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Effects of Organic and Nitrogen Fertilizer on Number of Leaves, Length of Leaves and Yields of Onion (*Allium cepa* L.) Var. Baftaim in Khartoum State.

A dissertation submitted to Sudan University of Science and Technology in partial fulfillment of the requirements of the degree of B.Sc. Honours in Horticulture

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الآية

قال تعالى:

(يَا أَيُّهَا الَّذِينَ آمَنُوا اتَّقُوا اللَّهَ وَلْتَنْظُرْ نَفْسٌ مَّا
قَدَّمَتْ لِغَدٍ وَاتَّقُوا اللَّهَ إِنَّ اللَّهَ خَبِيرٌ بِمَا تَعْمَلُونَ)

صدق الله العظيم

سورة الحشر الآية (18)

Dedication

*Can we thank the sun because it lit the minimum?????
But I will try to ask you're beautiful to be as you wish me.....*

*If I had in life, I would give it to you for your gift in the
heavens.*

*To those who rock the rock and shake the mountains... I do not
have the right to run.*

*O you who grew up to all and grew up, I will keep you Happy
with the age of short meet...*

To my father

*I know you do not wait for the return of the favor because you
are valuable in giving and if this is removed from the whole
world I will be engraved in my heart because it is taken from
you...*

To my mother

*Dear brothers and sister (Amjad-Ahmed-Osama-Azza) I
wish you a life full of happiness*

To whom did you have my life? They have a self-pulse.

They are my mind, my soul and all my gifts...

(S.A.M.K.E.F.A.H.O.N.Y.A.T)

To the spirit of my free precious (Mzamel Jibril)

*By your departure I burned my eyes and burned and my heart
was crying, they heard my miracles and my mother's kill me
every moment and the universe witnesses the myth of the
mothers...*

Acknowledgement

First of all, I render my gratitude and praise to the Almighty Allah (S B T).

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الخلاصة

أجريت التجربة في الحقل الإيضاحي لقسم البساتين (حقل الخضر) بكلية الدراسات الزراعية، شمبات، خلال الفترة من فبراير- يونيو 2017. نفذت التجربة باستخدام تصميم المربع اللاتيني والصنف المستخدم من البصل هو الصنف بافطيم والمعاملات المستخدمة في التجربة هي:-

Control (T₀)

2kg Compost(T₁)

50g Urea (T₂)

1kg:25g Compost +Urea(T₃)

زرعت البذور في مشتل الفنطاط ونقلت للحقل في 2017/2/4، تمت زراعة الشتلات في الحقل في تاريخ 2017/2/5. أضيف السماد علي جرعتين الأولى بعد شهر من الزراعة والثانية بعد شهر من الجرعة الأولى، جمعت البيانات عن عدد وطول الأوراق والإنتاجية من عدد 3 نباتات تم اختيارها عشوائيا من كل حوض بعد 5 أشهر من الزراعة.

أوضحت النتائج وجود فروقات معنوية في عدد الأوراق والإنتاجية باستخدام الأسمدة حيث نجد أن استخدام المعاملة Compost +Urea (T₃) هي أفضل معاملة.

كما أن النتائج قد أوضحت عدم وجود فروقات معنوية في طول الأوراق عند استخدام الأسمدة، لذلك يوصي بتوفير مياه الري اللازمة والانتظام في الري مع تجويد العمليات الفلاحية واختيار نوع التربة المناسبة للزراعة.

CHAPTER ONE

INTRODUCTION

Onion (*Allium cepa L.*) is major a vegetable crop in since the earliest records of history.

It is grown almost in all parts of the world, top ten Onion producing countries in 2008 were China, India , Australia, United stat, Pakistan ,Turkey ,Iran, Russia, Egypt and Brazil. World total production in 2008 was 72,348,213 metric tons. (FAO 2010)

Onion in Sudan is the most important vegetable crop .It ranks first with regard to area and quantities produced , It is grows in several stat in the Sudan i.e River Nile , Gazira , Northern Darfure , Khartoum , Western Darfure , Kassala sennar and small area in the other stat . Most of Onion production is consumed locally and only negligible portion of the crop is dehydrated or exported as afresh crop. However, Onion is expected to be one of the most important exportable horticultural crops to the nigh boring African countries, gulf area, Europe and Asia. Sudan Onion is mainly grown during the winter season.

