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## Effectiveness of Nursing Counseling on Psycho-social Burdens of women after Mastectomy

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### Abstract:

In surveys of the last 10 years, an increase has been reported in particular in breast surgery for breast cancer. Breast cancer can cause serious psychological problems due to many factors such as uncertainty in treatment, physical symptoms, fear of recurrence and death. To identify the effectiveness of nursing counseling on Psycho-social Burdens on women after mastectomy, a quasi-experimental design conducted on non-probability (purposive) sample of thirty women who had received a mastectomy as an intervention group selected during period from 2<sup>nd</sup> August to 10<sup>th</sup> November 2011. The study was conducted at three hospitals in Baghdad which considered the main settings that provided health care for the patients from all types of cancer. Baseline data collection (pre-test), Post-test1 and Post-test2 took place and application of the nursing counseling on Psycho-social burdens after mastectomy. The questionnaire form is consisted of two parts which included demographic and reproductive characteristics, and Psycho-social burdens after mastectomy. Content validity and reliability of the questionnaire determined through a pilot study, descriptive and inferential statistic is used to analyze the data. Results of the study showed that the highest of study sample 36.7 % were in age group (50-60) years old, 53.3% their age at menarche were 13-14 years old. The highest percentages of study group 46.7% their age at married were 20-24 years old. The highest mean of score related to the psycho-social burdens were referred to the thinking, anxiety, positive behavior, and sexual burdens. Highly significant differences had been obtained for the three matching (pre-post1, pre-post2, and post1-post2) related to psychological burdens, highly significant differences had been recorded for the two matched of testing (pre-post1, and pre-post2) except with the third matched (post1-post2) no significant differences was obtained related to the spiritual aspect, social and sexual burdens.

**Keywords:** Nurse, Breast cancer, Mastectomy, Counseling and Psycho-social burdens.

**المستخلص**

تهدف الدراسة إلى معرفة فاعلية المشورة التمريضية على الأعباء النفسية-الاجتماعية للنساء بعد استئصال الثدي. دراسة شبه تجريبية، تم اختيار عينة غير احتمالية (عمدية) لثلاثين من النساء بعد استئصال الثدي، خلال الفترة من 1 اب الى 10 تشرين الاول / 2011. وتم إجراء الدراسة في ثلاثة مستشفيات في بغداد والتي تعتبر المستشفيات الرئيسية لمعالجة كل أنواع السرطان. تم إجراء اختبار قبلي واختبارين بعدددين للعينة التجريبية مع إعطائهم المشورة فيما يخص كيفية تحسين الأعباء النفسية بعد استئصال الثدي. تكونت الاستمارة الاستبائية من جزأين، تشمل الخصائص الديموغرافية والأنجابية والأعباء النفسية للنساء بعد استئصال الثدي و تم تحديد صدق المحتوى وثبات الاستمارة الاستبائية من خلال دراسة استطلاعية واستخدام تحليل الإحصاء الوصفي والاستنتاجي في تحليل البيانات. تشير نتائج الدراسة إن أعلى نسبة (36.7%) من أفراد عينة الدراسة تتراوح أعمارهن بين (50-60) سنة، أعلى قياس وسطي سجل للتركيز والانتباه، الكابة، الشعور السلبي، القلق، التفكير، وأخيرا الشعور الايجابي توجد اختلافات كبيرة جدا في  $P < 0.01$  في مطابقة الاختبارات الثلاثة (اختبار قبل اعطاء المشورة-الاختبار الأول بعد اعطاء المشورة، اختبار قبل اعطاء المشورة-الاختبار الثاني بعد اعطاء المشورة، الاختبار الأول بعد اعطاء المشورة-الاختبار الثاني بعد اعطاء المشورة) فيما يتعلق في الأعباء النفسية.

**كلمات مفتاحية:** التمريض، سرطان الثدي، استئصال الثدي، المشورة والأعباء النفسية.

**Introduction**

Breast cancer is the most common cancer in women worldwide. It is estimated that more than 1.6 million new cases of breast cancer occurred among women worldwide in 2010 [1]. Rates of breast cancer around the world vary a great deal. In general, developed countries have higher rates than developing countries, and, women who live in developed countries tend to have a higher [lifetime risk](#) of breast cancer than women who live in developing countries [2]. Breast cancer treatment alters body realization of the patients and may influence body presentation and feeling about themselves as persons [3]. Surgical procedures such as mastectomy are emotionally stressful. The loss of one or both breasts evokes feelings of mutilation and altered body image, diminished self-acceptance, loss of a sense of femininity, reduction of sexual attractiveness

and function, anxiety, depression, hopelessness, guilt, shame and fear of recurrence and death [4]. The loss of roles at home or professional life caused by disease and swinging relations, feeling of dependency or strong pain, anxieties regarding life may cause breakdowns with immediate friends or marriages and they all adversely affect the life satisfaction and marital life of individuals [5]. In recent years, the counseling has emerged as an effective way to deliver psychosocial interventions to individuals with cancer. The counseling intervention acknowledges that each phase of the breast cancer experience (i.e., diagnosis, post surgery, adjuvant therapy, and ongoing recovery) is stressful and characterized by its own particular features [6,7]. Counseling have beneficial effect on the quality of life and bio-psychosocial burdens that would bring to a higher life expectancy and may help the patients deal

most successfully with their burdens ,come to a greater understanding of themselves and explore their natural strengths and in turn lead a more self-acceptance [8].

### Methodology

A quasi-experimental design (one group pretest-posttest design) was carried out throughout the present study with the application of a pre-test, post –test 1 and post –test 2 their psycho-social burdens after mastectomy. A convenience sampling (non probability) was used to select the study samples, who were attending the hospital to receive scheduled supplementary treatment after mastectomy in Baghdad Teaching Hospital, Medical Nuclear Hospital and Institution of Radiation and AL Kahadymia Teaching Hospital. They are considered the main settings that provided health care for the patients from all the Iraqi governorates as well as for all types of cancer .A total of 30 women agreed to take part in the study. The counseling program was designed to improve psycho-social burdens in women after mastectomy. The design was based on findings obtained from the initial assessment of women’s psycho-social burdens after mastectomy, as well as through a review of related literatures in previous studies. The questionnaire form is consisted of socio-demographic characteristics, reproductive

and clinical characteristics, Medical and surgical information, Previous history of breast problems, Family history, psychological burdens composed of 33 items, spiritual aspect composed of 9 items, social burdens composed of 18 items, and sexual burdens composed of 4 items An instrument was constructed through the use of (3) level type Likert scale to assess the psycho-social burdens after mastectomy. A pilot study was conducted at AL Kahadymia Teaching Hospital of (10) women with mastectomy during the period of 15<sup>th</sup> Jun 2011, to 17<sup>th</sup> July 2011, to determine the reliability of the study and measuring the effectiveness of nursing counseling on psycho-social burdens of women after mastectomy . To evaluate the validity of the questionnaire form, the researchers presented it to eleven experts in various fields. Reliability of the questionnaire was determined through the use of Pretest and Posttest approach, with an interval of about four weeks, for the determination of interval consistency of women’s psycho-social burdens after mastectomy, R = 0.95 for psychological burdens, R = 0.96 for social burdens, R = 0.91 for spiritual aspect, and R = 0.73 for sexual burdens. The statistical procedures include: Descriptive statistic (frequency, mean, percentage, relative sufficiency and graph) and inferential statistic (chi-square) approach have been used.

**Results**

Table (1) Distribution Socio-demographical Characteristics of Women after Mastectomy in the study group

Variables	Groups	Study = 30		χ <sup>2</sup> -test	P-value
		No	%		
Age / years	20 -	4	13.3	0.13	0.98
	30 -	7	23.3		
	40 -	8	26.7		
	50 - 60	11	36.7		
	$\bar{x} \pm SD$	43.67 $\pm$ 10.34			
Age at disease diagnosis /years	20 -	6	20.0	0.62	0.89
	30 -	6	20.0		
	40 -	8	26.7		
	50 - 60	10	33.3		
	$\bar{x} \pm SD$	41.93 $\pm$ 11.08			
Level of education	illiterate	3	10.0	7.97	0.24
	Read and write	5	16.7		
	Primary	1	3.3		
	Intermediate	5	16.7		
	Secondary	5	16.7		
	Institute	5	16.7		
	College & H.E.	6	20.0		
Occupation before incidence	House wife	13	43.3	4.94	0.08
	Employed	17	56.7		
Occupation after incidence	House wife	13	43.3	4.94	0.84
	Employed	17	56.7		
Economic status	High	14	46.7	3.08	0.21
	Middle	11	36.7		
	Low	5	16.7		



This Table demonstrates that the highest percentage study sample 36.7% were in age group (50-60) years old and 33.3% of study sample were in age at disease diagnosis group (50-60) years old; their educational level the highest percentage 20% were college graduate.

The woman's occupation before and after breast cancer incidence was most often 56.7% were employed of study sample. The economic status, the highest percentage 46.7% of study sample at high level.

Table (2) Distribution Reproductive and Clinical Characteristics of Women after Mastectomy in the study group

Variables	Groups	Study = 30		χ <sup>2</sup> -test	P-value
		No	%		
Age at menarche	12	5	16.7	1.49	0.47
	12 - 13	9	30.0		
	13 - 14	16	53.3		
	$\bar{x} \pm SD$	12.53 $\pm$ 1.01			
Age of married	< 20	10	33.3	2.29	0.51
	20 - 24	14	46.7		
	25 - 29	4	13.3		
	30 $\geq$	2	6.7		
	$\bar{x} \pm SD$	21.90 $\pm$ 4.35			
Age at first delivery	< 25	10	33.3	5.19	0.07
	25 - 29	17	56.7		
	30 $\geq$	3	10.0		
	$\bar{x} \pm SD$	24.276 $\pm$ 4.32			
Number of children	null	1	3.3	5.12	0.16
	1 - 2	7	23.3		
	3 - 4	13	43.4		
	$\geq$ 5 - 6	9	30.0		
	$\bar{x} \pm SD$	4.00 $\pm$ 1.91			
Breast Feeding	Yes	22	73.3	0.000	1.00
	No	8	26.7		
Duration of breast feeding for all children in months	12 - 48	5	16.7	2.558	0.465
	49 - 96	4	13.3		
	97 - 144	12	40		
	145 $\geq$	1	3.3		
	$\bar{x} \pm SD$	100.36 $\pm$ 49.62			
Using of hormonal contraceptive	Yes	17	56.7	0.60	0.43
	No	13	43.3		
Duration of using of hormonal contraceptive in years	1 - 2	7	23.3	4.51	0.10
	3 - 4	4	13.3		
	5 - 6	2	6.7		
	$\bar{x} \pm SD$	2.85 $\pm$ 1.28			
Using of hormonal replacement therapy	Yes	1	3.3	0.35	0.55
	No	29	96.7		
Stage of incidence	Before menopausal age	7	23.3	9.77	0.00

	At menopausal age	23	76.7		
The affected breast	Left	18	60.0	0.00	1.00
	Right	12	40.0		
Radical mastectomy	Yes	23	76.7	2.85	0.09
	No	7	23.3		
Duration since mastectomy	≤ 2 m	3	10	10.17	0.01
	3 - 4 m	13	43.3		
	5 - 6 m	10	33.3		
	7 ≥ m	4	13.3		
	$\bar{x} \pm SD$	4.5 ± 1.72			

This Table demonstrates that the highest percentage 53.3% their age at menarche were 13-14 years old, 46.7% their age at married were 20-24 years old, 56.7% their age at first child delivery were 25-29 years old and 43.4 %, their number of children 3-4, the highest percentage 73.3 % using breast feeding, 40 % of study sample their duration of breast feeding for all children from 97-144 months. The highest percentage 56.7% using the hormonal contraceptive methods of family planning. The highest percentage 23.3% of study sample were use the hormonal contraceptive for 1-2 years. The highest percentage 96.7% were didn't use hormonal replacement therapy. 76.7 % were at menopausal age, 60 % were the affected breast was the left. The highest percentages 76.7 % were treated by radical mastectomy and 43.3 % were the duration since mastectomy between 3-4 months.

Table (3) Distribution Previous History of Breast Problems of Women after Mastectomy in the study group

Variables	Groups	Study = 30		χ <sup>2</sup> -test	P-value
		No	%		
Previous breast problems	Yes	10	33.3	0.07	0.78
	No	20	66.7		
(If Yes)	Cyst infection	5	50.0	2.56	0.27
	Nipple Secretion	5	50.0		
	pain	0	0		
(If Yes) The affected breast	Right	3	30.0	9.97	0.00
	Left	7	70.0		
(If Yes) Treatment	Surgically	4	40.0	7.41	0.06
	Medical	1	10.0		
	Both	3	30.0		
	None	2	20.0		

This table demonstrates that the highest percentage 66.7 % didn't have previous history of breast problems

Table (4) Distribution Family History of Women after Mastectomy in the study group

Variables	Groups	Study = 30		$\chi^2$ -test	P-value
		N	%		
Relative have cancer	Yes	6	20.0	0.88	0.34
	No	24	80.0		
Site of cancer	None	24	80.0	10.0	0.01
	Breast	0	0		
	Uterus	3	10.0		
	Lung	1	3.3		
	Prostate	2	6.7		
Relative relationship	None	24	80.0	7.50	0.27
	First degree	5	16.7		
	Second degree	1	3.3		

This table

demonstrates that the highest percentage 80 % of study group their families didn't have a history of cancer.

Table (5) Assessment of Psychological Burdens and Spiritual Aspect of Women after Mastectomy related to the study group at Baseli

Main Domains	Sub Domains	Item No	Items	Yes						Never		Total	M		
				Always			Sometimes			N	%			N	%
				N	%	N	%	N	%						
Psychological Burdens	Thinking	1-	Thinking too much about what had happened to me	30	100.0	0	0	0	0	0	0	30	3		
		2-	Thinking about the future of my disease (progress of disease)	30	100.0	0	0	0	0	0	0	30	3		
		3-	Thinking too much about the future of my children and my family	30	100.0	0	0	0	0	0	0	30	3		
		4-	Thinking too much about the cost of this disease	29	96.7	1	3.3	0	0	0	0	30	2.9		
	Focus & Attention	1-	Suffering from forgetfulness	2	6.6	18	60.0	10	33.4	0	0	30	1.7		
		2-	Can't follow up interview with the others	0	0	15	50.0	15	50.0	0	0	30	1.5		
		3-	Don't have the ability to focus for a long time	1	3.3	12	40.0	17	56.7	0	0	30	1.4		
		4-	Don't remember past events which happened to me	0	0	7	23.3	23	76.7	0	0	30	1.2		
		5-	Don't remember all the events of the film when I finished it	0	0	1	3.3	29	96.7	0	0	30	1.0		
	Anxions	1-	Feeling anxious for the future of my disease (progress of disease)	30	100.0	0	0	0	0	0	0	30	3		
2-		Feeling anxious for the future of my children	30	100.0	0	0	0	0	0	0	30	3			
3-		Feeling anxious for the cost of this disease	29	96.7	1	3.3	0	0	0	0	30	2.9			
4-		Feeling anxious, fear of the future	30	100.0	0	0	0	0	0	0	30	3			
1-		Feeling sad and depressed mood	13	43.3	17	56.7	0	0	0	0	30	2.4			
2-		Lack of desire to work	18	60.0	12	40.0	0	0	0	0	30	2.6			
3-		Lack of desire to speak	17	56.7	13	43.3	0	0	0	0	30	2.5			
4-		Feeling inactivity and lack of activity	25	83.4	5	16.6	0	0	0	0	30	2.8			
Depression	5-	Want to cry whenever I remember my disease	22	73.3	8	26.7	0	0	0	0	30	2.7			
	6-	Want to loneliness and isolation	7	23.3	15	50.0	8	26.7	0	0	30	1.9			
	7-	Become upset for no reason	22	73.3	8	26.7	0	0	0	0	30	2.7			
	8-	Lack of interest in general appearance	24	80.0	6	20.0	0	0	0	0	30	2.8			
	1-	Breast tumors is a disease, like others it can be healed	20	66.6	10	33.4	0	0	0	0	30	2.6			
	2-	Feeling that life is beautiful	13	43.3	17	56.7	0	0	0	0	30	2.4			
	3-	Feeling that I'm still useful to my family and my society	15	50.0	15	50.0	0	0	0	0	30	2.5			
	4-	The disease made me feel other patients suffering	28	93.4	2	6.6	0	0	0	0	30	2.8			
Positive Feels	5-	The disease made me feel loved and supported by my family	28	93.4	2	6.6	0	0	0	0	30	2.8			
	6-	The disease made me care about things I have neglected	29	96.7	1	3.3	0	0	0	0	30	2.9			
	1-	Lost my role and importance in my family	2	6.6	16	53.4	12	40.0	0	0	30	1.6			
	2-	It made me hate myself	2	6.6	12	40.0	16	53.4	0	0	30	1.5			
	3-	Lost interest in everything	14	46.7	16	53.4	0	0	0	0	30	2.4			
	4-	Feeling that I cause my family sadness	28	93.4	1	3.3	1	3.3	0	0	30	2.9			
Negative Feels	5-	Want to cry every time and thinking about the illness	25	83.4	5	16.6	0	0	0	0	30	2.8			
	6-	Hate the way people feel sorry for me	30	100.0	0	0	0	0	0	0	30	3			
	1-	It's a redemption for my sins	29	96.7	0	0	1	3.3	0	0	30	2.9			
	2-	It taught me patience and endurance	29	96.7	0	0	1	3.3	0	0	30	2.9			
	3-	It's a test for my faith	30	100.0	0	0	0	0	0	0	30	3			
	4-	It made me want to help other people	30	100.0	0	0	0	0	0	0	30	3			
Spiritual Aspect	Positive Believers	5-	Taught me not to envy or hate	30	100.0	0	0	0	0	0	0	30	3		
		1-	A punishment from god	1	3.3	14	46.7	15	50.0	0	0	30	1.5		
		2-	Stopped doing my religious duties	1	3.3	22	73.3	7	23.3	0	0	30	1.8		
		3-	Don't forgive peoples mistakes and flaws	5	16.6	14	46.7	11	36.7	0	0	30	1.8		
		4-	Wonder what have done to deserve this	19	63.4	6	20.0	5	16.6	0	0	30	2.4		

This Table depicts that the highest mean score( 3) in items number 1, 2, and 3 related to the thinking, (1.7) in item number 1 related to the focusing and attention, ( 3) in items number 1, 2, and 4 related to the anxiety, (2.8) in items number 4 and 8 related to the depression, ( 2.9) in item number 6 related to the positive feelings, (3) in item number 6 related to the negative feelings, ( 3) in items number 3, 4, and 5 related to the positive behavior of the spiritual aspect and ( 2.4) in item number 4 related to the negative behavior of the spiritual aspect.

Table (6) Assessment of Socio- sexual burdens of women after Mastectomy related to the study group at Baseline.

Domains	Item's No	Items	Yes						Never			Total	M	
			Always			Sometimes			N	%	N			%
			N	%	N	%	N	%						
Social Burdens	Family Relation ship	1-	20	66.6	9	30.0	1	3.3	30	2.6				
		2-	21	70.0	9	30.0	0	0	29*	2.7				
		3-	18	60.0	12	40.0	0	0	30	2.6				
		4-	7	23.3	16	53.4	7	23.3	30	2				
		5-	27	93.4	2	6.6	0	0	29*	2.9				
		6-	1	3.3	8	27.5	20	68.9	29*	1.3				
	Social Relation ship	1-	2	6.6	26	86.8	2	6.6	30	2				
		2-	2	6.6	27	90.0	1	3.3	30	2.03				
		3-	1	3.3	26	86.8	3	10.0	30	1.9				
		4-	19	63.4	11	36.6	0	0	30	2.6				
		5-	3	10.0	27	90.0	0	0	30	2.1				
		6-	0	0	25	83.4	5	16.6	30	1.8				
7-		1	3.3	27	90.0	2	6.6	30	1.9					
Married Relations hip	1-	22	73.3	8	26.7	0	0	30	2.7					
	2-	22	73.3	7	23.3	1	3.3	30	2.8					
	3-	18	60.0	12	40.0	0	0	30	2.6					
	4-	3	10.0	20	66.6	7	23.3	30	1.8					
	5-	3	10.0	12	40.0	15	50.0	30	1.6					
Sexual Burdens	1-	29	96.7	1	3.3	0	0	30	2.9					
	2-	27	90.0	3	10.0	0	0	30	2.9					
	3-	25	83.4	5	16.6	0	0	30	2.8					
	4-	21	70.0	9	30.0	0	0	30	2.7					

This Table depicts that the highest mean score (2.9) in item number 5 related to the family relationship, (2.6) in item number 4 related to the social relationship, (2.8) in item number 2 related to the marital relationship, and (2.9) in items number 1 and 2 related to the sexual burdens.

Table (7) Effectiveness of Nursing Counseling on Psychological Burdens and Spiritual Aspect of study group at (pre, post-1 and post-2 periods).

Sub Domains	Periods	No.	Grand MS	SD	RS %	Matched Paired	P-value	C.S.	
Psychological Burdens	Thinking	Pre	30	1.01	0.05	33.61	Pre X Post-1	0.000	HS
		Post-1	30	1.79	0.24	59.72	Pre X Post-2	0.000	HS
		Post-2	30	2.25	0.45	75.00	Post-1 X Post-2	0.000	HS
	Focus & Attention	Pre	30	2.59	0.32	86.44	Pre X Post-1	0.016	S
		Post-1	30	2.78	0.27	92.67	Pre X Post-2	0.028	S
		Post-2	30	2.72	0.38	90.67	Post-1 X Post-2	0.445	NS
	Anxious	Pre	30	1.01	0.05	33.61	Pre X Post-1	0.000	HS
		Post-1	30	1.86	0.35	61.94	Pre X Post-2	0.000	HS
		Post-2	30	2.11	0.39	70.28	Post-1 X Post-2	0.025	S
	Depression	Pre	30	1.35	0.24	45.14	Pre X Post-1	0.000	HS
		Post-1	30	2.60	0.44	86.67	Pre X Post-2	0.000	HS
		Post-2	30	2.80	0.21	93.19	Post-1 X Post-2	0.028	S
	Positive Feels	Pre	30	1.02	0.07	33.89	Pre X Post-1	0.092	HS
		Post-1	30	1.17	0.46	38.89	Pre X Post-2	0.152	NS
		Post-2	30	1.13	0.40	37.59	Post-1 X Post-2	0.562	NS
	Negative Feels	Pre	30	1.66	0.25	55.19	Pre X Post-1	0.000	HS
		Post-1	30	2.44	0.29	81.48	Pre X Post-2	0.000	HS
		Post-2	30	2.54	0.17	84.81	Post-1 X Post-2	0.113	NS
Spiritual Aspect	Positive Believes	Pre	30	1.03	0.15	34.22	Pre X Post-1	1.000	NS
		Post-1	30	1.03	0.15	34.22	Pre X Post-2	0.326	NS
		Post-2	30	1.04	0.16	34.67	Post-1 X Post-2	0.725	NS
	Negative Believes	Pre	30	2.03	0.48	67.78	Pre X Post-1	0.000	HS
		Post-1	30	2.94	0.19	98.06	Pre X Post-2	0.000	HS
		Post-2	30	2.94	0.16	98.06	Post-1 X Post-2	1.000	HS

The findings of results according to the P-values for the three matching shows: Thinking and negative believes were highly significant differences had been obtained for the three matching (pre – post1, pre – post2, and post1 – post2), Anxious and Depression were a highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) and there were a significant differences had been recorded for the third matched of testing (post1 –

post2). Negative Feels were a highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2), as well as a non significant differences were obtained. Focus & Attention were a significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2), as well as a non significant differences were obtained. Positive Feels were a highly significant differences had been recorded for the matched of testing (pre – post1), except with the two matched of testing (pre- post 2, and post1 – post2) non significant differences were obtained. Positive believes was no significant differences had been obtained for the three matching (pre – post1, pre – post2, and post1 – post2).

Table (8) Effectiveness of Nursing Counseling on Socio-Sexual Burdens of study group at (pre, post-1 and post-2 periods).

Sub Domains		Periods	No.	Grand MS	SD	RS %	Matched Paired	P-value	C.S.
Social Burdens	Family Relation ship	Pre	30	1.46	0.39	48.52	Pre X Post-1	0.266	NS
		Post-1	30	1.55	0.27	51.67	Pre X Post-2	0.159	NS
		Post-2	30	1.57	0.31	52.41	Post-1 X Post-2	0.752	NS
	Social Relation ship	Pre	30	1.76	0.13	58.75	Pre X Post-1	0.010	S
		Post-1	30	1.61	0.26	53.65	Pre X Post-2	0.000	HS
		Post-2	30	1.61	0.26	53.65	Post-1 X Post-2	1.000	NS
	Married Relation ship	Pre	30	1.37	0.26	45.78	Pre X Post-1	0.000	HS
		Post-1	30	2.02	0.28	67.33	Pre X Post-2	0.000	HS
		Post-2	30	1.99	0.27	66.22	Post-1 X Post-2	0.582	NS
Sexual Burdens	Pre	30	1.88	0.28	62.78	Pre X Post-1	0.000	HS	
	Post-1	30	2.43	0.20	80.83	Pre X Post-2	0.000	HS	
	Post-2	30	2.43	0.22	81.11	Post-1 X Post-2	0.876	NS	

The findings of results according to the P-values for the three matching shows: Family Relationship was no significant differences had been obtained for the three matching (pre – post1, pre – post2, and post1 – post2). Social Relationship and Married Relationship and Social Relationship were a highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2), as well as a non significant differences were obtained. Highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2), as well as a non significant differences were obtained related to the sexual burdens.

Table (9) Effectiveness of nursing counseling on Main Domains of study group at ( pre, post-1 and post-2 periods)

Main Domains	Periods	No.	Grand MS	SD	RS %	Matched Paired	P-value	C.S.
Psychological Burdens	Pre	30	1.44	0.07	47.98	Pre X Post-1	0.000	HS
	Post-1	30	2.11	0.16	70.23	Pre X Post-2	0.000	HS
	Post-2	30	2.26	0.15	75.26	Post-1 X Post-2	0.002	HS
Spiritual Aspect	Pre	30	2.50	0.22	83.44	Pre X Post-1	0.000	HS
	Post-1	30	2.96	0.12	98.58	Pre X Post-2	0.000	HS
	Post-2	30	2.95	0.11	98.36	Post-1 X Post-2	0.810	NS
Social Burdens	Pre	30	1.53	0.19	51.02	Pre X Post-1	0.000	HS
	Post-1	30	1.73	0.15	57.55	Pre X Post-2	0.000	HS
	Post-2	30	1.72	0.16	57.43	Post-1 X Post-2	0.914	NS
Sexual Burdens	Pre	30	1.88	0.28	62.78	Pre X Post-1	0.000	HS
	Post-1	30	2.43	0.20	80.83	Pre X Post-2	0.000	HS
	Post-2	30	2.43	0.22	81.11	Post-1 X Post-2	0.876	NS

The findings of results according to the P-values for the three matching shows: there were highly significant differences had been obtained for the three matching (pre – post1, pre – post2, and post1 – post2) related to ychological burdens, highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2) no significant differences was obtained related to the spiritual aspect, social and sexual burdens.

**Discussion**

The study result shows that the highest percentage of study sample 36.7 % were in age group (50-60) years old with Mean and Standard deviation 43.67 10.34 of study groups, 33.3 % were in age at disease diagnosis in group (50-60) years old with Mean and Standard deviation 41.93 11.08. This result was consistent with international study conducted by Beuth et al (2008) who reported that the Mean and Standard

deviation of the age of study group was 44.63 10.16 [9]. Smeltzer and Bare [10] reported that the risk of developing breast cancer increases considerably with age. More than three-fourth of breast cancer develop in women who are over 50 years, and more than half occur in women age 65, young women get breast cancer, but less commonly [10]. Regarding level of education, the highest percentage 20% were college graduate of study sample. This finding agrees with Graydon [11] who found that (67%) of



women with breast cancer had high level of education. Petro-Nustus [20] found that women's age, level of education, having heard or read about breast cancer, were found to be significant factors of communication and encourage health seeking behavioral change after mastectomy [12]. Moreover, the women's Occupation before and after breast cancer incidence was most often 56.7 % were employed of study sample, These results are in contrast with a return to work rate of 82% of breast cancer survivors returned to work reported in a US breast cancer study [13]. Fismen and Stanghelle [14] conclude in his study that the counseling encouraged the patients to return to work and to become socially active again. Furthermore, the result regarding economic status have shown that the highest percentage of 46.7% of study sample at high level. This finding agree with study conducted by Robert et al. [15] which concluded that the women living in the highest socioeconomic status communities had greater odds of having breast cancer than women living in the lowest socioeconomic status communities [15]. Pollon and Gustavasson, [16] also reported that breast cancer is the disease of the high socioeconomic class [16]. The study result shows that the highest percentage of 53.3% their age at menarche was 13-14 years old, 46.7 % their age at married were 20-24 years old, 56.7 % their age at first child delivery were 25-29 years old and 43.4 % of them their number of children 3-4, the highest percentage of 73.3% using breast feeding, and the highest percentage of study sample 40 % their duration of breast feeding for all children from 97-144 months. 56.7% of study using the hormonal contraceptive. The highest percentage of study sample 23.3%

were use the hormonal contraceptive for 1-2 years. The highest percentage of 3.3 % were didn't use hormonal replacement therapy, the highest percentage 76.7% were at menopausal age. 60 % the affected breasts were left. The highest percentages 76.7% were treated by radical mastectomy and 43.3 % were the duration since mastectomy between 3-4 months. Finding of the study disagree with Smeltzer and Bare [10] who stated that women having children after 30 years, have twice the risk of developing breast cancer, as women having children at age 20 years, while others stated that women with late age at first birth compared to an early age were at similar risk of having breast cancer [10]. Wohlfahrt [17] also agree with Saudi study concluded that breast feeding in no way gives any protection to the patient [17]. American Cancer Society [18] stated that the primary factors that increase risk of breast cancer in women include along menstrual history (menstrual periods that started early and/or ended late in life), obesity, menopause, recent use of oral contraceptive, post-menopause hormonal therapy, nulliparity or having the first child after age of 30 years old, exposure to radiation, consumption of alcoholic beverages, and high breast tissue density [18]. It is worthwhile, to mention that our country has exposed to unjust war and high explosion and fatal weapon, these critical situation led our population exposed to tremendous hazardous influences. Consequently some of our results are different, compared to international literature. Herfindal and Gourleg [19] who stated that earlier age at first menstruation before age twelve and later menopause may increase the breast cancer risk, which means more estrogen exposure and more

opportunities for cells to become malignant, which agree with this study findings [19]. Breast cancer can occur anywhere in the breast, but the majority occurs in the upper quadrant where most breast tissue is located, breast cancer is more common in the left breast [20]. Modified radical mastectomy consists of removing the entire breast, chest muscles under the breast, and all of where under arm lymph nodes and skin around the breast [21]. The most effective evidenced by clinical experience shows 5 years survival rate is greater than 80%, while if the cancer cells have spread to the nodes of axilla, the 5 years survival rate falls to 60%. Therefore, it considers the most surgical approach to the breast cancer treatment [22], which is consistent to results of this study. The study result shows that the highest percentage 66.7% didn't have previous history of breast problems. Benign breast disease is a generic term describing all non-malignant breast conditions, some of which carry an increased risk for breast cancer while others do not. Women with proliferative breast disease without atypia have a two-fold increased risk; whilst those with atypical hyperplasia have a more than four-fold increased risk [23]. The study result shows that the highest percentage 80% their families didn't have a history of cancer. The finding of the study agree with Abeeret et al. [24] who reported in his study that over 85% of women who have a close relative with breast cancer will never develop the disease, and more than 85% of women with breast cancer have no family history of it. In developed countries it is estimated that hereditary factors contribute around a quarter of inter-individual differences in susceptibility to breast cancer, while environmental and lifestyle factors contribute the remaining

three-quarters [24]. Regarding assess the psycho-social burdens of women after mastectomy related to the study group, the study result shows that the highest mean score (3) in items number 1, 2, and 3 related to the thinking, (1.7) in item number 1 related to the focusing and attention, (3) in items number 1, 2, and 4 related to the anxiety, (2.8) in items number 4 and 8 related to the depression, (2.9) in item number 6 related to the positive feelings, (3) in item number 6 related to the negative feelings, (3) in items number 3, 4, and 5 related to the positive behavior of the spiritual aspect and (2.4) in item number 4 related to the negative behavior of the spiritual aspect, the highest mean score (2.9) in item number 5 related to the family relationship, (2.6) in item number 4 related to the social relationship, (2.8) in item number 2 related to the marital relationship, and (2.9) in items number 1 and 2 related to the sexual burdens. All the previous studies were in agreement with the present study, with breast cancer the risk of long term physical and psychological problems increase as well as social consequences appears to experience considerable difficulties interpersonal relationship with others, social, cognitive and emotional aspects of family life, concerns in relation to femininity, fears of sexual relations, social function [25]. Regarding effectiveness of nursing counseling on psycho-social burdens of study group at (pre, post-1 and post-2 periods), the study result shows that that highly significant differences at  $P < 0.01$  had been recorded for the three matching (pre – post1, pre – post2, and post1 – post2) related to psychological burdens, highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except

with the third matched (post1 – post2) no significant differences was obtained related to the spiritual aspect, social, and sexual burdens. The finding of the study agrees with Lieberman [26] reported that the participation in the counseling program leads to an improvement in the social-psychological functions in women with breast cancer [26]. A variety of counseling types such as psychological, behavioral and formats such as group, individual and telephone have demonstrated beneficial effect on the quality of life, symptom management and psychological functioning [27]. Margoosian [28] showed that the majority of strategies used by Iranian women to cope with breast cancer and accepted their disease was being positive on religious faith [28]. Many individuals extract positive meaning and benefit from their experience with cancer, reporting that it prompts enhanced family relationships, increased family relationships strength, deepened appreciation for life, greater spirituality, valued change in life priorities and goals [29]. The results of this study are similar to those of Matthews' research [30] who states that patients benefit from talking about their sexual issues and generally find more satisfaction in their life. It seems that the individual counseling is more effective for improving the sexual function because they can talk without shame about their sexual issues in a more relaxed environment [30].

## Conclusion

-Approximately half of the study samples were at age range between (50-60) years old, third of them institute and college graduate.

-Two third of the study sample groups were at menopausal age, approximately three quarter of study sample groups were treated by radical mastectomy, and approximately half of them were the duration since mastectomy between 3-4 months.

-Highest mean of score related to the psycho-social burdens were refer to the thinking, anxiety, positive behavior, and sexual burdens.

- Highly significant differences had been obtained for the three matching (pre – post1, pre – post2, and post1 – post2) related to psychological burdens, highly significant differences had been recorded for the two matched of testing (pre – post1, and pre – post2) except with the third matched (post1 – post2) no significant differences was obtained related to the, socio- sexual burdens and spiritual aspect.

## Recommendations

- Establishment of a counseling center in the breast cancer clinics to delegating caring responsibility to breast cancer patients.

- Construction of a counseling program which should be included as part of the patients' treatment program with the aim of reducing the symptoms of cancer and improving the quality of life.

- Establish a basic post mastectomy rehabilitation program included 'all' in-patient breast cancer patients of multidisciplinary approach comprised a series of structural exercises, information and group therapy sessions which were conducted by a social worker, nurse or physical therapist.

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## A Study of Some Bacteria Affecting Urinary Tract of Children with Renal Disease

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### Summary

This study was carried out between December 17, 2008 and August 25, 2009. It included 62 pediatric patients at the age range (1-12) years of both genders: 26 with chronic renal failure (CRF) and 36 with nephritic syndrome (NS), who were outpatients and in-patients in the dialysis unit in both Al-Mansour pediatric teaching hospital and Child's central teaching hospital. The control group consisted of 26 children. Urine and blood samples were collected from children with both renal diseases and healthy controls. Renal function was evaluated by biochemical tests of blood. After culturing the urine samples on both MacConkey agar medium and blood agar medium, general urine examination (GUE) was applied regardless the type of the renal disease. Results explained significant increase in both urea and creatinine concentrations in serum ( $P < 0.001$ ). General urine examination of both CRF and NS patients showed that casts presence in urine was not significant ( $p = 0.056$ ), while albuminuria was significant ( $P = 0.049$ ). The negative urine cultures were present in 64.5% of both patients' groups. The control group showed no bacteria in urine. The positive cultures in patients (35.5%) were indicating urinary tract infections (UTIs) with a significant relation with the type of renal disease ( $P = 0.042$ ). UTIs seemed to be related with gender ( $P = 0.044$ ). The bacterial growth included the following isolates: *E. coli* (54.55%), *Pseudomonas aeruginosa* (22.73%), *Klebsiella pneumoniae* (9.09%), *Proteus mirabilis* (9.09%) and *Morganella morganii* in one case only (4.55%). The bacterial isolates were different in their sensitivity to antibiotics, which included Ceftazidime, Cefterixone, Gentamycin, Nalidixic acid, Nitrofurantoin and Trimethoprim).

**Keywords:** Urinary tract, children, renal diseases.

## دراسة لبعض الملوثات البكتريولوجية للمسالك البولية لدى الأطفال المصابين بأمراض كلوية

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### الخلاصة

نفذت هذه الدراسة بين 2008-12-17 و 2009-8-25 وشملت 62 طفلاً مريضاً في المدى العمري (1-12) سنة ومن كلا الجنسين: 26 طفلاً مصاباً بالفشل الكلوي المزمن و 36 طفلاً مصاباً بالمتلازمة الكلوية، وكان المرضى خارجيين وراقدين في وحدة غسل الكلية في كل من مستشفى المنصور التعليمي للأطفال ومستشفى الطفل التعليمي المركزي وشملت المجموعة الضابطة 26 طفلاً. جمعت عينات الدم والادرار من مجاميع المرضى والأصحاء. تم تقييم الوظيفة الكلوية بواسطة الاختبارات الكيميوحيوية للدم. بعد زرع النماذج على وسطي آغار ماكونكي وآغار الدم أجري لها الفحص العام (بغض النظر عن نوع المرض الكلوي). أظهرت النتائج زيادةً معنويةً في يوريا وكرياتينين المصل ( $P > 0.001$ ). أما نتائج الفحص العام للادرار فأظهرت أن وجود القوالب في ادرار المرضى لم يكن معنوياً (الاحتمالية=0.056)، بينما كان وجود بروتين الالبومين في ادرار المرضى معنوياً (الاحتمالية=0.049). وجدت نتائج زرع الادرار السالبة في 64.5% من كلتا المجموعتين المرضيتين، كذلك كانت نتائج زرع الادرار سالبةً في المجموعة الضابطة. أما نتائج زرع الادرار الموجبة في المرضى (35.5%) فكانت تشير الى وجود التهاب السبيل البولي مع علاقةً معنويةً بنوع المرض الكلوي (الاحتمالية=0.042). لقد أظهر التهاب السبيل البولي علاقةً معنويةً مع الجنس (الاحتمالية=0.044). تضمن النمو الجرثومي الأنواع التالية: *E. coli* (54.55%) و *Pseudomonas aeruginosa* (22.73%) و *Klebsiella pneumoniae* (9.09%) و *Proteus mirabilis* (9.09%) وعزلةً واحدةً فقط من *Morganella morganii* (4.55%). اختلفت العزلات البكتيرية في حساسيتها للمضادات الحيوية والتي اشتملت على السيفترياكزون و السفتازديم و الجنتاميسين و حامض الناليدكسك و الترياميثوبريم والنايتروفورانتين.

**كلمات مفتاحية:** الجهاز البولي، الأطفال، أمراض الكلى.

### Introduction

Chronic kidney disease (CKD) is a worldwide public health problem progresses towards end stage renal disease (ESRD). In childhood, it is generally non-curable and progressive condition that leads to death by early adulthood [1]. Nephrotic syndrome (NS) is an important CKD in children which is characterized by the presence of proteinuria, hypoalbuminemia, hyperlipidemia and

edema. The other important CKD in childhood is chronic renal failure (CRF) which is a progressive irreversible destruction of the kidney tissues leading to the loss of renal function, and if not treated, it will result in death [2]. Urinary tract infection (UTI) is a common and important pediatric problem. The clinical importance of UTI is in the susceptibility to renal parenchymal damage and the presence of challenges moving to

imaging the strategies focused on children at risk of developing renal damage [3]. The knowledge of the causative agent of UTI in children is very important for effective treatment [4]. So, this study was carried out to:

1. Evaluate renal function by urea and creatinine in serum.
2. Detect the relation between bacterial UTIs occurrence and both of renal disease and gender
3. Investigate the bacterial antibiotic sensitivity according to the selected antibacterial agents.

## Materials and Methods

### Materials:

1. Ethanol 70% (GCC/ U.K)
2. Hydrochloric acid (HCl) (BDH/ U.K)
3. Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) 30% (BDH/ U.K)
4. Isoamyl alcohol (BDH/ U.K)
5. N-N-N-N-tetramethyl-1,4-phenylene diamine dihydrochloride (BDH/ U.K)
6. Normal saline (PSI/ K.S.A)
7. p-dimethylaminobenzaldehyde (Oxoid/ U.K)
8. Sedar oil (BDH/ U.K)
9. 9.Standard MacFarland solution (matching a turbidity of  $1.5 \times 10^8$  cell/ml) (BioMérieux/France)
10. 5-sulphosalicylic acid dehydrate (Himedia/ India)
11. Urea (Fluka/ Switzerland)

### Methods

#### Study groups

The pediatric patients were 26 of CRF and 36 of NS at the age of 1 to 12 years of both genders, who were outpatients and inpatients in the dialysis unit in both Al-Mansour pediatric teaching hospital and Child's central teaching hospital. The control group consisted of 26 children of both genders and at the same age range of the study groups.

### Blood and urine samples:

These samples were collected in sterile containers. In infants and small children, urine was collected in urine bags [5]. Specimens were taken from the patients and controls, and then transported to the laboratory for required tests.

### Evaluation of renal function:

After centrifugation of blood, sera were stored in Eppendroff tubes at -20°C. Then the following biochemical tests were applied:

#### 1 Blood urea:

Serum concentration of urea in the current study was determined by enzymic method (Urease – Modified Berthelot Enzymatic-Colorimetric). The procedure was applied according to the manufacturing company (BioMérieux/France).

#### Calculation:

$$\frac{\text{A sample}}{\text{A standard}} \times \text{Standard concentration}$$

Normal values of blood urea in children = (20 – 45) mg/dl

#### 2 Serum creatinine:

##### Principle:

This assay was done by using calorimetric method. Creatinine in alkaline solution reacts with picrate to form a colored complex according to (Randox Company).

#### Calculation:

$$\frac{\text{A sample}}{\text{A standard}} \times \text{Standard concentration}$$

Normal values of creatinine in children = (0.7 – 1.4) mg/dl

#### Preparation of indicators and culture media:

All indicators were prepared according to the directions of manufacturing companies.



**General urine examination (GUE):**

It is essential to report turbidity, pH and albumin concentration. Color and turbidity were detected by naked eye. pH paper for urine was used to quantify the acidity. Albumin indicator (prepared in 2.4) was used to detect the presence of albumin in urine. After centrifugation, one drop of sediment of each sample was taken on a slide and covered by cover slip and then was examined by light [6].

**Urine culture:**

Urine samples were cultured on both blood agar medium and MacConkey agar. This culture is the optimal method in UTIs diagnosis and detection of the causative agents. In this study, the bacterial growth was considered significant as below [7]:

-Equal to or less than 30 colonies: non significant growth.

-Equal to 31-100 colony: moderate and significant growth.

-More than 100 colony: heavy growth.

Then the bacterial isolates were identified.

**Identification of bacterial isolates [8]:**

The microscopically features of the isolated microorganisms after staining with Gram stain were identified, such as staining reaction to Gram stain, cell shape and arrangement of cells. The bacterial growth and motility were also tested as cultural characteristics. The biochemical tests were done as in Bergey's manual of microbiology, and then confirmed by api20E system to identify each bacterium.

**Antibiotics sensitivity test:**

This test was carried out by Kirby Bauer's disc diffusion method <sup>(10)</sup>. The resulting inhibition zones have been measured by using a ruler then compared with standard

inhibition zones determined by Clinical and Laboratory Standards Institute, 2009 <sup>(11)</sup>. Both of sensitivity and resistance to antibiotics was recorded. The antibiotics used in this study were part of drugs commonly used in the treatment of UTI in children <sup>(12)</sup>.

