Journal of Duhok University

University of Duhok

Veterinary and Agricultural Sciences
Published biannual by Duhok University

Address:
Kurdistan Region, Iraq
Duhok Governorate,
Presidency of Duhok University,
The Secretariat, JDU Editorial Board,

Tel.: 00964 62 7225259
E-mail: jdu@uod.ac

UoD Printing Press

JOURNAL OF DUHOK UNIVERSITY
Veterinary and Agricultural Sciences

VOLUME 12
NUMBER 1

JUNE
2009

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The paper should be valuable and should not have been published or submitted for publication in any other Journals. The text should be complete with abstract, introduction, material and methods, results, discussion and reference. The text must not exceed 15 pages for sciences papers and 25 for the humanities

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Table (1): The effect of pepper shoot & root aqueous extract on the growth of different other plants:

	Shoot Extract					Root Extract				
Plant type	Conc. %	Root length (cm)	Shoot length (cm)	Intact plant length (cm)	Inhibition %	Conc. %	Root length (cm)	Shoot length (cm)	Intact plant length (cm)	Inhibition %
Okra	0	*25.7 a**	27.8 a	53.5a	-	0	25.7a	27.8a	53.5a	-
	5	25.00a	26.77a	51.77a	3.23	1	24.50a	27.00a	51.50a	3.73
	10	24.50a	25.95a	50.45a	5.70	2	23.87a	25.65a	49.52a	7.43
Sorghum	0	21.6a	27.2a	48.8a	-	0	21.7a	27.2a	48.9a	-
	5	13.00b	17.25b	30.25b	38.03	1	9.8b	25.5ab	35.3b	27.6
	10	6.00c	5.50c	11.50c	76.44	2	9.4b	22.6b	31.9 b	34.6

Figure (1): xxxxxxxxxxxxx

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EFFECT OF SOWING METHODS AND MIXTURES ON HAY YIELD AND QUALITY

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(Received: October 23, 2008; Accepted for publication : March 3, 2009)

ABSTRACT

An field trial was carried out at two sites of Dohuk governorate- northern Iraq- College of Agriculture farm which situated at longtitude 43.01Eº, latitude 36.84Nº and altitude 583m above sea level and Zakho Agriculture Research Station of 42.41Eº, 37.8Nº and 433m above sea level. The soil texture of both locations is clay (Khelef, 2005).

The experiment was accomplished during winter growing season 2005-2006 under rainfed condition with an annual average rate around 500mm.

The experiment comprised two sowing methods (hand broadcasting and sowing in alternate rows of 20cm apart), barley or triticale in monoculture or in binary mixture at different rates (40:0, 30:10, 20:20, 10:30 and 0:20) cereals to vetch. Treatment combinations were allocated in split-split plot in RCBD with three replications. Hay yield and quality in terms of protein and ash content in percentage were subjected to variance analysis.

The results revealed no significant differences between sowing methods on hay yield and quality at both locations; similarly no differences were noticed between the two cereals, while the mixture rates 20:20 or 10:30 cereal: vetch resulted in hay yield enhancement at Dohuk and Zakho respectively. Moreover, sowing at mixture rate of 10:30 exceeded other rates for protein and ash percentage at both locations.

Total hay yield was higher at mixture rate 20:20 cereal: vetch sown in alternative rows at both locations while mixture rate 10:30 cereal: vetch resulted in higher protein and ash% at both location. However, 20 triticale: 20 vetch mixture gave higher hay yield which was 1308.8 kg\ donum at Dohuk, whereas 10:30 barley: vetch mixture recorded high protein and ash% 22.91and 12.66, respectively at Dohuk.

Barley with vetch 10:30 sown in alternate rows gave higher percentage of protein, while triticale with the same combination was better for ash%.

KEYWORDS Forage mixture hay yield quality.

INTRODUCTION

Animal wealth comprises a major part of Iraq national economy, and it is considered as a main source of life for millions of peoples (AL-Tekriti et al., 1981).This wealth exposed to a remarkable deterioration in terms of animals number or products quality, mainly due to seasonal feed deficit particularly in winter. This is a major constrait that effects animal production and market value in Kurdistan region which is characterized of dry farming (AL-Jadwaa, 1980).

The main source of winter feeds is cereal straw which is charactersed of low nutritive value, but it is cheap comparing to concentrated grain rations. The shortage in forage exaggerated due to limitation of rangeland productivity which is extending from level plains passing mountains foot hill up to mountains heights. (Radwan and AL-Fakhry, 1975). Over grazing, miss utilizing the land could cause extinction of some high nutritive value plants particularly legumes. Such limitation in pastures acreage also due to the fallowing system and plowing the fallow land (Mayuof and Al-Fakhry, 1982). Some areas can't be safely utilized due to mines of former military activities. As a result it will make a heavy burden on available range lands, so it will soon degraded.

The benefits of mixtures over monoculture attracted the attention of many researchers, in order to utilize growth resources more efficient than grown separately. Such benefits from mixtures comprised cereals as support plant to facilitate harvesting, higher yield, enhancement of nutritive value, palatability and reducing bloat incidence through counterbalancing protein and fiber ratio, as legumes contain higher protein in addition to caroteins and vitamins, specially A and D, calcium and phosphorous (Willard, 1956).

Other benefit of mixtures is that cereals will protect legumes from adverse effect of frost, while legumes have a magnified role in improving soil properties and nitrogen fixation. Mixtures will improve growing conditions and forage harvesting, since legumes have a scrambling growth habit (Rathwan and Al-Fakhry, 1976 and AL-Tekriti et al., 1981).

The study aim to grow cereals (barley and triticale) either alone or in binary mixtures with vetch (*Vicia sativa* L.) with different methods and rates and its influence on hay dry weight and nutritive value in terms of protein and ash content in percentage.

MATERIALS AND METHODS

The experiment was carried out during the growing season 2005-2006 at two locations, under rainfed condition with an annual average around 500mm.The first was the Agriculture College farm –Dohuk University, situated between longitudes 43.01°E, latituates 36.84°N , and altitude 583 meters above sea level, and the second location was the Agricultural Research Station at Zakho, situated between longitudes 42.41° E , latituates 37.8°N , and altitude 433 meters from the sea level and about 70 Km North of Dohuk. Climatic data were collected from a meteorological station at each experimental location (Table 1).

A physical and chemical soil analysis test was carried out for both locations, samples were drawn randomly from 30cm depth and analyzed at the Agriculture College central laboratory (Table 2).

* Part of M.Sc. Thesis of the first author.

Table (1): The meteorological data during growing season 2005-2006 at Dohuk and Zakho locations.

	Months	Temperature°C			Relative Humidity %	Rain Fall Mm	Remark
		Max	**Min**	**Average**			
Zakho(2005-2006)	October	28.3	11.7	20	31.26	0	Grand total of rainfall =532.1m
	November	19.6	5.3	12.45	48.8	26.8	
	December	17.4	6.1	11.75	51.2	50.7	
	January	10.5	2.4	6.45	64.05	151.2	
	February	12.8	5.6	9.2	61.6	166.9	
	March	20.6	7.2	13.9	46.9	24.2	
	April	28.8	11.95	20.38	61.16	107.6	
	May	30.8	14.2	22.5	39.2	4.7	
	June	40.45	19.37	29.91	27.88	0	

Table (2): Soil characteristics for the two locations.

	Months	Temperature° C			Relative Humidity %	Rain Fall Mm	Remark
		Max	**Min**	**Average**			
Zakho(2005-2006)	October	29.4	14.7	22.1	30	4.3	Grand total of rainfall =636.3mm
	November	20.9	8.4	14.7	40	27.7	
	December	18.8	7.5	13.2	47	89.3	
	January	10.5	3.2	6.9	57	175.7	
	February	13.7	5.6	9.7	56	181.3	
	March	20.4	8.9	14.7	42	34.6	
	April	23.7	13.9	18.8	55	118.9	
	May	31.5	17.4	24.5	32	4.5	
	June	40.1	23.8	32	21	0	

***** College of Agriculture University of Dohuk and Zakho Metrological station.

Table (2): Soil characteristics for the two locations.

Item	DOHUK LOCATION	ZAKHO LOCATION	REMARKS
N ppm	1512	1272	
P ppm	2.59	2.27	
K ppm	85.90	58.00	
pH	7.9	7.7	
Ec dS/m	0.55	0.45	
Organic Matter g/kg	1.18	1.37	
Soil texture			
Sand %	2.76	34.33	Clay soil at both location
Silt %	43.34	23.00	
Clay %	53.94	42.47	

***** Khelef, 2005

Seeds of two rowed local black barley (*Hordeum distichum* L.), triticale (×*Triticosecale Rimpaui* Wittm. var.GRFS.No.5) and common vetch (*Vicia sativa* L**.** var. IPA,2001) were obtained from Agricultural Researches Station in Malta, Field crops Department, College of Agriculture in Salahaddin university at Hawler and Agricultural Researches Station in Mosul, respectively. Seeds of these crops were sown in monoculture or in binary mixtures of different combinations rates as shown in table (3). Seeds of (100%) purity and about 90% germination according to ISTA (1985) rules were used in the experiment.

The fields at both locations were plowed with a disk plow two week's prior to sowing. The mass of soil was pulverized by rotyvator and the field was leveled manually before implementation of the experiment. The plots were prepared with an area (4m *1.2 m); the distances between the plots were kept to ½m and 4m length by 1.2m width and 1m between replicates.

The seeds were sown either hand broadcasting of mixed seeds or in alternative rows (six rows of 20cm apart per plot). The seeds were sown on 29/12/2005 and on 18/1/2006 at Dohuk and Zakho locations respectively.

The experiment at each location comprised a combination between three factors: two sowing methods, two cereals and five mixtures rates with vetch. The numbers of treatments were 20 with three replications, and the numbers of experimental units were 60 at each location.

The treatments were arranged in a spilt –split plot in randomized complete block design (SSP)with three replications. Main plot (sowing methods) broadcast (a1) and rows (a2), sub-plot (cereals) barley (b1) and triticale (b2) and sub-sub plot (mixture rates cereal with vetch) (c) C1= 40:0, C2=30:10, C3=20:20, C4=10:30, and C5=0:20. The data were statistically analyzed using SAS (2001) program. Least Significant Differences (L.S.D.) was used for means verification and for discussion of the results under probability of 0.05.

The following characters were studied, cereals and vetch hay yield which was achieved by placing in oven for period 48hours on temperature 70°C and inverted to kg/donum. The hay components were mixed to determine the chemical composition of protein and ash content as percentage. According to A. O. A. C. (2000).

Table (3):-Total hay yield (kg /donum) for barley or triticale plus vetch mixture at early heading stage.

Dohuk location

	Methods (A)	Sowing rate/Mixture (cereals + vetch)					Means of Methods
		40 + 0	30+10	20+20	10+30	0+20	
Methods * Sowing rate(A*C)	Broadcast	757.70 c	897.90 b c	1007.50 b c	761.50 c	808.90 c	846.70 a
	Rows	802.50 c	1127.30 a b	1352.90 a	987.20 b c	825.10 b c	1018.90a
Means of sowing rate(C)		780.10 c	1012.60 a b	1180.20 a	874.30 b c	817.00 b c	Means of Cereals (B)
Cereals x Sowing rate(B*C)	Barley	968.10 b	1090.90 a b	1051.60 a b	842.20 b c	806.50 b c	951.9 a
	Triticale	592.20 c	934.20 b	1308.80 a	906.30 b	827.60 b c	913.8 a
		Methods x Cereals x Sowing rate(A * B* C)					Methods x cereals (A* B)
Broadcast	Barley	920.50 b c d e	943.40 b c d e	837.80 b c d e	783.90 c d e	931.40 b c d e	883.4 a
	Triticale	595.00 e	852.40 b c d e	1177.30 a b c	739.10 d e	686.50 d e	810.1 a
Rows	Barley	1015.70 a b c d e	1238.50 a b	1265.50 a b	900.50 b c d e	681.60 d e	1020.40 a
	Triticale	589.30 e	1015.80 a b c d e	1440.30 a	1073.40 a b c d	968.60 b c d e	1017.50 a

Zakho location

	Methods (A)	Sowing rate/Mixture (cereals + vetch)					Means of Methods
		40 + 0	30+10	20+20	10+30	0+20	
Methods* Sowing rate (A*C)	Broadcast	943.50 b	1034.80 a b	1057.50 a b	1143.10 a b	1000.90 a b	1035.95 a
	Rows	954.20 b	1153.80 a b	1199.30 a	1193.50 a	953.80 b	1090.92 a
Means of sowing rate(C)		948.85c	1094.30 a b c	1128.41 a b	1168.27 a	977.35 b c	Means of Cereals (B)
Cereals x Sowing rate(B*C)	Barley	1098.50 a b c d	1210.20 a b	1182.90 a b c	1283.60 a	1014.40 b c d e	1157.90 a
	Triticale	799.20 e	978.40 c d e	1073.90 a b c d	1052.90 b c d	940.30 d e	969.00 a
		Methods x Cereals x Sowing rate(A * B* C)					Methods x cereals (A* B)
Broadcast	Barley	1054.50 b c d e	1001.90 b c d e	1077.40 b c d	1283.20 a b	971.60 c d e	1077.70 a
	Triticale	832.40 d e	1067.60 b c d e	1037.50 b c d e	1003.00 b c d e	1030.20 b c d e	994.20 a
Rows	Barley	1142.60 a b c	1418.30 a	1288.50 a b	1284.10 a b	1057.20 b c d e	1238.10 a
	Triticale	765.90 e	889.20 c d e	1110.20 a b c d	1102.90 b c d	850.50 c d e	943.70 a

***** Each set means associated with similar letters are not significantly different at 0.05according to L.S.D.
L.S.D.values: Dohuk A =662.17, B= 288.48, C= 217.69, A*B= 408.5, A*C= 308.3, B*C= 308.3, A*B*C= 436.0.
Zakho: A= 213.98, B= 393.29, C=154.29, A* B= 556.9, A*C= 218.5, B* C= 218.5, A* B* C=

RESULTS AND DISCUSSION

Hay yield (kg/do*) for cereals with vetch mixture at early heading stage:

The results shown in table (3), revealed no significant differences between sowing methods at both location. Mixture rates were significantly different at both locations; highest hay yield was for the mixture at ratio of (20 cereals+ 20 vetch) 1180.2 kg/donum at Dohuk, but the ratio of (10 cereals + 30 vetch) at Zakho recorded (1168.27kg/donum) and the least were for cereals sole culture 780.1 and 948.85 kg/donum for Dohuk and Zakho locations, respectively. Cereals were not significantly different.

The interaction of sowing methods with mixture rates were significantly different at both locations, highest values were recorded for sowing in alternative rows at mixture ratio of (20 cereals + 20 vetch) 1352.9 and 1199.3 kg/donum, while the least was found in broadcasting at pure cereals 757.7 and 943.5 kg/donum for Dohuk and Zakho locations, respectively.

Cereals with mixture rates interaction were also significantly different, mixture rates of 20 triticale + 20 vetch 1308.8 kg/donum hay was superior than almost all mixture rates at Dohuk location , while mixture of 10 barley + 30 vetch (1283.6) was better at Zakho location.

Concerning the sowing methods with cereals interaction, they were not significantly affected this trait at both locations. The second order interaction (methods* mixture rates * cereals) was significantly different at both locations. Mixture of triticale sowing in alternative rows at ratios (20 triticale + 20 vetch) exhibited the highest hay yield 1440.3 kg/donum at Dohuk, but at Zakho the ratio of 30 barley + 10 vetch in alternative rows gave the highest hay yield (1418.3 kg/donum), while the least values were recorded for triticale pure culture sown in alternative rows 589.3 and 765.9 for Dohuk and Zakho locations, respectively.

These results are in agreement with reports of Mohamed and Mohamed (1987) and Cakmake et al. (2005) who also referred to insignificant differences between sowing methods. Moreover, AL-Jadwaa (1980), AL-Tekriti et al. (1981) and Ross et al. (2004), noticed that the dry matter yield t/ha is significantly affected by the different mixtures treatments and by the interaction of locations and treatments, and triticale yield in pure stand was significantly higher in dry matter than oat in pure stand, and this was significantly higher than that of narbon vetch in pure stand. Dry yield of triticale was not different from the mixtures. Qamer et al. (1999) remarked that the mixtures of vetch and barley were generally more productive than any of the sole crops, with the yield of the best mixture V75%+B25% (7.6 t/ha) being almost twice as productive as sole vetch. While the highest dry matter was obtained with the treatment V75%+B25% (3.3 t/ha), which was approximately 50% higher in yield than sole vetch or sole barley (around 2 t/ha). Karaday and Buyukbure (2004) and Tuna and Orak (2007) referred to a significant differences between mixture rates, but it was contradicted with those findings of Tubileh (1977), Caballero et al. (1995) and Lithourgidis et al. (2007).

Forage quality criteria:-

Protein percentage (%):

The results shown in table (4) revealed insignificant differences between sowing methods at both locations on this trait. Mixture rates were significantly different at both locations. It was evident that the protein % increased as the rates of vetch increased in the mixture with the exception of cereals pure culture and mixture of 30 cereals + 10 vetch at Dohuk and cereals pure culture alone at Zakho, all other mixture which vetch involved were insignificantly different. The least were for cereals sole culture 9.67 and 10.16 % for Dohuk and Zakho locations respectively. Cereals crops were found insignificantly different at both locations.

The interaction of sowing methods with mixture rates were significantly different at both locations, highest values were recorded for sowing in alternative rows at 10 cereals + 30 vetch mixture rates (22.7083 and 21.942 %, while the least was found in broadcast or alternative rows for pure cereals (9.55 and 10.08 %) for Dohuk and Zakho locations, respectively.

Cereals with mixture rates interaction were also significantly different, barley crop sown at 10 barley + 30 vetch mixture rates exceeded almost all mixture rates at both locations. Concerning the sowing methods with cereals interaction, they were significantly different at Dohuk location, barley sowing in broadcasting which was significantly inferior than in alternative rows.

The second order interaction (methods * mixture rates * cereals) was significantly different at both locations. Barley sowing either in alternative rows or broadcasting at 10 barley + 30 vetch mixture rates gave highest values, while the least values were recorded for broadcast barley monoculture 8.33 and 9.58 % for Dohuk and Zakho locations respectively.

These results are in agreement with those of Mohamed and Mohamed (1987) who referred to insignificant effect of sowing methods on crude protein percentage. However, (AL-Tekriti et al., 1987) have stated that reciprocal lines methods surpassed other methods.

Concerning mixture rates, Mohammed (1977), Mohamed and Mohamed (1987) and Lithourgidis et al. (2007) refereed to significant differences between mixture rates, and Cox and Atkins (1979) reported that more precipitation increased the carbohydrate/protein ratio. The crude protein content ratio of legumes are higher than those of cereals and it was increased as legumes ratio increased in mixtures (Droushiotis, 1989; Roberts et al., 1989).

These results in are cross with those of Tubaileh (1977) as he found insignificant increase in protein content at growing vetch in mixtures with barley.

* do = ¼ ha.

Table (4): Protein percentage (%) for barley, triticale and vetch hay as a whole mixtures at immature stage (including spikes and pods).

Dohuk location								Zakho location							
	Methods (A)	**Sowing rate/Mixture (cereals + vetch)**					**Means of Methods**		**Methods (A)**	**Sowing rate/Mixture (cereals + vetch)**					**Means of Methods**
		40 + 0	**30+10**	**20+20**	**10+30**	**0+20**				**40 + 0**	**30+10**	**20+20**	**10+30**	**0+20**	
Methods * Sowing rate (A*C)	**Broadcast**	9.55 d	18.51 c	21.44 a b	21.90 a b	21.35 a b	18.55 a	**Methods * Sowing rate(A*C)**	**Broadcast**	10.25 c	18.80 b	20.60 a b	20.53 a b	20.95 a b	18.18 a
	Rows	9.79 d	20.81 b	21.00 a b	22.71a	20.98 a b	19.06 a		**Rows**	10.08 c	20.94 a b	20.30 a b	21.94 a	20.30 a b	18.75 a
Means of sowing rate(C)		9.67 c	19.66 b	21.22 a	22.30 a	21.17 a	**Means of Cereals (B)**	**Means of sowing rate(C)**		10.16 b	19.87 a	20.45 a	21.23 a	20.63 a	**Means of Cereals (B)**
Cereals * Sowing rate(B*C)	**Barley**	9.16 d	19.53 c	20.71 b c	22.82 a	21.19 a b c	18.68 a	**Cereals * Sowing rate(B*C)**	**Barley**	9.79 b	19.93 a	20.05 a	21.21 a	20.25 a	18.25 a
	Triticale	10.17 d	19.79 c	21.73 a b	21.79 a b	21.14 a b c	18.93 a		**Triticale**	10.54 b	19.80 a	20.85 a	21.25 a	21.01 a	18.69 a
		Methods x Cereals x Sowing rate(A * B* C)					**Methods *Cereals (A* B)**		**Methods x Cereals x Sowing rate(A * B* C)**						**Methods * Cereals (A* B)**
Broadcast	**Barley**	8.33 d	18.05 c	20.58 a b c	22.71 a	21.66 a	18.27 b	**Broadcast**	**Barley**	9.58 c	18.00 b	19.53 a b	20.01 a b	20.71 a b	17.57 a
	Triticale	10.76 d	18.95 b c	22.29 a	21.09 a b	21.04 a b	18.82 a b		**Triticale**	10.51 c	19.60 a b	21.68 a	21.05 a b	21.20 a	18.80 a
Rows	**Barley**	10.00 d	21.00 a b	20.83 a b	22.91 a	20.72 a b c	19.09 a	**Rows**	**Barley**	10.00 c	21.87 a	20.58 a b	22.41 a	19.78 a b	18.93 a
	Triticale	9.58 d	20.62 a b c	21.16 a b	22.50 a	21.24 a b	19.03 a b		**Triticale**	10.58 c	20.01 a b	20.01 a b	21.46 a	20.83 a b	*18.58 a*

***** Each set means associated with similar letters are not significantly different at 0.05according to L.S.D.

L.S.D.values: Dohuk: A= 2.553, B= 0.5804, C=1.335, A* B=0.8218, A*C=1.8909, B* C=1.8909, A*B*C= 2.6741.

Zakho: A= 3.6339, B= 1.5265, C= 1.576, A* B= 2.1616, A*C= 2.2321, B* C= 2.2321, A*B*C= 3.157

Ash percentage %:

The results displayed in table (5) revealed insignificant differences between sowing methods at both locations on this trait. Mixture rates were significantly different at both locations. It was evident that ash percentage increased as the rates of vetch increased in the mixture. Therefore, the least values were recorded for cereals sole culture (9.03 and 9.37 %) for Dohuk and Zakho location respectively. Cereals crops were found significantly different at Dohuk location only, where barley crop exceeded triticale.

The interaction of sowing methods with mixture rates were significantly different at both locations, highest values were recorded for sowing in alternative rows at 10 cereals + 30 vetch mixture rates 12.92 and 12.63 %, while the least was found in broadcast for pure cereals (9.06 and 9.15 %) for Dohuk and Zakho locations respectively.

Cereals with mixture rates interaction were also significantly different, vetch crop sown as pure surpassed almost all mixture rates. All mixture combinations were better than cereals sole culture.

Concerning the sowing methods with cereals interaction, the only exception was triticale broadcasting which gave significantly lower value than others at Dohuk, while at Zakho location, it was insignificant.

The second order interaction (methods * mixture rates * cereals) was significantly different at both locations. All mixture rates were significantly similar and significantly exceeded cereals sole culture. These results are in agreement with those of Mohammed (1977), Altaif (1982) and Thomson et al. (1990), who also referred to significant differences between mixture rates and this was contradicted by other researchers, Tubaileh (1977), who referred to insignificant differences between barley or oat with vetch mixtures on ash content.

Table (5):- Ash percentage (%) for barley, triticale and vetch hay in mixtures at immature stage (including spikes and pods).

Dohuk location								Zakho location							
	Methods (A)	Sowing rate/Mixture (cereals + vetch)					Means of Methods		Methods (A)	Sowing rate/Mixture (cereals + vetch)					Means of Methods
		40 + 0	30+10	20+20	10+30	0+20				40 + 0	30+10	20+20	10+30	0+20	
Methods * Sowing rate(A*C)	Broadcast	9.06 e	11.50 c d	11.58 b c d	12.37 a b c	12.50 a b c	11.41 a	Methods *Sowing rate (A*C)	Broadcast	9.15 c	11.00 b	12.08 a b	12.38 a	11.92 a b	11.28 a
	Rows	8.99 e	10.63 d	12.42 a b c	12.92 a	12.75 a b	11.54 a		Rows	9.59 c	11.31 a b	12.30 a	12.63 a	12.33 a	11.63 a
Means of sowing rate(C)		9.03 c	11.06 b	12.00 a	12.64 a	12.63 a	Means of Cereals (B)	Means of sowing rate(C)		9.37 c	11.15 b	12.13 a	12.51 a	12.12 a	Means of Cereals (B)
Cereals *Sowing rate(B*C)	Barley	9.23 d	11.37 b c	12.66 a	12.66 a	12.75 a	11.74 a	Cereals *Sowing rate(B*C)	Barley	9.18 d	10.97 b	11.80 a b	12.37 a	11.95 a b	11.25 a
	Triticale	8.83 d	10.75 c	11.33 b c	12.62 a	12.50 a b	11.21 b		Triticale	9.56 d	11.33 a b	12.58 a	12.52 a	12.30 a	11.64 a
	Methods x Cereals x Sowing rate(A * B* C)						Methods *Cereals (A* B)		Methods x Cereals x Sowing rate(A * B* C)						Methods *Cereals (A* B)
Broadcast	Barley	9.63 d e	12.16 a b c	12.50 a b	12.66 a	13.00 a	11.99 a	Broadcast	Barley	9.01 f	10.83 b c d e f	11.50 a b c	12.16 a b	11.66 a b	11.03 a
	Triticale	8.50 e	10.83 b c d	10.66 c d	12.07 a b c	12.00 a b c	10.82 b		Triticale	9.29 e f	11.16 a b c d	12.43 a b	12.60 a b	12.16 a b	11.53 a
Rows	Barley	8.83 e	10.58 c d	12.83 a	12.66 a	12.50 a b	11.48 a	Rows	Barley	9.36 d e f	11.11 a b c d e	12.10 a b	12.58 a b	12.23 a b	11.47 a
	Triticale	9.16 d e	10.66 c d	12.00 a b c	13.16 a	13.00 a	11.60 a		Triticale	9.83 c d e f	11.50 a b c	12.50 a b	12.66 a	12.43 a b	*11.78 a*

***** Each set means associated with similar letters are not significantly different at 0.05according to L.S.D.

L.S.D.values: Dohuk: A= 1.5281, B= 0.3751, C= 0.8698, A*B= 0.5312, A*C=1.2320, B*C=1.2320, A*B*C= 1.7423.

Zakho: A= 0.92, B= 0.494, C= 0.9111, A*B=0.6995, A*C= 1.2905, B*C=1.2905, A*B*C= 1.8250.

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تأثير طرق الزراعة ومعدلات مخاليط العلف في حاصل الدريس ونوعيته

الخلاصة

أجريت هذه الدراسة في موقعين لمحافظة دهوك – شمال العراق- حقل كلية الزراعة (الواقعة على خط طول 43.01°E وخط عرض36.84°N وارتفاع عن مستوى سطح البحر 583 متر) وفي محطة البحوث الزراعية في زاخو (الواقعة على خط الطول42.41° E وخط العرض 37.8°N وارتفاع عن مستوى سطح البحر 433 متر وحوالي 70 كيلومتر شمال دهوك) خلال الموسم الزراعي الشتوي 2005-2006 تحت الظروف المطرية حيث متوسط الأمطار السنوي بحدود 500ملم.

تضمنت التجربة طريقتين للزراعة (نثرا باليد وفي خطوط متبادلة على بعد 20سم بين الخطوط) وزراعة كل من الشعير أو الترتيكالي بشكل منفرد أو على شكل مخاليط علفية مع الكشون العادي بمعدلات بذار مختلفة (0:40، 10:30، 20:20، 30:10 و 20:0) لكل من الحبوب إلى الكشون ونفذت المعاملات كتجربة عامليه في ثلاث مكررات و تصميم القطع المنشقة مرتين (Split-Split plot design) في تصميم القطاعات العشوائية الكاملة (R.C.B.D.). لدراسة حاصل الوزن الجاف ونوعية العلف المتمثلة بالمحتوى البروتيني والرماد كنسبة مئوية إلى تحليل التباين.

دلت النتائج إلى عدم وجود فروقات بين طرق الزراعة في حاصل الوزن الجاف ونوعية العلف في كلا الموقعين وكذلك لم يختلف محصولي الحبوب فيما بينهما، بينما أدت نسب الخلط 20:20 أو 30:10 حبوب : كشون إلى تحسين حاصل الوزن الجاف في دهوك و زاخو على التوالي وحققت نسبة الخلط 30:10 تفوقا في النسبة المئوية للبروتين والرماد في كلا الموقعين.

كان حاصل الدريس الكلي اعلى عند نسبة الخلط 20:20 حبوب: كشون المزروعة في خطوط في كلا الموقعين، بينما سجلت نسبة الخلط 30:10 حبوب: كشون أعلى نسبة بروتين ورماد% في كلا الموقعين. وعموما فان نسبة الخلط 20ترتيكالي : 20 كشون حققت اعلى حاصل دريس الذي كان(1308.8 كغم/ دونم) في دهوك، بينما سجل الخليط 30:10 شعير: كشون اعلى نسبة مئوية للبروتين والرماد22.91 % و 12.66 % على التوالي. وان نسبة الخلط 10 شعير :30 كشون المزروعة في الخطوط المتبادلة اعطت اعلى نسبة للبروتين، بينما الترتيكالي كان بنفس نسبة الخلط افضل نسبة للرماد.

كار تێكرنا رێكێت چاندنا و بشێوێ ئاليكێ تێكەل لسەر بەرهەمێ و جورێ ئاليكێ

كورتی

ئەڤ ڤەكولينە ل دوو جها هاتە كرن ، زە ڤێت كوليژا چاندنی– زانكويا دهوك (دكەڤيتە دناڤ بەراهێلا درێژاهی E° 43.1 وهێلا پەحناتی N° 36.84 وبلنداهيا 583 م) وبنگەهێ ڤەگولێينت چاندنێ ل زاخو(دكەڤيتە دناڤ بەر هێلا درێژاها 42.41°E وبەحناتی 37.8°N وبلندا هيا 433 م كو دكەڤيتە ژێريا دهوكێ بێنزيكی 70 كم) ل وەرزێ چاندنێ يێ زستانێ 2005– 2006 لژێر بارودوخێت بارانێ كو تێدا سەرجەمێ بارانێت سالانە نيزيك 500 ملم.

ئەڤ تاقيكرنە ژ دوو رێكييت چاندنێ پێك دهێت (بژاندن وخەتێت پێك گهور بديراتيا 20 سم دناڤبەرا رێزادا) وچاندنا جەهی يان تەرتيكالی بشێوێ تاك يان بشێوێ ئاليكێ تێكەل دگەل كێلێكێ ئاسايی بسەرجەفێ توفێت جوراوجور (40 + 0، 30 + 10، 20 + 20، 0+ 20) هەر ژ دندك بو كێليك وئەڤ وفاكتەر وەك ڤەكولينەكا فاكتوريال هاتە ئەنجامدان د سێ دووبارا دا برێكا سيستەمێ Split-Split plot design د R.C.B.D. بو خاندنا بەرهەمێ كێشێ هشك وجورێ ئاليكێ پێكهاتيێ پروتينی دياردكەت وخولی وەك رێژا سەدی بو شلوڤەكرنا.

ئەنجاما دياركر نەبونا هيچ گورانەكی دناڤبەرا رێكێت چاندنێ د بەرهەمێ كێشا هشك دا وجورێ ئاليكی د هەردوو جها وهەروەسا بەرهەمێ توڤی نەهاتە گوهورين دناڤبەرا ئێك دا، بەلێ رێژا تێكەل 20:20 يان 30:10 توڤ: كێليك بويە ئەگەرا چاكرنا بەرهەمێ كێشا هشك لدهوكێ وزاخو لديڤ ئێك ورێژا سەدی 30:10 سەركەفتەك بدەست خوڤە ئينا درێژا سەديا بروتينی وخولی دا وهەرووجهاندا.

بەرهەمێ كێشا هشك يێ گشتی بلندتربو د رێژا تێكەلدا 20:20 دندك: كێليكا چاندنی د رێژا ندا ڤەردوو جهی دا، بەلێ رێژتيكەلی 30:10 دندكا: كێليك بلنديرين رێژا پروتين وخول٪ تومار كر دهەردوو جهی دا.

بەگشتی رێژا تێكەل 20 ترتيكالی:20كێليك بلنديرين بەرهێ كێشا هشك بدەست خوڤە ئينا رێ كو 1308.8 كغم/ دونم لدهوكێ، بەلێ تێكەلی 30:10 جەه:كێليك بلنديرين رێژا سەدی ياپروتين وخولی 22.91٪ و12.66٪ تومار كر لديڤ ئێك. ورێژا تێكەل 10جەهی: 30كێليكێ چاندنی درێژئێت ئالوگوردا بلنديرين رێژا پروتينی بدەست خوڤەئينا، بەلێ تەرتيكالی هەمان رێژا تێكەلی بوو وباشتر ژ رژێژا خولی بوو.

EVALUATING THE PRODUCTIVITY OF FIVE CUCUMBER (*Cucumis sativ*us L.) CULTIVARS AND THEIR RESPONSES TO VARYING RATES OF GIBBERELLIC ACID (GA_3)

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(Received:, November 2, 2008; Accepted for publication:, February 24, 2009)

ABSTRACT

This experiment was conducted at Field Researches of Horticulture Department, Agriculture College, Dohuk University during 2007 growing season to evaluate production superiority of five cucumber cultivars namely Babylon, Gabbar, Beitalpha Necrson, Beitalpha and Rasheed and their responses to gibberellic acid rates of 0.0, 100, 200 and 300 mg.l^{-1}. The results revealed that the superiority of the investigated cucumber cultivars could be categorized according to their fruit numbers per meter sq. and according to their yields. They were put in to the following sequence order: Babylon > Gabbar> Beitalpha > Rasheed > Beitalpha Necrson. 300 mg.l^{-1} appeared to be the most effective GA_3 rate. It gave the highest fruit number.m^{-2} and the highest yield (55.02 fruits .m^{-2} and 7429 g. m^{-2}, respectively). Regression analysis manifested that cucumber yield was cubically responded to different GA_3 concentrations and it could be estimated by the following equation: yield g.m^{-2} = 6356.4 + 28.033 (GA_3 rate) – 0.24097(GA_3 rate)^{**2} + 0.0005352 (GA_3 rate)^{**3}. Plants of Babylon cultivar sprayed by 100 mg.l^{-1} GA_3 seems to be superior over entire interaction treatments. It possesses the highest fruits .m^{-2} (69.65) and the highest fruit yield (9980 g.m^{-2}).

INTRODUCTION

Swiader *et al.* (1996) reported that cucumber is an annual prostrate plant. Three distinct types of vine growth can occur in the plant: indeterminate, determinate, and compact. Most cucumber plants are indeterminate, producing a small trailing vine 1-3 m long. However, determinate cultivars with a compact plant habit have been developed for home grower's and for mechanical, once-over harvesting. A single, un-branched tendril develops at each leaf axial. Trachoma occur on the angular stems and the triangularly ovate, 3-5-lobed leaves (Robion and Decker-Walters, 1997).

Slicing cucumber is the only cucumber type that is grown in Iraq. There is a little information being familiar to growers. Cucumber for pickling is usually purchased as slicing cucumber when its price being declined. Hochmuth *et al.* (1997) revealed that slicing cucumber are usually used uncooked in salads, although younger fruits may occasionally be pickled. Approximately 98% or more of the slicing type of cucumber are produced for the fresh market. Fruits of pickling cultivars are generally shorter and stouter than those of slicing cultivars and are as dark green in colour. USDA Cucumber is grown as a number of different types and is used as either a fresh or a processed vegetable. Some of the types of cucumber grown throughout the world are American pickling, European greenhouse (parthenocarpic), oriental trellis, middle-eastern (Beitalpha), and schalgurken. Cucumber types differ based on the type of use (fresh market or processed), fruit length, diameter, colour, colour uniformity, skin thickness, and skin surface protrusions (Shetty and Wehner, 2002).

Kevin (2006) postulated that there are over 100 different gibberellic acid, they could be mixed with other substances, for instance, tonic is created by combining gibberellic acid with other hormones (Indole-3-butyric acid and Naphthalene acetic acid) that induce root development. The combination of hormones will boost growth in different parts of the plant so they work together quite well. Recent studies indicating that combining gibberellic acid and indoleacetic acid or with brassinolide will improve plant growth.

Generally, it is assumed that GA promotes both cell division and cell elongation. GA exert its control on cell division through transcriptional activation of cyclin-dependent protein kinases and mitotic cyclin genes (Suter *et al*., 1995). Lately too many vegetable varieties have been introduced to Iraq including cucumber cultigens. These cultivars were provided with putative merits from their producing companies, in which growers are very confused which cultivar is better of which to be grown to sustain highest yield of best quality. Therefore, our attempt was made to evaluate five cucumber cultivars for their productivity and responses to varying gibberellic acid (GA_3) concentrations.

MATERIALS AND METHODS

This experiment was carried out during 2007 at the Research Field, Horticulture Department, Agriculture College, Dohuk University. The objective of this trail was to investigate the growth and yield responses of five cucumber cultivars to varying Gibberellic acid (GA_3) concentrations. Therefore, Babylon cultivar seeds were purchased from Local market and they were produced by (Peto Seed Company), Gabbar cultivar (Celebrity Seed Company), Beitalpha (Necrson Seed Company), Beitalpha (Pockets) and Rasheed (Pockets).

Split Plot within Factorial Randomized Complete Block Design (Split, F-RCBD) was selected to match this experiment. Cultivars were the main plots (A) in witch they were represented by Babylon (a_1), Gabbar (a_2), Beitalpha Necrson (a_3), Beitalph (a_4) and Rasheed (a_5). Whereas, the sub-main plots (B) were GA_3 concentrations, and they were represented by untreated check (b_1), 100 mg.l^{-1} (b_2), 200 mg.l^{-1} (b_3) and 300 mg.l^{-1}(b_4). Therefore, 20 treatments were included in this experiment. A treatment was replicated three times and each replicate was

represented by (1 x 3 m) furrow planted on one side with plant intra space of 25cm.

Soil was plowed vertically and once more horizontally on April, 20th., 2007, then dissected to cope with the proposed design, thereafter furrows were irrigated and a day latter seeds were sown at a depth of 5 cm with 2 seeds per a hill. Plants were fertilized by Di-Amonium Phosphate (DAP) at rates of 15 $g.m^{-2}$ on May, 3rd, 2007 and repeated on June, 6th., 2007. On June, 1st., 2007 plants were sprayed by a mixture of foliar micronutrients (Phytopherts), Hamates liquid, Benomyl, Biotex and Thiodan 35%, respectively, at rates of $2g.l^{-1}$, 20 $ml.l^{-1}$, $1g.l^{-1}$, 1.5 $ml.l^{-1}$, and 2 ml. l^{-1}). Plants were sprayed by four GA_3 rates (0.0, 100, 200, and 300 $mg.l^{-1}$), on June, 4th., 2007. Harvesting of cucumber fruits were commenced on June 13th. 2007 and was lasted till July 5th., 2007, where the experiment was curtailed. Subsequently, plants were harvested 6 times and at each harvest length, diameters of fruits were measured. Fruit fresh weights per m^2 and fruit number per m^2 were recorded. Plants were harvested and then plant fresh weight, leaf fresh weight and stem fresh weight were taken on July 15th., 2007. Finally, fruit, leaf and stem samples were weighed and then oven-dried at 60 C^0 for 72 hrs. thereafter they were weighed to calculate their dry matter percentages.

Table (1): Some physical properties of field soil on 2007 growing season.

Constituents	Units
Volumetric distribution of soil separate	
Sand %	3.4
Silt %	55
Clay %	41.6
Texture	Silty Clay

RESULTS AND DISCUSSION

Cultivar responses: The obtained results (table, 2 – 6) revealed that Babylon was superior over other investigated cultivars. It was profoundly exceeded Necroson in plant fresh weight (4.5%), fruit number at first harvest ((46%), fruit number at second harvest (55.36%), fruit number at fourth harvest (72.12%), fruit number at sixth harvest (43.7%), final means of fruit number (54.11%), fruit diameter at third harvest (18.65%), fruit fresh weight at second harvest (43.76%), fruit fresh weight at third harvest (29.14%), fruit fresh weight at sixth harvest (51.13%), final mean of fruit fresh weight (23.66%), second harvest yield (110%), third harvest yield (62.58%), sixth harvest yield (89.23%) and total mean of yield (85.34%). In addition to that, Babylon cultivar was more potent than Rasheed cultivar in terms of plant fresh weight (77.8%), leaves fresh weight (162%), final mean of fruit number (20.74%), fruit diameter (15.82%), second harvest fruit fresh weight (100%), sixth harvest fruit fresh weight (62.91%), fruit fresh weight final mean (17%), second harvest yield (43.7%), third harvest yield (64%), sixth harvest yield (81.2%) and final mean of total yield (50.7%). Furthermore, Babylon cultivar significantly exceeded Beitalpha cultivar in plant fresh weight (46.6%), leaves fresh weight (93.5%), fruit number at fourth harvest (53.6%), fruit length (31.73%), final mean of fruit length (19.5%), fruit diameter at third harvest (13.78%), second harvest fruit fresh weight (40.4%), sixth harvest fruit fresh weight (66.6%), final mean of fruit fresh weight (32%), yield of second harvest (27.9%) and mean of total yield (44.78%). Moreover, Babylon cultivar manifested higher responses than Gabbar cultivar in plant fresh weight (17%), yield at sixth harvest (105%), fruit diameter at third harvest (16.17%), fruit fresh weight at third harvest (51.2%) and mean of total yield (30.5%).

Gabbar cultivar came in the second order after Babylon, as it highly exceeded Necrson cultivar in terms of fruit fresh weight at first harvest (179.9%), fruit length at first harvest (16.7%), fruit number at first harvest (563.9%), fruit number at second harvest (67%), fruit number at fifth harvest (108%), yield of first harvest (299%), yield of second harvest (56.65%) and mean of total yield (42%). Besides, Gabbar cultivar exhibited higher responses than that of Rasheed cultivar. It substantially exceeded the latter cultivar in fruit fresh weigh at second harvest (151.1%) and final mean of fruit fresh weight (24.8%). Moreover, Gabbar cultivar was superior over Beitalpha. Since it hugely exceeded the latter cultivar in fruit length at first harvest (227%), fruit fresh weight mean (16.6%), mean of fruit length (25.45%) and fruit length at first, third and fourth harvests (136.3, 10.1 and 10.76%, respectively).

Beitalpha cultivar was categorized as the third cultivar in the sequence order. It significantly exceeded Necrson cultivar in yield at second harvest (64.9%), fruit number at second harvest (66.17%), and fruit number at fifth harvest (110.6%).

Rasheed cultivar, take the fourth order after Beitalpha in the ordering sequence. Rasheed cultivar substantially exceeded Necrson cultivar in third harvest yield (46.81%), and fruit number at second harvest (42.12%), fruit number at fifth harvest (92.5%), and fruit length mean (11.8%). Furthermore, Rasheed cultivar displayed better responses in relation to Beitalpha in terms of in fruit diameter mean (12.87%), fruit lengths at second, third, fourth and mean (27.37, 21.46, 23.27 and 29.74%, respectively). In addition to that Rasheed cultivar was superior over Gabbar cultivar in fruit length at third and fourth harvets (10.3, 11.5%) and over Babylon cultivar in fruit length at fourth harvest (13.76%).

Necrson appeared to be the worst cultivar. It displayed the lowest marketable yield, which considered the main criterion in vegetable production. However, this cultivar gave the highest fruit length in which it exceeded Babylon cultivar at second and fourth harvests (21.2 and 9.5%, respectively), Beitalpha cultivar at second, third, fourth and final mean (21.23, 14.49, 18.6 and 16.1%, respectively) and Gabbar cultivar at second harvest (7.2%).

Horticulturists are not like biologists they do not care much about plant growth and dry matter accumulations, unless these parameters in such ways assisted yield improvements. Therefore, yield is the

most important criterion of success. The results displayed that the five investigated cucumber cultivars could be categorized according to their fruit numbers $.m^{-2}$ and final yields in the following sequence order: Babylon> Gabbar> Beitalpha> Rasheed > Necrson. Smith *et al.* (1978) found that fruit number was more highly heritable (0.17) than fruit weight (0.02). Fruit number was found to be a more stable measure of productivity than fruit weight or value in a once-over harvest trail for cucumber (Ells and McSay, 1981). Thus, Babylon cultivar was superior over other cultivars in most of the detected traits, particularly in fruit number per meter square and final yield. Obviously, Babylon superiority might be assigned to its ability to mach with field microenvironments, which enabled this cultivar to exhibit best gene expression capability, as compared to other cultivars.

Evaluating of cucumber cultivars to find out the best responding cultivars required a hard task. Cultivars should experience multiple environment challenges to ascertain their production capabilities. Swallow and Wehner (1989) calculated that maximum efficiency was achieved by allocating test plots of cucumber culigens to different season's and years rather than locations and replications. Growers should be obeyed everything that consumers could possibly desire in order to sustain profitable market. In world wide and so as in Iraq, cucumber cultivar producing slim, uniform bright dark green coloured, crinkled thick skin and uniform cylindricality fruits is paramount. Fruit length is not as important as the above traits. All these parameters are present in the fruit of Babylon cultivar (tables, 2-6). Swiader *et al.* (1996) stated that cucumber fruits for fresh market slicing are preferably long, smooth, straight, thick skinned, with a uniform medium dark green colour. Fresh market cultivars have fewer spines than processing types. Each type should be cylindrical with blocky ends, although rounded ends are also acceptable for slices.

A wide knowledge, referring the differences among cultivars in their responses to environment, and cultivar distinguishing capability based on their growth habit, fruit appearance, and fruit spines would definitely help growers to meet consumer desire. Swiader *et al.* (1996) postulated that all commercial cucumber cultivars have either black or white spines on the fruit surface, a trait related to fruit maturity. White-spined cultivars are generally slower in their rate of development and retain their green colour and firmness longer than black-spined fruits. Cultivars with black spines tend to turn yellow prematurely, especially under high temperature, and produces larger fruits that soften with maturity. Consequently, black-spined cultivars are used for pickling in regions where summer conditions are relatively cool. White-spined hybrids have largely replaced black-spined cultivars in warmer growing regions and in areas where once-over machine harvesting prevalent.

The influences of GA_3 rates on growth and yield of five cucumber cultivars: Significant differences were not detected in the response of plant fresh weight to varying gibberllic acid rates (table, 2). However, regression analysis (figure, 1) displayed that plant fresh weight is commenced to rise at rates above 0.0 $mg.l^{-1}$ to approach its maximum value at 75 $mg.l^{-1}$, thereafter, fresh weight of plants showed reduction efficacy to attain its lowest magnitude at 200 $mg.l^{-1}$, then it is slightly reduced. Hence, plant fresh weight is cubically responded to varying GA_3 rates. Therefore, it could be predicted by the following equation: plant fresh weight (g) = 589.667 + 1.99222 (GA_3 rate) – 0.0215(GA_3 rate) ^{**2} + 0.0000841(GA_3 rate) ^{**3}.

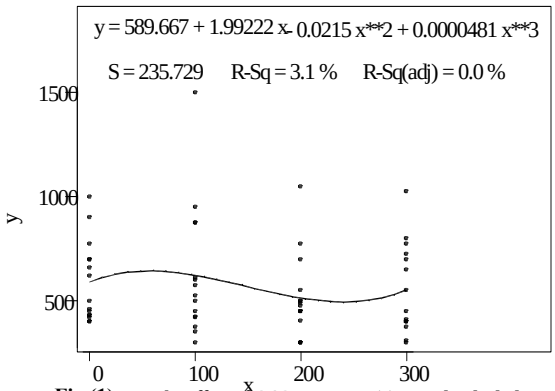

Fig (1): The effect of GA3 rates ppm (x) on individual plant fresh weigh g (y)

Table (2): The effect of GA_3 rates ($mg.l^{-1}$) on growth components and dry matter percentages.

	Traits	Pfwt	Sfwt	Lfwt	Sdm%	Ldm%	Fdm%
Cultivars	Bab	702.9a	261.7a	436.3a	6.56a	14a	3.97a
	Gab	600.4bc	268.1a	332.3ab	5.92a	13.6a	4.19a
	Necr	672.7ab	290.5a	382.3a	6.29a	12.7a	4.14a
	Beit	479.6bc	254.2a	225.4bc	7.07a	13.5a	3.85a
	Rash	395.4c	229.2a	166.3c	6.07a	13.8a	3.83a
GA_3 rate	0.0	589.7a	277a	318.7a	6.07a	13.2a	3.65a
	100	622a	273a	342.3a	6.73a	13.6a	4.27a
	200	513a	247.3a	262.3a	6.21a	14.1a	4.22a
	300	551.3a	244a	307.3a	6.48a	13.2a	3.84a
Babylon	0.0	711.7ad	241.7ab	446.7ab	6.68ab	14.3a	4ab
	100	600ad	241.7ab	358.3ab	6.29ab	13.6ab	3.84b
	200	758.3ac	278.3ab	463.3ab	5.93ab	14.3a	4ab
	300	741.7ad	285ab	456.7ab	7.33a	14ab	4.1ab
Gabbar	0.0	493.3bd	206.7b	286.7ab	6.48ab	14.1ab	3.84b
	100	695ad	308.3ab	386.7ab	6.27ab	14ab	5.79a
	200	546.7ad	245ab	301.7ab	6.16ab	14.2ab	4.1ab
	300	533.3ad	251.7ab	281.7ab	5.66ab	12.6ab	3.1b
Necrson	0.0	800ab	391.7a	408.3ab	4.51b	11b	3.5b
	100	933.3a	340ab	593.3a	7.43a	14.5a	4.5ab
	200	491.7bd	266.7ab	225b	6.13ab	13.6ab	4.3ab
	300	575ad	216.7b	358.3ab	6.07ab	11.4ab	3.9b
Beitalph	0.0	526.7ac	275ab	251.7b	7.32a	13.8ab	3.3b
	100	425bd	285.3ab	166.7b	6.87ab	12.9ab	3.5b
	200	433.3bd	250ab	183.3ab	6.68ab	13.6ab	4.5ab
	300	533.3ad	233.3ab	300ab	7.39a	13.5ab	4.2ab
Rasheed	0.0	416.7bd	270ab	180b	5.36ab	13ab	3.6b
	100	456.7bd	216.7b	206.7b	6.79ab	13.1ab	3.7b
	200	335d	196.7b	138.3b	6.15ab	14.6a	4.3ab
	300	373.3cd	233.3ab	140b	5.99ab	14.7a	3.8b

Pfwt = plant fresh weight ($g.m^{-2}$); sfwt = stem fresh weight ($g.m^{-2}$); lfwt = leaf fresh weight ($g.m^{-2}$); sdm% = stem dry matter percentages; ldm% = leaf dry matter percentages; fdm% = fruit dry matter percentages;

Non-significant differences were detected in the response of stem fresh weight to varying rates of applied GA_3 (table, 2). However, regression results (figure, 2) manifested that individual stem fresh weight responses to different GA_3 concentrations is governed by negative linear correlation in which it could be forecasted by the following equation: stem fresh weight (g) = 279.033 – 0.124667 (GA_3).

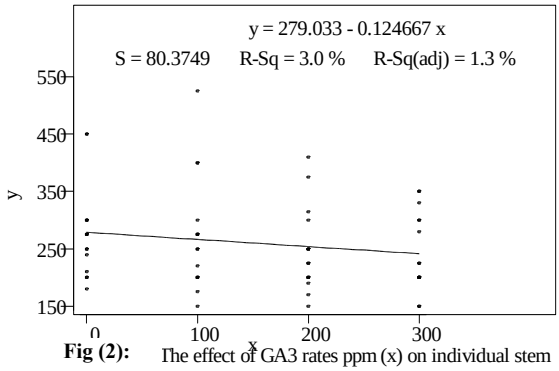

Fig (2): The effect of GA3 rates ppm (x) on individual stem fresh weigh g (y)

Significant differences were not found in the responses of fresh weight of leaves per plant to varying GA_3 concentrations (table, 2). Regression results (figure, 3) exhibited that fresh weight of leaves were increased at GA_3 rates beyond zero until they had their highest value at 75 $mg.l^{-1}$ then, they declined to their lowest value at 230 $mg.l^{-1}$ and finally slight increases were overwhelming. Subsequently, leaf fresh weight responses are dominated by cubic regression type and could be estimated by the following equation: leaves fresh weight per plant = 318.667+ 1.51722 (GA_3 rate) – 0.0166167(GA_3 rate) $^{**\,2}$ + 0.0000381(GA_3 rate) $^{**\,3}$.

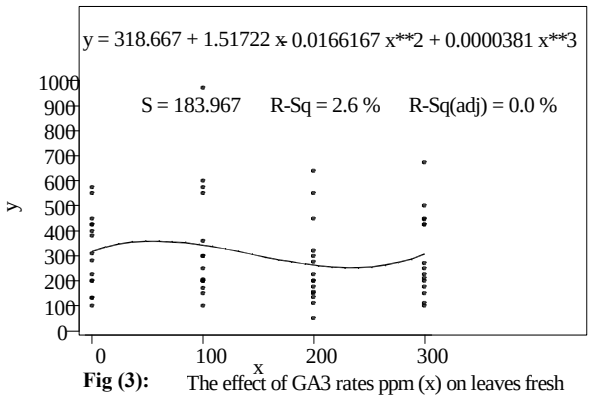

Fig (3): The effect of GA3 rates ppm (x) on leaves fresh weigh (g)/plant (y)

Significant differences were not detected in the responses of stem dry matter percentages to different rates of GA_3 (table, 2). Regression analysis (figure,4) showed that stem dry matter accumulations are increased at rates beyond zero till they approach their maximum magnitude at 90 mg.l^{-1}, then decline values are observed thereafter, they were slightly increased. Thus, cubic regression type is the most suitable equation for estimating these responses as below: (stem dry matter % = 6.07067 + 0.0190822(GA_3 rate) - 0.0001577(GA_3 rate)**2 + 0.0000003(GA_3 rate) **3.

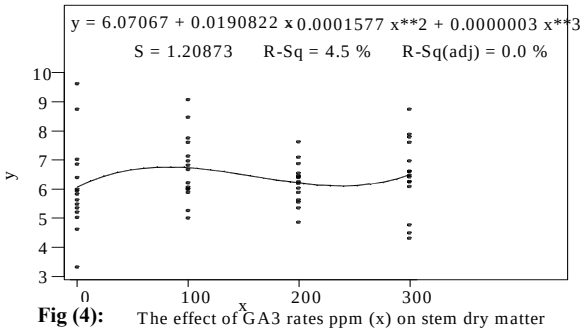

Fig (4): The effect of GA3 rates ppm (x) on stem dry matter percentage (y)

The obtained results (table, 2) manifested that leaf dry matter accumulation were not substantially affected by varying GA_3 concentrations. However, regression analysis confirmed that dry matter percentages of leaf were gradually increased beyond zero to attain its maximum value at 150 mg.l^{-1} rate and then gradual reductions were followed at rates higher than 150 mg.l^{-1} rate. Subsequently leaf dry matter percentages (figure, 5)could be estimated by the following quadratic equation:leaf dry matter percentage= 13.1709 + 0.0095393 (GA_3 rate)- 0.0000306(GA_3 rate)**^{2}.

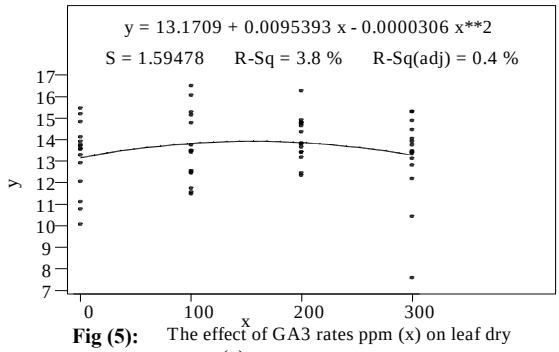

Fig (5): The effect of GA3 rates ppm (x) on leaf dry matter percentage (y)

Results in table (2) exhibited that accumulation of dry matter in fruits were not profoundly influenced by gibberellic acid application. However, gradual increases were found at rates beyond zero where the highest magnitude was confined to 190 mg.l^{-1} rate then overwhelming declines were observed (figure, 6). Therefore, dry matter accumulation in fruits is dominated by quadratic regression type and they could be forecasted by the following equation: fruit dry matter % = 3.6653 + 0.0080963 (GA_3 rate) - 0.0000253 (GA_3 rate) **^{2}.