Organic agriculture in defined a holistic production system which promotes and enhances agro-ecosystem health , including biological cycles and soil biological activity it emphasizes the use of management practices in preferences to use ,of off-farm inputs taking into account that regional conditions require locally system.

In recent years there is an increasing importance of the need to develop organic agriculture as a dynamic system taken from nature and does not depend on chemical inputs that limits the increase of environmental pollution and progressively improve agricultural condition in the long

term .Most countries o world promote organic farming In techniques in government policies (Abdalla2004).

Objectives:

The objectives of this study are:

To study the effects of Organic and Nitrogen fertilizer on Number of leaves, Length of leaves and yields of Onion (*Allium cepa* L.) var. Baftaim in Khartoum State.

CHAPTER TWO

LITERATURE REVIEW

Onion (*Allium cepa L.*), is a monocotyledons biennial plant. The genus *Allium* belongs to the family Alliaceae. It is native to Asia and it is believed to have originated in an area which includes Iran, West Pakistan, in Sudan it is the top vegetable in terms of consumption.

Botany:

Onion is by far the most popular and widely grown crop from genus in the Sudan and is important in daily diet .In Onion the flowers occur in groups called umbels. The fruit of this family is either a capsule or berry. The Onion is characterized by a pungent . Alliaceae compound leaves are slightly too markedly flatten on the upper surface. The bulb is made up o thick end bases of leaves attached to a small conical stem . The flowers are quite distinct , are usually greenish white in color, the print open widely , the stamens which are insect pollinated and there is probably frequent crosspollination among the flowers of the same umbel.

Growth requirement:

Onion can be grown under a wide range of climatic condition ,but the crop succeed in a mild climate without excessive rainfall or great extremes of heat and cold , cool condition with a adequate moisture supply are most suitable for early growth , followed by warn drier condition for maturation , harvesting and curing.

The soil:

Onion cans growth on different types of soils, light and heavy soils texture, rich of organic matter.

Crop nutrition:

There is great need for various nutrients to maximize vegetative growth, yield, and quality are storable .Fertilizer play ,pivotal role in crop production.

Application of nutrients is directly linked to the yield .The deficiency of major and micronutrient in soil is the most important factor responsible for lower productivity of Onion.

In Sudan fertilizers are normally imported .However ,the amounts utilized are very low when compared to other parts of the world , Indeed in rain field farming areas ,whether mechanized or traditional fertilizer are rarely used .The mean annual fertilizer use of N,PO₄ and K₂O is very low .

In Sudan the commonly only by nitrogen fertilizer specifically Urea .There is lack of information about crop requirement for other nutrient elements in spite of the fact that soil in the production areas intensively cultivated and in most cases rotation are rarely practiced.

Onion production:

The season of Onion production in Sudan practices vary considerably according to localities and climate .But in all Onion is grown by rising the seedling in nurseries then transplanting then in the field .Direct seeding is rarely practiced .In early planting at Gezira stat usually open nurseries are raised during July and August .The seeding are transplanted in ridges or flat beds after two months (September –October) .The harvesting period of early crop extend from November to April. The early crop is used without curing for immediate consumption due to the shortage of supply of Onion in the markets, The late crop is transplanted from December to February and bulbs are harvested in May and June .Bulbs from the late crop are allowed to mature and a large proportion of this crop is packed

arranged in one layer rows in the open areas as in Gazira (Fadassi....griat greeb).

Quintet of Seed:

(2-3kg) from good seed (4.5-7 pond) for nursery growth/Fadden.

Field cultivation:

A) Could be planted in plots (light soil) on rows 20^{cm} between the rows and 5-10^{cm} between the plant.

B) Could be planted in ridges 60cm· 70cm and 80cm on 3 ,4 and 5 rows.

Irritation in onion:

1. The first irrigating in first transplanting phase and directly after spraying the pesticide in grass.
2. The 2nd irrigating right after two-three day from the first irrigation even if the soil was wet.
3. The 3rd right after 27 day from the first One.

*Then after that irrigating every (7-10) day depending on weather and the soil conditions.

Timing of harvest:

Timing of harvest is important for number of reasons .However ,in areas where it is relatively wet ,bulb are lifted slightly earlier to avoid re rooting. Delayed harvesting may also result in reduction in subequent skin quality. Increased sprouting and rooting ,and reduction in hardness .In area of dry soil and dry climate ,such as the Sudan , re -rooting is far less of a problem and so bulbs are often left in the ground.