	Antibiotic	Symbol	Company
1	Ceftazidime 30 µg	CAZ	Bioanalyse/ Turkey
2	Ceftriaxone 30 µg	CRO	Bioanalyse
3	Gentamicin 10 µg	CN	Bioanalyse
4	Nalidixic acid 30 µg	NA	Bioanalyse
5	Nitrofurantoin 300 µg	F	Bioanalyse
6	Trimethoprim 10 µg	Tr	Himedia

**Statistical analysis:**

Data were translated into a computerized database structure. Statistical analysis was computer assisted using SPSS (Statistical Package for Social Sciences) 2008, version 17. The charts were done by using curve estimation system (the quadratic mode). The statistical significance of association between two variables within the same group was assessed by Chi-square. LSD was used in comparison between two different groups. p-value less than 0.05 was considered statistically significant (SPSS, 2008).

**Results and Discussion:****1. Renal function tests:****Blood urea values:**

As recorded in Table (1), the blood urea levels were significantly higher ( $P < 0.001$ ) in

both NS and CRF groups than that in the controls' blood. Our results agree with the findings of many studies [13,14,15,16,17] about CRF patients, and agree with Małyszko and Abeyagunawardena [18,19] about NS patients.

Our finding did not agree with that of Rizk *et al.* [20] because there was no statistically significant differences in their study groups; which may in-fact, have normal renal function [21].

The concentrations of urea in the blood depend not only on kidney function; but also on non-nephrogenous (non-renal) factors, like increased protein intake, accelerated protein catabolism, dehydration, and oligurea. Impaired renal perfusion and urinary tract obstruction can be possible causes of uremia (high blood urea levels). They may in turn cause damage to the kidney and thus cause renal uremia [22].

**Serum creatinine values:**

The levels of creatinine were much higher in the both sick groups' sera ( $P < 0.001$ ) than those of the healthy ones (Table 1).

This result agreed with the results of those about CRF [13,14,15,16]. Also it agreed with others [20,23,24] about NS patients.

Serum creatinine levels are not affected by a high protein diet as in the case of urea levels [15]. The creatinine level is more reliable parameter than urea level for identification of renal dysfunction, because the serum level of creatinine rises earlier than that of urea and the formation of creatinine is largely independent of protein metabolism. Any rise in blood creatinine is a sensitive indicator of kidney malfunction, because it is normally and rapidly removed from the blood and excreted [26]. Therefore,

serum creatinine may evaluate the progression of renal disease [24].

**Table (1): Biochemical tests results of nephrotic syndrome, chronic renal failure and control group.**

Test	Group	Mean	S.D ±	Minimum value	Maximum value
Blood urea	NS	59.5	10.3	44.97	74.2
	CRF	96.2	14.4	75.9	115.1
	Control	29.5	6.9	20	44
Serum creatinine	NS	1.85	0.43	1.33	2.73
	CRF	4.93	1.52	2.3	6.9
	Control	0.87	0.14	0.7	1.2

**Normal values:**

Blood urea: (20-45) mg/dl.

Serum creatinine: (0.7-1.4) mg/dl.

The increase in urea and creatinine levels in serum (called renal impairment) could be due to the decrease in the number of functioning nephrons in addition to the subsequent hypertrophy of them [27].

**2. The presence of casts in urine:**

The detected urinary casts in the GUE of each patient in NS and CRF groups were not statistically significant in their presence (the p-value was 0.056). This is clarified in Table (2). No casts were detected in the urine samples of control group. It was recorded that only 9.1% of patients with renal disease

showed cast nephropathy [28,29]. Some reference [20,29] mentioned that some children might occasionally have casts in their urine; such as hyaline, waxy and granular casts, which may be present especially when there is acute tubular necrosis [20,29]. Casts may be present especially when there is an acute tubular necrosis or the patient is at a risk of renal injury [30].

Table (2): The urinary casts' presence in sick groups as compared with control group.

Presence of casts	NS patients	CRF patients	Total
Positive	66.67%	42.3%	35
Negative	33.33%	57.7%	27
Total	100%	100%	62

**3. The presence of albumin in urine:**

The albuminuria was significant (p-value was 0.049). See table (3). This may indicate the increased glomerular permeability [31]. The urine samples of controls were albumin negative. This result is similar to others (14, 32) and [20,24] about CRF and NS respectively. Albuminuria indicates that the glomerulus is more permeable to serum proteins than usual, as it occurs in renal disease, because of glomerular injury [27]. The highest molecular weight plasma proteins, such as immunoglobulins and metal-binding proteins, can also pass the glomerulus in severe proteinuria [33]. Moreover, the diet habits of children, particularly high milk uptake, may increase the effort on the kidney for albumin or protein filtration, and hence encourage renal disease development (34). The p-value was not markedly significant; this could be due to that not all the sick children had reached to ESRD [33].

Table (3): Albumin presence in the urine of each patients groups as compared with controls.

Albumin in urine	NS patients	CRF patients	Total
Positive	91.67%	73.08%	52
Negative	8.33%	26.92%	10
Total	100%	100%	62

**4. Urinary tract infection occurrence with renal disease:**

The incidence of UTI had a significant association with the type of the renal diseases. The p-value was 0.042. The percentage of the positive cultures was 50% in the CRF patients, while it was 25% in the NS patients. The data are shown in table (4). 25% of nephrotic children had UTIs; it is the same percentage in [34]. A large number of bacteria in the urinalysis of CRF patients suggests UTIs [14]. Some authors [35,36] reported that 12.2% and 9.1% respectively of children with renal failure were having UTIs.. While the positive cultures were 92.7% in CRF patients in [37]. In NS patients, the immunoglobulins are lost in proteinuria, especially in chronic glomerular disease placing the child at risk of bacterial infections and UTI [31]. Many factors, such as accumulation of uremic toxins and dialysis itself, may affect the immune system or make them susceptible to viral or bacterial infections. The wide use of catheters in order to facilitate urination could be the main cause of nosocomial UTI, in addition to uroscopy and the long period of hospitalization for dialysis [38].

Table (4): The significant association of urinary tract infection with renal disease.

Urinary tract infection	NS patients	CRF patients	Total
Positive	25%	50%	22
Negative	75%	50%	40
Total	100%	100%	62

Total	100%	100%	62
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**5. Urinary tract infection occurrence with gender:**

The gender was significantly related to the occurrence of UTI in the children in this study. The p-value was 0.044. The higher rates of UTIs were observed in females. The females' predisposition to UTI is higher than that of males as stated by many researchers [39,40,41]. Some references [42,43] noticed that males' percentage of UTI in pediatric patients was the greatest (61.53% and 51.72% respectively) as the majority of them were uncircumcised (penile foreskin was present). There was a slight male elevation as the males' percentage was higher (54%, 56%) than that of females (46%, 44%) respectively <sup>(36)</sup>. There was no significant difference between both genders in the frequency of UTI in [35]. The shorter length of urethra in females and the close anatomical position with the contaminated vagina and anus opening can explain females' predisposition. While in males, the long urethra makes the ascending infection less frequent [44].

Table (5): The significant relationship between urinary tract infection and gender.

Urinary tract infection	Male patients	female patients	Total
Positive	28.3%	71.7%	22
Negative	56.25 %	43.25 %	40

**6. The bacteriological aspects:**

The positive cultures of urine samples formed 35.5% of the total count of patients' samples. The negative results formed the remaining (64.5%). Urine cultures of controls were negative. The bacteria were identified by morphological and biochemical tests according to Bergey's manual; confirmed by using api 20E system. The isolates included the following bacteria:

- **E. coli:** the majority of bacterial isolates was attributed to this bacterium (54.55% of UTI cases). Many references recorded that a variety of virulence factors of this bacterium has been identified, such as endotoxins in all strains, adhesins (pili) associated with UTIs and colonization factors. Capsule is present in some strains [8]. Children also may possess certain physiologic and anatomic characteristics that influence cell adhesiveness [45]. **E. coli** may be a less important cause of UTI after instrumentation of the UT (catheterization), or in patients with an underlying anatomic abnormality [27]. These bacteria colonize the intestine and periurethral region [43]. **E. coli** predominance was found in many studies [4,35,42,43,46] in children.
- **Pseudomonas aeruginosa:** it was in 22.73% of positive cultures. This result may be outweighed to the ability of this bacterium to utilize a very wide range of carbon and energy sources and to grow over a wide temperature range. So, it is widespread in various areas, such as moist environments in hospitals. Patients usually become infected from the environmental sites. **Pseudomonas aeruginosa** produces some substances that act as an adhesins and

cellular toxins, such as endotoxin, numerous exotoxins and exoenzymes [8,27]. This bacterium was isolated only from 4 years old children (5%) in [46], while it was 7.9% in [35] as it has predilection for the old and the very young age groups. The main cause of *Pseudomonas aeruginosa* UTIs in renal disease patients could be catheterization. It causes disease in humans with abnormal host defense and isolated mainly from patients with nosocomial UTI [8,45].

- ***Klebsiella pneumoniae***: This bacterium formed 9.09% of total UTI pathogens similar to those were isolated in [46] ranked the third class. Unlike *E. coli*, this bacterium is rarely associated with infections except as opportunists in compromised patients (like CRF patients). It occasionally produces UTI and it is common in the recurrent UTIs in hospitalized patients as it is hospital-acquired [8,45].

- ***Proteus mirabilis***: it was in 9.09% of UTIs. This was not similar to the result of (35, 43, 46) because *Proteus mirabilis* was the third causative agent of UTI in children (17.3%, 16.55%, 15% and 14.6% respectively) in these studies. The low incidence of *Proteus* UTI in our study could be attributed to the fact that this bacterium is rarely isolated from the faeces of children (8). This type might be hospital acquired. It has characterized virulence factors; such as endotoxins and urease, which have possible role in pathogenesis (45). The rapid motility may contribute to its invasion of the UT. It can produce UTIs in human only when it leaves the intestinal tract (8).

- ***Morganella morganii***: This bacterium was isolated from one case only (4.55%) only. This result was the same as that of (42) about UTIs in children with renal problem. Lewczyk et al. (2001) stated that this bacterium have

been mainly raised from the urine of (1-18) years old children (47). It is an important nosocomial pathogen. *Morganella morganii* is commonly isolated from patients who are chronically catheterized (8).

Table (6): Distribution of bacterial isolates according to the type of renal disease.

Bacteria	CRF group	NS group	Total	Percentage
<i>E. coli</i>	5	7	12	54.55%
<i>Pseudomonas aeruginosa</i>	5	0	5	22.73%
<i>Klebsiella pneumoniae</i>	2	0	2	9.09%
<i>Proteus mirabilis</i>	1	1	2	9.09%
<i>Morganella morganii</i>	0	1	1	4.55%
Total of positive cultures	13	9	22	35.5%
No growth	13	27	40	64.5%
<b>Total</b>	<b>26</b>	<b>36</b>	<b>62</b>	<b>100%</b>

The differences in the rates of infecting microorganisms probably due to multifactorial etiology of which different cultural habit, nutritional, socioeconomic and environmental factors and, also, might be due to age, gender or racial variations (46). These results are in agreement with those of (37) who isolated the same bacteria at the same classes from UTIs in patients with CRF. The primary reasons for *E. coli* and *Pseudomonas aeruginosa* predominance are their wide occurrence, ability to survive outside the human body for long periods and resistance to antibiotics (44). UTIs may result

from ascension of pathogens via the urethra. Development of such an infection is also furthered by obstructive anomalies, instrumentation, neurogenic bladder or VUR<sup>(48)</sup>. Nosocomial UTI has the higher rate in many Iraqi hospitals. This is significantly associated with the duration of hospitalization, urinary catheterization or urinary endoscopy<sup>(38)</sup>.

### **7. The antibacterial aspects:**

As shown in table (7), it is obvious that the antibiotic discs varied in their effects on the five types of bacteria. The significance was also different between cases according to the bacterial isolates and the drug used. Multiple drug resistance is common and might be under the control of transmissible plasmids<sup>(8)</sup>.

◆ Nitrofurantoin, which had 0% of resistance, was the unique effective antibiotic on *E. coli*. Nitrofurantoin was the most active agent against this bacterium in the results of [40,42] in Iraq. Nitrofurantoin is only used in urinary tract infections, and it is effective against Gram-positive and Gram-negative bacteria [48]. This bacterium was 100% resistant to both of Ceftazidime and Cefterixone. This resistance could be due to lack of Penicillin binding proteins (PBPs), the target cells, or poor permeation of bacteria by the drug [8]. *E. coli* was also resistant to Gentamicin, Nalidixic acid and Trimethoprim at a percentage of 100% for each of them. This disagreed with the<sup>(40)</sup> finding in Iraq, in which *E. coli* resistance against each one of those antibiotics was low. However, *E. coli* had recorded a high resistance to Trimethoprim (94.9%) in [49]. High rates of resistance were reported in [39] towards Gentamicin (75%) and Nalidixic acid (70%). The incidence of resistance in *E. coli* was

variable and often it was plasmid-mediated. Multiple-drug resistance is widely present in *E. coli* populations [45].

◆ *Pseudomonas aeruginosa* was resistant to all antibiotics in this study. This bacterium is difficult to control due to the presence of multiple drug-resistant strains. This is a therapeutic problem. These bacteria are often characterized by multiple resistance [48]. Antibiotic resistance has probably developed by the transfer of R plasmids from other drug-resistant enteric Gram-negative bacteria; or because of its propensity to develop resistance during therapy [45]. *Pseudomonas aeruginosa* isolates were the most potent ones against tested antibiotics in other references [4,41,49,50].

◆ Multiple antibiotic resistance, usually plasmid-mediated, is common in *Klebsiella pneumoniae* UTIs [45]. This may be related to highly resistance of *Klebsiella spp* to several types of antibiotic, and many reports have indicated the presence of multi-drug resistance in *Klebsiella pneumoniae* causing UTI [35,50]. The percentages of resistance against Nalidixic acid and Nitrofurantoin were the lowest (0%). The same resistance percentage against Nalidixic acid was reported in [39]. Nalidixic acid is very effective in *Klebsiella pneumoniae* UTIs [8]. Nitrofurantoin is only used in urinary tract infections, and it is effective against Gram-positive and Gram-negative bacteria [48]. This bacterium had a percentage of 50% resistance against Gentamicin. That may be attributed to the production of modification enzymes of active groups (amine and carboxyl) in Gentamicin by *Klebsiella pneumoniae*; so, it would be inactive. The resistance was 50% against Trimethoprim.

The moderate Trimethoprim resistant was recorded [49]. The Trimethoprim resistance might be as a result of plasmid R transfer. The highest resistance rates appeared towards Ceftriaxone and Ceftazidime (100% of each). The significant increase towards these two Cephalosporins was present in Saudi Arabia [4]. A percentage of resistance equals to 92.7% was recorded towards Ceftriaxone and 68.3% towards Ceftazidime. Cephalosporins are widely used. Therefore, they encountered significantly raising resistance by *Klebsiella* [51].

◆ The resistance percentage of *Proteus mirabilis* isolates was 100% towards each of Gentamicin, Ceftriaxone and Nitrofurantoin. While it was 0% against Ceftazidime and Trimethoprim. The Nalidixic acid resistance rate was 50%. The findings were not agreeing with those of [39] in Kirkuk to Gentamicin. The big difference between the mentioned results and ours may be due to the difference in residents. A moderate resistance was recorded towards Gentamicin [36,42,49]. The Ceftriaxone resistance rate was 0% in [42] in contrast with our study rate that was 100%, while [43] rate was 79.2%. The high susceptibility towards Ceftazidime was recorded by [42] in 85.7%. Strains of *Proteus mirabilis* vary greatly in antibiotic sensitivity<sup>(8)</sup>. Strong resistance against Nitrofurantoin (100%) equals to this study rate was recorded in [49], while others [36,42,50] recorded lower resistance percentages (22%, 55% and 21% respectively) towards it. As in other Gram-negative bacilli in nosocomial infections, multiple drug resistance was present. It may attribute to transmissible plasmids [8]. Trimethoprim resistance rate was 100% by [49]. The study result may indicate a higher affinity of isolates for

sulfonamides than for p-aminobenzoic acid (PABA) [8]. The moderate susceptibility towards Nalidixic acid was shown [36]. Nalidixic acid is useful as urinary antiseptic with low resistance rates [8].

◆ *Morganella morganii* was isolated from one case only, so the resistance pattern could be related to this strain. The variation of antibiotic susceptibility in *Morganella morganii* may attribute to genetic variation between isolates. So, the isolate which has the greatest number of resistance genes against some antibiotics will resist them [8].

Table (7): The resistance percentage of each type of bacteria according to the antibiotics discs.

Bacteria	Antibiotics discs <sup>*</sup>					
	CA Z	CR O	CN	NA	F	Tr
<i>E. coli</i>	100 %	100 %	100 %	100 %	0%	100 %
<i>Pseudomonas aeruginosa</i>	100 %	100 %	100 %	100 %	100 %	100 %
<i>Klebsiella pneumoniae</i>	100 %	100 %	50 %	0%	0%	50 %
<i>Proteus mirabilis</i>	0%	100 %	100 %	50 %	100 %	0%
<i>Morganella morganii</i>	100 %	0%	100 %	100 %	0%	100 %
p-value	0.0 01	0.0 01	0.0 63	0.0 03	0.0 01	0.0 03

\*CAZ: Ceftazidime, CRO: Ceftriaxone, CN: Gentamicin, NA: Nalidixic acid, F: Nitrofurantoin, Tr: Trimethoprim.

There are many resistance mechanisms against antibiotics by different Gram-negative isolates [8]. Plasmid controlled resistance is increasing in coliforms because they are growing nosocomial problem<sup>(30)</sup>. Nitrofurantoin was the most effective

antibiotic with less bacterial resistance. This result agreed with many findings [10,24,23]. Nitrofurantoin can be considered as the first line antibiotics for prophylaxis and or treatment of patients with recurrent UTI [4]. The highest resistance rates were recorded against Gentamicin. The same result was proved [21].

## Conclusion

1. *E. coli* had a predominance of more than half of UTIs in children with renal disease (54.55%), followed by *Pseudomonas aeruginosa* (22.73%). The other isolated bacteria were less frequent.
2. The highest resistance rates were recorded against Gentamicin.
3. GUE of both CRF and NS patients showed that casts presence in urine was not significant, while albuminuria was significant.
4. UTIs showed a significant relation with the type of renal disease and with gender.

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## Cinnamon Bark Extract Improved the Semen Quality of Male Albino Mice

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### Abstract

This work was conducted to examine the effect of the aqueous extract of cinnamon bark on some reproductive parameters of male mice. Ten healthy adult males of Swiss albino mice (*Mus musculus* L), their age between 80-100 days and their weight between 28-35 g, were selected, acclimated, then randomly categorized into two groups of five animals each and treated as follows. Group 1: Control mice that received orally by gavage needle 0.1 ml of tap water daily for 30 days. Group 2: Male mice treated orally by gavage needle with 0.1 ml of the aqueous extract of cinnamon bark daily for 30 days. After cervical dislocation both testes and epididymes immediately were dissected out, then the epididymal sperms parameters and the testes histological structures were estimated and the data were statistically analyzed. Cinnamon bark extract caused a highly significant increase ( $P < 0.01$ ) in sperms progressive motility which increased from 71 % in the male mice of the control group to 86 % in the male mice of the treatment group. The treated males had a significant larger ( $P < 0.01$ ) sperms concentration ( $3.4 \times 10^6$  /ml) than the males in the control group ( $2.1 \times 10^6$  / ml). The percentage of vital sperms was significantly increased ( $P < 0.05$ ) from 89.2% in the animals of the control group to 94.4% in the animals of the treated group. There was a highly significant increase ( $P < 0.01$ ) in the percentage of normal sperms in the treated male mice (92.8 %) in comparisons with the untreated (control) male mice (85.7 %). Although, the histological examination of the testes showed no significant differences ( $P > 0.05$ ) between the two groups of male mice, there was an obvious improvement in both of the diameters of seminiferous tubules and the thickness of germinal cell layer in favor of the treated mice. In conclusion, the oral daily treatment of the aqueous extract of cinnamon bark for 30 days improved some significant parameters of semen quality of male mice.

**Key words:** Cinnamon bark, aqueous extract, semen quality.

## مستخلص لحاء القرفة حسّن نوعية السائل المنوي في ذكور الفئران البيض

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### خلاصة

صممت هذه التجربة لدراسة تأثير المستخلص المائي للحاء القرفة على بعض المعالم التناسلية في ذكور الفئران. تم اختيار 10 ذكور من الفئران السويسرية البيض (*Mus musculus L*) السليمة والناضجة تراوحت أعمارها بين 80-100 يوم وأوزانها بين 28-35 غم. قسمت إلى مجموعتين وبواقع 5 ذكور في كل مجموعة، مجموعة المقارنة والتي عولمت يوميا ولمدة 30 يوم بـ 0.1 مل من ماء الحنفية بواسطة أنبوبة التغذية القسرية، ومجموعة المعاملة والتي عولمت يوميا ولمدة 30 يوم بـ 0.1 مل من المستخلص المائي للحاء القرفة بواسطة أنبوبة التغذية القسرية. عند انتهاء المعاملة قتلت الحيوانات واستخلصت كلا من الخصى والبرابخ ثم قدرت بعض معالم نطاف البرابخ ودرس التركيب النسجي للخصى وحللت النتائج إحصائيا. أدت المعاملة بالمستخلص المائي للحاء القرفة إلى زيادة عالية المعنوية ( $P < 0.01$ ) في النسبة المئوية للحركة التقدمية للنطاف والتي ارتفعت من 71% في ذكور فئران مجموعة السيطرة إلى 86% في ذكور فئران مجموعة المعاملة. كما كان لحيوانات المعاملة تركيز أعلى من النطاف ( $3.4 \times 10^6 / ml$ ) مقارنة بحيوانات مجموعة السيطرة ( $2.1 \times 10^6 / ml$ ) ( $P < 0.01$ ). وارتفعت النسبة المئوية للنطاف الحية من 89% في ذكور مجموعة السيطرة إلى 94.4% في ذكور مجموعة المعاملة ( $P < 0.05$ ). كما سجل ارتفاع عالي المعنوية ( $P < 0.01$ ) في النسبة المئوية للنطاف الطبيعية في الذكور المعاملة (92.8%) مقارنة بالذكور غير المعاملة (85.7%). ولم يتضح من دراسة التركيب النسجي وجود فروقات معنوية ( $P > 0.05$ ) بين خصى حيوانات المجموعتين، بالرغم من تحسن اقطار النبيبات المنوية وسمك طبقة الخلايا الجرثومية في خصى حيوانات المعاملة. لقد أدت المعاملة الفموية اليومية ولمدة 30 يوم بالمستخلص المائي للحاء القرفة إلى تحسن بعض المعالم التناسلية المهمة في ذكور الفئران.

**كلمات مفتاحية:** لحاء القرفة، المستخلص المائي، نوعيه السائل المنوي.

### Introduction

The name cinnamon is derived from the Greek word *kinnámōmon* which may ultimately stem from the Malayan word *kayee manis* meaning sweet wood [1]. In Arabic, it is called *Kerfa*, also best known in colloquial Iraqi as *darseen* maybe it comes from the Persian word *darchini* meaning the Chinese wood.

The cinnamon of commerce is the dried inner bark of a small evergreen tree 10–15 m tall, belonging to the family Lauraceae, and is

native to Sri Lanka, India, Bangladesh, and Nepal. The bark is widely used as a spice because of its distinct odor [2]. Currently, there are two types of cinnamon are cultivated, *Cinnamomum verum*, also known as Ceylon cinnamon, and *Cinnamomum cassia*, also known as Chinese cinnamon [3]

The cinnamon bark is one of the oldest herbal medicines that have been mentioned in Chinese texts as early as 4,000 years ago [4] eastern and western herbalists used it to treat various health problems. Moreover,

modern researches have demonstrated a number of benefits resulting from cinnamon supplementation, most notably hypocholesterolemic [5] hypoglycemic [6] and antioxidant [7] effects.

In male fertility, besides the bark was used by ancient healers to treat impotence and frigidity [3], some recent studies revealed a positive effect from cinnamon supplementation on male's reproductive efficiency [8], [9]

In view of the above, we conducted this work to examine the effect of aqueous extract of cinnamon bark on some reproductive parameters of male albino mice.

## Material and Methods

**Cinnamon Bark Extract:** Cinnamon bark were procured from local market in Baghdad city, ground in a grinder and an amount of 5 g soaked in 100 milliliter of water for one hour then gently heated for 15 minutes, filtered and kept in refrigerator for maximum one week. Each week fresh extract was prepared.

**Animals:** Ten healthy adult males of Swiss albino mice (*Mus musculus* L), their age between 80-100 day and their weight between 28-35 g, were used in the investigation. Mice were maintained under hygienic conditions in well ventilated room and had free access to maintenance food and water. The animals were kept out for one week prior to the experiment for acclimation in animal house of Department of Biology, College of Education for Pure Sciences, University of Baghdad.

**Treatment & Dosage:** The animals were randomly categorized into two groups of five animals each and treated as follows. Group 1: Control mice that received orally by gavage

needle 0.1 ml of tap water daily for 30 days. Group 2: Male mice treated orally by gavage needle with 0.1 ml of cinnamon bark extract daily for 30 days.

**Sample Collection:** After 30 days, all animals were sacrificed by cervical dislocation, and then both testes and epididymes immediately were dissected out and cleared of their adhering tissue. The testes were fixed in formalin 10% for histological analysis. The epididymis was finely minced by anatomical scissors in 1 mL of isotonic saline at 37 °C in a Petri dish. It was completely squashed by a tweezers for 1 min to expel the sperms to the Petri dish.

**Assessment of Sperms Parameters:** The sperms parameters were assessed according to World Health Organization methods & criteria [10]. The sperms parameters including: progressive motility, sperms concentration, sperms vitality and sperms morphology. Briefly, progressive motility was estimated subjectively at X 400 magnification using a 100-point scale for linear movement. The data were collected from 5 different fields in each sample and expressed in percentage of total cells. Sperm concentration was determined using the standard hemocytometric method. The dilution rate was 1:200 and the concentration was expressed as per ml. Sperms vitality was calculated using eosin nigrosin staining technique, from 2 slides 400 sperms were evaluated at X 400 magnification, the average percentage of vital (unstained) sperms was calculated. Sperms morphology was determined from the same two slides, a total of 600 sperms was examined at × 1000 magnification with oil immersion, the head & tail abnormality of sperms were determined, the average

percentage of normal sperms was calculated.

**Histological Examination:** For each testis, two slides of 10  $\mu\text{m}$  sections were prepared according to Pease method [11] and stained with H&E [12] Ten seminiferous tubules (ST) were randomly examined per section, their diameters and germinal cell layer thicknesses (from the basal membrane towards the lumen of the tubule) were measured using an ocular micrometer in a light microscope at X400 magnification, then the mean size of ST and germinal cell layer thickness were calculated [13].

**Statistical Analysis:** The Statistical Analysis System (SAS) in completely randomized design (CRD) [14] was used to analyze the data. Differences among treatment means were compared for statistical significance, using *t* test.

## Results

Cinnamon bark extract caused a highly significant increase ( $P < 0.01$ ) in sperm progressive motility which increased from 71 % in the male mice of the control group to 86 % in the male mice of the treatment group Fig.1.

The treated males had a significant larger ( $P < 0.01$ ) sperms concentration ( $3.4 \times 10^6/\text{ml}$ ) than the males in the control group ( $2.1 \times 10^6/\text{ml}$ ) Fig.2

The percentage of vital sperms was significantly increased ( $P < 0.05$ ) from 89.2% in the animals of the control group to 94.4% in the animals of the treated group Fig.3

Also, there was a highly significant increase ( $P < 0.01$ ) in the percentage of normal sperms in the treated male mice (92.8 %) in comparisons with the untreated (control) male mice (85.7 %) (Fig. 4).

Despite the histological examination of the testes showed no significant differences ( $P > 0.05$ ) between the two groups of male mice, there was an obvious improvement in both of the diameters of seminiferous tubules and the thickness of germinal cell layer in favor of the treated mice (Figs.5).

The seminiferous tubule diameter was 181.2  $\mu\text{m}$  & 144.7  $\mu\text{m}$  in the treated and untreated male mice respectively. Fig.6.

The thickness of germinal cell layer was 64.1  $\mu\text{m}$  in treated male mice and 50.2  $\mu\text{m}$  in the untreated (control) male mice .Fig.7.

## Discussion

Nutraicetical is a foodstuff that provides health benefits in addition to its basic nutritional value [15] and cinnamon has many bioactivities as well as rich in carbohydrate and essential amino acids [16] hence it can promote both health and reproduction.

In tradition Chinese medicine cinnamon was used as appetizer [17] and considered as a warming herb that can improve blood pelvic flow and prescribed to fortify yang (masculine force according to Chinese philosophy) [18]

One of its remarkable bioactivity is that cinnamon could act as an insulin mimetic. The aqueous extract of cinnamon increased glucose metabolism roughly 20-fold in-vitro in the epididymal fat cells [19]. The most active compound methyl hydroxy chalcone polymer (MHCP) increased insulin sensitivity by activating key enzymes that stimulate insulin receptors, while inhibiting enzyme that deactivate them [20]. In addition to that, cinnamon contain a number of antioxidants compounds which can effectively reduce

oxidative stress by scavenging reactive oxygen species (ROS) [21]

It is clearly from our study results that cinnamon has positive effects on the quality of male mice semen. The daily treatment for 30 days increased ( $P < 0.01$ ) the sperms progressive motility from 71% in the untreated animal to 86% in the treated animals, the sperm motility is regarded as a manifestation of sperm functional competence [22] and related to pregnancy rates [23]. Furthermore, the treatment increased ( $P < 0.01$ ) the sperms concentration from  $2.1 \times 10^6$  / ml in the untreated males to  $3.4 \times 10^6$  /ml in the treated males, the sperm concentration are related to both time to pregnancy [24] and pregnancy rates [23] and are predictors of conception [25]. These findings can be explained on the basis of cinnamon versatile bioactivities, cinnamon can increase the concentration of FSH, LH and testesone hormones [9] either by its direct effect [8] or probably because its effective mimetic of insulin. The insulin regulates the male hypothalamic-pituitary-gonadal axis and is essential for fertility [26]. The functions of FSH, LH and testesone hormones are well documented in male reproductive system.

The significant improvement in the percentage of vital sperms which raised from

89.2% in the control group to 94.4 % in the treatment group, and the percentage of normal sperm which increased from 85.7% in the control group to 92.8 % in the treatment group may be explained in the light of the antioxidants properties of cinnamon which can improve semen quality. Oxidative stress is considered as a major factor in the aetiology of male infertility [27] because both spermatogenesis [28] and Leydig cell steroidogenesis [29] are vulnerable to oxidative stress caused by ROS. The natural antioxidants can protect DNA and other molecules from cell damage induced by oxidation and can improve sperm quality and increase reproductive efficiency of males [30]

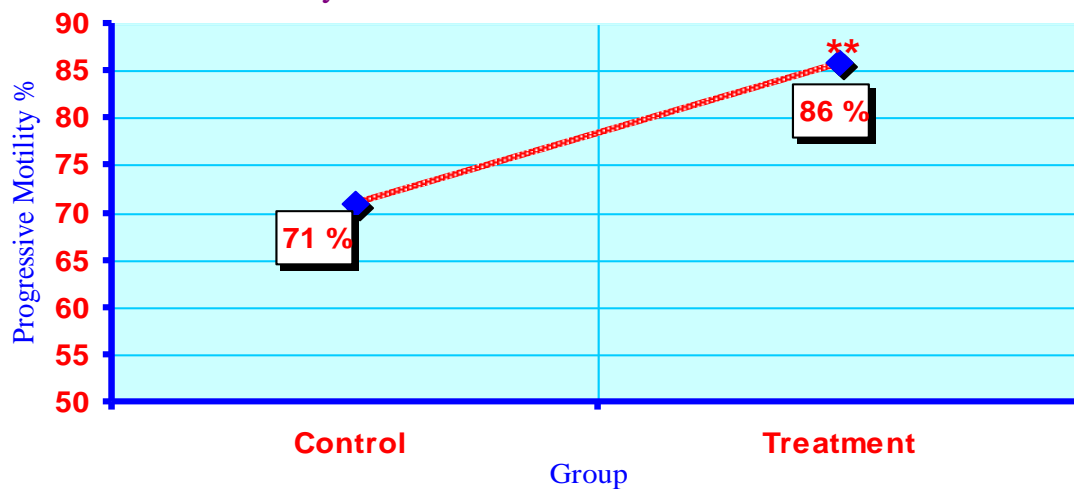
Our research results are in agreement with the results of Havez [8] and the results of Hemayatkah Jahromi *et al* (9). More research are needed to elucidate the mechanism of cinnamon action because until recently, little was known about mechanisms involved in its biological effects [31]

## Conclusion

The oral daily treatment of the aqueous extract of cinnamon bark for 30 days improved some significant parameters of semen quality of male mice.

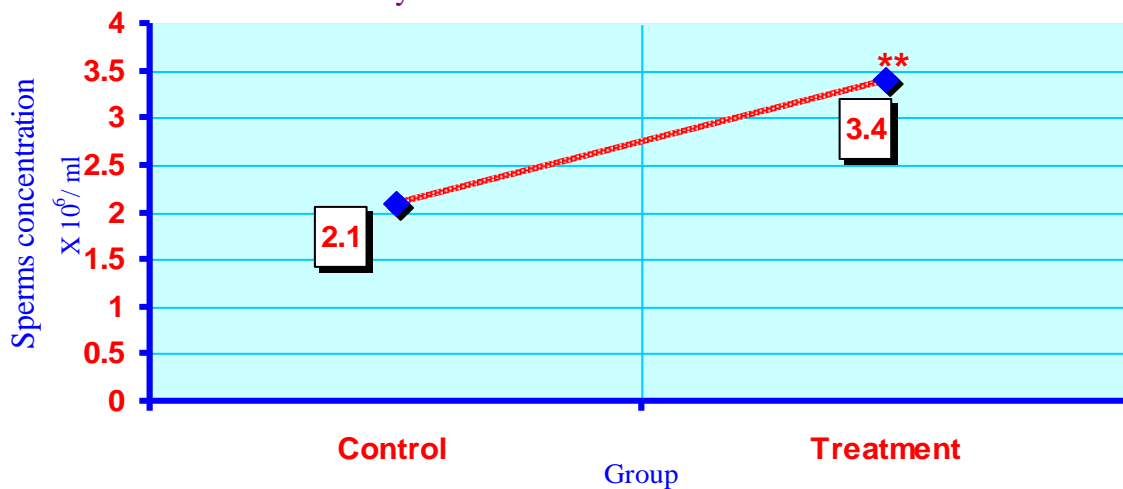


**Fig1:**The sperms progressive motility of male mice after 30 days of cinnamon bark extract oral treatment



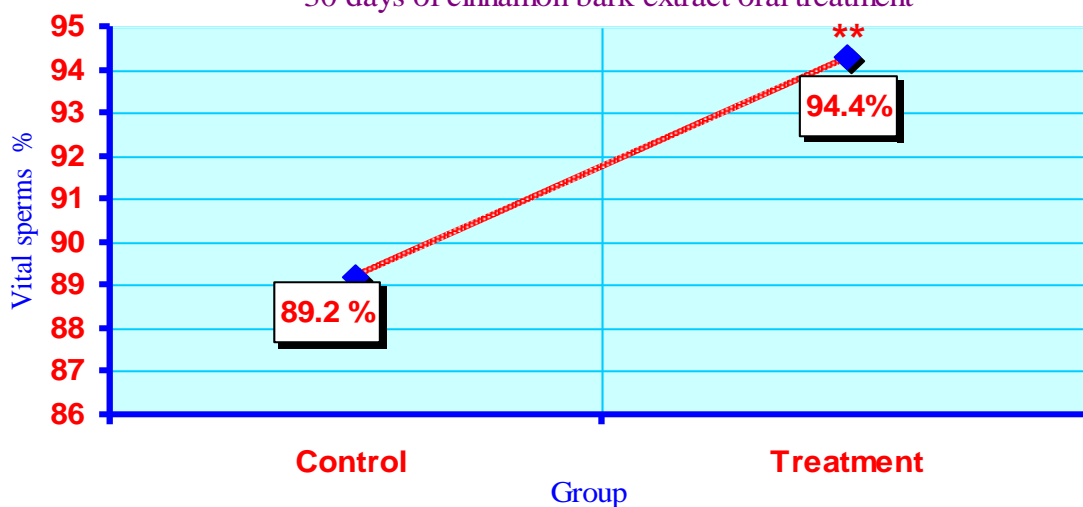
\*\* Differe from the control significantly( $P < 0.01$ )

**Fig 2:** The sperms concentration of male mice after 30 days of cinnamon bark extract oral treatment



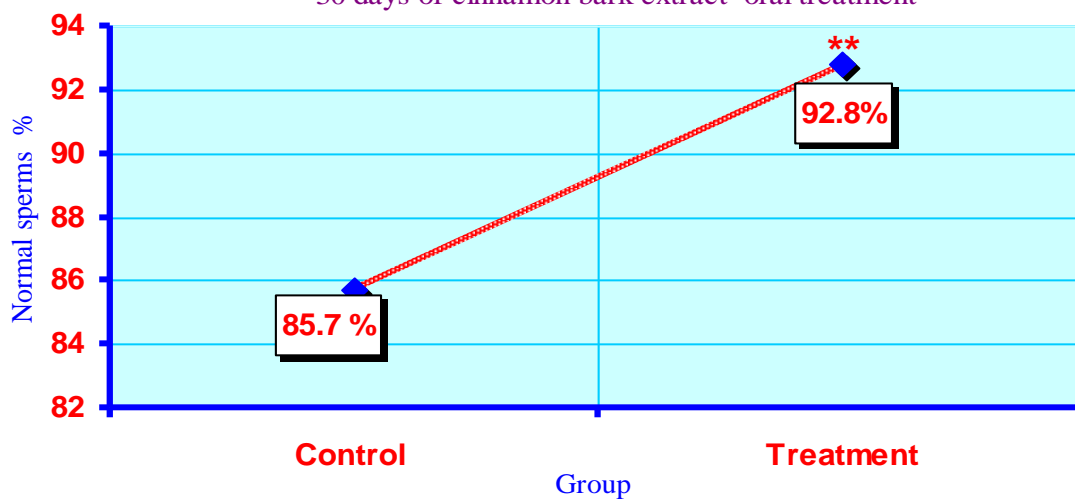
\*\* Differe from the control significantly ( $P < 0.01$ )

**Fig 3:** The vital sperms percentage of male mice after 30 days of cinnamon bark extract oral treatment

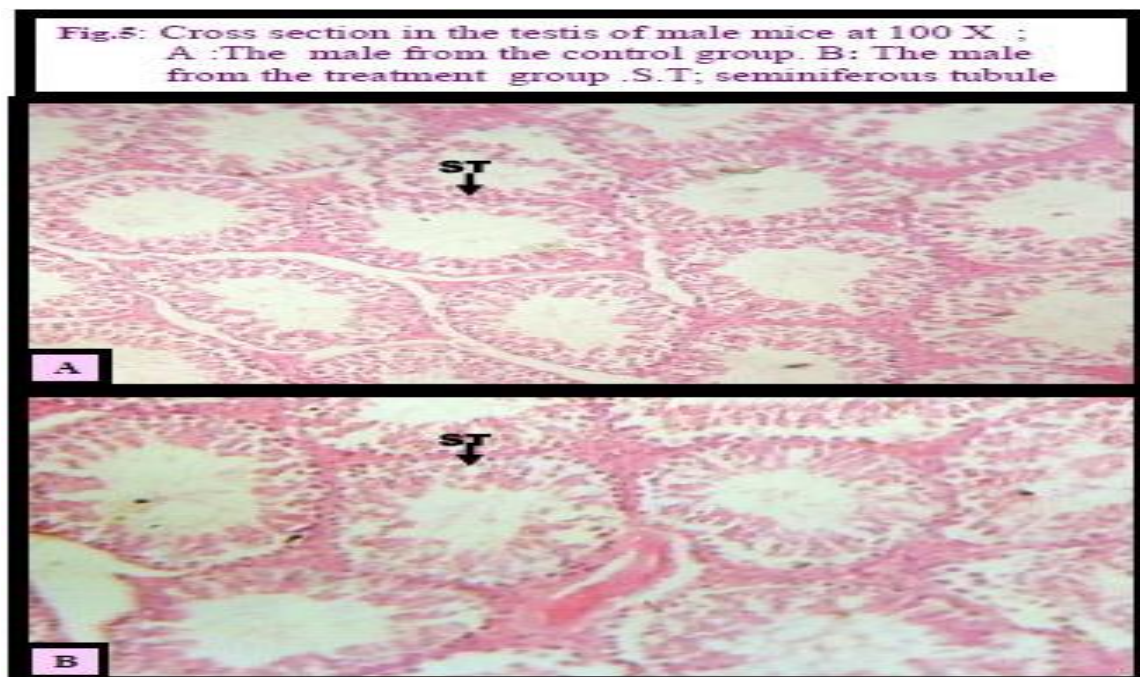


*\*\* Differe from the control significantly (P < 0.05)*

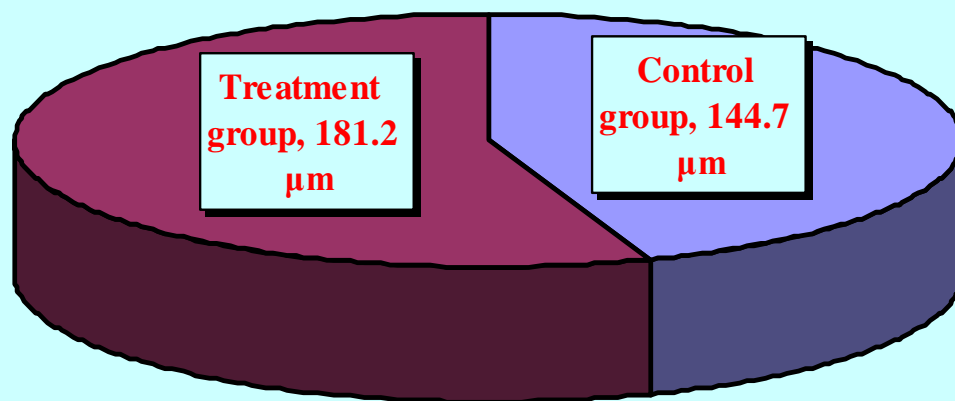
**Fig 4:** The normal sperms percentage of male mice after 30 days of cinnamon bark extract oral treatment



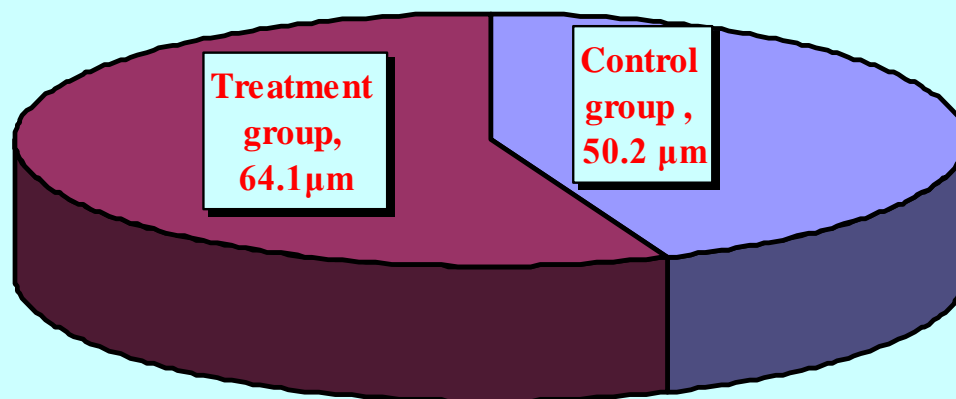
*\*\* Differe from the control significantly (P < 0.01)*



**Fig 6 :** The seminiferous tubules diameters of male mice testes after 30 days of cinnamon bark extract oral treatment



**Fig 7 :** The germinal cell layers thickness of male mice testes after 30 days of cinnamon bark extract oral treatment



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## Characterizations of Bioflocculant Produced by *Bacillus coagulans* 8B and Application in Domestic Wastewater Treatment

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### Abstract

Forty eight isolates belonged to *Bacillus* spp. were isolated from soil and water samples. Twenty two *Bacillus* isolates revealed a mucous phenotype when grown on nutrient agar plates. Only seven isolates of *Bacillus* were grown on starch broth media and gave flocculating activity for kaolin suspension. Isolate B8 (isolated from soil) gave the highest flocculating activity for kaolin suspension (37%). Biochemical tests for this isolate showed that B8 strain of *Bacillus coagulans*. The bioflocculant produced by *B. coagulans* B8 was extracted by organic solvents. Thin layer chromatography (TLC) analysis for *B. coagulans* B8 bioflocculant hydrolyzed by HCl with solvent system showed two brown spots when using phenol-sulphuric acid reagent with  $R_f = 0.41$  and  $0.58$  which resembled to galactose and glucose, and only one red-violet spot when using ninhydrin reagent ( $R_f = 0.68$ ) which may be resembled with phenylalanine. Domestic waste waters were of treated with *B. coagulans* B8 bioflocculant. Results showed that turbidity removal (flocculating activity) was reduced to 62.7%.

