{b}
Ca	17.43^{b}	12.45^{c}	13.47^{c}	20.60^{a}	13.98^{c}
Mg	29.24^{b}	21.59^{c}	16.91^{c}	44.78^{a}	17.55^{d}
Na	121.60^{b}	64.77^{e}	155.70^{a}	110.22^{c}	76.36^{d}
K	53.14^{c}	60.46^{b}	48.97^{d}	153.66^{a}	60.38^{b}
P	<0.01>	<0.01>	<0.01>	<0.01>	<0.01>

Values are means of triplicate determinations. Means in the same column not followed by the same superscripts differ significantly (P. ≤0.05).

The vitamin A and C contents are shown in Table 3 below. The vitamin A content was significantly (P. ≤0.05) high in Z.zanthoxylloides (3.84IU) and was not detected in U.guineense and P.excelsia. All samples with the exception of A.danielli had appreciable yield of vitamin C. Absence of vitamin A in some spices may not be clearly explained; however, one could suggest that the intrinsic lipid properties that identifies vitamin A as fat soluble vitamin may be lacking in these samples. The high vitamin C concentration is an added advantage in prophylactic control of malignant growths like cancer and the effects of free redical damage which leads to aging (Nwaoguikpe, 2009). As an antioxidant, it also help in the production and maintenance of collagen (Matters and Wildowson, 1992).

These results can be compared with the report by Okwu and Josiah, (2006) for A.Africana and B. Pinnatum. However, vitamin C content of these spices results are lower than what Nwachukwu and Ukoha, 2006 reported Zylopia aethiopica (89.76 mg/100g), and piper guineense (117.68mg/100g) The appreciable mineral and vitamin C contents of these spices and also the significant yield of vitamin A in Z.zanthoxylloides reveals the nutritional importance of these spices.

Table 3 : Vitamin contents of the spices.

Sample	Spices Vitamin A	Vitamin C
U.guineense	ND	17.72^{c}
Z. zanthoxylloides	3.84^{a}	16.54^{c}
P.excelsia	ND	21.85^{b}
A.danelli	0.38^{b}	5.55^{d}
S. aromaticum	0.26^{b}	31.73^{a}

Values are means of triplicate determinations. Means in the same column not followed by the same superscripts differ significantly (P. ≤0.05).

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Kinetic & Thermodynamic Study for Adsorption- Desorption of Diazinon with Copper in The Presence of Surfactant

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Abstract - In the present work change in the adsorption-desorption processes of Diazinon[O,O-diethylo-(2-isopropyl-6-methyl4pyrimidinyl) phosphorothioate] which is nonionic-organophosphorous pesticide, preformed by using batch equilibrium experiments on six agricultural soil samples. The kinetics study for adsorption processes investigated that first order rate law and power function equation model provided the best correlation with experiment results. The isothermal models Linear, Freundlich, and Langmuir were applied to describe the adsorption-desorption affinities to the soils. Thermodynamic parameters (**Δ**G, **Δ**H and **Δ**S) were also calculated according to the values of binding Langmuir constant K_L at 10, 25, 40 $\pm 1^{o}$C. Linear coefficient K_d values for adsorption process of diazinon varied between 3.261 - 6.413 mlg-1. Freundlich coefficient KF values for adsorption process varied between 1.194 - 1.506 mlg^{-1}. Langmuir coefficient KL for adsorption process varied between 0.017 - 0.020 mlg^{-1}. The negative values for each of **Δ**G, **Δ**H and **Δ**S constants confirmed that diazinon adsorption processes more at lower temperature and done via enthalpy effect.

Keywords : *Adsorption- desorption isotherms, Copper, Diazinon, HPLC, Surfactant.*

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Kinetic & Thermodynamic Study for Adsorption–Desorption of Diazinon with Copper in The Presence of Surfactant

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Abstract - In the present work change in the adsorption-desorption processes of Diazinon[O,O-diethylo-(2-isopropyl-6-methyl 4 pyrimidinyl) phosphorothioate] which is nonionic-organophosphorous pesticide, preformed by using batch equilibrium experiments on six agricultural soil samples. The kinetics study for adsorption processes investigated that first order rate law and power function equation model provided the best correlation with experiment results. The isothermal models Linear, Freundlich, and Langmuir were applied to describe the adsorption-desorption affinities to the soils. Thermodynamic parameters (ΔG, ΔH and ΔS) were also calculated according to the values of binding Langmuir constant K_L at 10, 25, 40 ±1°C. Linear coefficient K_d values for adsorption process of diazinon varied between 3.261 - 6.413 mlg^{-1}. Freundlich coefficient KF values for adsorption process varied between 1.194 - 1.506 mlg^{-1}. Langmuir coefficient K_L for adsorption process varied between 0.017 - 0.020 mlg^{-1}. The negative values for each of ΔG, ΔH and ΔS constants confirmed that diazinon adsorption processes more at lower temperature and done via enthalpy effect.

To investigate the presence of copper on the adsorption process of diazinon which enhance the adsorption, K_d, K_F and K_L values varied between 4.809 - 9.454 mlg^{-1}, 1.198-1.656 mlg^{-1} and 0.008- 0.023 mlg^{-1} respectively. Application of nonionic surfactant at critical micelles concentration cmc on the desorption for the presence of copper on the adsorption process of diazinon, K_d, K_{Fdes} and K_L for desorption process in presence of the nonionic surfactant ranged varied between 3.729- 8.058, 0.800- 1.207 and 0.005- 0.011 mlg^{-1} respectively. All results show a high hysteresis effect for Adsorption desorption processes.