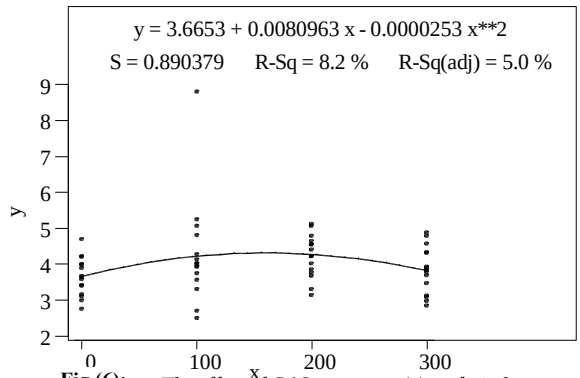

Fig (6): The effect of GA3 rates ppm (x) on fruit dry matter percentage (y)

Cucumber plants treated by 300 mg.l^{-1} rate substantially exceeded these of untreated check by 5% in fruit diameter of first harvest (table, 3). Means of fruit diameter at varying harvesting times were linearly responded to GA_3 rates. These responses could be estimated by the following equation: fruit diameter cm = 35828 + 0.0005747 (GA_3 rate).

Table (3): The effect of GA_3 rates (mg.l^{-1}) on diameters and length (cm) of fruits at varying harvests

	traits	fdiah2	fdiah3	fdiah4	fdiat	flh1	flh2	flh3	flh4	flht
cultivars	Bab	3.83a	3.88a	3.71a	3.71a	11.3ab	15.64c	16.32ab	16.72cd	15.3a
	Gab	3.82a	3.34b	3.8a	3.65a	13.73a	17.69b	15.8ab	17.06bc	16.1ab
	Necr	3.55a	3.27b	3.95a	3.62a	5.8b	18.96a	16.43ab	18.3ab	14.87b
	Beit	3.82a	3.41b	3.9a	3.71a	5.81b	15.64c	14.35c	15.43d	12.81c
	Rash	3.65a	3.35b	3.97a	3.66a	10.33ab	19.92a	17.43a	19.02a	16.62a
GA_3 rate	0.0	3.62a	3.39a	3.67a	3.56b	8.23a	17c	15.99a	17.29a	14.63a
	100	3.83a	3.46a	3.96a	3.68ab	9.93a	17.4bc	15.83a	16.88a	15.02a
	200	3.69a	3.41a	3.9a	3.7ab	10.54a	18.1ab	15.99a	17.28a	15.48a
	300	3.77a	3.55a	3.92a	3.74a	9.4a	18.67a	16.41a	17.68a	15.5a
Babylon	0.0	3.3b	4a	3.35a	3.55a	11.5ae	15.9eg	16.33ad	15.63cd	14.48ad
	100	4.14a	3.95ab	3.82a	3.63a	11.17ae	15.5gf	16.28ad	15.92be	14.72ad
	200	3.89ab	4.02a	3.87a	3.93a	5.03ce	18.83ad	17.08ac	17.42ad	14.59ad
	300	3.8ab	3.56ab	3.79a	3.72a	17.5ab	17.33cf	15.58ad	17.92ad	17.09a
Gabbar	0.0	3.76ab	3.19bc	3.74a	3.53a	13ad	18ae	15.83ad	18.75ac	16.4ab
	100	3.8ab	3.55ac	4.18a	3.85a	16.67ac	16.42dg	15.05ad	16.17be	16.07ac
	200	3.58ab	3.38ac	3.71a	3.65a	12ad	17.42cf	15.67ad	16.67be	15.44ad
	300	3.96ab	3.41ac	3.62a	3.66a	17.83a	18.53ae	16.58ad	16.67be	17.42a
Necrson	0.0	3.68ab	3.08c	3.83a	3.53a	0.0e	18.42ae	16ad	18.33ad	13.19cd
	100	3.67ab	2.92c	4.06a	3.55a	6be	18.75ad	15.27ad	18.25ad	14.57ad
	200	3.59ab	3.27ac	3.85a	3.69a	12.25ad	19.42ac	17.17ac	17.83ad	17.42a
	300	3.51ab	3.69ac	3.96a	3.72a	0.0e	19.18ad	17.15ac	18.33ad	13.67bd
Beitalph	0.0	3.92ab	3.1c	3.39a	3.47a	9.67ae	15.25gf	14cd	13.48e	13.15cd
	100	4.04a	3.52ac	3.95a	3.84a	4.83de	15.5gf	14.43bd	14.92de	12.42d
	200	3.65ab	3.38ac	4.08a	3.7a	8.75ae	14.48g	13.8d	15.92be	13.24cd
	300	3.66ab	3.63ac	4.16a	3.82a	0.0e	17.33cf	14.97ad	17.42ad	12.43d
Rasheed	0.0	3.44ab	3.59ac	4.02a	3.68a	7ae	17.42cf	17.58ab	20.25a	15.56ac
	100	3.49ab	3.36ac	3.79a	3.55a	11ae	20.92a	18.12a	19.17ab	17.3a
	200	3.75ab	3.01c	4.02a	3.6a	11.67ae	20.42ab	16.25ad	18.58ac	16.73ab
	300	3.91ab	3.44ac	4.06a	3.8a	11.67ae	20.92a	17.75a	18.03ad	16.89a

fdiah2, h3, h4(cm) = fruit diameter at second, third, fourth harvests, respectively; fdiaht = means of fruit diameters; flh1, flh2, flh3 and flh4 (cm) = fruit length at first to fourth harvests, respectively; flht = means of fruit lengths

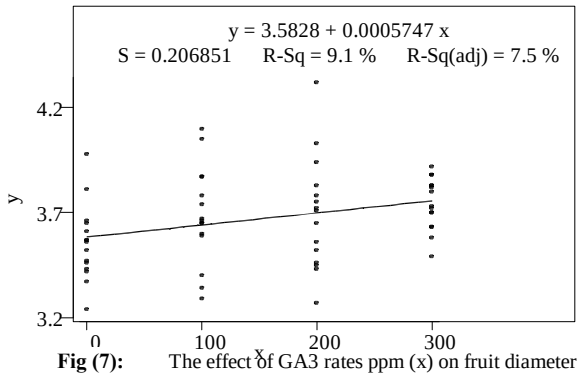

Fig (7): The effect of GA3 rates ppm (x) on fruit diameter mean cm (y)

Cucumber plants treated by 300 mg.l^{-1} GA_3 rate profoundly increased the fruit length at second harvest in relation to untreated check (9.8%) and to 100 mg.l^{-1} GA_3 rates (7.2%). Furthermore, 200 mg.l^{-1} GA_3 rate substantially exceeded that of control by (6.7%) in the same trait (table, 3). Regression analysis (figure, 8) exhibited that fruit length was linearly responded to GA_3 rates and this response could be estimated by the following equation: fruit length (cm) = 14.6945 + 0.003082 (GA_3 rate).

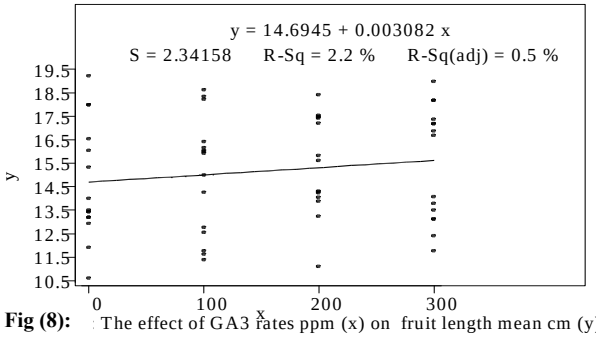

Fig (8): The effect of GA3 rates ppm (x) on fruit length mean cm (y)

Cucumber plants sprayed by 100 mg.l^{-1} rate substantially exceeded those sprayed with 300 mg.l^{-1} rate and with 200 mg.l^{-1} rate by (43.43 and 51.92%, respectively) in fruit number per meter square at fourth harvest. In addition to that, plant treated with GA_3 rate of 300 mg.l^{-1} apparently exceeded these of control in the above parameter at fifth harvest (table, 4).

Table (4): The effect of GA_3 rates (mg.l^{-1}) on fruit number per meter square at varying harvests and final number

	Traits	H1	H2	H3	H4	H5	H6	Ht
Cultivars	Bab	2.02ab	16.67a	9.17a	14.33a	4.42ab	12.67a	59.27a
	Gab	2.39a	17.92a	7.69a	11.46ab	5.69ab	9.31ab	54.47ab
	Necr	0.36c	10.73b	7.64a	8.18b	2.73b	8.82b	38.46c
	Beit	0.73bc	17.83a	8.75a	9.33b	5.75a	10.08ab	52.47ab
	Rash	1.5ac	15.25a	6.5a	10.25ab	5.33a	10.25ab	49.09b
GA_3 rate	0.0	1.6a	14.13a	7.93a	10.4a	3.6b	11.4a	49.06a
	100	0.9a	16.53a	6.87a	13.87a	4.87ab	8.87a	51.9a
	200	1.41a	14.93a	7.6a	9.13b	4.87ab	10.13a	48.08a
	300	1.82a	17.6a	9.4a	9.67b	6a	10.53a	55.02a
Babylon	0.0	1.92ad	14bd	11a	12.67ac	2.67bc	11ac	53.52ac
	100	3.12ad	22.67a	6.33ab	20.33a	5ac	14a	69.65a
	200	1.7ad	14.67ac	8.67ab	10bd	4.67ac	14a	53.7ac
	300	3.14ac	15.33ac	10.67ab	14.33ac	5.33ac	11.67ac	60.47ab
Gabbar	0.0	3.92a	19.33ab	6.67ab	10bd	5ac	12.33ac	57.25ac
	100	1.4ad	17ac	7ab	17.33ab	6.33ac	5c	54.06ac
	200	1.73ad	16ac	7.67ab	9.33bd	4ac	8.67ac	47.4bd
	300	3.31ab	20.33ab	9.33ab	10.33bd	8.67a	11ac	62.97ab
Necrson	0.0	0.0d	9.33cd	6.33ab	10bd	3.33ac	8.67ac	37.67cd
	100	0.33d	12.33bd	7.67ab	9bd	3.33ac	6.67ac	39.33cd
	200	1bd	6.33d	8ab	6.33d	1.67c	8.67ac	32d
	300	0.0d	16.33ac	8.67ab	7.33bd	2.33bc	11.67ac	46.33bd
Beitalph	0.0	1.73ad	15.33ac	7.67ab	10bd	3.67ac	11.33ac	49.67ad
	100	0.52cd	17ac	7ab	6d	5.33ac	7.33ac	43.19cd
	200	0.67bd	18.67ab	9.67ab	12ad	7.67ab	13.67ab	62.97ab
	300	0.0d	20.33ab	10.67ab	9.33bd	6.33ac	8ac	54.67ac
Rasheed	0.0	0.45cd	12.67bd	8ab	9.33bd	3.33ac	13.67ab	47.45bd
	100	0.94bd	13.67bd	6.33ab	16.67ac	4.33ac	11.33ac	53.27ac
	200	1.95ad	19ab	4b	8bd	6.33ac	5.67bc	44.95bd
	300	2.67ad	15.67ac	7.67ab	7cd	7.33ac	10.33ac	50.67ad

However, fruit numbers .m^{-2} were increased at rates beyond zero until they attain 90 mg.l^{-1} rate and then they were gradually declined to approach the lowest value at 200 mg.l^{-1} rate, finally they raised to their maximum value at 300 mg.l^{-1} rate (figure, 9). Therefore, fruit numbers are cubically governed by GA_3 and they could be forecasted by the following equation: fruits .m^{-2} = 49.0567 + 0.119924 (GA_3 rate) - 0.0000029 (GA_3 rate) **^{2}.

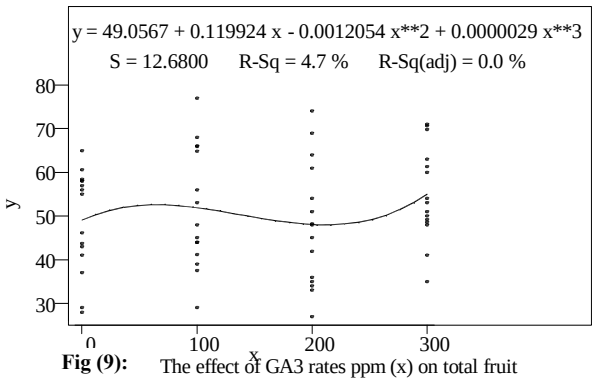

Fig (9): The effect of GA3 rates ppm (x) on total fruit number /m2 (y)

Plants treated with GA_3 rate of 300 mg.l^{-1} (table, 5) profoundly exceeded these of untreated check in individual fruit fresh weight at second harvest (26.14%), at third harvest (23.9%) and total mean (12.12%). Cucumber plants treated with 200 GA_3 rate highly exceeded these of control in mean of individual fruit fresh weight by (18.9%). Moreover, treatment of 100 GA_3 rate gave fresh fruit weights substantially higher than control at second harvest (26.14%) and in the total mean (10.87%). Regression analysis (figure, 10) displayed that fruit fresh weights are linearly correlated to GA_3 rates and thus they could be estimated by the following equation: fruit fresh weight (g) = 114.158 + 0.0490793 (GA_3 rate).

Table (5): The effect of GA_3 rates (mg.l^{-1}) on fresh weight of individual fruit (g) at varying harvests

	traits	H1	H2	H3	H4	H5	H6	Ht
cultivars	Bab	82.96ab	199.54a	139.81ab	142.21a	145.51a	123.17a	138.87a
	Gab	121.35a	131.9b	126.28ab	171.16a	117.93ab	116.97a	130.99b
	Necr	43.36b	138.84b	108.26b	170.34a	96.28b	116.97a	112.3cd
	Beit	48.33b	142.15b	107.19b	147.02a	87.35b	98.99a	105.17d
	Rash	87.06ab	147.34b	125.84ab	154.99a	89.32b	107.72a	118.71bc
GA_3 rate	0.0	72.33a	129.94b	110.71b	146.6a	90.47a	109.82a	109.98b
	100	73.02a	163.91a	118.82ab	152.9a	110.13a	1112.78a	121.93a
	200	86.97a	151.54ab	120.37ab	179.94a	125.79a	119.86a	130.8a
	300	97.33a	163.91a	137.2a	149.18a	104.17a	108.43a	123.38a
Babylon	0.0	92.5ac	177.24ac	136.66ad	135.14a	101.94ac	124.58ab	128.04ae
	100	70ac	202.01ab	131.37ad	140.17a	135.77ac	116.08ab	132.57ad
	200	45.83bc	215.34a	158.22ab	173.61a	174.93a	141.46ab	151.57a
	300	123.5ab	203.4ab	132.98ad	119.92a	169.39ab	110.54ab	143.29ab
Gabbar	0.0	111.67ac	131.78bd	102.57cd	139.01a	100.96ac	105.76ab	115.29cf
	100	134.17ab	151.16ad	138.44ad	187.71a	150.86ac	124.17ab	147.75a
	200	100ac	126.62cd	98.25cd	219.05a	133.47ac	118.02ab	132.81ad
	300	180a	145.8ad	166.09a	144.48a	97.25ac	129.32ab	143.98ab
Necrson	0.0	0.0c	82.33d	109.67bd	133.48a	116.06ac	88.45b	88.32g
	100	31.67bc	148.78ad	93.57d	170.17a	102.54ac	99.06ab	107.63df
	200	127.33ab	137.68bd	108.53bd	194.05a	98.75ac	153.33a	136.61ac
	300	0.0c	156.53ac	127.06ad	178.33a	64.17c	115.94ab	107dg
Beitalph	0.0	77.5ac	141.84bd	112.29bd	170.06a	77bc	112.92ab	115.27cf
	100	37.5bc	160.35ac	95.18d	122.92a	71.23c	95.3ab	97.08eg
	200	78.33ac	117.95cd	109.63bd	122.93a	105.33ac	91.78b	104.22eg
	300	0.0c	148.45ad	111.65bd	172.77a	95.83ac	95.96ab	104.11eg
Rasheed	0.0	80ac	116.33cd	92.38d	155.33a	56.39c	117.38ab	102.97eg
	100	91.75ac	157.24ac	135.52ad	143.52a	90.24ac	129.32ab	124.6af
	200	83.33ac	160.11ac	127.21ad	190.69a	116.47ac	94.72ab	128.76af
	300	93.17ac	155.66ac	148.24ac	130.42a	94.2ac	89.46ab	118.52bf

* H1,H2 and H6 =(Harvest1 to H1 to harvest 6); Ht= Total sum of yield;

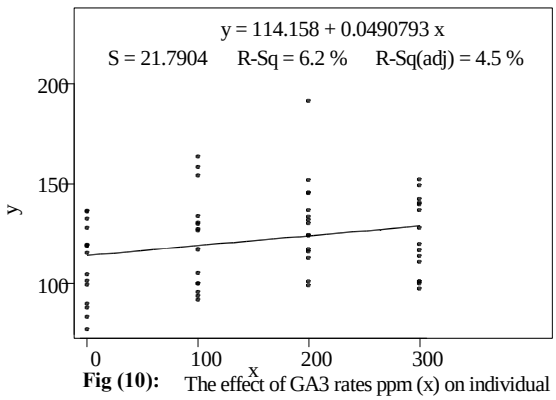

Fig (10): The effect of GA3 rates ppm (x) on individual fruit fresh weight mean g (y)

Cucumber plants sprayed by 300 mg.l^{-1} GA_3 rate (table, 6) highly exceeded these of untreated control in yield of second harvest (52.2%), 100 mg.l^{-1} GA_3 rate in yield of third harvest (52.9%) and check in yield of fifth harvest (88.34%). Plants treated with 100 mg.l^{-1} GA_3 rate substantially exceeded these of untreated in first harvest yield (47.6%) and these of 300 mg.l^{-1} GA_3 rate in the yield of fourth harvest (60.4%). Finally, 200 mg.l^{-1} GA_3 rate treated plants significantly exceeded the yield of fifth harvest (86.56%). Regression analysis (figure, 11) manifested that cucumber yield showed gradual increase until they reached their maximum magnitude at 100 mg.l^{-1}GA_3 rate , the they declined step by step to attain their lowest value 275 mg.l^{-1} GA_3 rate. Thereafter, they resumed to rise slightly. Therefore, cucumber yield response to GA_3 rates was overwhelming by the following cubic equation: yield g.m^{-2} = 6356.4 + 28.033 (GA_3 rate) – 0.24097(GA_3 rate)^{**2} + 0.0005352 (GA_3 rate)^{**3}. Gibberellic acid role in plant metabolism is well established. It is used exogenously to compromise the synthetic once to antagonized growth retardants. Kevin (2006) stated hat gibberellic acid (GA_3) is a naturally occurring plant hormone that regulates the growth of plants, including triggering seed germination. He found that if gibberellic acid is applied to a plant, the next generation of the plant would also benefit from faster flowering and increased height. The results showed that GA_3 application resulted in non-significant differences in some of the detected traits (tables, 2-6). Vavrina (1998) found that atonik when used in fall 1996, as either a foliar or a soil application had no effect on growth or yield of hybrid cucumber under seepage irrigation. He assigned his results to that the fall 1996 growing season was very mild, producing good plant growth and high yields statewide. Additionally, the cucumber crop was never under an imposed nutrient or water stress. These factors may have contributed to the lack of results noted. Perhaps under conditions of greater stress a plant growth stimulator (Atonik) would produce meaningful differences.

GA_3 application revealed slight increases in stem fresh weight, plant fresh weight, leaves fresh weight and dry matter accumulation in leaves. Koornneef and Van der Veen (1980) stated that the main characteristics of GA-deficient mutants like the Arabidopsis ga1-3 mutant is their dwarf growth and the occurrence of small dark green leaves. Carrera *et al.* (2000) postulated that GA overproduction phenotypes is characterized by longer hypocotyls, increased internodes length, pale green leaves, and early flower induction.

Cucumber treated with 300 mg.l^{-1} revealed significantly higher final fruit diameter and fruit length at second harvest (table, 3). These results might be assigned to the role of gibberellic acid in cell division and enlargements. Generally, it is assumed that GA promotes both cell division and cell elongation. GA exert its control on cell division through transcriptional activation of cyclin-dependent protein kinases and mitotic cyclin genes (Sauter *et al*., 1995). Or it might be referred to the role of GA_3 on xylem and xylem fiber. Erikson *et al*. (2000) found that transgenic hybrid aspen expressing an AtGA20-ox had more and longer xylem fiber compared to control plants, suggesting that elevated GA levels stimulate secondary growth. Short term of GA_3 feeding of excised petioles induced lignin formation in the absence of transcriptional activation of pathway specific genes. Thus, short term GA treatment mediates lignin deposition most likely by polymerization of performed monomers, whereas long term effects on lignifications involve elevated production of precursors by transcriptional stimulation of the biosynthetic pathway. Increasingly analysis of stem cross sections revealed a differential effect of GA on the formation of xylem and pith cells. The number of lignified vessels was in creased in AtGA20-ox plants pointing to a simulation of xylem formation while the number of pith cells declined indicating a negative regulation (Biemelt *et al*., 2004).

Cucumber sprayed by 300 mg.l^{-1} substantially increased fruit number, fruit fresh weight and yield (tables, 4-6). These results indicated that GA_3 enables the plant to generate more fruits through improving fruit setting by assimilate surplus. The gas exchange measurements of AtGA20-ox plants performed in the canopy chamber revealed approximately 10% higher photosynthetic activity compared to wild-type plants of lower GA. Apparently the rise in photosynthetic activity was not caused by an increased CO_2 assimilation rate per leaf area, but was most likely due to an optimal arrangement of leaves along the enlarged internodes, thereby avoiding self-shading of leaves. This was reflected by approximately 20% higher biomass accumulation of AtGA20-ox plants. (Biemelt *et al*., 2004). Higher fruit fresh weight is a reflect of higher growth rate of fruit, especially when plots are periodically harvested and so does yield. Kevin (2006) reported that increasing yield with gibberellic acid application is a well-researched area, although the results of gibberellic acid (GA_3) application vary depending on many factors, including the type of plant it has applied to.

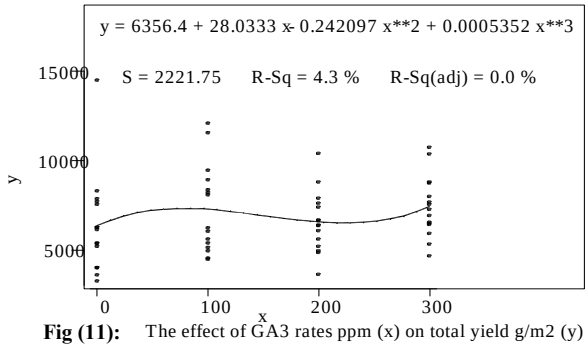

Fig (11): The effect of GA3 rates ppm (x) on total yield g/m2 (y)

Table (6): The effect of GA_3 rates

	traits	H1	H2	H3	H4	H5	H6	Ht
cultivars	Bab	226.67ab	3221.7a	1319.2a	1978.8a	697.5a	1901.3a	9384.3a
	Gab	343.08a	3292.5b	937.7ab	1963.1a	627.7a	927.3b	7191.3b
	Necr	43.36c	1527.3c	811.4b	1307.3a	368.6b	1005.5b	5063.4c
	Beit	86.25bc	2518.8b	951.7ab	1314.2a	504.2ab	1106.7ab	6481.7bc
	Rash	214.17ac	2242.3	804.5b	1455.8a	499.2ab	1049.2b	6227.7bc
GA_3 rate	0.0	190a	1837b	911.3ab	1488.3ab	343b	1587.3a	6356.4a
	100	136a	2711a	815b	2142a	545.3ab	924.7a	7274a
	200	186.13a	2236ab	895.3ab	1493.3ab	640.7a	1139.7a	6561.1a
	300	270.67a	2795.7a	1246.3a	1335.3b	646a	1135a	7429a
Babylon	0.0	283.3ab	2410bc	1538.3a	1873.3ac	271.7bc	3316.7a	9690ab
	100	141.7b	4326.7a	851.7ab	2825ab	631.7ac	1203.3b	9980a
	200	233.3ab	3071.7ab	1356.7ab	1608.3bc	880ac	1790ab	8940ac
	300	408.3ab	3078.3ab	1530a	1608.3bc	1006.7a	1295b	8927ac
Gabbar	0.0	350ab	2528.3bc	686.7ab	1380bc	516.7ac	973.3b	6435af
	100	311.7ab	2550bc	943.3ab	3406.7a	895ab	526.7b	8633ad
	200	250ab	2060bd	751.7ab	1755bc	531.7ac	881.7b	6230bf
	300	575a	2985.7ab	1346.7ab	1553.3bc	718.3ac	1350b	8529ae
Necrson	0.0	0.0b	633.3e	718.3ab	1321.7bc	441.7ac	753.3b	3868f
	100	31.7b	1800be	728.3ab	1435bc	486.7ac	673.3b	6230df
	200	127.3b	848.3de	810ab	1206.7bc	245bc	1223.3b	4461f
	300	0.0b	2561.7bc	1053.3ab	1241.7bc	236.7bc	1323.3b	6417af
Beitalph	0.0	208.3ab	2183.3bd	876.7ab	1678.3bc	288.3bc	1630ab	6865af
	100	58.3b	2733.3bc	666.7ab	728.3c	365ac	746.7b	5298cf
	200	78.3b	2155bd	1070ab	1426.7bc	803.3ac	1273.3b	6807af
	300	0.0b	3003.3ab	1193.3ab	1423.3bc	560ac	776.7b	6957af
Rasheed	0.0	108.3b	1430ce	736.7ab	1188.3bc	196.7c	1263.3b	4923ef
	100	136.7b	2145bd	885ab	2315ac	348.3ac	1473.3b	7303af
	200	241.7ab	3045ab	488b	1470bc	743.3ac	530b	6383af
	300	370a	2349.3bc	1108.3ab	850c	708.3ac	930b	6316af

* H1,H2000H6 =(Harvest1 to Harvest6); Ht= Total sum of yield;

Cultivars and GA_3 interaction: Plants of Babylon cultivar sprayed by 100 mg.l^{-1} GA_3 rate appeared to be the most potent interaction treatment. Since, it manifested the highest fruit number at sixth harvest (14 fruits. m^{-2}), Total fruit number (69.65 fruits. m^{-2}) fruit yield at second harvest (4326.7 g.m^{-2}), fourth harvest (2825 g.m^{-2}), and in the mean of total yield (9980 g.m^{-2}). These increases were substantially higher over most other interaction treatments (table, 2-6). On the other hand, untreated plants of Necerson cultivar were the worst interaction treatment. It gave the lowest dry matter percentages of stem, leaves and fruit (4.51, 10.97 and 3.53%, respectively), fruit diameter at third harvest and final mean (3.01 and 3.53 cm, respectively), fruit number at first harvest and final mean (0.0 and 37.67 fruit. m^{-2}, respectively), fruit fresh eight at sixth harvest and final mean (88.45 g and 88.32 g, respectively).

The highest plant fresh weight was accompanied with Necrson cultivar sprayed by 100 mg.l^{-1}. However, this cultivar failed in manifesting competitive yield. This might be attributed to the response of this cultivar to varying GA_3 concentrations. On the other hands, Babylon showed the best responses to GA_3 which reflected on yield and yield components. These improvements might be brought about through the influence of GA_3 on photosynthesis. Ashraf *et al.* (2002) found that GA_3 treatment of salt-stressed wheat plants resulted in an increased photosynthetic capacity, which was discussed as a major factor for a greater dry matter production. Although photosynthesis per unit area was unaffected in GA-deficient mutant, carbon assmilaton per unit plant mass was reduced compared to wild type, which was brought about by lower specific leaf area (Biemelt *et al.*, 2004).

Cultivar responses were apparent at third and fourth harvests, as they were conducted during late May. Naaldwijk (1999) reported that as light intensity and day length increase during May and June, the cucumber plant becomes increasingly more generative. More fruit will be harvested and less fruit abortion will occur. All of these things will put added strain on the allocation of assimilates to other plant parts such as leaves and roots. He assigned that as day length increases, night length decreases. Consequently, there is less time for the plant to respire during night and use up assimilates that it created during the day (photosynthesis). This will contribute to a generative plant growth environment. The same scenario will be acting on tomato and pepper crops. He stated that during the month of June, the opportunities to work with temperature less than 22^{0}C become less common. Temperatures are on the rise during this period. However, some steps can be taken to work the best possible way given the circumstances you have to work with. If the nights are still cool enough, there may still be possibilities to have a temperature correction in the morning in order to make the plant react generatively through ventilation.

Table (7): The meteorological data. (Obtained from forestry Dept.)

Parameters	April	May	June	July
Max Tem ^{0}C	19.9	33.1	38.9	40.8
Mini. Temp^{0}C	8.6	18.7	18.6	24.5
Relative Hum. %	59.3	40.6	28.6	25.2
Rainfalls (mm)	70.8	16.8	0.0	0.0

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تقييم خمسة أصناف للخيار (*Cucumis sativus* L) واستجابتها لمعدلات مختلفة من حامض الجبرليك GA3

الخلاصة

أجريت هذه الدراسة في حقل البحوث لقسم البستنة، كلية الزراعة، جامعة دهوك خلال موسم النمو 2007 لتقييم جـودة الانتاج لخمسة أصناف من الخيار وهي (Babylon و Beitalpha Necrson و Gabbar و Beitalpha و Rasheed) واستجابة هذه لأصناف لمستويات مختلفة من حامض الجبرليك.أظهرت النتائج امكانية ترتيب الأصناف حسب أفضليتها في الانتاج كما يلي: Beitalpha Necrson)> Beitalpha > Rasheed > Gabbar >(Babylon.

وكانت معاملة الرش 300 ملغم/ لتر GA_3 من أفضل المعاملات إذ أعطت أعلى عدد للثمار (55 ثمرة/ م^2) وأعلـى حاصـل (7429 غ/ م^2). أظهرت تحليلات اتجاه الانحدار بأن حاصل الخيار تتحكم فيه معادلة الانحدار من الدرجة الثالثة ويمكن تخمينه مـن المعادلة التالية:

Yield g/m2= 6356.4 + 28.033 (GA3 rate) – 0.24097 (GA3 rate)*2 + 0.0005352 (GA3)3 نباتـات صـنف Babylon المعاملة بمعدل 100 ملغم/ لتر حامض الجبرليك كانت من أفضل معاملات التداخل على الاطلاق حيث أعطت أعلـى عدد للثمار (69.65 ثمرة/ م^2) وكذلك أعلى حاصل (9980 غم/ م^2).**

هەلسەنگاندنا پێنج جورێن خیارا (Cucumis sativus L) وهاتنا بەرهەمی ل دویف رێژێن جودا ژ ترشیێ جبرلینی کورتی

ئەڤ ڤەکولینە هاتە کرن ل زەڤیێن ڤەکولینا ل پشکا بیستانکاری، کولیژا چاندنیێ، زانکویا دهوك دوەرزیێ شـینبوونیێ ل سـالا 2007 بهەلسەنگاندنا پێنج جورێن خیارا Babylon و Beitalpha Necrson و Gabbar و Beitalpha و Rasheed وهاتنا بەرهەمیێ وان ل دویف رێژێن جودا ژ ترشیێ جبرلینی. ئەنجامان دیارکر کو ئەم دشێین ئەڤان جورا وەکی خواریێ ل دویڤ ئێك بدانین:

Beitalpha Necrson> Beitalpha > Rasheed > Gabbar >Babylon سەرەدەریا رەشاندنیێ ب 300 ملغم/ لـتر ژجبرلینـی یـا ژهەمیان باشتربوو بدەستڤە ئینانا بلندترین ژمارا خیارا (55 خیار/ م^2) وبلندترین بەرهـەم (7429 غم/ م^2). ڤاڤارتنـا بـەریێ انحـداریێ دیارکر کو بەرهەمیێ خیاریێ دهێتە.بریڤەبرن ل دویف معادلا خواریێ:

Yield g/m2= 6356.4 + 28.033 (GA3 rate) – 0.24097 (GA3 rate) + 0.0005352 (GA3) رووەکـێن جـوریێ Babylon ئەوێن هاتینە رەشاندن ب 100 ملغم/ لـتر ژترشیێ جبرلینی باشترین سەرەدەریێن لێکدانیێ دیارکر بدانا بلندترین ژمارا خیـارا (69.65 خیار/ م^2) ودیسان بلندترین بەرهەم (9980 غم/ م^2) .

EFFECT OF THE RELATIONSHIP BETWEEN REEL, THRESHING CYLINDER AND FORWARD SPEEDS FOR MASSY FERGUSON HARVESTER ON QUALITATIVE LOSS PERCENTAGE OF CHICKPEA CROP (*Cicer arietinum L.*)

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(Received: November 10, 2008; Accepted for publication : March 3, 2009)

ABSTRACT

The experiment was conducted during the spring season 2007 at College of Agriculture farm, University of Duhok at Sumel, to study the effect of relationship between reel speed, threshing cylinder speed and forward speed for Massy Ferguson harvester on qualitative loss percentage of chickpea. The combine harvester was self-propelled machine (Massy Ferguson MF8XP). The harvester setting included three forward speeds (2.16, 4.20 and 6.10 km/h); three reel speeds (10, 20 and 35 rpm) and three threshing cylinder speeds (350, 450 and 550 rpm). The factorial experiment was designed as RCBD, with three replicates. The visible qualitative loss percentage of chickpea was measured through analysis seed samples into: Intact seeds, broken seeds, weed seeds, other crop seeds, inert matter; while the invisible qualitative loss was measured through germination test which was evaluated as : natural germination, abnormal germination, dead seeds (watery and soft). The differences between treatment means were verified by Duncan's multiple range tests (1955) at 5% significant level. The results showed that there was no significant effect of forward speed on intact seed percentage but with the third speed it recorded higher natural germination percentage (88.03%). Thresher cylinder speed visible in qualitative gave highest natural germination percentage were 74.46% at the first thresher cylinder speed. In visible seed loss the interaction of first forward speed and first reel speed with second thresher cylinder speed (S1R1C2) scored higher intact seeds percentage 82.54% and lower inert matter percentage 12.31% compared with other interaction. While invisible qualitative loss, higher natural germination percentage was the interaction of first forward speed and third reel speed with first thresher cylinder speed (S1R3C1) and in third forward speed and first reel speed with first thresher cylinder speed (S3R1C1) 93%.

KEYWORDS Chickpea Combine Harvester Qualitative loss Thresher

INTRODUCTION

Chickpea (*Cicer arietinum L.*) was an ancient pulse crop; it was traditionally grown in semi- arid zones of India and Middle Eastern Countries Opliner el al (1990).Mechanization of food legume production is often much less developed than mechanization of cereals.

During manual harvesting a little loss of seed occurs, if the crop is harvested on time. This method results in few broken seeds but requires a good deal of labor for harvesting and cleaning, but it is very costly Hassan (1987).

Today there is attitude toward mechanical harvesting of such crops, but Combine losses can be occurred due to improper operation and machine adjustment. Therefore, a thorough knowledge of the combine and its function, and a desire to do the best possible job, are essentials for good combine operation. The first step for efficient combining operation is through study and understanding of the operation manual.

The threshers unit plays a key role in determining the performance of a combine harvester. Besides losses due to threshing and shattering, broken seeds and un threshed pods. If the machine is not properly adjusted the losses could be substantial. The percentage of broken seeds and un-threshed pods was higher in large seeded cultivars.

The mechanical damage is main factors affect seed quality, seeds can suffer mechanical damage during combine harvesting, resulting in broken embryos and abnormal germination development. Suitable adjustment of the different combine harvester units can prevent very important damage Fougereux (2000).

This research was conducted to study the effect of compatibility of several combine harvester components setting on qualitative loss percentage of chickpea crop for mechanical harvesting. The harvesting components involved were; three forward speeds of the combine harvester, three settings of reel speeds and three setting of threshing cylinder speeds.

MATERIALS AND METHODS

The research was carried out in the field of the College of Agriculture/ Duhok University, during the spring season 2007. The soil of the field was silty clay loam. The experiment included the effect of three factors (speed of thresher cylinder, harvester's forward speed and reel speed).

Two donum were planted directly after preparing the land; plowing and smoothing the soil, hand seeded of Kabuli variety of chickpea of 98% germination was sown at rate of 80kg/ha, and then covered with spring-tine cultivator. The growth characteristics of this variety were plant height 39 cm, the height of the lowest pod 19 cm, seeds are of ovate -shaped, and large size rough to the touch, white in color.

The factorial experiment was used as RCBD with three replications each was of 1.5 x 30 m. The treatments assigned, three harvester forward speeds (S):S1, S2, S3 which were 2.16, 4.20, 6.10 km/h., three reel speeds (R): R1, R2, R3 were 10, 20, 35 rpm, three speeds for thresher cylinder(C): C1, C2, C3 were 350, 450, 550 rpm respectively. The visible qualitative loss percentage of chickpea crop was detected through, intact seeds, broken seeds; weed seeds, other crop seeds, and inert matter. The invisible qualitative loss through natural germination, abnormal germination, dead seeds (watery and soft) and ungerminated hard seeds were determined. The differences between treatment means were verified by Duncan's multiple range tests (1955) at 5% significant level.

The combine harvester used was self-propelled

machine (Massy Ferguson Harvester MF8XP) England 2000 industrial year, operation width 150 cm after regulation unit of harvester according to variety condition growth as follows: clearance between cylinder and concave 24 mm, sieve aperture up–down (16-10) mm and fan speed was 900 rpm. The moisture content of seed was 14%.

Measurement of the combine harvester parameters:

1)Forward speed – a distance of 50m was measured and marked by two wooden pegs close to the line of combine operation. The combine was allowed to travel; a stop watch was used to measure time taken in traveling the marked distance. The readings were repeated three times and average value was taken for three speeds.

2) Reel speed- the reel was marked at one of its ends by fixing a piece of cloth. The time required by the reel to complete 20 rounds was recorded. The procedure was repeated three times and the average was taken. The diameter of the reel was measured and the speed was converted to km/h. the reel speed to combine forward speed ratio was determined by dividing the reel speed by the combine forward speed.

3) Cylinder speed- the cylinder was observed through the screen beside the seat of driver.

The qualitative loss percentage of chickpea crop:

A- Visible qualitative loss

After harvest completion from each replication, six samples were randomly drawn from seeds tank, samples were mixed thoroughly with each other to forming uniform sample not less than one kg, after that divided in to two samples weight each of 100 g by Boerner mechanical divider, (Khalaf and Rajbo) 2006). Sample was analyzed into:

1- Intact sound seeds percentage.
2- Broken seeds percentage.
3- Weed seeds percentage.
4- Other crop seeds percentage.
5- Inert matter percentage.

B- Invisible qualitative loss

Sample of 200 seeds from each replicate was drawn and placed on two blotter paper distance between seeds were double the diameter of the seed approximately, covered by another paper and placed in germinator which was set on 20 C˚ for 8 days ISTA (1985). The test was then evaluated by sorting into: natural germination percentage, abnormal germination percentage, dead seeds percentage and hard seeds percentage (Hard seeds percentage not appears in this study).

RESULTS AND DISCUSSION

There was no significant effect of harvester forward speed on visible qualitative loss with the exception of weed seeds percentage. It was obvious that as the forward speeds increases the weed seeds percentage decreased, as S3 scored lower percentage 0.48% compared with other speeds S1, S2 (0.99%, 0.76%) respectively table (1). These results contradict those of Kushwaha el al. (2005) who found that cleaning efficiency increased with decreasing ground speed. There was significant differences on invisible qualitative loss, it was obvious that as forward speed increased led to increase natural germination percentage which accompanied with the reduction of abnormal germination and dead seeds percentage, S3 recorded higher percentage of natural germination percentage (88.03%) but lower abnormal germination and dead seeds percentage (10.81%, 1.14%) respectively. This result crosses those of Mesquita el al (2005) who stated that the effect of higher ground speed was significantly worse; increasing of ground speed led to decrease of natural germination due to mechanical damage on seed.

Table(1): Effect of harvester forward speeds on studied properties.

Properties / Harvester forward speed (S)	visible qualitative loss				Invisible qualitative loss		
	Intact seeds%	Broken seeds% *	Weed seeds% *	Inert matter% *	Natural germination %	Abnormal germination % *	Dead seeds% *
S1	70.756 a	5.488 a	0.990 a	22.764 a	82.556 b	15.963 a	1.851 ab
S2	71.324 a	4.921 a	0.768 b	22.986 a	84.963 ab	12.444 b	2.592 a
S3	72.235 a	4.763 a	0.483 c	22.517 a	88.037 a	10.815 b	1.148 b

- Harvester forward speed (S): S1, S2, S3 were 2.16, 4.20, 6.10 km/h.
- * Less loss values better.

Table (2) showed the significant effect of harvester reel speed on studied properties the visible qualitative loss in term of broken and weed seeds percentages; the comparisons showed a lower broken seeds percentage 4.55% at the R2 but found more weed seed percentage at the same speed 0.92%. Al-Bana (1998) signed that lower reel speeds act to decreases feed rate of threshing unit. In spite of the remarkable effect on invisible qualitative loss, it was appear that R1and R3 performed better adjustment because of higher natural germination percentage 87.44% and 86.81% and lower abnormal seedling percentage 11.40%, 10.74% respectively.

Table(2): Effect of harvester reel speed on studied properties.

Reel speed (R) \ Properties	visible qualitative loss				Invisible qualitative loss		
	Intact seeds%	Broken seeds% *	Weed seeds% *	Inert matter% *	Natural germination%	Abnormal germination % *	Dead seeds% *
R1	72.100 a	5.039 ab	O.678 b	22.182 a	87.444 a	11.407 b	1.518 a
R2	70.776 a	4.555 b	0.925 a	23.743 a	81.296 b	17.074 a	1.629 a
R3	71.439 a	5.578 a	0.639 b	22.343 a	86.815 a	10.741 b	2.444 a

- Reel speed (R): R1, R2, R3 were 10, 20, 35 rpm.
- * Less loss values better.

The effect of threshing cylinder speeds on studied properties was observed in table (3) revealed its significant influenced on all properties excluding weed seeds percentage only among all visible qualitative loss, intact seeds percentage was 74.46% at C1 rpm and decreased at C2 and C3 to 67.6%, 70.24% respectively, inversely broken seeds percentage was raised in C3 to 7.48% .also inert matter percentage was higher in C2 25.70%. Dirk and Samuel (1996) reported that high threshing (rpm) is the main culprit causing seeds damage and cob breaks up. So it is best to keep threshing cylinder as low as possible. But there was no significant effect on invisible qualitative loss.

Table (3): Effect of Threshing cylinder speeds on studied properties.

Thresher Cylinder speed (C) \ Properties	visible qualitative loss				Invisible qualitative loss		
	Intact seeds %	Broken seeds % *	Weed seeds % *	Inert matter % *	Natural germination %	Abnormal germination % *	Dead seeds% *
C1	74.461 a	3.709 b	0.817 a	21.012 b	86.074 a	12.000 a	1.925 a
C2	67.609 b	3.981 b	0.704 a	25.705 a	85.370 a	12.704 a	1.925 a
C3	70.245 b	7.482 a	0.721 a	21.551 b	84.111 a	14.519 a	1.740 a

- Thresher cylinder speed (c): c1, c2, c3 were 350, 450, 550 rpm
- * Less loss values better

Concerning the effect of the interaction between harvester forward speed and reel speed on study properties table (4), indicated a significant differences between all studied properties, explanation to this phenomenon in that the interaction between S3 R3 led to highest intact seeds percentage 76.48% led to decrease the broken seeds and also reduced weed seeds and inert matter percentage at (4.69%, o.46% and 18.35%) respectively. While inversely the interaction between S3R1 led to increase of natural germination percentage (91.22%) which accompanied with reduction of abnormal germination percentage (8.11%) compared with other interactions. Al-Bana (1998) recommended adjusting reel speed, forward speed ratio so the reel speeds to be equal or less from forward speed.

Table (4): Effect of the interaction between harvester forward speeds and reel speeds on studied properties.

Interaction between (SR) \ Properties	visible qualitative loss				Invisible qualitative loss		
	Intact seeds %	Broken seeds % *	Weed seeds % *	Inert matter % *	Natural germination %	Abnormal germination % *	Dead seeds% *
S1R1	72.448 ab	5.591 ab	0.725 b	21.236 bc	83.444 b	15.667 b	2.000 a
S1R2	67.024 bC	4.565 ab	1.422 a	26.988 ab	76.111 c	23.000 a	0.889 a
S1R3	72.797 ab	6.307 a	0.825 b	20.070 bc	88.111 ab	9.222 cd	2.667 a
S2R1	74.366 a	4.770 ab	0.828 b	20.035 bc	87.667 ab	10.444 bcd	1.889 a
S2R2	74.573 a	4.263 b	0.845 b	20.318 bc	82.000 b	15.111 bc	2.889 a
S2R3	65.033 C	5.730 ab	0.631 b	28.605 a	85.222 ab	11.778 bcd	3.000 a
S3R1	69.486 abC	4.756 ab	0.481 b	25.276 abc	91.222 a	8.111 d	0.667 a
S3R2	70.731 abC	4.836 ab	0.509 b	23.923 abc	85.778 ab	13.111 bcd	1.111 a
S3R3	76.488 a	4.697 ab	0.461 b	18.353 c	87.111 ab	11.222 bcd	1.667 a

- Harvester forward speed (S):S1, S2, S3 were 2.16, 4.20, 6.10 km/h.
- Reel speed (R): R1, R2, R3 were 10, 20, 35 rpm.
- * Less loss values better.

The results of the interaction of harvester forward speeds with threshing cylinder speed on studied properties were shown in table (5). It is obvious that there were significant differences for all measured properties. The analysis indicated that the interaction between S3C1 scored higher intact seeds percentage 76.67%, which was due to a reduction in lower broken seeds percentage 4.16%, also invisible qualitative loss, registered higher of natural germination percentage 90% and lower of abnormal germination percentage to 8.55%.Brindir and Kilgour (1995) mentioned higher of ground speed act to crease of loss pod led to decrease in put feed in to thresher unit, therefore, must decrease of cylinder speed.

Table (5): Effect of interaction between harvester forward speeds and threshing cylinder speed on studied properties.

Properties / Interaction between (SC)	visible qualitative loss				Invisible qualitative loss		
	Intact seeds %	Broken seeds % *	Weed seeds % *	Inert matter % *	Natural germination %	Abnormal germination % *	Dead seeds% *
S1c1	76.044 a	3.125 c	1.121 a	19.709 bcd	81.333 b	17.556 a	1.111 ab
S1c2	72.119 ab	3.707 c	1.016 a	23.157 abcd	83.556 b	13.889 abc	2.556 ab
S1c3	64.107 c	9.631 a	0.835 abc	25.427 abc	82.778 b	16.444 a	1.889 ab
S2c1	70.662 abc	3.835 c	0.945 ab	24.557 abcd	86.889 ab	9.889 bc	3.222 a
S2c2	68.370 bc	4.338 c	0.595 bcd	26.696 ab	85.556 ab	11.889 abc	2.556 ab
S2c3	74.940 ab	6.591 b	0.763 abc	17.705 d	82.444 b	15.556 ab	2.000 ab
S3c1	76.678 a	4.167 c	0.385 d	18.769 cd	90.000 a	8.556 c	1.444 ab
S3c2	68.338 bc	3.898 c	0.502 cd	27.261 a	87.000 ab	12.333 abc	0.667 b
S3c3	71.689 ab	6.225 b	0.564 cd	21.522 abcd	87.111 ab	11.556 abc	1.333 ab

- Harvester forward speed (S):S1, S2, S3 were2.16, 4.20, 6.10 km/h.
- Thresher cylinder speed (C): C1, C2, C3 were 350, 450, 550 rpm
- * Less loss values better.

Table (6) displayed the effect of interaction between reel speed and threshing cylinder speed on study properties. It reveled a significant effect, whereas interaction between R3C1 led to higher intact seeds percentage 76.51% and lower broken seed and weed seed percentage to (3.72%, 0.51%) respectively. Also, in invisible qualitative loss, this recorded higher natural germination percentage 89.44% and lower abnormal germination percentage to 8.11 %. Mansoor and Braney (2002) signed to increase of reel speed with decrease thresher speed for chickpea harvesting by combine.

Table (6): Effect of interaction between reel speed and threshing cylinder speed on studied properties.

Properties / Interaction Between (RC)	visible qualitative loss				Invisible qualitative loss		
	Intact seeds %	Broken seeds % *	Weed seeds % *	Inert matter % *	Natural germination %	Abnormal germination % *	Dead seeds% *
R1c1	74.111 ab	4.180 c	0.760 bc	20.948 bc	88.444 a	9.778 c	1,778 a
R1c2	74.958 a	3.945 c	0.662 bc	20.434 bc	87.444 ab	10.778 bc	1.778 a
R1c3	67.232 bC	6.993 b	0.611 c	25.164 ab	86.444 ab	13.667 abc	1.000 a
R2c1	72.760 ab	3.221 c	1.174 a	22.844 bc	80.333 c	18.111 a	1.556 a
R2c2	69.898 abC	3.857 c	0.599 c	25.645 ab	81.889 bc	17.000 a	1.111 a
R2c3	69.671 abc	6.586 b	1.002 ab	22.740 bc	81.667 bc	16.111 ab	2.222 a
R3c1	76.513 a	3.727 c	0.516 c	19.243 bc	89.444 a	8.111 c	2.444 a
R3c2	63.972 c	4.141 c	0.852 abc	31.035 a	86.778 ab	10.333 bc	2.889 a
R3c3	73.833 ab	8.867 a	0.549 c	16.749 c	84.222 abc	13.778 abc	2.000 a

- Reel speed (R): R1, R2, R3 were10, 20, 35 rpm.
- Thresher cylinder speed (C): C1, C2, C3 were 350, 450, 550 rpm
- * Less loss values better.

The effect of second interactions between harvester forward speeds, reel speed and threshing cylinder speed on study properties was obvious in table (7). There were a significant differences on visible and invisible qualitative loss, in visible seed loss interaction between S1R1C2 register higher intact seeds percentage to 82.54% and lower inert matter percentage to 12.31% compared with other interaction, but in invisible qualitative loss, higher natural germination percentage with the interaction between S1R3C1 and in S3R1C1 93%.Fernando el al (2004) and Taylor and Schroch (1995) signed to realize that acceptable harvesting losses and grain quality, provided that both machines are properly adjusted and operated for the crop condition in filed.

Table (7): Effect of interaction triad between harvester forward speeds, reel speed and threshing cylinder speed on study properties.

Properties / Interaction between (SRC)	visible qualitative loss				Invisible qualitative loss		
	Intact seeds %	Broken seeds % *	Weed seeds % *	Inert matter % *	Natural germination %	Abnormal germination % *	Dead seeds% *
S1R1c1	71.303 abcdefg	3.532 efgh	0.951 bcd	24.213 bcdefg	83.333 abcd	14.667 bcd	2.000 ab
S1R1c2	82.543 a	4.360 defgh	0.786 cde	12.310 g	80.667 bcd	15.333 bcd	4.000 ab
S1R1c3	63.498 Fg	8.882 b	0.436 de	27.183 bcde	86.333 abcd	17.000 bcd	0.000 b
S1R2c1	76.792 abcde	2.742 h	1.890 a	18.577 cdefg	67.667 e	31.667 a	0.667 ab
S1R2c2	60.882 G	3.762 efgh	0.885 bcde	34.472 b	79.000 cd	20.667 b	0.333 ab
S1R2c3	63.400 fG	7.193 bcD	1.491 ab	27.915 bcde	81.667 abcd	16.667 bcd	1.667 ab
S1R3c1	80.037 abc	3.103 fgh	0.521 de	16.338 cdefg	93.000 a	6.333 cd	0.667 ab
S1R3c2	72.932 abcdefg	3.000 gh	1.378 abc	22.690 bcdefg	91.000 ab	5.667 d	3.333 ab
S1R3c3	65.422 defg	12.820 a	0.576 de	21.182 cdefg	80.333 bcd	15.667 bcd	4.000 ab
S2R1c1	74.015 abcdef	3.985 efgh	0.991 bcd	21.008 cdefg	89.000 abc	8.333 cd	2.667 ab
S2R1c2	75.642 abcdef	4.197 defgh	0.660 de	19.502 cdefg	89.333 abc	10.000 bcd	0.667 ab
S2R1c3	73.442 abcdefg	6.130 bcdefg	0.833 bcde	19.595 cdefg	84.667 abcd	13.000 bcd	2.333 ab
S2R2c1	69.750 abcdefg	3.340 efgh	1.020 bcd	25.890 bcdef	85.000 abcd	12.000 bcd	3.000 ab
S2R2c2	80.912 ab	3.345 efgh	0.565 de	15.178 efg	85.000 abcd	12.667 bcd	2.333 ab
S2R2c3	73.058 abcdefg	6.107 bcdefg	0.950 bcd	19.885 cdefg	76.000 de	20.667 b	3.333 ab
S2R3c1	68.222 bcdefg	4.182 defgh	0.825 bcde	26.772 bcdef	86.667 abcd	9.333 bcd	4.000 ab
S2R3c2	48.557 h	5.473 cdefgh	0.561 de	45.408 a	82.333 abcd	13.000 bcd	4.667 a
S2R3c3	78.320 abcd	7.537 bc	0.508 de	13.635 fg	86.667 abcd	13.000 bcd	0.333 ab
S3R1c1	77.015 abcde	5.023 cdefgh	0.338 de	17.623 cdefg	93.000 a	6.333 cd	0.667 ab
S3R1c2	66.688 defg	3.278 efgh	0.541 de	29.492 bc	92.333 a	7.000 cd	0.667 ab
S3R1c3	64.755 efg	5.968 bcdefg	0.563 de	28.713 bcd	88.333 abc	11.000 bcd	0.667 ab

S3R2c1	71.738 abcdefg	3.583 efgh	0.613 de	24.065 bcdefg	88.333 abc	10.667 bcd	1.000 ab
S3R2c2	67.900 cdefg	4.467 defgh	0.348 de	27.285 bcde	81.667 abcd	17.667 bc	0.667 ab
S3R2c3	72.553 abcdefg	6.460 bcde	0.566 de	20.420 cdefg	87.333 abcd	11.000 bcd	1.667 ab
S3R3c1	81.280 a	3.897 efgh	0.205 e	14.620 efg	88.667 abc	8.667 cd	2.667 ab
S3R3c2	70.427 abcdefg	3.950 efgh	0.616 de	25.007 bcdefg	87.000 abcd	12.333 bcd	0.667 ab
S3R3c3	77.758 abcd	6.247 bcdef	0.563 de	15.432 defg	85.667 abcd	12.667 bcd	1.667 ab

- Harvester forward speed (S):S1, S2, S3 were 2.16, 4.20, 6.10 km/h.
- Reel speed (R): R1, R2, R3 were 10, 20, 35 rpm.
- Thresher cylinder speed (C): C1, C2, C3 was 350, 450, 550 rpm
- * Less loss values better.

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تاثير العلاقة بين سرعة مضرب الضم واسطوانة الدياس والسرعة الامامية للحاصدة ماسي فركسون على نسبة الفقد النوعي لمحصول الحمص

الخلاصة

اجري البحث في الفصل الربيعي لسنة 2007 في حقل كلية الزراعة، جامعة دهوك في سميل، وذلك لدراسة تاثير العلاقة التوافقية لبعض الوحدات العاملة في الحاصدة ماسي فركسون على الفقد النوعي المنظور وغير المنظور لمحصول الحمص باستخدام Massy Ferguson MF 8XP. وشملت الدراسة ثلاثة سرع امامية للحاصدة (2,16 ، 4,2 ، 6,1) كم/ ساعة وثلاثة سرع مضرب الضم (10، 20 ، 35) دورة/دقيقة وثلاثة سرع لأسطوانة الدياس (350 ، 450، 550) دورة/دقيقة. نفذت التجربة وفق تصميم التجارب العاملية بتصميم RCBD بثلاث مكررات، وتم حساب الفقد النوعي المنظور من خلال تحليل عينة البذور الى: البذور السليمة، البذور المكسورة، بذور الادغال، بذور محاصيل اخرى، المواد الخاملة كنسب مئوية وايضا تم حساب الفقد النوعي غير المنظور من خلال اختبار الانبات وتحليلها الى : البادرات الطبيعية، البادرات غير الطبيعية، البادرات الميتة او اللينة. حللت البيانات

التي تم الحصول عليها احصائيا واستعمل اختبار دنكن(1955) المتعدد المدى للمقارنة بين المتوسطات الحسابية بمستوى 5%، دلـت نتائج الدراسة : لم يكن لعامل السرعة الامامية تاثيرا معنويا في نسبة البذور السليمة وقد سجلت السرعة الثالثـة اعلـى نـسبة للبادرات الطبيعية وكانت 88,03%. وقد سجلت السرعة الاولى لاسطوانة الدياس اعلى نسبة للبذور السليمة وكانت 74,46%. لقد سجل التداخل بين السرعة الامامية الاولى للحاصدة والسرعة الاولى لـضرب الـضم مـع الـسرعة الثانيـة لاسـطوانة الدياس (S1R1C2) اعلى نسبة من البذور السليمة 82,54% واقل نسبة للمواد الخاملة 12,31% مقارنة بالتـداخلات الاخـرى، بينما الفقد النوعي غير المنظورفقد سجل اعلى نسبة للبادرات الطبيعية بتداخل السرعة الامامية الاولى للحاصدة مع السرعة الثالثة لمضرب الضم والسرعة الاولى لاسطوانة الدياس (S1R3C1) وبتداخل السرعة الثالثة للحاصدة مع السرعة الاولى لمضرب الـضم واسطوانة الدياس (S3R1C1) فقد سجلت 93% للبادرات الطبيعية .