**Keywords:** Bioflocculant, bacillus coagulant, wastewater

## خصائص الملبد الحيوي المنتج بواسطة *Bacillus coagulans* واستخدامه لمعالجة مياه المجاري المنزلية

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### خلاصة

تم عزل 48 عزلة بكتيرييه تعود الى جنس *Bacillus*، جمعت من عينات الماء والتربة. اعطت اثنان وعشرون عزلة صفة اللزوجة عندما زرعت على وسط الاكار المغذي، اظهرت سبعة عزلات فقط من *Bacillus* نمواً في وسط النشاء المغذي واعطت فعالية التلبد في عالق الكاولين. اعطت العزلة B8 ( المعزولة من التربة ) اعلى فعالية تلبد في عالق الكاولين (37%). اظهرت الاختبارات الكيموحيوية والفحص المظهري لهذه العزلة انها تعود الى نوع *Bacillus coagulans*. استخلص الملبد الحيوي من العزلة *B. coagulans* B8 بأستعمال المذيبات العضوية. اظهر التحليل الكروماتوغرافي للطبقة الرقيقة ( TLC ) للملبد الحيوي المتحلل، ان المنتج من *B. coagulans* B8 يحوي جزء كاربوهيدراتي وجزء بروتيني، حيث ظهرت بقعتان بنية اللون عند استخدام الفينول - حامض الكبريتيك لتحري عن الكاربوهيدرات (  $R_f = 0.41, 0.58$  ) التي ماثلت الكالكوز والكلوكوز، وظهرت بقعة واحدة حمراء غامقة عند استخدام النينهيدرين لتحري عن الاحماض الامينية (  $R_f = 0.68$  ) التي ماثلت الحامض الاميني الفنيل الانلين . درست قابلية مادة التلبد على ازالة مياه المجاري المنزلية، كانت القدرة على ازالة العكورة ( فعالية التلبد ) فقد اختزلت الى 62.7%.

**كلمات مفتاحية:** الملبد الحيوي، عزلات تلبد *Bacillus*، مياه المجاري.

## Introduction

Microbial flocculants (MBFs) are special natural organic macromolecule substances that can flocculate suspended solids, cells, colloidal solids, etc. [1]. Monomers of polyacrylamide (organic flocculant) are potent carcinogen and neurotoxic to humans and other animals [2]. Several bioflocculants from different microorganisms have been reported. Flocculants produced by *Bacillus subtilis* [3], *Bacillus licheniformis* [4] and *Rhodococcus erythropolis* [5], are predominantly protein in nature; whereas, those produced by *Bacillus firmus* [1]. Bioflocculants possess several advantages: such as safety, strong effect, biodegradable and harmless to humans and the environment, so they may potentially be applied in several industrial and waste water treatment processes such as pharmaceutical,

fermentation, food industries, drinking and downstream processing [1]. Inorganic and organic synthetic polymer flocculants are frequently used in water and wastewater treatment because they are economical and highly effective [6]. However, their use often gives rise to environmental and health problems in that some of them are not readily biodegradable and some of their degraded monomers, such as acrylamide, are neurotoxic and even strong human carcinogens. Residual alum concentration in treated water can also impose health problems apart from the production of high amount of sludge [6]. The aims of this study were: Isolation and Identification of *Bacillus* with highly productivity of bioflocculant. Study of some physico-chemical properties of bioflocculant. Determination of bioflocculant role in Domestic wastewater treatment.



## Materials and Methods

### Collection Sample, isolation and quantitative screening bacteria

Four grams of each soil sample was suspended in 20ml of sterilized distilled water in sterile flasks, shake to homogenize and heated to 80°C for 10 min. Serial dilutions for each sample were set up, then 0.1 ml of each dilution was spreaded on a nutrient agar plates, and incubated aerobically at 37°C for 24 h [7]. For water samples, 10ml was taken from each sample by sterile syringe, centrifuged at 6000 rpm for 15 min and heated to 80°C for 10 min. 0.1 ml of each sample was spreaded on the surface of nutrient agar plates and incubated at 37°C for 24 hour. The growing colonies were streaked on nutrient agar and this step was repeated until pure culture was obtained. A loop-full of highly mucoid isolates appeared on nutrient agar was inoculated in to 5ml of nutrient broth and incubated at 37°C for 48 h, after incubation the absorbency at 600 nm for each culture was measured. A smear of bacteria was prepared from purified culture, stained with Gram stain and examined under light microscope (100X lens) and the morphological feature of bacterial was observed including Gram reaction, shape and spore forming [3]. Biochemical tests were used to identification the bacteria. Highly mucoid isolates appeared on Brain heart infusion plates were selected and subjected to further step of screening represented by B8.

### Measurement of flocculating activity (flocculation test)

The flocculating activity was evaluated by measurement the turbidity of a kaolin suspension. Bacterial isolates were inoculated in 50 ml of starch broth medium and incubated at 37°C for 48 h, cells were precipitated by centrifugation at 6000rpm for 30 min, and 0.5 ml of cell free supernatant was added to 45 ml of kaolin suspension (containing 4.5 ml of CaCl<sub>2</sub> solution) in 100 ml

beaker. The mixture was vigorously stirred for 20s and left to stand, without shaking, for 5 min. The turbidity of the sample supernatant (A) was measured by the spectrophotometer at 550 nm. A control was prepared using the same method, but the cell free supernatant was replaced by distilled water (B). The flocculating activity was calculated according to the equation [8,11].

$$\text{Flocculating activity (\%)} = \frac{((O.DB - O.DA) / O.DB) \times 100}{}$$

Where:

O.DA: is the optical density of the sample experiment at 550 nm

O.DB: is the optical density of control experiment at 550 nm

### Extraction of bioflocculant

Extraction with two ratio of 96% ethanol:

Cell free supernatant was mixed with 96% cold ethanol at a ratio of 1:2 v/v and left overnight at 4°C. The aqueous layer was removed and the precipitate was washed in 5 ml distilled water and the precipitate layer was collected in a glass petri dish and left to dry at 60°C till dryness. The dried bioflocculant was collected and preserved in glass vials as dried powder [9].

### Analysis of bioflocculant by thin layer chromatography (TLC)

Separation and identification of *Bacillus* bioflocculant were performed by thin layer chromatography (TLC) using silica gel coated plate (TLC covered with silica gel 60) (20 × 20)cm, this method was applied as mentioned by [10].

### Treatment of waste water with bioflocculant

Samples of domestic wastewater with pH 6.5 and optical density (0.38) at 550 nm, were collected by sterilized bottle. The bottle was filled leaving about 30 mm of empty space to allow mixing during laboratory analysis.

Bioflocculant produced was applied to deal with domestic wastewater. Various amounts (0.25, 0.5, 0.75, 1, 1.25 and 1.5 ml) of cell free supernatant were added to 45ml of domestic wastewater containing 4.5 ml of  $\text{CaCl}_2$  solution in 100 ml beaker, the pH was adjusted to 11 due to the bioflocculant work in base condition to obtain best activity [3].

The turbidity of wastewater supernatant was measured with a spectrophotometer at 550 nm and percentage removal was determined by comparing the estimated values to that of the control (wastewater without bioflocculant). The flocculating activity was calculated according to the previous equation [8,10].

## Result and Discussion

Forty eight isolates were selected from 58 bacterial isolate, according to growth characteristic on nutrient agar and microscopic examination which belong to *Bacillus* spp. Fourteen isolates were isolated from water and 34 isolates from soil Table (1).

Pure cultures of *Bacillus* isolates were cultured on nutrient agar plates, for screening their ability to growth with mucoid appearance as indicator for flocculant production. Twenty two *Bacillus* isolates revealed a mucous phenotype (Figure 1).

The results showed that only seven isolates of *Bacillus* were grown on starch broth media and gave flocculating activity for kaolin suspension. Among them *Bacillus* B8 (isolated from soil) gave the highest flocculating activity for kaolin suspension (37%) (Figure 2). According to these results, the isolate B8 was selected for further study.

*Bacillus* B8 isolate was obtained from sample (water, soil), subjected to further biochemical tests. The results are shown in Table 2.

Bioflocculant produced by *B. coagulans* B8 was extracted by organic solvents in three

methods. The best extraction method was by ethanol at a ratio of 1:2 v/v, bioflocculant dried weight was 0.145 g/100 ml. While when extracted with acetone at a ratio 1:3 v/v and ethanol at a ratio of 1:4 v/v the dried weight were 0.078 g/100ml and 0.117 g/100 ml respectively, (Figure 3).

Bioflocculant contents produced by *Bacillus coagulans* B8 were analyzed by TLC to determine its components such as carbohydrate and protein.

Bioflocculant produced by *B. coagulans* B8 was hydrolyzed by 6N HCl at 100°C for 5 h before application on TLC [9], standard sugars (glucose, galactose, sucrose and fructose) and standard amino acids (phenylalanine and glutamic acid) were used as markers.

The *B.coagulans* B8 bioflocculant carbohydrate was detected on TLC by phenol-sulphuric acid reagent, the presence of sugar was observed as brown spots on TLC plate, two spots were observed with ( $R_f = 0.41$  and 0.58), which resembled to galactose and glucose (Figure 4). This result may indicate the presence of two kinds of sugars that may form basic and functional component of the bioflocculant.

Results showed that the optimal amount of bioflocculant of *Bacillus Sp.* for domestic wastewater was 0.5ml/50ml; the flocculating activity (turbidity removal) was 62.7% with pH 11 (Figures 6, 7)

From this study, it can be concluded the Ability of some *Bacillus* isolates obtained from soil or water can produce bioflocculant, and *Bacillus coagulans* B8 was the best in this field. The bioflocculant of *B. coagulans* B8 can be efficiently extracted with ethanol: water (1:2 v/v). The bioflocculant *B. coagulans* B8 is a glycoprotein made of polysaccharide (85%) and protein (7%) and its

active ingredient is polysaccharide. The polysaccharide moiety of the bioflocculant contains glucose and galactose, while the protein moiety of the bioflocculant contains phenylalanine. The bioflocculant produced by *B. coagulans* B8 has a satisfactory level of flocculating activity. These results suggest that this bioflocculant can be successfully applied for the clarification of wastewaters under various environmental conditions. Because the bioflocculant was formed in fermentation solution which bacteria and

culture medium were also included, the lower or higher amount than optimal one would induce the increasing of turbidity. So, it was important to confirm the optimal amount [11]. Matter in domestic wastewater may be broadly classified according to its origin as inorganic mineral matter or organic carbonaceous material. Substances producing turbidity are often inorganic, while those causing taste, odour, and colour are generally organic compounds.

Table (1): Numbers and percentages of *Bacillus* isolated from soil and water

Source of isolation	No. of samples	No. of <i>Bacillus</i> isolates	*Percentage of <i>Bacillus</i> spp. isolates from each sources%
Soil	40	34	58.62
Water	12	14	24.13
Total	52	48	82.75

\*The percentage above was calculated according to total isolates (58 isolates)

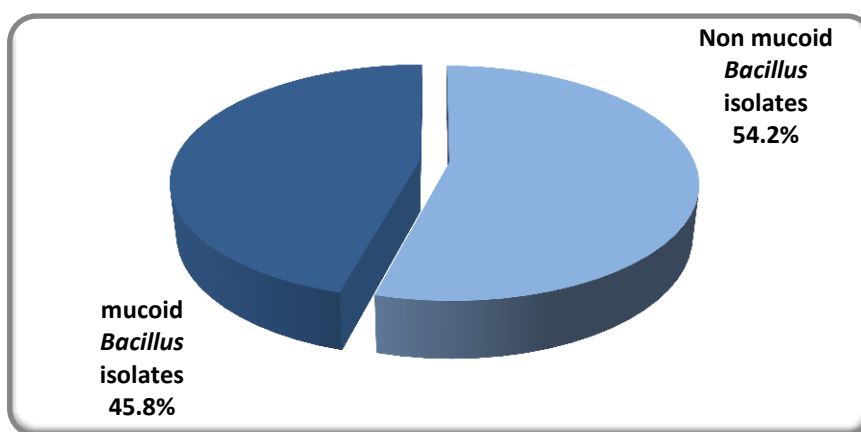


Figure (1): Percentage of muroid *Bacillus* isolates

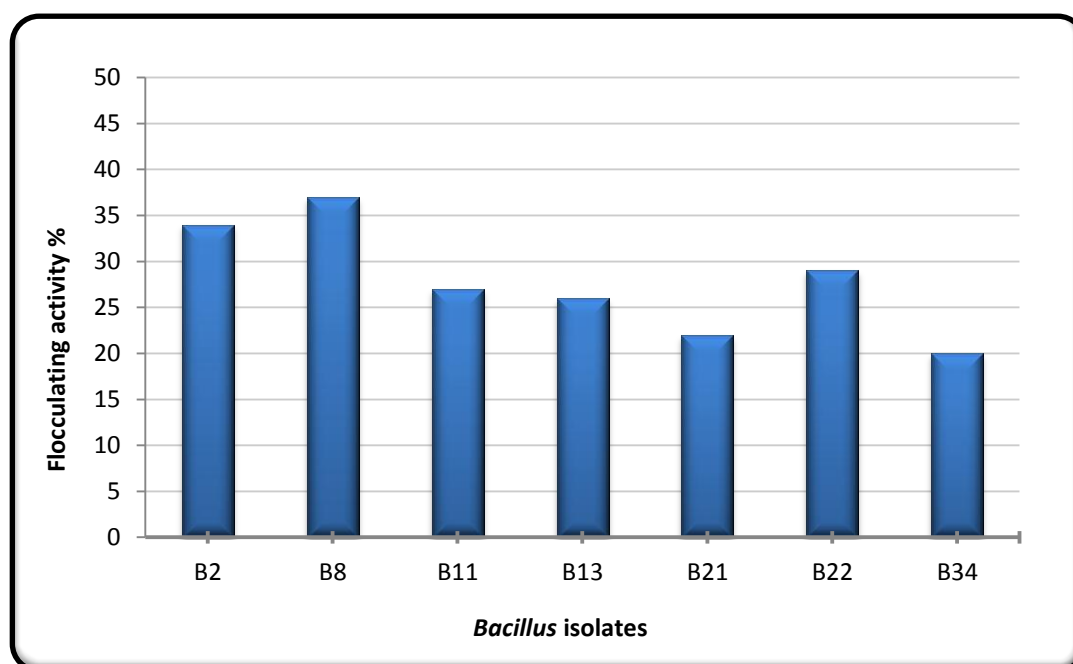


Figure (2): Production of bioflocculants by *Bacillus* isolates cultured in starch broth medium, pH 8 and incubated at 37°C for 48h.

Table (2) Biochemical tests for identification of *Bacillus coagulans* B8 isolate

Tests	Result
Catalse	+
Oxidase	-
Gram stain	+
Starch hydrolysis	+
Methyl Red	-
Vogeus-Proskauer	+
Egg-Yolk Lecithinase	-
Citrate Utilization	+
Motility	+
Indole	-
Growth in 7% NaCl	-
Growth at 40°C and 50°C	+
Acid production from Carbohydrate fermentation	
Glucose	+
Mannitol	-
Lactose	+
Fructose	+
Xylose	+

(+) Positive result

(-) Negative result

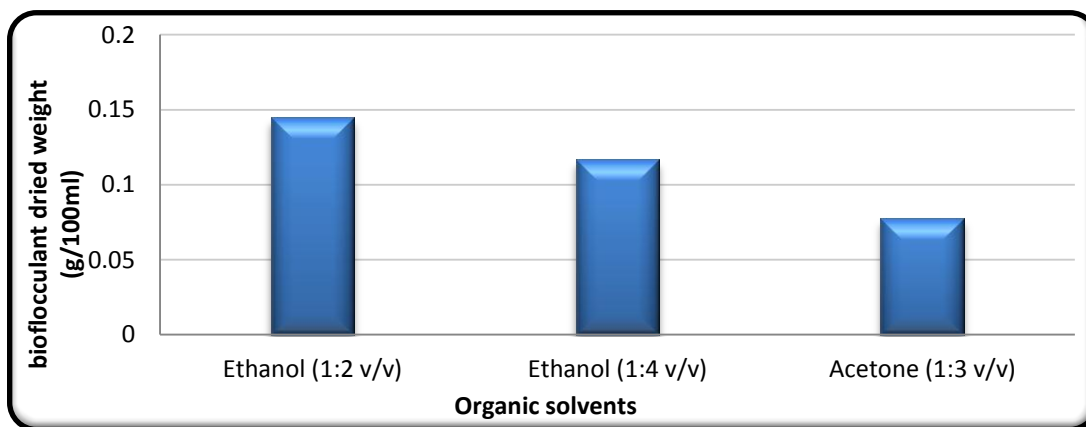


Figure (3): Bioflocculant extracted by different organic solvent

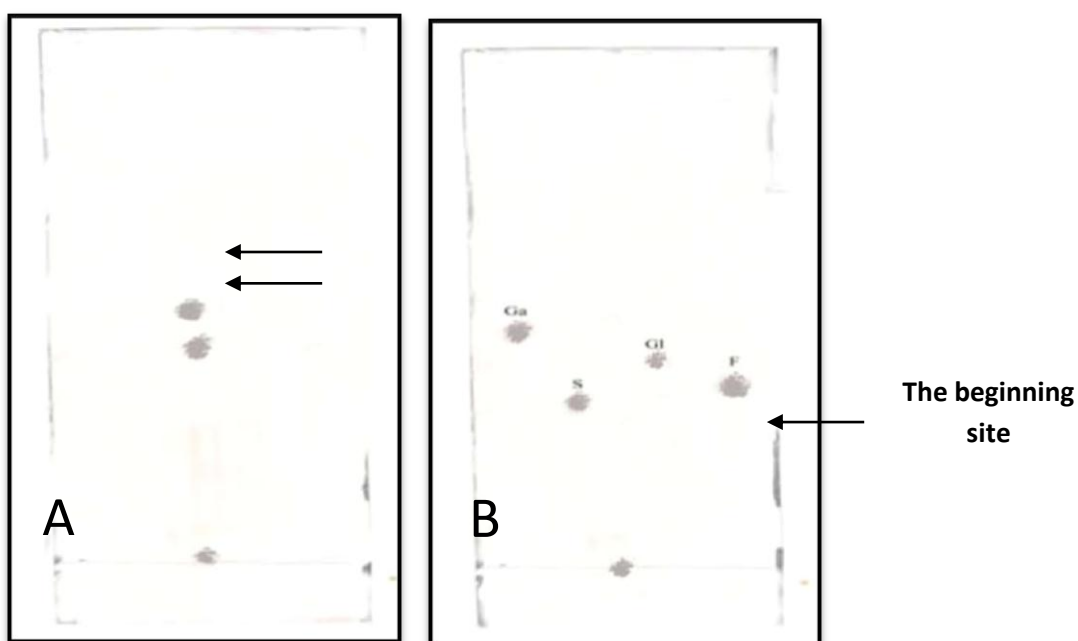


Figure (4): TLC analysis for detection of sugar of *B. coagulans* B8 bioflocculant by Phenol–sulfuric acid using silica gel plate with solvent system: butanol-acetic acid-water (3 : 1 : 1, w/w/w) and 96% ethanol-water (63 : 37, w/w) at room temperature:

A-TLC plate showed two brown spots with  $R_f = (0.58, 0.41)$   
 B- Sugar standards (Gl: glucose, Ga: galactose, S: sucrose, F: fructose)

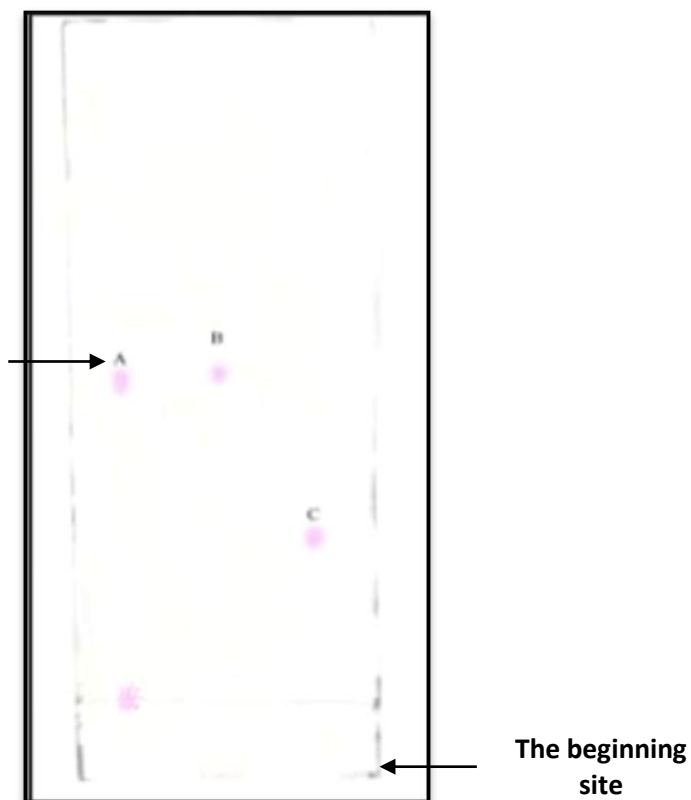


Figure (5): TLC analysis for detection of amino acids of *B. coagulans* B8 bioflocculant by ninhydrin using silica gel plate with solvent system : buthanol-acetic acid-water (3 : 1 : 1, w/w/w) and 96% ethanol-water (63 : 37, w/w) at room temperature. TLC showed red-violate spot with Rf= 0.68 (A: sample, B: phenylalanine, C: Glutamic acid)

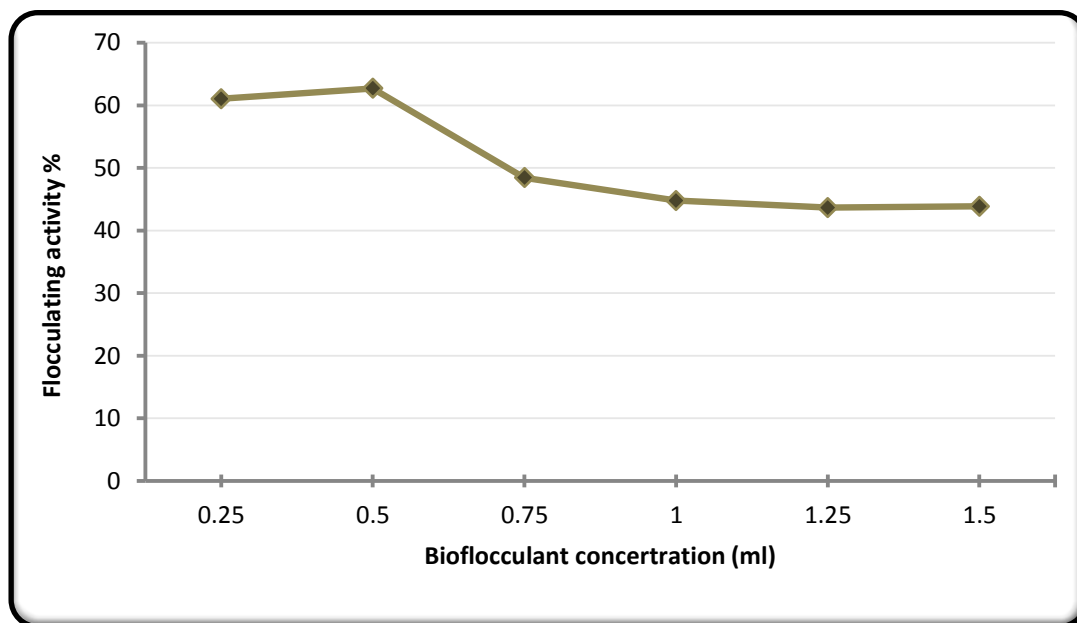


Figure (6): Effect of bioflocculant concentration of *B. coagulans* B8 on wastewater turbidity containing 1% CaCl<sub>2</sub>, pH 11

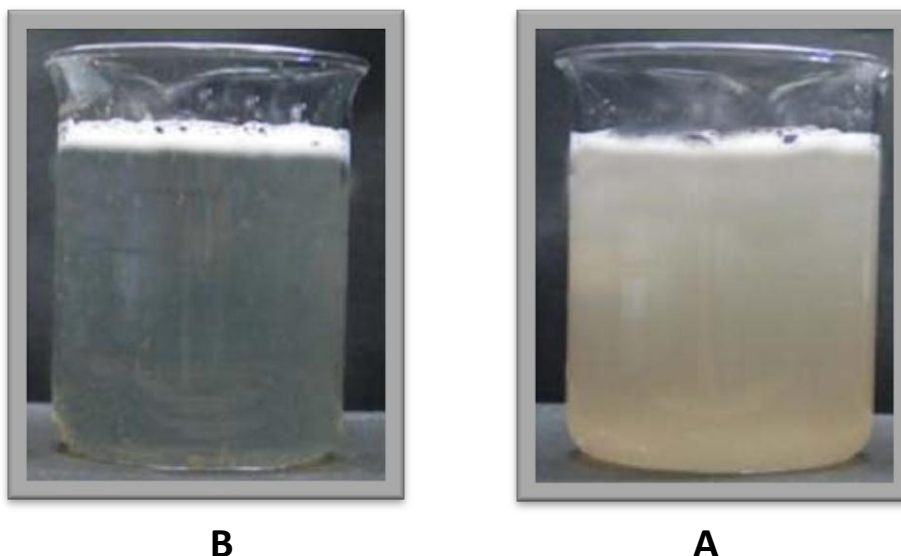


Figure (7): Effect of bioflocculant on the turbidity of wastewater containing 1% CaCl<sub>2</sub>, pH 11  
B: with bioflocculant      A: without bioflocculant

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## Effect of Essential Oils Extracted from the Peels of Two Species of *Citrus* on Some Fungi

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### Abstract

This study investigated the effect of essential oils extracted from peel of *Citrus limon* and *Citrus reticulata* on two species of fungi: *Penicillium expansum* and *Fusarium proliferatum* and also effect of two fungicides: Hymexazol and Benomyl against this fungi. Results showed that the essential oils of *C. limon* inhibited the radial growth of *P. expansum* and *F. proliferatum* at concentration 4.5 and 5%, respectively. However, the essential oil of *C. reticulata* inhibited this growth at concentration 5.5 and 6%, respectively. Moreover, the two fungicides inhibited radial growth of this fungi. In conclusion, there is a positive relationship between the increasing of concentration and the percentage of inhibiting of radial growth of fungi.

**Keywords:** Essential oils, citrus peels, fungi.

### تأثير الزيوت الطيارة المستخلصة من قشور نوعين من الحمضيات في بعض انواع الفطريات

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### خلاصة

هدفت الدراسة الحالية فحص تأثير الزيوت الطيارة المستخلصة من قشور نبات الليمون *Citrus limon* واللالنكي *Citrus reticulata* في نوعين من الفطريات (*Penicillium expansum* و *Fusarium proliferatum*) وتأثير اثنين من المبيدات الفطرية (Hymexazol و Benomyl) تجاه نفس الفطريات. أظهرت النتائج وجود تثبيط كامل للنمو الشعاعي للفطرين *P. expansum* و *F. Proliferatum* عند التركيز 4.5 و 5% على التوالي للزيت الطيار لنبات الليمون 5.5 و 6% على التوالي للزيت الطيار للالانكي. كذلك تثبيط النمو الشعاعي للفطرين من قبل اثنين من المبيدات الفطرية، في حين أظهرت التركيزات الادنى زيادة في معدل التثبيط مع زيادة التركيز لكل المواد المستعملة بالدراسة سواء كانت زيت طيار او مبيدات.

**كلمات مفتاحية:** زيوت أساسية، قشور الحمضيات، الفطريات.



## Introduction

Mandarin and lemon belong to family Rutaceae and order Geraniales which return to sub-class Archichlamyae (1). The origin of lemon (*Citrus limon*) is still uncertain. It must have originated somewhere in southeastern Asia while China is one of the native homes of the mandarin (*Citrus reticulata*) (2). Essential oils are complex natural mixtures of volatile secondary metabolites, isolated from plants by hydro- or steam distillation and by expression (3). The main constituents of essential oils are monoterpenes and sesquiterpenes including carbohydrates, alcohols, ethers, aldehydes and ketones which are responsible for the fragrant and biological properties of aromatic and medicinal plants (4). Citrus essential oils are present in fruit flavedo in high quantities. Peels consist of the epidermis covering the exocarp consisting of irregular parenchymatous cells, which are completely enclosing numerous glands or oil sacs. Citrus essential oils are a mixture of volatile compounds and which mainly consist of monoterpene hydrocarbons. The terpene fraction can constitute from 50 to more than 95% of the oil; however, it makes little contribution to the flavor and fragrance of the oil (5). Limonenes are found in the essential oil of various citrus leaves and fruit peels and have inhibited properties of both insects and fungi (6). Many studies investigated the essential oils of *Citrus limon* and *Citrus reticulata* against the growth of fungi (7,8,9,10,11,12,13,14,15,16,17).

The high quantity of citrus peel found as industrial waste and citrus industry presents a potential pollution problem, which would be reduced if the waste could be utilized as food of animals (18). Thus the aim of this study uses this waste as fungicide against some fungi and evaluates the effect of fungicides on the growth of fungi and this study is novel in Iraq.

## Material and Methods

**Plant collected:** The samples of *Citrus lemon* and *Citrus reticulata* collected in March 2012 from local market after the fruits had been washed, they were cut into six equal portions and the flesh was removed and used directly without dried (15)

**Fungi:** *Penicillium expansum* isolate was obtained from University of Baghdad, College of Science, Biology Department, while fungi isolate *Fusarium proliferatum* was obtained from fungi Laboratory postgraduate in University of Baghdad, College of Education Pure Science, Ibn al-Haitham, Biology Department and re-diagnosed and confirmed for them.

**Fungicides:** Pesticides Hymexazol and Benomyl (benzimidazole) have been obtained from the local markets and prepared according to the described method.

### Extraction of essential oils by steam distillation:

The extraction of essential oils have been extracting according to (12) protocol briefly, a 100 gm from fresh peels of plant and placed in the round bottom flask and filled with 1000 ml of distilled water then distillation apparatus was connected to the flask and take at 60 C. Distillation was continued until there was no more difference in successive readings of the oil volume. The yield of essential oil (%) was calculated as follows (16):

$$\text{Yield of essential oil}\% = \frac{\text{Volume of essential oil (mL)}}{\text{Fruit peel sample (g)}} \times 100$$

Oils collected in distilled dark bottles until used.

### Test of sensitive of fungi against essential oils

Each of Petri dish contained potato dextrose agar (PDA) and prepared the concentration below:

*C. limon* against *P. expansum* (1, 2, 3, 4, 4.5) (v/v)%

*C. limon* against *F. proliferatum* (1, 2, 3, 4, 4.5, 5) (v/v)%

*C. reticulata* against *P. expansum* (1, 2, 3, 4, 5, 5.5) (v/v)%

*C. reticulata* against *F. proliferatum* (1, 2, 3, 4, 5, 5.5, 6) (v/v)%

Dishes were inoculated with the fungus by cutting a 4 mm-diameter disc from pure cultures of *P. expansum* and *F. proliferatum* growing on PDA using a cork borer. This was done for each of concentration as well as for control (without essential oil). The cultures were incubated at 27 C in incubators for 6 days. Radial growth rate and inhibition ratio as estimated by measuring the maximum diameter of colonies was measured after 3-6 day and the ratio diameter/time was calculated by used the formula as shown below:

$$\% \text{ Growth inhibition} = \frac{DC - DT}{DC} \times 100 \quad (2)$$

DC = The diameter of mold colony from control plate.

DT = The diameter of the mold colony growth in experiment plate which contains the essential oil (9).

#### Test of sensitive of fungi against fungicide

By using the method of (18), the radial growth rate and inhibition ratio was measured according to formula (2). The concentrations of fungicides were prepared: Hymexazol against *P. expansum* and *F. proliferatum* (50, 100, 150, 200, 225) (w/v)% from the stock solution 36%.

Benomyl against *P. expansum* and *F. proliferatum* (50, 100, 150, 200, 225) (w/v)% from the stock solution 50%.

#### Statistical Analysis

All determinations were made in triplicates and the data is reported as mean  $\pm$  SE for (n = 3). Analysis of Variance (ANOVA) method was used for statistical analysis and at probability levels (0.05, 0.01, 0.001) for the purpose of evaluating the differences in the results of transactions in terms of being significant (influence of material) or not

significant differences (as a result of laboratory errors) (19).

#### Results and Discussion

**-Essential oils:** The results had been show that for every 100 grams of *C. limon* and *C. reticulata* peels contain (0.12, 0.08) ml [(0.12%, 0.08%) according to formula (1)] of essential oils respectively, this result is consistent with (20) they found that every 100 grams of *C. reticulata* peels contain 0.089 essential oils extracted by steam distillation.

**-Sensitive of fungi against essential oils:** The results showed that the treatment of fungi, *P. expansum* and *F. proliferatum* with essential oil extracted from the peel of fruits, *C. lemon* and *C. reticulata* have antifungal activity and gradually influenced the growth of these two isolates by increasing low concentration killer below the level of probability (0.001, 0.05, 0.01). The sensitivity of fungi were differed from two essential oil (Figure 1, 2, 3 and 4), where the complete inhibitory effect of essential oil of *C. lemon* on *P. expansum* and *F. proliferatum* were (4 and 4.5)% respectively, and for *C. reticulata* were (5.5 and 6)% . This results are agreed with (7) and (11) which found the essential oils of *C. lemon* and *C. reticulata* have effective toward *Penicillium* sp. and agreement with (8) that found there was an inhibitory of the essential oil *C. lemon* on *Fusarium* spp. and *Penicillium* spp. grown while the recent study was disagreed with studies (9) and (13) those found concentration 10% from *C. lemon* inhibited growth of *Fusarium* spp., moreover, the activity of fungicidal against the myceliae growth of *Fusarium* spp. was observed at a concentration of 4% of lemon essential oils in study (10), which is consistent nearly with what was found in this study (figure 2). Study (14) found that the essential oil of lemon extract has inhibition effect toward four food-borne fungal strains including *Fusarium* spp. The results showed also that the essential oils of *C. lemon* has a significant effect on *Penicillium* sp. growth

than *Fusarium* spp. at below the level of probability (0.001, 0.05, 0.01) (Figure 1,2). These findings are agreement with (11) that concluded hydrodistillated-essential oils from all citrus cultivars were strong antifungal agents toward *Penicillium* spp. While the essential oil of *C. lemon* showed inhibitory action more than essential oil of *C. reticulata* at below the level of probability (0.001, 0.05, 0.01) (figure 1,2,3 and 4), this agreement with (7) which is found that the essential oil of *C. lemon* have more inhibitory action against *Penicillium* spp. than *C. reticulata*. The essential oil of *C. reticulata* significantly inhibited the growth of *Penicillium* spp. more than *Fusarium* spp. at below the level of probability (0.001, 0.05, 0.01) (figure 3,4), this found agreed with (14) which reached that *Penicillium* spp. more affected than other fungi including *Fusarium* spp. and the essential oil extracted from *C. reticulata* has inhibition activity and agreement with (17) that found the essential oil of *C. reticulata* has effective inhibition toward *F. proliferatum*, but less than the impact of essential oil of *Citrus aurantifolia*.

This inhibitory action can be explained by the demonstration of the action of essential oils on the wall of fungi whose structure and function are altered and the transport of nutrients is modified (9). Essential oils extracted from aromatic plants such as *C. lemon* and *C. reticulata* that possess antimicrobial activity, while diameters of treated colonies were smaller than control group, depending on the concentration of oil (14). Extracts of citrus plants contain antifungal compounds that can be used as alternative to synthetic fungicides including fumigants and contact pesticides. The prospect of using citrus for development of natural fungicides is appealing and acceptable because citrus peels are readily available, environmentally safe, and less risky for developing resistance in pests, less hazardous to non target organisms and pest resurgence, less adverse effect on plant growth, less harmful to seed viability and

quality and above all less expensive. Based on these findings, citrus plant extracts are viable and can be possible alternative to synthetic pesticides for control of fungal diseases [9].

In a number of citrus species, the bitterness causative factors are limonoids, limonine being one of the potential antipest compounds known. A few other citrus limonoids including nomiline, nomilinic acid, ichangin and obacunonic acid are also bitter. Among these, limonine and nomiline are known to deter feeding in lepidopterans and coleopterans with variable efficacies. It appears that furan and epoxide groups play an important role in the activity of these compounds (21). Tangerine oil was obtained from the peel of *Citrus reticulata* is pleasant in taste and rich in aroma and is mainly used in food and beverages as flavoring agent.

As the essential oil is rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids and flavonoids, that are found to have effective as antimicrobial properties. The monoterpenes affect the structural and functional properties of lipid fraction of the plasma membranes of bacteria and yeasts, causing leakage of intercellular material and exit of critical molecules and ions leading to death of microbes. Terpenoids affect respiratory enzymes inhibiting microbial oxygen uptake and oxidative phosphorylation (12).

#### **-sensitive of fungi against fungicide**

The results had been shown in figure 5, 6, 7 and 8 suggested that there is a significant effectiveness of the fungicides used against two fungal isolates (*P. expansum* and *F. proliferatum*) at below the level of probability (0.001, 0.05, 0.01) and fungicide hymexazol more effective on two fungus than the fungicide Benomyl (Figure 5, 6, 7, 8) while the fungus *P. expansum* was more influenced by both fungicides (Figure 5,7) at below the level of probability (0.001, 0.05, 0.01). Benomyl used against *Fusarium* sp., when infected

guava wilt disease where added at concentration 0.2% (22) and inhibited the growth of *Fusarium* sp. by 83.64% (9), as also hymexazol used against *Fusarium* sp. (23). Study (24) was concluded that hymexazol at the dose recommended by the manufacturer

significantly reduced disease incidence for a period of 2 months after transplanting. However Benomyl is unstable and easily decomposed to methyl 2-benzimidazole carbamate in aqueous solutions (25).

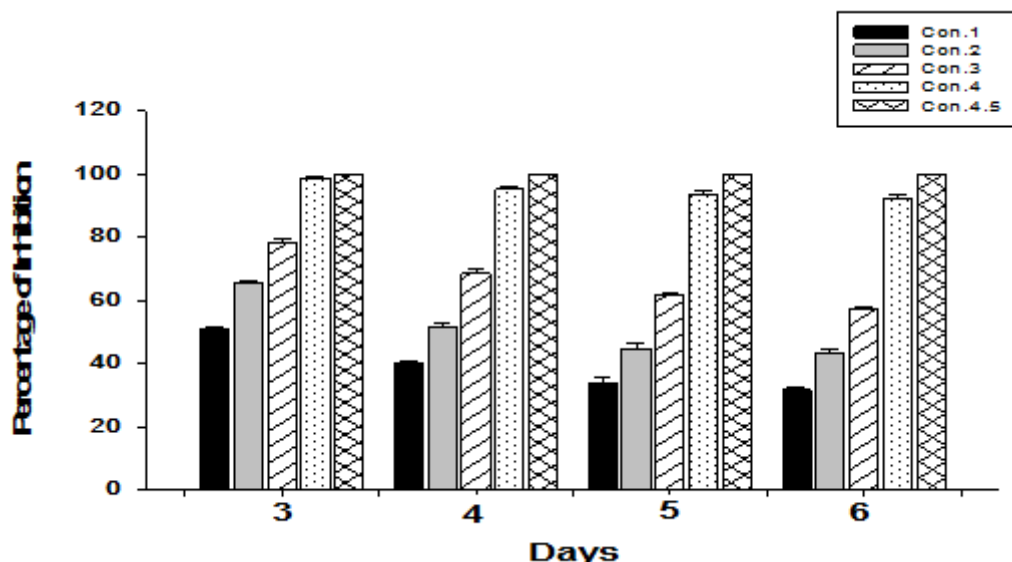


Figure (1): Inhibition% for different concentrations of essential oil of peel fruits of *C. limon* in surface growth of the fungus *P. expansum*.

Less significant difference (LSD) at 0.05 level for days 1.06 for concentrations 1.05 and interference 1.74.

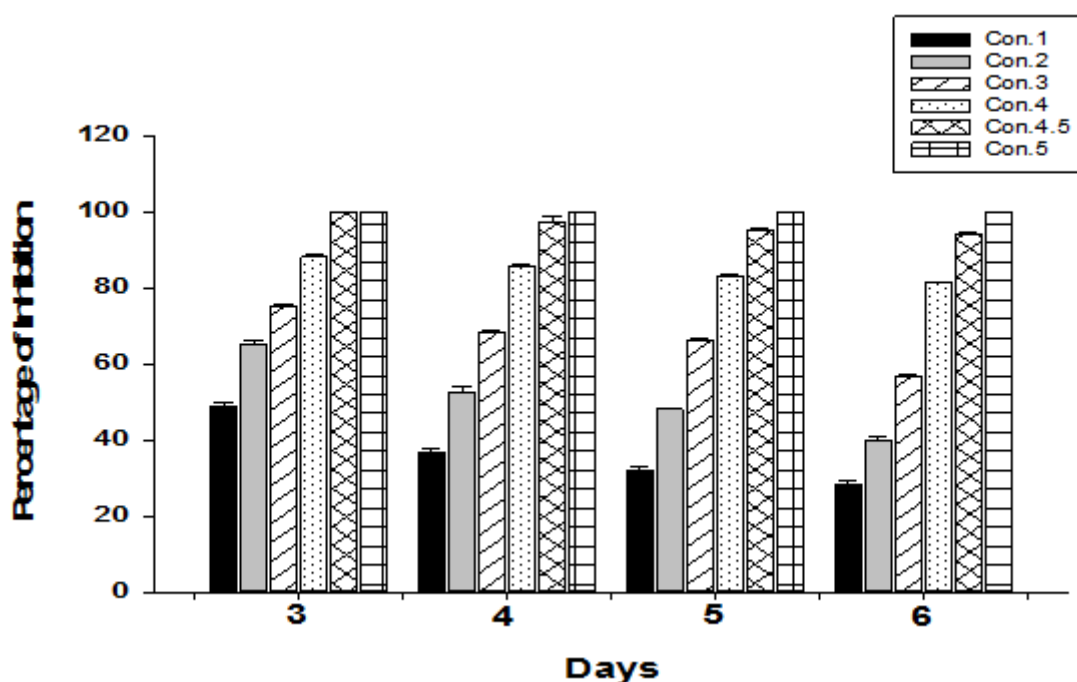


Figure (2): Inhibition% for different concentrations of essential oil of peel fruits of *C. limon* in surface growth of the fungus *F. proliferatum*.

Less significant difference (LSD) at 0.05 level for days 1.33 for concentrations 1.00 and interference 1.72.

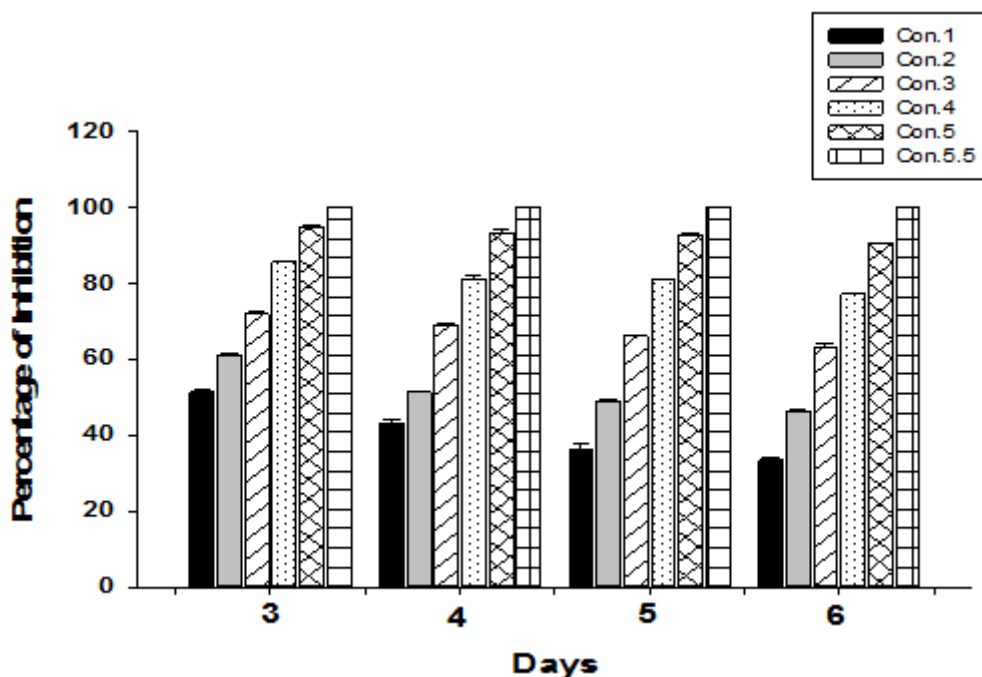


Figure (3): Inhibition% for different concentrations of essential oil of peel fruits of *C. reticulata* in surface growth of the fungus *F. expansum*.

