Effect of Organic Manure and Harvest Date on Growth and Yield of Onion

(Allium cepa L.)

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Abstract

The experiment was conducted in Agricultural college / Tikrit university , during winter season 2010 using four levels of organic manures (sheep manure) which were (3 , 6 , and 9 ton / dunum) and four harvest dates which were (114 , 128 , 142 and 156 days after planting) .

The experiment was applied using a Randomized Complete Block Design in three replication.

The results showed that the fertilizer in a level (6 ton / dunum) increased significantly plant height, vegetative growth weight, and bulb length. The fertilizer levels were not significant differences among them in other studied characters. The first harvest date increased dry matter percentage of bulbs, whereas the second harvest date increased vegetative growth and double bulb percentage. The forth harvest date increased other studied characters.

According to the interaction , the fertilizer level (6 ton / dunum) at the forth harvest date increased in most studied characters .

Introduction

Onion and its scientific name *Allium cepa* L. belongs to Alliceae which contain more than (250) genus, and about (4200) species. It is one of the most important winter vegetables which must be grown during all days of the year in most of the world countries especially in Iraq. This is because of people consume and also for the high quality since it contains carbohydrate, protein, and a number of vitamins. (Hasan, 1988).

No one know the original space of onion which is not known very well, but it may be in the area between Palestine till India (Matloub et al, 1989).

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Onion can be used either fresh such that used in cooking or in refrigerator. It also may be used as powder. It has a high quality since it is found that every (100 gm) of green onion has (92.5%) water, (1.3%) protein, (0.1%) fat, (4.3%) carbohydrate, (1.5%) sucrose, (0.9%) fibers, and (1%) Ash. In addition, it contain vitamins A, B1, and C (Matloub et al, 1989).

Onion is sown widely in Iraq for its high use as green or dry . It is also sown for producing seeds . The average of its production in Iraq is (8.810 ton/hectare) which is considered very low in comparison with the world average production (17.227 ton/hectare). Thus it is lower than in some countries as Iran , Turkey , and Syria . (FAO , 1998).

Organic fertilizers are considered as a source of organic matter for soil. It may be used as a substitute to the chemical fertilizers because it gives plants food elements for longer period and also increase soil fertility by increasing the activity of soil microorganisms (Belay et al, 2001).

Salman (2000) showed that the improving of plant growth and the increasing of onion crop was abstained by adding organic fertilizers in his experiment where he used three types of organic fertilizers (cow manure , city manure , and chicken manure) in three levels .

Whereas as Sultan (2001) indicated that the addition of organic fertilizers leads to increasing in plant length, fresh weight, dry weight of plant and the total yield of potato.

However , Salih (2001) clarified that the adding of organic fertilizers in to potato plant increased the average of tuber yield in (90%) and also it increases the tuber numbers and weight from (4-5) times .

The harvest date of onion is on of the important treatment because it takes from (4 – 5) months to reach ripe stage using bulb lets. Thus, it must not be hurried in harvest because the size of it increased in the last stages. At the same time, bulbs must not be leaf without harvest because new root will grow again and this may be affected on the harvest (Al-Khafaji and Al-Mukhtar, 1989).

Rodkiewice and Tendaji (1994), analized the effect of both premature and delayed harvest of sets, Wolska and Rawska onion varieties. The plants harvested prematurely did not show any signs of the closing vegetation but the bulbs were

already formed . The second date of harvest fell on the beginning of breaking over of tops with the foliage partial drying . The third harvest date was when the tops were fully broken over and dried down to big extent , while the bulbs were covered with clearly visible dry scale. The third stage gave increasing in the total harvest yield which reached to (35 t/ha) from the latter two harvest dates . For the importance of organic fertilizers in giving the plant some important food elements that it needs and easy to be gotten , and for the importance for harvest date , we must choose better date of harvest in order to get higher crop because the sooner or later of the harvest leads to decrease or harm the crop . Thus , the idea of the present research was to find out the best level of fertilizing with best date of harvest and the interaction between them .

Materials and Methods

The experiment took place in the college of agriculture / Tikrit University , during winter season (2010) in a field which its soil is (sand loam clay) as clarified in table (1).

To study the effect of organic fertilizer level (sheep manure) and the harvest dates on a number of vegetative growth characters, and the yield of onion crop where the white local variety was used. The shape of its bulbs is like ball, white skin. medium size and tart taste which is sown widely for the green crop and its ability for storage is good. (Al–Mohamdy and Al-Meshal, 1989).