كارتيرنا به يوندييێ دنافبەرا لەزاتيا پرواني و جەنجره لولەييێ و لەزاتيا سينگى يا دەراسيێ ماسى فركسون لسەر ريژا بەرزەبونا جورى بو بەرهەميێ نوكيێ

كورتيێ

ئەڤە ڤەكولينە هاتە ئەنجام دان د ورزەيێ بهارا سالا 2007 د زەڤيا كوليژا جاندنيێ دا، زانكويا دهوكيێ لسيميليێ، بو خاندنا كارتێكرنا پەيوەنديا رازيبونيێ بو هندك يە كێت كاركەر د دەراسێدا (ماسى فركسون) لسەر بەرزەبونا جوريێ ديتى و ونـەييێ ديتى بو بەرهەميێ نوكيێ بكارئينا ماسى فركسون ژ جوريێ MS8 XP

ئەڤيێ خاندنە سيێ لەزاتێت سينگى يێ دەراسيێ ب خوفە دگرتن(6,1– 4,2– 2,16) كم / سـەعتيێ وسـيێ لـەزاتيت پروانـيێ (10،20،35) دوره / دقيقى دا وسيێ لەزاتيت جەنجره لولەييێ (350،450،550) دوره / دقيقى دا ئەڤ ڤەكولينـە هاتـە بجـه ئينـان لديڤ ديزايينا تجاربيێ كاركەر بديزايينا RCBD بسيێ دوبارەكرنا، و بەرزەبونا جوريێ ديار هاتە هژمارتن بريكا شلوڤەكرنا نمونا توڤى بو: توڤيێ ساخ، توڤيێ شكەستى ، توڤيێ هستريا ، توڤيێ بەرهەميت دى. ماديت ژكاركـەتى وەك ريـژا سـەدى وهەروەسـا بەرزەبونا جوريێ نەييێ ديتى هاتە هژمارتن بريكا ديتنا شينبونيێ و شلوڤەكرنا ويێ بـو: بەرهـەميێ (تـوڤيێ) سروشـتى، بەرهـەميێ (توڤيێ) نەييێ سروشتى، بەرهەميێ (توڤيێ) مرى يان ييێ نەرم.

ئەو پيزانينيت هاتينە بدەست ڤە ئينان هاتينە شلوڤەكرن بريكا ئەزمونا دنكن(1955) يێبكەلەك ڤەكيشان بو جيـاوازيكرنيێ دنافبەرا نافنجيا هژمارتنيێ بئاستيێ5٪ ئەنجاميت ڤيێ خاندنيێ ئەڤەبون: كاركەيێ لەزاتيا سـينگى چ كارتيكرنـەكا ب مانـا نـەبوو لسەر ريژا توڤيت ساخ و لەزاتيا سييێ بلنديرين ريژا توڤيێ سروشتى تومار كر كو 88,03٪ بوو. و لەزاتيا ئيكيێ يا جەنجره لولەييێ بلندرين ريژا بەرزەبوونا توڤيێ ساخ تومار كر و 74,46٪ بو.چونا دگەل ئيك دنافبەرا لەزاتيا سينگيێ يا ئيكيێ يادەراسيێ و لەزاتيا ئيكيێ يا پروانيێ دگەل لەزاتيا دووێ يا جەنجره لولەييێ S1R1C2 بلنديرين ريژا توڤيێ ساخ تومار كر كو 82,54٪ بوو و كێمترين ريژا ماديێت ژكاركەتى 12,31٪ جياوازيكرن ب جونا ناڤ ئيكين دى، بەلێ بەرزەبونا جوريێ نـەييێ ديتـى بلنـدترين ريـژا تـوڤى سروشتى تومار كر ب چونا ناڤ ئيك لەزاتيا سينگيێ يا ئيكيێ يادەراسيێ دكەل لەزاتيا سييێ پروانيێ ولەزاتيا ئيكيێ يا جەنجره لولەييێ S1R3C1 ب چونا ناڤ ئيك لەزاتيا سييێ پروانيێ ولەزاتيا ئيكيێ يا جەنجره لولەييێ S1R3C1 ب جونـا نـاڤ ئيـك لـەزاتيا سـييێ يادەراسيێ دگەل ولەزاتيا ئيكيێ يا پروانيێ و جەنجره لولەييێ S3R1C1 كو 93٪ بو توڤيێ سروشتى تومار كر.

EFFECT OF PLANTING DATE AND SPRAYING WITH GA_3 ON GROWTH AND YIELD OF GARLIC (*Allium sativum* L.)

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(Received: November 12, 2008; accepted for publication : April 4, 2009)

ABSTRUCT

The effect of planting date and GA_3 on the growth and yield of a Chinese garlic were investigated during period 2006-2007. The experiment was consisted two planting date (1st October, 1st November2006) and different concentration of GA_3 (0, 25, 50 and 75 mg.l^{-1}). The objective of the work was to find out appropriate planting time and effective concentration of GA_3 on the growth and yield of garlic. Early planting favorably influenced plant high, number of cloves per bulb, number of bulbils per plant, fresh and dry weight of bulb, cloves, and roots, with the delay in planting time starting from November. There were no significant effect of GA_3 concentration used in several characteristic of garlic. The yield was chronologically reduced in later plantings, highest yield (2.165 Kg/m^2) was recorded from October planting and the minimum (0.967 Kg/m^2) from November. There were no significant of GA_3 on the yield, Control and higher concentration of GA_3 produced higher yield than the other reached (1.583, 1.609 Kg/m^2) respectively. The interaction effect of planting dates and GA_3 concentration indicate that early plantings grown with GA_3 showed better performance than the late planting grown with or without GA_3.

KEYWORDS *Garlic Planting date* GA_3

INTRODUCTION

Garlic (***Allium sativum*** L.) is the second most widely used cultivated ***Allium*** after onion (Bose and Som, 1990). It is widely used as a spice throughout the world. Garlic has been considered as a rich source of carbohydrate, protein and phosphorus (Kurian, 1995). It has a higher nutritive value than other bulb crops. Garlic has a hypocholesterolamic action and reduces the cholesterol concentration in human blood (Augusti, 1997). Its preparations are administered as a care against some long and lingering stomach diseases and sore eye and ear. Clove sprouting, leaf, bulb initiation and maturation are the main phonological stages in garlic. Bulbing of garlic is controlled by the day length and temperature to which the dormant cloves and growing plants are exposed before bulbing begins. Delay of a few weeks in the normal planting date lead to several losses in yield (Rahman, 1981 and Rahim, 1988). Siddique and Rabbani, 1985 reported that growth, bulb size and yield reduce due to delay planting. (Rahim *et al*, 1984) showed that 40% yield of garlic reduced when the planting was

delayed by 40 days after October 31. (Gasem *et al*,1989) reported that average weight of bulb, diameter of bulb and yield of Onion reduced when planting was delayed.

Planting growth regulator like gibberllic acid (GA_3) has been Known to play a vital role in bulbing of garlic (Moon and lee, 1980; Magsino,1961 ; Rahim and Fordham,1988).It has also been reported that foliar spray of GA_3 stimulates to form lateral bud and increases the number of cloves per bulb. Growth regulators have a potential use for the substitute of the cold requirement of flowering bulb (Rudnicki, 1976 and Hanks, 1982). Many studies have indicated that the application of growth regulators can affect the growth and development of bulb crops; but a little information is available for their effects on Garlic (Rahim, 1988). Therefore, an attempt was made to evaluate the effectiveness of different planting time and application of different concentrations of GA_3 on the growth and yield of the Chines cultivar of garlic which might help for substantial contribution to the region.

MATERIALS AND METHODS

This experiment was carried out during 2006 – 2007 growing season, at the experimental field of Horticulture Department, Agriculture College .Dohuk University, Dohuk Kurdistan Region, Iraq. The objective of this study was to investigate the growth and yield responses of Chinese garlic to planting date and growth

regulator, GA_3 as experimental treatments. A factorial Randomized Complete Block Design (F-RCBD) was chosen to include factor A tow planting date(a_1= 1st October, a_2= 1st November 2006) and factor B GA_3 rates of (b_1=0 mg.l^{-1}, b_2=25 mg.l^{-1}, b_3=50 mg.l^{-1}, b_4=75 mg.l^{-1}). Therefore, 8 treatments were included, each treatment was replicated three times .One replicate was represented by a furrow of 3.75m length, 0.75m width, planted on both sides with intra plant space of 0.15m. Comparison among averages was done by using Duncan's multiple range test at 5% to verify the differences between means of treatments (AL-Rawi and Kalaf-Allah, 1980). Garlic cloves were planted and then plants were fertilized by urea similarly to all treatments after month of planting. Garlic plants were sprayed by GA_3 rates twice in each planting date the first planting date sprayed on February, 25th 2007 and Mars, 28th 2007 the last planting date sprayed on Mars, 28th 2007 and on April, 22nd 2007. Weeds were manually predicated and other cultural practices were carried on whenever required. Five plants were harvested randomly at each time from each plot. First planting Plants were harvested on June, 1st 2007 and the last planting plant were harvested on June, 10th 2007thus harvested

plants were cleaned and brought to the vegetable laboratory. Plant height was measured as the tallest leaf length and fresh weight of (bulb, bulbils, leaves and roots)were measured and then dried by electrical balance then oven – dried at 65 ^{o}c for 72 h and were weighted, number of cloves per bulb, number of bulbils and leaves per plants were counted and finally yield kg.m $^{-2}$ was calculated .

RESULTS AND DISCUTION

The results in table(1) clearly show that planting date had a significant effect on vegetative growth and the early planting plants (1st October) gave the higher plant high, No. of leaves, bulbils per plant and no. of cloves per bulb compared with delay in planting date(1st November). The plant which were planted in 1st October exhibited highest number of leaves, bulbils, cloves (7.08), (5.29), (32.833) respectively and 1st November planted plant exhibited the minimum (6.60), (3.78), (3.41) respectively. This result are similar to those of (shahidur *et al*, (2004); Hsiao *et al*, 2002; Rahim *et al*, 1984 and Brewster, 1994 on onion), who reported that planting date affected on garlic vegetative growth. These plants received longer cool period and shorter day length which possibly enhanced meristematic elongation of plant and as a result maximum plant height was attained.

Regarding the effect of GA_3 concentration (25,50,75 mg.l^{-1}) it caused a significant increase in the plant high and the number of bulbils per plant and there is no differences between control and high concentration of GA_3 in plant high reached

(50.61, 50.95cm) respectively, but the 50 ppm of GA_3 gave higher number of cloves per plant(20.53) this result was agreement with this of (Rahman *et al*, 2006). Where as, it had no significant effect on the number of leaves per plant and cloves per bulb. Similar result was reported by (Nasim Ara, 1988; Shahidur *et al*, 2004 and Takagi and Aoba 1976) who reported that GA_3 enhanced rapid leaf proliferation by secondary lateral branching. GA_3 might activate some genes in the cell chromosomes which would form the RNA especially the mRNA leading to the formation of enzymes responsible for division and elongation process and finally they cause a change in the composition of cells (Mohammed and Al-Rayess, 1982).

The interaction effect of planting date and GA_3 on this characteristic were significant, the early plantings grown with or without GA_3 gave the highest plant high and number of leaves per plant compared with the late plantings grown with or without GA_3, However interaction effects showed that the highest number of bulbils per plant and cloves per bulb (5.60, 37.33) respectively were obtained from early planting time and 50 mg.l^{-1} of GA_3.

Tabel(1): Effect of planting date and GA_3 on (plant high, No. of leaves per Plant, No. of cloves/bulb and No. of bulbils per plant) of garlic.

Characteristic / Treatments		Plant high (cm)	No. of leaves\ plant	No. of cloves /bulb	No. of bulbils \plant
Planting days					
1st October		59.79 a	7.08 a	5.29 a	32.833 a
1st November		39.22 b	6.60 b	3.78 b	3.41 b
Growth regulators					
Control		50.61 a	7.02 a	4.7 a	15.5 b
GA_3 25 mg.l^{-1}		48.93 ab	6.63 a	4.57 a	17.41 ab
GA_3 50 mg.l^{-1}		47.52 b	6.73 a	4.52 a	20.53 a
$GA_3$75 mg.l^{-1}		50.95 a	6.98 a	4.35 a	19.07 ab
Interaction P*G					
1st October	Control	59.35 a	7.60 a	5.33 ab	227.67 c
	$GA_3$25 mg.l^{-1}	58.17 a	6.98 abc	4.90 ab	31.00 bc
	$GA_3$50 mg.l^{-1}	59.27 a	6.60 bc	5.60 a	37.33 a
	$GA_3$75 mg.l^{-1}	62.37 a	7.13 ab	5.33 ab	35.33 ab
1st November	Control	41.87 b	6.43 bc	4.23 abc	3.82 d
	$GA_3$25 mg.l^{-1}	39.70 bc	6.27 c	3.44 c	3.82 d
	$GA_3$50 mg.l^{-1}	35.77 bc	6.87 abc	3.37 c	3.72 d
	$GA_3$75 mg.l^{-1}	39.53 bc	6.83 abc	5.33 ab	2.80 d

Means followed the same letter within a column do not differ significantly from each other by using Duncan's multiple range test at 5% level .

It can be noticed from Table (2) that weight of bulbils, bulb, leaves and roots per plant were remarkably influenced by planting date and GA_3. Early planted plants (on 1st October) gave the higher weight of bulbils (0.819g), bulbs (68.63g), leaves (59.67g) and roots (15.69g) while delayed planted plants gave lower amount of them. These results confirm those of (Hsiao *et al*, 2002) and (Mohanty, 2001on onion) who found that the early planting time gave the maximum amount of weight of growth and yield.

Regarding the effect of GA_3 concentration (0, 25, 50,75 $mg.l^{-1}$) it had no significant effect on the growth parameters (Weight of bulbils, bulbs, leaves and roots). The interaction effect showed that the plants which were planted on 1st October with or without growth regulator had the highest weight of bulbils, bulb, leaves and roots.

Table (2): Effect of planting date and GA_3 on Fresh weight (bulbils, bulb, leaves and Root) per plant g of garlic.

Characteristic / Treatments		Weight of bulbils g	Weight of bulb g	Weight of leaves g	Weight of roots g
Planting days					
1st October		0.819 a	68.63 a	59.67 a	15.69 a
1st November		0.65 b	31.15 b	26.28 b	6.77 b
Growth regulators					
Control		0.65 a	47.66 a	51.27 a	12.30 a
GA_3 25 $mg.l^{-1}$		0.72 a	47.41 a	37.98 a	9.71 a
GA_3 50 $mg.l^{-1}$		0.77 a	49.89 a	41.56 a	10.89 a
$GA_3$75 $mg.l^{-1}$		0.79 a	54.6 a	41.08 a	12.02 a
Interaction P*G					
1st October	Control	0.64 a	62.44 a	71.30 a	17.31 a
	$GA_3$25 $mg.l^{-1}$	0.79 a	59.71 a	48.95 bc	12.55 ab
	$GA_3$50 $mg.l^{-1}$	0.95 a	74.20 a	62.76 ab	16.61 a
	$GA_3$75 $mg.l^{-1}$	0.90 a	78.17 a	55.65 ab	16.30 a
1st November	Control	0.67 a	32.89 b	31.24 cd	7.30 b
	$GA_3$25 $mg.l^{-1}$	0.64 a	35.11 b	27.01 d	6.88 b
	$GA_3$50 $mg.l^{-1}$	0.60 a	25.57 b	20.35 d	5.17 b
	$GA_3$75 $mg.l^{-1}$	0.68 a	31.03 b	26.51 d	7.75 b

Means followed the same letter within a column do not differ significantly from each other by using Duncan's multiple range test at 5% level .

Table (3) showed that the dry weight of bulbils, bulb, leaves and roots per plant were remarkably influenced by planting date and GA_3. Early planted plants (on 1st October) gave the higher dry weight of bulbils(0.64mg), bulb (54.78mg), leaves (12.62mg) and roots (2.22mg) while delayed planting plants gave lower amount of them. These results confirm those of (Hsiao *et al*, 2002) and (Mohanty, 2001on onion) who found that the early planting time gave the maximum amount of weight of growth and yield.

Regarding the effect of GA_3 concentration (0, 25, 50,75 $mg.l^{-1}$) it had no significant effect on the growth parameters (dry weight of bulbils, bulbs, leaves and roots). The interaction effect showed that the plants which were planted on 1st October with or without growth regulator had the highest weight of bulbils, bulb, leaves and roots. This is in agreement with the findings of (shahidur *et al*, 2004). Plant leaves are the main organs where photosynthetic are produced. So the amount of leaf dry matter increases with the increasing of leaf area and the number of leaves with the time course. As bulbing began after 60 day of growth, the photosynthetic efficiency of the leaves increased to meet their own as well as the growing bulbs.

Table (3): Effect of planting date and GA_3 on dry weight (clove, bulb, leaves and root) per plant mg of garlic.

Characteristic / Treatments		Dry Weight of bulbils mg	Dry Weight of bulbs mg	Dry Weight of leaves mg	Dry Weight of root mg
Planting days					
1st October		0.64 a	54.78 a	12.62 a	2.22 a
1st November		0.49 b	20.67 b	14.9 a	1.53 b
Growth regulators					
Control		0.55 a	40.14 a	13.81 a	1.79 a
GA_3 25 mg.l^{-1}		0.54 a	34.92 a	13.2 a	1.64 a
GA_3 50 mg.l^{-1}		0.60 a	37.75 a	14.07 a	2.33 a
$GA_3$75 mg.l^{-1}		0.58 a	38.11 a	13.97 a	1.73 a
Interaction P*G					
1st October	Control	0.60 abc	58.05 a	11.60 a	2.40 ab
	$GA_3$25 mg.l^{-1}	0.56 abc	45.11 a	15.05 a	1.70 ab
	$GA_3$50 mg.l^{-1}	0.74 a	59.12 a	14.03 a	2.60 a
	$GA_3$75 mg.l^{-1}	0.65 ab	56.85 a	9.81 a	2.17 ab
1st November	Control	0.50 bc	22.23 b	16.02 a	1.18 b
	$GA_3$25ppm	0.52 bc	24.73 b	11.35 a	1.58 ab
	$GA_3$50ppm	0.45 c	16.38 b	14.10 a	2.07 ab
	$GA_3$75ppm	0.50 bc	19.36 b	18.12 a	1.28 b

Means followed the same letter within a column do not differ significantly from each other by using Duncan's multiple range test at 5% level .

Table (4) shows that the yield decreased gradually with the lateness of planting. The highest yield (2.165 Kg/m^2) was obtained from October planting and the lowest (0.967 Kg/m^2) from November planting. These results agree with the findings of many authors (Das *et al*, 1985; Scheffer, 1985) and (Sarhan *et al* ,2005 on onion) who found that the early planting time gave the maximum amount of weight of growth and yield. The largest bulb size from the early planting contributed the highest yield. Smaller bulbs and lower yield was obtained from late planting which did not receive a long cool growing period which was essential for proper development of vegetative growth for garlic (Man and Minges, 1958; Rahman, 1981and jones and Mann, 1963) and (Sarhan, 2005 on onion). There were no significant effect between control and GA_3 on yield per M^2, bulb was higher in control and high concentration of GA_3 (1.583&1.609) Kg respectively than the other concentration. This result agree with the findings of (Maurya, 2001) found that GA levels increase the yield of onion.

The combined effect of planting date and different concentration of GA_3 showed that the highest yield (2.330Kg/m^2) was obtained from October planting and 75 ppm of GA_3 compared with the.

Table (4): Effect of planting date and GA_3 on yield of garlic (Kg/m^2)

GA_3 / Planting date	Control	GA_3 25 mg.l^{-1}	GA_3 50 mg.l^{-1}	$GA_3$75 mg.l^{-1}	Average means of Planting date
1st October	1.956 a	2.056 a	2.330 a	2.316 a	2.165 a
1st November	1.210 b	1.018 b	0.740 b	0.902 b	0.967 b
Average means of GA_3	1.583 a	1.537 a	1.535 a	1.609 a	

Means followed the same letter within a column do not differ significantly from each other by using Duncan's multiple range test at 5% level .

The main objective of the experiment was to observe the economic yield of garlic by planting in different planting dates and applying different concentration of GA_3. Early planting can influence higher yield with or without growth regulators. Further investigation in this respect may provide information regarding the optimum date of planting and effective concentration of growth regulator to have better yield.

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تاثير مواعيد الزراعة وتراكيز الجبرلين على النمووحاصل الثوم
(*Allium sativum* L.)

الخلاصة

اجريت تجربة حقلية في حقول كلية الزراعة / جامعة دهوك خلال موسم الزراعة 2006-2007 ، لدراسة تأثير مواعيد الزراعة (1 تشرين الاول،1 تشرين الثاني) والرش بحامض الجبرليك بتركيز (0,25,50,75) جزء بالمليون على صفات النمو وحاصل الثوم صنف الصيني. اظهرت النتائج بانه كان للموعد الاول تاثيرا معنويا على صفات النمووحاصل الثوم. ادى الموعـد الاول زيـادة معنوية في صفات ارتفاع النبات، عدد الاوراق، عدد الفصوص لكل راس، عدد البلابل لكل نبات والوزن الطري والجاف لكـل من البلابل، االرؤس، والجذور مقارنة بالموعد الثاني. لم يكن للجبرلين تاثيرا معنويا لاغلبية الصفات.ادى الموعـد الاول الى زيـادة نسبة الحاصل للثوم حيث اعطى (2.165)كغم/م^2 مقارنةللموعد الثاني(0.967) كغم/م^2.لم يكن للجبرللين تاثيرا علـى الحاصـل، الكونترول والتركيز العالي للجبرلين اعطى اعلى حاصل(1.583 و1.609) على التوالي. بالنسبة للتداخل بين مواعيـد وتراكيـز الجبرلين حيث كان التداخل بين الموعد الاول وتراكيز الجبرلين تفوقا معنوياعلى الموعد الثاني مع او بدون الجبرلين.

كارتێكرنا دەمێ چاندنێ و جبرلینی لسەر بەرهەمێ سیرێ (*Allium sativum* L.)

پوختە

ئەڤ ڤەكولینە هاتە بجهئینان لناڤ زەڤیێن ڤەكولینێن ل كولیژا چاندنێ – زانكویا دهوك دوەرزێ چاندنێ 2006–2007 ژبـو دیاركرنا كارتێكرنا دەمی چاندنێ (1 چریا ئێكـی، 1 چـریا دووێ) وەرشـاندن بجـبرلینی ب لـوكێن (0,25,50,75)پارچـەك ژ ملیونێدا لسەر شینكاتی و بەرهەمێ سیرێ ژ جوری چینی. . ئەنجامێن ڤەكولینێ دیار كر كو دەمی ئێكـی ژ چـاندنی زیادەكـا بەرچاڤ هەبو بو زێدەكرنا هەمی سالوخەتێن شبنكاتی وبەرهمئینانا سیرێ(دریژیا روەكی، ژمارا بەلگا، ژمارا فصوصا لسەركیدا، ژمارا بەلابلا ل روەكیدا،كێشا تەرو یا هشك یا بەلگا، بەلابلا، سەركاو رەگی بەلام دەمێ دووێ بـو ئەگـەرێ كێمكرنـا ڤـان سالوخەتا. جبرلینی چ زیادێن بەرچاڤ نەبوون بو پتریا سالوخەتان.دەمێ ئێكێ یێ چاندنێ زیادەكا بەر چاڤ هەبوو بو زێـدەكرنا بەرهەمێ سیرێ ل (2.165)كغم/م^2 بەلام دەی دووێ (0,967)كغم/م^2. جبرلینی چ زیادێن بەرچاڤ نەبوون بوزێدەكرنا بەرهەمی، بێ رەشاندن ئو رەشاندن ب لوكێ 75 پارچەكا ژملیونی پتریا بەرهەمی دا (1.583 و1.609) دیڤێكرا.تێكەلیا دناڤبـەرا دەمـێ چاندنێ و رەشاندن ب جبرلینی كو دەمێ ئێكی دگەل لوكێن جبرلینی بونە ئەگـەرێ زیـادێن بەرچـاڤ بەرامبـەر دەمـێ دووێ ورەشاندن و نە رەشاندنا جبرلینی.

TOXICITY OF FUNGI ASSOCIATED WITH DECLINE GRAPES

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(Received: November 12, 2009; Accepted for publication:May 19, 2009)

ABSTRACT

The study showed that filtrates of *Alternaria alternata* (Fr.) Keissler, *Fusarium lateritium* Nees., *Curvularia lunata* (var. aeria) Ellis and *Phaeomoniella chlamydospora* (Crous ,M. J. Wingfield ND l. Mugnai) Crous and Gams isolated from decline grapes exhibited high phytotoxicity for (Taifi cv.) canes. These results were conspicuously throughout the leaf necrosis , flow in the xylem vessels and the lack of water absorption that caused wilting of young branches after 24 hrs in addition to nominal electrolytical exudation from plant cells after 48 hrs . *Stemphylium herbarum* , *Cladosporium elatum* , and *Phomopsis viticola* filtrates also showed dispersion of alkaline foxin through vessels tissue which were better for conduction through xylem to foliage, wilting symptoms results by the toxication of conducting tissues , and eventually reverse on the water absorption .

INTRODUCTION

Fungi cause decline of grapevines are facultative parasites , grown on plant debries ; they kill the healthy plant tissues by excertion of toxins and then attacking the dead tissues (Necrotrophic) .

The nature of excreted toxins by necrotrophics are varied, some of them are specialized by one host or more, so it could damage a wide group of plants, while others expanded in their damages to other organisms (Yoder, 1981).These toxins have the ability to kill the host or the plant tissue in presence or absence of pathogen which are called pathotoxins as in the case of Vectorin which is produced by *Helminthosporium vectoria* (Lamari *et al.* 1995) . Other toxins have the ability of partial killing in the absence of the pathogen which are called vivotoxins as in the case of toxins produced by the species of *Fusarium oxysporum* (Pringle and Scheffer ,1963 ، Walton and Panaccione , 1993). Furthermore, such pathogens as *Alternaria* spp. produced toxins with a little effects separately which called phytotoxins like Alternaric acid (Goodman *et al.* 1967). *Alternaria* produces many groups of toxins include Dibenzo- and pyrones , Tetremic acid and Perylene groups produce toxins of distinctive specialization on their host as in the case of producing of AK compound by *A. kikachina* which was isolated from Japanies pears and AM compound which is produced by *A. mall* and destructive on apples (Briggs and Sheffer , 1981).

F. lateritium has the ability to produce a group of toxins, such as fusaric acids, whereas, others are specific on their hosts as lycomarsmines on tomato excesrted by

F. oxysporum (Garret, 1970).

Cladosporium produce of cladosporin and emadin toxins(Dixon and Polak–wyss,1991) .Curvularin from *Curvularia* (Garaway and Ivans , 1990).

P. chlamydospora infect the vascular tissue of young vines resulting in darkening and plugging of the xylem vessels (Mugnai et. al.1999 and Gubler , 2004) and producing several toxins such as 4-hydroxy –benzaldehye , sterehirsutinal and D-3-phenyllactic acid (Danilo , 2001).

MATERIALS AND METHODS

Toxicity Trials

Preparation of fungal filtrates :

Sterilized liquid media of Czapek ،s Dox (CZD)with streptomycin sulphate by 100 mg / L . media plus 5 mg ZnSo4 was poured in flask at the rate of 200 ml media was inoculated with 0.25 cm discs of five days old for *(A. alternate*, *C. elatum* , *C. lunata,* , *F. lateritium P. viticola, S. herbarum*, *P. chlamydospora*) and incubated at 25 – 27 C^{o} for 21 days . Flasks were sharked for 30 sec. at 40 RPM. , and filtered by using muslin cloth and repeated again by filter papers (Whatman –No 3)

(Kohmoto et al . 1979) .

1-Necrotic Test : Healthy uniform leaves of the (Taifi) c.v. were put in Petri-plates (90 mm in diameter) containing three layers of sterilized and wetted filter-papers whatman no 3 .

Grape leaves were punctured by sterilized needle, and inoculated with fungal filtrate for each cause. Plates were incubated in a dark place at 25 – 27 ◦c. for 48 and 72 hrs. Leaves of check plates were punctured and treated with distilled water. Observation of necrotic area , yellowing symptoms and lesions were noticed (Yoder *et al.* 1977).

2- Filtrates Flow in the Conducting Vessels : Each fungal filtrate was poured in four test tubes (2cm in diameter) at the rate of 15 ml per tube, mixed with 5 drops of 1% red alkaline foxin. Terminal branches with 3-5 leaves of "Taifi" grape vine cultivar portion of 0.5cm in diameter and 15cm in length were cut and emerged vertically in it, and incubated at room temperature, while the check branches (control treatment) were emerged in distilled water contained 1% red alkaline foxin without fungal filtrates. Observation of foxin follow in the branch tissues was detected by using anatomy microscope (DSK 8200) (Kohmoto *et al.* 1979).

3- Wilting of Young Branches : Fresh branches of grapevine with (3-5) leaves were emerged in test tubes containing fungal filtrates for 24, 48 and 72 hrs. at room temperature with fluorescent light, while the check branches were put in tubes containing distilled water only. The branches were transferred to the new tubes containing distillated water for observation of the wilting symptoms on the upper and lower leaves (Yoder, 1981).

4- Lack of Water Absorption : Fresh, homogenetically branches with 3-5 leaves were put in 15cm test tubes length (2 cm in diameter) and immersed by 0(control), 50 and 100% diluted filtrates. The tubes were blocked and tied with cellophane and incubated at room temperature. To compensate the losses of transpiration and water absorption, distillated water was added for tubes after 24, 48 , 72 and 96 hrs. Additive water was considered as absorbed volume by branches. Each treatment was replicated three times with three branches in each one (Kohmoto *et al.* 1979).Absorption lack was calculated by using the following equation:

Absorption lack = Water Volume additive to control – Water Volume to filtrate

5- Electrolytical Exudation : Discs(1.2 cm in diameter (E. E.) of young leaves of the terminal branches (third or fourth leave) were dipped in the glass bottle contain fungal filtrates for 20 min. glass bottle , then washed by distillated water. While the check leaves were dipped only in distilled water. 20 discs were transferred to a glass bottle containing 5ml distilled water, and incubated at 20-22◦c in shaking incubator (100 SPM) for 24, and 48 hrs. Results was estimated by using E.C. parameter. (Kohmoto *et al.* 1979).

RESULTS AND DISCUSSIONS

1-Necrotic Test : Leaf necrosis occurs as a dark brown spots and slightly irregular margins resulting in the acupunctured deposits which refer to chlorophyll (Wood, 1967).*Alternaria. alternata, Fusarium lateritium, Curvularia lunata* and *Phaeomoniella chlamydospra* caused severely necrosis on the grape leaves (Table 1).

Necrosis means the reaction of toxins in fungal filtrates with chlorophyll or some of in mineral composition in the plant tissues such as Mg and N. Several literature revealed that fungal toxins resulted in chloroplastids death, and destruction of starch and polysaccharides as well as decreasing of proteins and amino acids followed by leaf spotting and lesions(Caldwell *et al.* 1973).

Table (1): Lesions type caused by filtrates of decline fungi on vinegrape leaves (*in vitro)*

Fungi	Lesions type
Control	Non chlorotic local lesions
A. alternata	Necrotic bounded by chlorotic local lesions
P. viticola	Chlorotic local lesions
F. lateritium	Necrotic bounded by chlorotic local lesions
C. lunata	Necrotic bounded by chlorotic local lesions
C. elatum	Non chlorotic local lesions
S. herbarum	Non chlorotic local lesions
P. chlamydospora	Necrotic bounded by chlorotic local lesions

2 –Filtrates Flow in the Conducting Vessels: Longitudinal section of branches immersed in *S. herbarum* , *C. elatum* , and *P. viticola* filtrates showed dispersion of alkaline foxin through vessels tissue which were better for conduction through xylem to foliage, wilting symptoms results by the toxication of conducting tissues, and eventually reverse on the water absorption. Effects of *A. alternata* filtrates were confirmed by (Mohammed and abo - Raya, 1999) (Al-Bere, 2004) .

3- Wilting of Young Branches : *P. chlamydospora* caused wilting with symptoms of necrosis after 24 hrs. and developed to full defoliation after 48 hrs. (Table 2) *A. alternata* , *P. viticola* , *F. lateritium*, and *C. lunata* showed wilting of upper leaves only after 24 hrs. followed by necrosis after 48 hrs. Full defoliation caused by most fungal filtrates after 72 hrs. In contrast, *C. elatum* was less phytotoxic since symptoms disappeared before 72 hrs.

Table (2): Wilting test of branches by fungal filtrates after three period

Fungi	After 24 h.	After 48 h.	After 72 h.
Control	_	_	_
A. alternata	+	++	++++
P. viticola	+	+++	++++
F. lateritium	+	+++	++++
C. elatum	_	_	+++
C. lunata	+	++	++++
S. herbarum	_	++	+++
P. chlamydospora	+++	++++	++++

- = No wilting.
+ = Wilting of two upper leaves in branch.
++ = Wilting of upper and lower leaves.
+++ = Necrosis of all leaves .
++++ = Fall defoliation.

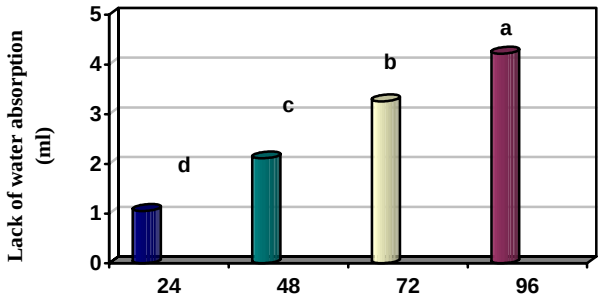
Severity of such pathogens as *P. chlamydospora* extended through vascular tissues of young vines and resulted in browning and plugging of the xylem vessels (Mugnai *et al.* 1999 and Gubler , 2004) . Fungal toxins such as 4-hydroxy – benzaldehye , sterehirsutinal and D-3- phenyllactic acid also reacted to produce toxical phenols led to symptoms of foliage wilt (Danilo , 2001).

4-Lack of Water Absorption : Severity of water lack absorption depended upon filtrates concentration with the time (Table 3). Therefore, pure filterates of *C. lunata* , *F. lateritium* , *P. chlamydospora* , *P. viticola* and *A. alternata* caused a significant lacking of water absorbed by immersion branches after 96 hrs. in spite of their effects by using 50 % filtrate for 24 hrs. (Fig1) .

Table(3): Lack of water absorption (ml) after several periods of immersion in fungal filtrates

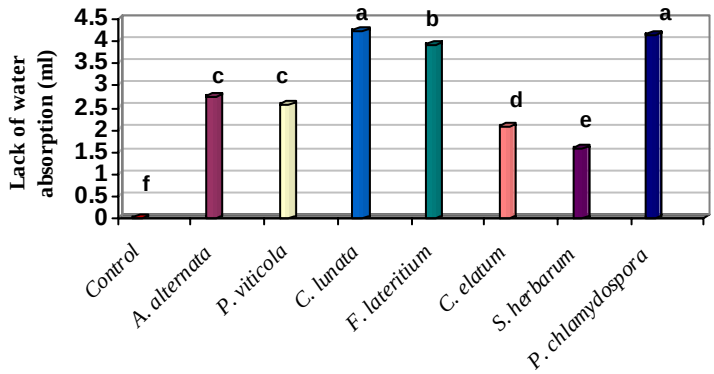
Period of immersion / Fungi	Filtrates concentration %							
	After 24 h		After 48 h		After 72 h		After 96 h	
	% 50	% 100	% 50	% 100	% 50	% 100	% 50	% 100
Control	* 0.0 z	0.0 z	0.0 z	0.0 z	0.0 z	0.0 z	0.0 z	0.0 z
A. alternata	0. 0 z	0.8 w-y	1.8 o-t	2.1 l-q	3.4 g-i	3.7 g	5.0 e	5.3 ed
P. viticola	0.6 xy	1.5 p-u	1.1 t-x	2.7 i-m	1.8 o-t	4.4 ef	2.8 i-l	5. 7 cd
C. lunata	1.3 r-w	2.1 l-r	2.8 h-l	4.0 fg	4.3 f	6.1 bc	5.5 e	7.8 a
F. lateritium	1.5 p-u	2.1 l-r	3.1 h-j	3. 7 g	4.4 ef	4.9 ef	5. 5 d	6.2 bc
C. elatum	0.8 v-y	1.3 s-w	1.5 p-u	2.4 k-o	2.2 k-p	2.5 j-o	2. 6 j-n	3.2 hi
S . herbarum	0.6 xy	0.8 w-y	0.9 u-y	1.3 s-x	1.9 n-s	2.1 l-r	2.5 j-o	2.7 i-l
P. chlamydospora	1.4 q-v	2.0 m-s	2.9 h-k	3.5 gh	4.9 e	5. 7 cd	6.1 bc	6.7 b

- Means followed by different letters were significantly different based on Duncan's Multiple Range test (p =0.05).



Fig(1): Effect of immersion period (hsr.) in fungal filtrates on the lack of water absorption

Generally,C. *lunata and P. chlamydospora* caused severe lacking of water absorption followed by *F. lateritium .A. alternata* and *P. viticola* were similar in their effects on the physiological absorption (Fig 2), *S. herbarum* was the lowest one.



Fig(2): Effect of fungal filtrates on the lack of water absorption

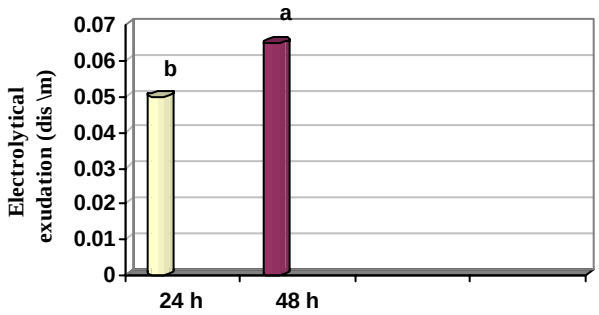
However, the toxins of fungal filtrates overruled in lacking absorbed water reversed on the vital respiration and the gaps were blocked as a result of decreasing water efforts and its contraction in the cells. The direct effects of this disproportion included the loss of plasmalemma permeability that led to electronical exudation outside the cells particularly potassium ions which stimulated osmotic decreasing of cells that protected the gaps, and their water swelling. Transpiration is considered a major role in absorption non-vital to water (Krmer, 1984).So the outcome is that a deficiency took place in water absorption by the branch.

5- The Electrolytical Exudation (E. E.) : The filtrates of all fungi achieved a significant nominal electrolytical exudation after 48 hrs. except *S. herbarm* which was delayed until 48 hrs.. This may be attributed to their mode of toxical action such as Alternuene , Alternariol , Tenuazonic acid , Altertoxin and Altertoxin - II (Schade and JR, 1984a) (Table 4) ,which affected on the plasmalemma permeability (Goodman *et al.* 1967). *P. viticola* also induced Trichothecenes (Cole and Cox, 1981; Scott, 1981 ; Ulrich and Patten, 1991). *P. chlamydospora* induced toxic phenols stimulate the electrolytical exudation from plant cells as a total electronic exudations were increased after 48 hours (Figure 3).

Table (4): Effect of fungal filtrates on electrolytical exudation of grapevines after 24 and 48 hrs

Fungi	Electrolytical Exudation(discm./m)			
	After 24 h		**After 48 h**	
Control	0.0367	e	0.0620	a-c
A. alternata	0.0570	a-d	0.0670	a-c
P. viticola	0.0567	cd	0.0617	a-c
C. lunata	0.0420	de	0.0737	ab
F. lateritium	0.0527	c-e	0.0740	a
C. elatum	0.0497	c-e	0.0577	a-d
S. herbarum	0.0507	c-e	0.0567	b-d
P. chlamydospora	0.0560	cd	0.0667	a-c

***** Means followed by different letters were significantly different based on Duncan's Multiple Range test (p =0.05)



Fig(3): Effect of immersion periods in the fungal filtrates on the electrolytical exudation

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دراسة سمية الفطريات المرافقة لتدهور كرمات العنب

الخلاصة

اظهرت الدراسة ان راشـح الفطريـات Alternaria alternata(Fr.) Keissler و Fusarium lateritium Nees. و Curvularia lunata (var. aeria) Ellis و Phaeomoniella chlamydospora (Crous ,M. J. Wingfield ND l. Mugnai) Crous and Gams المعزولة من فصبات العنب المتدهورة ذات سميةعالية لفصبات الصنف طايفي . ظهر ذلك واضحا من خلال نتائج التنخر الموضعي للأوراق حديثة العمر، سريان الراشح الفطري حديثة العمر ، سريان الراشح الفطري في الأوعيـة الناقلة وعجز الفصبات في امتصاص الماء وذبول الأفرع الحديثة بعد 24 ساعة والنضح الالكتروليتي من خلايا النبـات بعـد 48 ساعة. اظهرت رواشـح Cladosporium elatum , Phomopsis viticola Stemphylium herbarum , انتـشار صـبغة الفوكسين القاعدية خلال انسجة الاوعية لتصل عبر خشب الفصبات الى المجموع الخضري والتي تظهر بدورها اعراض الـذبول نتيجة لتسمم الانسجة الناقلة وينعكس ذلك في النهاية على امتصاص الماء .

ژەهراتیا دگەل جیاکرنا کەرووێ ژ سەر مێوێت تری یێ تێکچوی

پوختە

ئەنجامێن ڤەکولینێ دیارکر کو راشحێن ڤان کەرەوێن Alternaria alternata(Fr.) Keissler و Fusarium lateritium Nees. و Phaeomoniella chlamydospora (Crous ,M. J. Wingfield ND l. Mugnai) Crous and Gams و Curvularia lunata (var. aeria) Ellis ژە هراتی یاخویا بلند روپاتکر ل سەر تریێ تایبەتی ژئەگەرێن کورکێن جهی ل سـەر بەلگێن نوێدا ورژیانا راشحێ کەرووی دناڤ بورییێن ڤەگوهاستنێ دا ونەشیانا قەسەباتا ل سەر ڤەکێشانا ئاڤێ و چرمسینا تایێن نوی ورژیانا ئەلکترولیتی. راشحین, Cladosporium elatum Stemphylium herbarum و Phomopsis viticol دیار کرن کو بویاغا فوکسین یا قاعدی هاتیە بەلافکرن لناف بورین ڤە گوهاستینی هە تا دگەهیتە بە لگین کە سك کو سیمایین تیکچونین لسە ردیار دبن و ژ ئە گەرا وی میژینا ئاڤی لئ کیم دبیت .

EFFECT OF SOWING DATES ON GROWTH, YIELD AND YIELD COMPONENTS OF THREE VARIETIES OF WINTER CHICKPEA (*Cicer arientinum* L.)

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(Received: November 12, 2008; Accepted for publication : June 16, 2009)

ABSTRACT

A field trial was conducted at Agricultural College farm, Dohuk University, northern Iraq, under rainfall condition with an annual average 535 mm. for the growing season 2006-2007. Three winter chickpea varieties were involved (Ghab3, Ghab4 and Ghab5) which sown at three dates (17th December, 13th January and 20th February, 2006/2007).

The experiment was accomplished as Randomized Complete Block in split plot design with three replications. Results revealed that the early sowing date, 17th December significantly exceeded the two other dates for most studied characters of growth and yield. However, the two early sowing dates 17th December and 13th January scored higher values than late sowing date 20th February for all measured traits. In respect with chickpea varieties, they were performed similarly for most studied characters with an exception of plant height and lowest pod height which were superior for Ghab5and Ghab4, respectively.

Significant differences were evident for the interaction of varieties and sowing dates for all traits. Ghab5 variety sown on 17th December was superior than the two other varieties in giving higher values for most of growth characters, but this variety at second date 13th January recorded highest seed yield per donum (736.7 kg), followed by Ghab4, both varieties were performed better than Ghab3.

KEYWORDS Sowing Dates Chickpea Varieties Yield Components.

INTRODUCTION

Chickpea (*Cicer arientinum* L.) is one of the most pulses crops grown in Iraq, particularly at Northern province of Kurdistan. It ranks as second after fababean (*Vicia faba* L.) (Central Statistical Organization, 1992). Seeds are of high nutritive values due to high protein content (24%) (IPA, 1994). Their protein consist of high percent of essential amino acids (lysine) comparing to other legumes (Williams and Singh, 1987); and in addition to utilization the straw for livestock feed. Ali *et al*, (1995) stated in a study carried out in Sulaimania conditions on some winter cultivars of chickpea that these varieties appeared suitable height which makes them convenient for mechanical harvesting. Local chickpea is spring habitat growth which sown in Iraq, like other Mediterranean's basin countries in early spring to benefit from winter rainfall, and to avoid attack by Ascochyta blight as it is sensitive to cold climate(Abbas et al, 1996 and Al-Taee, 1997).

Singh *et al*, (1997) indicated that according to trails conducted in Syria, Ghab 4 cultivar produced plants that are taller and more tolerant to Ascochyta blight diseases than Ghab3 under rainfall conditions.

The average over ten years of winter sown chickpea produced 70% (692 kg ha^{-1}) more seed yield than the spring-sown crop, Singh *et al*,. (1997), and in the same direction they demonstrated according to studies based on 62 trails conducted over a period of seven years at different research stations as well as in farmer's fields in Syria that two varieties of chickpea were developed; Ghab4 which produced 13.4% more seed yield and taller plants as compared with Ghab3 and Ghab5 which gave 3.8% more seed yield.

Singh and Saxena (1999) referred to the fact that winter chickpea technology developed by ICARDA for the Mediterranean regions has resulted in an estimated one million tones of additional chickpea production. In Turkey an earlier sowing of chickpea by about four weeks in spring has been shown to increase yields by up to 25%.

Chickpea are well adapted to germination and seedling establishment in moderate conditions, follow by growth in cooler condition. These conditions are typical following autumn sowing in the Mediterranean or temperate environments. The Kabuli types appear to have strong growth during the seedling phase and the Desi types during the vegetative phase. The relative growth rate shows the strong effects of the environment.

Hayawaee, 2005. demonstrated two experiments on local chickpea at two different ecological locations in Ninevah province Northern Iraq (treatments included three sowing dates 15, Feb.; 1, Mar.; and 15, Mar.) for the growing season 2004. He postulated that most of the studied characters of early sowing date at both locations were superior significantly to those of the second or third sowing dates.

Therefore this study was aimed to find out the proper sowing date and performance of three winter varieties chickpea under conditions of Northern Iraq.

MATERIALS AND METHODS

The experiment was conducted at Agricultural college field at Sumail site, University of Dohuk (located between longitudes 43.01˚ E, latitudes 37.8˚ N and altitude 583 meters) for the growing season (2006/2007) in clay soil, under rainfall condition with an annual average 535 mm. The field was ploughed with disc plow then harrowed in autumn for a suitable seed bed preparation. The field then was divided into plots of 1m width X 3m length. The study implied three winter Kabuli varieties of chickpea (Ghab3, Ghab4 and Ghab5) and three sowing dates (17th Dec. 13th Jan. and 20th Feb.). Planting was done at 7cm depth and 12cm between seeds.

The experiment was setup as RCBD in split plot design with three replications, each replicate consist of 9 treatments (sowing date as a main plot and varieties as a sub plot), each plot comprised of four rows (25cm apart).

At maturity (end of May and mid of June) according to planting dates, ten individual plants were chose randomly from the two middle rows in each units on which the observations of vegetative characters and yield components were recorded. These characters were, number of main branches per plant, plant height (cm), lowest pod height (cm), plant air dry weight (g), pods weight (g), number of seeds per plant, seeds weight per plant (g) and seed yield kg/donum (Donum= 0.25 ha). Harvesting was done manually at full maturity stage on 31, May 2007, 31, May 2007 and 12, June 2007) for the three dates respectively.

The data were statistically analyzed with SAS 2001, and the means verifying were done according to Duncan's multiple range test (1955) at level 5%.

RESULTS AND DISCUSSION

The results in table (1) shows that the plant height and plant dry weight from early sowing date (17th Dec.) had exceeded on the other two dates, also there were no significant differences between the first and second sowing dates for lowest pod highest and number of branches , but it was obvious that all characters were declined steadily as sowing dates delayed. This was attributed to the fact that at early sowing date growth period prolonged in addition to that plants were more benefit of early rainfall. Such differences between sowing dates was reported by (Al-Obady 2000) who referred to the superiority of early sowing dates.

In respect with the performance of chickpea varieties, results show in table (1) that Ghab5 performed better than the two other varieties in plant height, while Ghab4 was better for highet of lowest pod. These slight differences may be due to their genetic potential as they were grown under the same environment conditions. Such differences between these cultivars have been confirmed by (Emenky, 2007). Other characters were not significantly differences.

Concerning with the plant height and the lowest pod height, it indicate to the capability utilization of machine in harvesting of these varieties.

The interaction between sowing dates and varieties were also significantly different as for all vegetative studied traits. There were inconsistently results, but it was clear that both Ghab4 and Ghab5 varieties sowing early at 17, Dec. were better performed in terms of some vegetative characters. However, Ghab3 variety was inferior, when sowing date were delay.

Table (1): Effect of sowing dates, varieties and their interactions on vegetative growth characters.

Treatments \ Characters		Plant Height (cm)		Lowest Pod Height (cm)		No. of Main Branches/Plant		Plant Weight (g)	
D1 (17/12)		61.59	a	39.51	a	3.54	a	28.25	a
D2 (13/01)		58.41	b	39.55	a	3.74	a	23.46	b
D3 (20/02)		45.12	c	29.88	b	3.14	b	14.60	c
Ghab3		53.73	b	35.02	b	3.54	a	21.46	a
Ghab4		54.69	ab	38.47	a	3.37	a	22.80	a
Ghab5		56.70	a	35.45	b	3.52	a	22.04	a
D1 (17/12)	**Ghab3**	60.97	a	38.87	a	3.70	ab	26.26	a
	Ghab4	60.63	a	40.70	a	3.33	a-d	29.38	a
	Ghab5	63.17	a	38.87	a	3.60	abc	29.11	a
D2 (13/01)	**Ghab3**	55.77	b	38.09	ab	3.80	a	21.31	abc
	Ghab4	60.17	ab	40.80	a	3.70	ab	25.78	a
	Ghab5	59.30	ab	39.82	a	3.73	ab	23.29	ab
D3 (20/02)	**Ghab3**	47.63	c	28.17	c	3.13	cd	16.82	bc
	Ghab4	44.47	c	33.80	b	3.07	d	13.26	c
	Ghab5	47.63	c	27.67	c	3.23	bcd	13.72	c

Results displayed in table (2) revealed a similar trend of vegetative characters in that the first two sowing dates exceeded the late sowing in all yield components traits. The same explanation of vegetative variation due to sowing dates was offered for yield components.

The response of chickpea varieties displayed no significant differences for all reproductive characters under study. However, the interactions of varieties with

sowing dates were significant for all measured characters under the study. Although the inconsistency were evident but these results resemble those of vegetative characters as regards the superiority of the varieties Ghab4, and Ghab5 with the first sowing date in comparison to other dates. Ghab5 at the first sowing date gave highest pod weight per plant (13.74) and number of seeds per plant (26.93). The highest seed yield kg/donum was achieved from Ghab5 at the second sowing date (13, Jan.) different from the same variety, although it was not significantly different from the first sowing date (17, Dec.), this was mainly may be due to the highest seed weight per plant.

Table (2): Effect of sowing dates, varieties and their interactions on yield and its components.

Treatments	Characters	Wt. 0f Pods /Plant (g)		No. of Seeds/Plant		Wt. 0f Seeds / Plant (g)		Seed Yield (kg/Donum)	
D1 (17/12)		12.06	a	24.86	a	7.85	a	612.40	a
D2 (13/01)		10.14	b	22.40	a	7.22	a	601.98	a
D3 (20/02)		6.60	c	18.50	b	4.81	b	401.02	b
Ghab3		9.18	a	23.19	a	5.94	a	494.63	a
Ghab4		9.33	a	20.36	a	6.40	a	533.09	a
Ghab5		10.29	a	22.21	a	7.05	a	587.68	a
D1 (17/12)	**Ghab3**	10.63	b	24.11	ab	6.63	abc	552.50	abc
	Ghab4	11.81	ab	23.53	ab	7.90	ab	658.30	ab
	Ghab5	13.74	a	26.93	a	7.52	abc	626.40	abc
D2 (13/01)	**Ghab3**	9.97	bc	22.80	abc	6.01	abc	500.60	abc
	Ghab4	10.27	b	22.13	abc	6.83	abc	568.70	abc
	Ghab5	10.69	b	22. 27	abc	8.84	a	736.70	a
D3 (20/02)	**Ghab3**	7.45	cd	22.67	abc	5.17	bc	430.80	bc
	Ghab4	5.92	d	15.40	c	4.47	c	372.20	c
	Ghab5	6.42	d	17.43	bc	4.80	bc	400.00	bc

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تأثير مواعيد الزراعة في النمو والحاصل ومكوناته لثلاثة اصناف من الحمص الشتوي (*Cicer arientinum* L.)

الخلاصة

اجريت تجربة حقلية في حقول كلية الزراعة- محافظة دهوك- شمال العراق- تحت الظروف المطرية حيث المعدل العام للامطار 535 ملم للموسم الزراعي 2006-2007.

تضمنت الدراسة ثلاث اصناف من الحمص الشتوي (غاب3،غاب4وغاب 5) وثلاثة مواعيد للزراعة(17 كانون الاول،13 كانون الثاني و20 شباط،2006).

نفذت التجربة كقطاعات عشوائية كاملة بتصميم القطع المنشقة وبثلاث مكررات. اشارت النتائج الى تفوق الموعد المبكر 17 كانون الاول معنويا على الموعدين الاخرين في معظم الصفات المدروسة للنمو والحاصل، وعموما فان الموعدين 17 كانون الاول و13 كانون الثاني سجلت اعلى القيم عن الموعد الثالث 20 شباط لجميع الصفات المدروسة.

اما بخصوص اداء الاصناف فانها كانت متماثلة بجميع الصفات باستثناء ارتفاع النبات وارتفاع اوطأ فرنة ،حيث تفوقت صنف غاب 5 وغاب 4 للصنفين على التوالي.

لقد شوهد اختلافات معنوية بين معاملات التداخل بين الاصناف ومواعيد الزراعة لجميع الصفات. فقد تفوق الصنف غاب 5 المزروع في 17 كانون الاول على الصنفين الاخرين باعطاء اعلى قيم لجميع الصفات، حيث هذا الصنف المزروع في الموعد الثاني 13 كانون الثاني قد حقق اعلى حاصل من البذور للدونم (736.7 كغم) وتبعه غاب 4، حيث ان كلاهما كانا افضل من الصنف غاب 3.

كارتێكرنا دەمێن چاندنێ لسەر شینكاتی و بەرهەمی و پێكهاتییێت بەرهەمی یێت سێ جورێن نوكا زڤستانی (*Cicer arientinum* L.) .

كورتی

ئەڤ ڤەكولینە هاتە بجهئینان ل زەڤیێن كولیژا چاندنێ– پارێزگەها دهوك–عیراق، لژێر كاودانێت بارانی ب رێژەیا 535 ملم بۆ وەرزێ چاندنێ2006–2007. ڤەكولین پێكهاتیە ژ سێ جورێن نوكا زڤستانی (غاب3، غاب4 وغاب5) وسێ دەمێن چاندنێ (17 ك1، 13ك2 و20 شواتێ) وهاتیە بجهئینان لدویف سیستەمێ (RCB) دیلوتێت بەش بەشەدا و سێ جاری دووبارە بییە.

ئەنجامێن ڤەكولینێ دیاركر كو دەمێ چاندنێ (17ك1) كارتێكرنەكا پێش چاڤ هەبییە لسەر هەردوو دەمێن دوی یێن چاندنێ بۆ پترین ساخلەتێن شلوڤەكری یێن شینكاتی و بەرهەمی. بشێوەكێ گشتی هەردوو دەمێن چاندنێ (17ك1 و13ك2) بلندترین رێژە تومارکرینە لسەر دەمێ چاندنێ (20 شواتێ) بۆ هەمی ساخلەتێن وەرگرتی. سەبارەت رەفتارا جورێن نوكا، ژئەنجاما دیاربییە هەمی جور وەك هەڤن بۆ پتریا ساخلەتا وجورێن غاب5 وغاب4 لدویف ئیك باشترین ئەنجام ئینایە.

دەربارەی لێكدان دناڤبەرا هەردوو سەرەدەریادا، چاندنا نوكا غاب5 ل 17ك1 باشترین كارتێكرن هەبییە ژلێكدانێت مایێ بۆ هەمی ساخلەتان، بەلێ چاندنا ڤی جوری ل 13ك1 بییە ئەگرێ بلندترین بەرهەم ئینان ژتوڤێ نوكێ (736.7 كغم/دونم) ولدویف دا غاب4 كو باشتربییە ژ غاب3.

EFFECT OF PLANTING METHODS, GA_3 AND ALAR ON SOME QUALITATIVE CHARACTERS OF CAULIFLOWER.