Less significant difference (LSD) at 0.05 level for days 1.01 for concentrations 0.76 and interference 1.31.

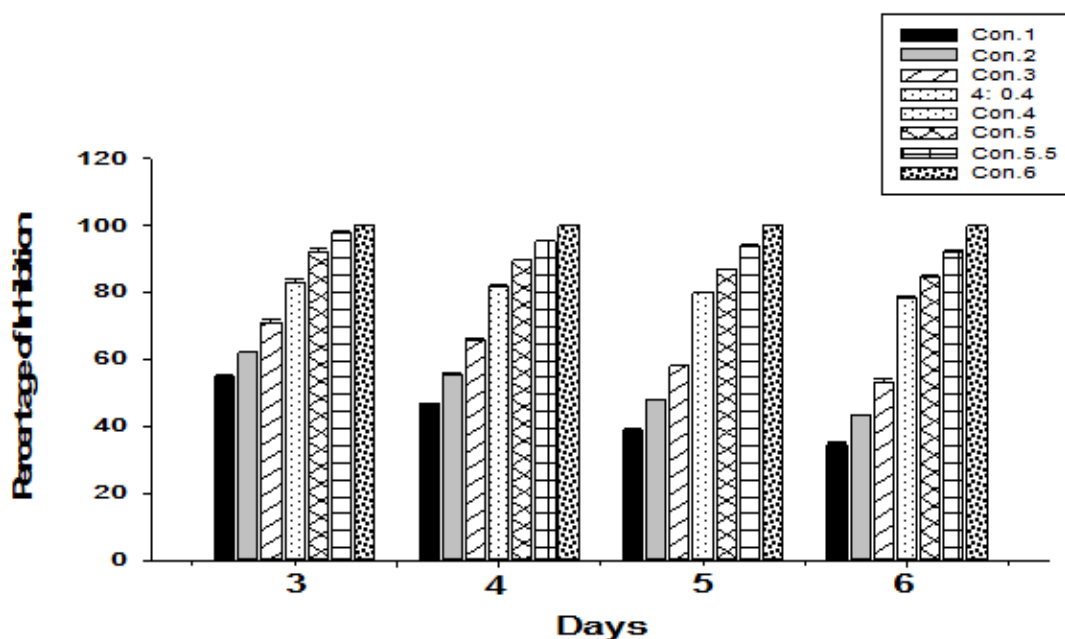


Figure (3): Inhibition% for different concentrations of essential oil of peel fruits of *C. reticulata* in surface growth of the fungus *F. proliferatum*. Less significant difference (LSD) at 0.05 level for days 2.68 for concentrations 2.02 and interference 3.47.

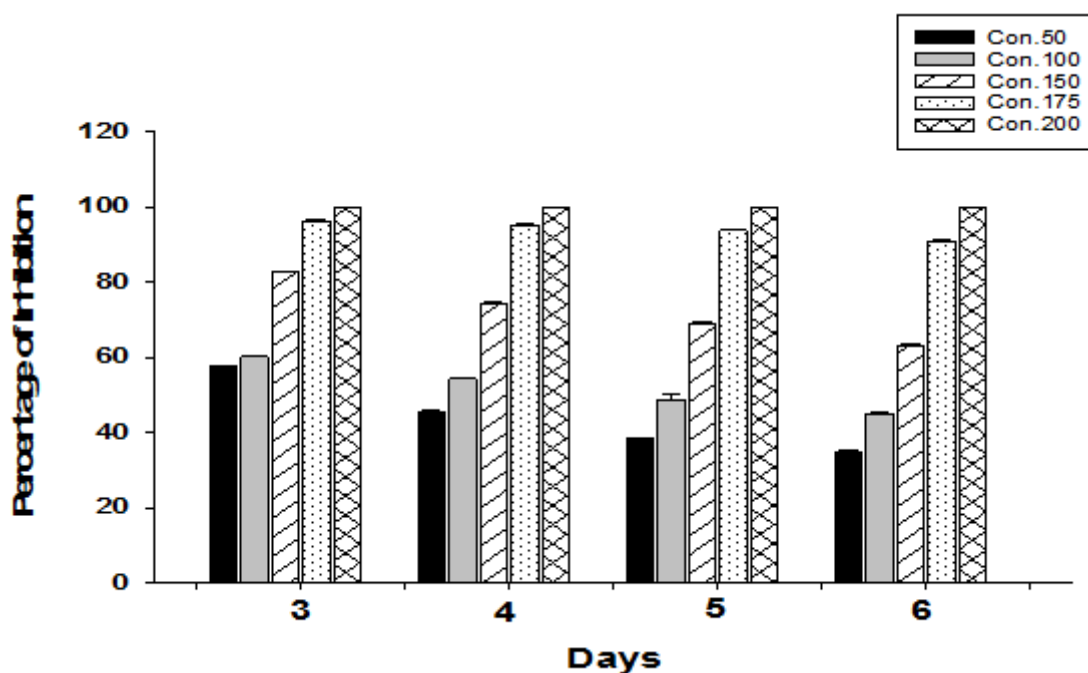


Figure (5): Inhibition% for different concentrations of Hymexazol in surface growth of the fungus *P. expansum*.

Less significant difference (LSD) at 0.05 level for days 1.33 for concentrations 1.32 and interference 2.19.

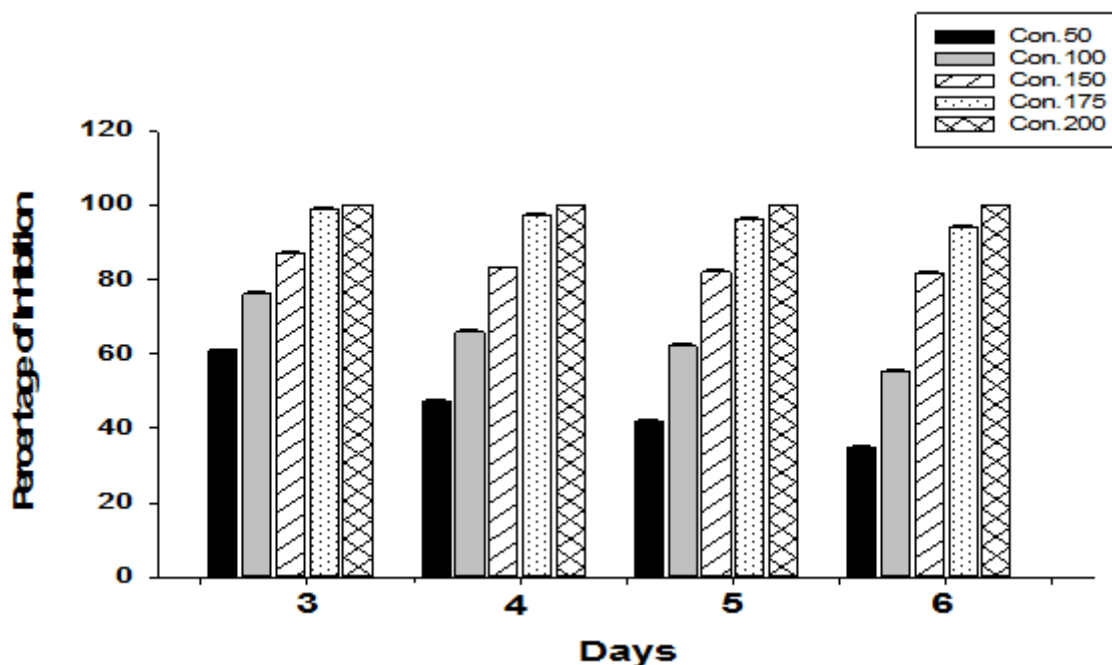


Figure (6): Inhibition% for different concentrations of Hymexazol in surface growth of the fungus *F. proliferatum*.

Less significant difference (LSD) at 0.05 level for days 1.62 for concentrations 1.60 and interference 2.66.

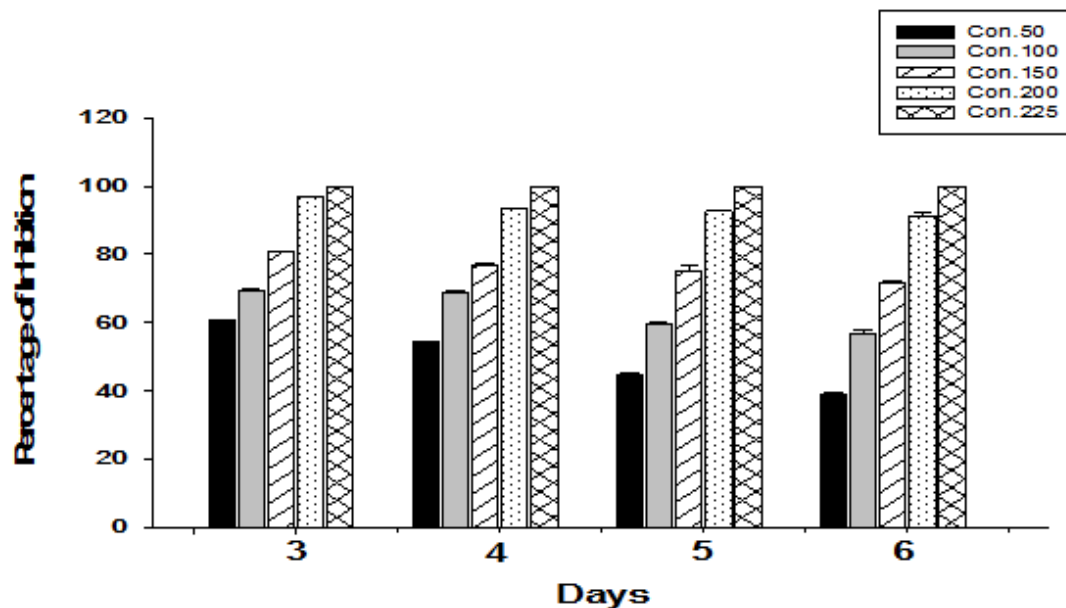


Figure (7): Inhibition% for different concentrations of Benomyl in surface growth of the fungus *P. expansum*.

Less significant difference (LSD) at 0.05 level for days 1.99 for concentrations 1.97 and interference 3.26.

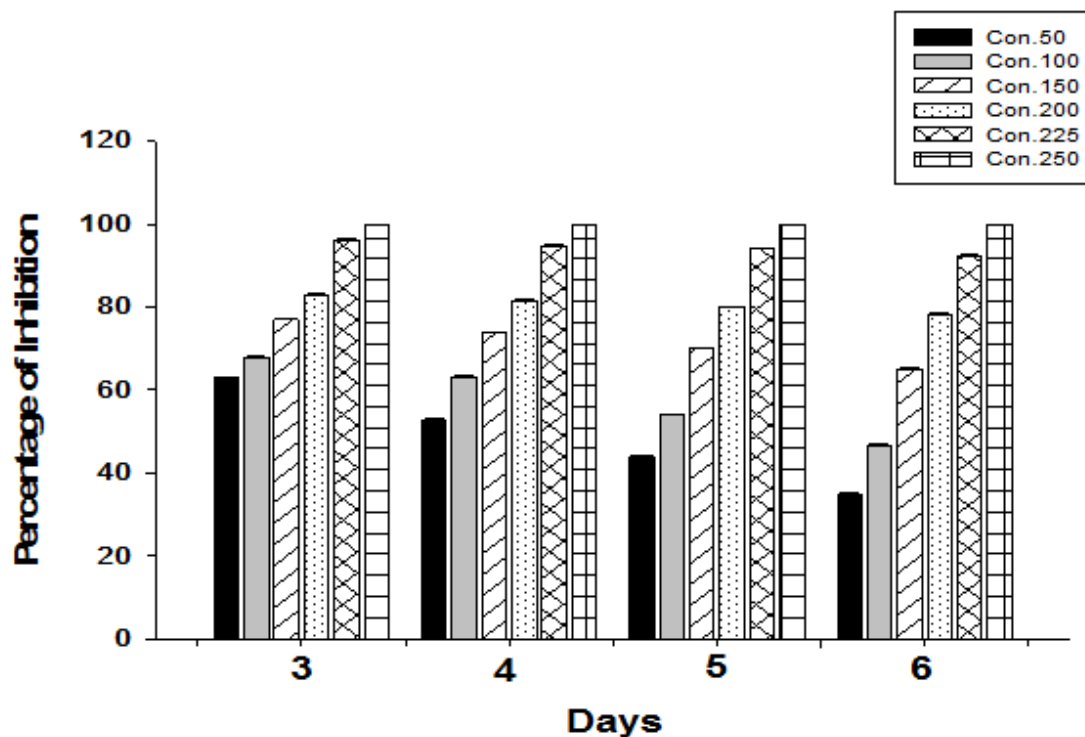


Figure (8): Inhibition% for different concentrations of Benomyl in surface growth of the fungus *F. proliferatum*.

Less significant difference (LSD) at 0.05 level for days 2.03 for concentrations 1.53 and interference 2.62.

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## Analysis of Dust Storms Using Satellite Imagery and Surface Observation on Iraq

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### Abstract

In most areas in Iraq, dust storms can be classified by the prevailed broad meteorological conditions. Examining the most common events that occurred in Iraq is important, specially the dust storms which caused by prefrontal and postfrontal winds that primarily occurred in the winter, and dust storms caused by persistent northerlies upon which occurred in summer. The objectives of this paper is concentrated on analyzing the synoptic situation leading up to such event south of Iraq and to conduct a complete case study of the meteorological conditions that led to the dust storm. The case study has been included an analysis of the lower level that will be used to assess the placement and timing of the surface cold front and the associated strong winds which lifted the dust. These analyses will be compared with the satellite imagery.

**Keywords:** Dust sources, Dust storms, Aerosol Index, Satellite images.

### تحليل العواصف الغبارية باستخدام صور الأقمار الاصطناعية والمشاهدات الارضية في العراق

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### خلاصة

يمكن تصنيف العواصف الغبارية بواسطة الشروط الانوائية المسببة لها. كما تم دراسة العواصف الغبارية في العراق. العواصف الغبارية في العراق تتولد من الرياح قبل الجبهة وبعد الجبهة التي تحدث بشكل رئيسي في الشتاء والعواصف الغبارية الناشئة من الرياح الشمالية في الصيف. ان الهدف من هذه الدراسة هو تحليل الموقف السايوتوبتيكي المؤدي الى العواصف الغبارية في جنوب العراق و دراسة الحالة من حيث الظروف الانوائية التي سببتها. كما ستتضمن الدراسة الحالية تحليل المعلومات الأولية السنوى الاسفل والمستخدمه لتقييم موقع وزمن سطح الجبهة الباردة والرياح القوية المصاحبة التي أدت الى رفع الغبار. سوف تقارن هذه التحاليل مع صور الأقمار الاصطناعية.

**كلمات مفتاحية:** مصادر الغبار، العواصف الغبارية، معامل العوالق، صور الأقمار الاصطناعية.

## Introduction

For more than two decades, Total Ozone Mapping Spectrometer (TOMS) instruments have been providing useful global data on the long range transport of smoke and dust plumes. TOM's measures back scattered radiances in the near Ultra Violet (UV) region of the spectrum and from these measurements, the TOMS ozone retrieval algorithm computes an absorbing Aerosol Index (AI), which is a qualitative measure of the presence of UV absorbing aerosols such as mineral dust and smoke. At the present time, the long term data recorded by the aerosol information from the TOMS instrument is continued by the Ozone Monitoring Instrument (OMI) flown on the EOS Aura spacecraft (launched July 2004). In spite of the fact that the Aerosol Index is a qualitative indicator of the presence of the

absorbing aerosols, many scientists have used it in variety of applications with the encouraging results [1, 2, 3]. For example, AI has been used in identifying the sources of air pollution over the globe, understanding the transport of air pollution across the oceans and continents, air quality forecast models, and radiation energy balance, and climate forcing studies [4, 5, 6]. The AI differentiated between absorbing and non absorbing aerosols, because it provides a measure of absorption of UV radiation by smoke and desert dust. AI positive values were associated with UV absorbing aerosols, mainly mineral dust, smoke and volcanic aerosols. However, negative values are associated with non absorbing aerosols (for example, sulfate and sea salt particles) from both natural and anthropogenic sources [7].

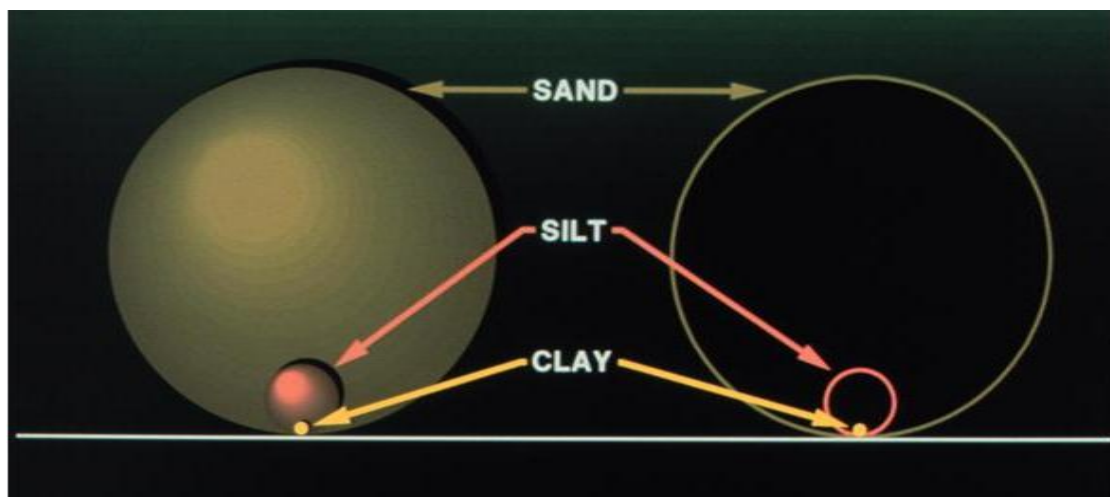


Figure (1): Particulate size distribution [8].

The transport of dust can be described to three processes depending on particle size (Figure (1)) and wind strength. These processes are creep, saltation, and suspension, as shown in Figure (2). Creep refers to a process by which particles slide or roll over the surface, generally without

breaking contact with the surface. This process is favored by large particles or lower wind speeds and will not usually result in large-scale dust storms [9]. Saltation is a process by which the particles may get airborne for short distances before falling back to earth. Although the particles do not

travel far from their source regions in this process, they can contribute to much larger scale dust transport by disrupting the surface at each impact, thus kicking up much finer particles which are then more susceptible to the third process, suspension.

Suspension occurs when the particles are held aloft by the air currents and can result in

the dust plume being carried far away from the source region if the lofted particles are small enough for the air currents to keep them airborne [9]. Generally the wind speeds required activating particle movement and thus initiate the three processes (Creep, Saltation, and Suspension) summarized above will depend on the size of the particles.

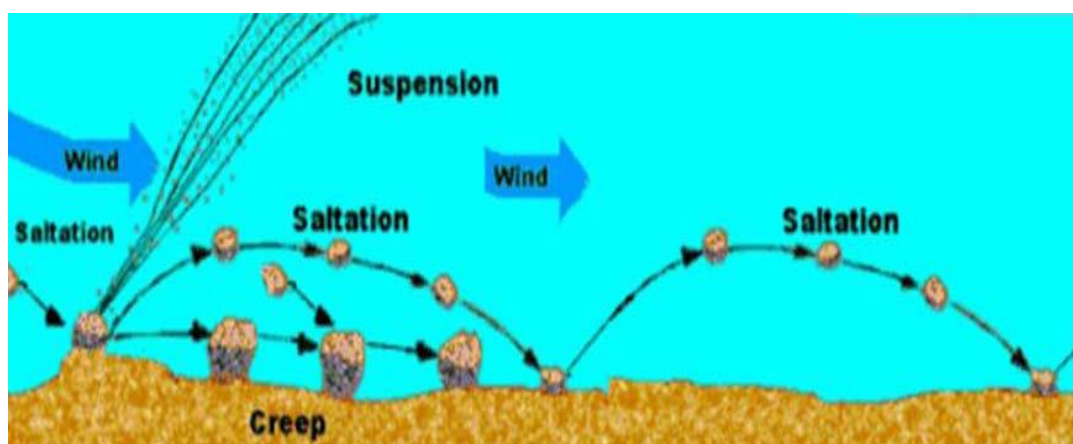


Figure (2): Dust transport processes [9].

### Materials and Methods:

The objectives for this paper were conducting a complete case study of the meteorological conditions that led to the dust storm. The lower level analysis will be used to assess the placement and timing of the surface cold front and the associated strong winds which lifted the dust. This analysis has been compared with satellite images. The following case was discussed using maps for the distribution of sea level pressure, surface temperature, and surface wind speed. A southerly flow ahead of the advancing cold front, which gradually increases in intensity with time, as the cold front approaches. These winds activate dust particles in the source regions and commence the dust storm process. The winds do not actually shift to a more northerly component until after the passage

of the cold front. At the surface, the winds vary in intensity. The surface winds over a wide spread area were clearly strong enough for the activation of dust and sand from the source regions in the area. The postfrontal dust storm occurred in 25 / 3 / 2011 has been discussed by a prognostic weather map, when the dust storm moved across Iraq. Dense dust storms with visibility less than 1 km were predicted along the associated cold front. In the winter months, frontal passage leads to strong northwesterly winds on the backside of the front. The resulting dust storm was referred to as a Shamal. The Shamal produced the most widespread hazardous weather known to the region

### Results and Discussion:

Figures 3-14 show a cold front generated sandstorm stretching to the south of Iraq. The front has passed and lies to the south of

the dust front. Strong northwesterly postfrontal flow was picked up dust along a front and appeared to be moving to the south and east. The winter Shamal was

generally characterized by durations of 24-36 hours. Sustained winds typically reach high values with stronger gusts.

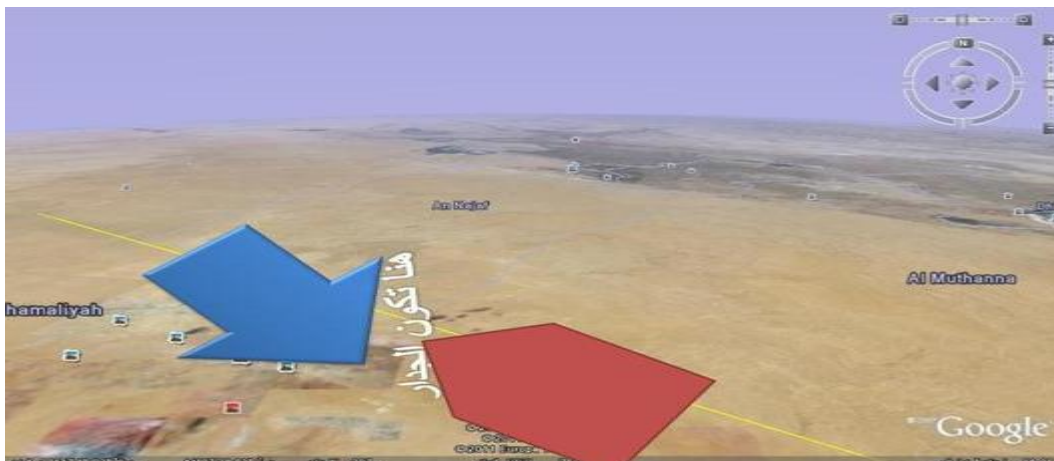


Figure (3) Satellite image indicating storm wall position

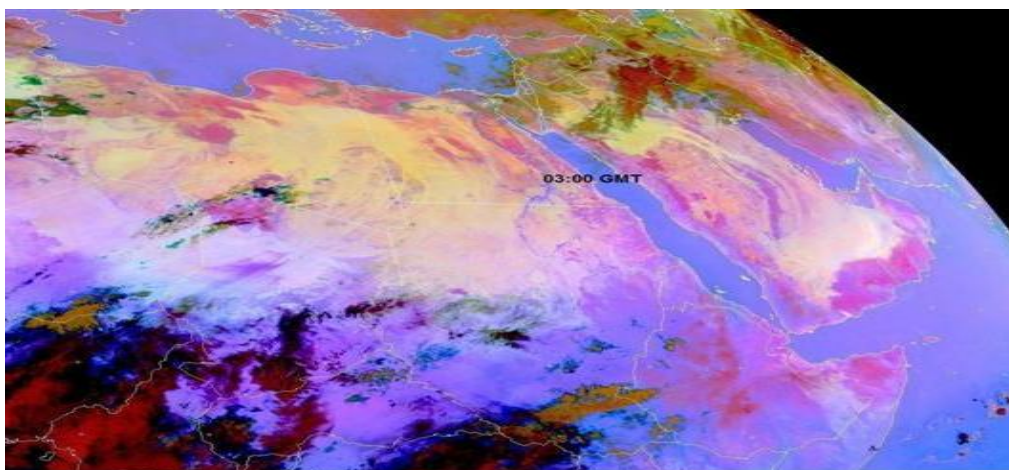


Figure (4) METEOSAT image at 03:00 GMT.

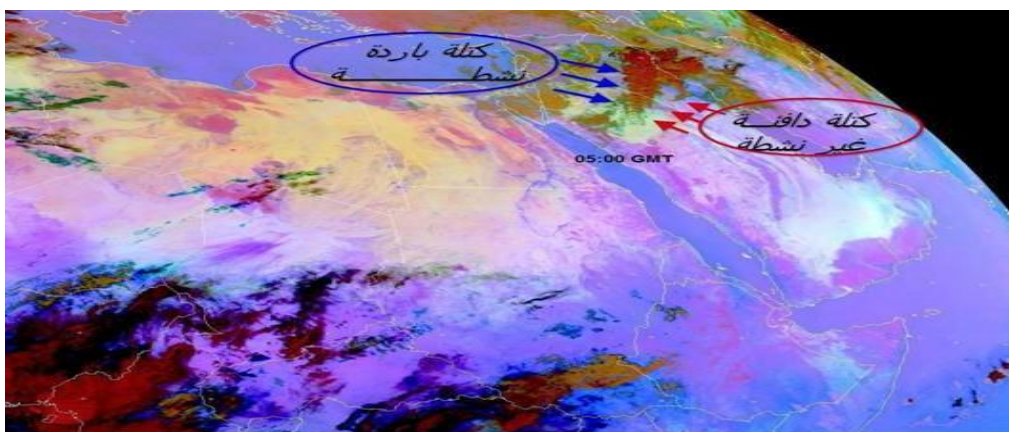


Figure (5) METEOSAT image at 05:00 GMT

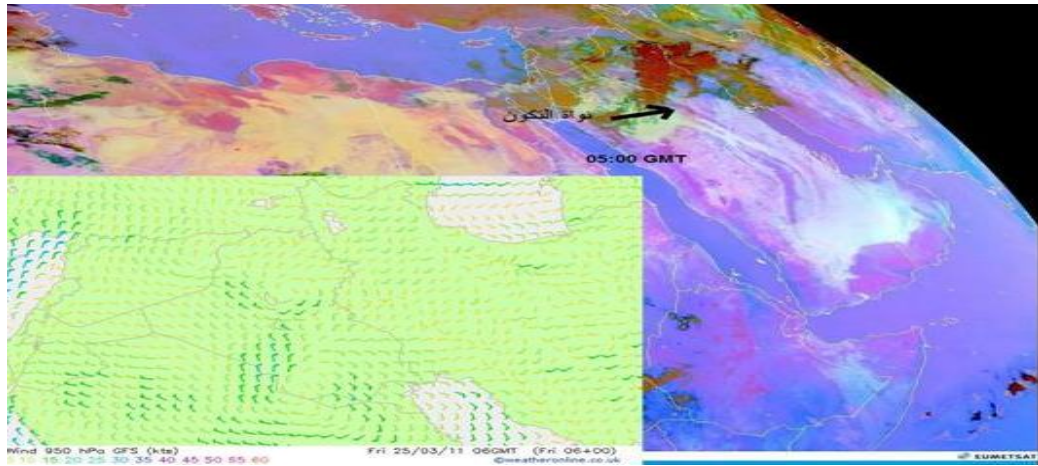


Figure (6) METEOSAT image and wind chart at 05:00 GMT

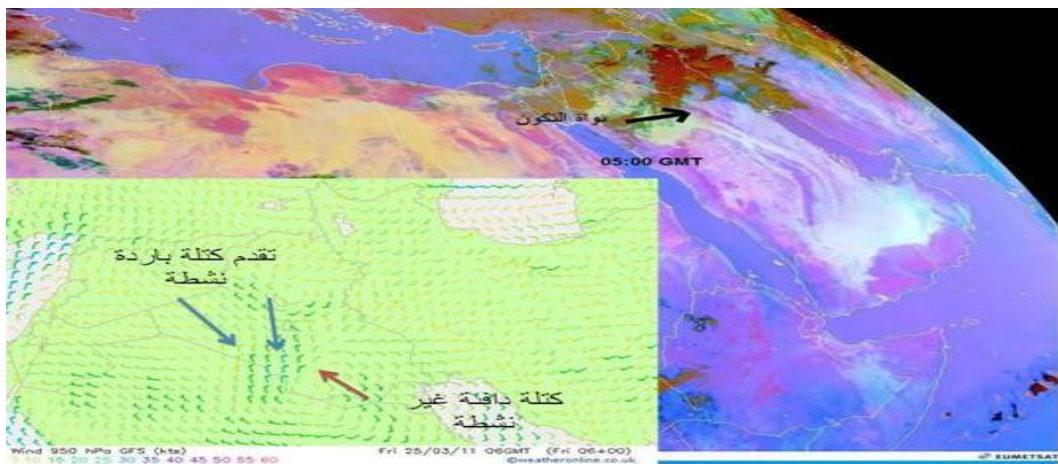


Figure (7) Wind chart indicating advance of cold front

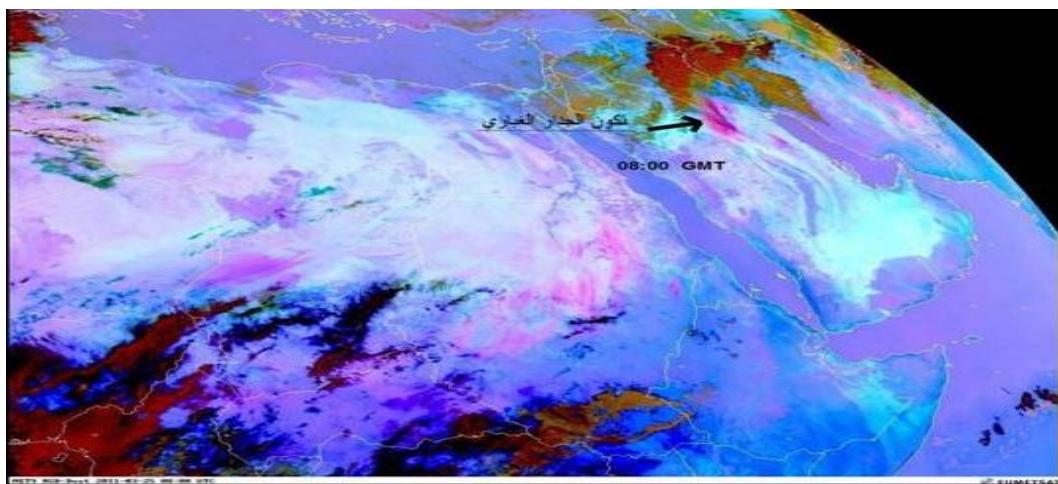


Figure (8) Formation of storm wall.

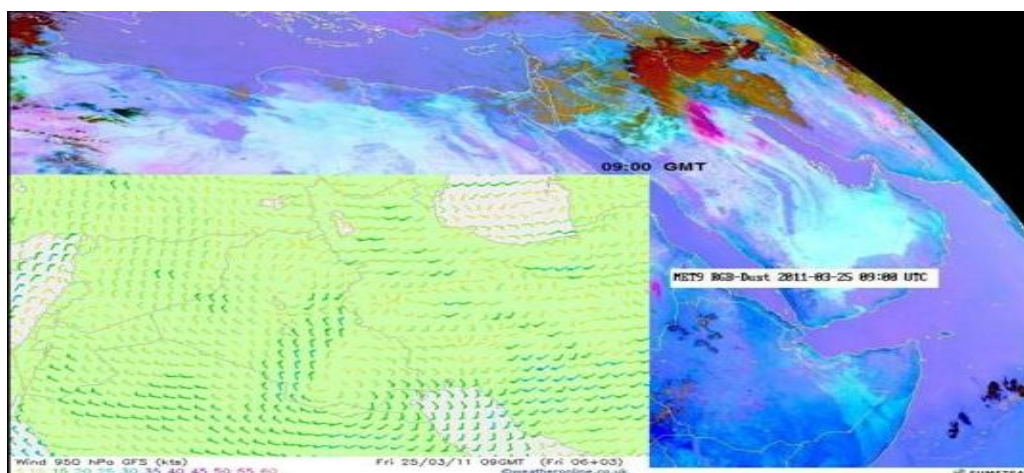


Figure (9) Wind chart overlaid on satellite image at 09:00 GMT

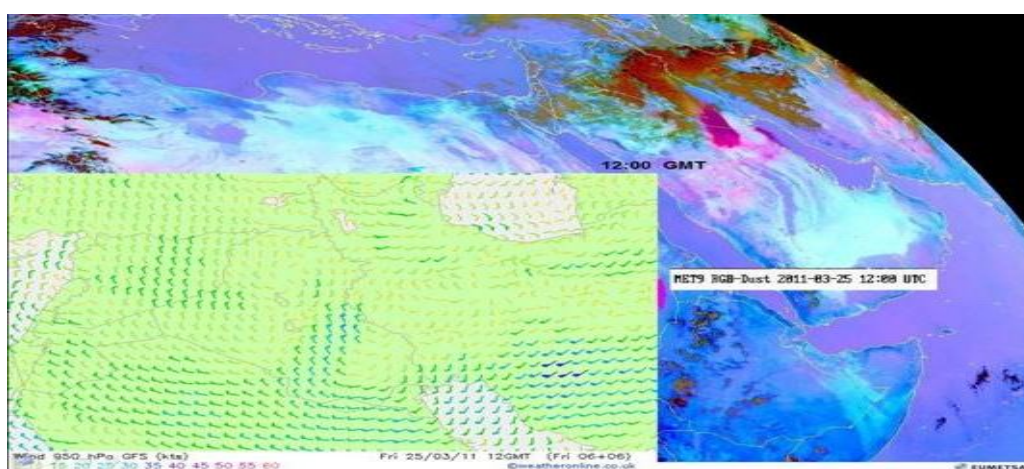


Figure (10) Wind chart overlaid on satellite image at 12:00 GMT.

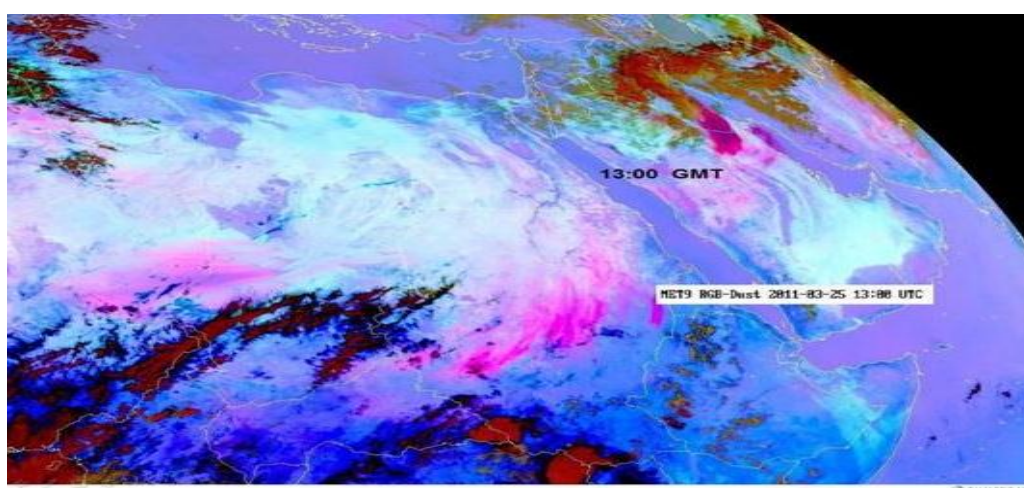


Figure (11) Satellite image at 13:00 GMT

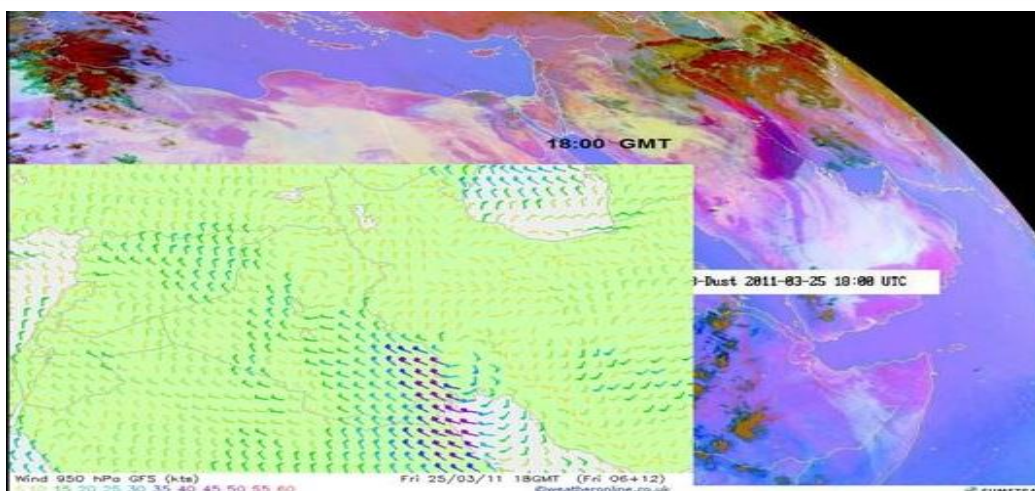


Figure (12) Wind chart overlaid on satellite image at 18:00 GMT

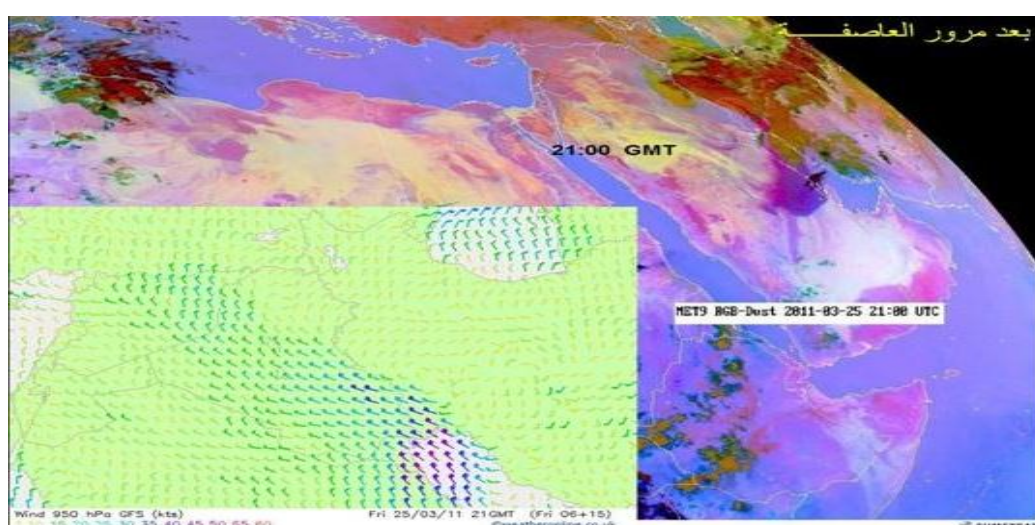


Figure (13) Wind chart overlaid on satellite image at 21:00 GMT

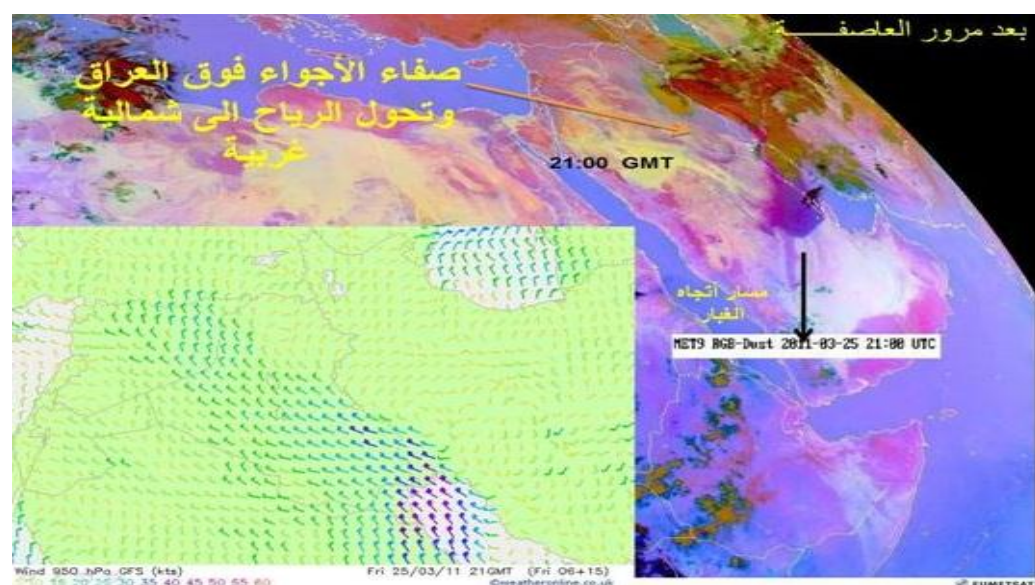


Figure (14) the clear weather at 12:00 GMT



The lower level has been analyzed in figures (15-26) that use to asses the placement and timing of the surface cold front and the associate strong winds which lifted the dust.



Figure (15) Temperature measurements during dust storm

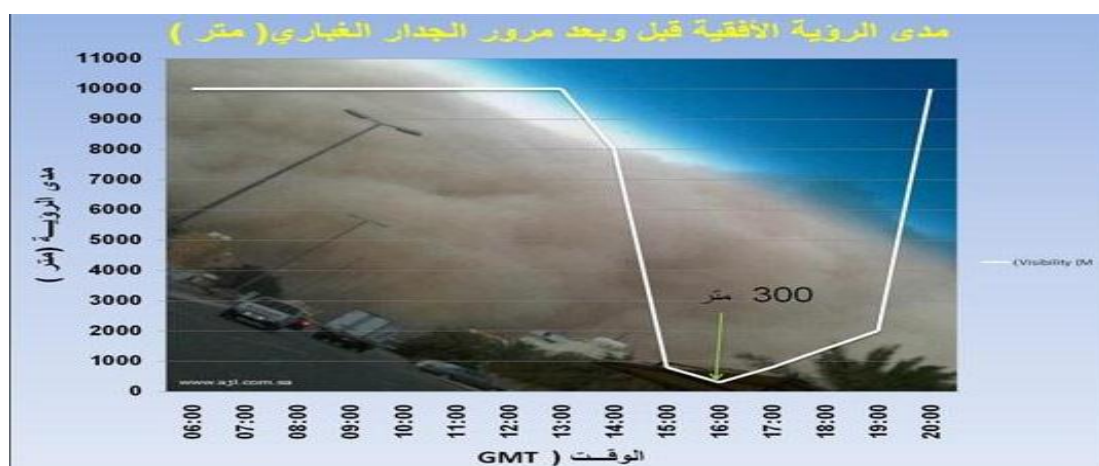


Figure (16) Visibility during dust storm

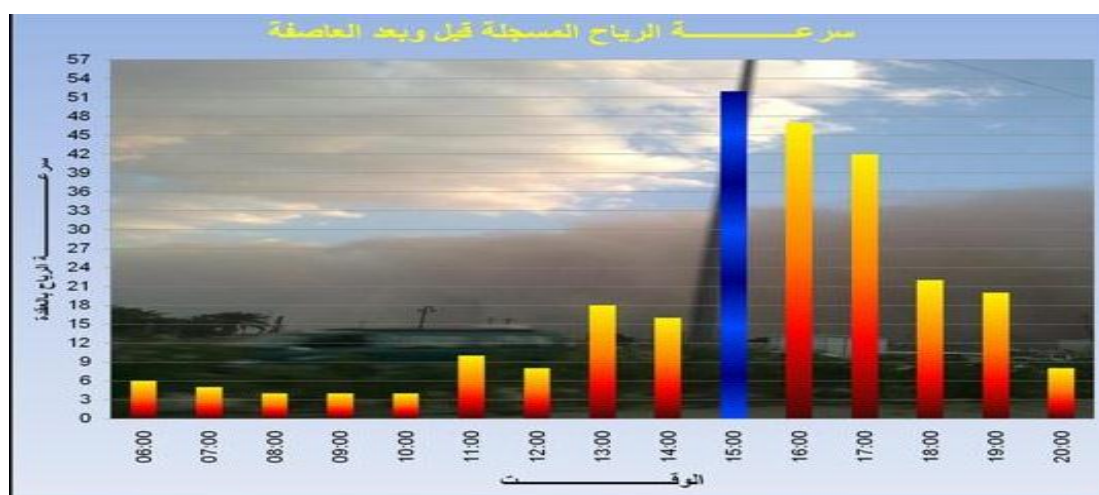


Figure (17) Wind velocity measurement.