Drying:

Drying and curing often take simultaneously in the tropic local practices in drying technique very considerably option including natural drying in the field.

Storage:

Cooking onion and sweet Onion are better stored at room temperature, optimally in a single layer ,in mesh bags in a dry ,cool, dark, well-ventilated location .In this environment cooking Onion hare a shelf life of Three to Four weeks ,cooking Onion will absorb odors from apples and pears .Also they draw moisture from vegetables with which they are stored which may cause them to decay.

Sweet Onion have a greater water and sugar content then cooking Onion this makes them sweet and milder tasting but reduces their shelf life. Sweet Onions can be stored refrigerated condition .They have a shelf life of around one month .Irrespective of type .Any cut pieces of Onion are best tightly wrapped, stored away from other produce and used within two to three days.

Insect:

- Thrips
- Cut worm

Diseases:

- Onion Yellow Dwarf Virus Diseases
- Pink Root Rot.
- Classification according pungent to pungency

There is a direct correlation between the degree of pungent, storage, capacity and dry matter ratio:

1. Non-pungent varieties (Texas Yellow gran-Zalingi).
2. Medium-pungent varieties (Thambko)
3. Pungent varieties (Saggai- Kamleen –Elhilo- Abu-Freaiwa-Baftaim S).

Onion varieties in Sudan:

Approved varieties are:

- Red (Baftaim S, Abu-freiwa, Saggai improved)
- Yellow (Kamlen).
- White (Elhilo).

Approved varieties in Sudan:

1/SAGGAI IMPROVED:

Approved in 1987 by Agricultural Research Corporation (ARC) Variety Release Committee. Characterized by: Big size, Crimson red color, highest productivity, Dry matter content less than 15%, Good storage capacity and it need 142 day to mature.

Kamleen:

Approved in 1987 by Agricultural Research Corporation (ARC) Variety Release Committee. Characterized by: Highest productivity of Saggai, Dry matter content about 15% and it is early maturity in 4-5 month.

Al-Helo:

Approved in 1987 by Agricultural Research Corporation (ARC) Variety Research. Characterized by: Highest productivity of Saggai and Kamlen, Dry matter content about 18% and it is fastest mature.

Baftaim S:

Candidate from ymen .Characterized by :It free of phenomena early bolters and doubles, Dry matter content bout 16%.It take 153 day to mature and it's the most productive varieties in Sudan. (Mohammed Ali 2009).

***Abu freaiwa:**

Its local variety spread significantly in the last ten years in Sudan of many advantages: Early maturity, High dry matter content 24%, pungent good storage.

Organic farming:

It is the form of agriculture that relies on crop rotation, green manure, compost biological pest control and mechanical cultivation etc... to maintain soil productivity and control past's .Excluding the use of synthetic fertilizer, pesticides and plant growth regulators.

Definitions:

- Organic Agriculture is more than a system of production that includes or excludes certain inputs.
- It is a whole system approach based upon sat of processes
- It results in a sustainable ecosystem for safe food, good nutrition animal welfare and social justice

Why organic farming

- Growing consumers awareness to safe food
- Environ net friendly.
- Higher economic returns compared to conventional products.
- Increase in number of control bodies working on Organic products
- The sustainability of both agriculture and the environment is key policy of today's common Agricultural policy (CAP).

Organic Farming Concepts:

- Supports and strengthens biological processes without using chemical control and synthetic fertilizers.
- Adheres to legally defined standards and norms of production processing and labeling.
- Covers economic and social aspects of Agricultural production locally as well as globally.

Organic agriculture requirements:

- Existence of production standards.
- Certification procedures
- Detailed regulations governing the production, importing, marketing, and labeling of organic products.

General objectives of organic agriculture:

- Promote large blooms and fruits.
- Condition soil.
- Build plant hardiness and resistance to disease, pests and drought.
- Promote root growth in transplants and seedling.

- Add balance of main macro-nutrients (nitrogen, phosphorus, potassium, calcium, magnesium and sulfur) plus important micronutrients.
- Winterize plants.
- Enhance composting process.
- Sind sandy soil.
- Loosen clay soil.

Organic fertilizers:

- Natural and organic fertilizers differ from chemicals in that they feed your plants while building the soil.
- Soils with lots of organic material remain loose and airy ,hold more moisture and nutrients ,foster growth of soil organisms. And promote healthier plant root development.
- If only chemicals are added the soil gradually loses its organic matter and macrobiotic activity .soil structure deteriorates becoming compact ,lifeless and less able in hold water and nutrients.