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(Received: December 22, 2008; Accepted for publication : March 4, 2009)

ABSTRACT

This study was conducted to study the effect of planting method (uncovered & covered) and spraying with GA_3 and Alar at concentrations of (150, 250) ppm and (1000, 2000) ppm respectively, on qualitative criteria and seed germination of cauliflower (Snow ball cv.) for growing season 2001- 2002. The results germination revealed that uncovered method of planting had a significant increase in dry matter % of leaves and seed germination %, whereas, the covered method affected significantly the dry matter % of curds, but caused a significant decreased in the number of days to curd formation, No. of days to flowering, No. of days to form 50% fruits, No. of days to seed ripening. On the other hand, there was no significant effect of growth regulators (GA_3 & Alar) on the dry matter % in the leaves and curds, P % in the leaves and curds and K % in the curds. While they had significant increase in N % in the leaves and curds, K % only in the leaves and seed germination % by using GA_3. Alar caused significant decrease in N % in the leaves and curds especially at high concentration (1000 ppm).

KEYWORDS *planting date* *GA_3, Alar* *cauliflower*

INTRODUCTION

Cauliflower(*Brassica oleracea* var. botrytis) is an important winter vegetable crops in Iraq belonging to Mustard family.Cauliflower is planted for its curds, which are the edible part of the plant, and the flower buds with the flower stalks before their flowering stalks. Cauliflower is considered as one of the vegetables with a high food value, it is used in cooking, pickling and salads. It has seen that the average productivity of cauliflower in Iraq and Syria were (9290.16 & 27493.44 ton/h) respectively in 1995 (Arabic State University, 1996). This indicate the low production of cauliflower per unit area in Iaq, which requires further studies that lead to greater crop production with best quality. Seeds are the primary base in the production of vegetable crops. Improved and better seeds result in a good quality if provided by factors that limit the production. One of the important factors that determine the production of curds and seeds in cauliflower is exposing the young plants to low temperature. Wiebe (1990) mentioned that cauliflower is among the plants that have obligate response regarding coldness requirements needed for flowering. For this reason this study was carried out to study some facilities and techniques under the conditions of Northern Iraq which depends completely on the plastic method (covered) to protect the plants, especially during the period of curd formation from the effect of weather fluctuation (mainly rains) till the final stage of the seed production. In addition, some plant growth regulators were used, such as gibberellin and alar with various levels to determine the effect of these chemicals on growth of plant and seeds yield. Gill and Singh (1973) stated that high temperature during the first period of planting (Snow ball cv.) had

helped in forming a good vegetative growth before winter and the drop of temperature in December, January and February. In a study carried out by Al-Assaf (1997) on the effect of planting method on cauliflower seeds production (Snow ball cv.), founded that the plastic covering method had resulted in a significant decrease in the no. of days to flowering, fruit formation and seed ripening as compared with the field method.

Gibberellin is regarded as one of plant growth regulators that stimulate complete plant growth especially stem growth where duplicates the growth when applied to the whole plant. This effect is resulted by enhancing the elongation and division of cells. Booij (1989) noticed that treating cauliflower plants (cv. Delirea) with GA_{4+7} after 31 days of transplanting in the field had led to accelerate curds initiation linearly with the increase of GA conc. form (10 to 120 mg/L). Aditya and Fordham (1995) carried out a study to know the effect of GA_3 and coldness on the growth of cauliflower plants using 4 concentrations (0,10, 100,1000) mg/L, they found that GA_3 had a significant effect on stem elongation. Al-Assaf (1997) stated that the no. of days from transplanting till forming 50% curds in cauliflowers, had decreased significantly by increasing GA_3 concentrations, whereas, this number had decreased from (118 & 113.62 days in the control treatment reaching (100.3 & 90.0) days in the highest concentration of GA_3 (150 mg/L) for both years (1995, 1996) respectively. Al-Ubaidi (1999) found that treating cauliflower plants (White cloud cv.) with gibberellin at concentrations of (50,100,150)mg/L, led to an increase in the growth and yield components linearly with the increase of concentration. Bora (1970) observed that treating Brossel-sprout transplants with GA_3 at concentrations of (25,100,400) mg/L increased the accumulation of the elements (N, P, K) in the leaves, and the concentrations of 100 mg/L was more effective as compared with the other concentrations. AL-Ubaidi (1999) reported that spraying Cauliflower plants (White cloud cv.) with GA_3 at concentration of (50,100,150) mg/L resulted in a drop in the percentage of dry matter and an increase in nitrogen and potassium percentages in leaves, whereas, no significant effect on the phosphorus percentage was observed.

Alar is regarded as one of the artificial growth retardant used in the field of Horticulture. Alar retards the vegetative growth, depresses the elongation of stem, affect indirectly on flower without causing any deformation in the plant and affects the date of ripening as well. Several studies showed that this substance had an anti-retardant effect. Alar as in Cycocel (ccc) has physiological effect on retarding growth , stimulation of flowering, increasing the compactness of curds and accelerating ripening. Al-Nuserawi (1999) and Ibrahim and Gazi (2001) found that treating Okra plants with Alar at concentrations of (0,1000,2000)mg/L for one, tow and three times, had caused a decrease in the length of the plant and the number of leaves per plant by 21.3%, 23.6% respectively. However it increased the number of branches per plant. Adedipe *et al.* (1969), working on pea plant, showed that B-9 at 1 ppm decreased N% and P%, but at 100 ppm, increased N% & P% and decreased K%. Boshunakov *et al.* (1989) found that treatment with (250,500)mg/L of ccc after transplanting of Cabbage (Bakan cv.) had no significant effect on the quality of seeds. El-Habbar (1989) found that treating Spinach plants with (0,1000,2000) ppm of Alar had no significant effect on the percentage and rate of germination.

MATERIALS AND METHODS

The investigation was performed at the Vegetable Field of Horticulture Department/ College of Agriculture / Duhok University during growing season of (2001-2002). Random samples of soil were taken before starting the research from different locations at a depth of about (30 cm) to make the necessary analysis of physical and chemical characteristics of the soil (Page *et al*, 1982). The results of this analysis are shown in table (1). Maximum and minimum temperatures, the amount of rainfall and the relative moisture in the research region during the growing season are illustrated in table (2) as recorded by the Weather Forecast Station of the Agricultural College.

Cauliflower seeds (Snow ball cv.) were planted in Jiffy-7 pots at the greenhouse in August 1st, 2001 then transferred to transplanting bags of 1:1 sand and loam. Seedlings were transplanted to the field after 45 days from seed sowing on furrows 80 cm apart and 40 cm between the plants. All agricultural operations were similarly carried out to all experimental units. Growth regulators solution were prepared in tow doses according to the decided concentrations. Spraying was done in tow stages, the first was after a month of transplanting in 15/10 and the second was after a month of the first spraying 15/11 in the early morning until saturation point (Saleh, 1978). The experiment involved the effect of tow planting methods (uncovered & covered) by using white transparent plastic cladding to cover the plastic house. The cladding was done in the first of December , 2001 and removed in the 1st of may, 2002. Five levels of tow growth regulators (0.0,150,250 ppm of GA_3 & 0.0,500,1000 ppm of Alar) in addition to the interactions among them. The treatments were arranged in an experiment by using Split Block Design within RCBD (main plot = planting methods, sub plot = growth regulators) with three replicates, each experimental unit contained 2 furrows 4m long and 80cm wide. Comparison among means was done by using Duncan's multiple range test at 5% to verify the differences between means of treatments (Al-Rawi &Kalaf- Allah, 1980). The data were recorded on percents of the dry matter and mineral substances (N, P, K) percents in the leaves and curds, no. of days to curds formation, no. of days to flowering, no. of days to from 50% fruit, no. of days to seed ripening, percent and rate of germination.

Table (1): Some physical and chemical characteristics of the soil of the field in the season (2001- 2002).

Characteristics	Measuring unit	2001
Volumetric distribution of soil separate		
Sand	Percentage (%)	3.40
Silt	Percentage (%)	55.000
Clay	Percentage (%)	41.600
Texture		Silt clay
Available nutrient content		
N	Percentage (%)	0.200
P	ppm	8.900
K	Mli equivalent / L	0.195
B	Percentage (%)	1.220
Organic matter	Percentage (%)	1.180
pH		7.660
E. C	Dsm^{-1} / m	0.322

Table(2): Average of maximum and minimum temperature, humidity and rainfall of season (2001-2002).

Months	Air Temp%		Humidity %	Rainfall (mm)
	Max.	Min.		
September	37.18	17.55	26.96	-
October	29.39	14.16	35.91	8.70
November	18.71	5.83	47.33	15.50
December	13.75	4.85	68.56	86.10
January	10.64	0.12-	66.5	69.00
February	15.94	2.29	59.17	31.60
March	18.95	5.90	51.80	152.50
April	20.68	8.16	66.53	54.10
May	29.91	12.22	38.95	3.00
June	35.73	18.72	27.18	-

RESULTS AND DISCUSSION

1.Effect on qualitative characters of:

1.1 LEAVES:

1.1.1. Dry matter%:

Table (3) reveal that the uncovered method gave higher leaf dry matter and the percentage was (10.94%). This result agree with those reported by Kadhim *et al*. (1984). The result might be due to the deficiency in leaf area which caused an increase in the accumulation of food material.

On the other hand, treatment with GA_3 and Alar had no significant effect on the dry matter % of leaves. Regarding the interaction treatment, the interaction between uncovered method with concentration of growth regulators were superior over the interaction between covered method with concentration of growth regulators. This might be due to the effect of planting method previously mentioned.

Table(3): Effect of planting method, GA_3 and Alar concentration and their interaction on qualitative characteristic of leaves .

Treatments \ Characteristic	Dry matter %	N %	P %	K %
Planting method				
Uncovered	10.94 a	2.86 a	0.32 a	3.07 a
Covered	8.78 b	2.90 a	0.29 a	2.85 a
Growth regulators				
Control	9.91 a	2.71 b	0.30 a	2.66 b
GA_3 150ppm	9.81 a	3.38 a	0.30 a	3.55 a
GA_3 250 ppm	9.65 a	3.68 a	0.31 a	3.61 a
Alar 500 ppm	9.95 a	2.43 be	0.31 a	2.51 b
Alar 1000 ppm	10.00 a	2.20 c	0.30 a	2.46 b
Interaction M*G				

Uncovered	Control	11.03 a	2.80 bc	0.32 a	2.66 cd
	$GA_3$150ppm	10.86 a	3.26 ab	0.32 a	3.70 a
	GA_3 250ppm	10.63 a	3.80 a	0.32 a	3.76 a
	Alar 500ppm	11.10 a	2.33 cd	0.32 a	2.80 b-d
	Alar 1000ppm	11.10 a	2.13 d	0.31 a	2.43 d
Covered	Control	8.80 b	2.63 cd	0.28 a	2.66 cd
	GA_3 150 ppm	8.76 b	3.50 a	0.28 a	3.40 a-c
	GA_3 250 ppm	8.66 b	3.56 a	0.31 a	3.46 ab
	Alar 500 ppm	8.80 b	2.53 cd	0.30 a	2.23 d
	Alar 1000 ppm	8.90 b	2.26 cd	0.29 a	2.50 d

*Means followed by the same letter within a column do not differ significantly from each other using duncan's multiple range test at 5% level.

1.1.2. Nitrogen, Phosphorus and Potassium percents:

The results in table (3) clearly show that there is no significant effect of both planting methods on the (N,P&K) percents in the leaves.

As For gibberellin treatment, GA_3 caused a significant increase in nitrogen and potassium percents in the leaves as compared with the control treatment. The differences were not significant between (150, 250ppm) of GA_3 concentrations. This confirms the results of Singh and Saimphi. (1968), Bora. (1970), Hussein. (1983) and Al- Ubaidi (1999). The reason behind that might be due to gibberllin′s role in increasing the vegetative growth wich leads to an increase in its efficiency by making use of the absorption of nutrient elements from the soil and increased their concentration in the plant Bora, (1970). However, Alar has reduced percents of (N&K) in the leaves by increasing the concentration of Alar. This is harmony with those of (Adedipe,1969) when he used Alar on the bean and Al-Ubaidi,(1999) when he used ccc on cauliflower. This result might be due to the role of Alar in inhibiting and retarding the growth and dwarfing the plants and that would lead to a small leaf area which decreases the process of absorption of food elements from the soil and concentration in the plant El- Habar, (1989). As for the effect of growth regulations on P%, there is no significant effect to be mentioned in this trait. The effect of the interaction between the planting methods and growth regulator was significant, the uncovered method of planting with the highest conc. of GA_3 gave the highest percentage of nitrogen and potassium.

1.2. CURDS:

1.2.1. Dry matter %:

Table (4) exhibits the effect of planting method and treatment of GA_3 and Alar on the dry matter % in the curds. The results indicated that the covered was more effective than uncovered method in increasing the dry matter % in the curds. This results differ from those reported by Khadhim *et al*. (1984). On the other hand, treatment with GA_3 and alar had no significant effect on the dry matter% in the curds. Regarding the interaction treatment, it was noticed that the superior interaction was between the covered method with the high level of alar which increased the dry matter % in the curds reaching (8.50%) as compared with other treatments with an increase of (22.65 %).

Table(4): Effect of planting method, GA_3 and Alar concentration and their interactions on qualitative characteristics of curds .

Treatments		Characteristic	Dry matter %	N %	P %	K %
Planting method						
Uncovered			7.04 b	2.88 a	0.40 a	3.24 a
Covered			7.85 a	2.63 a	0.31 a	3.06 a
Growth regulator						
Control			7.28 a	2.45 b	0.36 a	3.15 a
GA_3 150 ppm			7.28 a	3.20 a	0.37 a	3.38 a
GA_3 250 ppm			7.23 a	3.41 a	0.38 a	3.20 a
Alar 500 ppm			7.40 a	2.45 b	0.36 a	3.10 a
Alar 1000 ppm			8.03 a	2.26 b	0.30 a	2.93 a
Interaction M*G						
Uncovered	Control		6.93 de	2.76 bc	0.41 ab	3.23 a
	GA_3 150 ppm		6.93 dc	3.26 a	0.39 abc	3.63 a
	GA_3 250 ppm		6.76 e	3.33 a	0.44 a	3.26 a
	Alar 500 ppm		7.00 cde	2.60 cd	0.42 a	3.23 a
	Alar 1000 ppm		7.5G bcd	2.43 cde	0.34 bcd	2.83 a
Covered	Control		7.G3 bcd	2.13 e	0.32 cde	3.0G a
	GA_3 150 ppm		7.G3 bcd	3.13 ab	0.35 bcd	3.13 a
	GA_3 250 ppm		7.70 bc	3.50 a	0.33 cde	3.13 a
	Alar 500 ppm		7.80 ab	2.30 de	0.29 de	2.96 a
	Alar 1000 ppm		8.50 a	2.10 e	0.27 e	3.03 a

* Means followed by the same letter within a column do not differ significantly from each other using duncan's multiple range test at 5% level.

1.2.2. Nitrogen, phosphorus and potassium %:

It is clearly shown from table (4) that there was no significant effect of planting method on (N, P& K) percent in the curds. Gibberellin treatment resulted in an a significant increase in N % in the curds in comparison with the control treatment. This result confirm with those found by Singh *et al* (1968), Hussein (1983) and Al- Ubaidi (1999). The reason behind this increase of N % might be the same reasons as previously mentioned in the N % of the leaves. A decrease was shown in N% of the curds by spraying Alar specially at high concentration, but this decrease was not significant as compared with the control treatment. Application of GA_3 and alar also did not reveal any significant effect on the (P % & K %) in the curds.

The interaction effect was significant in increasing N % in the curds, and the best treatment in this regard was obtained between the covered method and 250 ppm of GA_3. As for the P % in the curds, the superior interactions was distinct between the uncovered method with (250) ppm of GA_3 and between the uncovered method and (500) ppm of Alar resulting in (0.44% and 0.42%) respectively as

compared with the control treatment. Whereas, the interaction treatment on the K % in the curds, revealed no significants on this character.

1.3. Stage of seeds formation:

It can be noticed from table (5) that the covered methods of planting affected significantly on the characters of (no. of days to curds formation, no. of days to flowering, no. of days to form 50% fruits and no. of days to seed ripening). This result confirm the finding of Boos & Schegoleva (1978), Benoit & Ceustermans (1980), Mol (1982) Wurr *et al.* (1990) and Al- Assaf (1997). The reason behind that might be that the plastic covers influenced in protecting the transplants at the first stage of growth from the effect of rain and freezing. On contrast, the effect of GA_3 treatments were also significant in decreasing the no. of days required to form the curd, no. of days of flowering, no. of days to forms 50% fruit and no. of days to seed ripening as compared with the control treatment. Higher concentration of GA_3 was more effective in this regard. These results are in harmony with those of Salter and Ward (1972), Yanmaz & Eris (1984), Booij (1989), Aditya & Fordham (1995), Al-Assaf (1997) and Al- Ubaidi (1999). This might be due to the active effect of Gibberellin in the stimulation of curd formation, as it was found that the increase in Gibberellin at the shoot apex can be regarded as a basic factor in the stimulation of curd formation in cauliflower (Wurr *et al*, 1990). Thomas *et a l.*(1972) also found that maximum level of the internal Gibberellin in the plant takes place in the period preceding the stimulation of curd formation. It was shown that GA_3 is one of the internal hormones which stimulate curd formation (Austin, 1970). Hence, this result may be explained by the fact that GA_3 might replace low temperature requirements which are needed by the biennial plants including *Brassicaceae* plants especially for flowering (Kahangi & Waithaka, 1981), or Gibberellin might affect the elongation of the stem through increasing the division and elongation of the cells. Flowering would result from an indirect effect of gibberellin in stem elongation that is necessary to form certain compositions which may stimulate the differentiation of flower primordia. This agree with what was mentioned by Devlin, (1975).

Alar treatment has significant effects on the no. of days to curd formation, no. of days to form 50% fruits and no. of day to seed ripening as compared with the control, whereas, Alar concentrations did not differ significantly in this regard except in the no. of days to seed ripening. These results agree with those of Knavel (1969) who used alar on tomato, Salter and Ward (1972) when they used alar and ccc on Cauliflower and Al- Ubaidi (1999) who used ccc on Cauliflower.

Concerning the effect of interaction between planting method and growth regulators, it is clear that the interaction treatment between covered method and high concentration of GA_3 (250 ppm) was superior on other treatments.

Table(5): Effect of planting method, GA_3 and Alar concentrations and their interactions on the number of days to curd formation, no. of days to flowering, no. of days to form 50% fruits and no. of days to seed ripening.

Characteristic / Treatments	Number of days to curd formation	number of days to flowering	number of days to form 50% fruit	number of days to seed ripening
Planting method				
Uncovered	145.20 a	211.14 a	216.05 a	256.89 a
Covered	123.98 b	196.12 b	207.18 b	247.13 b
Growth regulators				
Control	132.63 a	204.86 a	213.23 a	255.90 a
GA_3 150 ppm	130.13 b	204.10 a	210.90 cd	252.40 b
GA_3 250 ppm	126.40 c	201.60 b	209.80 d	248.00 d
Alar 500ppm	129. 83 b	203.90 a	211.80 bc	251.13 c
Alar 1000ppm	128.96 b	203.70 a	212.36 b	252.50 b
Interaction M*G				

Uncovered	Control	149.06 a	212.33 a	216.93 a	261.33 a
	GA_3 150ppm	146.33 ab	210.60 a	215.53 a	257.40 b
	GA_3 250ppm	141.66 b	210.60 a	215.00 a	252.86 cd
	Alar 500ppm	144.80 ab	211.13 a	216.66 a	255.86 bc
	Alar 1000ppm	144.13 ab	211.20 a	216.13 a	256.73 b
Covered	Control	126.20 c	197.40 b	209.53 b	250.46 de
	GA_3 150ppm	123.93 cd	197.60 b	206.26 cd	247.40 ef
	GA_3 250ppm	121.13 d	192.73 b	204.60 d	243.13 g
	Alar 500ppm	124.86 cd	196.66 b	206.93 bcd	246.40 f
	Alar l000ppm	123.80 cd	196.2 b	208.60 bc	248.26 ef

* Means followed by the same letter within a column do not differ significantly from each other using duncan's multiple range test at 5%Vo level.

1.4. Percent & rate of germination :-

Results in table (6) shows that uncovered method gave higher percent of germination (98.07%) with an increase of (13.13%) as compared with the covered method. Similar results have been reported by Ahmed & Hussein (1977) and Prabuki (1985) but did not confirm with those of Al-Assaf (1997). This might be due to the increase of the food stored in the seeds which are necessary to feed the embryo in the state of the uncovered method. Spraying with gibberellin was effective in increasing the germination percent especially at low concentration (150ppm). It gave (99.42%) with an increase of (10.21%) in comparison with the control treatment. Similar results have been obtained by Al-Assaf (1997) but does not agree with what was found by Aditya (1991)and Al-Ubaidi (1999) that GA_3 did not affect the percent of germination. The reason behind the increase in the germination percent by using GA_3 is that the embryo might be the main source to built vital gibberellin, or the vital creation of gibberellin might take place in the cotyledon. This agree with what was mentioned by Abdul and Mohammed, (1986) and Wali, (1990), who remarked that GA_3 had positive effect on the germination percent. It is stored inside the seeds with the reserved food material in a free or joined form. Whereas, spraying with alar resulted in decreasing the germination percent insignificantly. Regarding the interaction, the treatment between the covered method with high concentration of alar had a significant effect in decreasing the germination percent (68.20 %). Yet, interaction treatments between planting methods and spraying with GA_3 and the interaction between uncovered method and spraying with alar had no any significant effect to be mentioned. It can be noticed from Table (6) that planting method had no significant effect on the average rate of seedling germination per day. Growth regulators had also no significant effect on the rate of germination. The interaction effect was significant and the treatment of uncovered method with high conc.(250 ppm) of GA_3 and high conc. of alar (1000 ppm) resulted in increasing the rate of germination (26.79 , 26.39) seedling per day respectively with an increased of (47.35%, 45.15%).

Table (6): Effect of planting method GA_3 and Alar concentrations and their interaction on percentage and rate of germination.

Treatments	Characteristic	% of seeds germination	Rate of germination
Planting method			
Uncovered		98.07 a	23.25 a
Covered		88.31 b	19.88 a
Growth plants			
Control		94.10 a-c	19.40 a
GA_3 150 ppm		99.42 a	21.73 a
GA_3 250 ppm		98.22 ab	25.25 a
Alar 500 ppm		91.00 bc	21.75 a
Alar 1000 ppm		83.20 c	19.71 a
Interaction M*G			
Uncovered	Control	95.11 a	18.18 e
	GA_3 150 ppm	99.06 a	19.02 de
	GA_3 250 ppm	98.43 a	26.79 a
	Alar 500 ppm	99.53 a	25.90 ab
	Alar 1000 ppm	98.21 a	26.39 a
Covered	Control	93.10 ab	20.65 d
	GA_3 150 ppm	99.77 a	24.43 b
	GA_3 250 ppm	98.01 a	23.72 c
	Alar 500 ppm	82.46 ab	17.60 e
	Alar 1000 ppm	68.20 b	13.04 f

*Means followed by the same letter within a column do not differ significant from each other using duncan's multiple range test at 5% level.

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تأثير طريقة الزراعة ، الجبرلين والالار على بعض الصفات الكمية للقرنابيط
(Brassica oleracea var. botrytis)

الخلاصة

أجريت تجربة حقلية في حقول كلية الزراعة / جامعة دهوك خلال موسم الزراعة 2001-2002 ، لدراسة تأثير طريقة الزراعة (مغطاة و غير مغطاة) والرش بحامض الجبرليك بتركيز (0,150,250) جزء بالمليون والالار بتركيز (0,500,1000) جزء بالمليون على الصفات الكمية وإنبات البذور في القرنابيط صنف (snow ball) . أظهرت النتائج بأن طريقة الزراعة المكشوفة أدت إلى زيادة معنوية في نسبة المئوية للمادة الجافة في الأوراق ونسبة المئوية للإنبات، في حين أن طريقة الزراعة المغطاة أعطت تأثيرا معنويا لنسبة المئوية للمادة الجافة في الأفراص كما وادت الى تقليل عدد الايام اللازمة من الزراعة لحين تكوين الافراص، تفتح الازهار، تكوين الثمارونضج البذور. في جانب أخر إن استعمال منظمات النمو(الجبرلين و الالار) لم يكن لها تأثيرا معنويا في النسبة المئوية للمادة الجافة في الأوراق والأفراص الزهرية، نسبة المئوية للفسفور و للبوتاسيوم في الأفراص. بينما كان لها تأثيرا معنويا لنسبة المئوية للنتروجين في الأوراق والأفراص ونسبة المئوية للبوتاسيوم في الأوراق فقط ونسبة المئوية للإنبات باستعمال الجبرلين. أدى الالار نقصان معنوي في النسبة المئوية للنتروجين في الأوراق والأفراص خاصة عند التركيز العالي (1000) جزء بالمليون.

كارتێكرنا رێكا چاندنێ ، جبرلينی و ئالاری لسەر بەرهەمێ سەركاو توڤێ قەرنابیتێ
(Brassica oleracea var. botrytis)

پوختە

ئەڤ ڤەكولینە هاتە بجهئینان لناڤ زەڤیێن ڤەكولینێن ل كولیژا چاندنێ – زانكویا دهوك دوەرزێ چاندنێ 2002–2001 ژبو دیاركرنا كارتكرنا رێكا چاندنێ (نخافتی و نە نخافتی) وەرشاندن بجبرلینی ب لوكێن (0,120,250)پارچەك ژ ملیونێ دا وئالاری ب لوكێن (0,500,1000) پارچەك ژ ملیونێ دا ل سەر سالوخەتێن جوونی وریژا سەدی یا چاندنی یێن قرنابیتێ ژجورێ (snow ball). ئەنجامێن ڤەكولینێ دیار كر كو رێكا نە نخافتی بو ئەگەرێ زێدەبونەكا پێش چاڤ ل سالوخەتێن رێژا سەدی یامتایێ هشك دناف بەلگادا ورێژەیا سەدی یا شین بونێ، بەلام رێكا نخافتی بو ئەگەرێ زیدەبوونەكا بەرجاف ل رێژا سەدی یا متایێ هشك دناڤ سەركێن گولادا ،بەلام بو ئەگەرێ كێم كرنەكا بەرچاف دژمارا روژێن پێتفی ژ چاندنێ تاكو پەیدابوونا سەركێن گولا، ڤەبونا گولا، پەیدابوونا فێقی و گەهشتنا توڤی. هەر وەسا رەشاندن ب جبرلینی و ئالاری ج كارتێكرنێن پێش چاڤ نە بوون ل سالوخەتێن رێژا سەدیيا متایێ هشك دناف بەلگاو سەركێن گولادا، رێژا سەدی یا فسفوری و پوتاسیومی ل سەركادا. بەلام كارتێكرنا یەرچاف هەبوو بو رێژا سەدی یا نایتروجینی ل بەلگاو سەركادا ئو رێژا سەدی یا پوتاسیومی ل بەلگادا بتنێ و رێژا سەدی یا شن بوونێ بكارئینانا جبرلینیی. بەلام رەشاندن ب ئالاری بو ئەگەرێ كێم بوونەكا پێش چاڤ ل سالوخەتێن رێژا سەدی یا نایتروجینی ل بەلگاو سەركادا تایبەتی درێژا بلند(1000) پارجە ژ ملیونی.

USING THE NORMAL PRICES TO DETERMINATE THE HARVEST REVENUE AND LOSSES WITH REGENERATION DELAY FOR POPLAR STANDS IN ZAKHO

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(Received: December 22, 2008; Accepted for publication: June 15, 2009)

ABSTRACT

In this research, a poplar stand in Zakho-Dohuk was chosen to test the possibility of its investment according to the economical aspects. Further than the ability of delaying trees cutting to a period of time after ending the rotation period of the poplar in the region under investigation. After data collecting required for the economical evaluation like costs and revenues, a comparison was done using economical evaluating criteria (time preferable criteria) and net present value (NPV).

The test approved that the stand age of six years gave the highest net present value (14488.4) in (ID1000), so, trees must be cut at that year. As well as, bare land value (BLV) and soil expectation value (SE) criteria were used through specific mathematical equation to know the possibility of delaying cutting beyond the sixth year.

Data analysis illustrated that the age of six years gave the highest BLV (87468.46) in (ID1000) and the highest SE (90593.46) in (ID1000). Depending on the results, we recommend delaying not trees cutting beyond the age of six years because this will cause loosing revenues and decreasing the stands profits.

KEY WORDS Harvesting Delay Poplar Stand BLV NPV SE

INTRODUCTION

Time is considered as an important factor in the harvesting operations of forest, for the relationship of all harvesting operations and the other aspects with time, that directly depend on the achievement time of these operations. This all resulted from different correlations of time with other factors such as costs and revenues (economic aspects), Also the aspects of using water and soil addition to the wood supply during the determination and fast rotation period. Having into consideration that time should not be wasted during these operations; otherwise it will have reflections on programming successive operations period. However determination is not randomly, but rather measurements are needed to apply these operations. Sometimes it is possibility to leave the forest.

In sometime the artificial stands do some things instead of natural forest in produce of wood if the last one is not found or if have as small area and it can not supply wood of the market and this artificial stands have a high important in economic plan depended on economic study, but there are many factors like market wood prices in the provide of harvesting and tree costs at regeneration, of these factors on the economic aspects of the poplar stands in Zakho which contain large numbers of poplar stands and it needs harvesting plan.

Problem of research:

The economic theory mentioned frequently to the increasing normal prices, this state has caused increasing the volume of forest land, but there are many factors affect the forest land value while resulted in decreasing without having operation, or to cut it before getting rotation period because of some different considerations such as high costs of harvesting revenues which have taken from harvesting operation. When the exhibition of the wood into the market increases, it be the cause of increasing supply and it will cause of wood prices according to demands and supply rules that to be mentioned in economic theories. This problem need to do the economic evaluation of forest and stands and then there is possibility to decide on harvesting operation due to the scientific methods, Thus the amount of revenues would be clear and the best results one could get in certain time through the harvesting operation.

Hypothesis of research:

"According to the collected information from the poplar stands in Zakho and from the wood market in Dohuk we can putting the following hypothesis:

By using Economic criteria we can determine the optimum harvesting age of poplar stands in Zakho, and the delay in application at cutting trees in that age will cause negative effects on the stands revenues and on the next rotation of these stands"

Objective:

The objective of this research is to determine the harvesting revenues and economic side of Poplar stands in Zakho.

Literature Review:

Addition to what had mentioned above, there are many researches and experiences in forest project evaluation, in order to consider their economics and determine time of investment in local and world standards has been done. Due to the local standards, there is no delay in forest harvesting and investment that causes increasing revenues and profits for the project.

Brodie and Tedder (1982) determined the cost of a forest project and the amount of losing harvesting revenues when there is delay in cutting or new generation period. Both researchers proved that there is strong relationship between stable densities and instants and permitted cuttings. Because of the long period of growth in forest delaying in process of harvesting and investment cause progressive decreasing permitted cutting. In addition it causes sustained yield in forest either surplus programmed or non programmed delay. Despite, both researchers proved that there is a relationship between harvesting volume and time through continuously period, and

determined surplus and shortage which result from them. Hann and Brodie (1980) indicated also the delaying in regeneration and its affective factors. The facts that they were proved were that, there are factors affect regeneration on the amount of the permitted cutting of wood, or it should not be beyond the annual growth. But in the case of increasing the annual cutting from the annual growth, there should be a new policy for harvesting and finding some reasonable solutions for doing reforestation operation in actual time. The research also reached the fact that the ways were used for harvesting and reforestation and also the problems we face throughout the process have a main affective role on people to have a decision in early and late reforestation, and also delaying harvesting operations. But in the direction of evaluation of different forest, Shareef (2000) reached the fact that evaluation of different stands of eucalyptus, sycamore, and poplar in Nenavah district and determine times of harvesting and cutting that were imposed. He referred to the point that forest project would only be economical in the case of having suitable conditions and species in region. After tabulating suggested costs and revenues, the researcher determined the period of the cutting for eucalyptus, sycamore and poplar, with using time standards of economic evaluation. Al-Sarraf (2007) reached the determining optimizing economic period for different kinds of stands such as eucalyptus, sycamore and poplar in Nenavah district. He referred to the point that the best time of rotation period or harvesting time for poplar tree is six years with using different mathematical formula as using net present value with different insurance rates.

MATERIALS AND METHODS:

A stand of *Populus nigra* is selected in Zakho as a case study. The area for this reason is 5 hectares, also special measurements for providing needed materials of research such as yield counting diameters, heights, and ages of stand trees in order to compare the figure of yield tables which have been reached by Al-Ali (2005) and Al-Sarraf (2007) from the following formula:

$$Y=30.414+350.78(1-Exp\ (-0.0889786\ .A)$$

So

(Y) = is the Yield

(A) = is the Age

Throughout the comparison, the tables represent data and special measurement for selected stands. Thus we may use a yield table for black poplar for calculation. Stand yield shown in the second column, table (1) and we started to collect the data related to the price of polar poles in Dohuk wood market (Iskale), we collected different kind pole volumes to determine the price of one cubic meter from these pole volumes according to volume and number of poles in each class. We determined the number of pieces of poles in one cubic meter by using observed method by (David 1966) who has proved that the number of pieces of pole in one cubic meter decreases by increasing tree age (increasing diameter of pole). Despite the fact how much the volume and age increases, the price of pole increases. Thus the price of one cubic meter of pole increases in a certain limit and after that decreases by increasing the age of poles; reach to the degree that increased the volume of pieces. Thus the price of one cubic meter of poles decrease by the increasing the volume of pieces (poles). Here we calculated the price of one cubic meter of these poles on different ages that are shown in 3rd column of table (1). This table has been prepared to determine the data for using them in order to extract revenue of stands for successive years and different ages of trees. Also we determined the gross costs of the stand during the years of its age till the tenth.

Table(1): Shows the costs and revenues of ***Polulus nigra L***. stands in Zakho.

Age (Years)	Yield (m^3)	Price (ID1000/ m^3)	Gross Revenues (**ID1000**)	Gross Costs (**ID1000**)	N.P.V. (**ID1000**)
2	26.76	92.61	2478.3	40625	-38146.7
3	51.76	103.68	5366.5	23625	-182585
4	74.63	175.232	13077.6	23750	-106724
5	95.55	377.01	36023.3	27000	90233
6	114.68	469.7	53865.2	30875	22990.2
7	132.19	316.99	41836.8	32500	9336.8
8	148.21	184.925	27407.7	23750	3657.9
9	162.87	88.85	14470.9	23750	-9279.1
10	180.97	73.23	13252.4	34125	-20872.6

We gathered capital, productivity and current costs to get two columns; O gross cost and gross revenues for the stand in ten years. These figures were divided by the number of hectare (5) to get the cost and revenue of one hectare.

Then we discounted them by discounted rate8% which is acceptable and usable with forest projects according to the researches of (F.A.O.).

Thus we managed to get the gross discounted costs and revenues which are shown in following table.

We prepared the economic evaluation for the stand by estimating the net present value (N.P.V.) in order to understand the economic financial development for the stand years of its age and to know the delay of harvesting and its economic effect

and the possibility of finding this delay in the process harvesting and also the delay in reforestation by using the following formula (Bar Land Value) (Clutter L. etal,1983).

$BLV=Nt/(1+i)^t=SYt-R(1+i)^t-T[(1+i)-1]/i/(1+i)^{t-1}$

So:

BLV= Bare Land Value

Nt=Per-acre net return at harvest

S= Per-unit stumpage price

T= Rotation length

R=Per-acre regeneration cost

I=Inflation-free interest rate

T=Annual per-acre adulatory tax and administration cost

Yt= Per-acre yield in units out the end of the rotation

Also we use another special formula for land expected value(SE),(Clutter L. etal.,1983). as shown below:

$SE=Hv-Rc(1+i)^n/(1+i)^{n-1}$

So:

SE=Land expected value

Hv=Harvesting value

Rc= Regeneration cost

I= Interest rate (8%)

RESULTS AND DISCUSSIONS

We may prove and judge some projects whether they are economical or not through the application of some standards of economic evaluation of the data we mentioned before. One of those standards we used before for determining the optimum age of harvesting in poplar stands in Zakho was the net present value. Also we reached to the bare land value and land expected value throughout the application of special formula for each value, in order to reach the tables below which shows the results statistical analysis.

Table (2): Shows the net present value of ***Polulus nigra L.***stands in Zakho per donum.

Age (Years)	Gross Discount Revenue(**ID1000**/ha)	Gross Discount Cost(**ID1000**/ha)	N.P.V. (**ID1000**)
2	2124.6	34827.8	-32703.2
3	4259.9	18455.8	-14195.9
4	9612.1	17456.2	-7844.1
5	24517.5	18376.2	6141.3
6	33945.8	19457.4	*14488.4
7	24411.8	18963.7	5448.4
8	1408.4	12832.1	1976.3
9	7238.3	11879.7	-4641.4
10	6138.5	15806.7	-9668.2

In table (2) we using the formula at discount coefficient $\{(1/1+r)^n\}$ at discount rat 8%. According to the results of the process of application of (N.P.V.), it can be realized that these values started to increase with age increasing till reaching a certain stage, then decrease because the highest value which managed to get an optimum age of harvesting which is shown in table(2) at sixth age. The (N.P.V) was (14488.4) in (ID1000), and this was the highest value of (N.P.V) during ten years of age of stand. We can refer to the (N.P.V) of stand in first year which was negative because the increasing costs. Then increase resulted in decreasing the rates of revenue (because of was the young age of trees and they were not reached that value, as it became zero or low value). When we compare these values with the high cost values, we will realize that the (N.P.V) becomes zero or negative in the case we calculate costs and revenues. So the rate of (N.P.V) increases with the increase of age . Also it is mentioned that after reaching the forest and harvesting stage the rate of (N.P.V) decreases again till it reaches the highest possible rate as a result of cost increasing again. And in this case the forest may occur disease, insect, and… etc. The risks we mentioned, cause increasing of the costs again. In this case the growth of trees in first stages of the life of the stand increases. Then this increasing would be accessional till it reach the best age, after that this increasing in growth becomes more but this time it would be decline, and this reflects with costs that becomes a reason of decreasing in (N.P.V). We obviously realized, the points we mentioned above, after we analyzed the results of this study. Thus the most rates of (N.P.V) we got is the age of six years of the stand and this results are in harmony with a number of researches studied before. Also we realized that we can do the process of cutting and harvesting even in fifth year of age, because we can get some good (N.P.V) rates in fifth year of the age of stand, but in a condition of getting some requirements such as; the desire of the owner of the stand towards cash flow, or the owner expecting of the lack water requirements for stand of the poplar trees need too much water requirements, or the owners expectation of occurring insects, fungi, and diseases which harms the yield. Despite of this, it is better to have the process of cutting and harvesting in sixth year of its age. In addition to that there is possibility also to have the process of harvesting and cutting in the age of seventh of the tree which the same as sixth year give positive rates, and this is in the case of high necessity or in the lack of economic sides of this process. But when we refer to the (N.P.V), which is possible to use in order to determine the abilities of delaying the process of harvesting

for some years after optimum rotation period, that we could provide some additional revenues for the stands or there would be expectation of possibility of price increasing in wood markets in coming years.

Table (3): shows the results of statistical analysis of(B.L.V)&(SE) per donum.

Age (Years)	B.L.V.(ID)	S.E.(ID)
2	8684.39	11804.4
3	15404.09	18529.09
4	31491.83	34616.83
5	72252.54	75377.54
6	*87468.46	*90593.46
7	54427.89	57552.98
8	28127.02	31252.02
9	10479.88	13604.88
10	7490.41	10615.42

But results made it clear that the best year for harvesting was six years age, and the rate of (B.L.V) reached to (78468.46 ID) which was the highest rate in comparison with the previous years of the age of stand. If it was delayed it for coming year, it would cause the lost for (33040.57 ID), which is a very high rate that we might not put ourselves into risk for example in this case you may need doublicate the prices to catch our aim in delaying of harvesting. So the best thing to do it to have the process of harvesting is sixth year of age.

We discussed these results depending on economic rotation period which has relations with biological cutting that helped us to ed values from some of those standard that we applied in this study and which are mentioned in other studies.

The currant poplar stand that we are studying is a procession of private sector, and we have to take into consideration the goal of private sector and other reflections in general. The most important point in private sector is that the processor tries to regain his wealth in the course of a short time, so this point results the soon process of cutting and harvesting in short periods of time such as three years. Thus it is more beneficial economically and financially to have the process of harvesting and cutting in its scientific age than cutting and harvesting in the second or third year of its age. The results of research approved that if we gather the rates of (B.L.V) in first three years of the age of stand reached to (24088.48 ID) and this represent as first harvesting period for the stand. But in repeating this rotation in future we reach the double of this rate in six years, in a case that the rates of (B.L.V) for the sixth year reach (87468.46 ID) more than the duplicated rate of it. So in this case we advice the postponing harvesting and extend rotation period till the sixth year of age, for getting highest revenues and best profit.

When we use the (SE) standard after we apply a special formula the results approved that the best harvesting should be in sixth year of age, as this age provides the biggest (SE) which is (9593.46 ID) and this is the highest rate in comparison with first years before applying and after applying, so not be delay in cutting and harvesting only after sixth year o stand age. In the case that the owner of stand delayed it, he would be the responsible for decreasing revenues and profits which we could get through harvesting the private stand of black poplar in Zakho.

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الخلاصة

تم في هذا البحث اختيار مشجر فوغ في فضاء زاخو النابع لمحافظة دهوك لاختبار إمكانية استثماره ومن الأسس الاقتصادية فضلا عن اختبار إمكانية تأخير عملية الحصاد وقطع الأشجار إلى فترة زمنية تعقب الانتهاء من دورة القطع للفوغ في المنطقة قيد الدراسة وبعد جمع البيانات المطلوبة لإجراء التقييم الاقتصادي من تكاليف وعائدات. أجريت عملية المقارنة باستخدام معايير التقييم الاقتصادي (معايير التفضيل الزمني) ومنها القيمة الصافية الحالية(NPV) وقد أثبتت الاختبارات العمر ستة سنوات للمشجر تحقق اعلى القيمة الصافية الحالية(14488.4ألف دينار عراقي) ولذلك يجب قطع الأشجار عند تلك السنة، كما وقد استخدم معيار قيمة الأرض (Bare land value) ومعيار القيمة المتوقعة للتربة(Soil expected value) من خلال الصيغ الرياضية الخاصة بهما لمعرفة إمكانية تأخير عملية القطع إلى ما بعد السنة السادسة إلا انه ومن خلال تحليل البيانات لهذه الطريقة تبين بان العمر ستة سنوات أيضا يعطي اكبر(B.L.V) (87468.46 ألف دينار عراقي) وكذلك اكبر قيمة متوقعة للتربة(S.E.) (90593.40 ألف دينار عراقي) وبذلك نوصي بعدم تأخير القطع إلى ما بعد عمر ستة سنوات لان ذلك سوف يؤدي إلى تحمل صاحب المشجر فقد في مقدار العائدات وانخفاض الإرباح المتأتية من المشجر.

کورتی

دڤێ ڤەکولینێدا نهالستانەکا سپیندارا ل زاخو ل پاریزگەها دهوکێ هاتە ژێگرتن ژبو تاقیکرنا شیانین بەرئینانا وێ و ژ بنەماین ئابوری زێدەباری تاقیکرنا شیانین گیروکرنا کریارین درین و برینا دارا بو ژڤانەکێ دەمی پشتی چەرخا برینا سپینداریێ ت دەڤەرا ڤەکولین لێ هاتیەکرن. و پشتی مە داتاین پێتڤی بو ئەنجامدانا هەلسەنگاندنا ئابوری (پارین تێچوی و پارین ژێهاتی) کومکرین.

کریارا بەراوردکرنێ ب بکارئینانا پیڤەرین هەلسەنگاندنا ئابوری(پیڤەرین ژیگرتنا دەمی) وژ وانا نرخێ نوکە یێ سافی(NPV) هاتبو ئەنجامدان و تاقیکرنا بومە دیارکر کو ژیێ شەش سالی بو نهالستانێ بلندترین نرخێ نوکەیی سافی کو ((14488.4) عیراقی ب دەست خو ڤە ئینان وژبەر هندێ پیتڤییە کریارا برینا دارا د هەمان سال دا بهیتە کرن، وهەروەسا پیڤەرێ نرخێ ئەردی(BLV) و نرخێ پێشبینی کری بو ئاخێ(SE) هاتنە بکارئینان برێکا هزاردینارین هاوکیشین بیرکاری یەن تایبەتمەند ب وان ڤە ژ بو زانینا شیانین گیرو کرنا کریارا برینا دارا بوسالەکێ پشتی ژیێ شەش سالیێ پروژەی، سەرەرای ڤێ چەندێ و برێکا شروڤەکرنا داتایان بو ڤی شێوازی بو مە دیار بو کو هەروەسا ژیێ شەش سالی بلندترین (BLV) کو (87468.4 هزاردینار عیراقی) وهەروەسا بلندترین نرخێ پیشبینکری بوئاخێ(SE)کو (90593.40 هزاردینار عیراقی) و بڤی رەنگی ئەم پیشنیار دکەین کو برینا داری بوپشتی ژیێ شەش سالی گیرو نەکەن ژبەر کو دێ بیتە ئەگەرێ خو بەر گرتنا خودانێ نهالستانێ ئەوین پویچبونا درێژا پارین ژێهاتیین پروژەی و هەروەسا کێمبونا سودێ ژ نهالستانێ بو دهێت دکەت.

RESPONSE OF APPLE TREES CV. GALARINA (PALT) TO IRON AND ZINC FOLIAR SPRAY 2-YIELD AND SOME STORAGE CHARACTERISTICS

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(Received: January 13, 2009; Accepted for publication : May 12, 2009)

ABSTRACT

This study was conducted during 2008 growing season on apple trees CV. Galarina named in Duhok (Palt) budded on apple seedlings and grown on Gavark location / Duhok governorate. The trees were sprayed with five concentrations of iron (0, 40, 60, 80 and 100mg.L^{-1}.Fe) using Fe-EDDHA (6%) as a source of Fe, and five levels of Zinc (0, 15, 30, 60 and 120mg.L^{-1}. Zn) using Zn-EDTA (15%). Plants were sprayed twice during the growing; the first was at fruit set while the second was latter one month. The results indicated that foliar spray with either Fe or Zn or their combination significantly increased fruit fresh weight, number of fruit per tree, trees yield, fruit length, juice content and total soluble solids. However, fruit diameter ratio and fruit firmness were no responded. The best treatment was (80 mg.L^{-1}.Fe and 15mg.L$^{-1.}$ Zn) alone or with each other gave the highest yields (61.087Kg and 52.327Kg) respectively.

KEY WORDS Apple Fe Zn Storage.

INTRODUCTION

The apple (*Malus dumestica* Borkh) belongs to Rosaceae family and is one of the most important crops in terms of production (Childers,1983; Jackson, 2003; Bal, 2005 and Mayi, 2007). In the past it was generally regarded as a crop of the temperate zone. However, it is increasingly cultivated under sub-tropical and even tropical conditions. (Erez, 2000). Apple fruits are rich in Carbohydrate content, Organic acids, Proteins, Vitamins (A, B1, B_2 and C), minerals (Ca, P, Fe, K and Na) and some other nutritional compounds (Childers,1983 and Jackson, 2003). The world production of apple is about 62196470 tons.y^{-1} (FAO STAT, 2007). Iraqi production is about 64300 tons (Statistical group, 2004).

The aims of this study are:

Apple yield per tree in Iraq is very low compared to the international yield (Gani *et al.* 1978 and Yousif, 2002). Therefore, it is necessary to investigate the possibilities of improving growth and yield of apples with applying several cultural practices such as fertilization. 1-Improve vegetative growth as well as fruit quality and quantity in Galarina cultivar with spraying different concentration of chelated iron and Zinc at Gavarke location. 2-Investigated the effect of iron and Zinc treatment on storage ability and fruit characteristics of these cultivar after four months of storage

Galarina is known in Duhok a (Palt) apple that is capable resistant to apple scab and can be stored for short periods. It was improved in France from a Gala and Florina cross. The medium-size fruit matures in July. The skin color is greenish yellow of yellowish white flesh. The flavor is aromatic and slightly tart. Trees are moderately vigorous and are highly cultivated in Duhok governorate owing to their adaptation which had been acquired with time in this area. They gave high yield of a good quality.

Iron is a slightly mobile micronutrient in plants, so that its deficiency symptom is usually observed on the newly growing shoots as yellowing of intra veins tissues and veins sustain their green color. In severe deficiency incidences, the entire leaf area may be altered to white. It can be demonstrated that Fe is a very slightly mobile micronutrient when applying Fe solution on the surface of an iron deficient leaf tissue, then the treated tissue will turn to green color. Sourour (1992) observed that the treatment of 'Anna' apple trees with different forms and methods of iron applications profoundly improved tree yield and fruit quality through increasing fruit weight and TSS of juice and decreased total acidity. Fazal *et al.* (1996) noticed that the yield of 'Red Delicious' apple trees was significantly increased. However, fruit sugar content was decreased with foliar application of iron in comparison to the control. Patel *et al.* (1997) found that soil amendment with acid lime combined with foliar spray of iron in the form of $FeSO_4$ or Fe-EDDHA significantly increased tree fruit yield. Mamgain *et al.* (1998) noticed that apple tree yields in different orchards were positively affected with soil and foliar application of iron. Al-Kwami *et al.* (2002) found that spraying 'Aswad Diala' fig trees with iron sulfate at rate of 0.2% alone or mixed with N and Zn at the same concentration of iron significantly increased the fruit weight, fruit volume, fruit diameter, and fruit length. El-Seginy *et al.* (2003) showed that treatment of spraying 'Anna' apple trees grown in calcareous soil with Fe alone or in combination with Zn and Mn significantly improved tree yield, number of fruit per tree, fruit weight, fruit firmness, TSS, acidity and total sugar. Al-Aa'reji (2004) observed that spraying 'Le-Cont' pear trees with chelated iron (Fe-EDDHA) at concentrations of (30 and 60 mg.L^{-1}.Fe)alone or in combination with three levels of Mn (0, 15 and 30mg.L^{-1}.Mn) significantly increased number of fruits per tree, fruit weight, fruit volume, TSS and yield.

Zinc has often been described as a "rosetting" of leaves or "little leaf." Newly developing leaves are smaller than normal. Reduced shoot elongation keeps them close together, resulting in the rosette appearance. In severe cases, older leaves may drop, resulting in a more pronounced rosetting. In the early

spring, the observer might notice a delayed foliation of lateral leaves on last year's shoots. Awad and Atawia (1995B) illustrated that when 'Le-Cont' pear trees were sprayed twice a year with 60mg.Fe.L^{-1} alone or mixed with Mn and Zn at concentration of 25mg.L^{-1} for each, enhanced tree fruiting via fruit set and improved most fruit parameters which limited the quality, (weight, length, diameter, shape, color, firmness, TSS, total sugar, acidity), number of fruit per tree and yields. Gobara (1998) found that foliar application treatments of 'Le-Cont' pear trees with 36mg.Fe.L^{-1} in the form of Fe-EDDHA alone or mixed with some nutrients (Ca, K, B, Zn and Cu) resulted in a significant increase in tree yield, fruit weight and fruit diameter, TSS, total sugar, and reduced sugar and total acidity as compared to the control. Awad *et al.* (2000) observed that foliar application with Fe-sulfate at rate of 0.05% on 'Anna' apple trees alone or in combination with Zn and Mn sulfate at the same concentration substantially increased the yield, number of fruits per tree, fruit weight and fruit diameter. Ahmad and Morsy (2001) found that treating 'Anna' apple trees with iron alone or mixed with Cu, Zn, and ascorbic acid as a foliar application highly increased tree yields, number of fruit per tree, fruit weight, fruit length, fruit width, TSS, total sugar and reduced sugar and total acidity as compared to those of the control.

MATERIALS AND METHODS

This study was conducted during 2008 season in Duhok-Geverk location, (450m above sea level , investigate the effect of foliar application of iron and Zinc levels and their combinations on yield and fruit quality of Galarina (Palt**)** apple cultivar. Trees of 'Palt' apple cultivar was 10 years old, were selected at Geverk orchards. Trees were chosen on the basis of age, uniformity, shape, healthy state and vigority. NPK fertilizer (27:27:0) was applied at a rate of 0.78Kg per tree, integrated pest management program was applied to eradicate fungi and insects (Agrotica, 2005 and Mayi, 2007).

A Factorial Randomized Complete Block Design was used including two factors. The Fe concentrations (0, 40, 60, 80 and 100mg.L^{-1}), and Zn levels (0, 15, 30, 60 and 120mg.L^{-1}) and their interaction. Therefore, 25 treatments were involved in this experiment, each was replicated four times and one replicate was represented by one individual tree. Trees were sprayed with the proposed Fe, Zn concentration and their combination using Fe-EDDHA (6% Fe) and Zn-EDTA (15%) as a source of Fe, Zn respectively, mixed with 0.01% Tween 80% (Jean-Pierre, *et al.*1989). Trees were sprayed after fruit setting and one month later, (Awad and Atawia 1995, Gobara 1998, Ahmad and Morsy 2001 and Mayi, 2007).

The experiment was designed as Complete Randomize Design (CRD) in factorial experiment with two factors and four replicates, fruit were taken at harvesting (20 Fruits for each experimental unit).The fruits were rinsed with distilled water and then drenched in 50% bell fungicide at rate of 2g.L^{-1}. Then they were dried at room temperature and finally stored at 0 ± 2^0c and 90-95% humidity. The fruits were taken out before and after four months of storage and some important fruit characteristics were measured:

1- Fruit fresh weight (g).
2- Number of fruits per tree.
3-Tree yield (Kg).
4- Fruit length (Cm).
5- Fruit diameter (Cm).
6- Fruit Length/diameter (L/D ratio).
7- Juice (ml per fruit).
8- Total Soluble Solids percentage (TSS %).
9- Fruit firmness (kg/Cm^2).

The following parameters were estimated after four months of storage 20 fruits for each experimental unit using the same methods of the first experiment:

1- Fruit fresh weight (g).
2- Total Soluble Solids %).
3- Fruit firmness (Kg/cm^2).
4- Fruit juice content (ml per fruit).

Statistical Analysis

All the obtained data were tabulated and statistically analyzed with computer using SAS system (1996). The differences between various treatment means were tested with Duncun multiple range test at 5% level.

RESULTS

1-Fruit quality at harvesting time:

1-Fruit fresh weight: Results in (Table 1) revealed that spraying apple trees with either iron, zinc concentration resulted in a significant increase in fruit fresh weight, particularly at concentration of (100mg.L^{-1}.Fe) and (120mg.L^{-1}.Zn) as compared to the other treatments (292.192gm, (282.145gm). Combination between iron and zinc concentrations displayed that 120mg.zn.L^{-1} and tap water appeared to be the most effective treatment, as it gave the highest fruit fresh weight (343.585gm).

Table (1): Effects of iron, zinc and their interactions on fruit Fresh weight (gm) of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	167.415m	272.298fg	295.550cd	323.205b	343.585a	280.411b
40	167.415m	179.225l	223.125k	243.118ij	247.178i	212.012d
60	225.720k	246.375i	264.718gh	266.698gh	236.848j	248.072c
80	262.105h	271.450fg	274.690ef	298.480c	280.778e	277.501b
100	294.958cd	298.735c	274.908ef	290.023d	302.335c	292.192a
Zn means	223.523d	253.617c	266.598b	284.305a	282.145a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

2-Fruit number: Data in (Table 2) clearly show that spraying apple trees with Iron concentrations resulted in a significant increase in fruit number particularly at 80mg.L^{-1}.Fe rate, as compared to the untreated check. Apple trees treated with the negest zinc concentrations significantly increased fruit number, especially with 30mg.L^{-1} rate as compared to the untreated control. Results of iron and zinc interaction revealed that 30mg.L^{-1}.Zn plus tap water was the most effective treatment as it gave higher fruit number per tree (226.188fruit.tree^{-1}) in relation to control. However, lowest fruit number per tree coincided with the untreated control (95.170fruit.tree^{-1}).

Table (2): Effects of iron, zinc and their interactions on fruit number of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	means
0	95.170o	194.473e	226.188a	204.205cd	206.700cd	185.347b
40	95.170o	129.515n	181.943g-j	142.298m	136.325m	137.050d
60	161.958L	189.885ef	169.438k	166.275kL	177.803ij	173.072c
80	209.130c	218.318b	183.268f-j	186.478fg	201.693d	199.777a
100	176.385j	184.605f-i	186.195f-h	201.580d	178.805ij	185.514b
Zn means	147.563d	183.359b	189.406a	180.167c	180.265c	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

3-Tree yield Results in (Table 3) manifested that spraying apple trees with Iron concentrations resulted in a significant increase in tree yield particularly at 100 and 80mg.L^{-1}.Fe rate, as compared to the untreated check. Apple trees treated with zinc significantly increased fruit number, especially with 60mg.L^{-1} rate as compared to the untreated control. Results of iron and zinc interaction revealed that 80mg..L^{-1}.Fe plus 15mg.L^{-1}.Zn was the most effective treatment as it gave higher fruit number per tree (66.985Kg).However, the lowest fruit number per tree was coincided with the untreated control (15.170Kg).