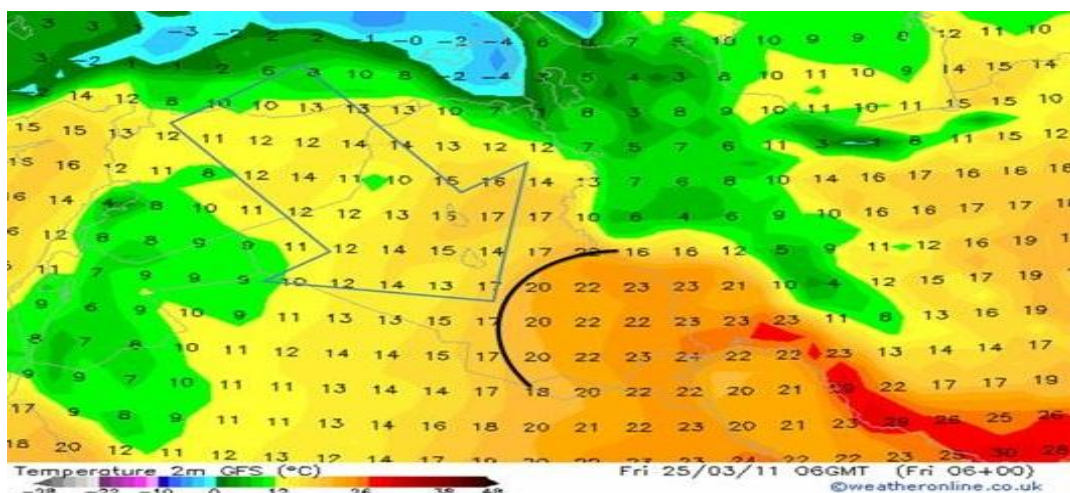


Figure (18) Surface temperature at 06:00 GMT.

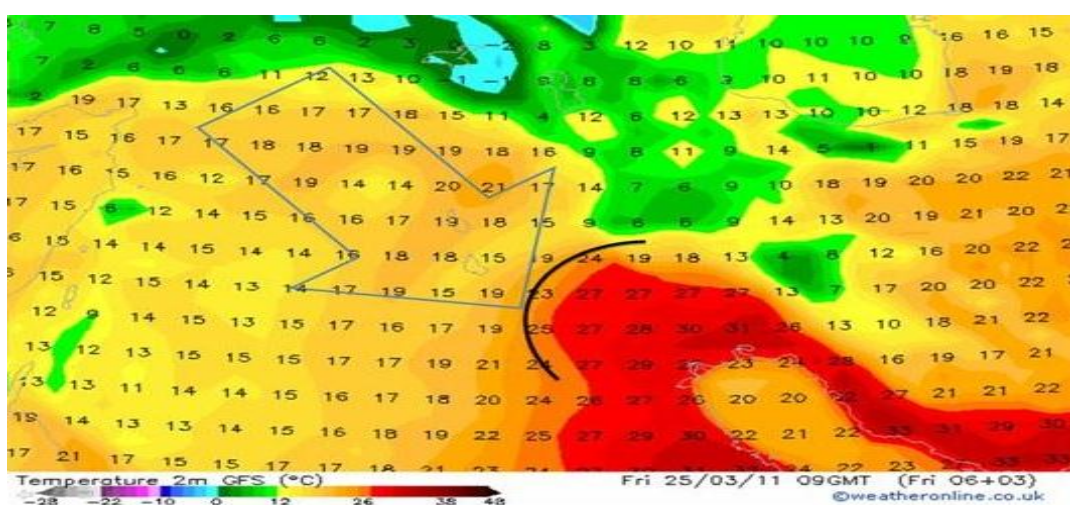


Figure (19) Surface temperature at 09:00 GMT.

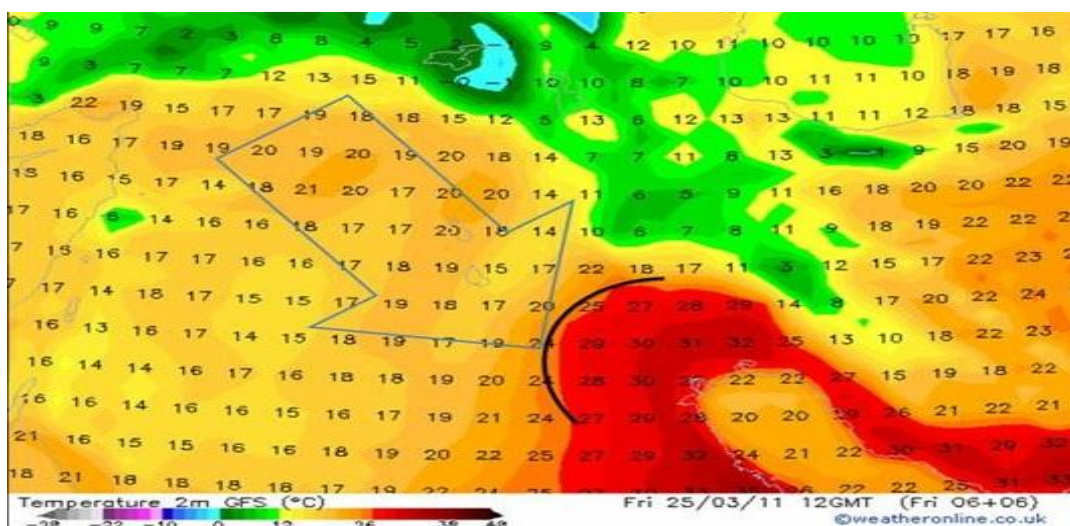


Figure (20) Surface temperature at 12:00 GMT.

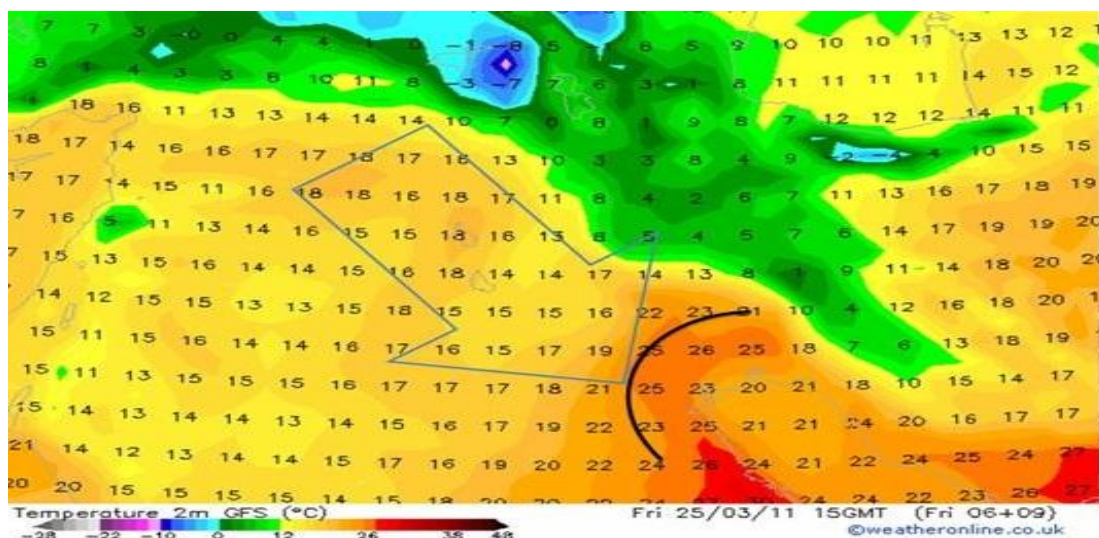


Figure (21) Surface temperature at 15:00 GMT.

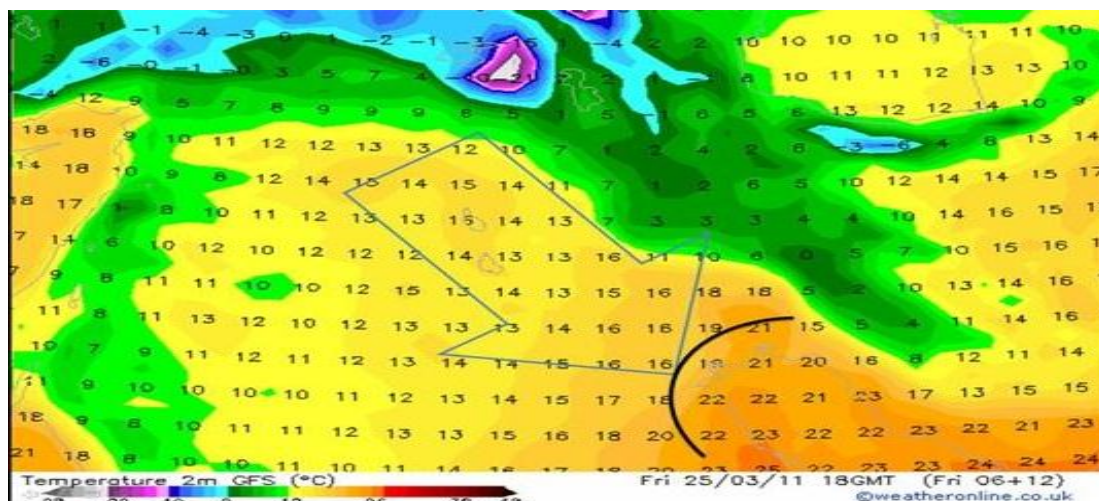


Figure (22) Surface temperature at 18:00 GMT.

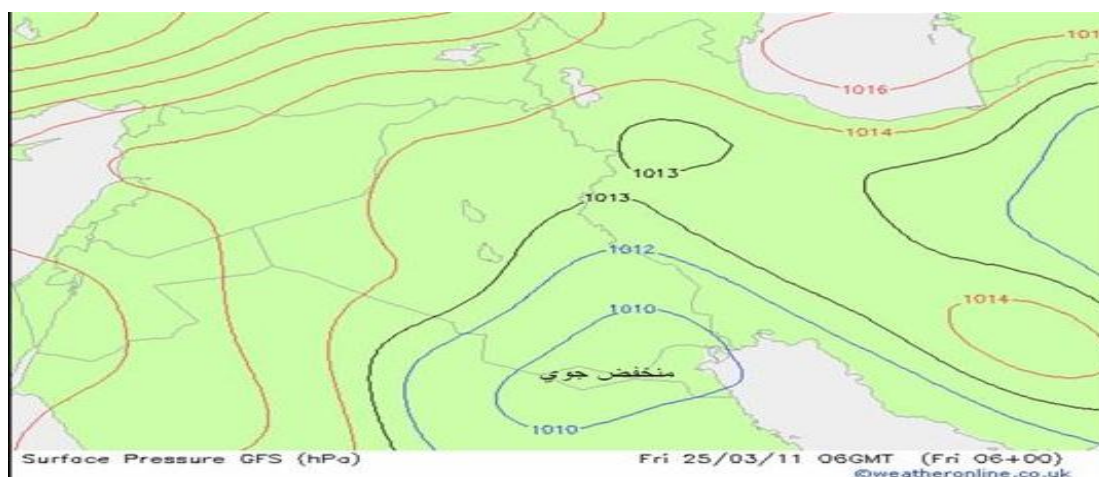


Figure (23) Surface pressure at 06:00 GMT

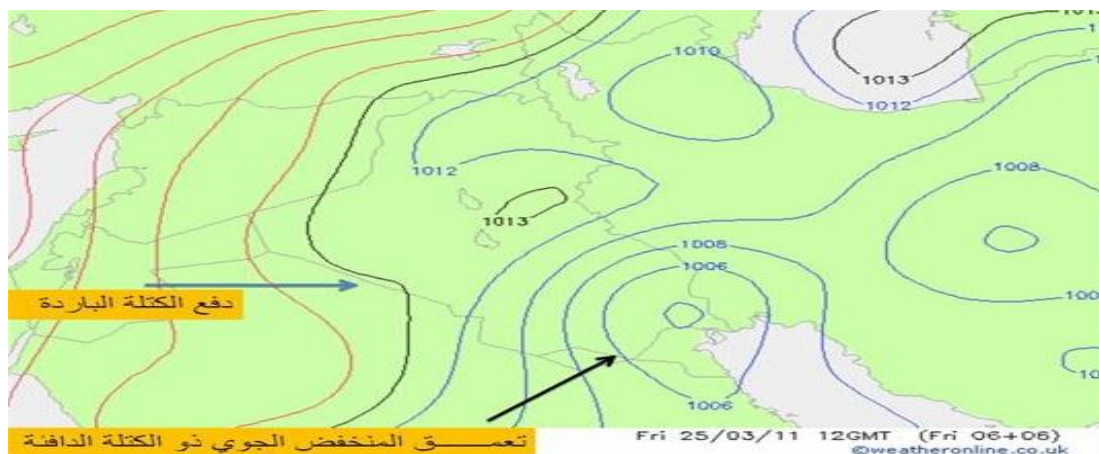


Figure (24) Surface pressure at 12:00 GMT.

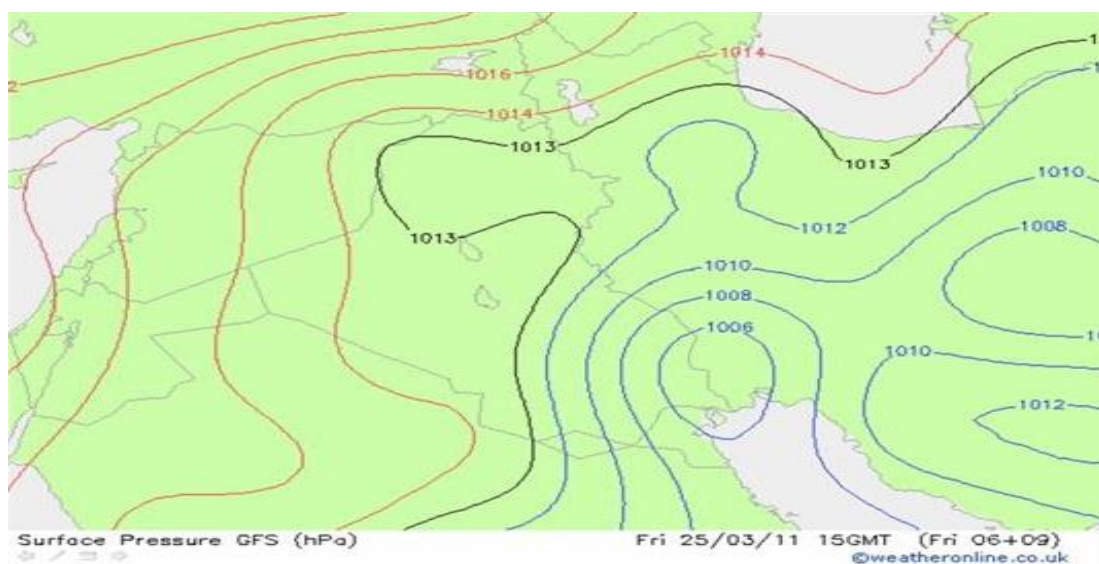


Figure (25) Surface pressure at 15:00 GMT.

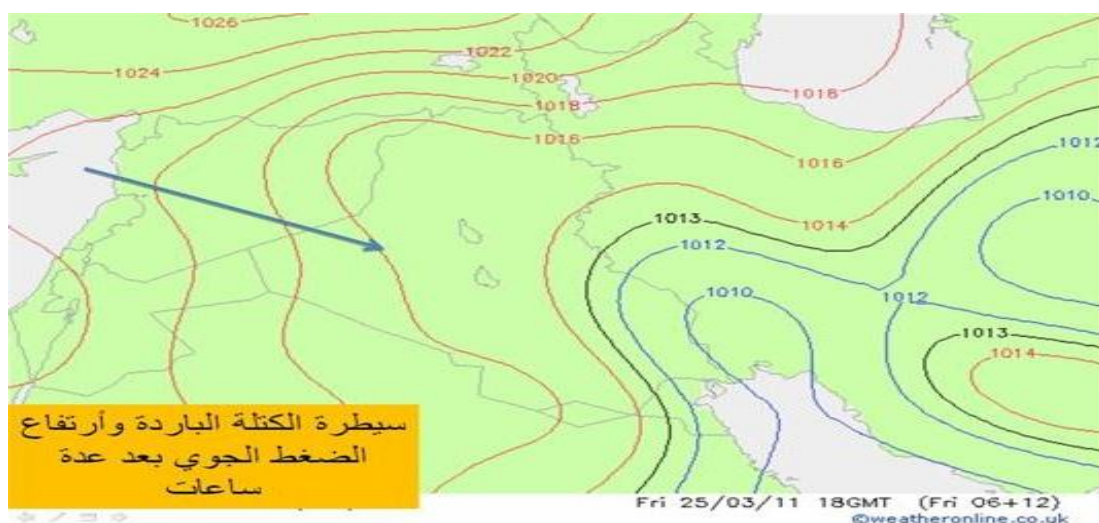


Figure (26) Surface pressure at 18:00 GMT.

The technology of satellite remote sensing has many advantages such as: wide coverage, continuous in the space and monitoring natural disasters quickly, so it can act as an important role in the dust storm monitoring, shown in figure (27). Remote sensing can monitor the scope of dust storm, its intensity grade and its moving trace.

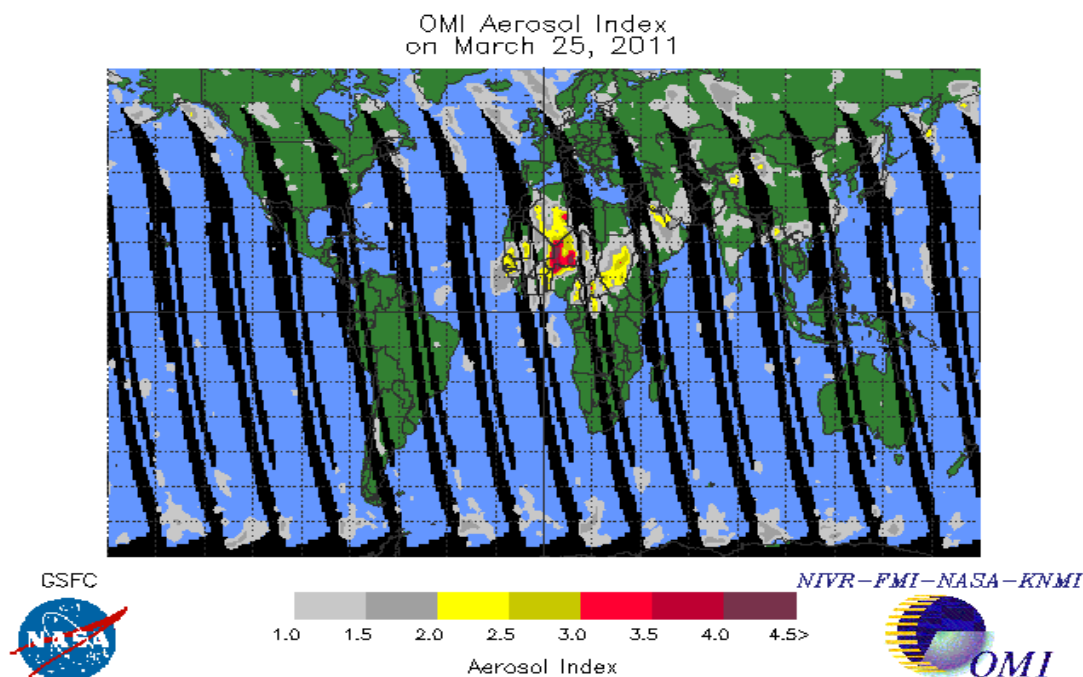


Figure (27) Ozone Monitoring Instrument image.

### Conclusions:

In summary, this paper describe the big systems were critical to forecast where the wind would be sufficiently strong to mobilize dust, combined with a sufficiently unstable boundary layer and an appropriate source region, to excite a dust storm. In conclusion, remote sensing technique plays an important role in monitoring and analyzing dust storm. The dust storm formation has been analyzed related to the local weather system, short-

term precipitation, soil moisture, and extent of deforestation, long-term increased drought, land use/land coverage changes, as well as other human activities, that produced a document for the nature, extent, causal factors associated with the severe sand and dust storms experienced in Iraq itself. Dust storms are a symptom and cause of desertification. They are often an early warning that the deprivation of environment.

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## Design of Digital Filters for Analysis of EEG Signal

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### Abstract

Analytical sequence technique was designed and applied on normal and epileptically human electroencephalography (EEG) data. This technique was composed of three stages. First extraction of EEG spikes and rejection noise, slow and artifacts components. Second determining amplitude threshold which describe spike incidence. Third representation of spikes per second on a bar chart. A set of a band pass filter was designed for extraction of EEG spikes. An accurate detection of spikes was obtained with band pass digital filters of double zero at ( $z=\pm 1$ ), single pole placed on a circle radius ( $r_1$  and  $r_2$ ) and 4<sup>th</sup> order pole was placed at the origin. A threshold program was successfully used to recognize the spikes incidence. Bar chart program was carefully used to count the number of incidence spikes per second on EEG data.

**Kew words:** Digital Filters, Signal Analysis, Digital Signal Processing

### تصميم مرشحات رقمية لتحليل إشارة تخطيط الدماغ

علي كاظم تقي<sup>1</sup> و تيماء نوري مصطفى<sup>2</sup> و ناز طلب جارالله<sup>1</sup> و امال جبار حاتم<sup>1</sup>

<sup>1</sup> قسم الفيزياء-كلية التربية/أبن الهيثم- جامعة بغداد

<sup>2</sup> كلية الطب-جامعة الموصل

### المستخلص

في هذه الدراسة تم تصميم وتطبيق تقنية لتحليل إشارة تخطيط الدماغ لأشخاص غير مصابين وآخرين مصابين بمرض الصرع لكلا الجنسين. تتكون هذه التقنية من ثلاثة مراحل: تم في المرحلة الأولى استبعاد النتوء وإزالة الضوضاء، الإشارة الضعيفة والتداخلات الموجودة في الإشارة. أما في المرحلة الثانية فقد تم تحديد حد العتبة للسعة لوصف حدوث النتوء. وفي المرحلة الثالثة تم تمثيل عدد النتوءات لكل ثانية بواسطة الأعمدة المستطيلة. تم تصميم عدد من المرشحات الرقمية التي تسمح بمرور حزمة معينة من الإشارة وذلك لاستبعاد النتوء من إشارة تخطيط الدماغ. وقد وجد بأن أدق كشف للنتوء كان باستخدام المرشح الرقمي الذي يتكون من صفر مزدوج في ( $Z=\pm 1$ ) وقطب مفرد موضوع في دائرة نصف قطرها (نق 1 نق 2) وأربعة أقطاب موضوعة في مركز الدائرة. عند تطبيق برنامج حد العتبة، تم الكشف عن النتوءات بنجاح. ولدى تطبيق برنامج الأعمدة المستطيلة لحساب عدد النتوءات لكل ثانية، استطعنا من خلاله تشخيص الحالة المرضية للمريض.

**كلمات المفتاح:** الفلاتر الرقمية، تحليل الإشارة، معالجة الإشارة الرقمية.

**Introduction**

The analytical sequence technique which is used in this study based on digital signal processing (DSP) for EEG analysis, which is help the EEGer indiscrimination between abnormal spikes and artifacts and normal.

The designed analytical technique involves three stages: first stage was deal with extraction of spikes from slow wave, noise and artifacts. These tasks can be achieved by development of a set of z- transform digital filters. Second stage was for development of threshold routine which recognized point event sequence. Third stage was for

developed bar chart program to illustrated number of incidence spikes per second on EEG data.

**Theory**

**Digital Filter**

Digital filters are a very important part of (DSP). A digital filter is just a filter that operates on digital signals, such as sound represented inside a computer. It is a computation which takes one sequence of numbers (the input signal) and produces a new sequence of numbers (the filtered output signal)[1].



Figure (1): A block diagram of a basic digital filter[2]

**Transfer Function**

The input  $x_n$  and output  $y_n$  sequences of a digital filter both represent signals sampled at discrete, uniformly spaced, time increments  $t_n$ . A finite impulse response (FIR) digital filter takes  $N+1$  of the most recent samples of  $x_n$ , multiplies them by  $N+1$  coefficient, and sums the result to form  $y_n$ . For an infinite impulse response (IIR) filter, the  $M$  previous samples of  $y_n$  are weighted and added in as well. In other words, an IIR filter uses feedback.

This is expressed mathematically by [3]:

$$Y_n = \sum_{k=0}^N b_k x_{n-k} + \sum_{k=1}^M a_k y_{n-k} \quad \text{-----(1)}$$

**Z-transform**

The z-transform is used to describe the properties of a sampled data signal or system, and it provides useful methods of representing the sampled data signal or system by either a finite set of poles and zeros(frequency-domain representation) or by a linear difference equation (time - domain representation ) [4].



Just as analog filters are designed using the Laplace transform, recursive digital filters are developed with a parallel technique called the z-transform. To reinforce that the Laplace and z-transforms are parallel techniques, we will start with the Laplace transform and show how it can be changed into the z-transform. The Laplace transform is defined by the relationship between the time domain and s-domain signals:

$$X(s) = \int_{t=-\infty}^{\infty} x(t)e^{-st} dt \quad \text{-----}(2)$$

where  $x(t)$  and  $X(s)$  are the time domain and s-domain representation of the signal, respectively.

The Laplace transform can be changed into the z-transform

$$X(z) = \sum_{n=-\infty}^{\infty} x[n]z^{-n} \quad \text{-----}(3)$$

Eq.(3) represents the standard form of the z-transform, which defines the relationship between the time domain signal,  $x[n]$ , and the z-domain signal,  $X(z)$  [5].

**The Digital filter transfer function**

The transfer function of the filter is the ratio  $Y(z)/X(z)$ , where  $Y(z)$  and  $X(z)$  are the z-transforms of the output and input signals respectively .

$$H(z) = \frac{Y(z)}{X(z)} \quad \text{-----} (4)$$

Multiplying the input transform  $X(z)$  by the transfer function  $H(z)$  gives the output transform  $Y(z)$  [4].

**Transfer function in pole –zero form**

An important feature of the z-domain is that the transfer function can be expressed as **poles** and **zeros**. This provides the second general form of the z-domain:

$$H(z) = \frac{(z - z_1)(z - z_2)(z - z_3) \text{-----}}{(z - p_1)(z - p_2)(z - p_3) \text{-----}} \quad \text{-----} (5)$$

Each of the poles ( $p_1, p_2, p_3, \dots$ ) and zeros ( $z_1, z_2, z_3, \dots$ ) is a complex number[5].

The behavior of the digital filter is governed by the location of its poles and zeroes in the z-plane [5]. One of the most important characteristics of the z-plane is that the region of filter stability is mapped to the inside of the unit circle on the z-plane. Given the  $H(z)$  transfer function of a digital filter, the poles location of this function determine stability of the filter. If all poles are located inside the unit circle, the filter will be stable. On the other hand, if any pole is located outside the unit circle the filter will be unstable [6]. As shown in figure (2).

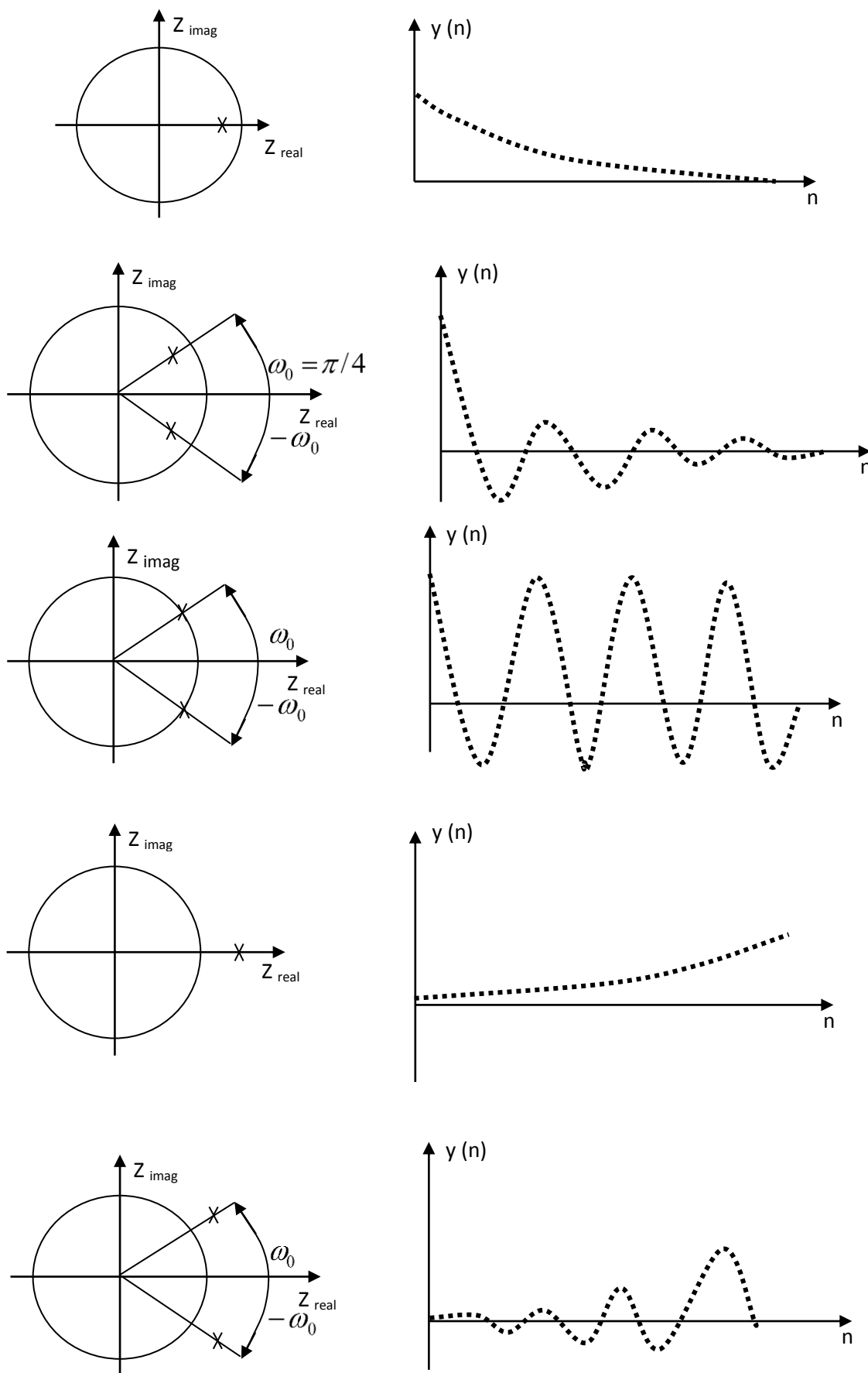


Figure (2): Various  $H(z)$  pole location and their discrete time-domain [6]

## Results

### A- Data plotting

EEG recordings were plotted on computer by using program MATLAB, so that the computer analysis could be compared with the original signal .In EEG analysis ,the sampling rate was chosen to be (160 Hz) to avoiding loss of information .The recorded data was displayed on the computer and compared to actual data, no loss of information was noticed , this was confirmed by medical specialist.

A computer printout of 16 channels of EEG recordings are shown in figure (3a) & figure (3b) respectively with **(40000-60000)** points of data on each channel, each channel has been analyzed alone .In figures (3a)and (3b) the signal from the beginning to  $(8.5 \cdot 10^4)$  points and the last  $(0.2 \cdot 10^4)$  points represent the calibration of EEG .Calibration is selected simultaneously for all channels by a switch on the control unite .A calibration signal of  $(100\mu V, 0.5Hz)$  square wave was recorded at the beginning of each record , which was used as a scaling signal of the actual absolute amplitude values.

To find the number of points per second we divided the total number of points over the total measuring time ,then we plot the EEG signal for one minute ,which consist of ten segments ,each segment represent 6 sec

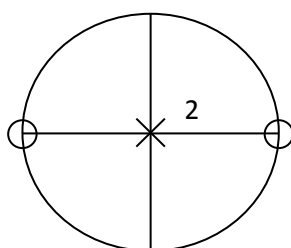
as shown in figure (4). This figure shows a computer print out of ten tracing (6 sec long )of one minute of data of channel two ,channel two was chosen for the processing the signal which has lowest noise contamination .On each trace the **1250** points correspond to **(6)**seconds of data.

### B-Analytical Technique

In this work, digital filtering operations form an important part of EEG signal analysis procedures. The signal to be analyzed consists of two main components, both of interest to diagnosis epilepsy cases and to the physiologist. These are action potential "spikes" and slow rhythmic wave. The tasks required a suitable filter for detecting and separating the spike from the slow wave and for noise reduction .For such operations, different configuration of band pass digital filters have been designed using z-transform techniques.

The band pass filters were designed to extract spikes and reject **(80Hz)** on data sampled at **(160Hz)**.

Firstly, a very simple band pass filter was designed as shown in figure (5), this filter has a single zero at **( z = ±1)** to get a rejection of low frequencies and noise components .The second order poles were placed at origin for phase response.



The

Figure (5): Pole-Zero Configuration of Simple Band Pass Digital Filter with single zero at  $( z = \pm 1)$

To find recurrence formula:

Since  $H(z) = \frac{Y(z)}{X(z)}$  ----- (7)

$H(z) = (1 - z^{-2}) = \frac{Y(z)}{X(z)}$  -----(8)

$Y(z) = X(z) - z^{-2}X(z)$

In general, we may transform a term such  $a_1 z^m \cdot X(z)$  into  $a_1 \bullet X(n+m)$  or a term  $a_2 z^k \bullet Y(z)$  into a term  $a_2 \bullet y(n+k)$  where m and k are integers. The reason of this is that z may be thought of as a shift operator multiplication by z is equivalent to time shift of T seconds [2]. Then the recurrence formula becomes

$\therefore y(n) = x(n) - x(n-2)$  ----- (9)

When this band pass filter was applied on the EEG signal low frequencies were extracted as shown in figure (6).

A second band pass digital filter was designed as shown in figure (7), which had a double zero at (z=1) to achieve a complete rejection of zero frequency, and a single zero at (z=-1) to reject noise.

The complex conjugate zero-pair were placed on the unit circle at (  $z = e^{\pm j\theta}$  ) with ( $\theta = \pm 45^\circ$ ) to extract frequency of (8-13) Hz and. (36-44)Hz. In addition a 5<sup>th</sup> order pole was placed at origin to maintain the condition so that the filter output is calculated from previous output and n<sup>th</sup> earlier inputs.

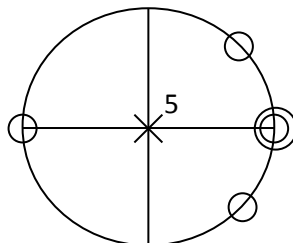


Figure (7): Pole-Zero Configuration of Band Pass Digital Filter with a double zero at (z=1), single zero at (z=-1), complex conjugate zero-pair at (  $z = e^{\pm j\theta}$  ) with ( $\theta = \pm 45^\circ$ ) and a 5<sup>th</sup> order pole at origin.

The z-transform function of this filter was found to be

$H(z) = \frac{(z-1)(z-1)(z+1)(z-e^{-j\theta})(z-e^{+j\theta})}{z^5}$  ----- (10)

$H(z) = \frac{(z^2-1)(z-1)(z-\cos\theta+j\sin\theta)(z-\cos\theta-j\sin\theta)}{z^5}$

$$H(z) = \frac{(z^3 - z^2 - z + 1)(z^2 - 2z \cos \theta + 1)}{z^5}$$

$$\therefore H(z) = \frac{z^5 - 2z^4 \cos \theta - z^4 + 2z^3 \cos \theta + 2z^2 \cos \theta - z - 2z \cos \theta + 1}{z^5} \dots\dots\dots (11)$$

$$z^5 Y(z) = z^5 X(z) - 2z^4 \cos \theta X(z) - z^4 X(z) + 2z^3 \cos \theta X(z) + 2z^2 \cos \theta X(z) - z X(z) + 2z \cos \theta X(z) + X(z)$$

$$y(n+5) = x(n+5) - 2 \cos \theta x(n+4) - x(n+4) + 2 \cos \theta x(n+3) + 2 \cos \theta x(n+2) - x(n+1) + 2 \cos \theta x(n+1) + x(n)$$

Which is equivalent to:

$$y(n) = x(n) - 2 \cos \theta x(n-1) - x(n-1) + 2 \cos \theta x(n-2) + 2 \cos \theta x(n-3) - x(n-4) + 2 \cos \theta x(n-4) + x(n-5)$$

Or

$$y(n) = x(n) - (1 + 2 \cos \theta)(x(n-1) + x(n-4)) - 2 \cos \theta (x(n-2) + x(n-3)) + x(n-5)$$

The recurrence formula of this filter is

$$\therefore y(n) = x(n) - (1 + 2c)(x(n-1) + x(n-4)) - 2c(x(n-2) + x(n-3)) + x(n-5) \dots\dots (12)$$

Where  $c = \cos \theta$

When this filter was applied on EEG data, it was found that although noise artifact and low frequency have somewhat been reduced, but they were still present as shown in figure (8).

An attempt was made to design ,digital filter using as few poles and zeros as possible in order to approximate desired frequency response characteristic since more z-plane poles and zeros are used, the more complicated is resulting recurrence formula and the more numerical calculations are involved in calculating any one out put sample value. Thus, the zero frequency and high frequency rejection are provided by the double zero at ( $z = \pm 1$ ) and the complex conjugate pole-pair were placed at  $z = r e^{\pm j\theta}$  on a circle of radius (r) which gives increased rejection of noise components a round (20) Hz and narrow pass band and a pole-pair on the origin for sharp cut off, as shown in figure (9).

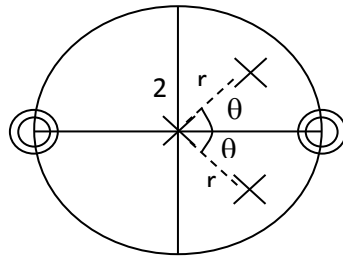


Figure (9): Pole-Zero Configuration of Band Pass Digital Filter with Double Zero at  $(z= \pm 1)$ , Complex Conjugate Pole-Pair were Placed at  $z = re^{\pm j\theta}$  on a Circle of Radius  $(r)$  and  $2^{nd}$  Order Poles at Origin.

The z-transform function of this filter was found to be

$$H(z) = \frac{(z-1)(z+1)(z-1)(z+1)}{z^2(z-re^{j\theta})(z-re^{-j\theta})} \dots\dots\dots (13)$$

$$H(z) = \frac{(z^2-1)^2}{z^2(z-r\cos\theta-jr\sin\theta)(z-r\cos\theta+jr\sin\theta)}$$

$$H(z) = \frac{z^4-2z^2+1}{z^4-2z^3r\cos\theta+z^2r^2} = \frac{Y(z)}{X(z)} \dots\dots\dots (14)$$

$$z^4Y(z)-2z^3r\cos\theta Y(z)+z^2r^2Y(z)=z^4X(z)-2z^2X(z)+X(z)$$

Then the recurrence formula becomes

$$y(n+4)-2r\cos\theta y(n+3)+r^2y(n+2)=x(n+4)-2x(n+2)+x(n)$$

Which is equivalent to:

$$y(n)-2r\cos\theta y(n-1)+r^2y(n-2)=x(n)-2x(n-2)+x(n-4)$$

The recurrence formula of this filter is.

$$y(n)=2r\cos\theta y(n-1)-r^2y(n-2)+x(n)-2x(n-2)+x(n-4) \dots\dots\dots (15)$$

The pole-position used were at  $(\theta = \frac{\pi}{6})$  and  $(r = 0.4)$ .

Figure (10) shows the result when this filter was applied to EEG data. The noise reduction in the signal was very good, when  $(\theta = \pi/6)$  and  $(r = 0.2)$  which represent the best local (angle and distance) for a pairs of poles, but some slow wave can be seen.

Figure (11) shows the output of filter of figure (9) with  $(\theta = \frac{\pi}{4})$  and  $(r = 0.4)$ , it is clear that there is some noise and artifact couldn't be removed.

In this filter, double zero are placed at  $(z = \pm 1)$  and single pole placed on a circle of radius  $(r_1)$  and  $(r_2)$  and a pole-pair on the origin for sharp cut off was designed, as shown in figure (12).

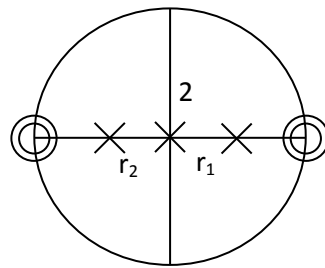


Figure (12): Pole-zero Configuration of Band Pass Digital Filter with Double Zero are Placed at ( $z = \pm 1$ ), Single Pole Placed on a Circle of Radius ( $r_1$  and  $r_2$ ) and a Pole-Pair on the Origin.

The z-transform function of this filter was found to be

$$H(z) = \frac{(z-1)(z+1)(z-1)(z+1)}{z^2(z-r_1)(z+r_2)} \text{----- (16)}$$

$$H(z) = \frac{(z^2-1)^2}{z^2(z^2-r_1z+r_2z-r_1r_2)}$$

$$H(z) = \frac{z^4-2z^2+1}{z^4-r_1z^3+r_2z^3-r_1r_2z^2} \text{----- (17)}$$

$$z^4Y(z) - r_1z^3Y(z) + r_2z^3Y(z) - r_1r_2z^2Y(z) = z^4X(z) - 2z^2X(z) + X(z)$$

Then the recurrence formula becomes

$$y(n+4) - r_1y(n+3) + r_2y(n+3) - r_1r_2y(n+2) = x(n+4) - 2x(n+2) + x(n)$$

Which is equivalent to:

$$y(n) - r_1y(n-1) + r_2y(n-1) - r_1r_2y(n-2) = x(n) - 2x(n-2) + x(n-4)$$

The recurrence formula of this filter is.

$$y(n) = r_1y(n-1) - r_2y(n-1) + r_1r_2y(n-2) + x(n) - 2x(n-2) + x(n-4) \text{----- (18)}$$

When this filter was applied with ( $r_1=0.8$  &  $r_2=0.3$ ) to EEG data. As shown in figure (13), it was found that the noise has not been completely eliminated.

By varying the value of ( $r_1$  &  $r_2$ ) of the filter of figure (12) and applied on the same EEG data, the noise and artifacts components were also not completely rejected as shown in figure (14) with ( $r_1=0.2$  &  $r_2=0.9$ ).

Finally ,the pervious filter can be modified to reduce the noise components completely by applying double zero at ( $z = \pm 1$ ), single pole placed on a circle of radius ( $r_1$  and  $r_2$ ) and 4<sup>th</sup> order pole was placed at the origin to provide sharp cut off as shown in figure (15) .