Keywords : Adsorption- desorption isotherms, Copper, Diazinon, HPLC, Surfactant.

I. Introduction

Diazinon [O,O-diethylo-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate] insecticide for agricultural and indoor pest control, it used for the control of pest in cruciferous vegetables and for controlling insect pests of tobacco plants (1&2). Organophosphours compound tend to have the characteristic phosphoryl bond oxon P=O, and thiophosphoryl bond thion P=S (3&4). It degrades photochemically produced hydroxyl radicals, degrading from thion to oxon compounds (5). The detection of organophosphates based on the reaction of the unshared pair of electrons available at the nitrogen of a pyridine ring with the available pair of electrons at the positive site of the organophosphates. A displacement takes place, with the alcohol moiety being split off (6&7). Hydrolysis of diazinon is relatively slow at pH 7 and 9, but is faster at pH 5 (8). Diazinon has toxic degradation products, and is a clear threat to aquatic ecosystems and salmon at current use rates, it commonly detected in surface water (9). The rate of adsorption in soil pore governed by temperature which indicated a partly physical and partly chemical(10). The correction of solubility- temperature effect on the standard enthalpy of the pesticide adsorption processes(11).

The presence of copper enhances adsorption due to strongly coordination and complex formation or through forming a bridge between the soil and diazonin. Finally it may be via the lowering negative charge, which easily adsorbed to the negatively charged soil surface (12).

The presence of nonionic surfactant with nonpolar end at cmc concentration enhances the apparent solubility of hydrophobic organic compounds when both coexist in soil. It represent an important tool for chemical remediation of contaminated soils(13&14). The molecule character has a great effect on adsorption and mobility through soil(15).

II. Materials and Methods

a) Soils

Fresh soil samples were taken from six soil samples were collected from six main agricultural, representing a range of physico-chemical properties. Subsamples of homogenized soils were analyzed for moisture content, organic matter content, particle size distribution, texture, pH, loss on ignition and exchangeable basic cations the detail were characterized in previous article(16).

b) Materials

Analytical grad substituted with following purities expressed in weight percent diazinon (purity 99%), were all purchased from Riedal-de Haen, Sigma-Aldrich company ltd. A nonionic surfactant TritonX 100

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(TX-100), its chemical name is [Octylphenol ethoxylate] surfactant, its Empirical formula is $(C_8H_{17}C_6H_4O(CH_2CH_2O)_NH)$; where N=9.5, its molecular weight is 625 g mol^{-1}, and its critical micelles concentration cmc concentration 0.0002M was obtained from Fluka AG, Buchs SG, and were used without further treatments. All chemicals used were of analytical grade reagents and used without pre-treatments. Standard stock solutions of the pesticides were prepared in deionised water.

c) Adsorption-Desorption Experiments

Adsorption of the pesticides from aqueous solution was determined at temperature (25±)1 C employing a standard batch equilibrium method. An aqueous stock solution of diazinon of 100 mgL^{-1} was prepared daily by diluting 1μl in 100 ml de-ionized water and methanol as co-solvent[6]. The stock and working solution were stored in the dark at 5°C for up to two days. Duplicate air-dried soil samples were equilibrated with different pesticide concentrations (25, 50, 75, and 100 μg ml^{-1}) at the soil solution ratio 1:10. The samples plus blanks (no pesticide) and control (no soil) were thermostated and placed in shaker for 0.5, 1, 2, 2.5, 3, 3.5, 4, 6 and 24h. The tubes were centrifuged for 20 min. at 3000 rpm. One ml of the clear supernatant was removed and analyzed for the pesticide concentration. Pesticide identification was done by PerkinElmer series 200 USA family high performance liquid chromatography (HPLC) equipped with a changed loop (20μl), C_{18} reversed phase column, flow rate 1.5 ml min^{-1}, and a variable wave length UV detector at wavelength 240 nm. Separation of diazinon in aqueous phase was achieved with a mobile phase of ratio 65:35 acetonitrile to water. Under these conditions the retention time was 4.49 min. To study the effect of temperature the same experiments done at temperature (10, 25, 40 ±1 C°) employing a standard batch equilibrium method[11].

The adsorption of diazinon-copper experiments done in the presence of 40 mgL^{-1}copper, the samples were shaken for 24h, and the amounts of Cu adsorbed were calculated from the difference before and after equilibrium. Each sample was injected twice to determine the pesticide content by integrating the obtained peak with the respective standard pesticides. The pesticide content was average of two measurements, with no more than 5% deviation between the measurements. Desorption processes were done at 25 ±1 ℃and done as each test tube was placed in a thermostated shaker after equilibration for 24 h with different pesticide concentrations the samples were centrifuged 5ml of supernatant was removed from the adsorption equilibrium solution and immediately replaced by 5ml of surfactant and this were repeated for four times [12&17].