Table (3): Effects of iron, zinc and their interactions on trees yield (Kg) of Galarina 'Palt' apple tree cvs. grown in Gavark locations

Fe	Zn					Fe means
	0	15	30	60	120	
0	15.675m	52.920gh	66.728a	65.788a	64.878b-c	53.137c
40	15.675m	23.053l	40.508j	39.408j	33.545k	30.438e
60	37.888kj	48.625hi	48.413hi	46.788i	47.258i	45.794d
80	60.788c-e	66.985a	54.233fg	58.850d-f	56.970e-g	59.565ab
100	64.013b-c	63..028b-d	55.030fg	61.338b-e	62.028b-d	61.087a
Zn means	38.808b	52.327a	52.982a	54.434a	52.936a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Dun
.0cans multiple ranges test at 5% level

4-Fruit length: Results tabulated in (Table 4) cleared that spraying apple trees with either iron or zinc concentration resulted in a significant increase in fruit length, particularly at concentration of 100mg.L^{-1}.Fe, (25.40cm). The combination between iron and zinc concentrations displayed that 100mg.L^{-1}.Fe plus 15mg.L^{-1}.Zn appeared to be the most effective treatment, as it gave the highest fruit length (28.995cm).

Table (4): Effects of iron, zinc and their interactions on fruit length (Cm) of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	22.348c-f	25.110a-e	26.063a-d	25.733a-d	24.463 a-e	24.743ab
40	22.348c-f	26.578a-d	22.748 c-f	22.148d-f	19.958ef	22.756b
60	24.680 a-e	22.208d-f	24.735 a-e	24.853 a-e	25.110a-e	24.317ab
80	24.290 a-e	18.385f	27.683a-c	28.393ab	25.245a-e	24.799ab
100	25.095 a-e	28.995a	25.763a-d	23.753a-e	23.400 b-f	25.401a
Zn means	23.752a	24.255a	25.398a	24.976a	23.635a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

5-Fruit diameter: The obtained results (Table 5) revealed that spraying apple trees with Iron concentrations at 80+60mg.Fe.L^{-1} significantly affected in fruit diameter. However, zinc at a rate of 15mg.L^{-1}.Zn significantly increased fruit diameter. The combination between iron and Zinc concentrations displayed that 60mg.L^{-1}.Fe plus 120mg.L^{-1}.Zn significantly increased fruit diameter, as it gave the highest fruit diameter (57.48cm).

Table (5): Effects of iron, zinc and their interactions on fruit diameter (Cm) of Galarina 'Palt' apple tree cvs. in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	42.550h-j	53.938bc	50.550c-f	48.655d-g	45.593g-i	48.257b
40	42.550h-j	53.993bc	45.913f-h	41.390ij	39.640j	44.697d
60	46.573f-h	49.640c-g	46.205f-h	50.590c-f	57.480a	50.098a
80	48.648d-g	53.480bc	46.913e-h	52.453cd	50.400c-f	50.379a
100	51.310c-d	50.365c-f	50.273c-f	43.418h-j	39.583j	46.990c
Zn means	46.326c	52.283a	47.971c	47.301b	46.539c	

Means of each factor and their interactions followed by the same letters are not significantly different

6-Fruit length/diameter ratio: It appears from the data in (Table 6) that spraying apple trees with Iron concentrations resulted in a non-significant increase in fruit length/diameter ratio. However, zinc treatment at concentration of 30mg.L^{-1} significantly increased fruit length/diameter ratio. The combination between iron and zinc concentrations showed that at 80mg.L^{-1}.Fe combined with 30mg.Zn.L^{-1} was the most effective treatment as it showed the maximum fruit length/diameter ratio (0.582cm).

Table (6): Effects of iron, zinc and their interactions on fruit length/diameter of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	0.530a-c	0.508 a-c	0.537 a-c	0.543 a-c	0.541 a-c	0.531a
40	0.526 a-c	0.527 a-c	0.514 a-c	0.529 a-c	0.503bc	0.520a
60	0.541 a-c	0.487c	0.542 a-c	0.529a-c	0.493c	0.518a
80	0.522 a-c	0.418d	0.582a	0.558 a-c	0.526 a-c	0.527a
100	0.520 a-c	0.580ab	0.535 a-c	0.544 a-c	0.563 a-c	0.548a
Zn means	0.527ab	0.504b	0.542a	0.541a	0.525ab	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

7-Fruit juice: It can be inferred from the data in (Table 7) that spraying apple trees with Iron concentration and zinc concentration each alone resulted in a significant increase in fruit juice content, particularly at concentration of 60mg.L^{-1}, 15mg.L^{-1} as compared to the untreated check. The combination between iron and zinc concentrations displayed that 100mg.Fe.L^{-1} plus120mg.Zn.L^{-1} appeared to be the most effective treatment, as they gave a significant increase in fruit juice content (181.859ml.fruit^{-1}).

Table (7): Effects of iron, zinc and their interactions on fruit juice (ml / fruit)of Galarina 'Palt' apple tree cvs. grown in Gavark location.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	82.648k	177.275b	165.285c	157.175d	103.605j	137.198c
40	82.648k	166.628c	144.745fg	128.403h	120.383i	128.561d
60	165.363c	169.685c	170.613c	165.518c	169.333c	168.102a
80	141.998g	150.663ef	153.040de	150.273ef	155.098de	150.214b
100	149.660ef	158.768d	142.708g	129.323h	181.859a	152.463b
Zn means	124.463d	164.604a	155.278b	146.138c	146.056c	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

8-Total soluble solid: Results in (Table 8) revealed that spraying apple trees with either Iron or zinc concentration resulted in a significant increase in total soluble solid content, particularly at concentration of 100mg.L^{-1}, 60mg.L^{-1} Since gave a significant increase in total soluble solid content (11.040%, 11.490%), respectively, as compared to the untreated check. The combination between iron and zinc concentrations displayed that 100mg.L^{-1}.Fe plus 60mg.L^{-1}.Zn appeared to be the most effective treatment, as they gave a significant increase in total soluble solid content (12.450%).

Table (8): Effects o f iron, zinc and their interactions on total soluble solid of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	9.500e	10.500 b-e	10.500b-e	11.500 a-d	11.750ab	10.750b
40	9.500e	10.250c-e	11.750ab	11.000a-d	11.750ab	10.850ab
60	10.750 b-e	11.250 a-d	10.750 b-e	10.750 b-e	11.000 a-d	10.900ab
80	10.500b-e	11.500a-c	11.000 a-d	11.750ab	10.000de	10.950ab
100	10.250a	10.500 b-e	10.500b-e	12.450a	11.500 a-d	11.04a
Zn means	10.100c	10.800bc	10.900a-c	11.490a	11.200ab	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

9-fruit firmness: Data reported in (Table 9) indicated that spraying apple trees with iron, zinc concentrations resulted in nonsignificant increase in fruit firmness. Results indicated that the combination between iron and zinc concentrations displayed that 60mg.Fe.L^{-1} and 120mg.L^{-1}.Zn appeared to be the most effective treatment as it gave the highest fruit firmness (12.695kg/cm^2). However, the lowest fruit firmness was accompanied to the untreated check (7.850kg/cm^2).

Table (9): Effects of iron, zinc and their interactions on fruit firmness (Kg/Cm) of Galarina 'Palt' apple tree cvs. grown in Gavark locations.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	7.850c	8.433c	8.265c	8.830bc	8.370bc	8.350a
40	7.850c	8.268c	9.265bc	9.015b	8.758bc	8.631a
60	7.978c	9.425b	9.208bc	8.725bc	12.695a	9.606a
80	9.373b	9.553b	8.488c	9.393b	8.853bc	9.132a
100	9.243b	9.098bc	9.008bc	8.963bc	10.263b	9.315a
Zn means	8.459a	8.955a	8.847a	8.985a	9.788a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

2-Fruits Quality after Four Months of Storage:

10- Fruit fresh weight after storage: Results in (Table10) revealed that spraying apple trees with either iron or zinc resulted in a significant increase in fruit fresh weight, particularly at 100mg.L^{-1}.Fe and 60mg.L^{-1}.Zn rate as compared to the untreated check. However, combination between iron and zinc concentrations displayed that 100mg.L^{-1}.Fe plus 60mg.L^{-1}.Zn the most effective treatment as it gave the highest fruit fresh weight (261.63g).

able (10): Effects of iron, zinc and their interactions on fruit fresh weight (gm) of Galarina 'Palt' apple tree cvs. grown in Gavark location after four months of storage at 0±1c.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	146.698j	228.700fg	251.225c-e	251.703b	250.988bc	225.864b
40	146.698j	194.093i	196.015i	220.100f-h	207.900hi	192.961e
60	194.048i	197.955i	218.430gh	209.155hi	210.238hi	205.965d
80	222.673f-h	234.678e-g	234.565e-g	253.143b	206.928hi	230.397c
100	237.860d-f	261.410a	232.588fg	261.630a	260.420a	248.782a
Zn means	189.595c	223.367b	226.565b	239.146a	227.297b	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

11-Total soluble solid: Results in (Table 11) revealed that spraying apple trees with either iron, zinc concentrations resulted in significant increase in total soluble solid. The combination between iron and zinc concentrations displayed that 100mg.L^{-1}.Fe plus15mg.L^{-1}.Zn appeared to be the most effective treatment as it gave the highest total soluble solid (11.750%). However, the lowest fruit firmness accompanied to the untreated check (8.250%).

Table (11): Effects of iron, zinc and their interactions on total soluble solid (%) of Galarina 'Palt' apple tree cvs. grown in Gavark location after four month storage 0±1c.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	8.250e	9.500de	10.000b-d	10.500a-d	10.500a-d	9.750b
40	8.250e	10.000b-d	11.000a-c	10.750a-d	10.750a-d	10.150b
60	9.750cd	11.000a-c	11.250ab	11.500a	11.000a-c	10.900a
80	11.000a-c	11.000a-c	11.500a	11.000a-c	9.500de	10.800a
100	10.750a-d	11.750a	10.000b-d	10.750a-d	11.500a	10.950a
Zn means	9.600b	10.650a	10.750a	10.900a	10.650a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

12-fruit firmness: Data reported in (Table 12) showed that spraying apple trees with iron or zinc concentrations resulted in nonsignificant increase in fruit firmness. Results indicated that the combination between iron and zinc concentrations displayed that 100mg.L^{-1}.Fe and 60mg.L^{-1}.Zn appeared to be the most effective treatment as it gave the highest fruit firmness (4.943kg/cm^2). However, the lowest fruit firmness accompanied to the untreated check (3.240kg/cm^2).

Table (12): Effects of iron, zinc and their interactions on firmness (Kg/Cm) of Galarina 'Palt' apple tree cvs. grown in Gavark locations after four month storage 0±1c.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	3.240c	3.990bc	4.348ab	4.588ab	4.353ab	4.104a
40	3.240c	4.308b	4.563ab	4.298b	4.450ab	4.172a
60	4.000bc	4.050bc	3.850bc	3.818bc	4.188ab	3.981a
80	4.523ab	4.523ab	4.488ab	4.705ab	4.738a	4.595a
100	4.543ab	4.638ab	3.973bc	4.943a	4.720a	4.563a
Zn means	3.909a	4.302a	4.244a	4.470a	4.490a	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level

13-fruit juice: Results in (Table 13) revealed that spraying apple trees with iron or zinc concentrations resulted in significant increase in fruit juice. The combination between iron and zinc concentrations displayed that 40mg.L^{-1}.Fe and 15mg.L^{-1}.Zn appeared to be the most effective treatment as it gave the highest fruit juice (142.720 ml.fruit^{-1}). However, the lowest fruit juice accompanied to the untreated check (62.673ml.fruit^{-1}).

Table (13): Effects of iron, zinc and their interactions on fruit juice (ml/fruit) of Galarina 'Palt' apple tree cvs.grown in Gavark locations after four month storage 0±1c.

Fe	Zn					Fe
	0	15	30	60	120	Means
0	62.673i	141.135a	126.173bc	121.873cd	101.763g	110.723d
40	62.673i	142.720a	129.728b	109.333f	93.900h	107.671e
60	141.943a	126.975cb	124.745b-d	121.433cd	138.785a	130.776a
80	124.600b-d	126.205bc	114.783ef	119.943	122.573cd	121.621b
100	114.300f	120.020de	129.570b	113.963f	109.920f	117.555c
Zn means	101.238e	131.411a	125.000b	117.309c	113.388d	

Means of each factor and their interactions followed by the same letters are not significantly different from each others according to Duncans multiple ranges test at 5% level.

DISCUSSIONS

The Effect of Fe and Zn

The obtained results revealed that iron application significantly improved most of detected parameters such as fruit quality at harvesting time such as fruit numbers, fruit fresh weight, yield, fruit length, TSS, fruit juice, and fruit quality after storage such as (fruit fresh weight, fruit juice, and TSS, Similar results were recorded by Sourour (1992); Awad and Atawia (1995B); Patel *et al.* (1997); Gobara (1998); Awad *et al*. (2000). Vegetative growth improvements, which were gained with the foliar application of Fe, were attributed to the actions of iron on metabolism of plant cell. Al-Taai *et al.* (1994) found that iron was implicated as a Co-enzyme in the synthesis of the chlorophyll and active components of cytochromes (Al-Kwami *et al.*, 2002). Application of iron resulted in substantial chlorophyll increases in the leaf of treated plants and leaf Fe concentration accompanied with increasing chlorophyll concentration in the leaves. Amar (2003) Stated that iron was involved as an active factor in the structure of catalase, peroxidase, oxidase and cytochrome enzymes which facilitate the performance of many physiological processes in plant cells. Mukherji and Ghosh (2005) found that iron plays role in the condensation of glutamate to δ-aminolevulinic acid and facilitated the

conversion of Mg-protophyrin 1X methyl ester to protochlorophyllide which are the two main steps in chlorophyll synthesis. Zn was responsible for synthesis and translocation of carbohydrates from leaves to fruit and encourage the biosynthesis of cellulose which positively strengthen the cell walls. In addition Zn played an important role in biosynthesis and translocation of the natural auxins namely IAA to pedicels of fruit (Gobara, 1998; Nijjar, 1985).

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استجابة اشجار التفاح صنف كلرينا (بلت) للرش الورقي بعنصري الحديد

2- والزنك في الحاصل وصفاتها قبل وبعد الخزن

الخلاصة

اجريت هذة الدراسة خلال موسم النمو 2008 على اشجار التفاح صنف كلرينا المطعمة على الاصول البذرية للتفاح، و المزروعة في منطقة كفرك في محافظة دهوك. رشت الاشجار حتى البلل الكامل بخمسة تراكيز من الحديد (0 ،40 ،80 ،100ملغم /لتر) باستخدام المادة المخلبية Fe-EDDHA 6 % و بخمسة تراكيز من الزنك (0، 15، 30، 60، 100ملغم /لتر) باستخدام المادة المخلبية Zn-EDTA 15 % و لمرتين في الموسم و بفترة شهر بين الرشة والاخرى. اكدت النتائج ان الش الورقي بالحديد و الزنك ادى الى زيادة معنوية في زيادة وزن الثمار، عدد الثمار،كمية الحاصل، طول الثمار، نسبة العصير قبل و بعد الخزن وافضل المعاملات هي معاملة 80 ملغم حديد | لتر و15 ملغم | لتر زنك و التي اعطت اعلى كمية من الحاصل و هي7 61,08 كغم ، 52,327 كغم على التوالي.

کارتێکرنا رەشاندنا توخمێت ئاسنی وتەنەکەی لسەرسێڤاگالارینا(پەلت)

2 - بەرهەم وسەخلەت بەری وپشتی کوگەهکرنێ

پوختە

ئەڤ ڤەکولینە هاتیە کرن لسالا 2008 لسەر دارا سێڤاگەلارینا ئەوا هاتیە نیاسین ب (پەلت)و هاتیە پیککرن لسەر نەمامکێت توڤکی لدەڤەرا گەڤەرکێ لپارێزگەها دهوك- دارێت سێڤا هاتنە رەشاندن ب دوو توخمێت خارنێ ئاسن و تەنەکە و تێکەلکەرێت وان بپێنج خەستییا بو هەرئێکی ژوان وەك (0،40 80"100"ملغمFe/لیترFe-EDDHA 6 ٪ ئو 0"15"30"60"120ملغمZn /لیتر Zn- EDTA 15٪ هاتنە رەشاندن دوو جارا یا ئێکێ پشتی خوپیتکیێ ویا دی پشتی وێ بهەیڤەکێ . ئو ئەنجام بڤی رەنگی بو رەشاندنا بەلگی بڤان توخما بویە ئەگەرا زێدەبونا کێشاسێڤا و ژمارا وان و چەندداتیا بەرهەمی و درێژیا سێڤێ شەربەتاسڤێبەری و پشتی کوگوهکرنێ و باشترین خەستی دڤەکولینێدا 80ملغمFe/لیتر+15 ملغم Zn /لیتر کو بەرهەم گهاندیە 087، 61 کگم ئو 52,327کگم بو هەردارەکێ لدیڤ ئێك.

J. Duhok Univ., Vol.12, No1, Pp 67-73, 2009

A COMPARATIVE STUDY ON BODY COMPOSITION AND CARCASS TISSUE DISTRIBUTION IN KIDS OF MERIZ AND NATIVE GOATS RAISED UNDER DIFFERENT FEEDING REGIMEN

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(Received: January 24, 2009;Accepted for publication : June 16, 2009)

ABSTRACT

Twelve weaned male kids from each of Meriz and native goat were weighed and randomly assigned equally into three groups according to different feeding regimen. Kids of 1st group had *ad libitum* access to concentrate (Intensive), whereas kids in the 2nd group were left at pasture for 45 days and then moved to the farm to fed *ad libitum* concentrate (Semi-intensive). The 3rd group of kids was freely grazed at pasture (Extensive). At the end of the trail (90 days), all kids were slaughtered and dressed. The right side from each carcass was fabricated into 8 major cuts for dissection into lean, fat and bone.

Weight of commercial cuts and their percentages of the carcass, percentage of separable lean, fat and bone in all cuts as well as in the right side of the carcass were not affected significantly by breed. The weight of commercial cuts were significantly (P<0.05) heavier in kids raised on intensively or semi-intensively compared to those raised on pasture.

Intensive and semi-intensive Meriz and native goat possessed a higher (P<0.01) fat percentages (12.00 and 10.02% respectively) and a lower (P<0.01) bone percentages (24.21 and 25.42%) than did pasture (3.05 and 34.07%), however, lean percentages were not differ among groups.

It can be concluded that feeding kids in concentrate results in heavier carcasses, and heavily muscled and fatter carcasses and lower bone percentage compared to kids raised on pasture.

KEY WORDS Native goat Meriz Carcass Tissue Feeding Regimen

INTRODUCTION

The world's goat population was around 715 million in 2000 with over 60% of that found in Asia and more than 95% in developing countries. Since 1985, there has been a significant increase (48%) in goat numbers all over the world (FAO, 2001) and consequently production of meat from goats has increased considerably during the last decade, becoming an important livestock enterprise in several parts of the world (Goetsch and Sahlu, 2004). Furthermore, the native goats with a population of 1.6 million heads (FAO, 2002) are important livestock species in Iraq; they can play an important role for the production of meat and milk, particularly under the agricultural systems prevailing in the country (Alkass and J0 uma, 2005).

Growth and development are the basis for meat production, whereas distribution of carcass tissues are significant in determining carcass quality. Lean muscle, and to a lesser extent fat, are the major edible tissues of the carcass. In countries where meat is sold in cuts, the lean content of each cut is an important factor in determining its value. Amount and site of fat in the carcass influence its quality. Bone is not edible tissue, but its proportion in the carcass affects those of other edible carcass tissues such as lean meat (Maghoub and Lodge, 1998).

Meriz is a native goat to Kurdistan region and raised mainly for its fine hair as well as for meat and milk production (Alkass and Juma, 2005). However, information relating to the potential of this breed to meat production and carcass composition is very scarce. Therefore, the objective of this study was to determine the effects of breed and feeding regimen on tissue distribution of meat, fat and bone in the carcass of Meriz and native goats.

MATERIALS AND METHODS

Animals and management:

This experiment was conducted at the animal farm of the College of Agriculture, University of Duhok. Twelve weaned kids (three months old) from each of Meriz and native goat with an average initial weight 11.7±0.47 and 12.10±0.37 kg respectively were used in this study. After the adaptation period of 15 days, the kids were weighed and randomly assigned equally into 3 groups according to different feeding regimen (intensive, semi intensive and pasture).

Kids from each breed of first group were kept in individual boxes and had *ad libitum* access to ration (ingredients composition barley 53%, Wheat bran 25%, Soybean meal 15%, Wheat straw 6%, Salts 0.5%, and Limestone 0.5% in addition to Vitamins 0.5%) and contained 16% crude protein. Drinking water was supplied *ad libitum* during the experiment of 90 days. Kids of the second group (semi intensive) was left at the pasture for the first 45 days of the experiment and then moved to the farm to be fed a concentrate mixture *ad libitum* for the rest of the experiment. The third group of kids was freely grazed at pasture (Little cherry, Oriental Hawthern, Valonia Oak, Kochi Thymes, Mediterranean Stinkbush and Meikle Shifshen) by the farmer. All kids were weighed biweekly after being fasted for 12hrs.

Experimental measurements:

At the end of the experiment, the kids were fasted for 12hr with free access to water and weighed immediately prior to slaughter (Slaughter weights averaged 17.97±1.36 and 17.92±0.96 kg for Meriz and native goat, respectively). The kids were

slaughtered and dressed. The dressed carcass comprised the body after removal of the head, skin, fore and hind feet, tail, kidney, kidney fat and the viscera. The digestive tract was removed and weighed, then empted of their content, washed, drained and weighed to facilitate the calculation of empty body weight. After evisceration, associated fat (pelvic, kidney, Omental and mesenteric, cardiac,) was removed and weighed.

After chilling the carcasses for 24 hours at 4 C^{o}, chilled carcass weights were recorded and dissected along the inside edge of the flank muscle to the distal end of the 13th rib. Then a straight line from the tip of the rib to the apex of angle was made by the junction of the foreleg and shoulder. After cutting the neck from the last cervical vertebra, 2 incisions perpendicular to the axis of the carcass were made between the 5th / 6th and 12th/ 13th vertebra to get a 5-rib shoulder and 7-rib rack. The loin and legs were separated from the interior edge of the legs and the loin was dissected through an incision between the Ilium (Balci and Karakas, 2007). The right sides of all carcasses were separated into 8 joints (neck, shoulder, rack, loin, leg, flank, breast and fore shank), (Figure 1). Each cut was dissected into lean meat, fat and bone tissues. Mean weights and percentages of lean meat, fat and bone were computed in the half of the carcass and related to the breed of animals and feeding system.

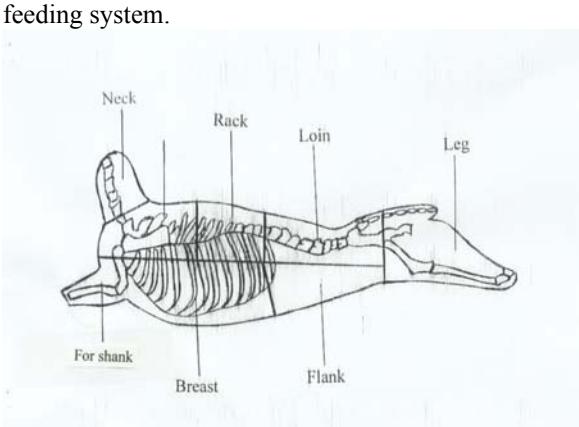

Fig (1): Carcass cuts of goats. (Alkass et al, 1985).

Statistical analysis

The data obtained was analyzed using the GLM (General Linear Model) within SAS (2001) program as in the following model:

$Yijk = \mu + Bi + Fj + BF (ij) + eijk$

Where:

Yijk = Observational value of kth animal.

μ = Overall mean

Bi = Effect of ith breed (i= Meriz, goat).

Fj = Effect of j th feeding system (j = intensive, semi-intensive, extensive).

BF(ij)= Effect of interaction between i th breed and j th feeding system.

Eijk = Experimental error assumed to be NID with (0, σ^2 e).

Since the results reveal no significant effect of interaction on all studied traits, therefore the data was re-analyzed without interaction.

Duncan multiple range tests (1955) also used to test the difference between the subclasses of each factor.

Correlation coefficient were computed for each tissue in all cuts and related to tissue weight in the half of the carcass.

RESULTS AND DISCUSSION

Carcass cuts:

Weight of the eight cuts and their percentages of the carcass side weight were comparable for both Meriz and native goat (Table 1). Similarly, Dhanda et al., (1999) observed that there were no significant differences between genotypes (Boer× Angora, Boer × Saanen, Feral × Feral, Saanen × Angora and Saanen × Feral) for the percentage contribution of primal cuts to carcass side weight. Cameron *et al*., (2001), on the other hand reported that the weight of seven primal cuts were significantly or numerically greater for crossbreds than for Spanish goat, whereas primal cuts expressed as a percentage of the carcass were not different among genotypes. Leg, loin and rack cuts are considered most valuable by consumers (Cameron *et al.,* 2001). These cuts make up nearly 60% of the lamb carcasses (Hale and Griffin, 1992). However, goats deposit relatively more tissue in fore quarters compared with cattle and sheep. In the present work and other reports (Hale and Griffin, 1992; Hogg *et al.,* 1992 Cameron *et al.,* 2001),leg, loin and rack cuts made up 46.5 and 47.3% of the carcass of Meriz and native goat, respectively.

The weight of cuts was significantly heavier in kids raised on intensively or semi-intensively compared to those raised on pasture (Table 1.). However, when cuts were expressed as a percentage of the carcass, no significant differences were observed among the three systems of the production except that for neck (Table 1). This result disagree with the finding of Daskiran *et al.,* (2006) who noticed no significant differences in weight or percentages of primal cuts of Norduz male kids raised under intensive or pasture conditions.

Composition:

Percentage of separable lean, fat and bone for individual cuts are presented in Table 2. It appears from the table that lean, fat and bone for individual cuts was not differ significantly between breeds; and the values obtained in the current work were comparable to those reported earlier by Tahir *et al*., (1994) for Iraqi native goats. There are few differences between genotypes in percentage of carcass tissue in the different cuts (Table 2). The

percentage of lean tissue in the shoulder, rack and flank cuts was highest for native goats, and the bone percentage was greatest in the shoulder and rack cuts for Meriz. The percentage of fat was higher in all cuts except the fore shank and neck for Meriz compared to those of native goat. Similar to the present results, Oman *et al*., (2000) in Spanish ×Boer and Spanish male goats fed a high concentrate diet and Cameron *et al.,* (2001) in Boer×Spanish, Boer×Angora and Spanish goats found the proportions of separable lean, bone and fat in individual cuts were not markedly influenced by genotype.

The high carcass lean contribution of leg (69.81% and 68.25%) and shoulder (63.73% and 66.73%) for Meriz and goat, respectively (Table 2) noted in the present study are in close agreement with the findings of Owen *et al.,*(1975), Argaosa *et al*., (1977). Hogg *et al.,* (1992) and Cameron *et al.,*(2001). In the current study, loin, shoulder and breast provided the highest quantities of carcass fat. However, Hogg *et al.,* (1992) observed 28.7 and 15.5% of carcass fat in the shoulder and breast cuts, respectively. These results may indicate that deposition of fat tissues and growth rate of muscles and bones are varied between the different parts of the carcass of goats.

Carcasses of the kids raised on pasture or semi-intensively had a higher percentage of lean in all cuts except the leg cut. On the other hand, fat percentages were highest for carcasses of kids raised intensively or semi-intensively in all cuts except flank and fore shank cuts. Similarly, Oman *et al.,* (1999) found that feedlot Boer×Spanish and Spanish goat carcasses, had a higher ($p<0.05$) percentage of lean than did Spanish goat carcasses, and feedlot carcasses possessed higher ($p<0.05$) fat percentages than range carcasses. Also, Daskiran *et al.,* (2006) obtained that the fat content of the rack cut of intensively raised Narduz male kids was higher than kids raised on pasture. Diet has been found to affect carcass characteristics in other species. Tatum *et al.,* (1989) indicated that lambs fed in a feedlot produced fatter carcasses than lambs fed limited or no grain. Several studies have verified this for beef cattle (Burson *et al.,* 1980: Schroeder *et al.,* 1980).

Table 3. shows the effect of breed and feeding system on distribution of lean, fat and bone tissues in the right side of the carcasses. Weights of lean meat, fat and bone tissues or their percentages of chilled carcass weights did not show significant differences between Meriz and native goats. However, Meriz tended to had 1.60% higher fat and 1.72% lower bone than did native goats. Similarly, Cameron *et al*.,(2001) reported that lean as a percentage of the carcass was similar among genotypes (Boer×Spanish, Spanish and Boer×Angora), the percentage of fat was numerically lowest for Spanish, and the percentage of bone was greater ($p<0.05$) for Boer×Spanish than Spanish and Boer×Angora wethers. However, Oman *et al.,*(1999) reported that Boer×Spanish goats in the feedlot treatment had greater ($p<0.05$) actual and adjusted fat thickness and carcass conformation than Spanish goats.

In the present study, kids raised intensively and semi-intensively had significantly ($p<0.01$) higher weights of lean and bone, whereas the weight of fat was significantly ($p<0.05$) differ among groups, being highest for kids raised intensively followed by semi-intensive and finally by pasture. Also, intensive and semi-intensive Meriz and native goat carcasses possessed a higher ($p<0.01$) fat percentages and a lower ($p<0.01$) bone percentages than did pasture Meriz and native goat carcasses; however, lean percentages were not differ among groups. Previously Daskiran *et al*., (2006) indicated that the fat and bone tissues content of the rack joint were significantly higher and lean content was significantly lower of intensively raised Narduz kids than that kids raised on pasture. Also, it was reported that feedlot Boer×Spanish and Spanish goat carcasses possessed higher ($p<0.05$) lean and fat percentages and lower ($p<0.05$) bone percentages than range goat carcasses (Oman *et al.,* 1999).

Table (1): Weight (Kg) and proportions (%) of cuts for Meriz and native goat raised on different feeding regimen.(mean ±s.e.)

Trait		Breed		P-Value	Feeding System			P-Value
		Meriz	**Goat**		**Intensive**	**Semi-intensive**	**Extensive**	
Shoulder	Wt	724.58±97.89^{a}	650.00±80.05^{a}	N.S	932.50±94.71^{a}	737.50±83.85^{a}	391.87±29.51b	**
	%	21.02±0.94^{a}	20.24±1.51^{a}	N.S	22.55±1.19^{a}	20.58±1.79^{a}	18.751±1.38a	N.S
Rack	Wt	322.91±44.43^{a}	265.83±24.52^{a}	N.S	373.12±54.23^{a}	326.25±20.43^{a}	183.75±16.84b	**
	%	9.44±0.44^{a}	8.46±0.52^{a}	N.S	8.82±0.55^{a}	9.31±0.58^{a}	8.72±0.73^{a}	N.S
Loin	Wt	258.66±40.43^{a}	240.00±22.24^{a}	N.S	331.25±45.14^{a}	261.25±23.93^{a}	152.50±10.97b	**
	%	7.34±0.39^{a}	7.59±0.24^{a}	N.S	7.92±0.50^{a}	7.30±0.41^{a}	7.18±0.18^{a}	N.S
Leg	Wt	990.83±104.97^{a}	987.58±87.74^{a}	N.S	1243.25±115.55^{a}	1063.13±55.78^{a}	661.25±47.91b	**
	%	29.73±0.60^{a}	31.22±0.68^{a}	N.S	30.15±1.09^{a}	30.16±0.82^{a}	31.12±0.48^{a}	N.S
Breast	Wt	290.83±38.73^{a}	262.08±26.15^{a}	N.S	341.25±44.36^{a}	315.00±26.22^{a}	173.12±15.61b	**

	%	8.48±0.429[a]	8.38±0.55[a]	N.S	8.21±0.67[a]	8.96±0.70[a]	8.12±0.40[a]	N.S
Flank	Wt	155.41±21.53[a]	137.91±16.57[a]	N.S	202.50±26.80[a]	145.0±12.60[a]	92. 50±5.59b	**
	%	4.53±0.27[a]	4.37±0.28[a]	N.S	4.88±0.46[a]	4.07±0.23[a]	4.41±0.25[a]	N.S
Fore shank	Wt	265.08±29.02[a]	258.33±25.43[a]	N.S	283.75±35.04[a]	288.75±29.02[a]	213.75±30.73[a]	N.S
	%	8.21±0.72[a]	7.81±0.74[a]	N.S	6.86±0.67[a]	8.38±1.00[a]	8.79±0.89[a]	N.S
Neck	Wt	363.75±29.61[a]	368.33±26.21[a]	N.S	429.37±26.14[a]	391.87±15.46[a]	276.87±31.03b	**
	%	11.20±0.44[a]	11.87±0.49[a]	N.S	10.57±0.42[b]	11.17±0.39b	12.87±0.59[a]	**

N.S : non significant
****** P<0.01
Within a raw and comparison, means without a common superscript letter differ significantly.

Table (2): Proportions of separable carcass tissues of cuts for Meriz and native goat raised on different feeding regimen. .(mean ±s.e.).

Trait		Breed		Feeding System		
		Merize	**Goat**	**Intensive**	**Semi-intensive**	**Extensive**
Shoulder	**Lean**	63.73±1.20	66.73±2.08	62.72±1.49	66.39±3.17	66.57±0.98
	Fat	10.86±1.90	9.34±1.71	11.18±2.42	11.29±2.31	7.83±1.86
	Bone	25.40±1.18	23.93±1.54	26.09±1.57	22.32±1.79	25.59±1.49
Rack	**Lean**	55.54±1.65	57.71±1.69	55.22±1.99	57.23±1.04	57.43±2.87
	Fat	8.39±1.92	7.41±1.80	9.44±2.29	9.51±2.18	4.76±2.06
	Bone	36.44±2.91	34.87±2.06	35.90±3.30	33.26±2.06	37.81±3.70
Loin	**Lean**	60.75±2.58	58.89±2.39	59.01±2.93	60.41±1.32	60.04±4.37
	Fat	10.22±1.85	8.21±1.29	9.35±2.01	10.10±2.41	8.19±1.51
	Bone	29.03±3.85	32.90±3.06	31.63±4.08	29.49±358	31.76±5.37
leg	**Lean**	69.81±1.34	68.25±0.94	70.05±0.62	68.11±1.35	68.92±2.03
	Fat	7.44±1.13	5.64±0.98	6.34±1.45	8.27±1.55	5.01±0.60
	Bone	22.74±1.86	26.10±1.13	23.60±1.47	23.61±2.03	26.05±3.35
Breast	**Lean**	51.45±1.43	52.43±1.65	51.21±1.88	52.33±2.33	52.27±1.50
	Fat	18.97±2.79	14.42±1.94	16.38±3.37	19.79±2.66	13.90±2.92
	Bone	29.57±2.52	33.15±2.31	32.41±3.65	27.86±1.98	33.82±2.97
Flank	**Lean**	80.50±2.55	84.40±3.33	82.90±3.68	81.93±4.02	82.51±3.65
	Fat	19.49±2.55	15.59±3.33	17.09±3.68	18.06±4.02	17.48±3.65
Fore shank	**Lean**	58.99±2.00	54.51±1.61	54.22±1.88	58.41±2.50	57.60±2.55
	Fat	4.02±0.97	4.11±1.10	3.83±1.14	4.18±1.60	4.18±1.10
	Bone	36.97±2.57	41.38±2.39	41.93±2.39	37.40±3.58	38.21±3.30
Neck	**Lean**	63.26±1.97	60.71±1.53	61.89±2.61	62.26±2.34	61.79±1.74
	Fat	1.31±0.49	2.15±0.80	1.79±0.93	1.94±0.97	1.45±0.58
	Bone	35.42±2.07	37.14±1.78	36.31±2.72	35.79±2.57	36.74±1.9

Table (3): Total half carcass weight (gm) yield and proportion of separable carcass tissue for Meriz and native goats raised on different feeding regimen. (mean ±s.e.).

Trait	Breed		P- Value	Feeding System			P- Value
	Meriz	**Coat**		**intensive**	**Semi-intensive**	**Extensive**	
Carcass Wt.	3155.83±255.55[a]	3370.83±376.51[a]	N.S	4136.88±371.52[a]	3532.50±170.65[a]	2120.63±141.34b	**
Carcass lean Wt.	2014.17±172.35[a]	2163.33±247.46[a]	N.S	2641.25±239.80[a]	2285.63±137.54[a]	1339.38±104.68b	**
Carcass fat Wt.	265.00±53.76[a]	359.58±81.61[a]	N.S	519.37±89.05[a]	352.50±17.21b	65.00±12.24c	*
Carcass bone Wt.	874.16±38.05[a]	847.91±57.36 [a]	N.S	976.25±65.17[a]	890.62±28.88[a]	716.25±33.82b	**
Lean %	63.60±0.59[a]	63.78±0.78[a]	N.S	63.78±o.96[a]	64.44±o.87[a]	62.86±0.89[a]	N.S
Fat %	7.56±1.15[a]	9.16±1.41[a]	N.S	12.00±1.19[a]	10.02±0.35[a]	3.05±0.54b	**
Bone %	28.76±1.21[a]	27.04±1.83[a]	N.S	24.21±1.47b	25.42±0.84b	34.07±0.75[a]	**

N.S : non significant
***** P<0.05
****** P<0.01
Within a raw and comparison, means without a common superscript letter differ significantly.

Table (4): Correlation coefficients for weight of separable tissue in cut and the carcass of Meriz and native goat.

Traits		Meriz	Goat
Lean meat in the Half carcass	**Meat in the:**	0.929**	793**
	Shoulder	0.955**	0.772**
	Rack	0.976**	0.920**
	Loin	0.992**	0.933**
	Leg	0.913**	0.632*
	Breast	0.826**	0.761**
	Flank	0.561*	0.501N.S
	Fore shank	0.886**	0.909**
	Neck		
Fat in the half carcass	**Fat in the:**	0.969**	
	Shoulder	0.943**	0.893**
	Rack	0.925**	0.952**
	Loin	0.924**	0.882**
	Leg	0.981**	0.921**
	Breast	0.879**	0.716**
	Flank	0.561*	0.659*
	Fore shank	0.509N.S	0.664*
	Neck		0.696*
Bone in the half Carcass	**Bone in the:**	0.834**	0.799**
	Shoulder	0.830**	0.456N.S
	Rack	0.730**	0.050N.S
	Loin	0.816**	0.934**
	Leg	0.862**	0.299N.S
	Breast	0.776**	0.331N.S
	Fore shank	0.675*	0.567N.S
	Neck		

N.S.: non significant
***** P<0.05
****** P<0.01

Correlation coefficients

Correlation of lean meat in the side and all meat in the cuts of the Meriz and native goat carcasses were highly significant (p<0.01) except that of fore shank in goat. Fat tissues in all studied cuts of the carcass (except that of neck in Meriz) correlated significantly with the content of dissected fat in the side of the carcass (r =0.561- 0.969). Of the eighth cuts studied, only bone in the shoulder and leg had significant correlation coefficients with bone in the half of the native goat carcasses, whereas in Meriz all correlations were significant (r = 0.675-0.862). It appears that leg cut is the most convenient part of the carcass for predicting lean meat, fat and bone in the carcass of Meriz and native goat under the circumstances of the current work. Working with Iraqi black goat, Tahir *et al*., (1994) found high correlation coefficients between lean percentage of the breast and leg with the lean percentage of the side of the carcass, and the percentage of fat in the side of the carcass correlated significantly with the fat content of all cuts except neck. Bone content of the carcass correlated significantly with the arm, rack and breast.

Also, Cameron *et al*., (2001) indicated that the correlation coefficients for weights of separable tissue in primal cuts and the carcass were all highly significant suggesting that the weights of separable tissue in the loin cuts, followed by primal leg cuts, were most highly related to the weights of separable tissue in the carcass.

Fat depots

Fat contents in the body of Meriz and native goats raised under different feeding regimen are given in Table (5). As proportion of empty body weight, total body fat averaged 4.71±0.93 and 3.77±0.55% for Meriz and native goat, respectively. The difference between them lacked significance. The values reported in the present study were similar to those noticed by Mayi (2009) for Meriz and native goat. In the present work, non-carcass fat was approximately 41.4- 44.6% of total body fat. However, Cameron *et al*., (2001) indicated that internal fat mass of Boer × Spanish, Boer × Angora and Spanish goats was approximately 7% of empty body weight, with 72.77±1.967% associated with digestive tract. Also, there have been previous reports of considerable internal fat deposition by Dhofari and Batina goats, (Mahgoub and Lu, 1998) and desert goat (Khidir *et al.,* 1998).

Kids fed a concentrate diet have a higher proportion of carcass and non-carcass fat depots resulted in having 1.06 and 1.59% more total body fat than kids raised semi-intensively and on pasture, respectively.

Implications:

It appears from our results that breed type had no effect on the weight and proportions of primal cuts and tissue distribution of the cuts and carcass. While feeding Meriz and goats intensively results in heavier carcasses, and more heavily muscled and fatter carcasses and lower bone percentage compared to kids raised on pasture. Further research is warranted to evaluate effects of other production conditions on performance comparisons of both breeds in Kurdistan region.

Table (5): Proportions of fat depots in the empty body weight of Meriz and native goats raised under feeding regimen. (mean ±s.e.).

FAT DEPOT %	BREED		FEEDING SYSTEM		
	Meriz	**Goat**	**Intensive**	**Semi-intensive**	**Extensive**
Pelvic	0.37±0.10	0.31±0.07	0.41±0.12	0.33±0.07	0.28±0.11
Kidney	0.34±0.09	0.27±0.06	0.37±0.11	0.25±0.05	0.29±0.09
Mesenteric and omental	1.22±0.36	0.89±0.20	1.46±0.44	0.80±0.23	0.90±0.38
Cardiac	0.08±0.014	0.08±0.02	0.09±0.01	0.06±0.02	0.10±0.02
Total non Carcass	2.01±0.55	1.56±0.33	2.34±0.68	1.44±0.33	1.57±0.59
Carcass Fat	2.70±0.42	2.21±0.25	2.78±0.58	2.62±0.34	1.96±0.29
Total body fat	4.71±0.93	3.77±0.55	5.12±1.26	4.06±0.65	3.53±0.80

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دراسة مقارنة لتركيب الجسم وتوزيع الانسجة في جداء المرعز والماعز المحلي المرباة تحت نظم تغذوية مختلفة

الخلاصة

تم توزيع 12 من جداء كل من الماعز والمرعز بعد وزنها عشوائيا الى ثلاثة مجاميع متساوية على نظم تغذوية مختلفة. تم تغذية المجموعة الاولى على العليقة المركزة وبصورة حرة (مكثف)، اما المجموعة الثانية فلقد تركت في المرعى لمدة 45 يوما ومن ثم غذيت على العليقة المركزة بصورة حرة للمدة المتبقية من التجربة (شبه مكثف)، في حين تركت المجموعة الثالثة لتتغذى على المرعى فقط (واسع) خلال مدة التجربة (90 يوما). تم وزن الحيوانات مرة واحدة كل اسبوعين . وفي نهاية التجربة تم ذبح الجداء ومن ثم تم تقطيع الجانب الايمن الى ثمانية قطع رئيسية وذلك لاجراء الفصل الفيزيائي لمكونات القطع من اللحم والدهن والعظام.

لم تتاثر كل من وزن القطع الرئيسية ونسبها من وزن الذبيحة، وكذلك مكوناتها من اللحم والدهن والعظام معنويا بالسلالة. بينماكانت وزن القطع الرئيسية اثقل للجداء المرباة بصورة مكثفة او شبه مكثفة على نظيراتها من الجداء المرباة على المرعى.

كانت نسبة الدهن اعلى معنويا ($P<0.01$) في جداء المرعز والماعز المرباة تحت نظام المكثف وشبه المكثف (12.00 و 10,02% على التوالي) ونسبة عظام اقل ($P<0.01$) (24.21 و 25.42%) على مثيلاتها المرباة في المرعى (3.05 و 34.07%). في حين لم تكن الفروقات معنوية بين الانظمة المختلفة في نسبة اللحم.

يمكن الاستنتاج بان تغذية الجداء على العليقة المركزة قد ادت الى وزن ذبائح اثقل ونسبة لحم ودهن اعلى ونسبة عظام اوطأ مقارنة بالجداء المغذاة على المرعى فقط.

بەراوردكرنا پێكهاتیێ لەشی ودابەشكرنا شانە ل گیسكێت مەرەز وبزنی یێت خودانكری لژێررژێمێت خارنی یێت جودا

پوختە

12 گیسكێت هەر ئێك ژ مەرەز وبزنی هاتنە دابەشكرن پشتی سەنگكرنا وان بو سێ گروپێت وەك ئێك لسەر سێ جورێت خوارنێ. گروپا ئێكێ ئالیكا تیر ب ئازادی دخوار (تێكرا) وگروپا دووێ بو ماوێ 45 روژا ل كوزێ وپاشی لسەر ئالیكا تیر بو ماوێ دی یێ ڤەكولینێ (45روژ) (نیف تێكرا)، وگروپا سیێ هاتە خودانكرن لسەر كوزێ تنێ (بەرفرەه) هەمی دەمێ ڤەكولینێ. هەمی گیسك هاتنە سەنگاندن دو هەفتیا جارەكێ ولدیماهیا ڤەكولینێ گیانەوەر هاتنە سەربرین ولایێ راستێ هاتە دابەشكرن بو هەشت پارچێت سەرەكی بو چێكرنا ژێك جوداكرنا فیزیائی بو وان پارچا ژ گوشت وچەوری وهەستی.

كارتێكرنا بەرچاڤ یا جورێ بزنێ نەبو لسەر كێشا پارچێت سەرەكی ورێژا وان ژ كێشا كەلەخی، هەر وەسا پێكهاتیا وان ژ گوشت وچەوری وهەستی. كێشا پارچێت سەرەكی گرانتر بون بو گیسكێت خودانكری لسەر ئالیكا تیر وكوز وئالیكا تیر بەرامبەر گیسكێت خودانكری ل كوزێ تنێ

رێژا چەوریێ بلند تر بو بەرچاڤ ($P<0.01$) ل گیسكێت خودانكری لژێر رژێما تێكرا ونیف تێكرا (12.00 و 10.02 ٪ لدیف ئێك) ورێژا هەستیا كێمتر ($P<0.01$) (24.21 و 25.42٪) لسەر وەكخویێت خودانكری لسەر كوزێ (3.05 و34.07٪)، بەلێ پا جوداهی نەدبەرچاڤ بون نافبەرا رژێمادا د رێژا چەوریێ دا.

دیاردبیت ژ ئەنجاما كو ئالیكدانا گیسكا لسەر ئالیكا تیر كێشا كەلەخی گرانتر دا ورێژا گوشتی وچەوری بلندتر ورێژا هەستیا كێمتر بو بەراورد دگەل گیسكێت ئالیكا وان تنێ ل كوزێ.

EFFECT OF CASTRATION AND LEVEL OF PROTEIN ON GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF LOCAL GOAT*

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ABSTRACT

The present work was carried out at the Animal farm, College of Agriculture, University of Duhok, where a total of 20 weaned (3-4 month old) male local goats with an average live body weight of 15.64±0.79 kg were divided randomly into two equal main groups. The first one was castrated, whereas the second group was left intact (control). Each group was then assigned randomly into two dietary protein levels (12 or 16%). Ration was offered *ad libitum*. The animals were weighed at weekly interval just prior to morning feeding.

Results revealed that daily gain in weight was not affected significantly neither by castration (0.074 vs. 0.073kg) nor by level of protein (0.067 vs. 0.080kg). Castrates fed with 12% protein converted feed to gain more efficiently than the kids fed 16% protein (10.52 vs.11.85 kg /kg),conversely intact kids fed 12%protein had a lower feed efficiency compared with kids fed 16% protein(13.13 vs. 10.78 kg / kg).

Dressing percentage based on slaughter weight and empty body weight averaged 47.88 and 56.91%, respectively; however the differences due to castration and level of protein are not significant. Castrates had a thicker fat over eye muscle (1.34±0.20mm) and a smaller eye muscle area (7.30cm²) than intacts (0.98±0.17mm and 8.47cm², respectively). Kids fed a high dietary protein level had significantly (P<0.05) a thicker fat over eye muscle area (1.44±0.21mm) than kids received 12% protein (0.92±0.15mm). However, the eye muscle area did not differ between the two groups fed either 12 or 16% protein. Also, Lean, fat and bone content of the leg, percent sale cuts and non- carcass fat were not affected significantly in both treatments.

KEY WORDS *castration, protein carcass goat*

INTRODUCTION

Goats are well adapted to the environmental and limited feed and utilize marginal land to produce high protein products (Kadim *et al.* 2003). The number of goats has increased globally, even in countries with high and intermediate incomes (Morand-Fehr *et al.* 2004). Furthermore there is also a world wide tendency for the rapid increase in demand for goat meat (Stankov *et al.* 2002) due to several reasons including a good source of desirable fatty acids (Banskalieva *et al.* 2000), the development of subcutaneous fat is slow (Warmington and kirton, 1990), and reducing the risk of cardiovascular disease (Stankov *et al.* 2002).

Since, growth is a very important characteristic of animal for meat production, man attempted to manipulate growth of farm animals through several means such as breeding, nutrition, castration…etc. to increase meat production (Mahgoub *et al.* 1998). Although, castration has been practiced for centuries, the difference in the rate of gain between castrates and intact kids are unclear. While Mackenzie (1970) and Kyomo (1978) found that castrated male goats grew faster and are heavier than the entire male goats, Nitter (1975) and Louca *et al.* (1977) on the other hand, reported that male goats grew faster than castrated.

Dietary nutrients, especially energy and protein, are the major environmental factors affecting meat production in goats (Shahjalal *et al.* 1992). Louca and Hancock (1977) pointed out that increasing the protein level in the diet from 10.9 to 16.6 % increases the growth of kids. Similarly, Titi *et al.* (2000) concluded that kids fed ration containing 16% protein had significantly higher growth rate compared with kids fed either 12, 14, & 18% protein. Therefore, the objective of this study is to investigate the effect of castration and the level of protein on growth rate, feed efficiency and carcass characteristics of local goats.

MATERIALS AND METHODS

The present study was conducted at the Animal Farm, College of Agriculture, University of Duhok during the period from 2nd July to 31st December 2007, where a total of twenty weaned (3-4 months old) male native goat purchased from local market with an average live body weight of 15.64±0.79kg were used in this study. Kids were divided randomly into two equal main groups (10 kids each); the first one was castrated using elastrator rubber rings, while the second group was left intact as a control. Each main group was then randomly assigned into two dietary protein levels namely 12% low protein (LP) or 16% high protein (HP). Each group was housed in a separate pen (2x2m) during fattening period (120 days) and allowed 15 days to adapt to the experimental conditions and feed prior to the commencement of the study. During the adaptation period, all kids were protected against Foot and Mouth disease, Enterotoxaemia and Pox, drenched against endo-parasites and ecto-parasite was irradicated by sprying the animals. One kid died (Intact+16 C.P.) at the mid of the experiment for an unknown cause.

Ration was offered *ad libitum* and the quantity offered daily was divided into two halves and fed at 8.00 and 16.00 hrs and refusals were collected and weighed on the next day before the morning feeding. Clean water and mineral blocks were available at all times. The composition of rations together with chemical analysis is shown in Table 1. Also, vitamins were added to the concentrate mixture at a rate of 0.5%. All animals were weighed at the beginning of the experiment and at weekly interval thereafter just prior to the morning feeding.

Kids were weighed after fasting for 12hrs with free access to water, and slaughtered and dressed according to the Muslim (Halal) way. The dressed

* Part of M.Sc. Thesis of the first author.

carcass comprised the body after removing the skin, head, fore feet, hind feet and the viscera. Kidney and pelvic fat were retained in carcass, testis and scrotal fat were also removed. Hot carcass weight and weights of the head, skin, feet and some visceral organs (heart, liver, lungs plus trachea, spleen and digestive tract) were recorded. Empty body weight was computed as the difference between slaughter weight and the weight of digestive content. Omental, mesenteric, cardiac and scrotal fat were separated immediately after the slaughter and weighed.

Table (1). Composition and chemical analysis of the ration.

Criteria ingredient	Ration(1) (%) 12% C.P.	Ration(2) (%) 16% C.P.
Barely	72	53
Wheat bran	15	25
Soya bean meal	5	15
Wheat straw	6	6
Salt	1	0.5
Limestone	1	0.5
Chemical analysis %*		
Dry matter	94.97	94.89
Crude protein	11.9	15.5
Ether extract	3.7	4.4
Ash	5.3	5.6
*Energy(K.cal)***	2566.6	2541.6

*****Chemical analysis was carried out at nutrition lab.
******Khawaje *et al.* (1978).

After chilling the carcasses at 4C° for 24hrs, cold carcasses were weighed and then the kidney, pelvic and channel fat were removed and weighed separately. The carcass was split along the vertebral Column into left and right halves using an electrical saw. The left half was separated into eight wholesale (leg, loin, rack, neck, shoulder, breast, flank and fore shank), weighed and expressed as a percent of chilled carcass weight.

The area of *longissimus dorsi* muscle at the 12th rib was determined by tracing the muscle on semi - transparent waxed paper, and the area was measured by a compensating polar planimeter. Fat thickness over the *L. dorsi* muscle was recorded by averaging three separate measurement using Vernia.

After weighing, the leg was separated physically into dissectible muscle, bone and fat, weighed and expressed as the percentage of the leg weight. Proximate analysis of food samples was performed according to AOAC (1984).

The data obtained were analyzed using the GLM (General Linear Model) within SAS (2001) Program. Dancan's multiple range test (1955) also used to test the difference between the subclasses of each factor, using GLM of SAS (2001).

RESULTS AND DISCUSSION

1.1-Growth Rate

Daily gain averaged 0.074±0.01 and 0.073±0.01kg for castrated and intact kids, respectively (p>0.05) (Table 2); Similarly, Misra *et al.* (1986) and Tahir *et al.* (1994a) concluded that castration had no significant effect on live body weight gain. While, Taha (1990) and Nsoso *et al.* (2002) noticed a higher average daily gain in weight in castrates than entire males, on the other hand, Johnson *et al.* (1995), Mahgoub & Lodge (1998) reported that castrates grew at the slowest rate than intact kids. However, such differences in the results are unclear as stated earlier by Muhikambele *et al.* (1994). In the present study, the average growth performance of kids fed 12 and 16% crude protein was 0.067, 0.080 kg/day, respectively (P>0.05). However, previous studies showed that growth rate of kids increased with the increase of protein content in the diet (Ash and Norton, 1987a; Negesse *et al.* 2001). Titi *et al.* (2000) concluded that kids fed rations containing 12, 14 or 18% crude protein had similar final weight and gain, while those fed the 16% crude protein had the highest value. In the present work, the lack of significant effect of protein level on growth rate may be firstly attributed to the similar amount of protein available from both protein levels at the small intestine although there were differences in crude protein intakes between the two diets (Shahjalal *et al.* 2000), or secondly may be due to the energy level in the ration (Titi *et al.* 2000).

1.2-Dressing Percentage

In the present study, there were no significant differences between those of intact males and castrates in dressing percentage 1(48.00 vs. 47.77%) and 2 (56.63 vs. 57.15%) Similarly, Tahir *et al.* (1994a) and EL-Hag *et al.* (2007) found that castration did not affect significantly the dressing percentage. However, other reports have shown a superiority of castrated males compared to those of intact males (Nsoso *et al.* 2004 and Koyuncu *et al.* (2007)). Although kids fed 16% protein had a higher dressing percentage 1 and 2 compared with those fed 12% protein (Table 2); yet the differences were not significant. However, the lack of significant effect on carcass characteristics due to protein treatments indicated that the availability of protein at the tissue level was considered to be similar despite the differences in dietary protein intake (Shahjalal *et al.* 2000). The overall mean of shrinkage percent was 4.21±0.29; (Table 2) yet it was not differ significantly between intact and castrated males as well as between

kids receiving 12 or 16% dietary crude protein. These findings are on the line of the observation of Tahir *et al.* (1994a) on the Iraqi local goat and Koyuncu *et al.* (2007) on the Turkish hair kids. The greater loss in weight on chilling of goat can be possibly attributed to their thin subcutaneous fat cover. Similar results have also been reported by Dhanda *et al.* (2003) who found a greater loss in weight of chilling Capretto carcasses compared to Chevon carcasses.

Table (2). Effect of castration and dietary protein level on growth rate and some carcass characteristics (Mean±s.e)**.**

Trait	Overall mean	Treatment		Protein level	
		Castrate	Intact	12 %	16 %
No. animals	19	10	9	10	9
Initial weight (kg)	15.64±0.79	15.30±0.99 [a]	15.98±1.29 [a]	15.60±1.16 [a]	15.68±1.15 [a]
slaughter weight (kg)	24.28±1.04	24.08±1.30 [a]	24.52±1.74 [a]	23.77±1.56 [a]	24.86±1.41 [a]
Daily gain (kg)	0.073±0.01	0.074±0.01 [a]	0.073±0.01 [a]	0.067±0.01 [a]	0.080±0.01 [a]
Empty body weight (kg)	20.40±0.83	20.09±0.99 [a]	20.76±1.42 [a]	20.02±1.18 [a]	20.83±1.22 [a]
Hot carcass weight (kg)	11.68±0.57	11.54±0.71 [a]	11.84±0.95 [a]	11.40±0.88 [a]	12.01±0.76 [a]
Dressing%					
1	47.88±0.56	47.77±0.70 [a]	48.00±0.94 [a]	47.60±0.94 [a]	48.19±0.61 [a]
2	56.91±0.73	57.15±0.90 [a]	56.63±1.23 [a]	56.33±1.25 [a]	57.55±0.71 [a]
Chilled carcass weight (kg)	11.19±0.55	11.07±0.70 [a]	11.33±0.90 [a]	10.91±0.86 [a]	11.51±0.70 [a]
Shrinkage %	4.21±0.29	4.13±0.42 [a]	4.29±0.42 [a]	4.40±0.49 [a]	3.99±0.29 [a]
Rib-eye area (cm^2)	7.85±0.43	7.30±0.49 [a]	8.47±0.70 [a]	7.52±0.62 [a]	8.23±0.60 [a]
Fat thickness(mm)	1.17±0.14	1.34±0.20 [a]	0.98±0.17 [a]	0.92±0.15 [b]	1.44±0.21 [a]

Means within different letters within groupings differ significantly.
(1): Based on slaughter weight.
(2): Based on empty body weight.