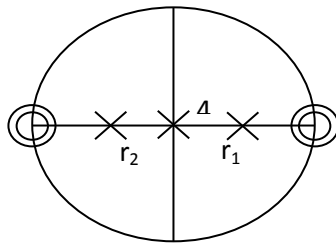


Figure (15): Pole-Zero Configuration of Band Pass Digital Filter with double zero at  $(z = \pm 1)$ , single pole placed on a circle of radius  $(r_1$  and  $r_2)$  and  $4^{th}$  order pole was placed at the origin.

The z-transform function of this filter was found to be

$$H(z) = \frac{(z-1)(z+1)(z-1)(z+1)}{z^4(z-r_1)(z+r_2)} \text{----- (19)}$$

$$H(z) = \frac{z^4 - 2z^2 + 1}{z^6 - r_1z^5 + r_2z^5 - r_1r_2z^4} = \frac{Y(z)}{X(z)} \text{----- (20)}$$

$$z^6Y(z) - r_1z^5Y(z) + r_2z^5Y(z) - r_1r_2z^4Y(z) = z^4X(z) - 2z^2X(z) + X(z)$$

Then the recurrence formula becomes

$$y(n+6) - r_1y(n+5) + r_2y(n+5) - r_1r_2y(n+4) = x(n+4) - 2x(n+2) + x(n)$$

Which is equivalent to:

$$y(n) - r_1y(n-1) + r_2y(n-1) - r_1r_2y(n-2) = x(n-2) - 2x(n-4) + x(n-6)$$

Or

$$y(n) = r_1y(n-1) - r_2y(n-1) + r_1r_2y(n-2) + x(n-2) - 2x(n-4) + x(n-6) \text{----- (21)}$$

When this filter was applied with  $(r_1=0.4$  &  $r_2=0.7)$ , a reduction in the noise components and low frequencies was obtained as shown in figure (16). To be sure that the noise components was reduced accurately, another two applications of the above filter were applied to the same EEG data one with  $(r_1=0.9$  &  $r_2=0.1)$  and the other with  $(r_1=0.1$  &  $r_2=0.8)$ .The results of these applications are shown in figure (17) and figure (18) respectively. In comparison between there figures, it was found that the filter with  $(r_1=0.1$  &  $r_2=0.8)$  yielded a useful reduction in noise components together with spikes

which are sufficiently clear to be detected by means of a simple threshold technique.

**C-Threshold Technique for Detection of the Spike Sequence**

In order to study the incidence patterns of the contraction spike they must be recognized and separated from the noise and presented as an event sequence in time. That is to say , a new signal must be generated which has the value **0** at all times except the sample point at which a spike is recognized ,when its value must be **1** .Such signal is known as a point event series and it is



obtained from the filtered spike signal by means of a threshold detection algorithm.

Several factors contribute to the design of such a routine. In our spike signal the amplitude of the spike is generally greater than all other components so in principle a simple threshold system will detect its presence.

Figure (19) shows the extraction process applied to one minute of EEG (channel two). The top trace (a) shows the original EEG record for one minute. The center trace (b) shows the signal after being filtered with the a band pass digital filter whose z-plane plot is shown on figure (15). The trace (c) shows the binary out put from the threshold program; it is the point process representation of the spike component incidence. It is clear from this figure that the incidence of spike has been successfully recognized.

#### **D-Bar Chart**

The bar chart is a convenient graphical device that is particularly useful for displaying nominal or ordinal data-data like ethnicity, sexes and treatment category. The various categories are represented along the horizontal axis. The height of each bar is equal to the frequency of items for the category [7]. Bar charts are usually drawn with a gap between the bars (rectangles), because each bar describes a different item [3].

#### **Bar Chart Applied on EEG Data**

The bar chart routine was applied to EEG data of normal subject, as shown in figure (20). The top trace (a) shows the original EEG record for one minute of EEG data. Trace (b) shows the results of filtered signal by using band pass digital filter of figure (15). The third trace (c) shows the point event

representation of the spikes. The bottom trace (d) shows the number of spikes per second for one minute generated by program (**Bar chart**). Each bar represents one second. The height of the bar equals to the number of spikes per second.

As a check on the bar chart operation "by eye" count the number of spikes showed that the bar chart truly represented the number of spikes per second incidence patterns in the original data.

#### **Discussion**

Computer analysis of EEG aims to extract information from the signal and presents it in a more objective and convenient for interpretation. Many analytical techniques, such as spectral analysis standard deviation, have been developed. These techniques were based on their analysis on Fast Fourier Transform (FFT). Disadvantages with spectral analysis are the requirement of a fairly long observation time to achieve good spectral estimates. Another disadvantage is that the power spectrum doesn't give the desired result, when a certain characteristic values are need, like peak frequencies.

In the present study, a new technique was developed and applied on one minute EEG record of normal and epileptically females and male. The develop band pass-threshold-bar chart technique was based on z-transform signal process. This technique gives an accurate measure of the spike incidence patterns in EEG data. The problem of noise, slow wave and artifacts component can be effectively eliminated.

In addition, the development technique in actually counting spikes and displaying their incidence patterns is a great important on the technique. In which an adaptive spike

detection algorithm was constructed by combining the different threshold value of discriminate function.

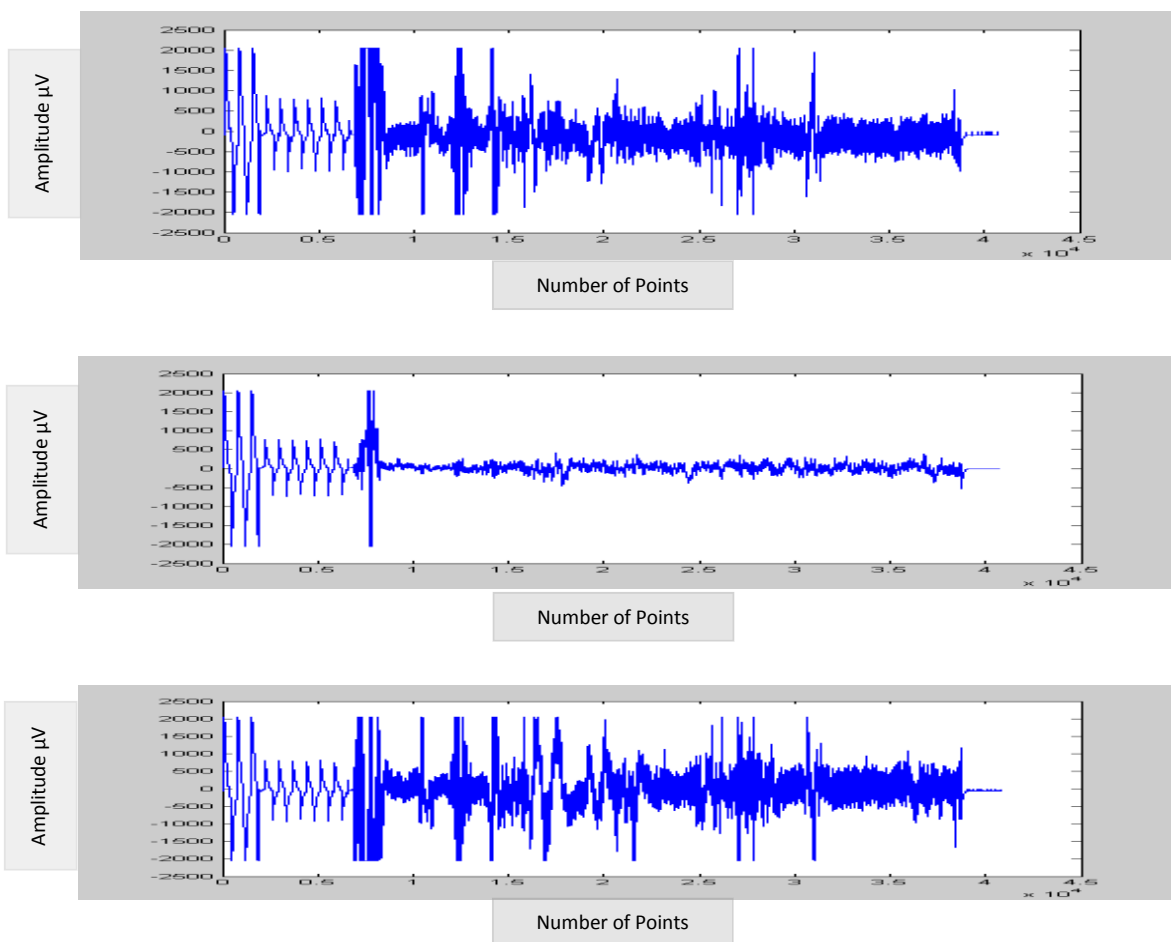
Application the band pass threshold technique on EEG data for one minute duration of normal and epileptically female and male during open and closed eyes state, the application of this technique shows an increase in the number of spikes per second of epileptically female and male as compared to the EEG of normal female and male this increase reface to more action potential (an electrical phenomenon that occurs in nerve cells) occurs.

**Conclusion**

In EEG assessment, transient activities mixed with background activity play an important

role in neurology. Spikes are sometimes hidden to the eye dominate noise. So, it was necessary to develop a technique of a great complexity to extract the spikes from slow wave and noise components. Thus, with original real time sampling of 160 Hz spikes could be adequately extracted by means of a band pass filter has a double zero at  $z=\pm 1$ , single pole placed on a circle of radius ( $r_1$  and  $r_2$ ) and 4<sup>th</sup> order pole was placed at the origin. After this filtering operation spikes incidence could be recognized using a simple threshold routine. The output of threshold routine was used successfully to generate a bar chart to calculate the number of spikes per second.

It is concluded that this method is potentially very useful in the analysis of EEG signal.



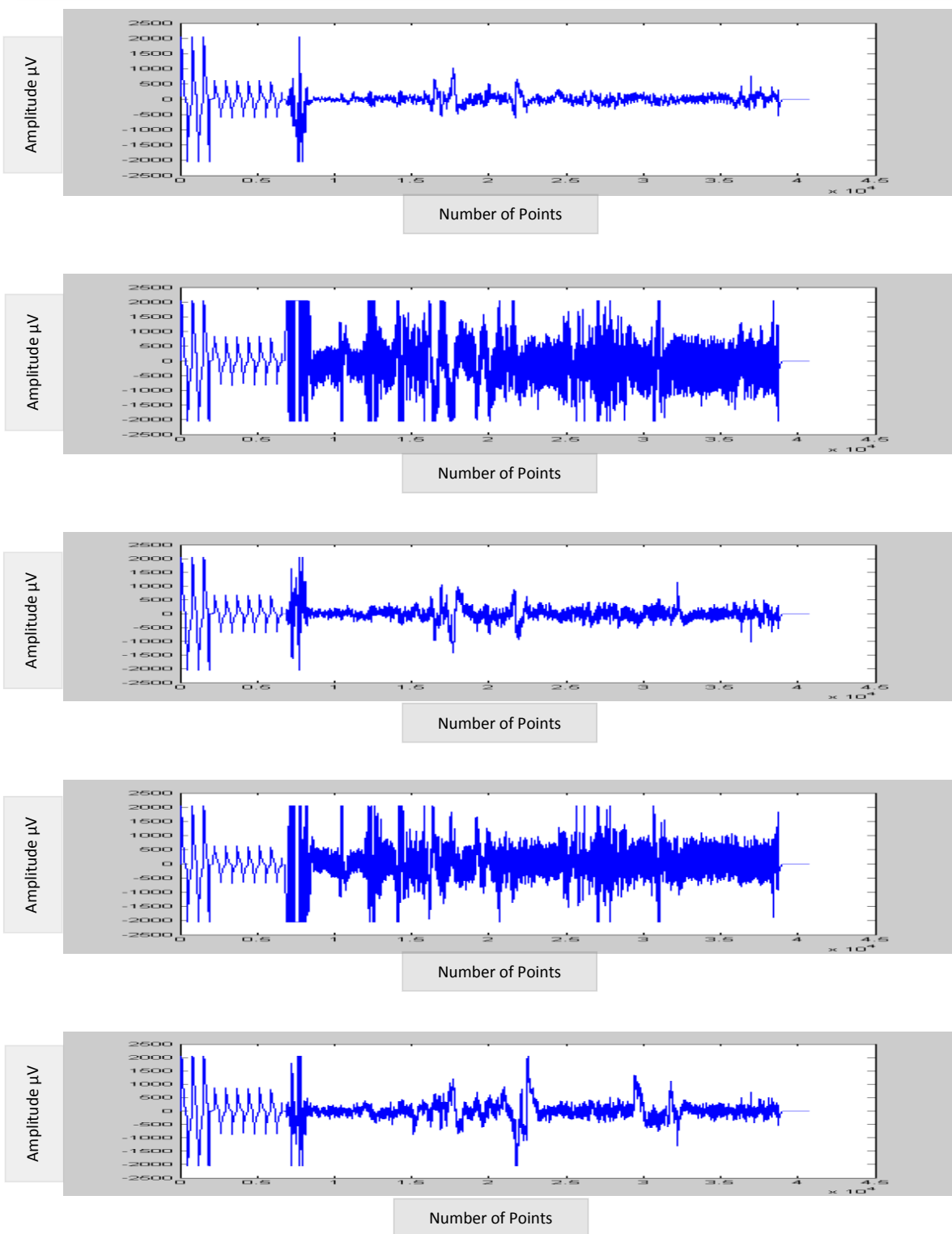
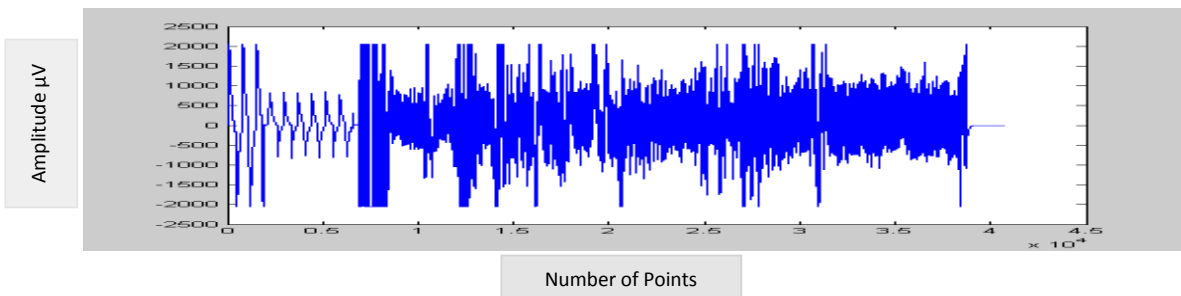
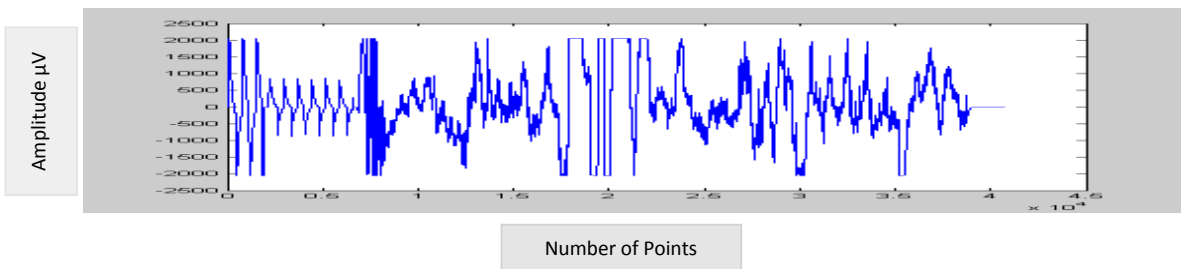
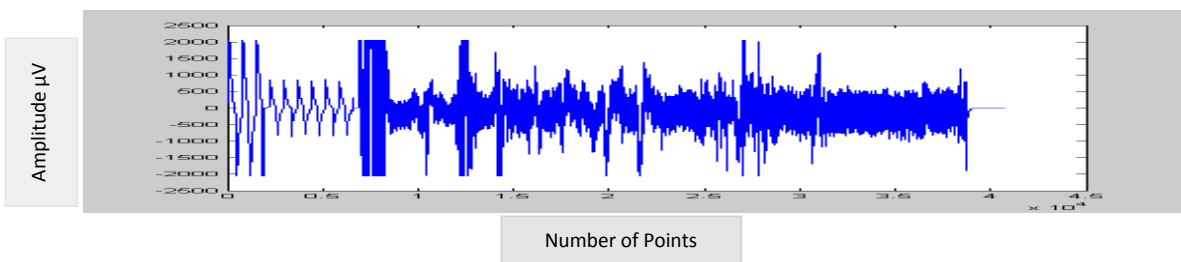
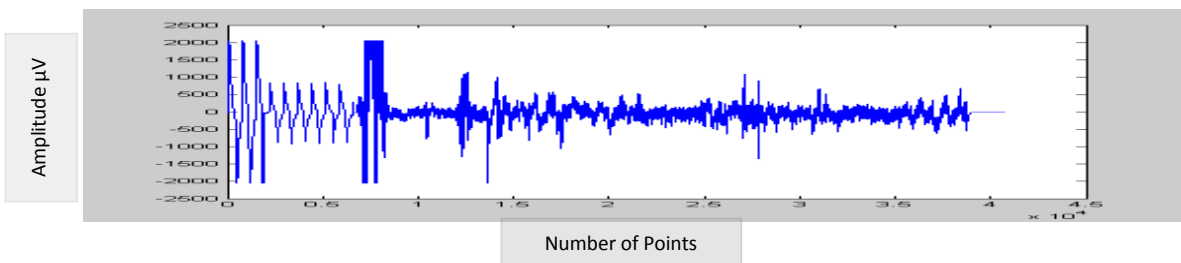
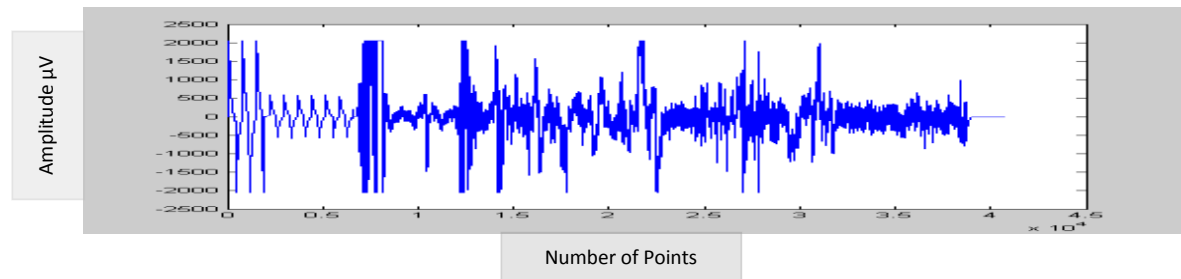
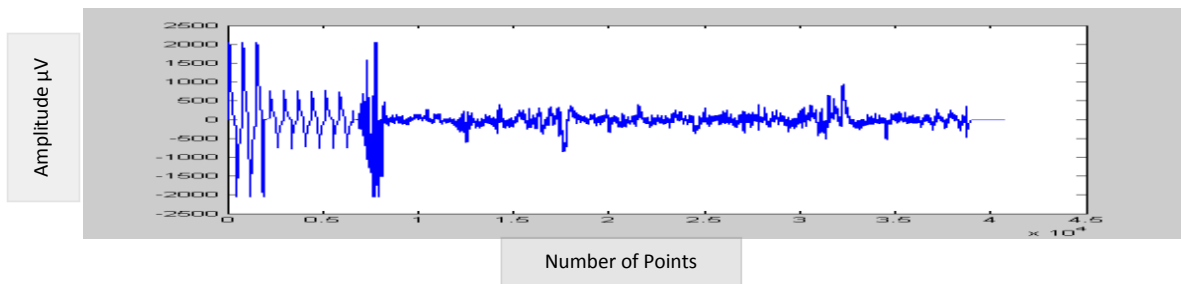


Figure (3a): First 8<sup>th</sup> Channels of EEG Signal of Four Minutes Duration



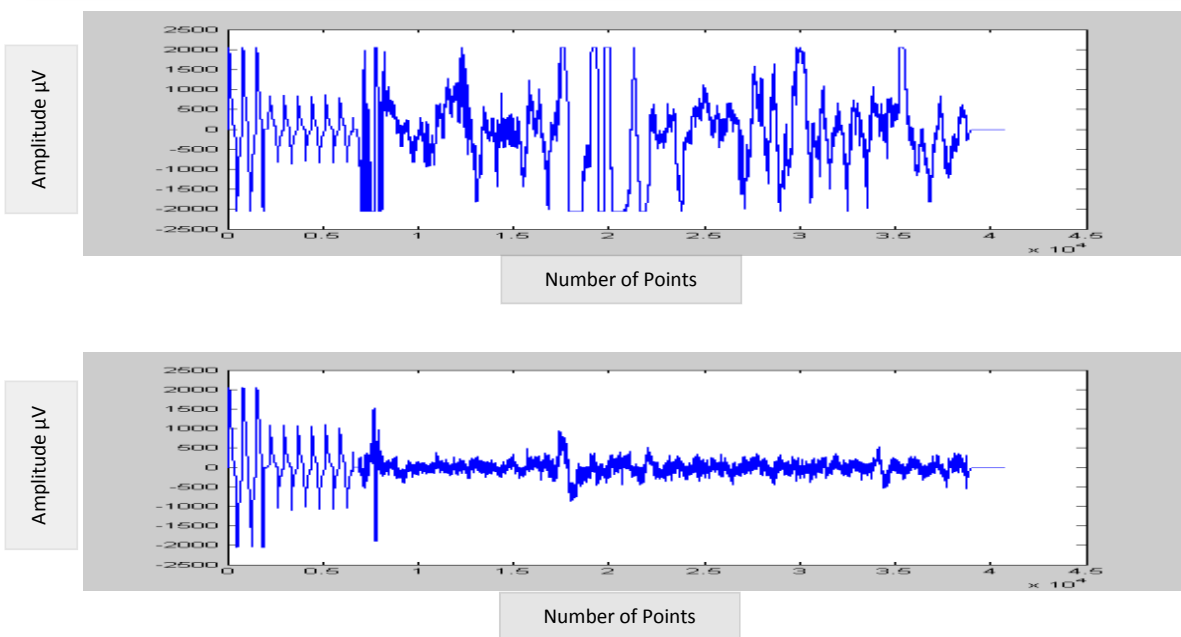
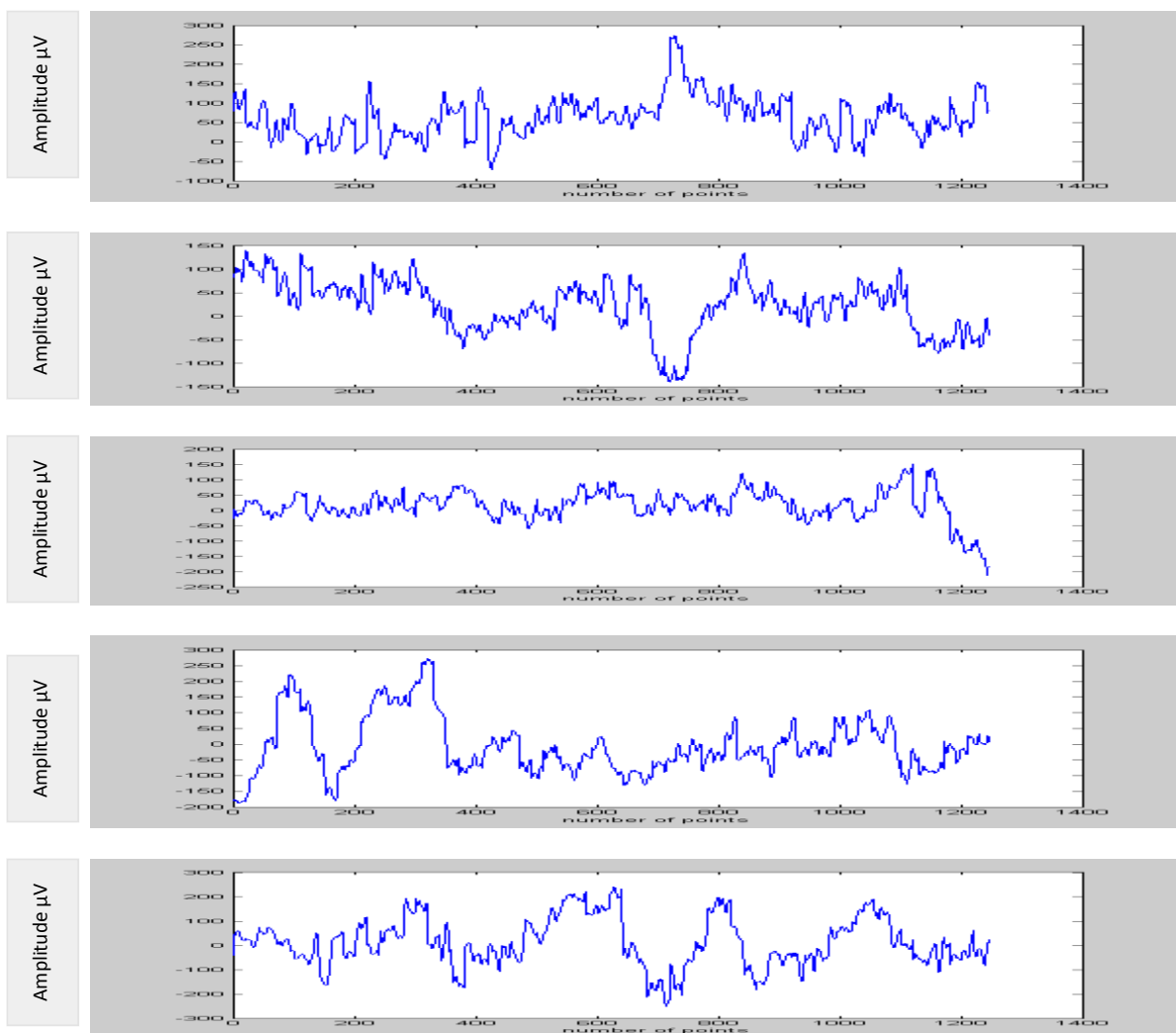


Figure (3b): Second 8<sup>th</sup> Channels of EEG Signal of Four Minutes Duration



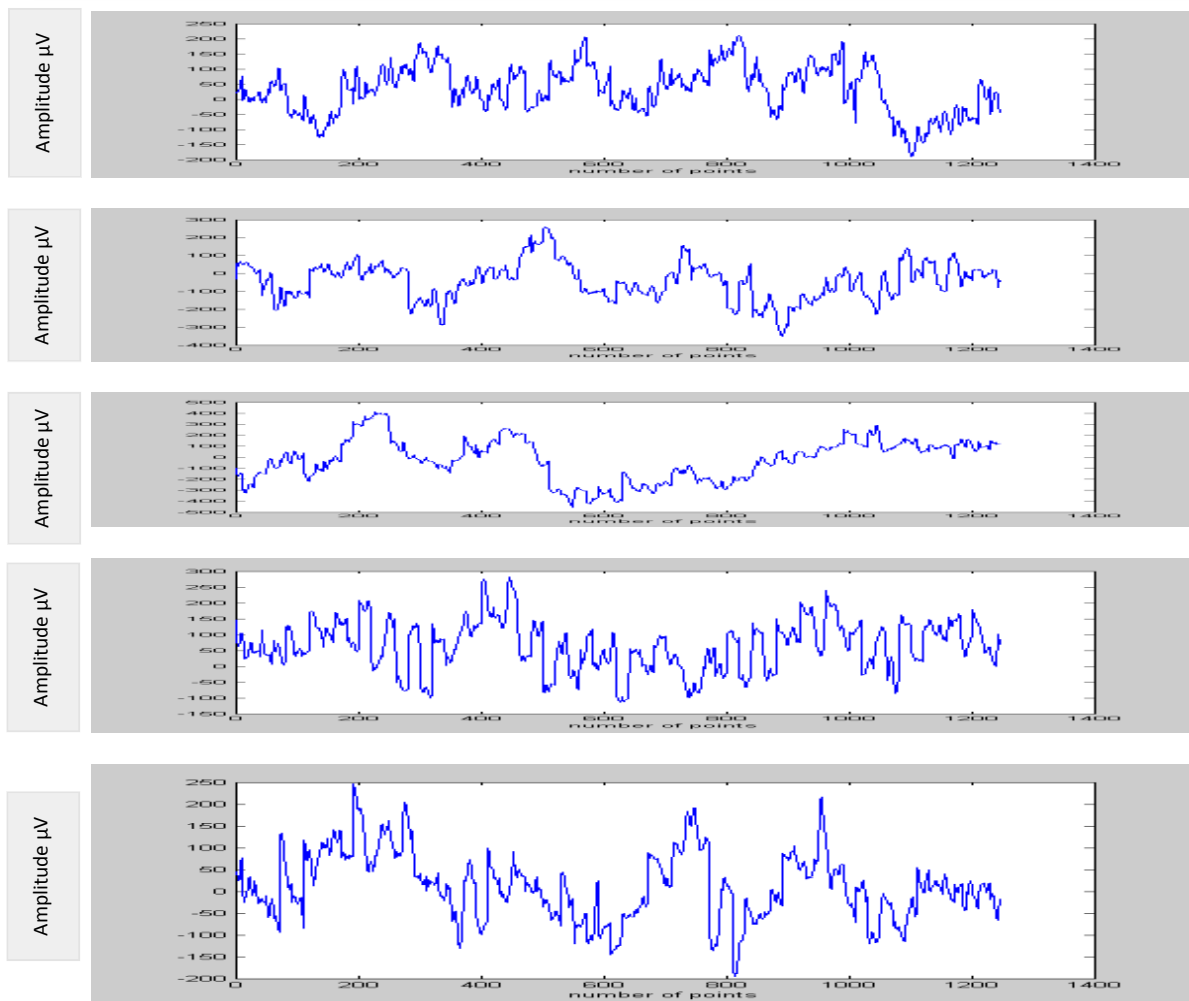
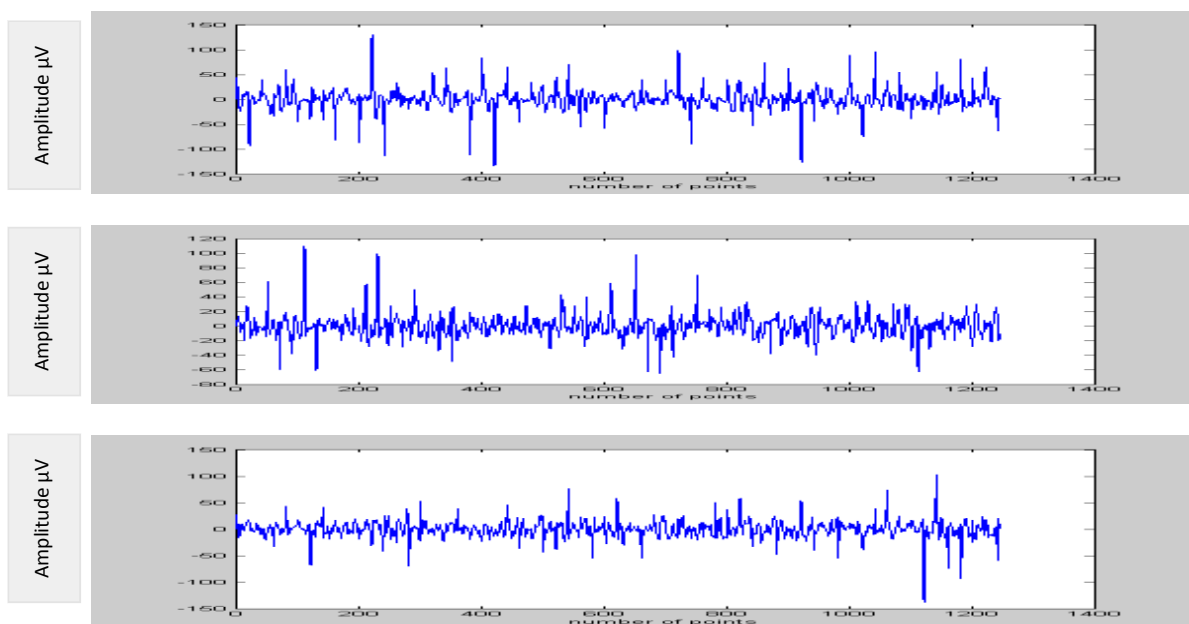


Figure (4):Ten Traces of Channel Two of One Minute off EEG1250 Points on Each Tracer to Six Second Duration Corresponding



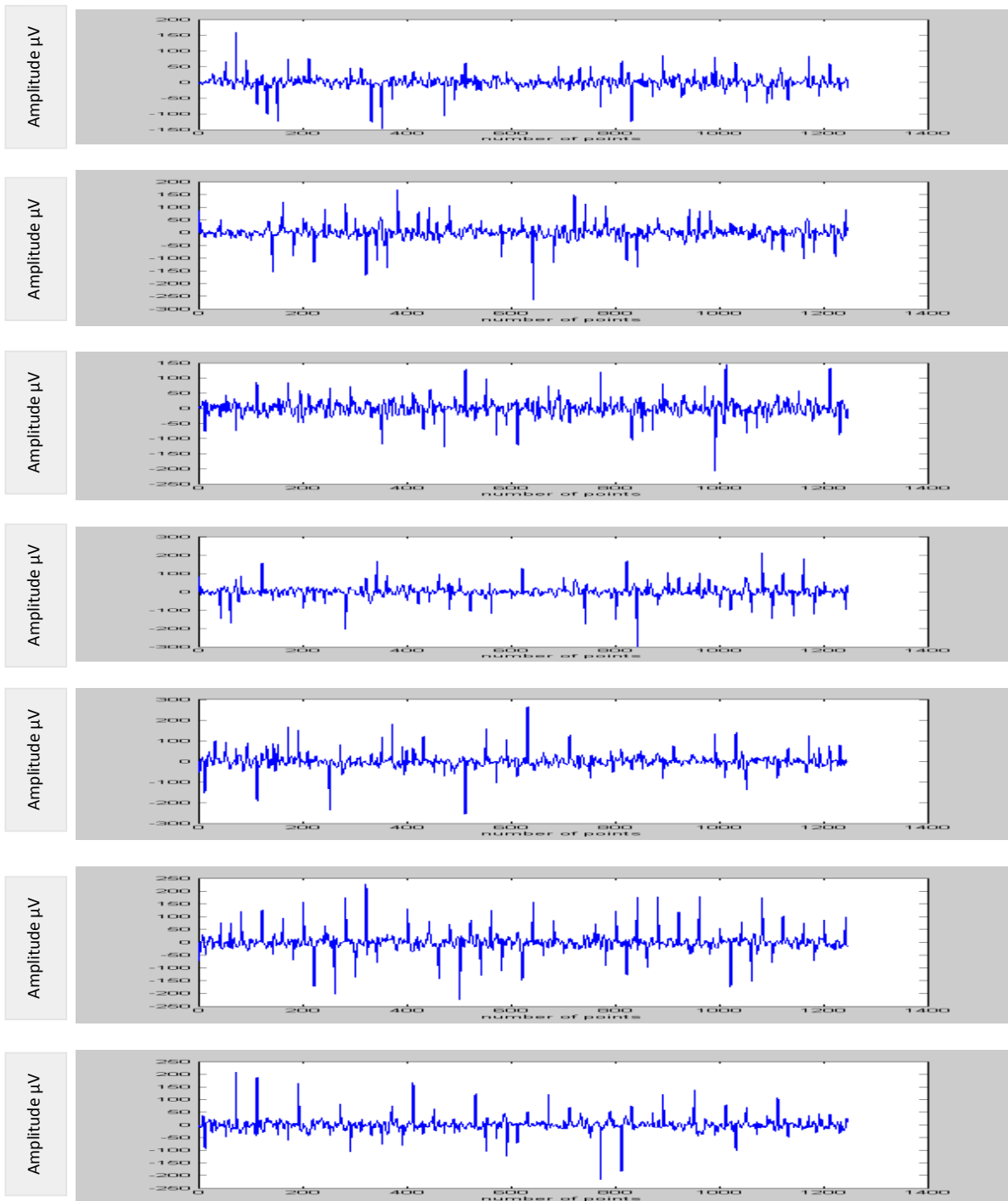
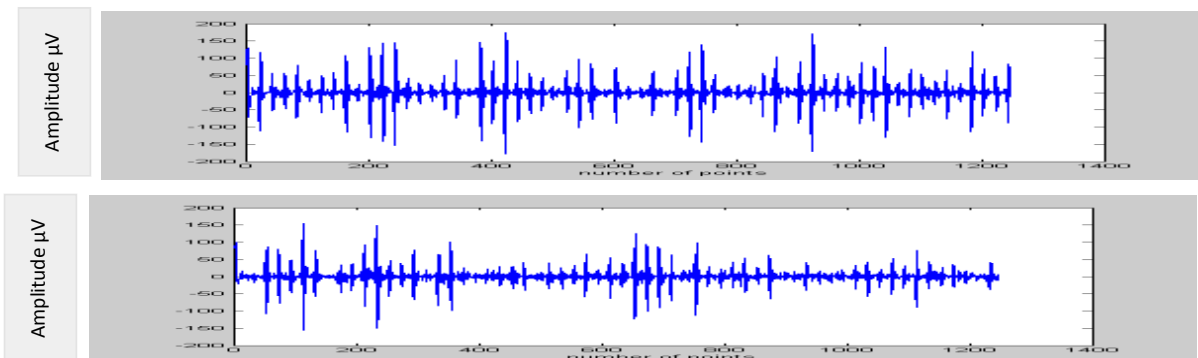


Figure (6): Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (5)



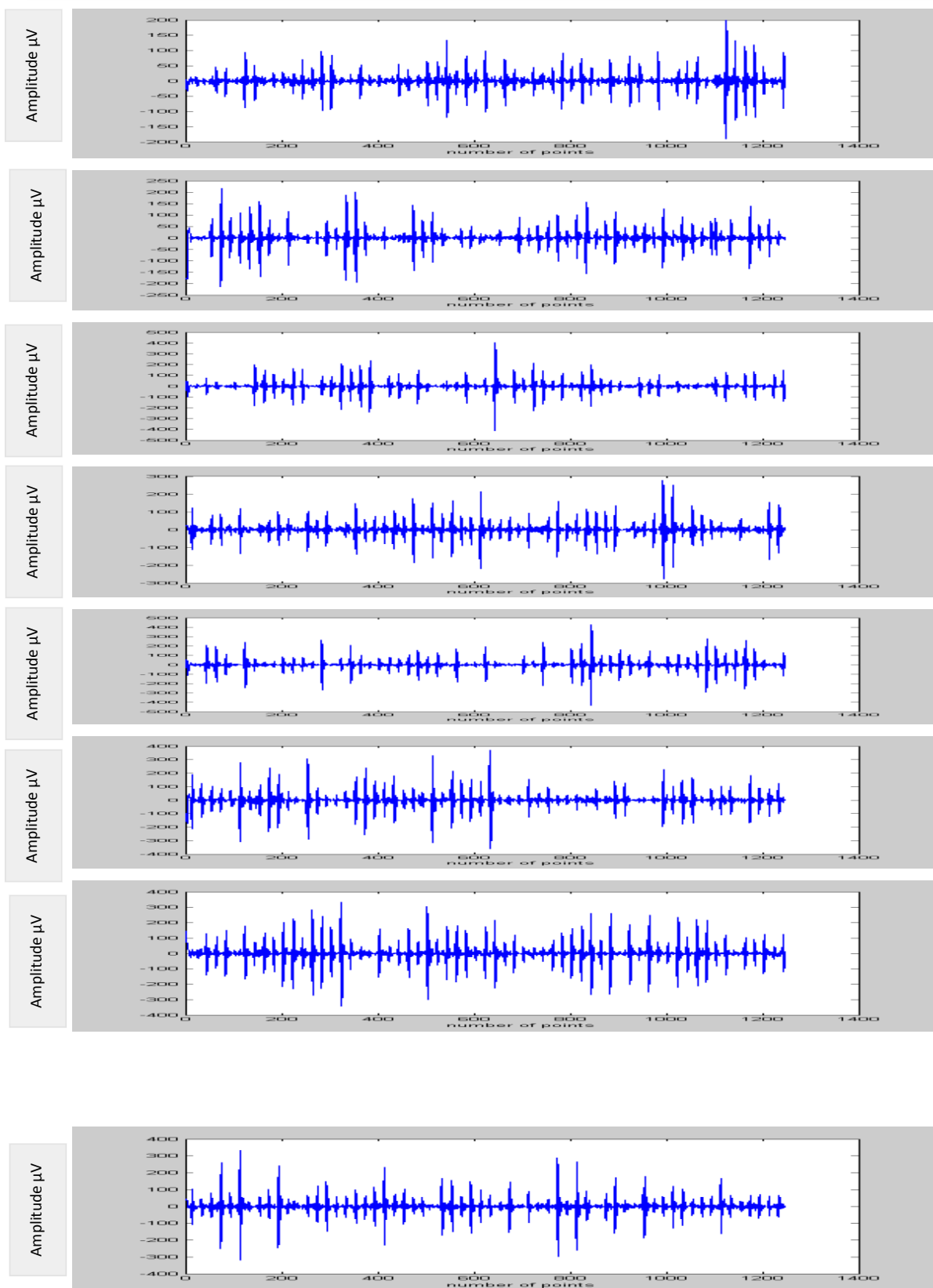
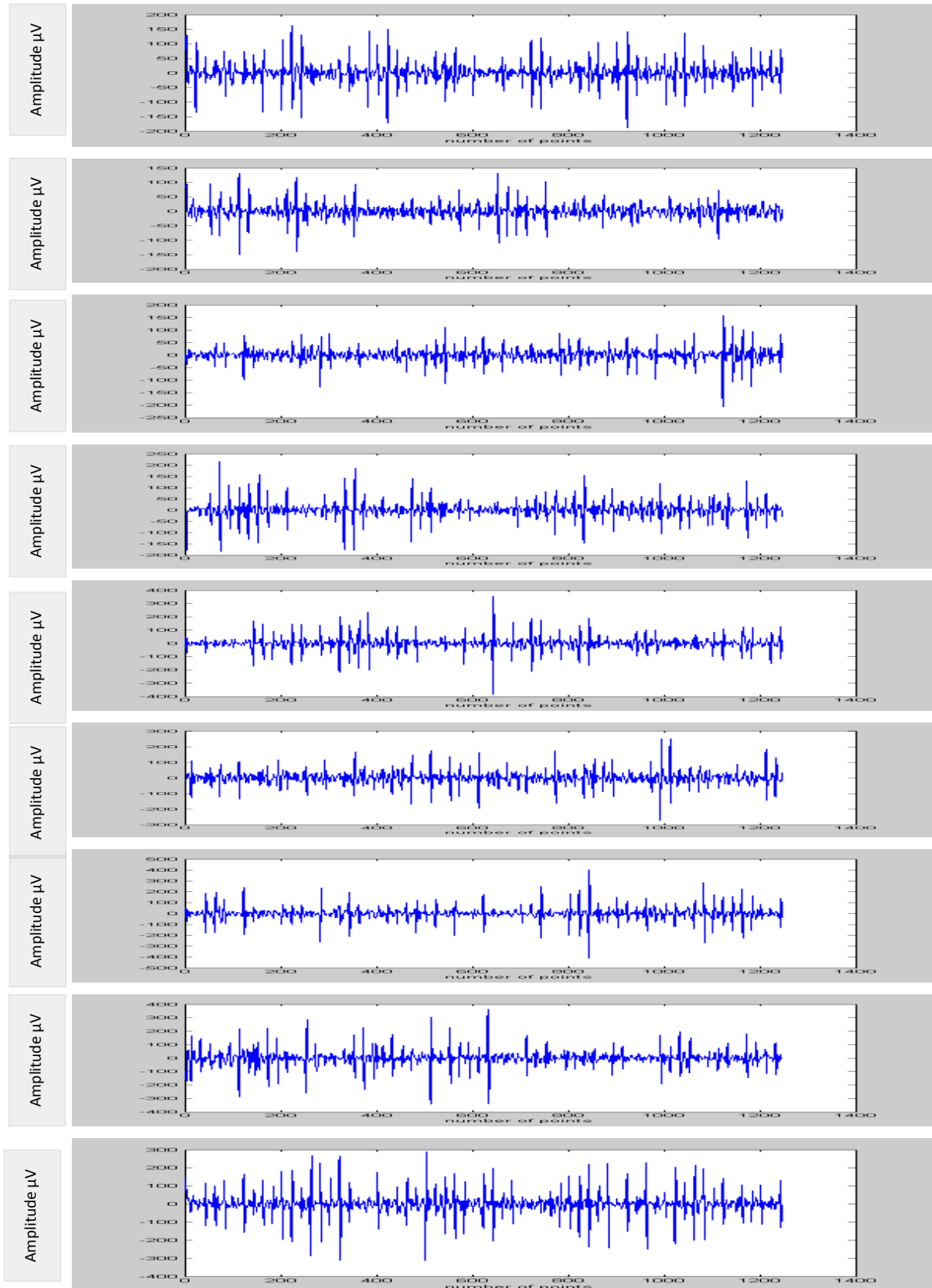