Compost:

- Organic matter improves the drainage and aeration of clay soil
- Compost has limited plant nutrients.
- Composting helps sandy soil hold water and nutrients .
- Compost holds moisture "like a sponge" and releases fertilizer nutrients slowly.
- Increases the activity of earthworms and other natural soil organisms beneficial to plant growth.

Requirement for compost:

The breakdown of organic yard wastes is biological processes depend on microorganism activity. Like most living things, these microbes require:

- Favorable temperatures.
- Moisture.
- Oxygen.
- Nutrients.

Adequate fertilizer is one of the potential agronomic practices for boosting crop production .The improvement of growth and yield of Onion crop is associated with physiological processes in the plant for which nitrogen is a limiting factor for obtaining optimum yield than any other elements. Many researchers have investigated the effect of nitrogen on vegetative growth of Onion plant.

Hassan and Ayoub 1997 in Sudan Gezira studied the effect of N ,P and K on yield of Onion .They found that nitrogen fertilizer gave highly significant increases in total yield ,average bulb size ,doubles and decreased bolting compared with other element of P and K .Also, nitrogen fertilizer increased the yield when application was before irrigation.

Osama and Ali 1991 in Kassala and Nouria 1992 under Shambat conditions ,studied different levels of nitrogen on the yield and quality of Onion .They found that nitrogen fertilizer increased total yield and marketable yield when used nitrogen in the farm of Urea. Also, under the same conditions heirs, (2000) used Three levels of nitrogen fertilizer (0.120 and 240kg N/H) on Onion. His results indicated that application of nitrogen at the rate of 120 kg significantly increased vegetative growth,

bulb size, total and marketable yield. Bolting percentage decreased with increase of nitrogen dose while doubling incidence increased.

Madan and Sandhu in Pakistan 1985 studied the effect of application of N, P₂O₅ and K₂O at 120, 60 and 60kg/Ha. On growth and yield of Onion plants, they found that excellent plant growth and maximum bulb and dry matter yield were obtained at three doses compared with the control.

Patel and Vachhani 1994 found that yield of Onion increased with the rate of N and P, but did not differ significantly with K fertilizer application.

Singh and Mohanty 1998 concluded that combined application of N and P at higher rates produced excellent performance. They recommended rate for commercial Onion production at 160,80 and 60kg of N,K₂O and P₂O₅/ha. Singh *et al* (2000) concluded that Onion productivity could be enhanced considerably by application of 100,30.8 and 83 kg of N,P and K.

Ayoub *et al* 1999 in Faisalabad studied the effect of seven different combinations of N, P₂O₅ and K₂O on yield of Onion. Their results revealed that all combinations gave significantly higher yield compared to the control. Although maximum yield was obtained with the application of N,P₂O₅ and K₂O at 85,50 and 150 kg /ha, half dose gave yield very close to above treatment. However, very little or no response was observed with varying doses of potash beyond 15kg/ha.

CHAPTER THREE

MATERIALS AND METHODS

Field experiments were carried out during winter season of 2017 at the Experimental Farm of the College Agricultural Studies Sudan University of Sciences and Technology at Shambat Khartoum North (15-4 N ,32-23E) 280 M above sea level.

Plant material:

Seedling of the Onion Variety Baftaim was obtained from Al-Fantaz nursery

In 4/2/2017.

Assignment of treatments:

The experiment was conducted using Latin Square Design with the four treatments

A) Control (T₀).

B) Compost "Quick Green" (T₁) 2 kg/4^m.

C) Urea (T₂) 50 g/4^m.

D) Compost "Quick Green" 1kg+ 25g Urea (T₃).

Fertilizers application:

The fertilizer was applied in tow equal doses. The dose 30 days after planting and the second dose 30 days after the first one.

Cultural practices:

The seedling were sown on ridges 70^{cm} (N-S).Four rows in the ridges and spacing of 10^{cm} between the seedlings.

The sowing date was 5/2/2017 and the plots were irrigated on the same day after transplanting and the 2nd irrigating after 4 days from the first. After that every 7 days.

Weed control was done every week and the herbicide Stomp was applied in the same day after planting, the plant was sprayed with karate against Thrips.