In general, the lower live weight gain and feed efficiency in this study may be attributed to the poor genetic potentiality of the local goat for converting dietary nutrients into body tissues and growth compared with improved breeds.The daily feed intake was found to increase along with the increase in the level of protein in the diet. This result was in accordance with those reported by Saikia & Baruah (1997).

1.3-Rib Eye Area and Fat Thickness

Intact males had insignificantly larger eye muscle area than castrates (8.47 vs. 7.30 cm^2) (Table 2). Similarly, Shelton *et al.* (1984) and Tahir *et al.* (1994a) indicated that intact males had larger eye muscle area than castrate kids. Castrates had thicker fat over eye muscle (1.34±0.20mm) compared to intact males (0.98±0.17mm) (Table 2). This result was similar to those reported earlier on the Iraqi local goat by Taha (1990) and Shelton *et al.* (1984) on Angora kids.

No significant differences were observed in rib eye area between kids fed with 12 and 16% CP (7.52 vs. 8.23cm^2), but the kids fed a high dietary protein level had significantly ($P<0.05$) a thicker fat over eye muscle area (1.44 mm) compared to kids fed low protein level (0.92mm) .

1.4-Feed Intake and Feed Conversion Efficiency

Intact kids fed 12% dietary crude protein had a lower average body weight gain (0.060 vs. 0.093kg), daily feed intake (0.788 vs. 1.003kg) and poorer feed conversion (13.13 vs. 10.78kg/kg) efficiency compared to kids fed 16% dietary protein. Whereas, castrate kids fed with 12% protein consumed less feed daily, but converted feed to gain more efficiently than the kids fed 16% protein (Table 3). Similarly, Negesse *et al.* (2001) indicated that kids fed with 80 gm CP/kg DM gained at a lower rate, consumed less feed daily and converted feed to gain less efficiently than the kids in other groups (105, 128 and 155gm CP/kg DM).

1.5-Physical Dissection

Although intact kids had a higher lean (66.30 vs. 65.38%), and a lower fat percentage (13.60 vs. 15.65%) and a higher bone percentages (20.09 vs. 18.97%); however, the differences between them lacked significance. The results of the present study are in agreement with those of Tahir *et al.* (1994b) and Koyuncu *et al.* (2007) who also found that castration had no significant effect on the tissue distribution in goats. Intact kids had a higher lean: fat ratio (5.38 vs. 4.58) and a lower lean: bone ratio (3.34 vs. 3.47) (Table 4). Similarly, Mahgoub and Lodge (1996) reported that the muscle/ fat ratio was higher in bucks than wethers and females.

Lean and bone tended to decrease and fat tended to increase with increasing crude protein level in the diet ($P>0.05$) Similarly, it was demonstrated by Negesse *et al.* (2001) that there was no effect of the level of protein in the diet on the body composition or the composition of the gain. However, it was shown that despite the differences in dietary protein intake, at the small intestine these differences were much smaller due to extensive degradation of the high protein diet in the rumen. It may therefore be reasonable to expect little differences in the body composition attributable to the protein supplied by the diets (Ash and Norton, 1987b).

1.6- Carcass Cuts

With the exception of shoulder (Table 5), there were no significant differences between castrates and intacts in percentage contributions of all wholesale cuts to carcass weight. Similarly, Tahir *et al.* (1994a) and Koyuncu *et al.* (2007) have reported that the proportion of whole sale cuts did not differ significantly between the two sexes. Kids fed with 12 or 16% dietary protein level had no significant effect on the percent of primal cuts. This may be due to that level of protein not affected significantly the carcass weights; hence these cuts are expressed as a percent of carcass weight.

Table (3). Feed conversion efficiency for intact and castrated kids fed 12 or 16% dietary protein level.

Parameter	Intact		Castrate	
	12% C.P.	16% C.P.	12% C.P.	16% C.P.
Initial weight (kg)	16.44	15.52	14.76	15.84
slaughter weight (kg)	23.72	25.51	23.82	24.33
Average daily gain (kg)	0.060	0.093	0.075	0.071
Daily feed intake (kg)	0.788	1.003	0.789	0.842
Feed/gain (kg/kg)	13.13	10.78	10.52	11.85

Table (4). Effect of castration and dietary protein level on dissectible lean, fat and bone in leg joint (Mean±s.e).

Trait	Overall mean	Treatment		Protein level	
		Castrate	Intact	12 %	16 %
No. animals	19	10	9	10	9
Lean%	65.81±0.83	65.38±1.28 [a]	66.30±1.08 [a]	66.19±1.10 [a]	65.40±1.30 [a]
Fat%	14.68±0.99	15.65±1.50 [a]	13.60±1.24 [a]	13.78±1.39 [a]	15.69±1.41 [a]
Bone%	19.50±0.47	18.97±0.56 [a]	20.09±0.76 [a]	20.03±0.80 [a]	18.91±0.42 [a]
Lean: fat ratio	4.96±0.42	4.58±0.48 [a]	5.38±0.70 [a]	5.35±0.64 [a]	4.52±0.52 [a]
Lean: bone ratio	3.41±0.08	3.47±0.10 [a]	3.34±0.13 [a]	3.35±0.13 [a]	3.47±0.10 [a]

Means within different letters within groupings differ significantly.

Table (5). Effect of castration and dietary protein level on the percent sale cuts (Mean±s.e).

Trait	Overall mean	Treatment		Protein level	
		Castrate	Intact	12 %	16 %
No. animals	19	10	9	10	9
Shoulder %	23.61±0.40	22.86±0.37[b]	24.44±0.66[a]	23.91±0.67[a]	23.27±0.41[a]
Loin%	9.07±0.32	8.93±0.46[a]	9.22±0.46[a]	8.71±0.45[a]	9.47±0.43[a]
Leg%	30.39±0.42	31.06±0.59[a]	29.64±0.50[a]	30.51±0.55[a]	30.26±0.66[a]
Rack%	9.27±0.19	9.28±0.28[a]	9.26±0.28[a]	9.24±0.22[a]	9.31±0.34[a]
Tail%	0.34±0.01	0.35±0.02[a]	0.32±0.02[a]	0.34±0.01[a]	0.33±0.03[a]
Breast%	9.54±0.23	9.69±0.29[a]	9.37±0.36[a]	9.59±0.40[a]	9.48±0.20[a]
Flank%	5.15±0.26	4.97±0.23[a]	5.34±0.48[a]	4.87±0.18[a]	5.45±0.50[a]
shank%	6.62±0.23	6.89±0.28[a]	6.30±0.35[a]	6.76±0.38[a]	6.46±0.23[a]
Neck%	6.03±0.18	5.96±0.30[a]	6.10±0.22[a]	6.06±0.23[a]	6.00±0.30[a]

Means within different letters within groupings differ significantly.

1.7-Non- Carcass Components

In the present study, percentages of head, feet, pelt, full and empty digestive tract, gut, liver, kidneys, heart and lungs expressed as proportions to live body weight did not differ significantly between castrated and intact males except for spleen percentage (Table 6). Similar results have been reported earlier on the Iraqi local goat (Tahir *et al.* 1994a). The effect of dietary crude protein on non-carcass components was not significantly differ between intact and castrated kids. However, the results of the present study disagree with the data of Atti *et al.* (2004) who found that goats fed a medium protein level (130g/kg DM) had the heaviest($P<0.05$) liver and gut and tended to have heavy digestive tract contents compared to goats fed high (160g/kg DM) or low crude protein diets(100g/kgDM).

1.8-Non- Carcass Fats

The percent of non–carcass fat as the proportion of live body weight averaged 5.87±0.41 and 5.94±0.71 for castrates and intact kids, respectively ($P>0.05$) (Table 7). It was noted earlier that the percent caul and kidney fat expressed on the basis of live body weight were not significantly affected by castration on the Iraqi local goat (Tahir *et al.* 1994a). Also, no significant difference was obtained between kids fed with diets containing 12% and 16% crude protein. Hango *et al.* (2007) indicated that fat free gastro intestinal tract is an early maturing tissue in goats and the possibility of changing its proportion relative to live weight through dietary manipulation is small. Among body fat depots, omental contributed the highest proportion expressed as a percent of non-carcass fat (43.95%) followed by pelvic and kidney fat (31.37%), mesenteric (22.25%) and cardiac (2.44%) (Table 7). Thus, this result agrees with the earlier findings that visceral fat depots comprise the main store sides in goat carcasses, while subcutaneous fat deposition is scarce (Mourand *et al.* 2001).

Table (6). Effect of castration and dietary protein level on some offal and edible organs (% of live body weight) (Mean±s.e).

Trait	Overall mean	Treatment		Protein level	
		Castrate	Intact	12 %	16 %
No. animals	19	10	9	10	9
Head %	6.81±0.17	6.50±0.17 [a]	7.16±0.28 [a]	6.92±0.29 [a]	6.69±0.19 [a]
Feet %	2.95±0.08	2.99±0.10 [a]	2.91±0.13 [a]	2.94±0.10 [a]	3.00±0.13 [a]
Pelt %	9.15±0.38	9.17±0.68 [a]	9.12±0.31 [a]	9.28±0.65 [a]	9.00±0.38 [a]
Full digestive tract%	23.15±0.66	23.64±1.19 [a]	22.60±0.45 [a]	22.39±1.09 [a]	23.98±0.62 [a]
Empty digestive tract%	7.35±0.19	7.31±0.31 [a]	7.40±0.21 [a]	7.01±0.24 [a]	7.74±0.25 [a]
Gut%	15.79±0.68	16.33±1.24 [a]	15.20±0.41 [a]	15.38±1.20 [a]	16.25±0.58 [a]
Liver%	2.00±0.08	2.00±0.09 [a]	2.00±0.13 [a]	1.89±0.14 [a]	2.11±0.05 [a]
Heart%	0.63±0.03	0.66±0.04 [a]	0.60±0.04 [a]	0.65±0.04 [a]	0.61±0.04 [a]
Lung%	1.32±0.05	1.39±0.07 [a]	1.25±0.05 [a]	1.31±0.06 [a]	1.34±0.07 [a]
Kidney%	0.33±0.01	0.34±0.01 [a]	0.31±0.01 [a]	0.32±0.01 [a]	0.34±0.01 [a]
Spleen%	0.21±0.01	0.24±0.02 [a]	0.17±0.01 [b]	0.19±0.02 [a]	0.23±0.02 [a]

Means within different letters within groupings differ significantly.

Table (7). Effect of castration and dietary protein level on percent non-carcass fat and the proportions of fat depots (Mean ±s.e).

Trait	Overall mean	Treatment		Protein level	
		Castrate	Intact	12 %	16 %
No. animals	19	10	9	10	9
Non- carcass fat*	5.90±0.39	5.87±0.41 [a]	5.94±0.71 [a]	6.13±0.66 [a]	5.65±0.38 [a]
Pelvic & Kidney	31.37±1.59	30.26±2.61 [a]	32.60±1.78 [a]	29.56±2.32 [a]	33.37±2.08 [a]
Cardiac	2.44±0.25	2.68±0.37 [a]	2.17±0.32 [a]	2.23±0.34 [a]	2.68±0.37 [a]
Mesenteric	22.25±2.24	23.87±3.42 [a]	20.45±2.89 [a]	20.14±2.94 [a]	24.59±3.41 [a]
Omental	43.95±2.39	43.19±4.09 [a]	44.79±2.46 [a]	48.07±2.34 [a]	39.37±3.91 [a]

***** As a percentage of slaughter weight.

Means within different letters within groupings differ significantly.

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الخلاصة

أجريت هذه الدراسة في الحقل الحيواني/ كلية الزراعة/ جامعة دهوك ، حيث تم توزيع (20) من جداء الماعز بعمر (3- 4 شهر) وبوزن ابتدائي 15,64 ± 0,79 كغم عشوائيا إلى مجموعتين متساويتين إذ تم خصي المجموعة الأولى والثانية تركت كسيطرة. ومن ثم تم توزيع كل مجموعة إلى مجموعتين ثانويتين لتتغذى على عليقة بصورة حرة تحوي على12او 16٪ بروتين خام.وكان يتم وزن الجداء أسبوعيا.

يتبين من النتائج انعدام التأثير المعنوي في معدل الزيادة الوزنية اليومية لكل من ألخصي (0,074مقارنة ب 073، 0 كغم) ونسبة البروتين (067 ،0 مقارنة ب 0,080 كغم). كانت الجداء المخصية التي تناولت 12٪ بروتين أفضل من نظيرتها التي تناولت 16٪ بروتين في كفاءة التحويل الغذائي (10,52 مقارنة ب 11,85كغم/ كغم). وعلى عكس ذلك فلقد حققت الجداء غيرالمخصية والمغذاة على 16٪ بروتين كفاءة تحويل غذائي أفضل من مثيلاتها المغذاة على12٪ بروتين (10,78مقارنة ب 13,13كغم/ كغم). بلغت نسبة التصافي محسوبة على أساس وزن الجسم والوزن الفارغ (47,88و56,91 ٪ على التوالي) و لم يكن لكلا المعاملتين تأثير معنوي في هذه الصفة. كان سمك الطبقة الدهنية للجداءالمخصية أعلى (34 ، 1 ملم) ومساحة العضلة العينية اقل (30 ،7 سم2) عن مثيلاتها الجداء غير المخصية (0,98 ملم و 47 ، 8 سم2 على التوالي). كما كان سمك الطبقة الدهنية للجداء المغذاة على 16٪ بروتين اسمك معنويا من الجداء المغذاة على12٪ بروتين (1,44مقارنة ب 0,92 ملم) ، أما مساحة العضلة العينية فلم تكن الفرو قات بينهما معنوية. كما تبين انعدام التأثير المعنوي للمعاملات في كل من نسبة اللحم والدهن والعظام في الفخذ ونسبة قطعيات الذبيحة و نسبة دهن الأحشاء.

پوختە

ئەڤ ڤەكولینە دگوڤێن گیانەوەری یێن كولیژا چاندنێ ل زانكویا دهوكێ هاتبوو ئەنجام دان، ب بەلاڤكرنا 20 گیسكێن ژیێ (3–4هەیڤی) وب سەنگا دەستپێكیا وان(15.64±0.79) كیلوگرام ب شێوەیەكێ بەربەلاڤ بو دوو گروپێن سەرەكی كو گروپێ ئێكێ هاتبوونە خەساندن وگروپێ دی هاتنە هێلان وەكو فاكتەرێن كونترول.وپشتی هینگێ هاتنە بەلاڤكرن لسەردووگروپێن بنەكی ژبو پێدانا دوو جورێن ئالفی ب شێوەكێ ئازاد یێن كو پێكهاتین ژ12یان 16٪ پروتینێ خاڤ ،ودهاتنە سەنگاندن هەفتیانە. هاتە دیار كرن ژ ئەنجاما نە بونا چ كارتیكرنێن پێشچاڤ بو هەردوو ساخلەتان خەساندن(0.074 بەراوردكرن دگەل0.073 كیلو گرام) و رێژا پروتینی(0.067 بەراوردكرن دگەل0.080 كیلو گرام) لسەر زێدە بونا سەنگێ روژانە . گیسكێن خەساندی یێن 12٪ پروتین پێ هاتیە دان باشتربون ژهەڤكویڤن خوین كو 16٪ پروتین وەرگرتین دشیانێن ڤەگوهاستنا خوارنێ دا(10.52 بەراوردكرن دگەل 11.85 كغم/ كغم) وبەروڤاژی ڤی چەندێ گیسكێن نە خەساندی ویێن 16٪ پروتین پێ هاتیە دان شیانێن ڤەگوهاستنا خوارنێ باشتربون ژهەڤكویڤن كو 12٪ پروتین پێ هاتیە دان(10.78 بەراوردكرن دگەل 13.13 كغم/ كغم).رێژا پاقژیا هاتیە هژمارتن لسەر بنەرەكێ سەنگێ لەشی و سەنگێ ڤالا د گەهشتە(47.88و56.91٪) و خەساندنێ و ئاستێ پروتینی چو كارتیكرنێن پێشچاڤ دڤێ ساخلەتێ دا نەبو. ستویراتیا تیڤلێ رونی د گیسكێن خەساندیدا پتربو(1.34ملم)و روبەرێ زەڤلەكا عەینی كێمتربو(7.30 سم چوارگوشە)ژهەڤكویڤن خوین نەخەساندی(0.98 ملم و8.47 سم چوارگوشە)لدویڤ ئێكرا، هەروەسا ستویراتیا تیڤلێ رونی د گیسكێن رێژا 16٪ پروتین پێ هاتیە دان ستویرتربوژ گیسكێن 12٪ پروتین پێ هاتیە دان(1.44 بەراوردكرن دگەل0.92 ملم) بەلێ چ جوداهیێن پێشچاڤ دناڤ بەراواندا نەبو د روبەرێ زەڤلەكا عەینی دا ،هەروەسا تێتە دیاركرن نە بوناچ كارتیكرنێن پێشچاڤ یێن هەردوو ساخلەتان (خەساندن و ئاستێ پروتینی) لسەر رێژا گوشتی ،روێنی ، هەستی د رانی دا ورێژا پارچێن لەشی ، ورێژا روێنی روێ یڤیكان.

PROPAGATION OF *Myrtus communis* L. *In vitro*

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(Received: February 25, 2009; Accepted for publication: May 19, 2009)

ABSTRACT

The cultivated Myrtle (*Myrtus communis* L.) is commonly grown in Kurdistan Region of Iraq for ornamental, as well as medicinal purposes, with some propagation difficulties. For rapid clonal propagation of this plant, the shoot apices, from actively growing adult plants, were excised and cultured on MS medium supplemented with various combinations of growth regulators to induce shoot proliferation and subsequent rooting. Following 4 weeks of incubation, the shoot tips grew into 2 cm tall shoots in a medium supplemented with 0.5mg/l BAP.

The effects of the cytokinins BAP and kinetin were tested for their ability to induce shoot multiplication, while the auxins IBA, IAA and NAA were tested for rooting. The results revealed that the optimal concentration for shoot multiplication ranged between 1- 1.5mg/l BAP. No beneficial effect was obtained from inclusion of Kin in the culture medium. On the other hand, best rooting of individual shoots was attained in a medium enriched with 1 mg/l IBA.

KEY WORDS *Myrtus communis* tissue culture auxins cytokinins *in vitro*.

INTRODUCTION

Myrtle (*Myrtus communis* L.) is an evergreen shrub belonging to the Myrtaceae family that grows extensively in Kurdistan region of Iraq, with an increasing interest as a future plant. It is widely used for ornamental purposes such as fencing, road sides and green cutting (Skekafandeh, 2007). It has also been used as a medicinal plant for the scent and the essential oils of the leaves, whose active compounds are used in medicinal industries (Ruffoni *et al.,* 2003) such as antimicrobial stimulant, (Salih and Nadir, 1984) antiseptic and bactericide (Scarpa *et al.,* 2000).

This plant is conventionally propagated by cuttings, with some problems usually encountered in rooting stage (Scarpa *et al.,* 2000). Seed propagation, on the other hand, is less wanted due to the possible genetic variations usually observed in new generations. *In vitro* propagation trials for this plant were first reported by Uhring (1983) who reported some difficulties in the rooting phase, while Ruffoni *et al.* (2003) reported low rates of multiplication. In fact, they suggested that rooting and acclimization are the points to be focused upon in order to obtain protocols for mass propagation system of Myrtle. Therefore, the objective of this investigation is to determine the effects of different cytokinins and auxins on multiplication and rooting stages, respectively. The development of micropropagation program is of prime interest for the production of a large number of genetically uniform and healthy plants that can be used for different objectives.

MATERIALS AND METHODS

Healthy growing shoots measuring 8-10 cm were collected from Malta Experimental Station, Duhok Province, Kurdistan Region of Iraq in April, 2008.

The shoots were thoroughly washed under running tap water to remove dirts and dusts, followed by surface disinfestation by immersing in a mixture of 5% NaOCl solution containing few drops of Tween-20 surfactant. A gentile vacuum was applied for 15 min. to dislodge the air bubbles possibly captured within the tissues. Working within the confines of a laminar-air- flow hood, the disinfestant was discarded and the shoots were rinsed 3 times with autoclaved deinonized water and transferred to sterile Petri dish. The shoot apex, consisting of apical meristeme , leaf primordia and 1-2 expanded leaves were excised and transferred to culture vessel containing nutrient medium.

The nutrient medium employed in this investigation consisted of Murashige and Skoog (1962) inorganic salts, in addition to the followings (in mg/l): sucrose (30,000), inositol (100), thiamine HCl (0.4), BAP (0.5) and glycine(0.5). The pH of the medium was adjusted to 5.7± 0.1 with 1N NaOH or HCl, prior to the addition of agar (7, 000). The medium was brought up to the final volume, then dispensed at 25 ml rates, into 250 ml Mason jars and capped with colorless PVP covers and fitted with rubber bunds. The medium was then sterilized by autoclaving for 15 min. under 1.04 kg/cm² and allowed to solidify under room temperature.

Following culture initiation, the developed shoots were divided into nodal segments, measuring about 1 cm tall and containing 2 nodes, and cultured on fresh medium of the same composition, but supplemented with specific concentration of the test cytokinin. The effects of BAP (Benzylamino purine) and Kinetin (N^{-6} furfurylamino purine)were tested for their ability to induce shoot multiplication. Both cytokinins were tested at 0.0, 0.25, 0.50, 1.00 and 1.50 mg/l levels. The number and length of the newly initiated shoots were recorded 6 weeks after incubation.

On the other hand, the auxins IBA (indole -1- butyric acid), IAA (indole -3- acetic acid) and NAA (naphthalene -1- acetic acid) were tested for root induction in shoots produced from multiplication stage . The auxins were tested at the 0.0, 0.25, 0.50, 1.00 and 1.50 mg/l concentrations, in case of NAA,0.5 mg/l of BAP was added to the rooting medium . Data, regarding root number and length, were collected following 6 weeks of growth on such media. A total of 24 replicates were initiated for each treatment. The least significant difference was determined and the means were compared according to SAS (2001)..

RESULTS AND DISCUSSION

Proliferation of the cultured shoot apex started as early as one week of incubation in the culture room. Single shoots developed from the cultured apex reached 3- 4 cm tall following 4 weeks of incubation. No abnormalities were observed in the newly initiated shoots, and no callus was associated with their development (Fig. 1). The initiation stage was thus terminated, and the new shoots were transferred to the multiplication stage. The shoots were divided into small nodal segments (Fig. 2) and cultured on fresh medium supplemented with various concentrations of BAP or kinetin, with their basal end embedded in the medium.

Fig (1): Newly initiated shoots one month in culture.

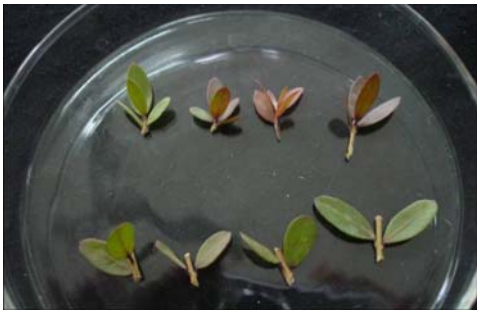

Fig (2): Nodal segments from fig. (1) ready for culture.

Enhanced axillary shoot proliferation was observed in the nodal segments after 3-4 weeks in BAP- containing media, however the number of new shoots varied according to BAP concentration (Table 1). The average number of shoots increased significantly with the presence of BAP in the medium. The multiplication rate reached its maximum in the medium containing 1.5 mg/l BAP. The number of shoots increased from 1.12 at the control, to more than 19 shoots at 1.5 mg/l concentration, and this increase was significant when compared to all other treatments. Shoot length, on the other hand showed an inverse relationship with BAP concentration (Table 1). The length of shoot was reduced drastically with increased BAP concentration. The least shoot length was attained at the 1.5mg/l BAP level, which reached 0.79 cm, as an average, as compared to 2.26 cm in BAP- free medium.

Inclusion of kinetin in the multiplication medium resulted in slight increase in shoot number, however this increase was not always significant when compared to the control. The highest shoot number was attained in the presence of 0.25 and 0.50 mg/l of kinetin per liter medium which differed significantly from the control, however no significant differences were observed between the two treatments. Higher concentrations (i.e. 1.0, 1.5 mg/l) resulted in a non – significant reduction in shoot number (Table 1). In the presence of kinetin in the culture medium, however no significant differences were observed between the treatments.

Table (1): Effect of different cytokinin concentrations on *in vitro* shoot multiplication of *Myrtus communis*

Cytokinin	Conc., mg/l	No. shoots/ explant	Length of shoots (cm)
BAP	0.00	1.12 c*	2.26 ab
	0.25	4.00 c	2.81 a
	0.50	5.59 c	1.6 ab
	1.00	11.84 b	0.88 b
	1.50	19.09 a	0.79 b
L. S. D.		5.36	1.492
Kin.	0.00	1.04 b	2.96 a
	0.25	1.42 a	1.38 b
	0.50	1.45 a	1.30 b
	1.00	1.25 ab	1.67 b
	1.50	1.25 ab	1.64 b
L. S. D.		0.305	0.421

***** Numbers followed by the same letter are statistically not different at 0.05 level of probability.

From the preceding results, it was obvious that BAP was more effective in inducing shoot proliferation in *Myrtus communis* L. shoots than the kinetin. Similar observation has been reported for different cultivars of Myrtus (Scarpa *et. al.*, 2000; Ruffoni *et. al.*, 2003; Lucchesini *et al.*, 2001 and Shekafandeh , 2007). In the meantime, the shoot length was reduced with increased BAP concentration. This reduction in length may be attributable to the competition on nutrient media and space in cultures received high BAP concentration. Furthermore, the kinetin showed a less stimulatory effect on shooting when compared to BAP. This can be explained on the basis of two double bonds in BAP structure, compared to single bond in kinetin molecule (Robins et. al., 1986). The potent effect of BAP in shoot initiation is well documented in a wide scope of concentration in different plants belonging to various families and genera.

The cultured shoots continued their growth and reached 8-10 cm after 2 month of incubation. Figure(4) shows a representative culture to indicate the extent of shoot growth and development.

Fig (3): Shoot proliferation on BAP medium after four weeks.

Fig (4): Extent of shoot growth after two months in culture.

The results revealed that the three tested auxins (IBA, IAA, and NAA) stimulated root initiation in *Myrtus communis* L., however the extend of rooting varied according to auxin type and concentration. IBA was the most effective auxin, followed by IAA and NAA. Inclusion of 1 mg/l of IBA in the medium resulted in a significant increase in roots number when compared to the control (Table 2). Lower concentrations (0.25 and 0.5mg/l) also caused less significant increase in root number where 3.71 and 3.29 roots were developed, respectively. Increasing IBA concentration to 1.5 mg/l did not improve the rooting. Root length, on the other hand, reached its maximum at the 0.25 mg/l IBA level which was significant when compared to other treatments (Table 2). Figure 5 shows representative rooted culture to reveal the tap root system observed in this treatment.

IAA, on the other hand also caused significant increase in roots number when compared to the control (Table 2) however the other treatments also induced rooting but no significant differences among them, neither with the 1 mg/l treatment, were observed. In general, IAA showed no significant effect on rooting, although root length was more than double in the presence of 1mg/l IAA (Table 2).

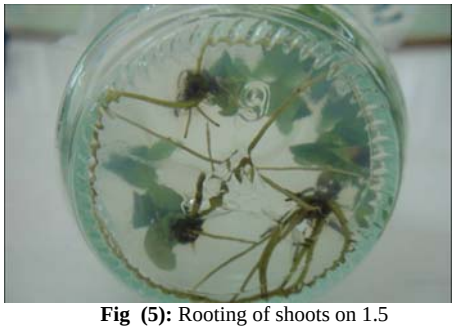

Fig (5): Rooting of shoots on 1.5 mg/l IBA- containing medium.

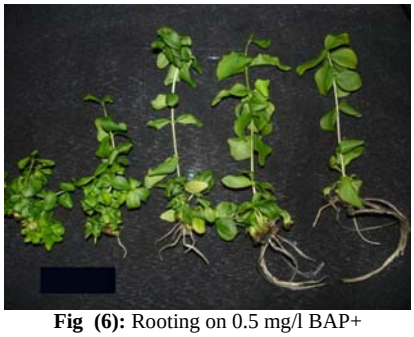

Fig (6): Rooting on 0.5 mg/l BAP+ (Left to right) 0, 0.25, 0.5, 1 and 1.5 mg/l NAA

Table (2): Effect of different auxin concentrations on *in vitro* rooting of *Myrtus communis.*

Auxin	Conc., mg/l	No. roots/ shoot	Length of roots (cm)
IBA	0.00	0.00 c	0.00 d
	0.25	3.71 ab	8.11 a
	0.50	3.29 ab	6.02 b
	1.00	4.29 a	4.36 c
	1.50	2.71 b	5.64 b
L. S. D.		1.459	0.676
IAA	0.00	0.46 b	0.85 a
	0.25	1.06 ab	0.82 a
	0.50	0.85 ab	1.67 a
	1.00	1.83 a	1.95 a
	1.50	1.04 ab	1.72 a
L. S. D.		1.049	1.151
NAA+ 0.5 mg/l BAP	0.00	0.13 d	0.28 c
	0.25	0.41 cd	0.43 c
	0.50	1.54 bc	0.52 c
	1.00	2.58 b	2.35 b
	1.50	5.59 a	3.84 a
L. S. D.		1.154	1.364

***** Numbers followed by the same letter are statistically not different at 0.05 level of probability.

The auxin NAA, finally, was the least effective among tested auxins and only 5 shoots rooted in the whole experiment, regardless of NAA concentration. Thus, the whole experiment was repeated following inclusion of 0.5 mg/l BAP in the culture medium. The synergistic effect of both growth regulators was evident (Table 2). A significant increase in root number was attained in 1.5 mg/l NAA concentration which was statistically significant over all concentrations. Root length was also the highest at this concentration.

The role of auxins in rooting induction is well known (Hunter, 1978). In this investigation the best rooting was attained in the presence of 1 mg/l IBA. This result is in agreement with others who worked on Myrtle (Damiano *et al.*, 2007; Ruffoni *et al.*, 2003 and Grigoriadou and Leventakis , 2000). Other investigators suggested the inclusion of NAA (Nobre, 1994 and Khosh – Khui *et al.*, 1984). Still others (Scarpa *et al.*, 2000 and Ruffoni *et al.*, 2003) suggested IAA for rooting. In general the auxins increases cell wall elasticity and stimulates cell elongation followed by adventitious root formation (Damiano et al., 2007). Although NAA alone was not effective in root induction, a combination of NAA and BAP was found to result in better rooting, an observation was similarly reported by Khosh – Khui *et. al.* (1984). In all cases, the induction of rooting depends on the endogenous hormonal balance of the cultured tissues. This balance is altered by the additional growth regulators added to the medium, and this alteration may increase or decrease the hormonal balance to a level sufficitent to trigger the initiation of adventitious roots. Further more rooting was improved in NAA containing media when BAP was included at 0.5 mg/l level. This observation confirms those of Khosh – Khui *et al.* (1984).

In this investigation it was possible to increase the number and length of shoots and roots to rates much higher than those reported by others (Ruffoni et al., 2003; Damiano et al., 2007 and Shekafondeh, 2007). Thus the protocol for clonal mass propagation of Myrtle can be improved to achieve better plants. Further investigation concerning hardening and acclimatization stages is still in progress.

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إكثار نبات الياس (*Myrtus communis* L.) في خارج الجسم الحي

الخلاصة

يزرع الياس (Myrtus communis L.) بصورة شائعة في إقليم كوردستان العراق لأغراض الزينة، فضلاً عن أغراض طبيـة، بالرغم من وجود بعض الصعوبات في إكثاره خضرياً. ولغرض تحديد برنامج للإكثار السلالي السريع لهذا النبات، فقد تم استئصال القمم النامية من أفرع نباتات بالغة وزرعت في وسط MS المجهز بتوليفات مختلفة من منظمات النمو النباتية بهدف استحثاث إكثار الأفرع ومن ثم تجذيرها. وبعد مرور أربعة أسابيع من التحضين، تطورت القمم المزروعة إلى أفرع بطول 2 سم وذلـك في وسـط غذائي يحتوي على 0.5 ملغم/ لتر من الـ BAP.

تم اختبار قابلية السايتوكينينات (BAP و Kinetin) في استحثاث تضاعف الأفرع، في حين جرى اختبار الاوكسينات (IBA و IAA و NAA) في تجذير الأفرع. لقد أظهرت النتائج بأن التركيز الأمثل لتضاعف الأفرع تتراوح بين 1-1.5 ملغم/ لتـر مـن الـ BAP، في حين لم يتم الحصول على تأثير مفيد لوجود الكاينتين في الوسط الغذائي. ومن الناحية الأخرى، فقد أمكن الحـصول على أفضل تجذير للأفرع بصورة منفردة في وسط غذائي يحتوي على 1 ملغم/ لتر من الـ IBA.

زێدەکرنا روەەکێ یاس (*Myrtus communis* L.) ب رێکا چاندنا شانا

کورتی

رووەکێ یاس (Myrtus communis L.) ب شێوەکێ سروشتی ل کوردستانا عیراقێ شـین دبیـت ودهێتـه بکارئینـان وەك رووەکەکێ جوانیێ ودیسان وەك رووەکەکێ پزیشکی، لێ چەند ئاستەنگ هەنە دزێدەکرناوی دا. ژبۆ زێدەکرنا بلەز یا ئـەڤی رووەکی، پشکێن سەری ژجهێن شینبوونا ئەکتیڤ ژرووەکێن گەهشتی دهێنـه وەرگـرتن وچـاندن دنـاڤ میـدیایێ MS دگـەل ئامادەبوونا پێکخاتییێن جورا وجور ژکەرەستێن هورمەنی ژبو پالدانا چێبوونا چقا ورویها. پشتی چوار حـەفتیا ژداینگـەهکرنێ، پشکێن سەری هەتا 2 سم ددرێژاهیێ دا شین دبن دماڤ میدیایێ ئەوێ 0,5 ملغم/لـتر ژBAP تێدا هەی.

کارتێکرنێن سایتوکاینینا (BAP) و (Kinetin) هاتنە تاقیکرن ژبو زانینا کارتێکرنا وان ل سەر زێدەکرنا چقا. دیسان هـەر سێ جورێن ئوکسینا (IBA, IAA & NAA) هاتنە تاقیکرن ل سەر رویهدانێ. ئەنجامان دیارکر کو باشترین رێژە ژبو زێـدەکرنا چقا دناڤبەرا 1 تا 1,5 ملغم/لـتر ژ BAP. چ مفایێن بەرچاڤ نەهاتنە بدەستڤەئینان ژکارئینانا کاینتین دنـاڤ میـدیایێ دا. باشـترین رویهدانا چقا هاتە بدەستڤەئینان دناڤ میدیایێ 1 ملغم/لـتر IBA تێدا هەی.

EFFECT OF NPK FERTILIZER AND INDOLE-3-BUTYRIC ACID (IBA) ON GROWTH AND YIELD OF GARLIC (*Allium sativum* L.)

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(Received: March 10, 2009; Accepted for publication : June 16, 2009)

ABSTRACT

This experiment was carried out during 2006-2007 growing season at the field of research, Horticulture Department, Agriculture College, Dohuk University, Dohuk. Plants of garlic were fertilized by NPK 10:10:10 at rates of 0, 10, 20 and 30 g.m^{-2}. In addition to that these plants were sprayed twice by indole-3-butyric acid at rates of 0, 100, 150 and 200 mg.l^{-1}. The objective of this investigation was to evaluate the growth and yield responses of garlic to NPK, IBA and their combinations. The obtained results revealed that 20g.m^{-2} NPK was the most effective rate, as compared to other rates. It displayed the highest yield 1.7 kg.m^{-2}, bulbils number.m^{-2} 26, gloves number per bulb 6.13, and leaves number 6.38. Regression analysis exhibited that garlic yield was linearly responded to NPK rates and it could be estimated by the following equation: yield kg.m^{-2} = 1.39967 + 0.016633 (NPK rate). Likewise, 200 mg.l^{-1} IBA was the most potent rate, it gave the highest yield 1.7 kg.m^{-2}. Garlic yield was quadritically responded to IBA rates, and it could be forecasted by the following equation: yield kg.m^{-2} = 1.48282 + 0.00084118 (IBA rate) - 0.0000441(IBA rate)^2. Garlic plants fertilized by 10 g.m^{-2} NPK and sprayed with 200mg.l^{-1} IBA was the most effective interaction treatment, as it gave the highest yield 2.03 kg.m^{-2}.

KEY WORLD Garlic NPK IBA

INTRODUCTION

Garlic (*Allium sativum* L) belongs to the family Alliaceae. It is the second most widely used of the cultivated bulb crops after onions. It is an erect annual herb that can reach a height of 75-90 cm and grows during dry and mild winter season (Brewster, 1994).

Garlic is believed to have originated in Central Asia (India, Afghanistan, W. China, Russia etc) and spread to other parts of the world through trade and colonization (Purseglove,1972 & Tidal,1986). According to FAO (FAO,2001), production of garlic stood at about 10 million tones per annum which is only about 10% that of bulb onions. China is the world largest producer followed by South Korea. The world average yield of garlic is about 10t ha^{-1}, but can go up to 19t ha^{-1}.

Garlic is rich in sugar, protein, calcium, potassium, phosphorus, sulfur, iodine, fiber and silicon, in addition to vitamins. Its pungent flavor makes it used mainly as a spice, seasoning and flavoring for foodstuff involving both green tops and bulbs (Matloob *et al* , 1980).

A number of studies in various parts of the world have shown that garlic production can be improved through appropriate cultural practices (Kusomo & Widjajanto, 1973 and Aleksiev, 1989). Maksoud *et al.* (1984) from Egypt also reported significant favorable effects of nitrogen application on yield. In Brazil Carvalho *et al*. (1996) in trial with 3 rates of applied N(0-120 kg ha^{-1}), 4 rates of K(0-160 kg ha^{-1}), observed various effects of N and K reported that the total and marketable bulb yields were affected only by N. Rizk, (1997) mentioned that increasing the rate of NPK fertilizers increased vegetative growth parameters and yield of onion bulb. Almadini, *et al*. (2000) found that increasing the application of NPK fertilizers significantly increased the growth and yield of onion under Hassa condition.

Growth substances are used to regulate growth and improve productivity and quality of various plant species. Indole-3-butyric acid has different effects on plant growth and development when applied exogenously (Ludwing-Muller,2000).Dipping roots of onion seedling in 20 ppm (IAA) or (IBA) solution before transplanting increased average number of leaves and fresh weight of bulbs (Maurya & Lai, 1975 and Singh *et al*, 2002). Rizk *et al*,(1996) and El-Mergawi *et al*, (1999) mentioned that spraying IAA and NAA had a favorable effect on growth characters and yield production of onion. IBA significantly increased vegetative growth and improve average yield and its quality of onion (Midan *et al*, 1982) and of maize (Amin *et al*, 2006). Therefore, an attempt was made to evaluate the effectiveness of different NPK rate and application of different concentrations of IBA on the growth and yield of the Chines cultivar of garlic which might help for substantial contribution to the region.

MATERIALS AND METHODS

This experiment was carried out during 2006– 2007 growing season, at the experimental field of Horticulture Department , Agriculture College .Duhok University ,Duhok Kurdistan Region ,Iraq . The objective of this study was to investigate the growth and yield responses of Chinese garlic to varying NPK and IBA rates .

A factorial Randomized Complete Block Design (F- RCBD) was chosen to include factor (A) four rates of NPK 10: 10: 10 namely (0 ,10 , 20 and 30 g.m^{-2}) and factor (B) IBA rates of (0 , 100 ,150 and 200 mg.1^{-1}). Therefore , 16 treatments were included , each treatment was replicated three times .One replicate was represented by a furrow of 3.75 m length ,0.75 m width, planted on both sides with intra plant space of 0.15 m.

Garlic gloves were planted on October, 1st 2006 then plants were fertilized according to their proposed rates on February,26 th 2007 by NPK fertilizer 10:10: 10 this fertilizer was also contained organic matter (4%) , MgO 3% , CaO 3% ,Fe 0.1 % and Zn 0.02 % .Garlic plants were sprayed by IBA rates on February, 27 the 2007.Weeds were manually predicated and other cultural practices were carried on whenever required.

Plants were harvested on June,1st 2007 , thus harvested plants were cleaned and brought to the vegetable laboratory .Fresh weight of flowering stalk were weighed by electrical balance then oven – dried at 65 ^{o}C for 72 h and were weighed glove number per bulb , leaves number per plants were counted and plant heights were measured and finally yield kg.m $^{-2}$ was calculated

RESULTS

The results (table, 1) revealed that application of IBA rates displayed no significant increases. However, regression analysis (figure,1) revealed that yield showed gradual increases until it reached its maximum value at the rate of 100 mg .1^{-1}. Then declined to sustain its initial vale which resemble to untreated check. Yield could be estimated by the following equation : Yield kg. m^{-2} = 1.48282 + 0.0084118 (IBA rate) – 0.0000441 (IBA rate)^{**2}

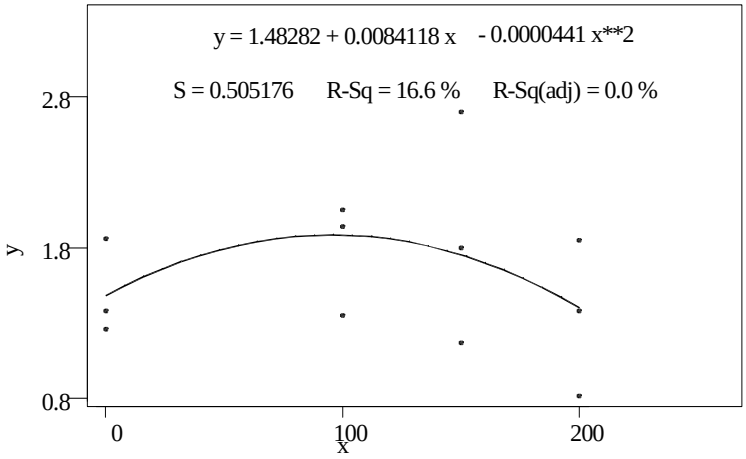

Fig (1): The influence of IBA rates ppm(x)on Garlic yield kg/m2(y).

The obtained results revealed that application of 100 mg.1^{-1} IBA highly increased the flowering stalk fresh weight , as it significantly exceeded that of control by (50.47 %). However, non- significant differences among other rates were defected (table, 1). Regression analysis (fig, 2) displayed that flowering stalk fresh weight is negatively responded to IBA rates and it could be estimated from the following equations (flowering stalk fresh weight g) = 6.80467 – 0.0130933 (IBA rate).Garlic plants treated with 200 mg .1 $^{-1}$ IBA highly exceed these of control by (111.11%) in flowering stalk dry weight. However, non-significant differences were observed among other IBA rates. Regression analysis manifested that flowering stalk dry weight commenced to decline in control to attain their lowest values at 110 mg.1^{-1} IBA then started to increase until they reach a value(2.09 g) at 200 mg.1^{-1}. However , it was lower than that of untreated check (fig , 3) . Therefore , flowering stalk dry weight was negatively correlated to IBA rates and it could be forecasted from the following quadratic equations :Flowering stalk dry weight (g) = 1.53282 – 0.0142548 (IBA rate) + 0.0000586 (IBA rate)^{**2}

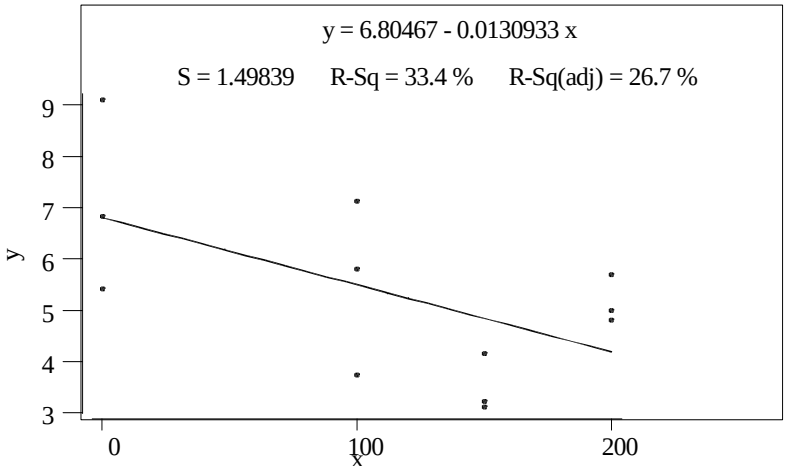

Fig (2): The influence of IBA rates ppm(x)on flowering stalk fresh weight of Garlic pant(y).

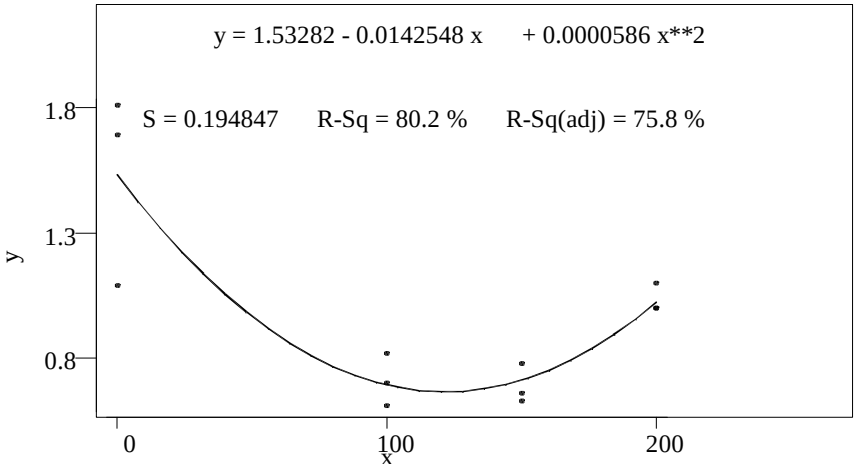

Fig (3): The influence of IBA rates ppm(x)on dry weight of Garlic flowering stalk (y).

Non – significant differences were detected among IBA rats in bulbils number m^{-2} (table, 1) . Regression analysis revealed that bulbils number was gradually declined as the IBA rates increased (fig, 4). Therefore, a negative linear regression is governed the responses of bulbils number to IBA rates and it could be estimated from the following negative line equation: (Bulbils. m^{-2}) = 43.5714 – 0.149524 (IBA rate).

The obtained results (table, 1) manifested that significant differences were not detected in the response of the glove number per bulbils to varying IBA rates. Regression analysis (figure ,5) shows that glove numbers per bulb were declined at rates beyond zero to attain the lowest value at 25 mg.1^{-1} IBA rate , then started to increase the reach their maximum value at 150 mg. 1^{-1} rate then they decreased to attain the initial at 200 mg. 1^{-1} IBA rate . Therefore, glove numbers per bulb responses to IBA rates is governed by the following cubic equation :(glove number per bulb) = 5.8 – 0.0208889 (IBA rate) + 0.0003267 (IBA rate)^{**2} - 0.0000011 (IBA rate)^{**3} .

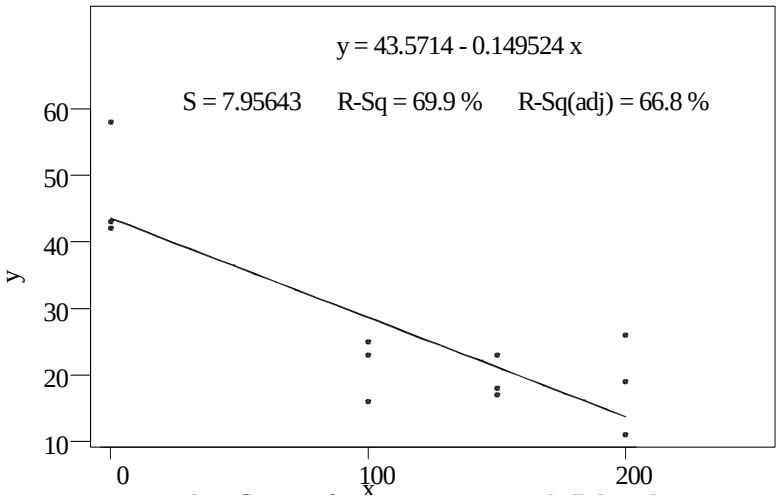

Fig (4): The influence of IBA rates ppm(x)on bulbil number/m2 (y).

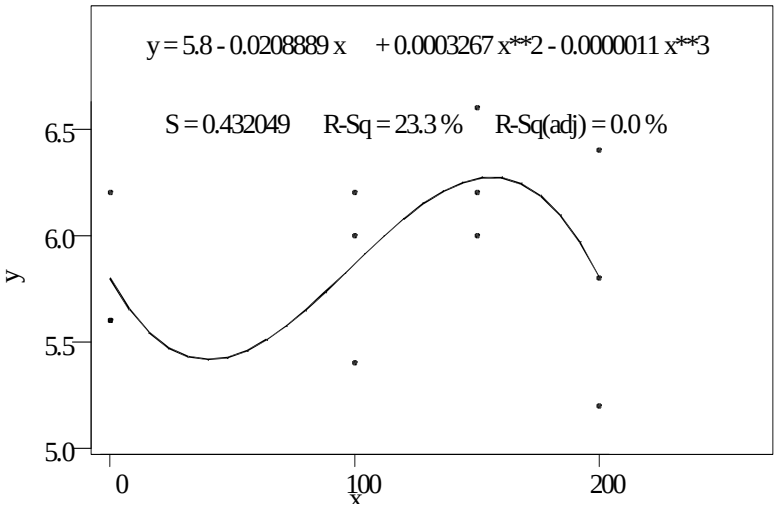

Fig (5): The influence of IBA rates ppm(x)on gloves number per bulb(y).

Non – significant differences were detected in the responses of plant height to IBA rates (table, 1). Plant height was decreased at rates beyond zero until they lowest value at 100 mg $.1^{-1}$ IBA the plant height started to show gradual increases to restore their initial value at 200 mg $.1^{-1}$ IBA rate (figure, 6) .A quadratic regression type is governed the responses of plant height to IBA rates . These response could be predicted by the following quadratic equation : Plant height cm) = 51.7191 -0.0947909 (IBA rate) + 0.0005179 (IBA rate $)^{**2}$.

Non – significant differences were detected in the responses of leaf number per plants to different applied IBA rates (table, 1). The regression analysis (figure, 7) revealed that leaf number per plant is linearly responded to varying IBA rates and it could be forecasted by the following positive equation: Leaf number per plant = 5.81333 + 0.0024 (IBArate

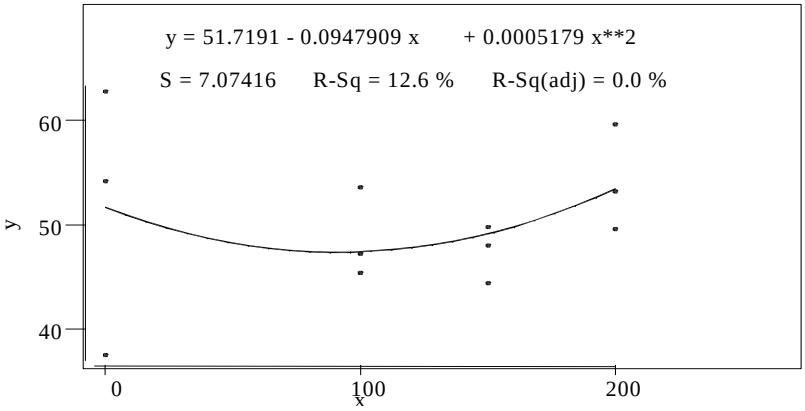

Fig (6): The influence of IBA rates ppm(x)on Garlic plant height cm(y).

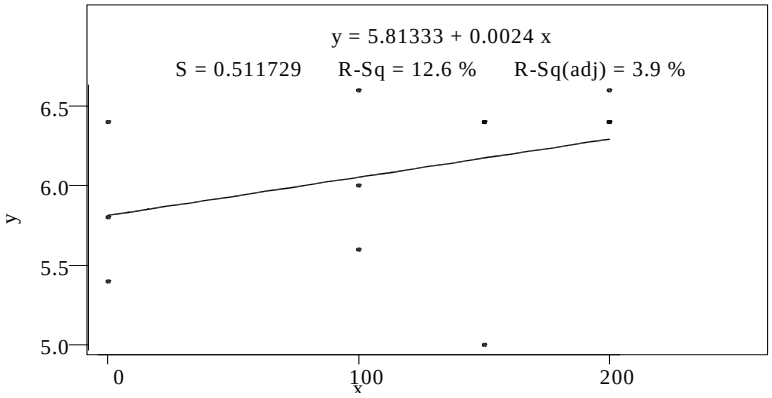

Fig (7): The influence of IBA rates ppm(x)on leaf number per plant (y).

Effect of NPK rates on growth and yield of Garlic

Non – significant difference were observed in the yield responses to varying NPK rates (table, 1). However, a positive correlation was found to govern these responses (fig, 8) .Yield could be estimated by the following liner equation: Yield kg .m $^{-2}$ = 1.39967 +0.0166333 (NPK rates).

The obtained results ((table , 1) revealed that the highest fresh weight of flowering stalk (9.02 g) was accompanied with untreated check which was significantly exceed these of (20 NPK g.m^{-2}) and 30 NPK rates by (58.3 %) and (68.91 %), respectively . Fresh weights of flowering stalk (figure, 9) were gradually increased at rates above zero until they reach their highest value at 18 g.m $^{-2}$ then commenced and decline to settled at a value close to that of check with 30 g.m $^{-2}$ NPK rate. Therefore, fresh weight of flowering stalk were quadratically, responded and they cold be forecasted from the following equation: Flowering stalk fresh weight g =6.9855 + 0.504717 (NPK rate) – 0.015825 (NP rate) $*^{*2}$.

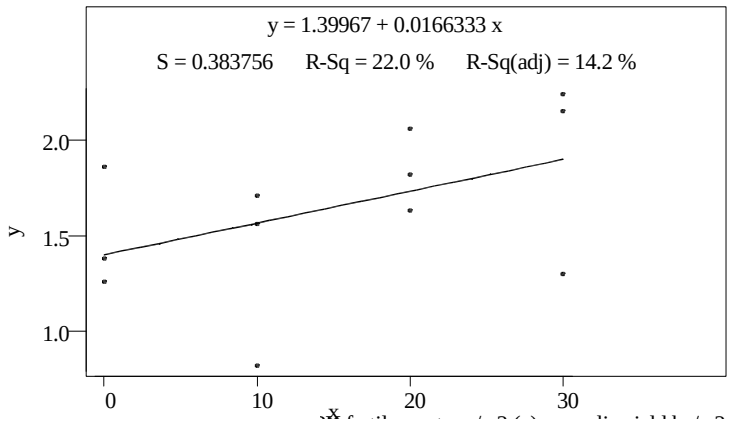

Fig (8): The influence of NPK fertilizer rates g/m2 (x) on garlic yield kg/m2

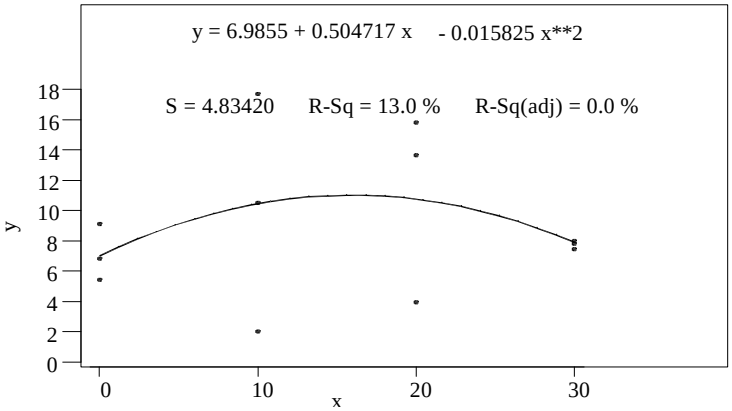

Fig (9): The influence of NPK fertilizer rates g/m2 (x) on flowering stalk fresh weight g(y).