III. Data Analysis

a) Adsorption Kinetics

The rate constants for adsorption of each pesticide on soils were calculated using the first order rate expression[18]:

$$Log(C_\circ - C_t) = \log C_\circ - \frac{k}{2.303}t \qquad (1)$$

Where k is the rate constant ($hour^{-1}$), t the time (hour), C_o the concentration of pesticide added(μg ml^{-1}) and C_t the amount adsorbed (μg ml^{-1}) at time t. In all cases, first order equation provided satisfactory fit for the data by a linear plots of log (C_o – C_t) against t as shown in (Table 1).

Power function equation used to describe the pesticides adsorption-desorption from soils is given as[19]:

$$Ln(C_t) = \ln C_\circ - k \ln t \qquad (2)$$

Where C_t is the amount of the pesticides released at time t. A plot $\ln C_t$ versus ln (t) should give a straight line with a slope (k) and the intercept is ln (C_o) where the value of slope of straight line is coefficient of release rate as shown in (Table 1).

b) Adsorption-Desorption Isotherms

i. *Linear Adsorption Coefficient (Distribution Coefficient)*

The distribution coefficient (K_d) was calculated using the equation [17&20]:

$$C_s = K_d C_e \qquad (3)$$

The distribution coefficient (K_d) was calculated by taking the ratio of adsorption concentration in soil (C_s) and equilibrium concentration in solution (C_e). The results were summarized in (Table 2, 3, 4, and 6).

ii. *Freundlich Adsorption Isotherm*

Adsorption isotherm parameters were calculated using the linearized form of Freundlich equation[21]:

$$LogC_s = \log K_F + \frac{1}{n}\log C_e \qquad (4)$$

C_s and C_e were defined previously, K_F is Freundlich adsorption coefficients, and n is a linearity factor, it is also known as adsorption intensity, 1/n is the slope and $\log K_F$ is the intercept of the straight line resulting from the plot of $\log C_s$ versus $\log C_e$. The values of K_F and 1/n calculated from this regression equation showed that Freundlich adsorption model effectively describes isotherms for both pesticides in all cases. The results were summarized in (Table 2, 3, 4, and 6).

iii. *Langmuir Adsorption isotherm*

Data from the batch adsorption conform to Langmuir equation[22]:

$$\frac{C_e}{C_s} = \frac{1}{C_m K_L} + \frac{C_e}{C_m} \quad (5)$$

C_m is the maximum amount of pesticide adsorbed (adsorption maxima, μg ml^{-1}), it reflects the adsorption strength and K_L is the Langmuir adsorption coefficient, binding energy coefficient. The results were summarized in (Table 2, 3, 4, and 6).

The same equations (3, 4 and 5) used to describes the process of desorption in all experiments and on all soil samples [23]. Where k is k_{des} is the desorption rate constant (h^{-1}), Ct is the amount of released pesticides at time t and C is C_e is the amount of released pesticides at equilibrium the results was demonstrated in (Table 6).

c) Thermodynamic parameters

i. *Standard free energy change*

Values of binding Langmuir constant K_L, can be expressed in terms of the standard Gibbs or free energy for adsorption (ΔG) [24].

$$\Delta G = -RTLnK_L \quad (6)$$

The results were summarized in table 5.

ii. *Standard enthalpy change*

The standard enthalpy change of adsorption (ΔH) represents the difference in binding energies between the solvent and the soil with the pesticides. Values of ΔH determined graphically from the following equation[25]:

$$LnK_L = \frac{\Delta H}{RT} + cons\tan t \quad (7)$$

Plotting $-\ln K_L$ against 1/ T, a straight line is expected the standard enthalpy change (ΔH) of adsorption were determined from the slope as shown in Fig1. The results were summarized in table 5.

iii. *Standard entropy change*

The entropy changeΔS for each system were determined by using the equations bellow [26].

$$\Delta G = \Delta H - T\Delta S \quad (8)$$

The values of ΔS were summarized in table 5.

d) Hysteresis coefficient

Hysteresis coefficients (H), can be determined by using the following equation[27].

$$H1 = \frac{n_a}{n_{des}} \quad (9)$$

Where n_a and n_{des}ratio for Ferundlich adsorption and desorption constants, respectively, indicating the greater or lesser irreversibility of adsorption in all samples, the highest values corresponding for which the highest adsorption constant was obtained. The coefficient H_1 is a simple one and easy to use, Data in table 7 demonstrated H_1 values the selected soil samples.

The extent of hysteresis was quantified by using hysteresis coefficient (ω), it was defined on the discrepancy between the sorption and desorption isotherms, and calculated by using Freundlich parameters estimated from sorption and desorption isotherms separately, (ω) expressed as[28]:

$$\omega = (\frac{n_a}{n_{des}} - 1)x100 \quad (10)$$

Recently Zhu et. al [23] proposed an alternative hysteresis coefficient (λ) based on the difference in the areas between adsorption and desorption isotherms, they derived the following expression for the parameter λ for the traditional isotherms:

$$\lambda = (\frac{n_a + 1}{n_{des} + 1} - 1)x100 \quad (11)$$

e) Organic matter normalized adsorption coefficient

The linear or distribution coefficient (K_d) is related to soil organic carbon (OC) and soil organic matter (OM) by the following equations[21]:

$$\%OC = \frac{\%OM}{1.724} \quad (12)$$

$$K_{OM} = \frac{100K_d}{\%OM} \quad (13)$$

$$K_{OC} = \frac{100K_d}{\%OC} \quad (14)$$

IV. Results and Discussion

Data in Table 1 showed the values of rate constant for the adsorption of diazinon on different soil samples using two models first order rat law and power function equations, the values were in the range from 0.967 to 2.139 h^{-1} and 0.104 to 0.244h^{-1} for the two equations respectively, and the value of standard error (S.E.) from 0.129 to 0.185 and from 0.132 to 0.214 for the two equations respectively. Diazinon has a high octanol water partition coefficient ($\log K_{ow}$= 3.81) exhibited the moderate rate of accumulation with 14.1 % adsorption on the soil solid matrix after 0.5 hours. The

adsorption of diazinon in all cases followed first order rate law as reported in literature [29]. The non-linear adsorption isotherms might be expected for diazinon which competes with a limited number of cation exchange sites contributes significantly to adsorption process. The magnitude of the Kd is moderate were ranged between 3.261 - 6.413 mlg^{-1}. as shown in Fig2-a. These findings are in agreement with the hydrophobicity of the pesticide as represented by octanol-water partition coefficient value [29].

The Freundlich adsorption model effectively describes isotherm for diazinon on all soil samples as shown in Fig2-b, values of K_F were varied from 1.194 1.506 mlg-1. Values of KF for diazinon was in the order of S3>S4>S5>S1>S6>S2, the difference in the behavior of diazinon toward the soil samples is due to the difference in the type of interaction with the soil which it is likely due to the binding of its phosphoric side moiety to cation on the clay or organic matter, adsorption is correlated with unoqupied phosphate adsorption capacity of a soil. The values of n all n>1 the variable slopes of the adsorption isotherm obtained for different soil systems studied reveal that diazinon adsorption on soil is complex phenomena involving different types of adsorption sites with different surface energies[20].

Langmuir adsorption model effectively describes isotherm for diazinon on all soil samples as shown in Fig2-c, with regression factor R^2 ranged between 0.704- 0.948, values of K_L ranged from 0.017 to 0.020 mlg^{-1} the maximum amount of diazinon adsorption (C_m) ranged from 333.33 to 1000 mg g^{-1} the high C_m values on the examined soil samples could be explained by the high affinity of diazinon to bind to soil organic matter and clay values of K_L for diazinon was in the order of $S_4>S_1>S_3>S_6>S_5>S_2$. The different value of adsorption coefficients for the same pesticide with different soils is due to soil organic carbon and clay content. A significant differences in the chemistry of the soil organic carbon may be encountered from soil to soil in its polarity, elemental composition, aromaticity, and condensation evolution from loss polymer to condensed cool –like structures[30&31]. Therefore, soil organic carbon and clay are not adequate to estimate different soil adsorption capacity, but also their quality and their chemical nature are important.

Data in Table 2, 3, and 4 shows the effect of temperature on the adsorption of diazinon on different soil samples. The values of free energy change ΔG for adsorption of the studied pesticides on the selected soil samples at 283.15, 298.15 and 313.15K were summarized in tables 5. The negative value of ΔG and decreased with the rise in temperature, indicating that at all experimental temperatures; the interactions of diazinon on soils were spontaneous [32]. The ΔG values were in the range -5.888 to -11.742 $KJmol^{-1}$. The negative values of ΔH indicated the exothermic behaviors of the reaction, as the temperature increases the negative values of ΔH is decreased. The linear nature of the plot indicates that the mechanism of adsorption is not changed as temperature is changed. The values of enthalpy change ΔH followed the range -7.892 to -47.887 $KJmol^{-1}$. The values of R^2 were in the range 0.816 to 0.996. The negative enthalpy of adsorption for partition coefficient, indicating an exothermic binding reaction, showing that the interaction of pesticides with the soil is an energetically stable exothermic process and the adsorption occurred through a bonding mechanism[11&33]. The negative values of entropy change ΔS followed the range -65.600 to -194.48 $Jmol^{-1}$ k^{-1}.

The presence of copper on the adsorption process of diazinon which enhance the adsorption as shown in table 6, K_d, K_F and K_L values for adsorption process varied between 4.809 - 9.454 mlg^{-1}, 1.198-1.656 mlg-1 and 0.008- 0.023 mlg^{-1} respectively. The regression coefficient R^2 value ranging between 0.697-0.766, 0.853-0.993, and 0.713-0.987 for each model respectively, the standard error S.E. value between 0.118 – 0.372, 0.424-0.569, and 0.231-0.287. The regression equations relating that the highest values are the most fitted model, our results agreed with research[13]. The desorption experiments were conducted with a nonionic surfactant TritonX-100 at concentration 0.1cmc, cmc and 20cmc on diazinon sorbed soil[17&34]. The K_d values for desorption process in the presence of cmc concentration of the surfactant varied between 3.729- 8.058mlg^{-1} while the value of R^2 ranging from 0.874 to 0.979 with standard error S.E. value between 0.165 – 0.630. Freundlich coefficient for desorption process K_{Fdes} for diazinon in the presence of cmc concentration of the surfactant varied between 0.800- 1.207 mlg^{-1}, the R^2 value ranging from 0.982 to 0.998 with S.E. 0.404-0.607, the values of n_{Fdes} 1.166-1.348. Langmuir desorption coeffecient K_L ranged from 0.005- 0.011 mlg^{-1} the maximum amount of diazinon desorption (C_m) ranged from 500 to 1000 mg g^{-1} the R^2 value ranging from 0.636 to 0.989 with S.E. 0.138-0.219.