Figure (8): Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (7)





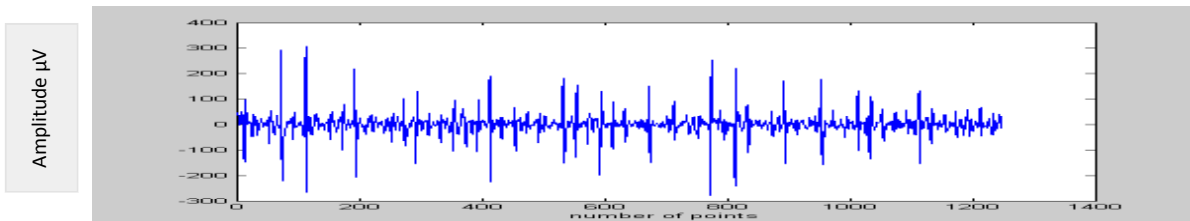
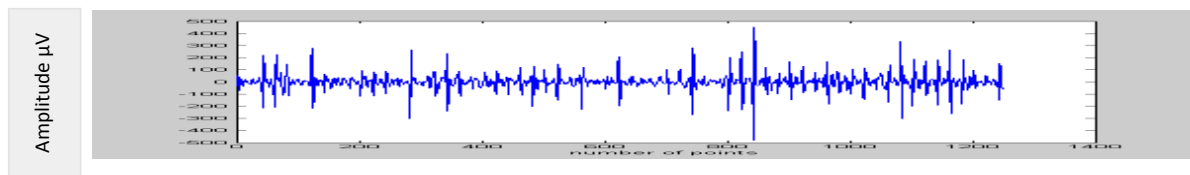
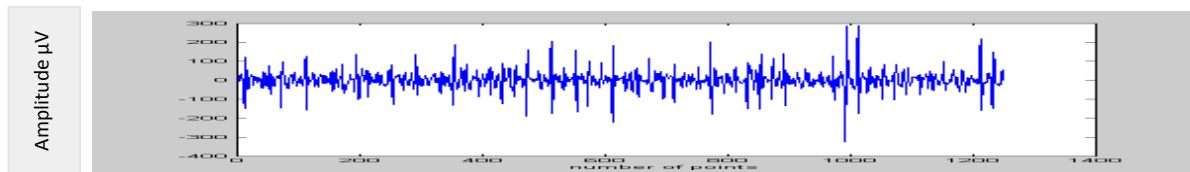
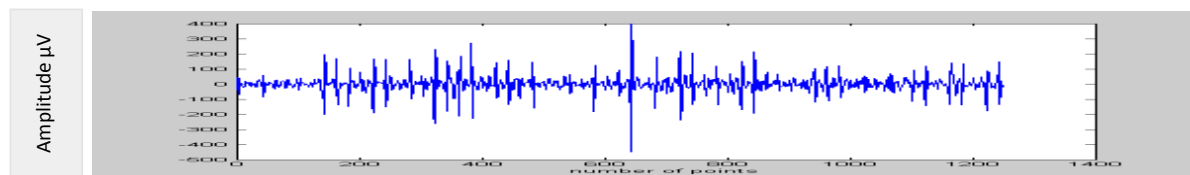
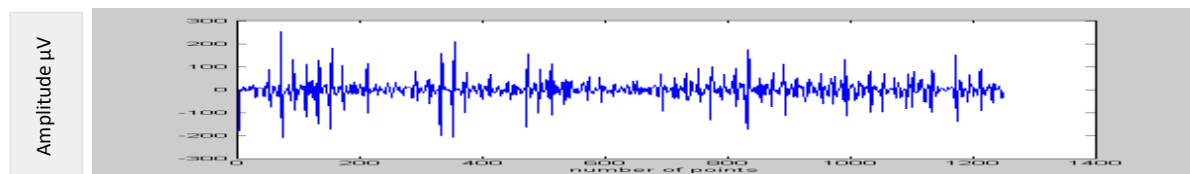
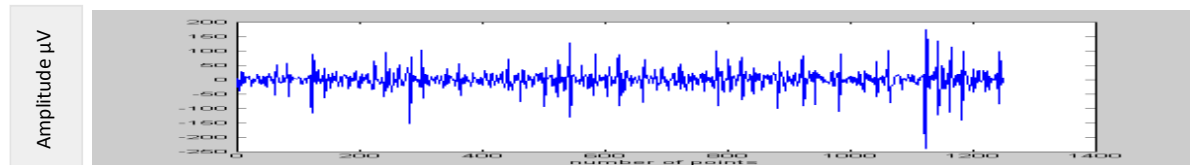
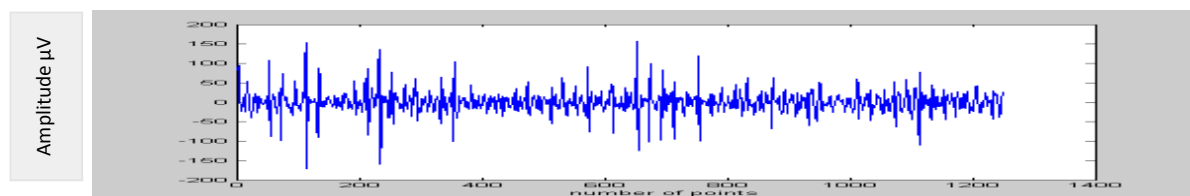
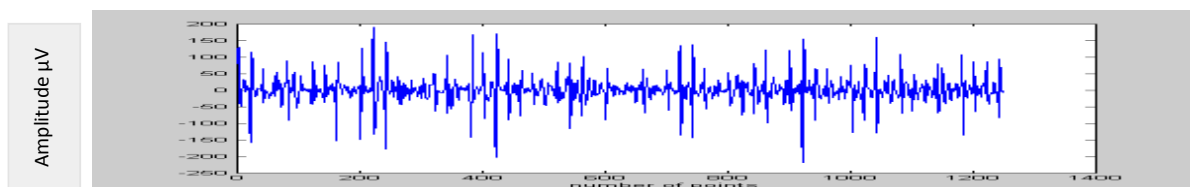


Figure (10) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (9)with  $(\theta= \pi /6) , (r=0.2)$

**filter of figure (9)with  $(\theta= \pi /6) , (r=0.2)$**



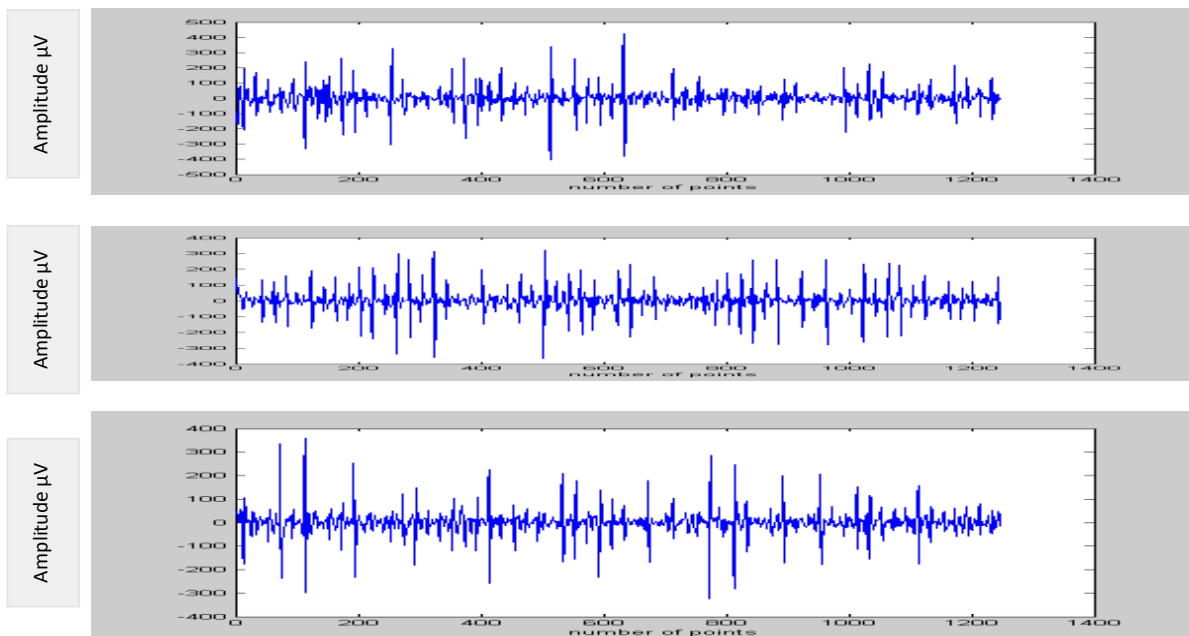
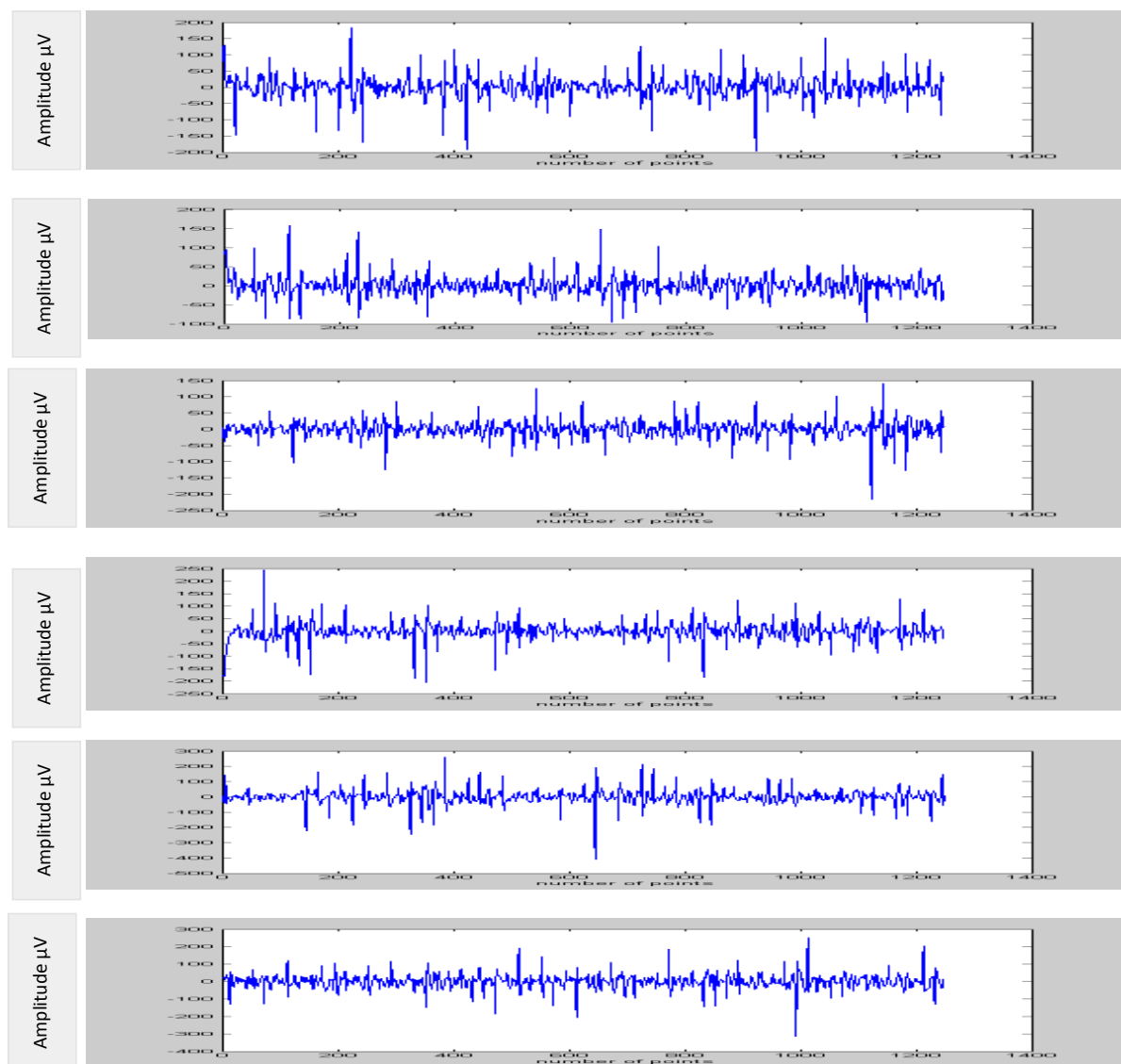


Figure (11) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (9) with  $(\theta = \pi / 4)$  ,  $(r = 0.4)$



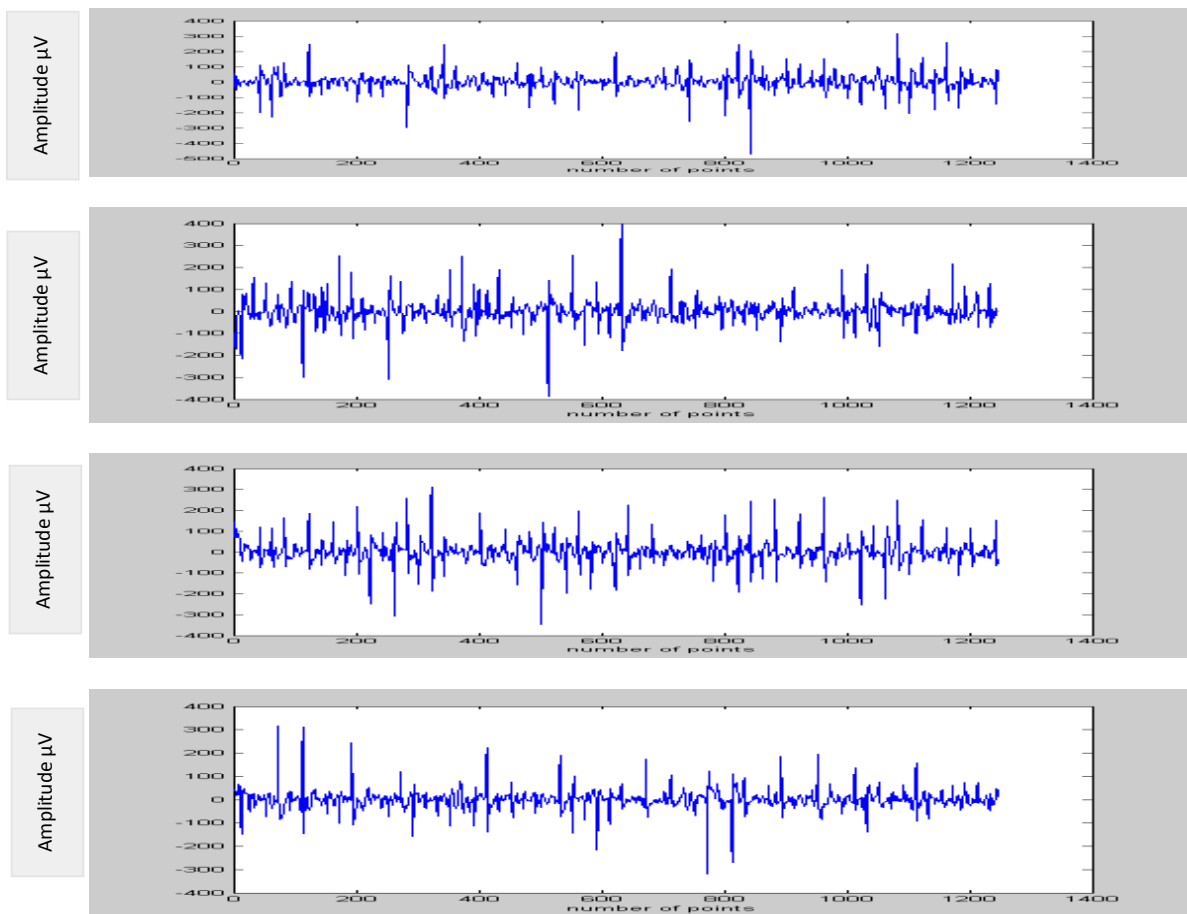
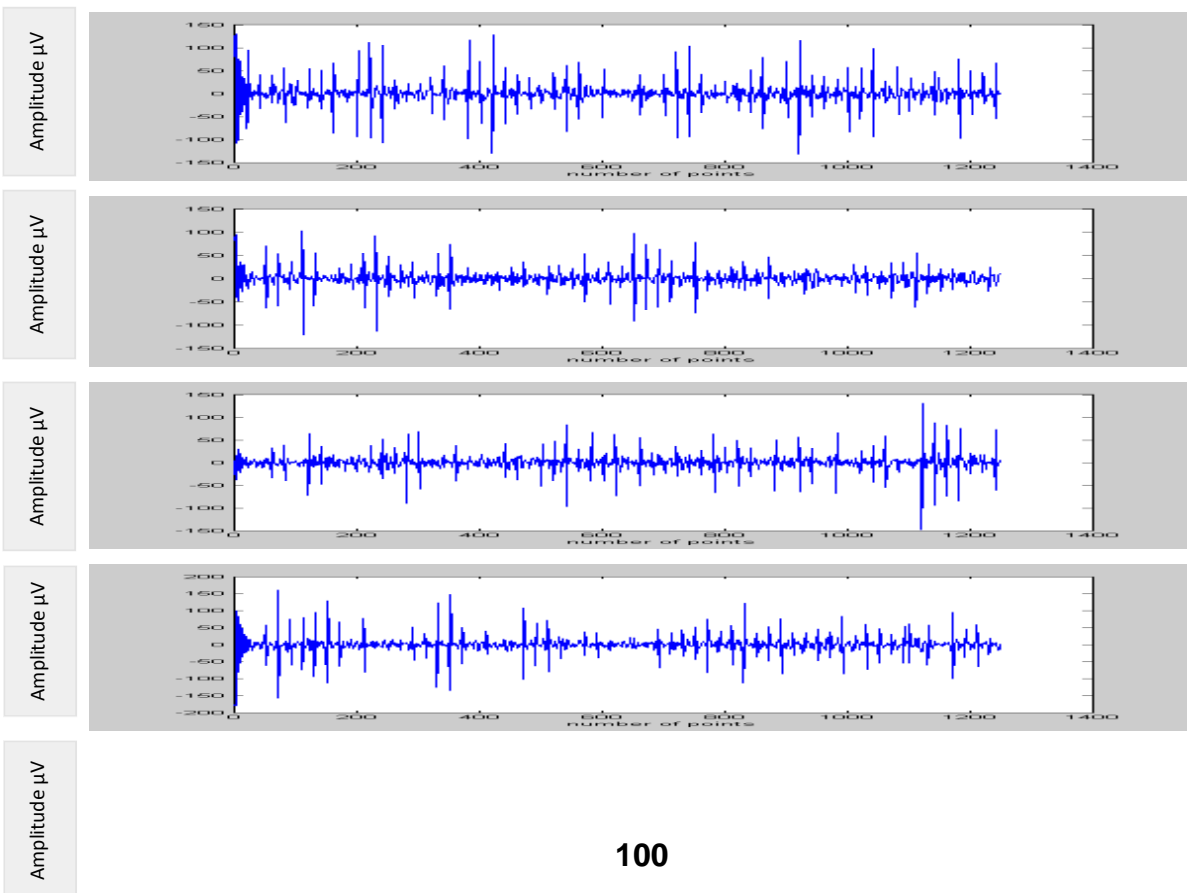


Figure (13) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (12) with ( $r_1=0.8$ & $r_2=0.3$ )



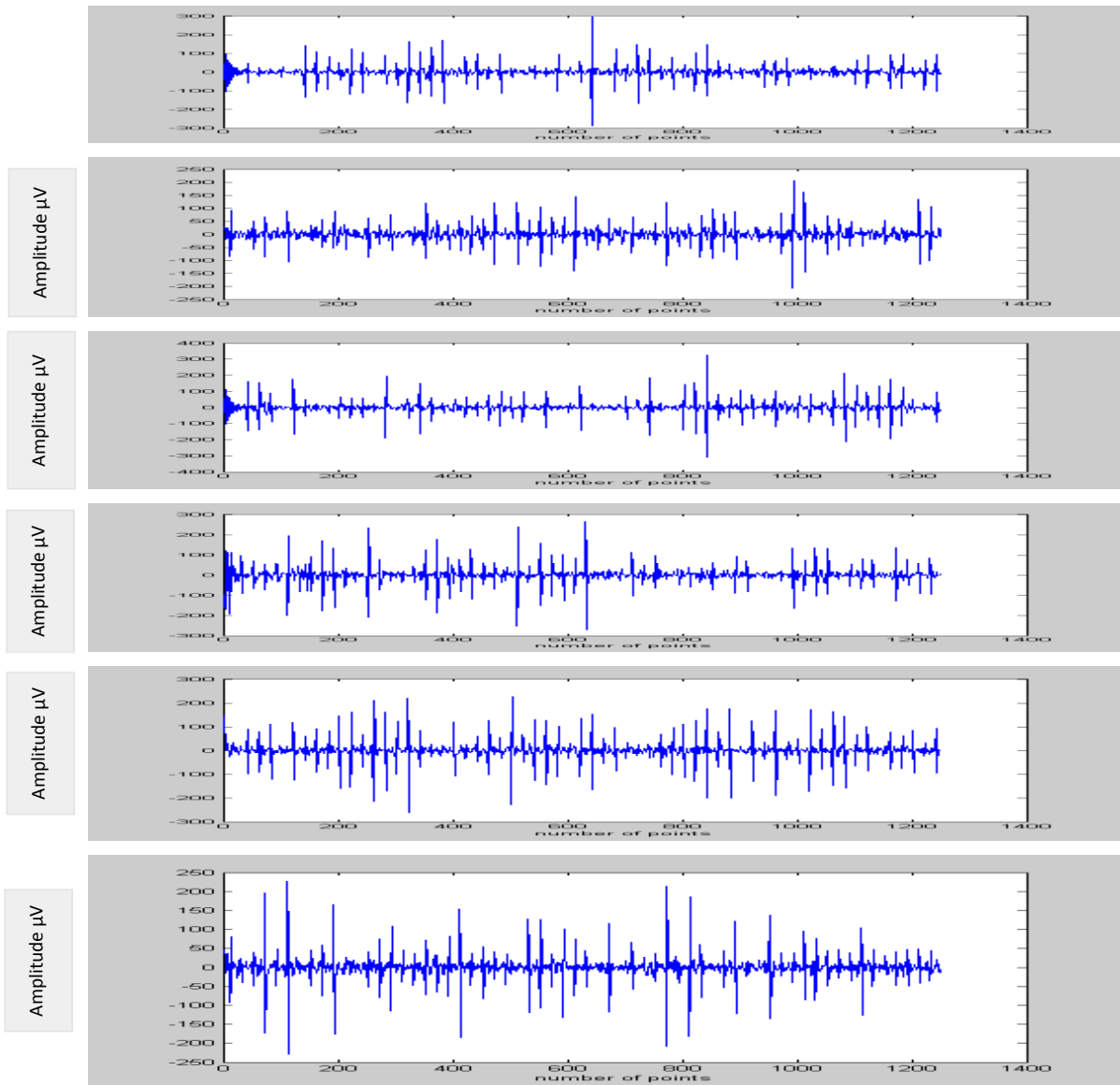
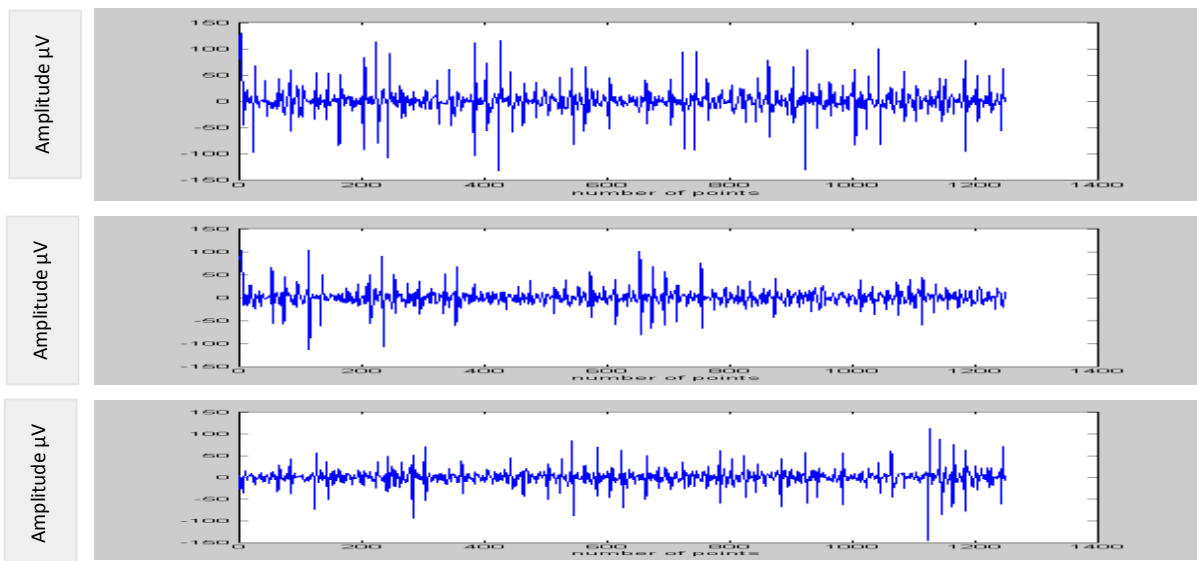


Figure (14): Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (12) with ( $r_1=0.2$  &  $r_2=0.9$ )



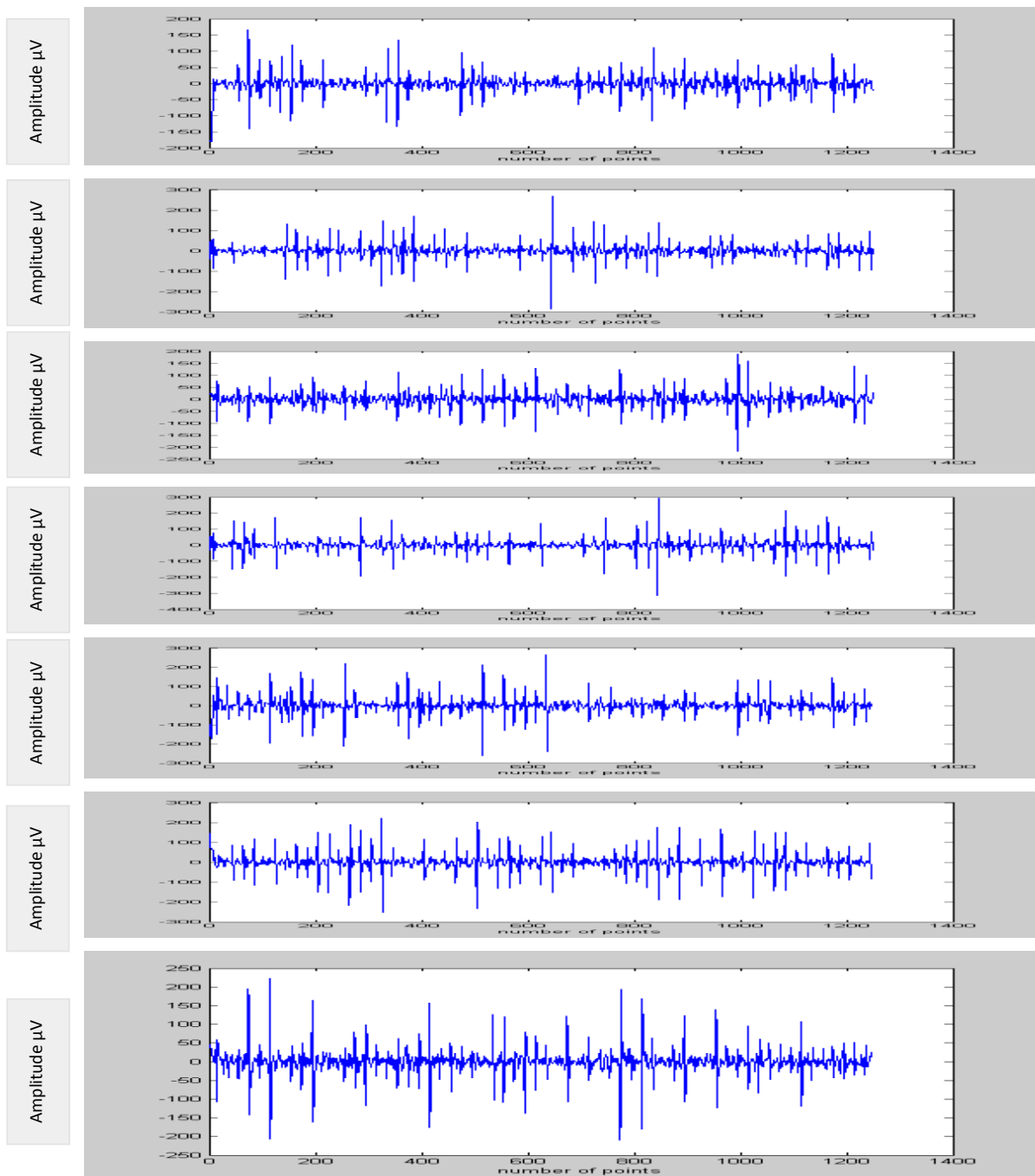
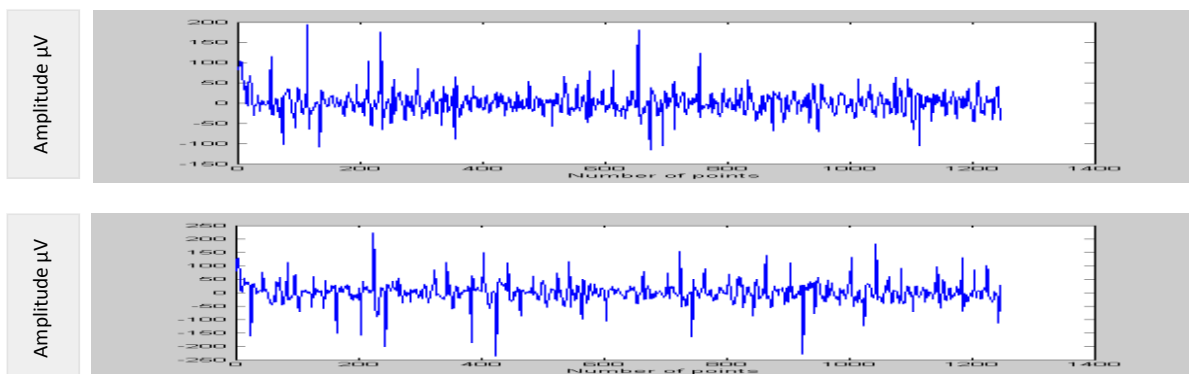


Figure (16) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (15) with  $(r_1=0.4&r_2=0.7)$



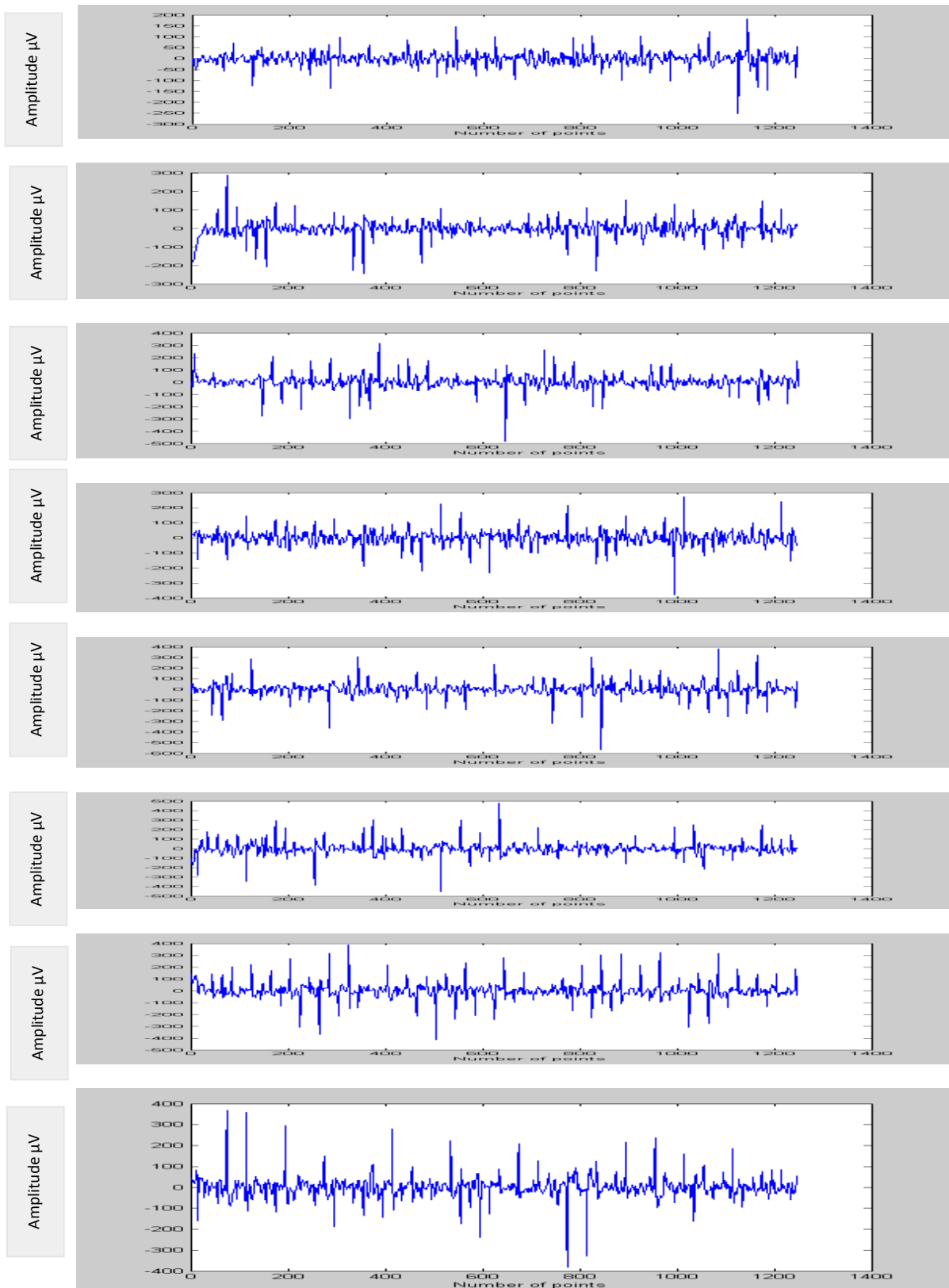
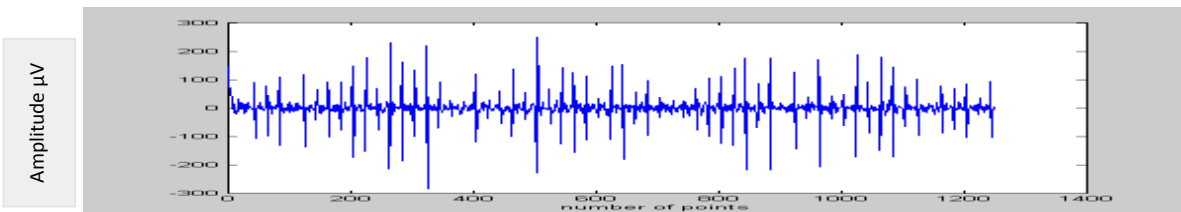
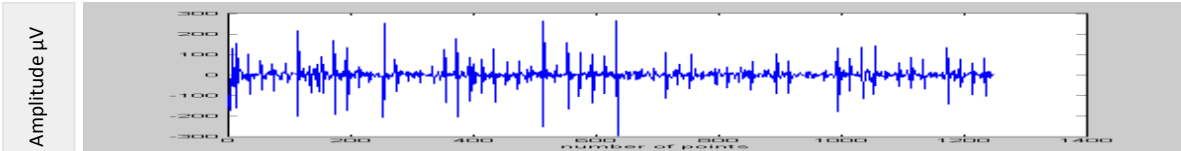
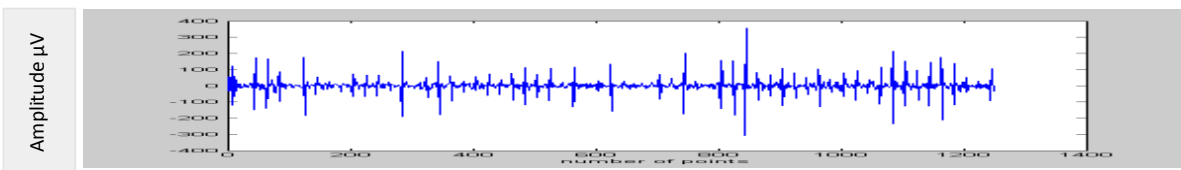
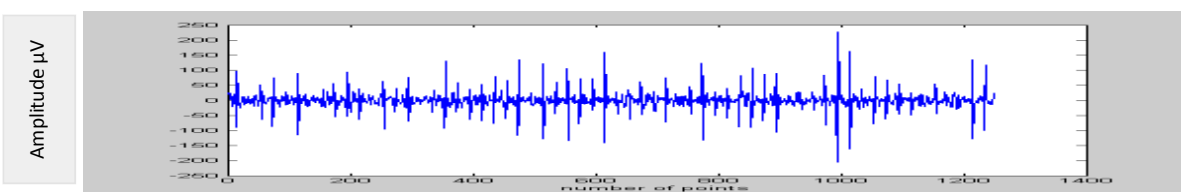
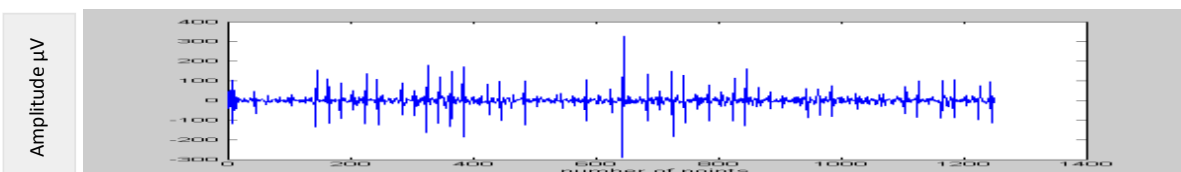
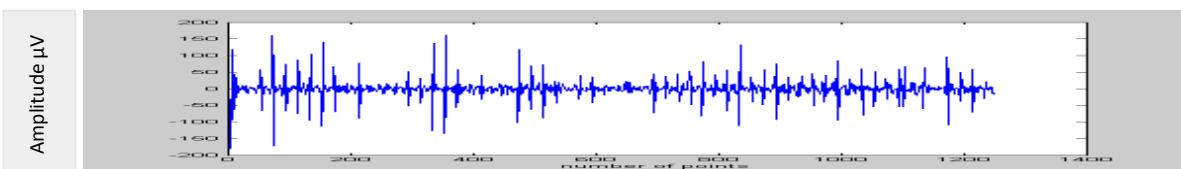
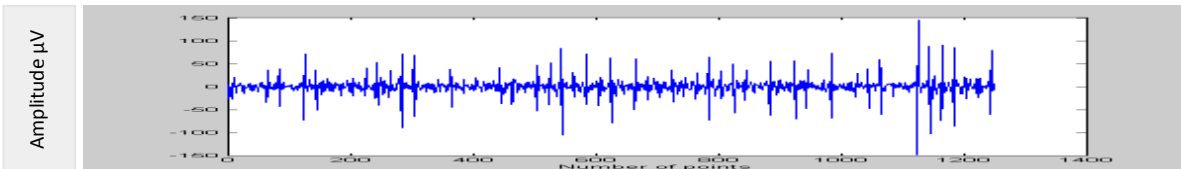
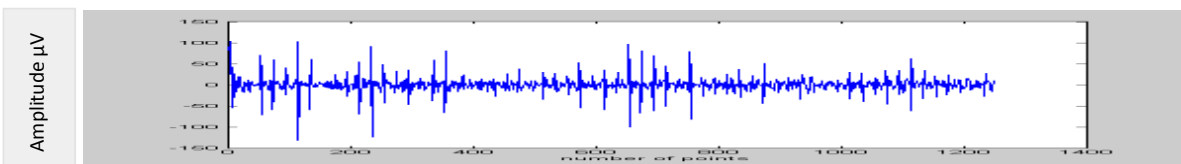
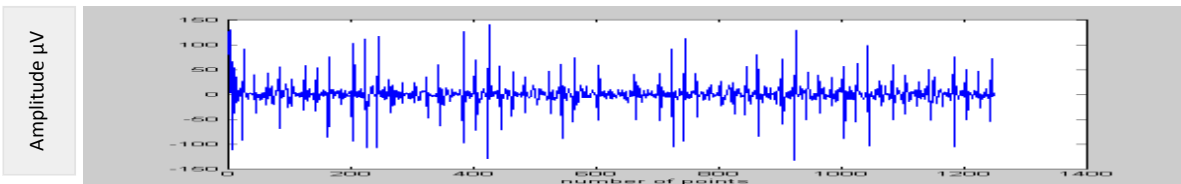


Figure (17) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (15) with ( $r_1=0.9$ & $r_2=0.1$ )





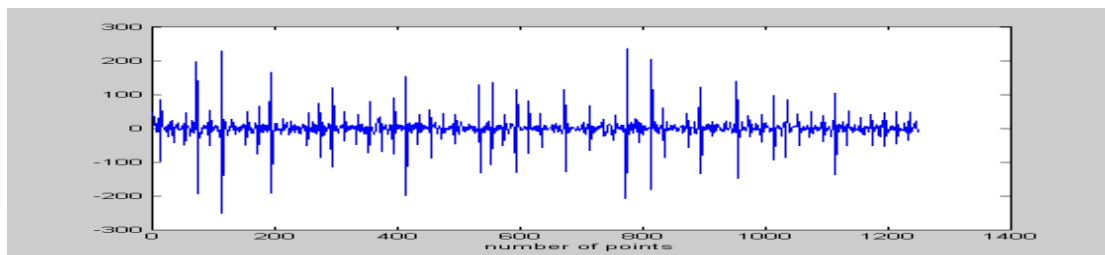


Figure (18) : Ten traces of channel two of one minute record of EEG data passed through band pass digital filter of figure (15) with( $r_1=0.1$ & $r_2=0.8$ )

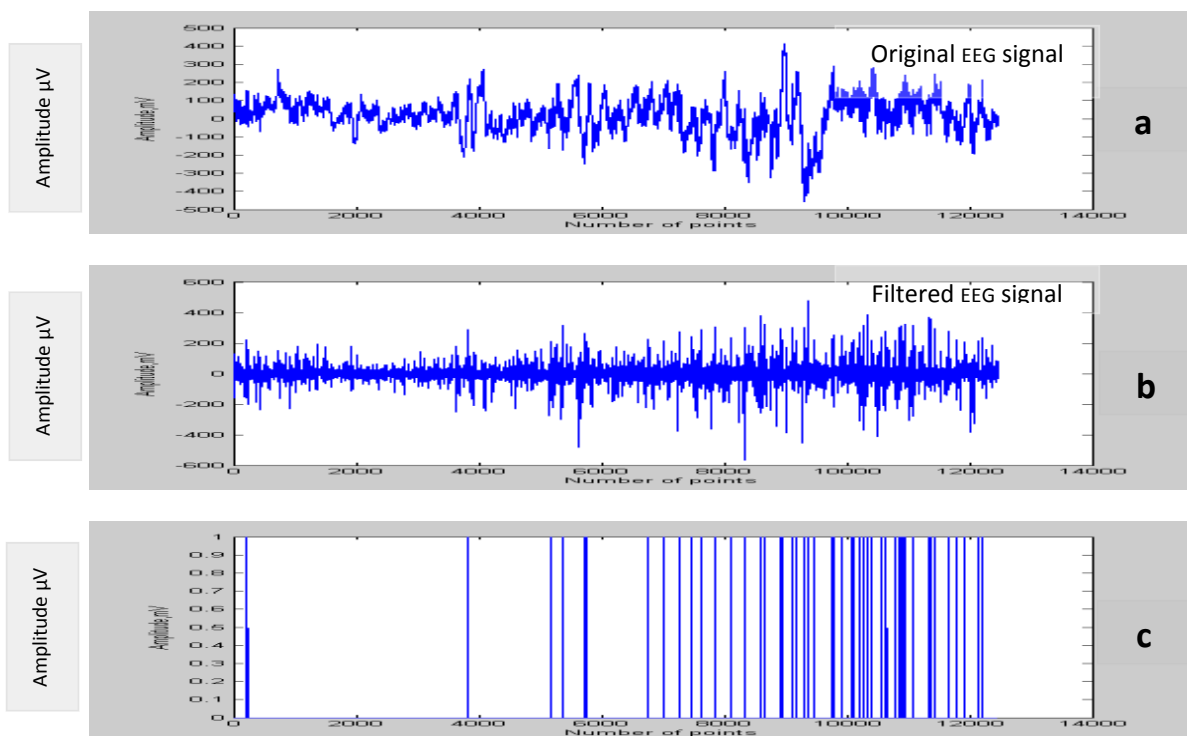
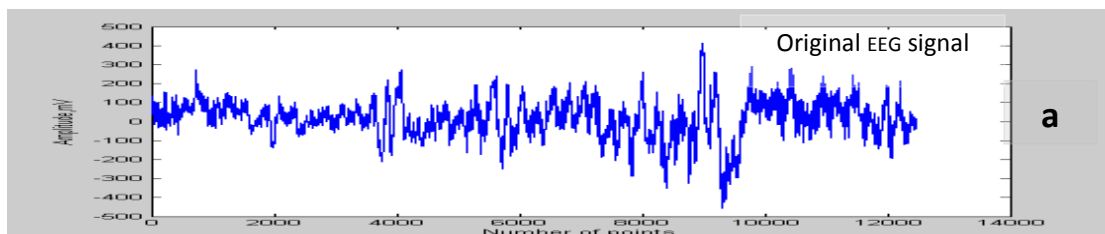