The dry weight of flowering stalk were significantly decreased when NPK rates were applied . Thus untreated plants showed the highest value as it was significantly exceeded that of 30 g.m^{-2} NPK by (95.37 %). However, significant differences among other NPK rates were not detected (table, 1). Similar regression pattern (figure, 11) was found here to that observed in the responses of stalk fresh weight above. Subsequently the dry weight of the flowering stalk cold be estimated by the following quadratic equation: Dry weight of flowering stalk g =1.765 + 0.175833 (NPK rate) – 0.00655 (IBA rate)^{**2}

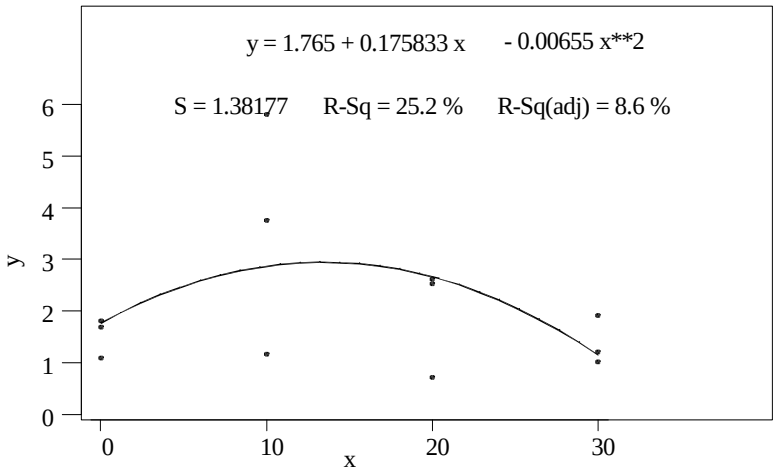

Fig (10): The influence of NPK fertilizer rates g/m2 (x) on flowering stalk dry weight g(y).

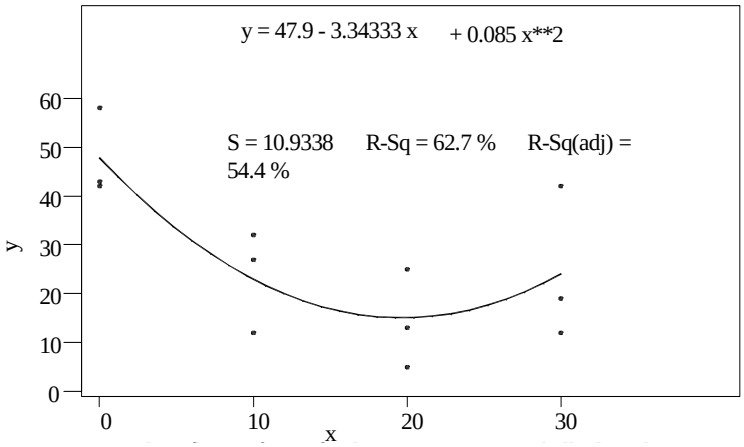

Fig (11): The influence of NPK fertilizer rates g/m2 (x) on bulbuil number m2(y).

Non – significant difference were observed in the responses of bulbils number per bulb to varying NPK rates (table, 1) . However , bulbils number per bulb were declined at rates above zero until the reach their lowest value at 21 g.m $^{-2}$ NPK rate (figure, 11) then graduals increases were observed . Therefore , the bulbils number per bulb were quadratically responded to varying NPK rates and they could be predicated by the following equation : Bulbils number per bulb = 47.9 – 3.34333 (NPK rate) + 0.085 (NPK rate)^{**2} .

Non – significant difference were found in the response of glove number per bulb to varying NPK rates

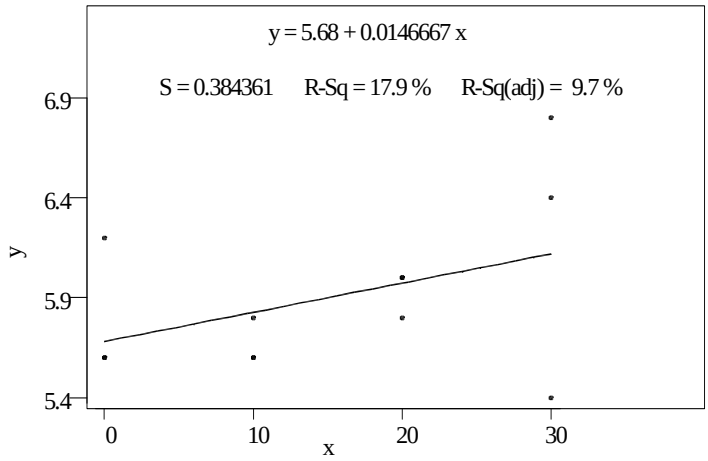

Fig (12): The influence of NPK fertilizer rates g/m2 (x) on glove number per bulb(y).

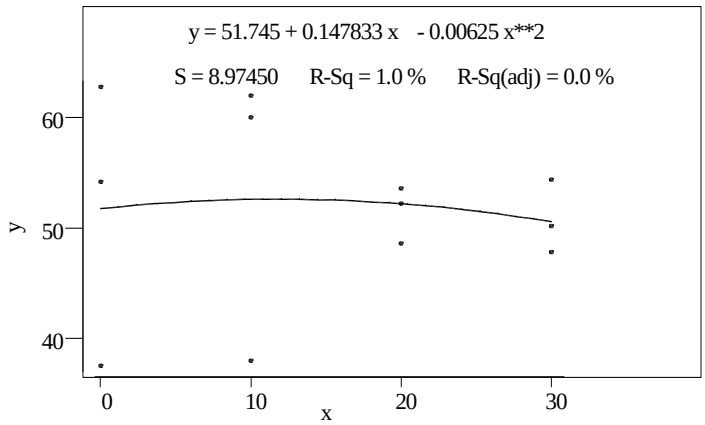

Fig (13): The influence of NPK fertilizer rates g/m2 (x) on plant height cm(y).

(table, 1) . Glove number per bulb manifested a positive liner correlation with varying NPK rates (fig, 13) and these responses could be estimated by the following equation: Glove number per bulb=5.68+0.0146667(NPK rates).

Non – significant difference were observed in the responses of plant height to different NPK rates (table`,1). Plant height showed slight reduction at NPK rates beyonel zero and these response could be forecasted by the following quadratic equation (fig, 13): (plant height cm= 51.745 +0.147833 (IBA rate)– 0.00625 (IBA rate)^{**2} .

Non – significant difference were found in the responses of leaf number per plant to the varying NPK` rates (table,1). Leaf number per plant (figure. 14) were positively correlated to varying NPK rates and could be predicated by the following equation: (leaf number per plant)= 5.66667 + 0.0266667 (NPK rate).

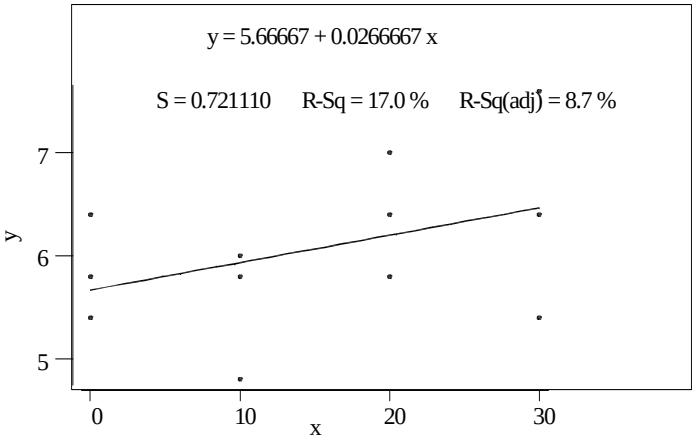

Fig (14): The influence of NPK fertilizer rates g/m2 (x) on leaf number perplant(y).

Effect of NPK rates and IBA rates combination on growth and yield of garlic

The highest yield 2.03 kg .m $^{-2}$) was obtained from garlic plants sprayed by 200 mg.1^{-1} IBA and 10 NPK rates. However , non – significant difference were detected among all other interaction treatments. Garlic plants sprayed by 0 mg .1^{-1} IBA and 0 NPK rates resulted in the highest bulbils flowering stalk fresh weight (14.99 g) . Whereas the lowest flowering stalk fresh weight (2.37 g) was obtained from garlic plants sprayed by 100 mg.1^{-1} IBA combined with 10 g.m^{-2} NPK .

Garlic plants sprayed by 100 mg.1^{-1} IBA combined with 0 NPK rate gave the highest flowering stalk dry weight (3.57 g) which substantially exceeded the lowest interaction treatment by (711.36 %).

Garlic plants sprayed by 0 mg.1^{-1} with 0 NPK gave the highest bulbils number per meters (47.67) ,while the lowest value (16.00) which was found in garlic plants sprayed by 100 mg.1^{-1} IBA combined with 30 g.niz NPK . Plants sprayed by 100 mg.1^{-1} IBA fertilized with 20 g.m^{-2} NPK was the most potent interaction treatment as it gave the highest glove number per bulb (6.69) which was significantly exceeded garlic plants sprayed by 100 mg.1^{-1} IBA with 20g NPK fertilization showed the lowest glove number per bulb (5.67).

DISCUSSION

The obtained results revealed that IBA application resulted in growth and thereby yield improvements. Similar results were obtained by Abdel (1995), when he studied the influence of IBA on *Allium cepa* L., local red cv. These improvements might be attributed to the influence of auxins on cell division and cell enlargements. In one of the first studies using cdc2 or cyclin probes, it was shown that *cdc2* mRNA levels in pea roots were increased significantly within l0 min of exposing the roots to lAA (50 ixM). The cdc2 protein content and activity continued to rise to 25 h and were significantly higher than in the water control. Roots incubated for 24 h in zeatin riboside showed much reduced levels of cdc2 protein in the elongation zone correlating with inhibited lateral root formation (Srivastava, 2001). Ferreira *et al* (1994) transformed *Arabidopsis* plants with a construct consisting of the promoter of a mitotic cyclin gene *(CyclAt)* fused to the reporter gene, *GUS.* Treatment of the transgenic plants with auxins (lAA, NAA, or 2,4- D) induced the formation of many laterals, which also showed strong GUS activity Similar results were obtained with constructs containing the promoter of *cdc2aAt* (the *Arabidopsis* homologue of *cdc2)* and *GUS.* Cell

division may not therefore be the engine of plant growth, but it remains at least a vital process for the continuation of growth by maintaining cells at a physiologically effective size; small enough to allow adequate levels of gene transcripts and other nucleus-derived elements to permeate the cytoplasm (Inze, 2007).

The significance of nitrogen in cell metabolism is well established. It is the main source of amino acids which is the building units of enzymes. Nitrogen is a component of nitrogen base of nucleic acid. Likewise, phosphorous is the main source of metabolism energy (Goodwin and Mercer, 1985 ; Dey and Hrborne , 1997).

The combination of IBA and NPK boosting the plant growth and yield. Auxin-mediated lateral root formation requires nitric oxide (NO), as recently demonstrated in tomato (Correa-Aragunde *et al.*, 2004). The NO-mediated induction of lateral root primordia could be related to the increased expression of kinase (*CDKA;1*) and cyclin (*CYCD3:1*) and the downregulation of the CDK inhibitor (*ICK2*) genes (Correa-Aragunde *et al.*, 2006).

		Yield kg / m^2	Fresh weight flowering stalk(g)	Dry weight flowering stalk(g)	Bulbil number /m^2	Glover number /bulb	Plant height (cm)	Leave number / plant
NPK g(A)	0	1.6 a	9.02 a	2.11 a	29.16 a	5.90 a	51.76 a	6.07 a
	10	1.7 a	5.59 b	1.77 ab	21.33 a	5.90 a	49.77 a	6.18 a
	20	1.7 a	8.04 a	1.63 ab	26.00 a	6.13 a	48.54 a	6.38 a
	30	1.5 a	5.34 b	1.08 b	21.83 a	5.95 a	50.37 a	6.03 a
IBA ppm	0	1.63 a	5.33 b	0.99 b	26.75 a	5.93 a	50.44 a	6.08 a
	100	1.6 a	8.02 a	1.86 a	19.66 a	6.10 a	49.21 a	5.92 a
	150	1.6 a	7.85 a	1.64 ab	27.83 a	5.82 a	51.32 a	6.33 a
	200	1.7 a	6.79 ab	2.09 a	24.08 a	9.03 a	49.48 a	6.33 a
A*B 0 g	0	1.5 a	7.11 b- h	1.53 c-f	47.67 a	5.80 ab	51.50 a	5.87 a
	100	1.4 a	10.07 bc	3.57 a	23.67 b	5.67 b	53.33 a	5.53 a
	150	1.3 a	11.13 ab	1.96 b-f	21.00 b	5.93 ab	51.47 a	6.40 a
	200	1.9 a	7.76 b-g	1.38 c-f	24.33 b	6.20 ab	50.80 a	6.47 a
10 g	0	1.8 a	5.55 c-h	0.71 ef	21.33 b	5.87 ab	48.73 a	6.07 a
	100	1.5 a	2.37 h	0.44 f	12.67 b	5.80 ab	48.53 a	6.00 a
	150	1.6 a	7.87 b-f	2.64 a-c	29.67 b	5.87 ab	53.33 a	6.27 a
	200	2.03 a	6.56 b-h	3.26 ab	21.67 b	6.67 ab	48.47 a	6.40 a
20 g	0	1.9 a	3.50 f-h	0.69 ef	19.33 b	6.27 ab	47.40 a	5.93 a
	100	1.4 a	14.99 a	2.48 a-d	26.33 b	6.69 a	46.97 a	6.40 a
	150	1.3 a	9.50 b-d	1.14 c-f	31.00 b	5.73 ab	52.13 a	6.80 a
	200	1.6 a	4.18 e-h	2.22 a-e	27.33 b	5.93 ab	47.67 a	6.40 a
30 g	0	1.6 a	5.17 c-h	1.03 d-f	18.67 b	5.8 ab	54.13 a	6.47 a
	100	1.7 a	4.65 d-h	0.95 d-f	16.00 b	6.33 ab	48.00 a	5.73 a
	150	1.5 a	2.88 gh	0.84 ef	29.67 b	5.73 ab	48.33 a	5.87 a
	200	1.3 a	8.67 b-e	1.50 c-f	23.00 b	5.93 ab	51.00 a	6.07 a

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تأثير NPK و IBA في نمو وحاصل الثوم (*Allium sativum* L.)

الخلاصة

أجريت دراسة خلال الموسم الزراعي 2006-2007 في حقول االبستنة - كلية الزراعة / جامعة دهوك. تم تسميد نبات الثوم بالسماد المركب NPK 10:10:10 بنسب 0، 10، 20 و 30 غم /م^2، ورشت مرتين بمحلول IBA وبتراكيز 0، 100، 150 و 200 ملغم / م^2 ، والهدف الأساسي من الدراسة هي تقدير مدى استجابة نمو وحاصل الثوم للسماد المركب NPK و محلول IBA والتداخل بينهما، أظهرت النتائج بان 20 غم / م^2 من NPK كان اثر تأثيرا من التراكيز الأخرى نمو والحاصل حيث كان الحاصل 1.7 كغم / م^2 ، عدد البلابل / م^2 26 ، وعدد الفصوص / بصلة 6.13 وعدد الأوراق / نبات 6.38 . أوضحت التحليل الإحصائي بأنه كان لحاصل الثوم استجابة خطية من نوع Linear لسماد NPK وتم حسابها بالشكل التالي : الحاصل كغم / م^2 = 1.39967 + 0.016633 (نسبة NPK). أما IBA كان للتركيز العالي 200 ملغم / لتر أكثر التراكيز تأثيرا وأعطى أعلى حاصل 1.7 كغم / م^2 وكان لحاصل الثوم استجابة من نوع quadratic لتراكيز IBA حسب المعادلة التالية: الحاصل كغم / م^2 = 1.48282 +0.00084118 (نسبة IBA)- 0.0000441 (نسبة IBA)^2 . أظهرت التداخل بان تسميد الثوم ب 10 غم /م^2 NPK مع الرش بتركيز 200 ملغم / لتر IBA كان أكثر التداخلات تأثيرا مقارنة مع المعاملات الأخرى وأعطى أعلى حاصل 2.03 كغم / م^2 .

كارتێكرنا IBA و NPK لسەر شینكاتی و بەرهەمێ سیرێ

كورتی

ئەڤ ڤەكولینە هاتیە ئەنجامدان لوەرزێ چاندنێ 2006–2007 ل زەڤیێن كولیژا چاندنێ / زانكویا دهوك ژبو زانینا چەندا تیا هاتنا بەرهەمێ سیرێ ژ كارئینانا زبلێ كیمیاوی یێ پێكهاتی NPK 10:10:10 ب رێژەیا 0 ،10 ، 20 و 30 غم/م^2 وهەرووسا بكارئینانا كەرستێ IBA یێ شل دوو جاری لسەر رووەكێ سیرێ وب رێژەیا 0 ،100 ، 150 و 200 مغم/م^2 ولیكدان دناڤبەرا هەردوو فاكتەرا هاتە وەرگرتن. ژئەنجاما هاتە دیاركرن كو 20 غم/م^2 زبلێ NPK كارتێكرنەكا مەزنتر هەبی ژ لوكێن دیتر لسەر شینكاتی وبەرهەمی (بەرهەم 1.7 كغم/م^2 ،ژمارا بەلابلا /م^2 26، ژمارا فصوصا / سەركەكی 6.13 وژمارا بەلّكا / رووەكەكی 6.38 . شروڤەكرنێن ژمێریاری دیاركر كو سیرێ ئستیجابە هەبی ژجورێ Linear بو زبلێ NPK وهاتە ژمارتن ب ڤی شیوەی: (بەرهەم كغم/م^2 = 1.39967+0.016633 (رێژەیا NPK). وسەبارەت IBA، كرئینانا 200 ملغم/م^2 كارتێكرتەكا بلند هەبییە وبییە ئەگەرێ هاتنا 1.7 كغم/م^2 ژ بەرهەمێ سیرێ ئستیجابا وێ ژجورێ Quadratic بی لدویف هاوكیشا داهاتی : بەرهەم كغم /م^2 = 1.48282+0.00084118 (رێژەیا IBA)–0000441. (رێژەیا IBA)^2 .ولێكدان دناڤبەرا هەردوو فاكتەرادا دیاركر ب كارئینانا 10 غم/م^2 NPK دگەل رەشاندنا كەرستی IBA ب رێژەیا 200 ملغم/م2 ژهەمی لێكدانا پتر كارتێكرن هەبی بەروارکرن دگەل سەرەدەرییێن دیتر و بییە ئەگەرێ دانا بەرهەمی ب سەنگا 2.03 كغم/م^2.

EFFECT OF CASTRATION AND SLAUGHTER WEIGHT ON SOME FATTENING PERFORMANCE AND CARCASS CHARACTERISTIC OF KARADI LAMBS*

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(Received: March 17, 2009; Accepted for publication : June 16, 2009)

ABSTRACT

This experiment was carried out at the Animal Project of Animal Production Department, College of Agriculture, University of Duhok, wherein 30 weaned Karadi ram lambs (4-5 months age) and averaged 23.58 ±0.4 kg in weight , were divided randomly into two halves. The first was castrated and the other half left intact (Control). Then following an adaptation period for 10 days, the lambs were weighed and randomly allocated to three different slaughter groups (30, 37.5 and 45.0 kg). Each group of lambs was kept in a separate pen and fed a concentrate diet *ad libitum* containing 15.5% crude protein and 2541.6 kcal. Upon reaching the desired weight, each animal was slaughtered and dressed.

Results revealed that castration had no significant effect on daily gain (0.25 *vs.* 0.25 kg), rib eye area, fat thickness, lean, fat and bone content of the leg and non-carcass fat. However, wether lambs slaughtered at 30 and 37.5kg were more efficient in converting feed into gain, had significantly (p<.05) higher dressing percentage based on empty body weight (57.64 *vs.* 55.47%) and had significantly (p<.05) lower percent head and neck than the intact.

Daily gain of lambs slaughtered at 30kg surpassed significantly (p<.01) (0.30kg) those lambs slaughtered at 37.5kg (0.24kg) and 45.0kg (0.23kg). Heavier lambs had significantly (p<.01) higher empty body weight, hot or chilled carcass weight, dressing percentage and rib eye area. Also as weight increased percent fat and non carcass fat increased significantly (p<.01) and percent lean and bone decreased (p<.01).

KEY WORDS Castration Weight Carcass Karadi Lambs.

INTRODUCTION

The economic usefulness of sheep in meat production would be enhanced by increased frequency and rate of reproduction, more efficient growth to heavier market weights and more desirable meat qualities (Dickerson *et al*., 1972). Thus, the sheep industry is advised to increase lamb production efficiency and lamb product availability by increasing slaughter weights of market lamb (Crouse *et al*., 1981).

Since, growth is a very important characteristic of animals for meat production thus man attempt to manipulate growth of farm animals by several means including breeding, nutrition, castration….etc. to increase meat production (Mahgoub *et al*., 1998).

Sheep with a population of 6 million head (FAO, 2000) are considered the most important farm animals in Iraq, and the greatest portion of income comes from the sale of lambs. Nevertheless, their importance is further enhanced because they are the most suitable farm animals to the extensive area of arid and semi-arid lands of the country, as well as, the major source of likelihood for the rural inhabitants of these areas (Juma & Alkass, 2000). The Karadi which comprises about 18-20% of the sheep population native to the northeastern mountains, villages and undulating dry-farming plain of Kurdistan region (Alkass & Juma, 2005).

Traditionally lamb's meat is considered one of the most preferred types of meat by Iraqi consumers. Lamb is usually slaughtered between weaning (3-4 months) and one year old. This procedure indicates that lambs are slaughtered under a wide range of body weights and fattening conditions, namely, 30kg or less (light), 40kg (average), and 50kg or more (heavy). This situation is usually controlled by demand rather than following an efficient system for producing meat from lambs. Thus, establishing such a system could be of special importance (Rashid *et al*., 1987).

Therefore, the objective of this study is to determine the effect of different slaughter weights and castration of Karadi lambs on fattening performance, carcass characteristics, and distribution of non- carcass fat.

MATERIALS AND METHODES

The experiment was conducted at the Animal Project of Animal Production Department at the College of Agriculture, University of Duhok from 5th of September to 17th of December, 2007.

Thirty weaned (4-5 months age) and averaged 23.58 ±0.4 Kg in weight Karadi ram lamb purchased from local market of Duhok were used in this experiment. Upon arrival to the farm, one half of the lambs (15) were randomly castrated using elastrators (rubber rings), and the other half (15) left intact (Control). After an adaptation period for 10 days, the lambs were weighed and randomly designated to prescribed slaughter weights at 30, 37.5 and 45 kg.

Each group of lambs was kept in a separate pen and fed on a group bases. Clean water and mineral blocks were available constantly. Concentrate was offered *ad libitum* at 08.00 a.m. daily after quantifying and discarding the residue of the previous day. The ration consist of 53% barley, 25% wheat bran, 15% soybean meal, 6% wheat straw, 0.5% salt, 0.5% limestone, 0.5% of vitamins were added to the ration and contained 15.5% crude protein. Also, two lambs were died for unknown causes, and another lamb was excluded from the experiment because of abnormal growth.

The lambs were slaughtered when each of them was reached his assigned slaughter weight (30, 37.5,

* Part of M.Sc. Thesis of the first author.

and 45 kg) following fasting for 18-h, with free access to water and weighed immediately prior to Slaughter. Hot carcass included kidney and kidney fat, edible offal comprised of testes, spleen, liver and heart, and inedible offal constitute, lung, head, feet and skin were weighed. Omental, mesenteric and cardiac fat were separated and weighed. The digestive tract were removed and weighed, then empted of their content, washed, drained and weighed. After chilling for 24hr (4-6 c°), the carcasses were weighed, and then the kidney and kidney fat were removed and weighed separately.

After chilling, the carcass was then split along the mid line and the left half was cut into leg, loin, rack, neck, shoulder, breast, fore shank, and the fat tail . The weight of each cut was recorded and expressed as a percent of chilled carcass weight.

Rib eye area was obtained by tracing the longissumus dorsi muscle (between 12th-13th rib) upon acetate paper and measured with planimeter (Tamaya Digitinizing Area-line meter), and the fat thickness over the longissumus dorsi was measured with vernia. The left leg of each carcass was dissected completely into fat, lean, and bone. The three components were weighed separately to determine their percentages.

The statistical analysis of data was carried out using the GLM (General Liner Model) with SAS (2001) program as in the following model:

Yijk =μ +Ci + Pj +CP (ij) + eijk

Where:

Yijk: observational value of kth animal.

μ= Overall mean.

Ci= Effect of ith castration (I= C, N).

Pj= Effect of jth weight (J=30, 37.5, 45kg).

CP (ij) =Effect of interaction between i^{th} castration and j^{th} weight.

eijk = Experimental error assumed to be NID with $(0,\sigma^2 e)$.

Duncan multiple range test (1955) was also used to test the difference between the sub classes of each factor.

RESULTS AND DISCUSSION

1.1- Live Body Weight Performance

The findings related to fattening performance (initial and final weights, fattening period and average daily weight gain) of rams and castrated Karadi lambs slaughtered at 3 different weights (30, 37.5 and 45kg) are presented in (Table 1).

Examination of the effect of sex on average daily gain in weight shows that rams made similar gains (0.25 ± 0.01kg) to those of wether lambs. Therefore, the overall mean of final body weights of non castrated lambs (37.78 ± 1.61kg) were comparable with those of the castrated lambs (38.16 ± 1.56kg) (Table 1). This observation does not agree with the results from other studies reporting superior weight gains in non castrated sheep when compared with castrated sheep (Schanbacher and Crouse, 1980 and Arnold and Meyer, 1988). However, this finding is in accordance with that reported by Lirette *et al*., (1984) and Alkass *et al*., (1985).

Lambs slaughtered at 37.5 and 45 kg exhibited significantly (p<.01) the lowest gain of 0.24 ± 0.01 and 0.23 ± 0.01 kg /day, respectively compared to lambs slaughtered at 30 kg, which gained 0.30 ± 0.03 kg/ day (Table 1). Thus, in this study, results showed that daily gain of Karadi lambs decreased over 30 kg slaughter weight possibly due to the deposition of fat tissues, and supported the finding reported by Rashid *et al*., (1987); Gohler (1989); Aksoy (1995) and Balci and Karakaş (2007), who found that daily live weight gain in lambs slaughtered at different weights decreased with increasing slaughter weights. On the contrary, these results do not agree with those published by Nakev *et al*., (1982), and Borton *et al*., (2005) who found that average daily gain did not differ between normal and heavy slaughter weights.

Table (1): Effect of castration and slaughter weight on growth performance and some carcass traits of Karadi lambs (mean ± S.e.).

Trait	Overall mean	Sex		Slaughter Wt. (kg)		
		Rams	**Wethers**	**30**	**37.5**	**45**
No. of Animals	27	13	14	8	9	10
Initial Wt. (kg)	23.58 ±0.40	23.49 ±0.57 a	23.67 ±0.58 a	23.68 ±0.48 a	23.42 ±0.69 a	23.64 ± 0.61 a
Final Wt. (kg)	37.98 ±1.10	37.78 ±1.61 a	38.16 ±1.56 a	31.09 ±0.31 c	36.97 ±0.67 b	44.41 ± 0.38 a
Period (day)	61.41 ±5.79	62.15 ±7.69 a	60.71 ±8.85 a	26.50 ±4.65 c	58.89 ±2.68 b	91.60 ± 5.63 a
Daily gain (kg)	0.25 ±0.01	0.25 ±0.02 a	0.25 ±0.01 a	0.30 ±0.03 a	0.24 ±0.01b	0.23 ± 0.01 b
Empty body wt.(kg)	32.76 ±1.10	32.63 ±1.56 a	32.89 ±1.61 a	25.76 ±0.48 c	31.94 ±0.55 b	39.11 ±0.42 a
Hot carcass wt.(kg)	18.63 ±0.75	18.16 ±0.99 a	19.07 ±1.13 a	13.91 ±0.26 c	18.24 ±0.44 b	22.76 ±0.51 a
Dressing % (1)	48.68 ±0.70	47.80 ±0.90 a	49.50 ±1.04 a	44.74 ±0.64 b	49.33 ±0.63 a	51.25 ±1.03 a
Dressing % (2)	56.60 ±0.60	55.47 ±0.77 b	57.64 ±0.81 a	54.04 ±0.66 b	57.10 ±0.87 a	58.18 ±0.98 a
Child carcass wt.(kg)	18.01 ±0.74	17.53 ±0.98 a	18.45 ±1.13 a	13.31 ±0.29 c	17.62 ±0.44 b	22.11 ±0.51 a
Shrinkage %	3.49 ±0.26	3.59 ±0.36 a	3.39 ±0.38 a	4.34 ±0.65 a	3.40 ±0.35 b,a	2.87 ±0.24 b
Fat thickness (mm)	2.62 ±0.20	2.48 ±0.22 a	2.75 ±0.34 a	2.15 ±0.26 a	2.92 ±0.45 a	2.72 ±0.30 a
Rib eye area(cm^2)	11.25 ±0.40	11.18 ±0.61 a	11.32 ±0.54 a	9.70 ±0.30 b	10.50 ±0.50 b	13.18 ±0.55 a

Means within different letters within grouping differ significantly.

(1) Based on slaughter weight.

(2) Based on empty body weight.

1.2-Feed Conversion Rate

The total feed intake (kg) required to produce one (kg) live weight gain by lambs in this experiment was 3.83 and 3.40 for rams and wethers in slaughter group one (30kg), respectively. The corresponding values for lambs slaughtered at 37.5(group 2) were 5.84 and 4.96 and 4.97 and 5.88 for lambs slaughtered at 45kg (group 3). It seems that wethers were more efficient than rams in 30 and 37.5kg slaughter groups. But this case was changed in the 45kg slaughter group even though rams were more efficient than wethers by 19%. This may be due to deposition of more fat in wethers than rams. Such result were in agreement with those cited by Shelton and Carpenter (1972), who found that rams were more efficient in feed conversion by 12 to 15% than wethers. Also, in Iraq, fattening Awassi lambs on 3% concentrate of their body weight and slaughtered at 30kg attained better feed efficiency than those slaughtered at 37.5 and 45.0 kg. On the other hand, lambs on 1.5% concentrate of their body weight and slaughtered at either 37.5 or 45 kg had better feed efficiency than those slaughtered at 30kg (Al-Jaryan *et al*., 1995).

Feed to gain ratio increased as slaughter weight increased. The trend for relatively constant daily gain in group 2 and 3 and reduced feed efficiency in growing lambs was similar to that reported by Sents *et al*., (1982). Such reduction in feed efficiency, particularly in wethers, could be due to deposition of fat.

1.3-Dressing Percentage

Empty body weight, carcass weight, dressing percentage and shrinkage percent as affected by sex and slaughter weight are given in Table (1). Although empty body weight and carcass weight either hot or chilled were heavier for wethers (32.89 ± 1.61, 19.07 ± 1.13 and 18.45 ± 1.13 kg, respectively) than those for rams (32.63 ± 1.56, 18.16 ± 0.99 and 17.53 ± 0.98 kg, respectively), the differences between them were not significant.

Comparison of sex and their effects on dressing percentage indicates that wethers had significantly higher dressing percent based on empty body weight (57.64 *vs*. 55.47%) but not on the basis of live body weight (49.50 *VS*. 47.80 %) (Table 1). The superiority of wethers in this trait could be due mainly to the significant reduction in the weight of head for wethers compared to those of rams (4.87 *vs*. 5.16 %) (Table 4) and to higher gut content (14.19 vs. 13.86 %). This finding is consistent with the results reported by Lloyd *et al*., (1981); and Alkass *et al*., (1985) and Arnold and Mayer (1988) who indicated that rams had lower dressing percentage than wethers.

Comparison of slaughter weight treatments and their effects on carcass traits indicate that the heavy weight lambs had significantly ($p<.01$) higher empty body weight, carcass weight either hot or chilled, dressing percentage and lesser cooler shrink (Table 1). Similar findings were documented many times in the past by Thomas *et al*., (1976) and Lloyd *et al*., (1981).

1.4- Fat Thickness and Rib- eye Area

Rams had less subcutaneous fat over the rib eye muscle (2.48 mm) than did wethers (2.75 mm). Also, the difference in rib eye area between the two sexes indicates a tendency for wethers to have a larger rib eye area (11.32 cm^2) than rams (11.18 cm^2) (Table 1). However, there were no significant differences between them in both traits. Also, Kemp *et al*., (1972) and Alkass *et al*., (1985) reported that wethers were fatter than rams, and Lloyd *et al*., (1981) observed no significant difference in rib eye area between rams and wethers.

In the current experiment, carcass back fat thickness and rib eye area increased with an increase in slaughter weight. However, the difference between the slaughter groups was significant only for rib eye area. Similarly, Sents *et al*., (1982), Macit (2002) and Balci and KarakaŞ (2007) reported that where the slaughter weight increased, the rib eye area was expanded and the fat was thicker.

1.5-Wholesale Cuts

Whole sale cuts (shoulder, loin, leg, breast, flank and expensive muscle) from the left side were slightly heavier for the wethers than rams which reflected differences in carcass weight (Table 2). Rams possessed significantly ($p<.01$) more neck than wethers. Similarly, Butterfield *et al*., (1984) showed that the muscle, which was retarded to the maximum degree by castration, was the splenius and other muscles which were in close anatomically related to splenius.

As slaughter weight increased, percentage leg, breast and fore shank decreased; and percentage shoulder, rack and fat tail increased reflecting the influence of fat. However, percentage loin, flank, neck and expensive muscle were changed slightly among slaughter weight groups (Table 2). These changes are similar to those reported by Kemp *et al*.,(1981) and Sents *et al*., (1982). However, such changes reflect the different rates of maturity among the whole sale cuts previously reported by Palsson and Verges (1952) in that leg mature relatively early and the neck and loin are later maturing regions.

1.6-Physical Separation

The physical separation data for the leg from the left side showed that castration had little influence on tissue composition of leg. Rams possessed similar lean (62.50 ± 0.60 *vs.* 62.53 ± 1.05%), slightly less fat (18.20 ± 0.75 vs. 19.15 ± 1.33 %) and higher bone (19.30 ± 0.53 vs. 18.32 ± 0.64 %) content than wethers (Table 3). Lirette *et al*., (1984); Alkass *et al*., (1985) and Karim *et al*.,(2002) found that the tissue distribution was not significantly affected by castration. As weight increased, percent fat increased ($p<0.01$) and percent lean, bone and lean: fat ratio decreased ($p<0.01$) (Table 3). These results suggest that more lean than fat was deposited in growing lambs during the initial part of a feeding period. However, during the latter stages of growth, fat increased more than lean.

Results obtained in this experiment were in accordance with those reported earlier by several authors (Aksoy, 1995 and Jeremiah *et al*., 1997).

1.7-Edible and Offals

Examination of the effect of sex on edible organs shows that rams had significantly (p<.05) higher percentage of liver (2.06 vs. 1.86 %) than wethers. Also, the kidneys and lung is lower (p>.05) for wethers in comparison with those of rams (Table 4). However, it seems that the act of castration either inhibits in some obscure ways the latter part of the rapid growth of these organs in the early postnatal period (Widdowson, 1984) or as secondary effect to the depression of appetite by castration. Also, the percentage of head was significantly (P<.05) reduced by castration (5.16 *vs*. 4.87 %). This may be due to feminization of the horns. These results are in accordance with those reported earlier by Hammond *et al*., (1971), Morgan and Owen (1973) and Darwash (1977).

Comparison of slaughter weight treatments and their effects on edible and offals indicates that light lambs (30 kg) had significantly (P<.01) higher percentages of head, kidneys, liver and heart, than lambs slaughtered at 37.5 and 45.0 kg live weight (Table 4). Similarly, Sents *et al*., (1982) concluded that as live weight increased, the percentage of offals decreased. The reason behind these changes could be explained by the difference in maturation pattern of these components (Palsson and verges, 1952).

1.8-Non-carcass Fat

Data presented in Table (4) show that wether lambs had a higher percentage of non-carcass fat (1.600 ± 0.19%) compared to the intact lambs (1.22 ± 0.15%). However, the difference between them lacked significance. Results of the present study agree with those from various other reports indicating that wether lambs had higher kidney and pelvic fat than the intact lambs (Schanbacher and Crouse, 1980 and Notter *et al*., 1991).

The mean shown in Table (4) reveals that as slaughter weight increased, the percent non-carcass fat significantly (p<.05) increased. This result confirm those of Kemp *et al*., (1981); and Sents *et al*.,(1982) who found that as slaughter weight increased, the percent kidney and pelvic fat significantly increased.

It appears that the omental fat form the highest proportion of total non-carcass fat (56.19 %) followed by kidney and pelvic fat (25.19 %), cardiac fat (9.32 %) and finally mesenteric fat (8.60 %). Therefore, differences were evident between the various non-carcass fat, and at different weights for the same body fat. These may be explained largely in terms of the relative order of developmental maturity of body parts and are in agreement with that of the earlier work of Palsson and Verges (1952).

Table (2): Effect of castration and slaughter weight on wholesale cuts (%) of Karadi lambs (mean ± S.e.).

Trait	Overall mean	Sex		Slaughter Wt.(kg)		
		Rams	**Wethers**	**30**	**37.5**	**45**
No. of Animals	27	13	14	8	9	10
Shoulder	18.15 ±0.45	17.85 ±0.65 a	18.44 ±0.6 a	16.60 ±0.88 b	18.04 ±0.85 b,a	19.49 ± 0.36 a
Loin	9.21 ±0.26	8.98 ±0.30 a	9.43 ± 0.41 a	9.67 ±0.76 a	9.08 ±0.23 a	8.97 ±0.28 a
Leg	29.43 ±0.44	29.35 ±0.68 a	29.52 ±0.60 a	31.52 ±0.64 a	28.91 ±0.70 b	28.24 ±0.56 b
Fat tail	16.64 ±0.85	16.81 ±1.22 a	16.49 ±1.25 a	13.85 ±0.95 b	16.98 ±1.96 a,b	18.58 ±0.94 a
Breast	8.05 ±0.50	7.84 ±0.77 a	8.25 ±0.67 a	11.42 ±0.54 a	6.91 ±0.56 b	6.38 ±0.27 b
Flank	2.67 ±0.13	2.64 ±0.16 a	2.70 ±0.21 a	2.42 ±0.18 a	2.64 ±0.20 a	2.89 ±0.26 a
Fore shank	3.14 ±0.11	3.21 ±0.11 a	3.08 ±0.20 a	3.43 ±0.31 a	3.27 ±0.13 b,a	2.79 ±0.08 b
Neck	4.51 ±0.10	4.80 ±0.14 a	4.25 ±0.12 b	4.71 ±0.21 a	4.38 ±0.19 a	4.48 ±0.14 a
Rack	8.18 ±0.41	8.52 ±0.60 a	7.86 ±0.56 a	6.37 ±0.58 c	9.79 ±0.72 a	8.17 ±0.32 b
Expensive Joints	56.80 ±0.62	56.18 ±0.83 a	57.38 ±0.92 a	57.80± 0.70 a	56.03 ±1.44 a	56.70 ±0.93 a

Means within different letters within grouping differ significantly.

Table (3): Effect of castration and slaughter weight on physical components of the leg[(1)] of Karadi lambs (mean ± S.e.).

Trait	Overall mean	Sex		Slaughter Wt. (kg)		
		Rams	**Wethers**	**30**	**37.5**	**45**
No. of Animals	27	13	14	8	9	10
Lean %	62.52 ± 0.60	62.50 ± 0.60 a	62.53 ± 1.05 a	64.74 ± 0.64 a	62.63 ± 0.99b,a	60.6 ± 0.98 b
Fat %	18.69 ± 0.77	18.20 ± 0.75a	19.15 ± 1.33 a	15.04 ± 0.64 b	18.75 ± 1.04 a	21.57 ± 1.19 a
Bone %	18.79 ± 0.35	19.30 ± 0.53 a	18.32 ± 0.46 a	20.22 ± 0.35 a	18.62 ± 0.74 b	17.80 ± 0.41 b
Lean : fat ratio	3.52 ± 0.17	3.52 ± 0.17 a	3.52 ± 0.29 a	4.38 ± 0.24 a	3.45 ± 0.26 b	2.90 ± 0.17 b
Lean :bone ratio	3.35 ± 0.06	3.27 ± 0.09 a	3.43 ± 0.07 a	3.21 ± 0.08 a	3.40 ± 0.14 a	3.42 ± 0.08 a

(1) Expressed as a percent of weight of leg.
Means within each classification followed by different letter are significantly different.

Table (4): Effect of castration and slaughter weight on offal organs(%)[1] and non-carcass fat of Karadi lambs (mean ± S.e.).

Trait	Overall mean	Sex		Slaughter Wt. (kg)		
		Rams	**Wethers**	**30**	**37.5**	**45**
No. of Animals	27	13	14	8	9	10
Heart	0.45 ±0.01	0.46 ±0.01a	0.45 ±0.02a	0.52 ±0.01a	0.45 ±0.02b	0.40 ±0.02b
Liver	1.96 ±0.06	2.06 ±0.09a	1.86 ±0.07b	2.27 ±0.07a	1.90 ±0.08b	1.76 ±0.08b
Lung	1.37 ±0.04	1.42 ±0.03a	1.33 ±0.06a	1.44 ±0.03a	1.32 ±0.08a	1.37 ±0.06a
Kidney	0.30 ±0.01	0.32 ±0.02a	0.29 ±0.01a	0.33 ±0.01a	0.33 ±0.03a	0.27 ±0.01b
Spleen	0.26 ±0.02	0.26 ±0.03a	0.25 ±0.02a	0.22 ±0.04a	0.28 ±0.03a	0.27 ±0.02a
Skin	10.03 ±0.27	10.45 ± 0.41 a	9.63 ±0.32 a	9.44 ±0.41 a	9.93 ±0.46a	10.58 ±0.46 a
Feet	2.54 ±0.03	2.55 ± 0.05a	2.53 ±0.05a	2.56 ±0.05a	2.59 ±0.06a	2.48 ±0.06a
Head	5.01 ±0.08	5.16 ± 0.10a	4.87 ±0.13b	5.42 ±0.11a	4.97 ±0.12b	4.71 ±0.11b
Total non-carcass fat	1,42 ± 0.13	1.22 ± 0.15 a	1.60 ± 0.19 a	0.90 ± 0.09 b	1.51 ± 0.16 a	1.74 ± 0.25 a
Omental fat % *	56.19 ± 16.5	58.32 ± 2.37a	54.21 ± 2.25 a	51.71 ± 2.03 a	57.48 ±3.57 a	58.60 ± 2.41 a
Mesenteric fat % *	8.60 ± 0.79	9.64 ± 1.29 a	7.63 ± 0.92 a	10.19 ±1.18 a	7.54 ± 0.99 a	8.27 ± 1.70 a
Kidney pelvic fat % *	25.90 ± 1.40	23.29 ± 1.88 a	28.31 ±1.88a	27.34 ±2.63 a	26.37 ± 2.57 a	24.31 ± 2.26 a
Cardiac fat % *	9.32 ± 0.88	8.75 ± 0.83 a	9.85 ± 1.53 a	10.76 ±1.73 a	8.61 ± 1.80 a	8.82 ± 1.14 a

Means within different letters within grouping differ significantly.
[1] Expressed as a percent of slaughter weight.
* Expressed as a percent of total non carcass fat.

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الخلاصة

أجريت هذه الدراسة في حقل قسم الإنتاج الحيواني / كلية الزراعة / جامعة دهوك ، إذ استخدم 30 حمل كرادي بعمر 4-5 أشهر ومعدل وزن ابتدائي 23.85±0.4 كغم ، قسمت الحيوانات عشوائيا إلى مجموعتين متساويتين حيث أجريت عملية الخصي لإحداها في حين تركت الثانية بدون خصي(سيطرة). ومن ثم تم توزيع كل مجموعة رئيسية عشوائيا إلى ثلاث مجاميع متساوية (5 حيوانات لكل مجموعة)، لذبحها عند أوزان 30 ، 37.5 و 45 كغم. غذيت الحملان تغذية حرة لحد الشبع على عليقة تحتوي على بروتين خام 15.5% و طاقة 2541.6 كيلوكالوري. ذبحت الحيوانات لدى وصولها إلى الوزن المقرر لكل منها.

تشير النتائج إلى انعدام التأثير المعنوي للخصي في معدل الزيادة الوزنية اليومية (0.25 مقارنة ب 0.25 كغم\يوم)، مساحة العضلة العينية، سمك الطبقة الدهنية، محتوى الفخذ من اللحم و الدهن والعظام و دهن الأحشاء. تفوقت الحملان المخصية والمذبوحة بأوزان 30 و 37.5 كغم في كفاءة التحويل الغذائي على مثيلاتها غير المخصية، و كذالك تفوقت معنويا (أ< 0.05) في نسبة التصافي المحسوبة على أساس الوزن الفارغ (57.64 مقابل 55.47 %) وكانت الرقبة و الرأس اخف معنويا (أ< 0.05) من مثيلاتها المخصية .

تفوقت الحملان المذبوحة عند وزن (30 كغم) (أ< 0.01) (0.3 كغم) في معدل الزيادة الوزنية اليومية على نظيراتها المذبوحة بوزن 37.5 كغم (0.24 كغم) و 45 كغم (0.23 كغم)، كما كانت الحملان الثقيلة الوزن أعلى معنويا (أ< 0.01) في وزن الجسم الفارغ ووزن الذبيحة الحار و البارد و نسبة التصافي و مساحة العضلة العينية. كما رافق زيادة الوزن عند الذبح زيادة معنوية (أ< 0.01) في نسبة الدهن في قطعة الفخذ و دهن الأحشاء وانخفاض في نسبة كل من اللحم و العظام.

پوختە

ئەف ڤەكولینە هاتە ئەنجام دان ل پروژێ پشكا بەرهەمێ گیانەوەری / كولیژا چاندنێ / زانكویا دهوك، 30 بەرخێت كوردی هاتنە بكارئینان ژبێ وان دنافبەرا 4-5 هەیڤان وكێشا دەستپێكی 23.85± 0.4 كگم، وهاتنە دابەشكرن بێ جوداهی بو دوو گروپێت وەگ هەڤ وپروسیسا خەساندنێ هاتە ئەنجام دان بو گروپا ئێكێ وژلایەكێ دی ڤە گروپا دی ما وەك خو بێ خەساندن (كونترول). ولدیف دا هەر گروپەك هاتە دابەشكرن ڤە بو سێ گروپا (5 بەرخ بو هەر گروپەكێ)، بو سەرژێكرنێ د كێشێت 30، 37.5 و 45كگم.

ئالیكدانا بەرخا یا ب شێوەیەكێ ئازاد بو تا تێربونێ. وبەرخ هاتنە سەرژێكرن دەمێ كێشا وان گەهشتیە كێشا بو دەست نیشانكری.

ئەنجامێت ڤەكولینێ دیاركرن كو خەساندنێ چ كارتێكرنا بەرچاڤ نەبو ل سەر تێكرایێ زێدەبونا كێشا لەشی یا روژانە (0.25 كگم/روژ)، روبەرێ ماسولكا چاڤ ، ستیراتیا تەخا بەزی ، رێژێت هەر ئێك ژ گوشتی وبەزی وهەستی درانی دا وبەزێ ریڤیكا. شیانا گوهارتنا خوارنێ یا بەرخێت خەساندی و یێت سەرژێكری ل كێشێت 30 و37.5 كگم دا پتر بو ژ وەكهەڤێت خوییێت نەخەساندی هەر وەسا رێژا خوریێ پتر بو بەرچاڤ (أ < 0.05) یا هاتیە هژمارتن لسەر كێشا ڤالا (57.64 بەرامبەر 55.47 ٪) وستو وسەر سڤكتر بو ژ یێت نەخەساندی.

زێدەبونا كێشا لەشی یا روژانە دبەرخێت سەرژێكری ل كێشا 30 كگم زێدەتربو بەرچاف (أ<0.01) (0.3 كگم) بەرامبەر یێت سەرژێكری دكێشێت 37.5 كگم (0.24 كگم) و 45كگم (0.23 كگم). هەر وەسا كێشا ڤالا وكێشا لەشی یا گەرم وسار ورێژا خوریێ وروبەرێ ماسولكا چاف پتر بو دبەرخێت سەنگا وان گران بەرچاف (أ<0.01). هەروەسا زێدەبونا كێشا لەشی ددەمێ سەرژێكرنێ زێدەیەكا بەرچاف (أ<0.01)درێژا بەزی دپارچا رانی دا وبەزێ ریڤیكا وكێمبون درێژا گوشتی وهەستی دا.

LEAD CONCENTRATION IN WHEAT AND SOIL ADJACENT TO ZAKHO-SEMEL ROADWAY IN DUHOK CITY-KURDISTAN REGION, IRAQ.

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(Received: March 17, 2009; Accepted for publication : June 16, 2009)

ABSTRACT

Wheat and soil samples were collected from five locations (around the roadway between Semel and Zakho in Duhok city) at distances 20 m, 50 m, and 100 m north and south of the edge of the roadway. Samples were analyzed to assess the accumulation of lead (Pb) in relation to the distance from the road. Mean Pb concentration in wheat grains of all locations was 0.412 mg. kg $^{-1}$ d. m and in soil samples of all locations was 6.669 mg. kg $^{-1}$. Pb concentration in wheat and soil samples varied among distances from the road but a general picture was 20 m; 0.421 mg. kg $^{-1}$ d. m., 50 m; 0.418 mg. kg $^{-1}$ d. m., 100 m; 0.397 mg. kg $^{-1}$ d. m. for wheat and 20 m; 6.733 mg. kg $^{-1}$, 50 m; 6.693 mg. kg $^{-1}$, 100 m; 6.582 mg. kg $^{-1}$ for soil samples.

Wheat grains and soil samples showed statistical influence of sides on wheat grains and soil Pb concentration. South side showed higher concentration of Pb in wheat grains (0. 425 mg. kg $^{-1}$ d. m.), and north side showed lower concentration (0.399 mg. kg $^{-1}$ d. m.). But the circumstance was inverted incase of Pb content in soil samples. North side showed higher concentration of Pb (6.765 mg. kg $^{-1}$), and South side showed lower concentration (6.573 mg. kg $^{-1}$). The weekly intake of Pb was 19.23 µg. kg $^{-1}$ body weight which didn't exceeds the provisional tolerable weekly intake (25 µg. kg $^{-1}$) body weight of Pb for an adult (60 kg person) established by the joint FAO/WHO, (WHO, 1993).

KEY WORDS Pb Wheat grains Soil Distance intervals Weekly intake.

1. INTRODUCTION

Wheat (*Triticum sp.*) is the most widely cultivated of all cereals. A wheat crop is harvested somewhere in the world during every month of the year. In most area of world, it is the principal food for man.

The properties of gluten in wheat are such that it produces breadstuffs generally superior to those from any of the other cereal grains (Leonard and Martin, 1963)

Wheat is one of the most important crops among major crops grown and consumed in Kurdistan region because it provide human with carbohydrates, minerals, and vitamins and its quality influence on human health.

Wheat grains may be contaminated by heavy metals such as lead (Pb) which cause serious diseases in human even at low concentration (Koeppe, 1982).

Lead (Pb) has been recognized as non-essential and toxic minerals to crops even when its occurrence is in small quantities; it may be harmful to the plants (Parsons, 2003).

Our understanding of Pb importance as an environmental contaminant increases when relationship was found between damage, lessening, and alteration of human and animal physiological functions and lead content in crops.

It is also has been found that the soil polluted by heavy metals will inter the food chain making problems to the humans and animals, and also to plants.

Plants absorb metals either by the root-system or by plain absorption and humans receive their allotment of these metals by the use of vegetation (Koeppe, 1982, Surriaya and Abdul-Hai 1999).

Lead has many industrial and commercial uses. It is used for ammunition production, in ceramic glass, as solder, production of batteries, paints, piping, insecticides, and alloys.

Lead is used in gasoline as anti-knock in the form of tetraethyl or tetramethyl (Edwards, 1979).

Automobiles are considered the main source of lead pollution in the world. Automobile constitutes an important source of lead in Iraq (Mohamed, 2003).

Organic lead in fuel (tetra ethyl or/and tetra methyl) is/are converted to inorganic salts during the combustion and exhaust out the automobile as a halides, hydroxides, and oxides with smaller amounts as carbonates and sulfates (National Academy of Sciences, 1972).

Lead which has recently been precipitated as halides are easy instant, consequently more toxic to plants (Zimdahl and Koeppe, 1979).

The aim of this work was to determine the concentration of lead in wheat grains and soil samples collected at different distances from a heavily-trafficked road, and compare Pb content in wheat grains with its hygienic standard for grains.

2. MATERIALS AND METHODS

The lead (Pb) was determined in wheat grains and soil samples collected in 2005. Five arid croplands adjacent to the roadway between Zakho and Semel in Duhok city (most of Selevaney plain and part of Duban plain) were choose (Fig. 1).

The highway runs in an east-west direction and consists of two lanes divided by a 2 m-wide grass median strip.

Both of wheat grains and soil samples were taken at distances of 20 m, 50 m, and 100 m north and south of the edge of the roadbed; at each distance three replicates were taken; the distance between each replicate was 5m. Although three samples of soil surface layer (0 to 20 cm) were taken within same belts.

Wheat ears were collected and brought to lab and hand trashed to separate seeds from straw. Seeds then dried in oven at 70°C for 72 hrs.

The dried matter was then powdered in the mixer-grinder. About (0.5 gm) of powdered sample was transferred to a 100 ml conical flask, 10 ml of acid mixture (nitric acid: perchloric acid) at the ratio (9:4) was added according to the procedure of digestion used by Tandon, (1999).

The flasks were placed on a hot plate with low temperature in the digestion chamber, and then the cap of the flask was opened to release the NO_2 fumes. The digestion continued until the liquid become colorless.

Soil samples were passed through a 2 mm sieve and homogeneously mixed and digested according to Jakson, (1958) as shown in the following steps:

About 0.5 gram of finely grounded soil samples were placed each in 50 ml conical flask and digested with 10 ml of a mixture of (sulfuric acid: nitric acid: perchloric acid) of ratio of (3:1:1) on a hot plate (200° C) in digestion chamber until reaching colorless.

After that the digested soil sample was diluted with deionized water and completed to the volume in a 50 ml voltmeter flask.

Lead was determined in wheat grains and soil samples using (Perkin Elmer, model; A-Analys 200) Atomic Absorption Spectrophotometer (AAS). The element was analyzed at the chemistry department laboratory, college of science, Duhok University.

Randomized Complete Block Design Statistical analysis was conducted with an analysis of variance. Differences were accepted at the 0.05 level of probability.

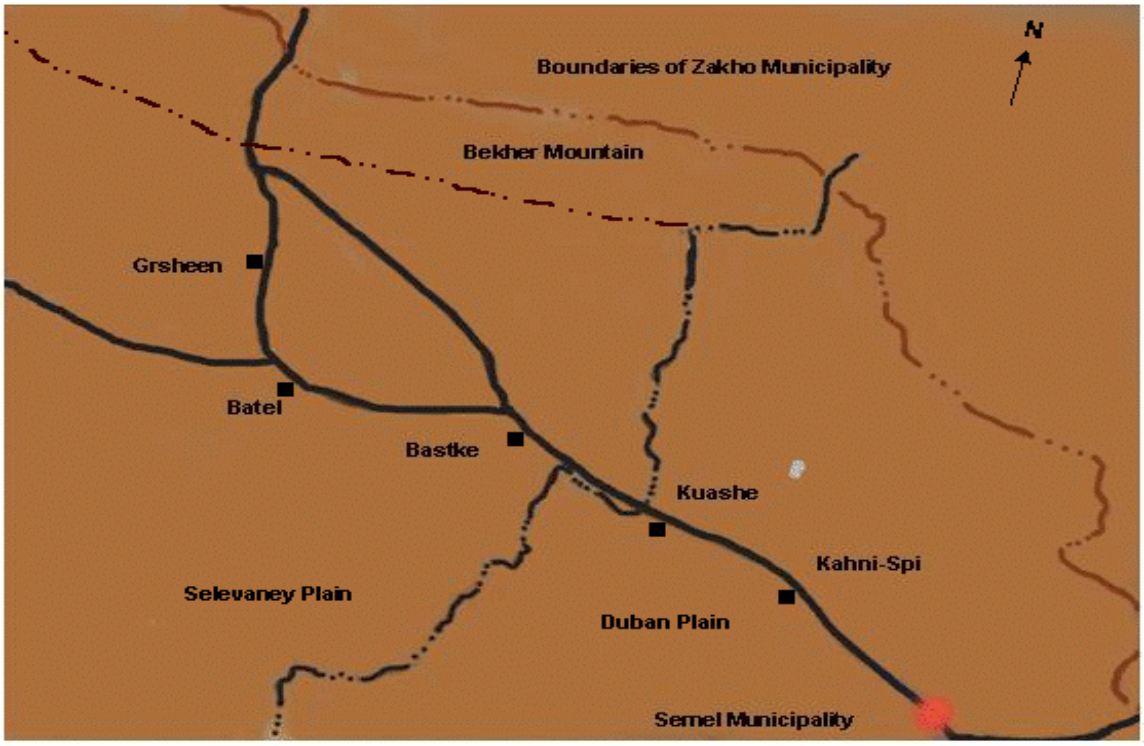


Fig (1): Map of studied locations around the highway road between Semel and Zakho**.**

3. RESULTS AND DISCUSSION

The lead concentration in wheat grains and soil samples is represented in tables 1, 2. The average concentration of Pb in wheat grains of all locations was 0.412 mg. kg $^{-1}$ d. m. (dry matter).