The soil was ploughed and divided in to units ($1.5 \times 1.5 \text{ m}^2$). (30) kg of (N) as urea , (30) kg of (P_2O_5) as third super phosphate , and (35) kg of (K_2O) as potassium selphate were added to the soil , and the bulb lets were sown on lines (30) cm between lines (10) cm between plants . (Al – Khafaji and Al – Mukhtar , 1989).

The experiment was organized in a Randomized Complete Block Design (R. C. B. D.) in three replications in the field of the experimental unit . The mean was compared using Duncan's test significant range in a significant level (5%). The (SAS 2002) program was used in static analysis of data.

The study contained two factors :

1) Organic Fertilizers (Sheep manure) in four levels :

a-Control (without Fertilizer).

b-Fertilizer of (3 ton / dunum).

c- Fertilizer of (6 ton / dunum) .

d-Fertilizer of (9 ton / dunum).

2)Harvest Dates :

a-After (114) days from planting.

b-After (128) days from planting.

c- After (142) days from planting.

d-After (156) days from planting.

The bulb lets were planted in 25/1/2010 in the field . Irrigation and cultivation treatment was carried out as it was done in onion field (Matloub et all , 1989). Then . the measures were taken in average of (5) plants of experimental unit .

The following measures were carried out :

plant height (cm). 2)Leaf numbers (leaf / plant). 3)Vegetative growth weight (gm). 4) Dry matter percentage (%). 5) Flowering bulb percentage (%). 6) Double bulb percentage (%). 7) Bulb length (cm). 8) Bulb diameter (cm). 9) Bulb size (mm³). 10) Bulb weight (gm). 11) Bulb dry matter percentage (%). 12) Total yield (ton/hectare).

Characters	Sand	Silt	Clay	Texture	рН	N	Р	К	E.C.	0.M.
	Gm/kg ⁻¹	Gm/kg ⁻¹	Gm/kg ⁻¹			РРМ	РРМ	ΡΡΜ	Ms/cm	Gm/kg ⁻¹
value	600	270	180	S.L.C.	7.54	30.3	5.06	25	4.01	5.5

Results and Discussion

Table (2) shows that the treatment of fertilizers in level (6 ton / dunum) increased significantly : the plant height , and plant vegetative growth weight . It gave increment in the plant height of (12.98%), (4.88%), and (10.12%) percentage

compared to fertilizer treatments in levels (3 and 9 ton / dunum) successively. It also gave increment in plant vegetative growth weight of (30.17%), (8.08%), and (22.12%) compared to the least and fertilizer treatment in levels (3 and 9 ton / dunum) successively. Whereas the control treatment. gave less value for plant height and plant vegetative growth weight reached to (57.22cm), and (85.71 gm) successively. There was no significant difference among treatments in other studied vegetative growth characters.

Characters Treatment	plant height (cm)	Leaf numbers (leaf / plant)	Vegetative growth weight (gm)	Dry matter percentage (%)	Flowering bulb percentage (%)
Control	57.22 c	14.93 a	85.71 b	16.25 a	1.95 a
3 ton/dunum	61.64 bc	14.63 a	103.22 ab	17.77 a	1.58 a
6 ton/dunum	64.65 a	13.89 a	111.57 a	16.62 a	1.22 a
9 ton/dunum	58.66 bc	13.54 a	91.36 ab	17.07 a	1.81 a

Table (2) Effect of Manure Fertilizers on some Vegetative Growth Characters of onion

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

Table (3) indicates there was no significant difference among treatments in all the studied characters of yield except the character of bulb length . The fertilizer treatment in level (6 ton / dunum) appeared a significant increment for this character . It gave the highest value which is (5.96 cm) . It had no significant difference with the other levels . Whereas , the control treatment had less value which was (5.52 cm) . It also had no significant difference with fertilizer treatment which is (9 ton / dunum) . The reason behind the increment of organic fertilizer treatment in some vegetative growth and yield characters may be that the addition of organic fertilizer leaded to the increment of growth and yield characters because there is a relationship in improving the feed treatment in the root radius from the feed elements , the improvement of soil structure and the increment of some benefit lives in the soil which leads to the improvement of growth and yield character . (Gupta and Rathore , 1995)