Figure (19): (a) Original EEG record,(b) the signal after being filtered with the digital filter whose z-plane is shown on figure(15), (c) the point process representation of the spike sequence for one minute record of channel two



Filtered EEG signal

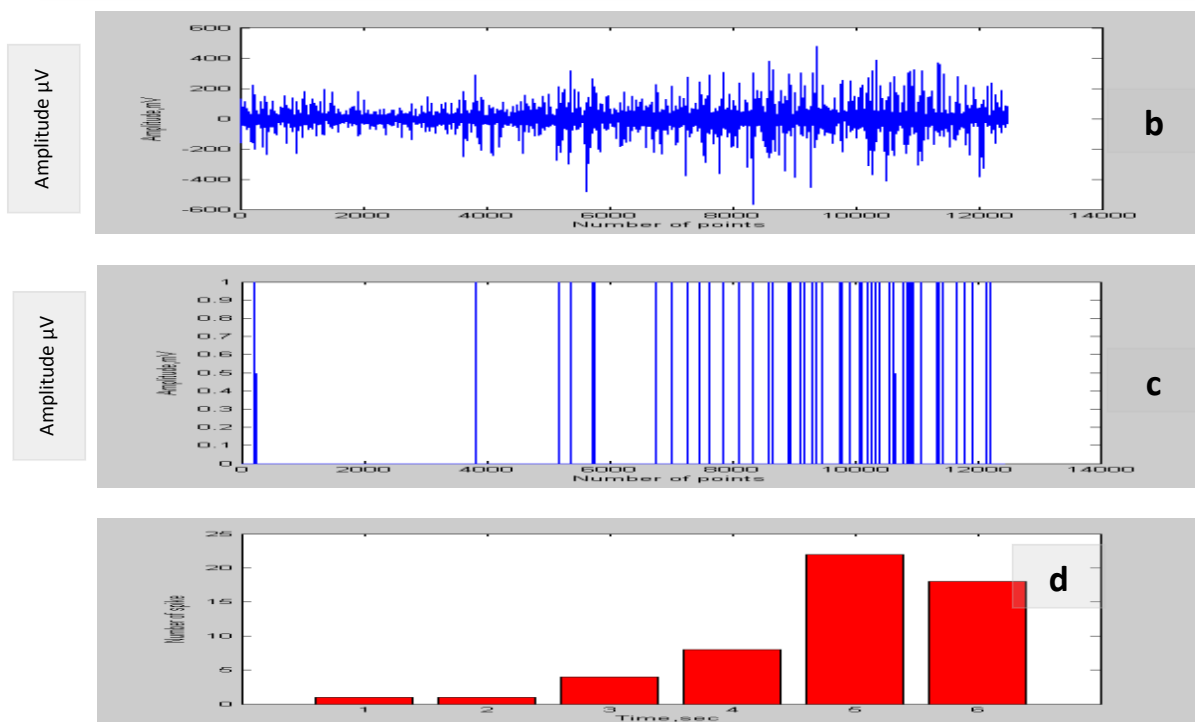


Figure (20): (a) Original record for one minute of EEG record on channel two for normal subject (b) the signal after being filtered with the digital filter whose z-plane is shown on figure (15), (c) the point process representation of the spike sequence (d) spikes per second bar chart



Figure (21): (a) Original EEG record for 6 second for epileptically patient record on channel two (b) the signal after being filtered with the digital filter whose z-plane is shown on figure (15) (c) the point process representation of the spike sequence (d) spikes per second bar chart

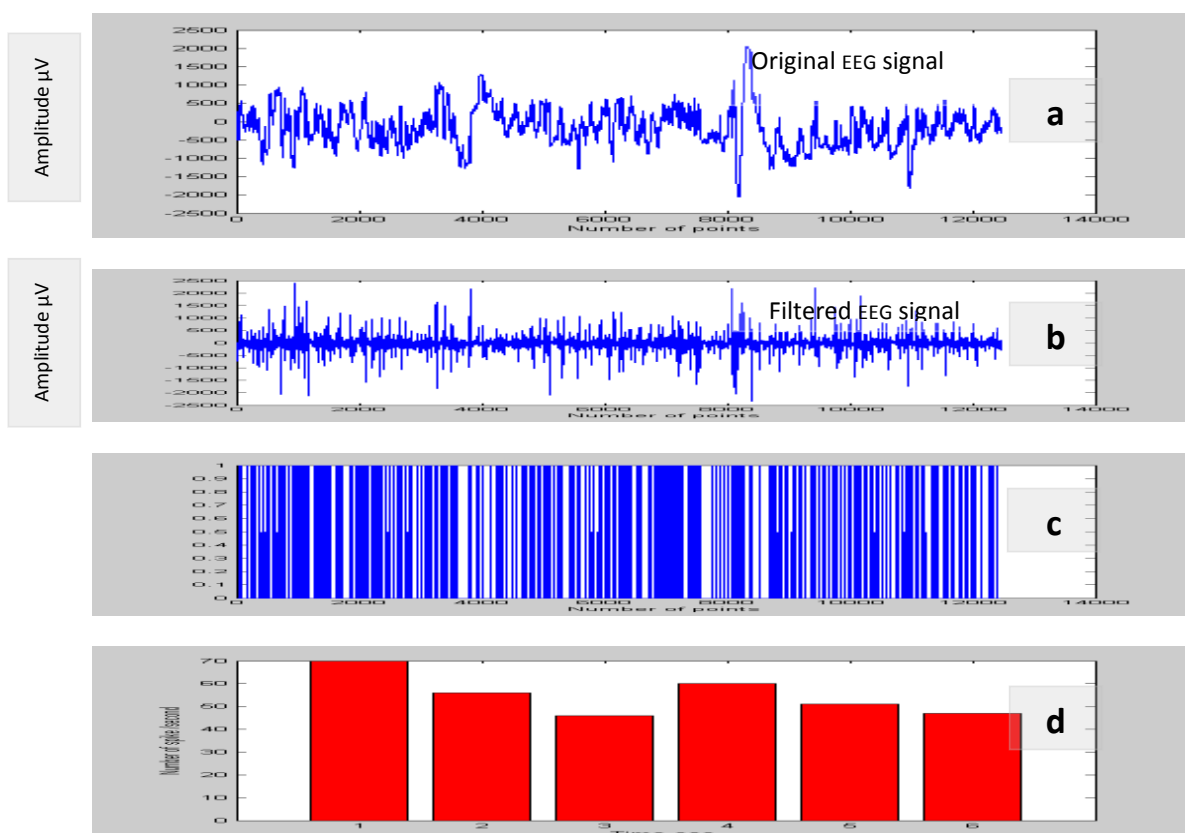


Figure (22): (a) Original EEG record for one minute for epileptically patient record on channel two (b) the signal after being filtered with the digital filter whose z-plane is shown on figure (15), (c) the point process representation of the spike sequence (d) spikes per second bar chart

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## Enhance Network Intrusion Detection System Using Bee Algorithm

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### Abstract

Intrusion detection systems have sequential steps begin with selecting training and testing dataset, the preprocessing dataset, selecting most important features, and finally constructing the most reliable classifier. This research focuses on building a reliable Network Intrusion Detection System (NIDS) to detect traditional and modern attacks with minimum number of features. The proposal creates dataset depending on KDD. The proposal will inject KDD with new sessions to represent most modern attacks. This update requires adding new features for the dataset, since these features are critical to detect these modern attacks. The proposal considers updated dataset without any assumptions says that the dataset is idealism, so there are preprocessing steps to be done to make it consistence for training and constructing the classifier. Meta heuristic bee's algorithm will be used as Feature Selection technique with the support of two of statistical ranking filters. The ranking of features with bee give an optimized ordering to the most critical and intrinsic features in the space of training and constructing classifier. The results obtained by constructing the most reliable classifiers Interactive Dichotomizer 3 classifier (ID3), Naïve Bayesian Classifier (NB), Artificial Neural Network (ANN) and Support Vector Machine (SVM) depending on both updated dataset and bee's ranked features sets give effective efficiency in reducing false alarms and increasing detection rates.

**Keyword:** IDS, feature reduction, KDD training data, bee's algorithm.

### تحسين نظام كشف التطفل الشبكي باستخدام خوارزمية النحل

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**خلاصة**

يتكون تحسين نظام كشف التطفل الشبكي باستخدام خوارزمية النحل ومجموعة بيانات KDD أنظمة كشف التطفل من خطوات متتابعة تبدأ مع اختيار مجموعة البيانات الخاصة بالتدريب والاختبار ، ثم المعالجة الأولية لمجموعة البيانات واختيار الخصائص المهمة، وأخيرا بناء المصنف الأكثر موثوقية. يركز هذا البحث على بناء نظام كشف تطفل شبكي لكشف وتحديد الهجوم التقليدي والحديث مع اقل عدد من الخصائص. يقوم المقترح بخلق مجموعة بيانات تعتمد على الـ KDD . المقترح سوف يقوم بضخ جلسات ارتباط شكلية الى KDD تمثل المجموعات الأكثر حداثة. يتطلب هذا التحديث إضافة خصائص جديدة لمجموعة البيانات حيث أن هذه الخصائص تكون مهمتها تحديث الهجمات الحديثة. يأخذ المقترح بنظر الاعتبار مجموعة البيانات المحدثة بدون أي افتراضات تقول أن مجموعة البيانات مثالية ولذلك هناك خطوات معالجة أولية سوف يتم إيجازها لجعل مجموعة البيانات متناسقة في رحلة بناء واختيار المصنف. استخدمت خوارزمية النحل كتقنية اختبار الخصائص مع دعم من اثنين من مرشحات الترتيب الاحصائية في فضاء بناء واختيار المصنف. تعتمد النتائج المستحصلة بواسطة بناء المصنف الأكثر موثوقية *ID3, NB, ANN* على كلاهما مجموعة البيانات المحدثة وخوارزمية النحل كتقنية لترتيب الخصائص حسب أهميتها أعطت نتائج مهمة جدا . في تقليص الإنذارات الخاطئة وزيادة نسبة الكشف.

**كلمات مفتاحية:** IDS، إختزال الخصائص، مجموعة بيانات KDD، خوارزمية النحل.

**1. Introduction**

Intrusion Detection is a security service that monitors and analyzes system events to find, and provide (real-time) warning of unauthorized access attempts to resources. The intrusion detection systems are classified as: Host-based IDS (HIDS): monitor single host activity, Distributed Host-based IDS combining info from multiple hosts, and Network-based IDS (NIDS) monitor network traffic.

There are two approaches of IDS, often used in combination, these are: anomaly detection which defines normal behavior threshold detection and profile based signature detection that defines proper behavior Sequence of events [1, 2].

The **Bees Algorithm** is a new population-based search algorithm that mimics the food foraging behavior of swarms of honey bees. In its basic version, the algorithm performs a kind of *neighborhood search* combined with

*random search* and can be used for optimization problems [3,4].

KDD 2000 is a training data that consists of the first seven weeks of traffic with approximately 4.9 million connections and the testing data consists of the last two weeks of traffics with approximately 300,000 connections. It injected with new types of attacks that were not exist in training data. Each record consists of 41 features of various types as well as a class label that is either normal or one of attack types. The classes in KDD dataset can be categorized into five main classes (one normal and four main intrusion classes: probe, Denial of Service (DOS), User to Root (U2R), and Remote to Local (R2L)). These four classes are divided into 22 different attacks which they are: DOS (back, land, Neptune, pod, smurt and teardrop), R2L (ftp\_write, guess\_password, imap, multihop, phf, spy, warezclient, and warezmaster), U2R (buffer\_overflow, perl, loadmodule, and rootkit) and Probing

(ipsweep, nmap, portsweep, and satan) [5-10].

## 2. Related Works

Pietraszek [5], has proposed machine learning method for IDS alert classification, in order to reduce the amount of false positives. Viinkka et al [6], have suggested the use of time series modeling for modeling regularities in large alerts volumes. Vaarandi [7], proposed IDS alerts classification algorithm which distinguishes important alerts from redundant ones. The author improved his work by proposing algorithms that suggest an IDS alert classification method which is based on frequent itemset mining and data clustering algorithm. Eunhye Kim, et al [8], statistical feature construction scheme is proposed in which factor analysis is orthogonally combined with an optimized k-means clustering technique. Also SOM is performed for unsupervised anomaly detection. Dewan Md. Farid , et al [9], a new learning algorithm for adaptive network intrusion detection using naïve Bayesian classifier and decision tree is presented. It performs balance detection and keeps false positives at acceptable level for different types of network attack. Also eliminate redundant attributes as well as contradictory examples from training data that make the detection model complex. Lee W., et al [10], famous datasets used in traditional and newest IDS is KDD CUP1999. In that dataset the intrusion data characterized into three sets of features, these are: basic features, content features, and traffic features. So this dataset describes network connection using of total 41 features that cover all the types of attacks to the greatest extent possible [10].

## 3. The Proposed Policy to Enhance NIDS

This research enhances IDS across enhancing two important stages which they are: selecting training and testing dataset and optimize feature space to include intrinsic

features. Algorithm1 will explain the outlines of sequential stages, to enhance NIDS:

### **Algorithm1: Enhanced NIDS**

Input: DARPA KDD, sessions present most modern attacks, and new features.

Output: Effective NIDS

Process:

1. Creating updated dataset to have various sessions from KDD (normal and all variations of attacks).
2. Inject the proposed dataset by sessions present most modern attacks.
3. Adding new features related to the injected session that present attacks not exist in KDD.
4. Preprocessing the created dataset since it will be a mixture of many resources and contains new features added to dataset. So there are many problems will appear such as noise, in complete attributes and missing values.
5. Proposing Bee algorithm for ranking the features depending on averaging two ranking methods. By applying proposed bee algorithm on features will register three cases 44 features, top 22 features and top 11 features.
6. Construct four classifiers such as: ID3, NB, NN and SVM on preprocessed updated dataset three times depending on the three cases considered with bee ranking. That is to evaluate the proposed IDS with various classifiers.
7. Allow the enhanced NIDS to be adaptive by reporting the stranger sessions and analyzing them to extract the new attacks appear in them. Then if there is a new feature must added to dataset must repeat all steps above, else just add the session to dataset and classify it with it is classifications.

End

### **3.1. Dataset Creation (inject sessions and features)**

The created dataset used for training and testing most of its sessions taken from KDD. About quarter of the created dataset is injected by connection sessions that have most modern attacks. The proposed created dataset will be divided into two subsets, one for training and second for testing. These two subsets have 400,000 records, 300,000 records for training and 100,000 for testing. Most of these records are selected in very precise manner to have various types of normal and intrusion connections. The new types of attacks taken into account are:

1. Financial malware that has the ability to hijack customer's online banking sessions in real time using their session ID tokens.
2. Types of worms such as Conficker.
3. Java Script Obfuscation and Zeus Botnet Kit.

*These types of attacks could be taken under one name called **Extended Attack** which is collect most new attacks that not correlated with the famous four types of attack in DARPA dataset. The proposal increases the no. of features which seems important to be added because it related to the new attacks added as a connection session to the dataset. These added features are:*

*Connection-based traffic features are obtained using some knowledge of connection domain, such as **type of connection (wire or wireless), connection security (encrypted or not encrypted) and connection multimedia (image, video, sound and text).***

*By this proposed feature the no. of depended features will be **44 features**, and no. of general classes will be **6 instead of 5**. These Classes are: Normal connections, Denial of Service (DoS), Remote to User (R2L), User to Root (U2R), Probing (Probe), and Extended Attacks. For more explanation see table (1).*

### 3. 2. Dataset Preprocessing

In addition to the injected sessions there was features development along with all parts of

dataset (parts taken from DARPA and parts injected to it). The proposed dataset has ratio of noise in its data records, this noise presents the most challenging issues in ID application which is aim to detect the intrusions using data mining techniques. Noise removal of dataset at the learning time is to avoid over-fitting the dataset. Treating noise can be done as in the following:

1. Treating missing attribute values by replacing their values with the most frequent attribute value in the dataset. But missing values in the proposal presented by the three features added in connection sessions injected, which they don't found in the sessions taken from KDD2000.
  - Connection types in all traditional KDD will fill with (wire, encoded 0).
  - Connection security 50% in traditional KDD will fill with (encrypted, encoded 0) and other 50% will fill with (unencrypted, encoded 1).
  - Connection multimedia 25% in traditional KDD will fill with (text, encoded 0), 25% will fill with (image, encoded 1), 25% will fill with (sound, encoded 2) and 25% will fill with (video, encoded 3).
2. Treating redundant examples by removes redundancy by keeping only a unique example in the dataset (some new sessions may redundant because it presents an old attack with new vision). By doing so, it will speeds significantly up the learning process.
3. Treating incomplete attribute problem by avoiding the essential attributes of a problem is not used to describe in the dataset (by adding the three proposed features, this problem was solved).
4. Treating misclassified examples by labeled with a true classification instead of wrong classification (in the proposal the injection of session must be real, mean by real the injected sessions taken from network connected with Internet

and deal with all connection types, media and encrypted/unencrypted sessions).

### 3.3. Feature Selection (propose bee algorithm as ranking method)

The most important step in building IDS is how to characterize the important features they will be based in increasing detection rate and optimized trigger alarms (reduce false positive alarms, reduce low important alarms, and reduce false negative alarms). By optimizing features the data space will also be optimized, so the training dataset and training time will be more efficient for classification that work under real time environment.

The proposal presents the metaheuristic algorithm (Bee) as a feature ranking algorithm that by making the following assumptions:

1. The weights of features will be taken by its correlation to the 6 classes; this correlation will be measured by average of two ranking methods *Chi-Square* and *Gain Ratio*.
2. Some terminologies in Bee algorithm will be replaced according to the proposal of feature selection, these are:
  - $n$  the scout bees will be;  $n$  no. of features
  - $m$  sites and  $e$  best sites will be;  $m$  selected features and  $e$  best features
  - $nep$  no. of bees recruited will be;  $nep$  weight given to  $e$  best features
  - $nsp$  no. of bees recruited will be;  $nsp$  weight given to  $(m-e)$  features
  - Patches will be; features set.
  - Neighborhood for features will be; other features in the same type (as in the proposal there are 6 types) then features in other feature type's subset.

So after interpretations in the two points above the proposal bee algorithm for feature

ranking will be introduced in the following Algorithm2.

### Algorithm2: Proposed Bee Algorithm for Feature Ranking

#### Parameters

1.  $n$ : number of all known features
2.  $m$ : number of features selected out of  $n$  visited features
3.  $e$ : number of best features out of  $m$  selected features
4.  $nep$ : weight given for best  $e$  features (rich)
5.  $nsp$ : weight given for other  $(m-e)$  selected features (poor)
6.  $ngh$ : initial size of features set which includes features and its neighborhood features and stopping criterion

#### Process

1. Initialize population with random features. ( $n$  features are placed randomly in the search space).
2. Evaluate fitness of the population. Fitness calculation for features obtained from average of two ranking measures *Chi-Square* and *Gain Ratio*.
3. While (stopping criterion not meet). While no more new ranking for features. // forming new population.
4. Select features for neighborhood search. (Feature that have the highest fitness are chosen as "selected" and features from same type subset are chosen for neighborhood search (after complete the features from same type subset algorithm will begin with the other feature type subset)).
5. Weighted selected feature (more weights for features in best  $e$  features) and evaluate fitness.
6. Select the fittest feature from each feature set. (For each feature set, only the feature with the highest fitness will be selected to form the next feature population).
7. Assign remaining features to search randomly and evaluate their fitness.



8. End While.

**End Process.**

### 3. 4. Classifier Constructing

Always IDS have database either has all signatures of known attack which support the misuse intrusion detection or has all the normal behavior which support the anomaly intrusion detection. The proposal support IDS with database has both normal and attacks in all its variations to decide if that attack or not, if it was attack then it determines its type.

The research record detecting intrusions using most of strong data mining algorithms used in last year: Decision Tree (DT) ID3, Naïve Bayesian (NB), Neural Network (ANN), Support Vector Machine (SVM). These learning algorithms implemented in WEKA environment to evaluate the optimization of updated KDD and proposed feature selection.

## 4. Discussion and Experimental Work

The number of features increased to be 44 features and types of connection increased to be 6 general classes. Now will display the number of training and testing examples, as depended in the updated dataset, see Table 2.

The Proposed Feature Ranking is to use an intelligent approach (bee's algorithm) which is differing from traditional approach where the best subsets are chosen upon iterative evaluation experiment. This approach is supported with measures that calculate the correlation to quantify each with class (normal traffic or intrusion traffic (all the 6 classes)). So, the feature will has a rank represent the feature importance in intrusion detection, three ranked features subsets were involved, these are 44 features set, 22 features subset and 11 features subset. In order to evaluate the performance of updated dataset and proposed bee's

algorithm feature selection for network intrusion detection. Ideally, IDS should have an attack Detection Rate (DR) of 100% along with False Positive (FP) of 0%. Nevertheless, in practice this is really hard to achieve. The most important parameters involved in the performance estimation of IDS are shown in Table 3.

The results obtained from constructing the four classifiers (ID3), (NB), (NN), and (SVM), on the updated KDD 2000 dataset and proposed bee's feature selection are very consistence and convergence with results in previous works [5, 6, 7, 8, 9, and 10]. The results in the following Tables (4, 5, and 6) present DR and FP measures with each classifier relating to the six classes. Each of these tables show the results of classifiers applied on updated dataset but each one consider case of the three features subsets cases.

## 5. Conclusions

From results obtained in implementing the enhanced NIDS reached to the following conclusions:

1. Updating KDD by a proposed created dataset to has new injected sessions, make it reliable and novel since it will contain most modern attacks not appear in KDD2000.
2. Because of injection there is three features added to be 44 features. This makes dataset suffer from missing values. But by applying preprocessing to dataset make the constructed classifier dependable and truth.
3. Optimizing no. of features to consider the critical feature will make the classifier constructing optimized in time and space. Also make the classifier work more speed as real-time system, since no. of features will be checked much less than original numbers of all features.

From Tables (3, 4, and 5), the results obtained are more consistence with previous

related work and enhanced, especially with classifiers in 11 top features. This ensures the intelligent ranking.

validity of updating KDD and using bee's algorithm as dependable

**Table 1. Proposed Dataset Update KDD**

<i>Session ID</i>	<i>Traditional features (41)</i>	<i>Added Features (3)</i>
<i>1</i> <i>.</i> <i>.</i> <i>.</i>	<i>Traditional KDD2000 sessions</i>	<i>Filled with proposed encoded values</i>
<i>.</i> <i>.</i>	<i>Injected Sessions for modern intrusion Already have (44) features</i>	

**Table 2. Number of examples for training and testing**

Connection Types	Training examples	Testing examples
Normal	65,000	15,000
Denial of Services	85,000	35,000
Remote to User	73,000	15,000
User to Root	27,000	5,000
Probing	40,000	20,000
Extended	10,000	10,000
No. of Examples	300,000	100,000

**Table 3. IDS parameters and their meaning**

Parameters	Meaning
True Positives (TP) – Detection Rate (DR)	Attacks occur and alarm raised
False Positives (FP)	No attack but alarm raised

**Table 4. Comparison of the results using 44 features**

Method	Normal	DOS	U2R	R2L	Probe	Extended
ID3 (DR%)	99.70	99.76	99.25	99.27	99.30	99.12
ID3 (FP%)	0.08	0.04	0.11	6.81	0.40	5.83
NB (DR%)	99.25	99.69	72.25	99.11	99.13	99.05
NB (FP%)	0.06	0.04	0.14	8.02	0.45	6.83
NN (DR%)	99.30	99.50	85.04	99.01	99.09	89.17
NN (FP%)	0.07	0.03	0.50	9.81	0.60	4.83
SVM (DR%)	99.80	99.50	99.30	99.48	99.66	99.76
SVM (FP%)	0.09	0.05	0.18	8.81	0.45	7.83

**Table 5. Comparison of the results using 22 features**

Method	Normal	DOS	U2R	R2L	Probe	Extended
ID3 (DR%)	99.95	99.96	99.97	99.97	99.98	99.96
ID3 (FP%)	0.03	0.02	0.05	4.81	0.40	4.83
NB (DR%)	99.95	99.96	99.97	99.97	99.98	99.96
NB (FP%)	0.02	0.01	0.03	3.08	0.29	3.67
NN (DR%)	99.95	99.96	99.97	99.97	99.98	99.96
NN (FP%)	0.04	0.02	0.12	5.34	0.23	3.51
SVM (DR%)	99.95	99.96	99.97	99.97	99.98	99.96
SVM (FP%)	0.01	0.04	0.03	3.23	0.09	3.28

**Table 6. Comparison of the results using 11 features**

Method	Normal	DOS	U2R	R2L	Probe	Extended
ID3 (DR%)	99.97	99.97	99.97	99.97	99.98	99.98
ID3 (FP%)	0.03	0.02	0.05	4.81	0.40	4.83
NB (DR%)	99.98	99.99	99.99	99.99	99.98	99.98
NB (FP%)	0.02	0.01	0.03	3.08	0.29	3.67
NN (DR%)	99.96	99.96	99.97	99.97	99.98	99.98
NN (FP%)	0.04	0.02	0.12	5.34	0.23	3.51
SVM (DR%)	99.97	99.98	99.98	99.97	99.98	99.98
SVM (FP%)	0.01	0.04	0.03	3.23	0.09	3.28

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## Optimize TSP using Ant Colony System using Java

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### Abstract

The travelling salesman problem (TSP) probably is the most prominent problem in combinatorial optimization. It is simple definition along with its notorious difficulty has stimulated many efforts to find an efficient algorithm. In this research use Ant Colony System to solving TSP and generating good solutions to both. The work has been extended to calculate the correlation coefficient between the number of nodes and number of iterations.

**Keywords:** TSP, Ant Colony System.

### تحسين مشكلة البائع المتجول باستخدام نظام مستعمرة النمل باستخدام جافا

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### خلاصة

مشكلة البائع المتجول (TSP) هي على الأرجح المشكلة الأبرز في التحسين الاندماجي. ان التعريف البسيط لهذه المشكلة مع الصعوبة الكبيرة قد تم تمثيلها (ومازالت تمثل) حيث الكثير من الجهود بذلت لإيجاد خوارزمية فعالة. في هذا البحث تم استخدام مستعمرة النمل في حل مشكلة البائع المتجول (TSP) وتوليد الحلول الجيدة. وقد تم عمل حساب معامل الارتباط بين عدد العقد وعدد مرات التكرار.

**كلمات مفتاحية:** مشكلة البائع المتجول، التحسين الاندماجي.

## 1. Introduction

### 1.1. Travelling Salesman Problem (TSP)

The travelling salesman problem (TSP) is an NP-hard problem in combinatorial optimization

studied in operations research and theoretical computer science. The task is to find the shortest possible route that visits each city exactly once and returns to the origin city . The problem was first formulated as a mathematical problem in

1930 and is one of the most intensively studied problems in optimization. It is used as a benchmark for many optimization methods. Even though the problem is computationally difficult, a large number of heuristics and exact methods are known, so that some instances with tens of thousands of cities can be solved. A salesman must visit  $n$  cities, passing through each city only once, beginning from one of them which is considered as his base, and returning to it. The cost of the transportation among the cities (whichever combination possible) is given. The program of the journey is requested, that is the order of visiting the cities in such a way that the cost is the minimum[1].

As in figure (1), let's number the cities from 1 to  $n$ , and let city 1 be the city-base of the salesman. Also let's assume that  $c(i,j)$  is the visiting cost from  $i$  to  $j$ . There can be  $c(i,j) < c(j,i)$ . Apparently all the possible solutions are  $(n-1)!$ . Someone could probably determine them systematically, find the cost for each and everyone of these solutions and finally keep the one with the minimum cost. These requires at least  $(n-1)!$  steps.

If for example there were 21 cities the steps required are  $(n-1)! = (21-1)! = 20!$  steps. If every step required a  $m.sec$  we would need about 770 centuries of calculations. Apparently, the exhausting examination of all possible solutions is out of the question. Since we are not aware of any other quick algorithm that finds a best solution we will use a heuristic algorithm. According to this algorithm whenever the salesman is in town  $i$  he chooses as his next city, the city  $j$  for which the  $c(i,j)$  cost, is the minimum among all  $c(i,k)$  costs, where  $k$  are the pointers of the city the salesman has not visited yet. There is also a simple rule just in case more than one cities give the minimum cost, for example in such a case the city with the smaller  $k$  will be chosen. This is a greedy algorithm which

selects in every step the cheapest visit and does not care whether this will lead to a wrong result or not [2].

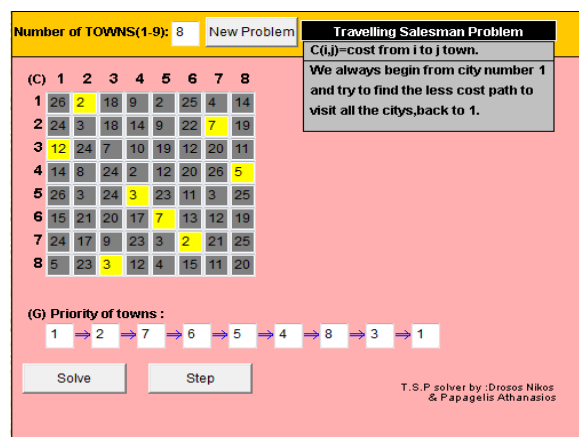


Figure (1) Traditional TSP Solving.

### 1.2. Ant colony

An initial look at ants in nature does not give an impression of an animal with a high IQ, but a closer look reveals that they are highly efficient in at least one task. Finding the shortest route between two points by starting from the hive they are prone to walk randomly around until they find a point of interest, e.g. a food source. When traveling back to the hive, they will deposit a chemical substance called pheromone as they go, which will help them find their way back to where they came from. When other ants encounter the path of pheromone, they will follow it, becoming less random in their movement. These will then also deposit pheromone, strengthening the already existing path. Because pheromone is a volatile substance, a constant stream of ants is required to keep up the strength of the trail. This means that if a shorter trail exists, the power of this trail's pheromone will be stronger, as the ants will traverse the trail in a shorter amount of time, while the pheromone still evaporates at the same speed. After a (relatively) short time span, the majority of the ants will therefore be following the shortest path, as this path has the strongest pheromone[3].

### 2. Design of proposal

In this paper problem has been resolved in a manner seller mobile ant as it reaches the best way to travel from one town to another in order

to visit all cities once and using Java to solve this problem and examples of movement from Basra to Mosul and all the cities of Iraq. When traveling back to the hive, they will deposit a chemical substance called *pheromone* as they go, which will help them find their way back to where they came from. When other ants encounter the path of pheromone, they will follow it, becoming less random in their movement. These will then also deposit pheromone, strengthening the already existing path. Because pheromone is a volatile

substance, a constant stream of ants is required to keep up the strength of the trail. This means that if a shorter trail exists, the power of this trail's pheromone will be stronger, as the ants will traverse the trail in a shorter amount of time, while the pheromone still evaporates at the same speed. After a (relatively) short time span, the majority of the ants will therefore be following the shortest path, as this path has the strongest pheromone[4,5,6].

$$P_{i,J}^k(t) = \frac{[\tau_{i,J}(t)]^\alpha \cdot [\eta_{i,J}]^\beta}{\sum_{u \in J_i^k} [\tau_{i,u}(t)]^\alpha \cdot [\eta_{i,u}]^\beta} \quad \text{if } J \in J_i^k$$

$\tau_{ij}$  is the amount of pheromone on arc  $i,j$   $\alpha$  is a parameter to control the influence of  $\tau_{ij}$   $\eta_{ij}$  is the desirability of arc  $i,j$  (a priori knowledge, typically  $1/d_{i,j}$ )  $\beta$  is a parameter to control the influence of  $\eta_{ij}$ . We take the 12 cities will be an Iraqi, he moves salesman through these cities from the city to another using ACO method.

```

Loop
  Randomly position m artificial ants on n cities
  For city=1 to n
    For ant=1 to m
      {Each ant builds a solution by adding one city after
      the other}
      Select probabilistically the next city according to
      exploration and exploitation mechanism
      Apply the local trail updating rule
    End for
  End for
  Apply the global trail updating rule using the best ant
Until End_condition
    
```

**Description of the Proposal TSP algorithm**

**Example**

From ACO and TSP Let  $P = 0.1, \alpha = 0.1, \beta = 2, Q = 0.9$

Random number = R = 0.39 , 0.16, 0.51, 0.01, 0.03, 0.04

Nineveh =A , Salahuddin = B, Diyala =C , Baghdad =D , Babylon= E, Wasit =F, Qadisiyah = G , Dhi Qar = H  
Muthanna = I , Anbar = J, Maysan =K, Basra = L

Solve the problem includes 5 steps, each step determines the ants move from one city to another, where is calculated according to the equation mentioned above. Set a limit to the distance between the two cities based on the pheromone left by ants during the movement and the way that has the highest pheromone is based, has been in this example to determine distances between cities as well as alpha and beta and the value of pheromone.

**Step 1**

$$\sum_A [A]^\alpha \cdot [J]^\beta + [A]^\alpha \cdot [B]^\beta$$

$$\sum_A [1]^{0.1} \cdot [1/25]^2 + [1]^{0.1} \cdot [1/15]^2$$

$$= 0.0016 + 0.004$$

$$= 0.0056$$

$$P_{A,J}^1(1) = \frac{0.0016}{0.0056} = 0.286..$$

$$P_{A,b}^1(1) = \frac{0.004}{0.0056} = 0.714..$$

$$R_1 < A.B$$

$$0.39 < 0.714$$

$$\therefore A \xrightarrow{*} B$$

$$\text{Cost} = 15$$

$$\text{Pheromone, } \Delta \tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{15} =$$

**Step 2**

$$\sum_B [B]^\alpha \cdot [A]^\beta + [B]^\alpha \cdot [F]^\beta + [B]^\alpha \cdot [C]^\beta + [B]^\alpha \cdot [D]^\beta$$

$$\sum_B [1]^{0.1} \cdot [1/15]^2 + [1]^{0.1} \cdot [1/35]^2 + [1]^{0.1} \cdot [1/33]^2 + [1]^{0.1} \cdot [1/20]^2$$

$$= 0.0044 + 0.0008 + 0.0009 + 0.0025$$

$$= 0.0086$$

$$P_{B,A}^1(2) = \frac{0.0044}{0.0086} = 0.511..$$

$$P_{B,F}^1(2) = \frac{0.0008}{0.0086} = 0.093..$$

$$P_{B,C}^1(2) = \frac{0.0009}{0.0086} = 0.104$$

$$P_{B,D}^1(2) = \frac{0.0025}{0.0086} = 0.290$$



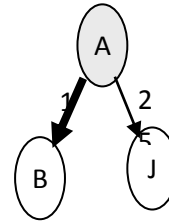
$$R_2 \prec B.F$$

$$0.16 \prec 0.290$$

$$\therefore B \xrightarrow{*} D$$

$$\text{Cost} = 35$$

$$\text{Pheromone, } \Delta \tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{35} =$$



**Step 3**

$$\sum_D [D]^\alpha \cdot [F]^\beta + [D]^\alpha \cdot [E]^\beta + [D]^\alpha \cdot [J]^\beta$$

$$\sum_D [1]^{0.1} \cdot [1/45]^2 + [1]^{0.1} \cdot [1/15]^2 + [1]^{0.1} \cdot [1/20]^2$$

$$= 0.0004 + 0.0044 + 0.0025$$

$$= 0.0073$$

$$P_{D.F}^1(3) = \frac{0.0004}{0.0073} = 0.054$$

$$P_{D.E}^1(3) = \frac{0.0044}{0.0073} = 0.602$$

$$P_{D.J}^1(3) = \frac{0.0025}{0.0073} = 0.342$$

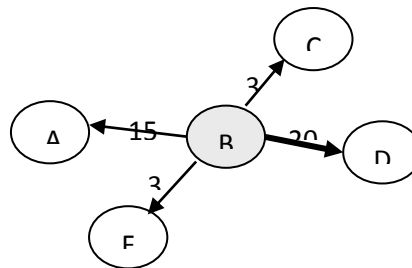
$$R_3 \prec D.E$$

$$0.51 \prec 0.602$$

$$\therefore D \xrightarrow{*} E$$

$$\text{Cost} = 50$$

$$\text{Pheromone, } \Delta \tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{50} =$$



**Step 4**

$$\sum_E [E]^\alpha \cdot [G]^\beta + [E]^\alpha \cdot [K]^\beta + [E]^\alpha \cdot [J]^\beta + [E]^\alpha \cdot [F]^\beta + [E]^\alpha \cdot [I]^\beta$$

$$\sum_J [1]^{0.1} \cdot [1/15]^2 + [1]^{0.1} \cdot [1/40]^2 + [1]^{0.1} \cdot [1/40]^2 + [1]^{0.1} \cdot [1/20]^2 + [1]^{0.1} \cdot [1/33]^2$$

$$= 0.0044 + 0.0006 + 0.0006 + 0.0025 + 0.0009$$

$$= 0.009$$

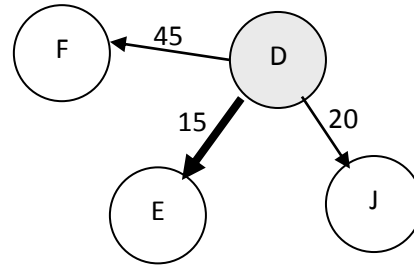
$$P_{E.G}^1(4) = \frac{0.0044}{0.009} = 0.48$$

$$P_{E,K}^1(4) = \frac{0.0006}{0.009} = 0.006$$

$$P_{E,J}^1(4) = \frac{0.0006}{0.009} = 0.006$$

$$P_{E,F}^1(4) = \frac{0.0025}{0.009} = 0.277$$

$$P_{E,I}^1(4) = \frac{0.0009}{0.009} = 0.1$$



$$R_4 \prec E.K$$

$$0.006 \prec 0.06$$

$$\therefore E \xrightarrow{*} K$$

$$\text{Cost} = 90$$

$$\text{Pheromone}, \Delta\tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{90} =$$

**Step 5**

$$\sum_k [K]^\alpha \cdot [J]^\beta + [K]^\alpha \cdot [F]^\beta + [K]^\alpha \cdot [H]^\beta + [K]^\alpha \cdot [L]^\beta + [K]^\alpha \cdot [G]^\beta$$

$$\sum_k [1]^{0.1} \cdot [1/15]^2 + [1]^{0.1} \cdot [1/40]^2 + [1]^{0.1} \cdot [1/25]^2 + [1]^{0.1} \cdot [1/55]^2 + [1]^{0.1} \cdot [1/150]^2$$

$$= 0.0044 + 0.0006 + 0.0016 + 0.0003 + 0.00004$$

$$= 0.00694$$

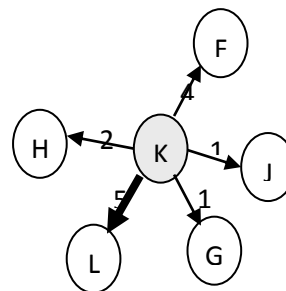
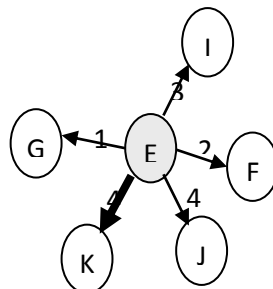
$$P_{K,J}^1(5) = \frac{0.0044}{0.00694} = 0.634$$

$$P_{K,F}^1(5) = \frac{0.0006}{0.00694} = 0.086$$

$$P_{K,H}^1(5) = \frac{0.0061}{0.00694} = 0.250$$

$$P_{K,L}^1(5) = \frac{0.0003}{0.00694} = 0.043$$

$$P_{K,G}^1(5) = \frac{0.00004}{0.00694} = 0.005$$



$$R_5 \prec K.L$$

$$0.03 \prec 0.043$$

$$\therefore H \xrightarrow{*} L$$

Cost = 145

$$\text{Pheromone}, \Delta\tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{145} =$$

**Step 6**

$$\sum_L [L]^\alpha \cdot [I]^\beta + [L]^\alpha \cdot [H]^\beta$$

$$\sum_L [1]^{0.1} \cdot [1/200]^2 + [1]^{0.1} \cdot [1/55]^2$$

$$= 0.000025 + 0.0003$$

$$= 0.000325$$

$$P_{L,I}^1(6) = \frac{0.000025}{0.000325} = 0.07$$

$$P_{L,H}^1(6) = \frac{0.0003}{0.000325} = 0.92$$

$R_6 < L.I$

$0.04 < 0.07$

$\therefore L \xrightarrow{*} I$  Gool

Cost = 345

$$\text{Pheromone}, \Delta\tau_{ij}(t) = \frac{Q}{\text{cost}} = \frac{0.9}{345} = 0.0026$$

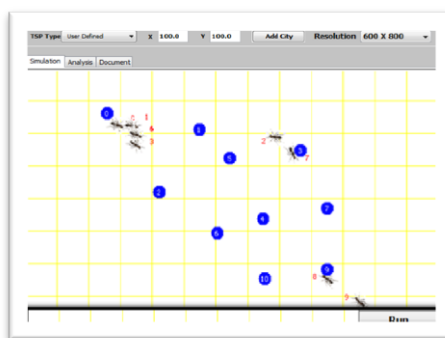
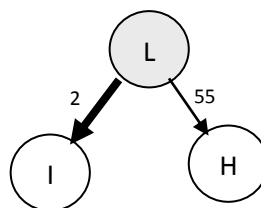


Figure (2) select number of cites and position.

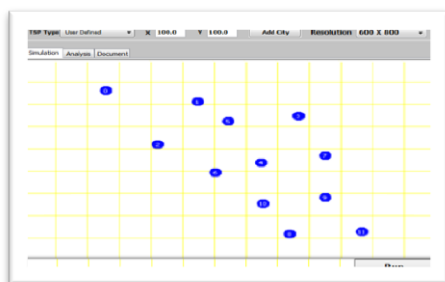


Figure (3) ant chose the cites randomize.

### 3- The Implementation of the Proposal System

The implementation of the proposal done by using java language the application consists of several interfaces start to select number of cites to visit and location, ant chose the cites randomize , result path to movement ant from cite to another show in fig.1,2 and 3.

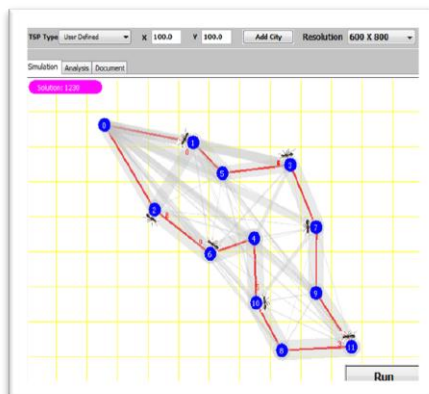


Figure (4): Path to movement ant from cite to another

### 4-Conclusions:

1. There are many ways in which TSP can be improved so that the number of tours needed to reach a comparable performance level, making its application to larger problem instances feasible.
2. The elimination of closed-circuit condition that may occur in TSP.
3. Rely on the ants gives the best solutions in the shortest time in the process of movement between cities.

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