Data in table 7 demonstrated H1 values for diazinon from the selected soil samples in the range from 1.236-1.714. The calculated values of hysteresis coefficient (ω) for adsorption-desorption for diazinon on the selected soil samples ranged from 23.6 to 71.4. Whereas hysteresis coefficient (ω) is only applicable for the traditional type isotherms of the successive desorption[35&36].The hysteresis coefficient (λ) for diazinon from the selected soil samples were ranged from -22.3 to 47.8 .

V. Conclusion

The batch kinetics experiments were used to investigate the behavior of diazinon in six agricultural soil samples. The soil OC and clay content and the chemical

nature of both constituents determined the adsorption affinity of the soil. The using of pesticide diazinon may increase pesticides leaching to depth relative to the use on agricultural soil samples. The cmc concentration gave the best results in desorption. So the used surfactant solution is therefore fairly effective in desorption of diazinon from the contaminated soil. Thermodynamics and kinetic investigations of clay and soils are limited. Adsorption experiments were conducted at 10, 25, and 40°C to study the thermodynamic parameter, associated with the adsorption of the studied pesticides on the selected soil samples.

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Table 1 : Adsorption rate constants for diazinon adsorption on the selected soil samples.

Soil	Conc. ppm	First order rate equation			Power –function equation		
		(calc (h^{-1})		R^2	(calc (h^{-1})	S.E	R^2
S_1	25	1.288	0.148	0.884	0.244	0.135	0.963
	50	1.372	0.144	0.824	0.121	0.174	0.932
	75	1.500	0.143	0.967	0.108	0.197	0.998
	100	1.320	0.153	0.813	0.123	0.208	0.918
S_2	25	1.442	0.144	0.978	0.107	0.142	0.917
	50	1.566	0.143	0.958	0.157	0.179	0.801
	75	1.605	0.144	0.910	0.135	0.200	0.984
	100	1.083	0.138	0.997	0.131	0.214	0.892
S_3	25	1.071	0.129	0.848	0.172	0.133	0.980
	50	1.329	0.129	0.939	0.185	0.175	0.973
	75	1.454	0.130	0.959	0.170	0.197	0.898
	100	1.429	0.130	0.984	0.186	0.211	0.858
S_4	25	0.967	0.131	0.986	0.152	0.132	0.839
	50	1.197	0.134	0.937	0.180	0.173	0.946
	75	1.395	0.134	0.930	0.146	0.198	0.707
	100	1.411	0.139	0.985	0.182	0.211	0.913
S_5	25	1.092	0.135	0.863	0.136	0.135	0.994
	50	1.166	0.133	0.974	0.185	0.172	0.934
	75	1.422	0.139	0.979	0.171	0.197	0.831
	100	1.518	0.145	0.950	0.184	0.212	0.952
S_6	25	1.117	0.130	0.985	0.160	0.138	0.928
	50	1.596	0.145	0.969	0.106	0.179	0.960
	75	2.139	0.185	0.945	0.109	0.202	0.908
	100	1.579	0.142	0.991	0.104	0.214	0.931

Table 2 : Adsorption of diazinon linear, Freundlich and Langmuir models isotherm parameters on the selected soil samples at 283.15 K.

Adsorption Models	Parameter	Soils					
		S_1	S_2	S_3	S_4	S_5	S_6
Ads.Distr. coffi.	K_d (calc)	12.927	6.976	8.773	10.441	6.931	8.814
	S.E	0.376	0.279	0.329	0.286	0.132	0.127
	R^2	0.724	0.764	0.778	0.810	0.788	0.893
Freundlich	K_F(mL/g)	1.678	1.601	1.641	1.567	1.288	1.288
	S.E	0.639	0.499	0.551	0.592	0.509	0.558
	n_F	1.730	2.079	1.969	1.647	1.412	1.311
	R^2	0.991	0.938	0.951	0.998	0.963	0.987
Langmuir. coffi.	K_L (ml/g)	0.024	0.076	0.061	0.018	0.011	0.082
	S.E	0.205	0.263	0.242	0.219	0.282	0.225
	C_m(µg/g)	1000	500	1000	1000	1000	1000
	R^2	0.999	0.833	0.841	0.956	0.937	0.965

Table 3 : Adsorption of diazinon linear, Freundlich and Langmuir models isotherm parameters on the selected soil samples at 298.15 K.

Adsorption Models	Parameter	Soils					
		S_1	S_2	S_3	S_4	S_5	S_6
Ads.Distr. coffi.	K_d (calc)	6.413	3.261	5.503	6.107	5.200	3.559
	S.E	0.161	0.899	0.224	0.229	0.140	0.117
	R^2	0.862	0.737	0.725	0.784	0.720	0.730
	K_{OC}(mL/g)	229	314	172	259	272	236
	K_{OM}(mL/g)	3.949	5.411	2.968	4.469	4.682	4.066
Freundlich	K_F(mL/g)	1.353	1.194	1.506	1.494	1.357	1.291
	S.E	0.487	0.347	0.449	0.473	0.441	0.362
	n_F	1.572	1.754	2.045	1.912	1.724	1.893
	R^2	0.977	0.947	0.871	0.900	0.990	0.954
Langmuir. coffi.	K_L (ml/g)	0.019	0.017	0.019	0.020	0.018	0.019
	S.E	0.257	0.313	0.279	0.269	0.282	0.309
	C_m(µg/g)	1000	333.3	500	500	500	333.3
	R^2	0.855	0.796	0.704	0.708	0.948	0.854

Table 4 : Adsorption of diazinon linear, Freundlich and Langmuir models isotherm parameters on the selected soil samples at 313.15 K.