Characters	Double bulb	Bulb	Bulb	Bulb size	Bulb dry	Bulb	Total
	percentage	length	diameter	<i>(</i> 3)	matter	weight	yield
	(%)		(cm)	(mm [°])	percentage		(ton/hec
Treatment		(cm)			(%)	(gm)	tare)
Control	43.75 a	5.52 b	5.24 a	83.17 a	15.82 a	83.21 a	7.31 a
3 ton/dunum	38.50 a	5.87 a	5.52 a	93 53 a	15.97 a	94.54 a	8.31 a
6 ton/dunum	39.25 a	5.96 a	5.55 a	95.35 a	15.79 a	97.36 a	8.56 a
9 ton/dunum	42.00 a	5.77 ab	5.55 a	91.01 a	16.18 a	93.23 a	8.19 a

Table (3) Effect of Manure Fertilizers on some Yield Characters of onion

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

Table (4) indicates that the date of harvest had significant difference in : Plant height and leaf numbers . The second date of harvest increased vegetative growth weight and gave the highest value which was (124.36 gm) . The forth date of harvest gave less value of this character which was (87.31 gm) but was non significant difference from the first and third dates . According to the dry matter percentage of the vegetative growth , the first date of harvest gave more than second , third and forth dates which were (179.06%),(172.12%) and (144.83%) successively.

Characters	plant height	Leaf numbers	Vegetative	Dry matter
	<i>.</i> .	(leaf / plant)	growth weight	percentage
Treatment	(cm)		(gm)	(%)
First harvest date	57.87 a	12.87 a	87.61 b	31.73 a
Second harvest date	60.87 a	14.42 a	124.36 a	11.37 b
Third harvest date	61.71 a	14.84 a	92.56 b	11.66 b
Forth harvest date	61.71 a	15.26 a	87.31 b	12.96 b

Table (4) Effect of Harvest Dates on some Vegetative Growth Characters of onion

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

It is obvious from table (5) that the forth harvest date gave significantly increases in all studied yield characters except double bulb percentage, but it wasn't significant difference compared with the third date in the dry weight percentage of bulbs. Whereas, the first date gave less values in all studied yield characters. The second date gave the highest value of double bulb percentage which was (52.83%). But had no significant difference compared to the third and forth harvest date.

Whereas the first date gave less value of this character which was (16.17%) which considers unwanted character. Thus, the first date is the best one in this character. Why was the forth date gave preferred in most of the yield character? This is because the food in bulbs moves quickly from the vegetative growth to the leaf base and this helps in growing the bulb size and increasing the crop. (Matloub et al, 1989).

Characters	Double	Bulb	Bulb	Bulb size	Bulb dry	Bulb	Total
	bulb	length	diameter	4 3 5	matter	weight	yield
-	percentage		(cm)	(mm [°])	percentage		(ton/he
Treatment	(%)	(cm)			(%)	(gm)	ctare)
First harvest date	16.17 b	4.90 c	3.35 d	26.38 d	12.41 c	28.45 d	2.49 d
Second harvest date	52.83 a	5.88 b	5.45 c	82.31 c	15.12 b	82.31 c	7.23 c
Third harvest date	42.67 a	5.99 b	6.17 b	105.38 b	17.65 a	108.15 b	9.51 b
Forth harvest date	51.83 a	6.35 a	6.89 a	149.00 a	18.59 a	149.44 a	13.14 a

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

Table (6) indicates that the fertilizer level (6 ton / dunum) for the second , third and forth harvest dates increased significantly in plant height . It had no significant difference with the other two levels of all harvest dates . Whereas the control treatment of the forth harvest dates gave less value in this character which was (57.22 cm) . It also had no significant difference with the two levels (3 and 6 ton / dunum) for all harvest dates and also with fertilizers level (6 ton / dunum) of the first date . The table also indicates that there was no significant difference in leaf numbers among treatments .

The same table indicates that the fertilizers using (6 ton / dunum) of the second harvest date gave the highest value in vegetative weight (155. 16 gm) give it this significant increment in all other treatments that has no significant difference with the comparative treatment of the second harvest date and fertilizer treatment in the level (3 ton / dunum) of the second and third harvest dates , fertilizer treatment in level (6 ton / dunum) of the forth harvest date , and fertilizer treatment in level (9 ton / dunum) of the second harvest date . Whereas , fertilizer treatment using (9 ton / dunum) of the forth harvest date gave less value of this character which was (72.23 gm). It had no significant difference

with the control treatment and using fertilizer (3 and 9 ton / dunum) of the forth harvest dates and fertilizer level (6 ton / dunum) of the first harvest date .