Table (1): Pb concentration (mg. kg $^{-1}$ d. m.) in wheat grains samples taken at different distances from the roadway.

Locations	Distance from the roadway edge (m)	Side of the roadway		Location's Means
		North	South	
Grsheen	20	0.524* a	0.4782 ab	0.4615** a
	50	0.454 a-d	0.427 a-f	
	100	0.431 a-e	0.453 a-d	
Batel	20	0.334 e-h	0.463 a-d	0.4091 b
	50	0.417 b-f	0.434 a-e	
	100	0.428 a-f	0.376 b-g	
Bastke	20	0.328 f-h	0.393 b-g	0.360 c

	50	0.364 c-g	0.406 b-g	
	100	0.280 gh	0.393 b-g	
Kuashe	20	0.452 a-d	0.458 a-d	0.443 a
	50	0.451 a-d	0.407 b-g	
	100	0.453 a-d	0.437 a-d	
Kahni-Spi	20	0.359 d-h	0.426 a-f	0.388 bc
	50	0.402 b-g	0.422 a-f	
	100	0.312 gh	0.410 b-g	
Sides mean		0.399 b	0.425 a	**0.412*** **

***** Means with same letters are not significantly different at 5% based on Duncan's Multiple Range Test.
****** Location means with same letters are not significantly different at 5% level based on Duncan's Multiple Range Test.
******* General mean of 90 samples

Maximum Pb content (0.524 mg. kg $^{-1}$ d. m.) in wheat grains was recorded in Grsheen location at 20 m distance (north) from street edge and minimum Pb content (0.280 mg. kg $^{-1}$ d. m.) in wheat grains was recorded in Batel location at 100 m distance (north) from street edge.

The average concentration of Pb in soil samples (table 2) of all locations was 6.669 mg. kg $^{-1}$. Higher Pb content in soil samples (7.143 mg. kg $^{-1}$) was recorded in Kuashe location at 100 m distance (south) from street edge.

Minimum Pb content in soil samples (5.715 mg. kg $^{-1}$) was recorded in Bastke location at 100 m distance (south) from street edge which differs significantly.

Table (2): Pb concentration (mg. kg $^{-1}$) in soil samples taken at different distances from the roadway.

Locations	Distance from the roadway edge (m)	Side of the roadway		Location's Means
		North	South	
Grsheen	20	7.132* a	7.122 a	6.892** a
	50	6.955 a-d	6.780 a-f	
	100	7.066 ab	6.796 ef	
Batel	20	6.985 a-d	6.422 def	6.441 b
	50	6.801 a-f	6.208 f	
	100	6.515 b-f	5.715 g	
Bastke	20	6.628 a-f	6.423 def	6.440 b
	50	6.492 b-f	6.323 ef	
	100	6.465 c-f	6.311 ef	
Kuashe	20	6.647 a-f	6.573 a-f	6.831 a
	50	7.058 abc	6.824 a-e	
	100	6.744 a-f	7.143 a	
Kahni-Spi	20	6.675 c-f	6.726 a-f	6.741 a
	50	6.460 c-f	7.027 abc	
	100	6.858 a-e	6.703 a-f	
Sides mean		6.765 **a**	6.573 **b**	**6.669*** **

***** Means with same letters are not significantly different at 5% based on Duncan's Multiple Range Test.
****** Location means with same letters are not significantly different at 5% level based on Duncan's Multiple Range Test.
******* General mean of 90 samples.

By comparing the obtained data with the results reported by different authors (table 3), the average concentration of Pb in wheat in all locations was not higher than those values recorded by Szabo and Fodor, (2006), and Lavado, (2006), Rafiq et all, (2006), in Hungary, Argentina, and Pakistan respectively, and was within the values recorded by Nan et all, (1999), and Skrbic et all, (2005) in China and Serbia respectively. Same thing for Pb concentration in soil which was less than results of Milbery et all, 1980; Reinirkens, 1996; Hääl et all, 2004; Wieczorek et all, 2005; and lavado, 2006.

Table (3): Pb contents in soil and wheat grains from different sources and different countries

Country	Sample from	Wheat Grains (mg. kg^{-1} d. m.)	Soil (mg. kg^{-1})	Source
USA	Soil depth 50-10 cm	----	21.4	Mibery et al, 1980
Germany	50 m from roadway	----	22.0-30.2	Reinirkens, 1996
China	Samples selected from different fields	0.09-18.45	----	Nan et all, 1999
Estonia	20 m from road edge	----	9.4-85	Hääl et all, 2004
Serbia	Different fields	0.075-1.099	----	Skrbic et al, 2005
Poland	Very close to road	----	11.89	Wieczorek et all, 2005
Pakistan	Samples were purchased from market	1.09	----	Rafiq et all, 2006
Argentina	Samples collected near cities	1.45	9.28	Lavado, 2006
Hungary	Not polluted soils	0.6	----	Szabo and Fodor, 2006

But concentration of Pb in soil of all locations didn't exceed maximum permissible level of Pb in agriculture soils considered by most countries (table 4).

Table (4): Maximum permissible levels (mg. kg^{-1}) of Pb in agriculture soils of different countries.

McGrath, 1993		Wild, 1994	Bespamiatnov, 1985	Wieczorek et all, 2005
Germany	Denmark	E. C. R.	Russia	Polish
100	**40**	**50**	**30**	**< 20**

Weekly intake

The provisional tolerable weekly intake of Pb is 25 µg. kg^{-1} body weight of Pb for an adult (60 kg person) established by the joint FAO/WHO, (WHO, 1993). According to the ministry of trading and food substances, the monthly consumption of 9 kg of flour (which represent 12 kg wheat as flour extraction from wheat is 75%) is inferred for a person in Iraq. As the mean Pb content in wheat grains in present study is 0.412 mg. kg^{-1} d. m. therefore the weekly intake of Pb is 19.23 µg. kg^{-1} body weight.

Otherwise, Pb intake from wheat grains sampled from all locations Grsheen, Batel, Bastke, Kuashe, and Kahni-Spi was (21.5, 19.1, 16.8, 20.7, and 18.1 µg. kg^{-1} body weight) respectively didn't exceed that proposed by FAO/WHO joint (WHO, 1993).

Lead is mostly located in the outer layers of wheat grains; Pb content is reduced by milling by about 30-50 %, depending on the ash content of flour (Brŭggemann and Kumpulainen, 1995). In that way the provisional tolerable weekly intake of Pb from the present study will reduce to 13.46-9.62 µg. kg^{-1} body weight.

Distances from roadway

From the table 5, it is obvious that Pb concentration in wheat grains and soil samples varied among distances from the roadway, 20 m showed higher Pb concentration (0.421mg. kg^{-1} d. m.) in wheat and (6.733 mg. kg^{-1}) in soil and 100 m distance showed lower Pb concentration, (0.397mg. kg^{-1} d. m.) in wheat and (6.582 mg. kg^{-1}) in soil but a general view of Pb concentration in wheat and soil in relation to the distance from roadway was 20 m> 50 m> 100 m. Also there was a correlation between Pb concentration in soil and wheat because Pb content in wheat grains increased as Pb content in soil increased.

Table (5): Pb concentration in wheat and soil sampled from different distances from the roadway.

Distances from the roadway	Pb concentration	
	Wheat	Soil
20 m	0.421	6.733
50 m	0.418	6.693
100 m	0.397	6.582
	0.412*	6.669*

***** General mean of 90 samples

The present results of Pb content in wheat grains samples of all locations were found to place within the standard of Pb in grains 1.0 mg. kg^{-1} proposed by the National Standard Bureau of Peoples Republic of China (Nan and Cheng, 2001).

But slightly higher than the maximum permissible level of Pb in grains 0.4 mg. kg^{-1} d. m. proposed by FAO/WHO, (1999)

Lead concentrations determined in soil samples, regardless of the distance from the road, were much

lower than their mean content considered natural in uncontaminated soils (Table 4), in light of this circumstance; the soil of studied locations is not polluted with Pb.

Sides of roadway

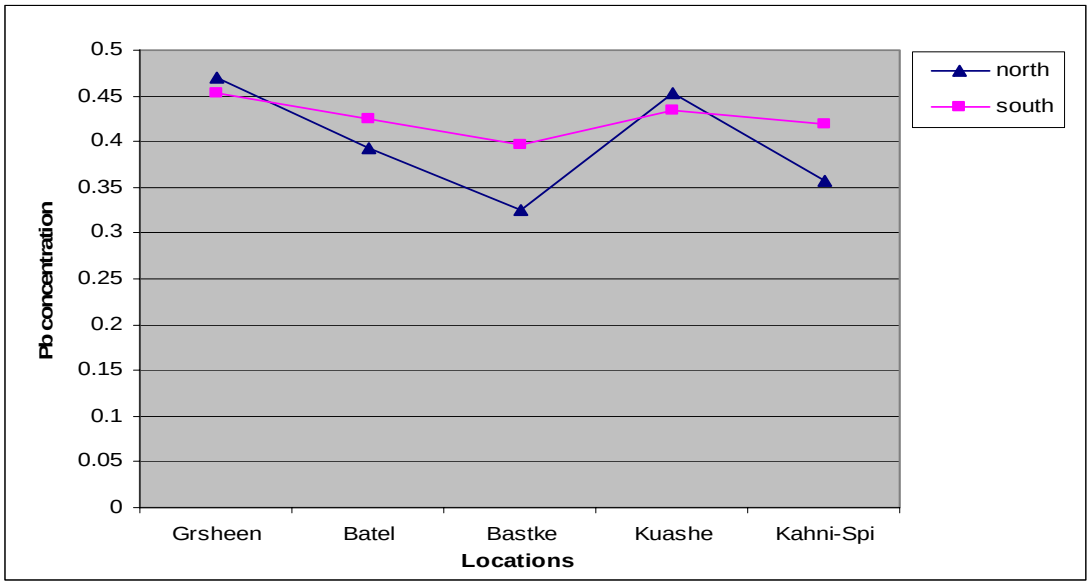
Wheat grains and soil samples showed statistical influence of sides on wheat grains and soil Pb concentration (tables 1, 2).

About Pb concentration in wheat; South side showed higher concentration (0. 425 mg. kg $^{-1}$ d. m.), and north side showed lower concentration (0.399 mg. kg $^{-1}$ d. m.). But the circumstance was inverted incase of Pb content in soil samples; South side showed lower concentration (6.573 mg. kg $^{-1}$), and north side showed higher concentration(6.765 mg.kg^{-1}).

This indicates that the occurrence of higher Pb concentration in wheat grains of south side could be attributed to factors other than the soil concentration. For example Weber and Hryńczuk, (2000) found that; much higher amounts of the metals such as Pb appeared to have been taken up by the plants from leaf contamination than the soil.

Whereby the higher Pb content in wheat grains sampled from south side of roadway may be due to the prevailing wind direction; northwest during March and most of April (Batel Meteorology station 2005) (period of effective vegetative growth of wheat in the studied region) these winds carry out the borne Pb from automobiles exhaust by the direction they blow to.

It is obvious from figures2,3 that the concentration of Pb in wheat grains sampled from south side is more than of north side in locations Batel,Bastke,and Kahnis-Spi;but the circumstance was inverted incase of Pb concentration in soil;north side showed higher concentration in locations Grshin,Batel, and Bastke



Fig(2): Pb concentration (mg. kg^{-1} d. m.) in wheat grains of studied locations at both sides of roadway.

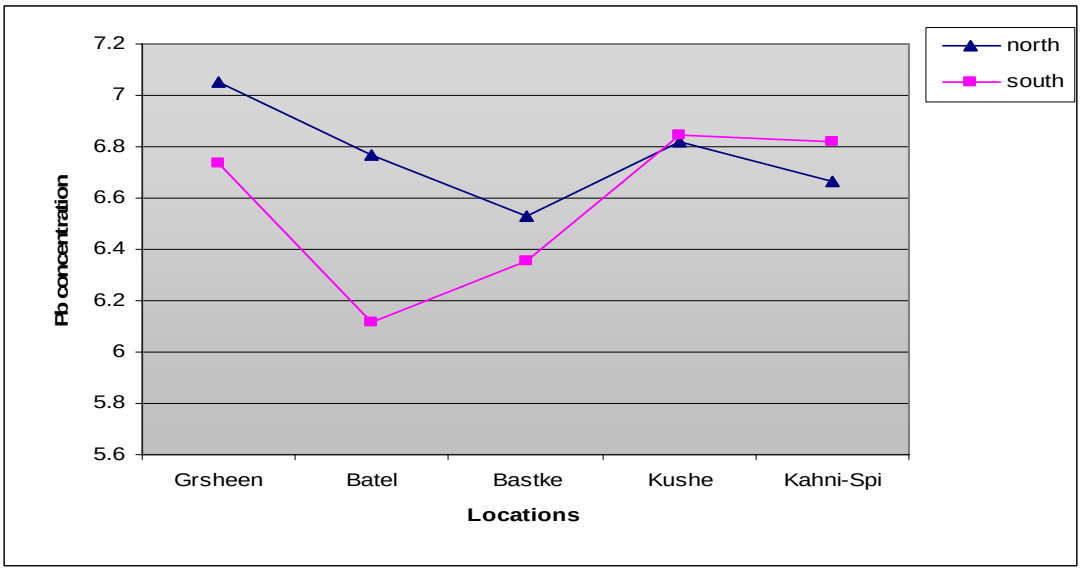


Fig (3): Pb concentration (mg. kg^{-1}) in soil of studied locations at both sides of roadway.

4. CONCLUSIONS

1- The lead concentration in wheat and soil samples decreased with an increasing distance from the road.
2- South side showed higher concentration of Pb in wheat grains samples, and north side showed lower concentration. But the circumstance was inverted incase of Pb content in soil samples.
3- Lead concentration determined in the soil samples regardless of the distance from the road, was much lower than its mean content considered natural in uncontaminated soils.
4- Weekly intake of Pb didn't exceed that proposed by FAO/WHO joint.
5- These results confirmed that the occurrence of Pb concentration in wheat grains could be attributed to the effects of wind direction.
6- Because there is no research has been published on Pb content in wheat and wheat is a main crop in Duhok City therefore study of the pollutants in wheat deserve further investigation in order to include wide area.

ACKNOWLEDGEMENT

I would like to express my appreciations to Shukri H. Salih (Horticulture Dept., College of Agriculture, Duhok Univ.) for expert help with statistical analysis in, to Raeed M. Gorany (Chemistry Dept., College of Education, Duhok Univ.) for assistance in the assessment of Pb by AAS, and also to both of Khalis Saeed and Shivan Barwary (directorate of agriculture in Duhok city-Batel branch) for their kind providing metrological information.

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تركيز الرصاص في التربة والحنطة المزروعة بجانب الطريق الذي يربط فضاء زاخو مع فضاء سميل في مدينة دهوك-اقليم كوردستان \ العراق

الخلاصة

جمعت عينات من حبوب الحنطة والتربة من خمسة مواقع حول الطريق الذي يربط فضاء زاخو مع فضاء سميل في مدينة دهـوك عند المسافات 20م و 50 م و 100م من حا فة الطريق وعلى الجانبين حيث تم تقدير عنصر الرصاص في الحبوب والتربة. وقد كان معدل تركيز الرصاص في الحبوب 0.412 مغ. كغ $^{-1}$ و. ج. (وزن جاف) وفي التربة 6.669 مغ. كغ $^{-1}$. وقـد تغـاير تركيـز الرصاص في عينات الحبوب والتربة اعتماداً على البعد من الشارع وبالشكل التالي ؛ بالنسبة لحبوب الحنطة: 20 م (0.421 مغ. كغ $^{-1}$ و. ج.) ؛ 50م ، (0.418 مغ. كغ $^{-1}$ و. ج.)؛ 100م ، (0.397 مغ. كغ $^{-1}$ و. ج.) ؛ وبالنسبة لعينات التربة: 20م 6.733 مغ. كغ $^{-1}$) ؛ 50م ، (6.693 مغ. كغ $^{-1}$) ، 100م ، (6.582 مغ. كغ $^{-1}$). وقد كان للبعد عن الشارع تأثير على تركيز الرصاص في كل من عينات الحنطة والتربة حيث قلّ تركيز الرصاص بالابتعاد عن الطريق. وكان معدل تركيز الرصاص في عينات الحنطـة المأخوذة من الجهة الجنوبية (0.425 مغ. كغ $^{-1}$ و. ج.) أعلى من معدل تركيز الرصاص في العينات المأخوذة من الجهة الـشمالية (0.399 مغ. كغ $^{-1}$ و. ج.). لكن هذه الحالة انعكست في حالة التربة حيث كان معدل تركيز الرصاص في عينات التربة المأخوذة من الجهة الشمالية للشارع (6.573 مغ. كغ $^{-1}$) أعلى من معدل تركيز الرصاص في العينات المأخوذة من الجهة الجنوبيـة (6.765 مغ. كغ $^{-1}$).بالنسبة للمأخوذ الأسبوعي للرصاص جراء تناول الحنطة المزروعة في موقع الدراسة حوالى 19.23 مايكروغرام .كـغ من وزن الجسم والذي لم يتجاوز الحد المسموح به من قبل منظمتا الصحة والأغذية والزراعة العالميتان.

ريژا رساسی لناڤ ئاخێ وگەنمی ل سەر ریکا زاخو و سێمێلێ ل دهوکێ–هەرێما کوردستانێ\عیراق

کورتی

ئەڤ ڤەکولینە هات بجهینان ل سەر هندەك زەڤییێت گەنمی کو سامپلێت گەنمی وئاخێ هاتن وەرگرتن ژ ناڤ پێنج زەڤییێت گەنمی کو تکەڤن ل سەر ریکا زاخو وسێمێلێ ل دهوکێ وبدویراتیا 20 م و 50 م و 100م ژ هەردوو رەخێت ریکێ. ئاستێ رساسی هات وەرگرتن ل ناڤ گەنمی وئاخێ دا وئەنجاما دیارکر کو ریژا رساسی لناڤ گەنمی دا 0.412 ملغم. کغم$^{-1}$ گرانیا هشك و ل ناڤ ئاخێ دا 6.669 ملغم. کغم $^{-1}$. ئاستێ رساسی ل ناڤ گەنمی وئاخێ دا کێم بی ل دویف دیوراتیێ ژ ریکێ وبڤی رەنگی: بو گەنمی 20 م (0.421 ملغم. کغم$^{-1}$ گرانیا هشك) " 50م ، (0.418 ملغم. کغم$^{-1}$ گرانیا هشك)" 100م ، (0.397 ملغم. کغم$^{-1}$ گرانیا هشك)" وبو ئاخێ: 20م (6.733 ملغم. کغم$^{-1}$)" 50م، (6.693 ملغم. کغم$^{-1}$)" 100م ، (6.582 ملغم. کغم$^{-1}$). ئاستێ رساسی د سامپلێت گەنمی دا ئەوێت هاتین وەرگرتن ژ زەڤیێت باکورا ریکێ (0.425 ملغم. کغم$^{-1}$ گرانیا هشك) کـو مەستربین ژ ئەوێت هاتین وەرگرتن ژ زەڤیێت باشورا ریکێ (0.399 ملغم. کغم$^{-1}$ گرانیا هشك). ئەڤ چەندە هات گوهرین ل گەل ریژا رساسی د ناڤ ئاخێ دا و بڤی رەنگی: ئەوێت هاتین وەرگرتن ژ زەڤیێت باکورا ریکێ (6.573 ملغـم. کغـم$^{-1}$) کـو کێمتربین ژ ئەوێت هاتین وەرگرتن ژ زەڤیێت باشورا ریکێ (6.765 ملغم. کغم$^{-1}$). وەرگرتنا رساسی یا حەفتیانـە ژ خوارنـا گەنمی بو کەسەکێ(19.23 مایکروغرام. کغم$^{-1}$ گرانیا لـەشی) کو نە بوریە ژوان توخیبا ئەوێت هاتین دەینان ژ لایێ هـەردوو کومەلێت تەندروستی و چاندنێ وخوارنێ ییت جیهانی.

IMMUNOLOGOCAL AND PHYSIOLOGICAL EVALUATIONS IN PATIENTS WITH DIABETES MELLITUS IN ERBIL CITY

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(Received: January 22;2009 Accepted for publication : September 16,2009)

ABSTRACT

The present study was carried out in Emergency unit of Hawler Teaching Hospital-Erbil city, which included 100 diabetic patients (50 males and 50 females) to determine the level of some immunological, haematological and biochemical parameters. The results were compared to those obtained from a group of 100 healthy non-diabetic controls (50 males and 50 females). The results showed that the phagocytic index was significantly (P < 0.001) increased in diabetic patients compared to controls. The serum level of IgM, IgA and IgG were significantly (P < 0.001, P < 0.01, P < 0.05) higher in diabetic patients compared to controls, while the action of complement proteins (C3 and C4) showed a significant decreased (P < 0.05 , P < 0.001) in diabetic patients as compared to controls. The specific activity of Adenosine deaminase ADA was significantly (P < 0.001) higher in diabetic patients compared to controls. The results revealed that the level of Hb, PCV, RBC were significantly decreased (P < 0.001, P < 0.01and P < 0.05) respectively in diabetic patients as compared with controls. WBC was significantly higher(P < 0.001) in diabetic patients as compared with controls, such increase was clearer in the neutrophil counts. The result of leucocytes (eosinophils, lymphocyte and monocyte) did not show significant differences in patients and control (p>0.05). Significant increase (P < 0.001) was observed in serum level of glucose, cholesterol, creatinine and urea in diabetic patients compared to controls. The total serum protein was significantly decreased (P < 0.001) in diabetic patients as compared to controls. The specific activity of ALP show significant increase (P < 0.001, P < 0.01) in diabetic patients compared to controls, while AST and ALT did not show significant differences in patients and controls(p>0.01).

KEYWORDS Diabetes mellitus Bactericidal activity IgG, IgA, IgM, C3 C4 Phagocytosis Anemia Biochemical parameter.

1- INTRODUCTION

Diabetes mellitus is a disease characterized by persistent hyperglycemia (high blood sugar levels), resulting either from inadequate secretion of the hormone insulin, an inadequate response of target cells to insulin, or a combination of these factors. Diabetes is a metabolic disease needs medical follow up, treatment and lifestyle changes (1). There are many causes and forms of diabetes known. The three most common patterns of diabetes have been recognized over the last thirty years as type 1, type 2 and gestational diabetes (2).

Type (1) diabetes is an autoimmune disease with unknown etiology but with a definite outcome, resulting in the progressive misdirected immunological destruction of insulin-secreting pancreatic beta islet cells by auto reactive leukocytes and their mediator (3). Immunological disturbances in Type 2 diabetic individuals are associated with cell mediated responses and inappropriate T-lymphocyte function, which is vital in this pathogenic condition (4). Adenosine deaminase (ADA), an enzyme distributed in the human tissues was considered as good marker of cell mediated immunity it plays crucial role in lymphocyte proliferation and differentiation and shows its highest activity in T-lymphocyte (5). Many recent studies showed relation of diabetes mellitus with increasing activity of ADA (6). Diabetic patients have normal or increased levels of immunoglobulins which may simply indicate frequency of infection in these patients (7). Significant increases in serum IgA and IgG concentrations were observed where as the concentration of IgM was significantly decreased in diabetic patients (8)

There is a marked decrease in Haemoglobin (Hb) level, Packed cell volume (PCV) and Red blood cells (RBC) count in diabetic patients, while the White blood cells (WBC) and neutrophil count increased in these patients (9). Osar et al. (2004) showed that there is no significant differences in leucocytes and neutrophil counts.

Diabetes mellitus due to absolute or relative deficiency of insulin, this can arise in different ways, affects of carbohydrate, protein and fat metabolism (11). Fasting glucose level showed significant increase in diabetic patients (10). The rise of plasma cholesterol level in diabetes is due to elevated in the plasma concentration of low density lipoprotein (LDL) and very low density lipoprotein (VLDL) which may be due to increased hepatic production of VLDL or decreased removal of VLDL and LDL from circulation (12). Urea and creatinine accumulate in renal failure patients, in diabetes mellitus this accumulation is worsened by high dietary protein intake (12). Hepatomegaly and abnormalities of liver enzymes occur as consequence of hepatocellular glycogen accumulation, the typical biochemical findings are mildly to moderately elevated aminotransferases (ALT, AST) and mild elevations of Alkaline phosphatase (ALP) (13,14).

The aim of this study includes determination of some immunological and physiological parameters changes in male and female diabetic patients.

2- MATERIALS AND METHODS

The study was carried out in Emergency unit in Hawler Teaching Hospital on 100 cases of diabetic mellitus patient (50 males and 50 females) and 100 healthy (50 males and 50 females). Blood samples were collected from both groups by sterile disposable syringes from vein.

One hundred diabetic patients of both sexes and healthy people during their attendance of the Emergency unit of Hawler Teaching Hospital were

used in the present study. Their ages ranged from 30 to 70 years with no evidence of hepatic, cardiac and renal diseases and were not taking medications. Informed consent was obtained from each individual. 3-4 ml of peripheral blood samples were drawn in the morning from the patients and controls by disposable syringes. 1.5 ml transferred into non-heparinized tube for determination of Hb, PCV, RBC, WBC, DLC and phagocytosis. 2-3 ml was transferred into glass tubes after clotting centrifuged for 20 minutes at 3000 r.p.m. The serum was used for determination of sugar, cholesterol , protein,urea , creatinine, Immunoglobulin, complement ADA and protein.

Phagocytosis was determinate by two methods, first include the ability of phagocytic cell to phagocyte killed yeast cell and the second method was to study the ability of phagocytic cell to reduce NBT (15). Single redial immunodiffusion was used to determinate the quantitative determination of Immunoglobulins and complement (16). Specific activity of Adenosine deaminase was determined in the serum according to (17).

Cyanomethaemoglobin method was used for Hb determination (18). Heparinized capillary tube and microhematocrite centrifuge were used for determination of PCV (18). Hemocytometer method was used for determination of RBC and WBC counts. Differential Leukocyte counts were determinate by preparation of blood films (19). Fasting serum glucose was determinate using an enzymatic colorimetric method using according to the method of (20). Serum cholesterol was determinate according to the method of (21). Serum urea was determined according to the method of (22). Serum creatinine was determined according to the method of (23). Serum protein was determined according to the method of (23). Serum ALP was determined according to the method of (24). Serum AST and ALT was determined according to the method of (25).

Analysis of data was performed by using SPSS (version 10). Results are expressed as mean ± S.E. Independent unpaired t-test was used to compare the parameters between diabetic patients and healthy controls. P value < 0.05 was considered statistically significance (26).

3- RESULTS

Table (1) demonstrates significant (P< 0.001) increase in phagocytic index and nitroblue tetrazolium reduction in patient of both sexes as compared with control.

Table (1): Effect of diabetes mellitus on NBT reduction and phagocytic index in both sexes as compared with controls.

Sex	Groups	NO.	Mean ± S.E	
			Phagocytic index	NBT %
Male	Patients	50	41.120 ± 0.265	9.333 ± 0.077
	Controls	50	34.954 ± 0.563	6.100 ± 0.124
	P value		0.000	0.000
Female	Patients	50	36.580 ± 0.223	8.209 ± 0.117
	Controls	50	31.440 ± 0.631	6.404 ± 0.120
	P value		0.000	0.000

Table (2) showed the level of immunoglobulin IgM was significantly (P < 0.001) increase in male and in female of diabetic patient (P < 0.05). The level of IgA was increased significantly (P < 0.05) in male and in female (P < 0.001) of diabetic patient. Also the level of IgG was increased significantly (P < 0.001) in male and in female(P < 0.01) of diabetic patient as compared with control. The level of complement protein C3 was decreased significantly (P < 0.05) in patient of both sexes as compared with control, and the level of complement C4 was decreased significantly (P < 0.001) in patient of both sexes as compared with control.

Table (2): Effect of diabetes mellitus on immunoglobulins and complements in both sexes as compared with controls.

Sex	Groups	NO.	Mean ± S.E				
			IgM mg/dL	IgA mg/dL	IgG mg/dL	C3 mg/dL	C4 mg/dL
Male	Patients	50	145.00 ± 5.79	199.80 ± 7.21	1173.50 ± 22.55	100.60 ± 3.90	20.16 ± 0.53
	Controls	50	114.00 ± 5.03	174.20 ± 6.45	979.20 ± 24.00	113.00 ± 4.46	25.99 ± 0.86
	P value		0.000	0.05	0.000	0.05	0.000
Female	Patients	50	99.50 ± 3.46	131.32 ± 4.85	1259.30 ± 73.79	90.10 ± 3.52	13.80 ± 0.13
	Controls	50	91.30 ± 1.04	100.30 ± 1.72	982.36 ± 28.74	112.70 ± 4.23	16.20 ± 0.20
	P value		0.05	0.000	0.01	0.05	0.000

Table (3) showed significant increase (P < 0.001) in adenosine deaminase level in patients of both sexes as compared with control.

Table (3): Effect of diabetes mellitus on specific activity of adenosine deaminase in both sexes as compared with control.

Sex	Groups	NO	Mean ± S.E
			ADA u/mg protein
Male	Patients	50	0.898 ± 0.063
	Controls	50	0.557 ± 0.046
	P value		0.000
Female	Patients	50	0.700 ± 0.037
	Controls	50	0.449 ± 0.029
	P value		0.000

Table (4) demonstrate significant (P < 0.001) decreased in level of Haemoglobulin, Packed cell volume (P < 0.01) in male and (P < 0.001) in female and red blood cells count (P < 0.001) in male and (P < 0.05) in female of both sexes of diabetic patient as compared with control. On the other hand white blood cell count increased significantly (P <0.001) in patients of both sexes as compared with control. There is a significant increase (P < 0.001) in neutrophil count in patients of both sexes as compared with control. Non significant differences were observed in the number of eosinophil, lymphocyte and monocyte of both patients and control of both sexes (P > 0.05).

Table (4): Effect of diabetes mellitus on some hematological parameters in both sexes as compared with control.

Sex	Patients	NO.	Mean ± S.E							
			Hb g/dL	PCV %	RBC X 10^6 mm^3	WBC/ mm^3	Neutrophil Cell/ mm^3	Eosinophil Cell/ mm^3	Lymphocyte Cell/ mm^3	Monocyte Cell/ mm^3
Male	Patients	50	12.060 ± 0.136	37.200 ± 0.408	429.600 ± 10.635	11010.00 ± 256.602	5106.70 ±32.450	151.400 ± 0.941	1690.60 ± 2.683	268.800 ± 1.213
	Control	50	13.520 ± 0.166	39.000 ± 0.465	447.800 ± 9.535	9475.00 ± 208.963	4778.34 ±34.979	149.300 ± 0.810	1694.80 ± 3.040	268.100 ± 1.254
	P value		0.000	0.01	0.001	0.000	0.000	0.005	0.325	0.626
Female	Patients	50	10.890 ± 0.063	33.580 ± 0.180	396.800 ± 5.223	10120.00 ± 184.368	4897.00 ±44.333	155.000 ± 0.861	1576.40 ± 2.814	255.600 ±0 .524
	Control	50	11.850 ± 0.113	35.500 ± 0.183	416.100 ± 6.126	8980.00 ± 146.182	4476.00 ±56.896	153.500 ± 0.908	1569.02 ± 4.974	156.000 ± 1.487
	P value		0.000	0.000	0.05	0.000	0.000	0.234	0.200	0.492

Table (5) showed significant increase (P < 0.001) in serum sugar, cholesterol, creatinine and urea level in patients of both sexes as compared with control, while serum protein level show significant (P < 0.001) decrease in patients of both sexes as compared with control. Also as shown in table (5) the activity level of serum Alkaline phosphatase was increased significantly (P < 0.001) in male (P < 0.01) and in female of diabetic patient as compared with control, with non significant difference in the activity level of Serum Aspartate transaminase and Alanine transaminase in both patients and control of both sexes.

Table (5): Effect of diabetes mellitus on some biochemical parameters in both sexes as compared with control.

Sex	Groups	NO.	Mean ± S.E							
			Sugar mg/dL	Cholestrol mg/dL	Creatnine mg/dL	Urea mg/dL	Protein g/dL	ALP g/dL	AST u/L	ALT u/L
Male	Patients	50	220.000 ± 9.000	3.822 ± 0.231	1.911 ± 0.073	43.44 ± 1.75	5.290 ± 0.105	82.612 ± 2.421	32.600 ± 0.636	63.500 ± 1.173
	Controls	50	109.500 ± 1.819	2.445 ± 0.113	1.025 ± 0.032	17.99 ± 0.31	7.760 ± 0.098	71.164 ± 2.214	31.900 ± 0.569	64.400 ± 1.162
	P value		0.000	0.000	0.000	0.000	0.000	0.000	0.103	0.740
Female	Patients	50	226.300 ± 7.067	3.506 ± 0.126	1.382 ±0.047	35.032 ± 0.467	4.802 ± 0.076	100.030 ± 2.316	32.800 ± 0.611	59.340 ± 0.738
	Controls	50	108.800 ± 1.677	2.684 ± 0.120	0.961 ± 0.026	16.014 ± 0.611	8.236 ± 0.159	91.556 ± 1.439	31.200 ± 0.719	58.400 ± 0.753
	P value		0.000	0.000	0.000	0.000	0.000	0.01	0.086	0.945

4- DISCUSSION

The results of the present study showed increased in phagocytic index and nitroblue tetrazolium reduction in diabetic males and females. These results are in agreement with previous researches (27, 28), they referred to the function of neutrophil which can be evaluated by measuring oxidative metabolism using tetrazolium dyes. Superoxide productions in neutrophils have been developed to evaluate the function of patients with various disorders, and the neutrophil of diabetic patients give clearly high superoxid production.

The results demonstrates significant increase in the levels of IgM, IgA and IgG in the patients, this result was in agree with the results of the previous researches (29, 30) since the diabetic patients suffered from different types of bacterial infections, their sera containing these nonspecific antibodies might have killed the bacterial cells while the complement had been destroyed by heat inactivation. Lower level of C3 might be associated with its high catabolic rate, and lower level of C4 could be derive from immuno consumption or defective production, immuno consumption of C4 is unlikely to resulting impaired C4 function in insulin dependent diabetes (31, 32).

Adenosine deaminase is a polymorphic enzyme that irreversibly deaminates adenosine to inosine, contributing to the regulation of intracellular and extra cellular concentration of adenosine. Genetic variability of the enzyme could contribute to degree of obesity in non-insulin dependent diabetes mellitus (33). Increased adenosine level in cells was associated with the inhibition of Lymphocyte function which has been shown to be toxic to cell (34). Increases in ADA level could be attributed to the destruction of ß-cell in pancreas which was considered to be the major cause of diabetes mellitus, such destruction cause an increase in leakage of the enzyme which is present in high concentration to the plasma (35).

In our study, the results showed significant decreases in level of Hb, PCV, RBC count. Decreasing of these parameters called “anemia” in diabetic patients anemia which is the result of diminished erythropoietin production and to a lesser degree increased excretion of erythropoietin in the urine (36). Potential factors include a reduced number of specific erythropoietin-synthesizing interstitial cells and disruption of the interstitial anatomy (37) In other words structural renal abnormalities may play a role in the a etiology of anemia in diabetes because decreased renal function causes lower erythropoietin concentration (38). Erythrocyte half-life is abnormal in diabetic patients. This is due to several pathologies that have an impact on erythrocyte viability, such as increased osmotic stress which is a consequence of accumulation of sorbitol and decreased Na / K – ATPase activity (39). Increased in WBC and neutrophil counts in diabetic patheints were also reported by (40,41). The cause of WBC count and neutrophil increased is due to inhibition of migration of these cells to infected tissue or inflammation. The erythrocyte deformation at low share force increased count of neutrophils and impaired deformability of passive neurophils may increase the risk for acute cerebro-vascular complications.

The results demonstrate significant increase in the serum sugar level in both sexes of diabetic patient. Insulin is the principle hormone that regulates uptake of glucose into most cells from the blood, deficiency of insulin or the sensitivity of its receptors plays a central role to increase the level of blood sugar (42). The results showed significant increase in level of serum cholesterol, this in agreement with that finding of (43) which indicate that in diabetic patients formation of cholesterol, ketonobodies and amount of free faty acid dose not have time to be oxidized in the Krebs cycle and with a lack of insulin, the content of blood free faty acid, triglycerides and cholesterol increased. Increasing of serum creatinine and urea in our study is in agreement with (44) which indicate that excess protein break down produce an excess of amino acids which are the principle precursor of non-production nitrogen compound. Protein decreased is in agreement with the results obtained by (45) that there is many reasons one of them is most patients keep his weight under ideal regime with marked weight loss, which lead eventually to reduce body mass and low serum protein as a reflection of protein state of the body. Elevated serum ALP activity was related to bone fraction isoenzyme (46). Serum ALP activity significantly higher in patients with autoimmune disease this could be due to leakage of ALP from cells that were killed or injured by the autoimmuno processes and (or) by abnormal cell activation (47).

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المعايير المناعية و الفسلجية لدى مرضى داء السكري في مدينة اربيل

الخلاصة

اجريت هذه الدراسة في قسم الطوارىء في مستشفى اربيل التعليمي في محافظة اربيل، حيث شملت 100 شخص مصاب بداء السكر (50ذكر و 50 أنثى) لتقيم مستويات بعض العوامل المناعية و الدموية و الكيموحيوية وقد قورنت النتائج بمجموعة التحكم وشملت 100 شخص سليم (50ذكر و 50 أنثى). اظهرت النتائج أن أرتفاع معامل البلعمة ومعامل اختزال ملون NBT بصورة معنوية (P<0.001) في كلا جنسي مرضى داء السكر مقارنة بمجموعة التحكم. ارتفع وبشكل معنوي مستوى الكلوبيولينات المناعية IgA, IgM, IgG (P <0.05, P <0.01, P <0.001) لدى مرضى داء السكر مقارنة بمجموعة التحكم. كدلك حصل ارتفاع معنوي (P<0.001) في معدل الفعالية النوعية لانزيم الأدينوسين دي أمينيز لدى مرضى داء السكر مقارنة بمجموعة

التحكم. بينت النتائج انخفاض معنوي في مستوى خضاب الدم وحجم خلايا الدم المتراصة و عدد كريات الدم الحمر (P <0.05, P <0.01, P <0.001) لدى مرضى داء السكر مقارنة بمجموعة التحكم. اما عدد كريات الدم البيض فقد ارتفع معنويا (P<0.001) كما ارتفع عدد خلايا الدم البيض العدلة لدى مرضى داء السكر مقارنة بمجموعة التحكم. لم تظهر اختلافات معنوية في عدد خلايا الدم البيض الحمضية و اللمفية و وحيدة النواة لدى مرضى داء السكر و مجموعة التحكم. حصل ارتفاع معنوي (P<0.001) في مستوى سكر الكلوكوز و الكوليسترول والكرياتينين و اليوريا لدى مرضى داء السكر مقارنة بمجموعة التحكم. انخفض مستوى البروتين معنويا (P<0.001) لدى مرضى داء السكر مقارنة بمجموعة التحكم. ارتفعت ارتفاعا معنويا (P<0.01) الفعالية النوعية لانزيم الفوسفاتيز القاعدي لدى مرضى داء السكر مقارنة بمجموعة التحكم. بينما الفعالية النوعية لانزيمي الانين ترانس أمينيز و اسبارتيت ترانز أمينيز لم تظهر اية فروقات معنوية لدى مرضى داء السكر مجموعة التحكم.

پوختە

ئەم توێژینەوەیە لەبەشی فریاکەوتنی نەخۆشخانەی هەوێری فێرکاری لە شاری هەولێر ئەنجام درا، 100 کەس لەوانەی کە تووشی نەخۆشی شەکرە بوون دەست نیشان کران (50 کەس ڕەگەزی نێرو 50 کەس ڕگەزی مێ) بە مەبەستی دیاریکردنی هەندێك هۆکاری بەرگری و خوێن و کیمیای زیندەگی وە بەراوردکردنی لەگەڵ 100 کەسی ئاسایی (50 نێرو 50 مێ). بەرەنجامەکان پێشنیاردەکەن کە هاوکۆلکەی قوتدان و NBT کاریگەری واتایی P<0.001 هەیە بە بەرزبوونی لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی. ئاستی ئیمیوونۆگلۆبیولینی IgA, IgM, IgG کاریگەری واتاییان هەبوو P<0.001, P<0.01, P<0.05 بە بەرزبوونی لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، بەڵام پرۆتینە تەواوکارەکان C3 و C4 ئاستیان دابەزی P<0.05, P<0.001 لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی. چالاکی ئەنزیمی ئەدینۆسین دی ئەمینێز بەرز بوو P<0.001 لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، هەروەك دەرەنجامەکان دەریانخست کە ئاستی هیمۆکلۆبیولین و قەبارەی خانەی خوێنی پەستێوراو و ژمارەی خرۆکە سورەکانی خوێن دابەزی P<0.001, P<0.01, P<0.05 لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی. ژمارەی خرۆکەی سپی یەکانی خوێن و خرۆکە دەنکۆڵەدارە هاووتاکان بەرز بوو P<0.001 لە نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، بەڵام ژمارەی خرۆکەی دەنکۆڵەداری ترش و لیمفە خانە و تاکە خانە هیچ جیاوازی یەکی نەبوو لە نەخۆشی شەکرەو کەسانی ئاسایی. ئاستی گلوکۆز، کۆلسترۆڵ یۆریاو کریاتین بەرز بوو P<0.001 لە شلەی خوێنی نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، ئاستی پرۆتین نزم بوو P<0.001 لە خوێنی نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، وە چالاکی ئەنزیمی فۆسفاتیزی تفتی بەرز بوو P<0.01 لە شلەی خوێنی نەخۆشی شەکرە وە بە بەراوردکردنی لەگەڵ کەسانی ئاسایی، بەڵام چالاکی ئەنزیمەکانی ئەلەنین و ئەسپارتێت ترانز ئەمینەیز هیچ جیاوازی یەکی نەبوو لە نەخۆشی شەکرەو کەسانی ئاسایی.

تعليمات النشر في المجلة جامعة دهوك

يجب ان تكون البحوث المنشورة في المجلة مستوفية لقواعد النشر وخاضعة للتقييم العلمي، ولم يسبق ان نشرت او قدمت للنشر الى اية جهة اخرى، ويجب ان يتضمن البحث خلاصة ومقدمة، وان يتبع الباحث طريقة موحدة ومنهجا واضحاً في البحث، وان يحدد النتائج التي توصل اليها والمصادر التي اعتمد عليها، وأن لا تتجاوز عدد صفحاته عن (20)عشرين صفحة بالنسبة للبحوث العلمية، و(25)خمس وعشرين صفحة للبحوث الإنسانية.

التعليمات الخاصة بشكل وترتيب البحث:

1. المضمون:

يجب ان يكون مطبوعا بنمط (عادي)، خط (Traditional Arabic)، حجم (14)، تباعد الأسطر(تقريبي 12)، المحاذاة (مضبوطة).

2. الهوامش :

تكتب الهوامش في اخر البحث.

3. اعداد الصفحة:

يطبع البحث على ورق حجم (A4) مع ترك (2.5 سم)من يمين الصفحة، (2 سم) من يسار الصفحة و(3 سم)من الجهتين العليا و السفلى.

4. ارقام الصفحات:

تكتب أرقام الصفحات في الجهة اليسرى من أسفل الصفحة.

5. العناوين:

يكتب العنوان الرئيسي للبحث بخط بارز وسط الصفحة، ويفضل ان يكون شاملا ومختصرا، نوع الخط (Traditional Arabic) و بحجم (15).وأما العناوين الرئيسة داخل البحث فتكتب بحجم (15) وبخط بارز في وسط الصفحة، أما العناوين الثانوية داخل البحث فتكتب بحجم (14) وبخط بارز على يمين الصفحة، مع التأكيد على استخدام طريقة الاعداد (1-1-1)، (1-1-2) في ترتيبها.

6. اسم الباحث:

يتكب اسم الباحث (الباحثين) والقابهم العلمية وعناوين عملهم تحت العنوان الرئيسي للبحث في وسط الصفحة، نوع الخط (Traditional Arabic)،حجم(11).

(انظر المثال الاتي)

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7. الخلاصة:

يكتب الباحث ملخصاً لبحثه ، يوضح فيه باختصار هدف البحث والنتائج وأهم التوصيات على ان لاتزيد كلمات الملخص عن (300) ثلاثمائة كلمة، و تكتب الخلاصة بخط (Traditional Arabic)، حجم(12)، تباعد الأسطر (مفرد)، يجب على الباحث اختيار ما لا يقل عن أربع كلمات دالة ليتم استخدامها كمفاتيح للبحث، تكتب بخط(Traditional Arabic) مائل، حجم(12) في نهاية الخلاصة.

(انظر المثال الآتي)

التجارة الدولية، القانون التجاري، منظمة التجارة الدولية، الدول النامية.

من الضروري ان يكتب الباحث فى نهاية البحث ملخصا للبحث باللغتين الكردية والانكليزية ان كان البحث مكتوبا باللغة العربية،او بالعربية والانكليزية ان كان البحث مكتوبا باللغة الكردية، او بالعربية والكوردية ان كان مكتوبا باللغة الانكليزية.

8. الصور والجداول:

- ترقم جميع الجداول والاشكال التي قد ترد في البحث، وتطبع على اوراق منفصلة، وبواقع جدول في كل صفحة، ويعطى لكل جدول عنوان مختصر يكتب في اعلاه بخط بارز، اما الاشكال التي قد تكون عبارة عن خطوط بيانية او خرائط او صور فتوضع داخل صفحات البحث وترقم، وتعنون بعناوين مختصرة توضع اسفل الشكل.

المصادر العلمية المعتمدة:

*يفضل استخدام الطريقة العلمية في كتابة المصادر، بالنسبة للبحوث العلمية فتكتب كل التفاصيل المتعلقة بالمصادر، وفي حال تجاوز عنوان احد المصادر السطر الواحد، يترك فراغ(1سم) في بداية السطر التالي وترتب المعلومات على النحو التالي :

أ . اسم المؤلف أو المؤلفين .

ب . تاريخ الطبع أو النشر .

جـ . اسم المصدر (كتاب أو بحث) .

د . دار النشر بالنسبة للكتب ، والمجلة بالنسبة للأبحاث العلمية.

وكما هو مبين في الأمثلة الآتية :

- د .عبد المقصود محمد عبد المقصود ،(1423هـ - 2006 م)، دراسة البنية الصرفية في ضوء اللسانيات الوصفية ،ط1، الدار العربية للموسوعات، بيروت.

- أ.د حسام سعيد النعيمي ،(شوال 1423هـ -كانون الثاني 2003 م)،جهود القدماء في دراسة المقطع الصوتي ،مجلة آفاق الثقافة والتراث ،دبي ،السنة العاشرة ،العدد الأربعون ،الصفحات : (65-87).

*أما بالنسبة للبحوث الإنسانية فتكتب مصادرها بالطرق التقليدية المعروفة والمتبعة. وعلى النحو التالي: اسم المؤلف أو المؤلفين، اسم المصدر، رقم الطبعة، مكان الطبع (دار النشر والدولة)، سنة الطبع، رقم الصفحة. وأما إن كان المصدر من أجزاء متعددة فيكتب الجزء بعد اسم المصدر.

*الانترنيت :

في حالة اعتماد الباحث على الانترنيت عليه الرجوع إلى الأبحاث العلمية الخاضعة للتقييم العلمي، والمنشورة على شبكة الانترنيت مثل المجلات الالكترونية والكتب والمراجع العلمية الالكترونية .

9. يحفظ البحث على قرص (CD) ويسلم إلى مجلة جامعة دهوك مع أربع نسخ مطبوعة، إما بشكل مباشر ، أو يرسل عن طريق عنوان المجلة البريدي:

إقليم كردستان – العراق
رئاسة جامعة دهوك
سكرتارية هيئة تحرير مجلة جامعة دهوك
البريد الالكتروني :
Email: jdu@uod.ac.

ملاحظة :تنشر المجلة الأبحاث التي يرتقي تقويمها الى مستوى الأصيل أو القيم فقط.

ڕێنماییێن بەلاڤكرنێ ل گوڤارا (زانكويا دهوك) ێ

گشتی:

پێدڤیە ڤەكولین یا بژارە و سەراپایی بیت و پێشوەخت نەهاتبیتە بەلاڤكرن یان شاندن بۆ چ گوڤارێن دیتر. دیسان پوختەیەك و پێشەكیەك و ڕێبازەكا فەكولینێ یا یەكگرتی و ئەنجام و ژێدەران بخوڤە بگریت، زێدەباری وێ چەندێ كو نابیت هیچ ڤەكولینێن لقێ زانستی ژ(20) لاپەڕان پتربن و ڤەكولینێن لقێ زانستێن مروڤایەتی ژی ژ (25) لاپەڕان پتر بن.

ناڤەروك:

پێدڤیە ڤەكولین ب ڕێنڤیسەكا ئاسایی (نورمال) بهێتە نڤێسین و ب فۆنتێن نڤێسینا كوردی (Ali-k-traditional) قەبارێ (16) بیت. دەربارەی دەسپێكرنا پەرەگرافان ژی ، پێدڤیە ل دەسپێكا هەر پەرەگرافەكی بۆشایەكا پێویست هەبیت .

پەراوێز:

نابیت پەراوێز د ناڤ تێكستیدا بهێنە بكارئینان .هەمی پەراوێز دێ كەڤنە دوماهییا ڤەكولینێ.

بەرهەڤكرنا لاپەری :

پێدڤیە لاپەڕ ژ جورێ (A-4) بیت و بۆشایا ل سەرێ وی و ل بنێ وی (2,5 سم) بن و لایێ ڕاستێ (3 سم) بیت و لایێ چەپێ ژی (2 سم) بیت .

ڕێزبەندیا لاپەڕان:

دەربارەی ڕێزبەندیا لاپەڕان پێویستە ژمارە ل كوژێێ چەپێ یێ بنێ هەر لاپەڕەكی بهێتە دانان .

ناڤونیشان:

ناڤونیشانێن ڤەكولینێ دێ ب خەتێ ()قەبارێ(18) فۆنتێن كوردی قەبارێ (18) ل نیڤا لاپەڕی هێنە نڤێسین ، دیسان ناڤو نیشان و سەرەبابەتێن ژ ناڤدا ژی دێ ب نڤێسینەكا دیار هێنە نڤێسین. هەمی ناڤونیشانێن لاوەكیێن ناڤ ڤەكولینێ دێ بڤی ڕەنگێ ژێری هێنە ژمارەكرن ، یێن سەرەكی(1.، 2.، 3.،..)،یێن لاوەكی ژی (1.1)یێن لاوەكی تر ژی (1.1.1.)وهتد.

ناڤێ ڤەكولەری:

ناڤێ ڤەكولەری پێویستە ب خەتی(Ali-k-traditional)قەبارێ (13) بهێتە نڤێسین و ل نیڤا لاپەڕی ، ب مەرجەكی بكەڤیتە بن ناڤونیشانێن ڤەكولینێ و بۆشایی د ناڤبەرا هەردووكاندا هەبیت ، هەروەسا نەگەهیتە هەردوو لایێن ڕاست و چەپێ یێن لاپەڕی . پاشی د ڕێزا دبندا ناڤونیشانێن زانستی و كاریێن ڤەكولەری ، هەروەكو ڤێ نموونا ژێری بهێنە **توماركرن:**

1- پشكا جوگرافی ، كولیژا ئادابێ ، زانكويا دهوكێ ، عێراق ، هەرێما كوردستانێ ، عێراق .

2- پشكا زانستێ ئاخ و ئاڤێ ، كولیژا چاندنێ ، زانكويا دهوكێ ، عێراق ، هەرێما كوردستانێ ، عێراق .

كورتیا ڤەكولینێ:

پەیڤا (كورتیا ڤەكولینێ) دێ ب خەتەی (Ali-k-traditional) قەباری (15) ل لایێ ڕاستێ یێ لاپەڕی هێتە نڤێسین . نابیت كورتیا ڤەكولینێ ژ (300) پەیڤان تێ بپەڕیت و هەرچار كلیلێن پەیڤان (Key word) دێ كەڤنە بنێ كورتیا ڤەكولینێ و پێدڤیە ب خەتەكێ دیار و لار (Italic) قەبارێ (13) بهێنە نڤێسین. بۆ نموونە:

كلیلێن پەیڤان: زانستێ زمانی ، دەنگسازی ، دەنگسازیا كوردی ، هێز و ئاواز .

دیسان پێدڤیه، ئەگەر ڤەكولین ب چ زمان بوو (كوردی، عەرەبی، ئنگلیزی) كورتیا ڤەكولینێ ب هەردوو زمانێن دیتر ژی د گەلدا بیت. بۆ نموونه: ئەگەر ڤەكولین ب(زمانێ كوردی) بوو، پێویسته كورتیا وێ ب هەردوو زمانێن (عەرەبی و ئنگلیزی) ژی د گەلدا بیت .

وێنه و خشته:

ژبلی خشتا هەمی هێلكاری و نەخشه و وێنه، وەك وێنه دهێنه هژمارتن . پێدڤیه ژمارێن عەرەبی ل سەر هەمی نەخشه و وێنا بهێنه دانان ، دیسان پێدڤیه ئەڤ نەخەشه و وێنه نەهێنه كەرتكرن بۆ لاپەڕەیەكێ دیتر و جهێ وان د ئێك لاپەڕەدا بكەت و نەكەڤنه سەر پەراوێز و هژمارێن لاپەڕان . هەروەسا پێدڤیه ناڤێن وێنه و خشتا د سەر واندا بهێنه نڤێسین ، كو ناڤەراستێ بگریت و ژ ڕێزەكێ و پتر بۆشایی د ناڤبەرا خشته و وێنا و ناڤێن واندا هەبیت . بۆ نموونه :

خشته (1): هندەك زانیاری ل سەر دامەزراندنا كولیژێن زانكویا دهوك

كولیژ	سالا دامەزراندنێ	پشكێن وێ
پزیشكی	1992	نشترگەری ، ..
ئاداب	1994	زمانێ كوردی ، ..

ژێدەر:

پێدڤیه بۆ توماركرنا ژێدەران، ل دەسپێكێ ناڤێ ڤەكولەری بهێته نڤێسین، پاشی سال دناڤبەرا دوو كڤانادا، واته شێوازێ (APA) بهێته پەیڕەوكرن وئەگەر زانیارییێن ژێدەرەكی ژ ڕێزەكێ بورین، وی دەمی درێزا دبندا دێ هێنه تەواوكرن، ب مەرجەكی(1)سم بۆشایی ل سەرێ ڕێزێ بمینیت. ئەگەر ژ ژێدەرەكی پتر یێن ئێك نڤێسەر دڤەكولینێدا هاتنه بكارئینان وی دەمی ، هەمان شێوازێ (APA) دێ هێته بكارئینان ، بەلێ پشتی توماركرنا سالێ دێ بۆ ژیدەرێ ئێكێ(أ) ب ڕەخ سالێڤه هێته نڤێسین و بۆ یێ دوێ(ب) و..هتد .بۆ پتر پێزانینا ل سەر بكارئینانا ژێدەرا چ كتێب بن یان گوڤار و ڕوژنامه و تورا ئەنترنێتێ ..هتد. بەرێ خوبده خالا(References) ژ ڕێنماییێن بەلاڤكرنێ ل گوڤارا زانكویا دهوك ب زمانێ ئنگلیزی .

پێشكێشكرنا ڤەكولینێ:

پێشكێشكرنا ڤەكولینێ بۆ گوڤارێ دێ بڤی ڕەنگی بیت :

1- چار دانەیێن كوپیكری ژ ڤەكولینێ .

2- CD یێ ڤەكولینێ كو تێدا فایلەكا (Microsoft word document Format) هەبیت ڤەكولینێ بخوڤه بگریت و ل سەر ڤی ناڤونیشانێ ل خارێ بهێته پێشكێشكرن بۆ گوڤارێ :

هەرێما كوردستانێ – عێراق
پارێزگەها دهوك
سەروكاتیا زانكویا دهوك
سكرتاریەتا دەستەكا نڤێسەرێن گوڤارا زنكویا دهوك
ژمارا تەلەفونێ : 062-7225259
E-mail:jdu@uod.ac

ئەگەر ڤەكولەر یێ ژ دەرڤەی پارێزگەها دهوكێ بیت د شێت ب ڤی ناڤەنیشانێ ژێری ڤەكولینا خو پێشكێشی گوڤارێ بكەت (www.jdu.uod.ac/Submissions.htm)

تێبینی:- كوڤار بتنێ ئەوان ڤەكولینان بلاڤ دكەت ئەوێن ئاستێ هەلسەنگاندنا وان دگەهیته پلا (رەسەن) یان (بەهادار).

گــوڤارا زانكــویا دهــوك

زانستێن چاندنێ و ڤیتێرنەری

پەربەنــدا 12 خزیران

هژمارا 1 2009

گـوڤـارا زانكويـــا دهـــوك

زانكویـــا دهـــوك
گوڤارەكا زانستێن چاندنێ و ڤیتێرنەری
زانكویا دهوك نیڤ سالانە دەردئێخیت

ناڤـ و نیشان:
هەرێما كوردستانا عیراقێ
پارێزگەها دهوك
سەروكاتیا زانكویا دهوك
سكرتاریەتا گوڤارا زانكویا دهوك
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