Adsorption Models	Parameter	Soils					
		S_1	S_2	S_3	S_4	S_5	S_6
Ads.Distr. coffi.	K_d (calc)	3.326	1.757	2.299	2.585	3.019	1.719
	S.E	0.141	0.399	0.602	0.369	0.725	0.335
	R^2	0.712	0.741	0.741	0.812	0.671	0.756
Freundlich	K_F(mL/g)	1.363	0.865	1.067	0.747	1.096	0.805
	S.E	0.346	0.249	0.284	0.317	0.335	0.248
	n_F	2.173	1.608	1.773	1.261	1.628	1.531
	R^2	0.777	0.934	0.957	0.952	0.917	0.940
Langmuir. coffi.	K_L (ml/g)	0.016	0.011	0.017	0.007	0.015	0.015
	S.E	0.316	0.343	0.333	0.321	0.317	0.345
	C_m(µg/g)	333.3	250	250	500	333.3	200
	R^2	0.745	0.761	0.879	0.776	0.778	0.905

Table 5 : Free energy change, standard entropy change and standard enthalpy change at three temperatures for adsorption of diazinon on the selected soil samples.

Temp(K)	Parameter	Soils					
		S_1	S_2	S_3	S_4	S_5	S_6
283.15	ΔG (kJ/mol	-8.780	-6.067	-6.584	-9.457	-10.617	-5.888
	ΔS (J/mol. K)	-66.260	-190.55	-135.57	-113.60	-65.600	-169.89
298.15K	ΔG (kJ/mol	-9.824	-10.100	-9.824	-9.697	-9.958	-9.824
	ΔS (J/mol. K)	-66.429	-194.48	-139.62	-108.69	-59.872	-174.56
313.15K	ΔG (kJ/mol	-10.766	-11.742	-10.608	-12.918	-10.934	-10.934
	ΔS(J/ mol. K)	-66.254	-190.42	-135.43	-113.77	-60.119	-169.74
ΔH (kJ/mol)		-9.9812	-47.887	-31.803	-22.709	-7.892	-42.219
R^2		0.996	0.924	0.836	0.839	0.816	0.872

Table 6 : Adsorption of diazinon in the presence of 40ppm of copper and desorption in the presence of TritonX-100 at cmc concentration, the linear, Freundlich and Langmuir models isotherm parameters on the selected soil samples.

Models		Parameter	Soils					
			S_1	S_2	S_3	S_4	S_5	S_6
(adsorption)	linear.Distr. coffi.	K_d (calc)	9.454	4.809	6.623	8.578	6.274	5.410
		S.E	0.257	0.131	0.291	0.372	0.143	0.118
		R^2	0.766	0.750	0.697	0.733	0.762	0.766
	Freundlich coffi.	K_F(mL/g)	1.553	1.328	1.599	1.656	1.340	1.198
		S.E	0.569	0.424	0.487	0.544	0.482	0.452
		n_F	1.689	1.727	2.137	2.045	1.567	1.441
		R^2	0.991	0.993	0.890	0.853	0.955	0.907
	Langmuir. coffi.	K_L (ml/g)	0.017	0.017	0.023	0.015	0.011	0.008
		S.E	0.231	0.287	0.267	0.245	0.265	0.275
		C_m(µg/g)	1000	500	500	1000	1000	1000
		R^2	0.987	0.945	0.766	0.713	0.941	0.820
(desorption)	Des.Distr. coffi	K_d (calc)	8.058	3.739	3.729	4.532	4.371	4.001
		S.E	0.165	0.630	0.583	0.620	0.465	0.349
		R^2	0.932	0.874	0.968	0.979	0.979	0.975
	Freundlich coffi.	K_{Fdes}(mL/g)	1.207	0.921	0.842	0.865	0.857	0.800
		S.E	0.566	0.404	0.426	0.607	0.436	0.414
		n_F	1.348	1.328	1.248	1.193	1.191	1.166
		R^2	0.982	0.983	0.991	0.990	0.996	0.998
	Langmuir. coffi.	K_L (ml/g)	0.011	0.011	0.010	0.005	0.005	0.005
		S.E	0.138	0.219	0.200	0.173	0.189	0.201
		C_m(µg/g)	1000	500	500	1000	1000	1000
		R^2	0.767	0.963	0.731	0.636	0.851	0.989

Table 7 : Hysteresis effect for Adsorption of diazinon in the presence of 40ppm of copper and desorption in the presence of TritonX-100 at cmc concentration on the selected soil samples.