The table indicates that using fertilizer level (3 ton / dunum) of the first harvest date increased significantly in dry matter percentage of the vegetative growth which had no significant difference compared with the control treatment and the two other levels of fertilizers for the first harvest date of this character . Whereas , fertilizer treatment in level (6 ton / dunum) for the second harvest date gave less value of this character was (10.74%) which had no significant difference compared with the control treatment and fertilizer treatments in all its levels of the second , third and forth harvest dates .

Cha	racters	plant height	Leaf numbers	Vegetative growth	Dry matter percentage	
		(cm)	(leaf / plant)	weight (gm)	(%)	
		(cm)			(70)	
Treatr	nent					
	Control	57.22 b	12.44 a	78.18 b	29.01 a	
First harvest date	3 ton/donum	58.26 ab	13.08 a	98.95 b	34.28 a	
	6 ton/dunum	57.35 b	11.94 a	90.11 b	31.52 a	
	9 ton/dunum	58.66 ab	12.44 a	83.20 b	32.11 a	
	Control	57.22 b	15.76 a	104.40 ab	11.32 b	
Second harvest date	3 ton/dunum	60.54 ab	14.19 a	118.21 ab	11.78 b	
	6 ton/dunum	67.08 a	13.83 a	155.16 a	10.74 b	
	9 ton/dunum	58.66 ab	13.91 a	119.67 ab	11.63 b	
	Control	57.22 b	15.76 a	79.88 b	11.64 b	
Third harvest date	3 ton/dunum	63 88 ab	15.55 a	107.02 ab	12.41 b	
	6 ton/dunum	67.08 a	14.13 a	93.02 b	11.38 b	
	9 ton/dunum	58.66 ab	13.91 a	90.31 b	11.21b	
	Control	57.22 b	15.76 a	80.36 b	13.03 b	
Forth harvest date	3 ton/dunum	63.88 ab	15.72 a	88.68 b	12.63 b	
	6 ton/dunum	67.08 a	15.66 a	107.98 ab	12.85 b	
	9 ton/dunum	58.66 ab	13.91 a	72.23 b	13.32 b	

Table (6) Effect of Manure Fertilizers and Harvest Dates on some Vegetative Growth Characters of onion

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

Table (7) indicates that the control treatment for the second harvest date gave highest value of double bulb percentage which was (63.67%). It was not significant difference from the control treatment of the third and forth harvest dates, and with fertilizer levels (3 and 6 ton / dunum) of the second, third, and forth harvest date. The fertilizer level of the first harvest date (3 ton / dunum) gave two values of this character. It had no significant difference with the control treatment of the first and forth harvest dates and with the fertilizer level (3 ton / dunum) of the third harvest date , (6 ton / dunum) of the first and second harvest dates , and with the fertilizer level (9 ton / dunum) of the first three harvest dates . From the same table , we can see that the level (6 ton / dunum) of the forth harvest date increased significantly in bulb height, bulb size, bulb diameter, dry matter percentage of the bulb, bulb weight and the yield. It gave the highest values for these character which were (6.51 cm), (170.55), (7.37 cm), (19.34%), (173.85 gm) and (15.29 ton / dunum) successively which had no significant difference with the control treatment of the forth harvest date using the fertilizer level (3 ton / dunum) of the second, third and forth harvest dates and the fertilizer level (6 ton / dunum) of the second and third harvest dates and the fertilizer level (9 ton / dunum) of the second, third and forth harvest dates in bulb length.

Also , It had no significant differences with both fertilizer levels (3 and 9 ton / dunum) of the forth harvest date in the bulb size character which was not different significantly with the control treatment and fertilizer levels (3 and 9 ton / dunum) of the forth harvest date of the bulb diameter character . Also , there was no significant difference of control with the comparative treatment using fertilizer levels (3 and 9 ton / dunum) of the third and forth harvest dates and the using fertilizer level (6 ton / dunum) of the third harvest date in dry matter percentage of the bulb . It was not difference significantly with both fertilizer levels (3 and 9 ton / dunum) of the forth harvest date in bulb weight and the yield . Whereas the control treatment of the first harvest date gave less value of bulb length , size , diameter , weight and yield . It had no significant difference with all fertilizer treatment of the first harvest date gave less value of bulb dry matter percentage which had no significant difference with the control treatment (3 ton / dunum) of the first harvest date gave less value of bulb dry matter percentage which had no significant difference with the control treatment and two other fertilizer levels of the first harvest date .