Soil	Diazinon		
	H_1	ω	λ
S_1	1.252	25.3	-22.3
S_2	1.300	30.1	-30.7
S_3	1.712	71.2	-47.3
S_4	1.714	71.4	-47.8
S_5	1.316	31.6	-36.0
S_6	1.236	23.6	-33.2

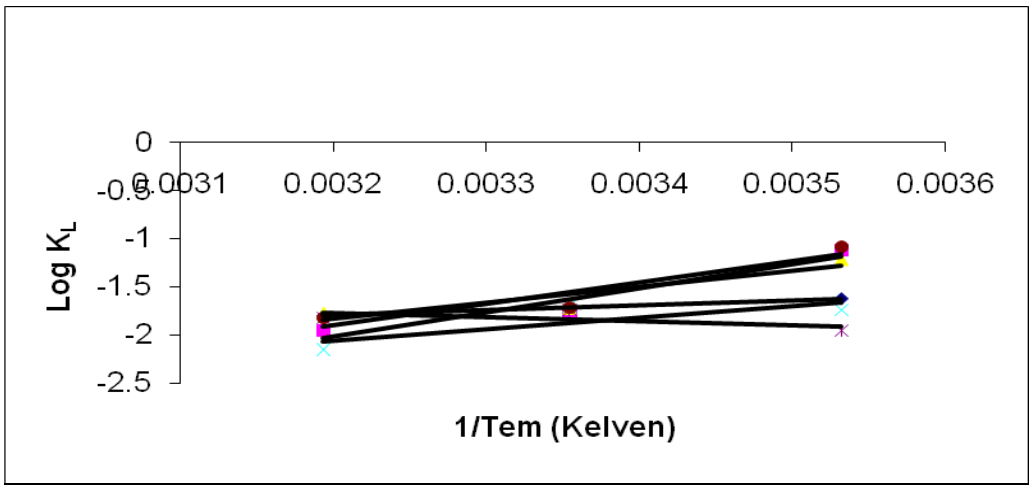
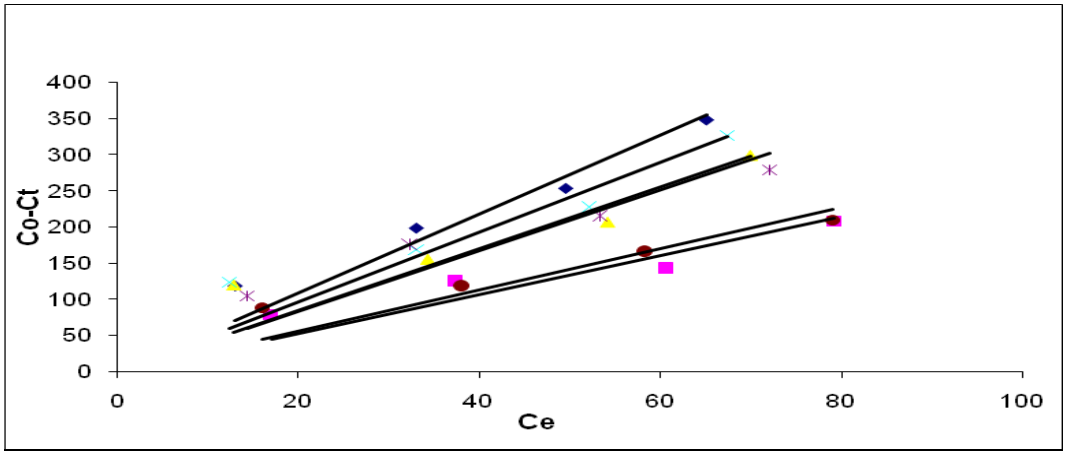


Figure 1 : Variation of log K_L with 1/T for adsorption of diazinon on the six soil samples(♦ S_1, ■ S_2, ▲ S_3, x S_4, * S_5 ●S_6).



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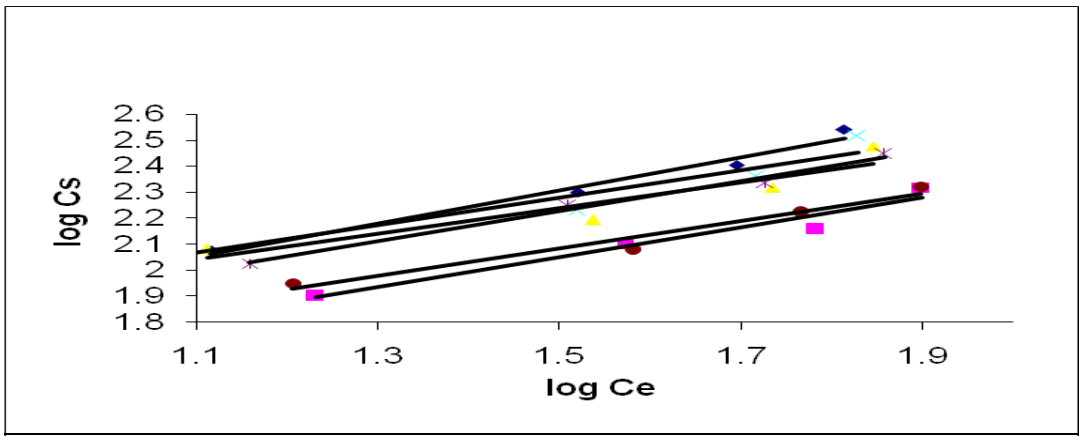
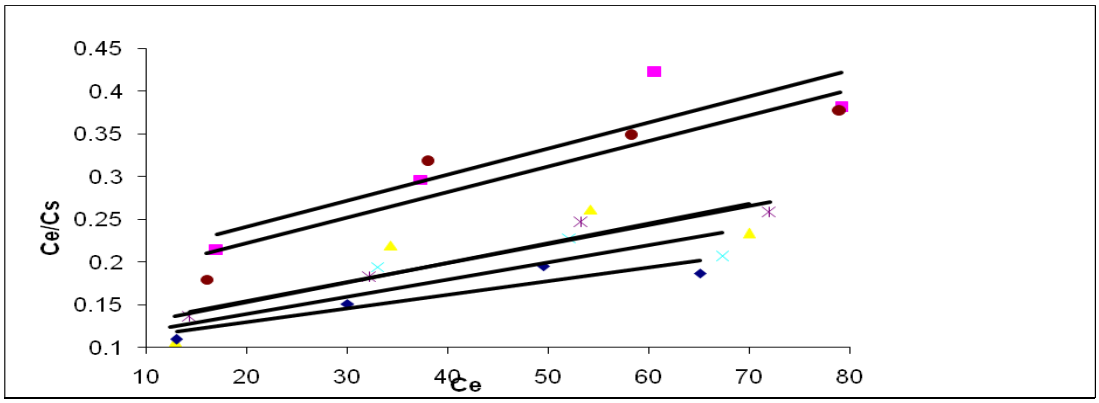
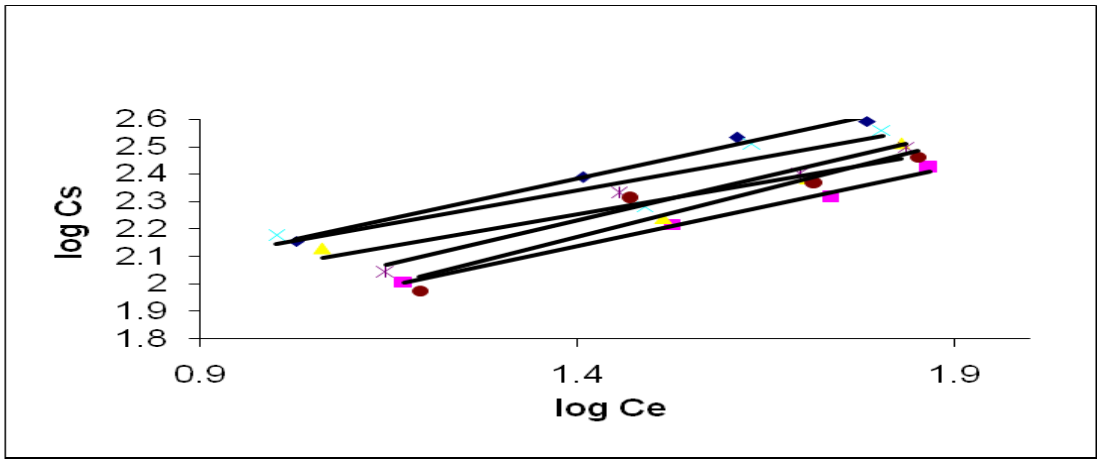


b-



c-

Figure 2 : Fitted models for diazinon adsorption (a) Linear(b) Ferundlich (c)Langmuir, isotherms on selected soil samples (♦ S_1, ■ S_2, ▲ S_3, x S_4, * S_5, ●S_6).



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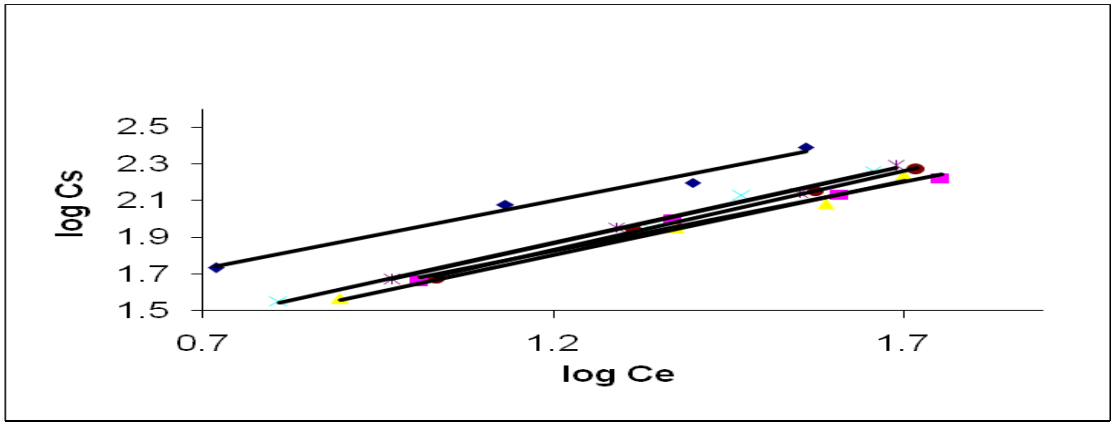

b-

Figure 3 : Fitted Ferundlich model for diazinon alone in presence of 40ppm of copper (a) adsorption (b) desorption in presence of nonionic surfactant, isotherms selected soil samples (♦ S_1, ■ S_2, ▲ S_3, x S_4, * S_5, ●S_6).

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Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Color Charges: It is the rule of the Global Journals Inc. (US) for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.

Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

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the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. **Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. **Think technically:** Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be

sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page

- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to

shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic

principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.

- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals Inc. (US)

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation) by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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