Cha	iracters	Double	Bulb	Bulb	Bulb size	Bulb dry	Bulb	Total yield
		bulb	length	diameter		matter	weight	ton/hectare
		percentage		(cm)	(mm³)	percentage		
-		(%)	(cm)			(%)	(gm)	
Treath	nent							
	Control	15.00 bc	4.58 f	2.88 f	21.44 f	12.92 efg	20,19 f	1.77 f
First harvest	3 ton/donum	0.00 c	4.98 ef	3.48 f	29.71 f	11.20 g	31.72 f	2.78 f
date								
	6 ton/dunum	11.00 bc	4.89 f	3.31 f	25.33 f	12.15 fg	27.06 f	2.37 f
	- ••							
	9 ton/dunum	38.67 abc	5.15 def	3.75 f	29.05 f	13.38 efg	34.84 f	3.06 f
	Control	63 67 -	E EE ada	F 00 -	74.22.4	15 04 h ada	60.24	C 00 -
	Control	63.67 a	5.55 cae	5.09 e	71.22 e	15.94 bcde	69.31 e	6.09 e
Second	3 ton/dunum	55.00 ab	5.88 abc	5.45 de	85.06 de	14.91 cdef	83.14 de	7.31 de
harvest date	• •••••, •••••		0.00 0.00					
	6 ton/dunum	44.00 abc	6.21 ab	5.70 de	92.67 de	14.40 def	93.94 de	8.26 de
	9 ton/dunum	48.67 abc	5.87 abc	5.58 de	80.30 de	15.23 cdef	82.86 de	7.28 de
	Control	53.33 ab	5.71 bcd	6.34 bcd	106.00 cd	16.80 abcd	109.99 cd	9.67 cd
Third baryost	2 ton /dunum	20 C7 aba	C 17 ab	C 2C had	114 44 had	10.00 ab	447.75	10.25 had
date	3 ton/dunum	39.67 abc	6.17 ab	6.36 DCa	114.44 DCa	18.88 ap	11/./5	10.35 bca
uate							bca	
	6 ton/dunum	50.00 ab	6.22 ab	5.83 cde	92.86 de	17.29 abcd	94.62 de	8.32 de
	· · · · · ·							
	9 ton/dunum	27.67 abc	5.87 abc	6.14 bcd	108.05 cd	17.63 abc	110.25 cd	9.69 cd
	Control	43.00 abc	6.24 ab	6.64 abc	133.89 bc	17.64 abc	133.37 bc	11.73 bc
_								
Forth	3 ton/dunum	59.33 ab	6.46 a	6.81 ab	144.92 ab	18.89 ab	145.59 ab	12.80 ab
narvest date	C ton /dunum	52.00 ab	6 51 0	7 27 0	170 55 6	10.24 a	172.05 -	15.20 a
	e ton/aunum	52.00 ab	6.51 a	7.37 a	170.55 a	19.34 a	173.85 a	15.29 a
	9 ton/dunum	53.00 ab	6.20 ab	6.73 abc	146.66 ab	18.48 ab	144.98 ab	12.75 ab
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Table (7) Effect of Organic Manure and Harvest Dates on some yield Characters of onion

*The used values of the same letter to each character which aren't different significantly to Duncan test of different borders in level (5%)

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تأثير السماد العضوي و موعد الجني على نمو و حاصل البصل الأخضر (Allium cepa L.) غسان جايد زيدان قسم البستنة وهندسة الحدائق / كلية الزراعة / جامعة تكريت

الخلاصة

نفذت تجربة حقلية في كلية الزراعة / جامعة تكريت خلال الموسم 2010 لدراسة أربعة مستويات من التسميد العضوي (مخلفات الأغنام) هي (بدون و 3 طن و 6 طن و 9 طن / دونم) و أربعة مواعيد جني بعد (114 و 128 و 142 و 156 يوماً من الزراعة) .

صممت تجربة عاملية وفق تصميم تصميم القطاعات العشوائية الكاملة و بثلاثة مكررات ، بينت النتائج ان التسميد بمستوى (6 طن / دونم) قد تفوق معنوياً في كل من صفة طول النبات و وزن النمو الخضري و طول الرأس و لم تختلف مستويات التسميد فيما بينها في باقي الصفات المدروسة ، و لقد تفوق موعد الجني الأول في صفة النسبة المئوية للمادة الجافة للرؤوس فيما تفوق موعد الجني الثاني في صفة الوزن الخضري و صفة الأبصال المزدوجة فيما تفوق موعد الجني الرابع في باق الصفات المدروسة ، و بالنسبة للتداخل فقد تفوق مستوى التسميد (6 طن / دونم) لموعد الجني الرابع في الق الصفات المدروسة .