CHAPTER FOUR

RESULTS

Vegetative growth parameters of Onion plant as affected by Urea and Compost fertilization.

Table 1. Mean and Total (Σ) of length of leaves, number of leaves, yield/plant of Onion:

Treatment	Mean no of leave	Mean length of leave	Mean of yield g/f
Control (t0)	8.5	33.8	38.5
Compost(t1)	7.8	37.5	48.5
Urea (t2)	8.3	37.3	45
Compost+urea(t3)	8.8	37	53
ΣY	133	582	740
C.V%	6.6%	14.7%	9.9%
SE \pm	0.2	1.3	1.2
LSD	0.2	3.4	11

Show the mean and Total (Σ) of length of leaves, number of leaves, yield /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month ,C.V And LSD.

Number of leaves/plant:

Table 1 and Fig 1 show the number of leaves per plant at 5 month after planting .Statistical analysis indicated that there was significant difference among the treatment, culms and rows in the number of leaves per plant. (Also there was significant difference among the three levels of the fertilizer.)

Table 2. ANOVA For Number of Leaves

S.O.V	DF	SS	MS	F Calculated	F5%	F1% Tablets
Total	15	33.4				
Treatment	3	2.2	0.7	7*		
Row	3	12.2	4.1	41**	4.53	9.15
Culms	3	17.5	5.8	58**		
Error	6	5.9	0.1			

Show the analysis of variance (ANOVA TABLE) to Number of leaves/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month.

Table 1 and Fig 2 show Length leave per plant at 5 month after planting. Statistical analysis indicated that there was no significant difference among the treatment, culms and rows in Length leave. (Also there was no significant difference among the three levels of the fertilizer.)

Table 3. ANOVA For Length of leave:

S.O.V	DF	SS	MS	F Calculated	F5%	F1% Tablets
Total	15	297.7				
Treatment	3	37.2	12.4	0.44		
Row	3	58.7	19.6	0.69	4.53	9.15
Culms	3	105.2	35.1	1.23		
Error	6	171	28.5			

Show the analysis of variance (ANOVA TABLE) to Length of leave/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month.

Table 3 and fig 3 show yield per plant at 5 month after planting. Statistical analysis indicated that there were significant differences among the treatment, culms and rows in the yield. (Also there was significant difference among the three levels of the fertilizer).

Table 4. ANOVA For Yield:

S.O.V	DF	SS	MS	F Calculated	F5%	F1% Tablets
Total	15	34869.8				
Treatment	3	34820.8	11606.9	558**		
Row	3	34240.8	11413.6	548.7**	4.53	9.15
Culms	3	34316.8	11438.9	549.9**		
Error	6	125	20.8			

Show the analysis of variance (ANOVA TABLE) to yield/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month

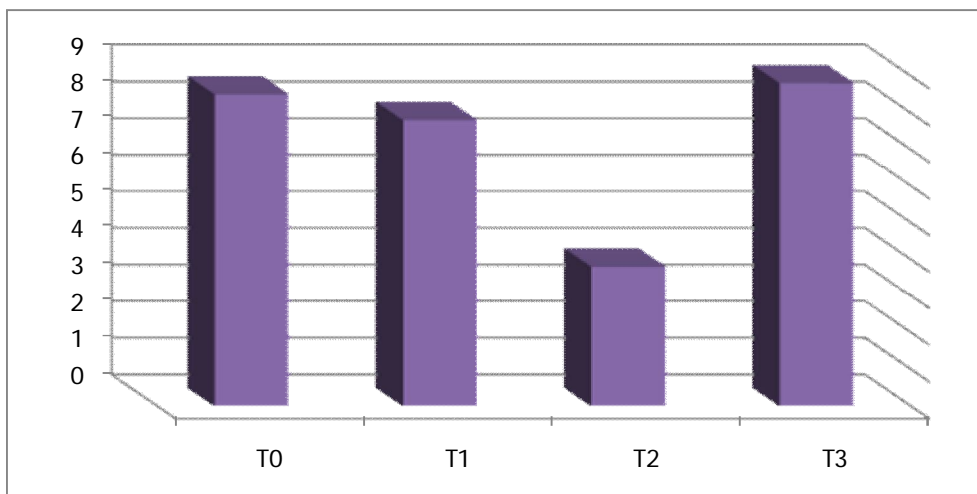


Figure 1. Number of leaves/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month

Length of leave:

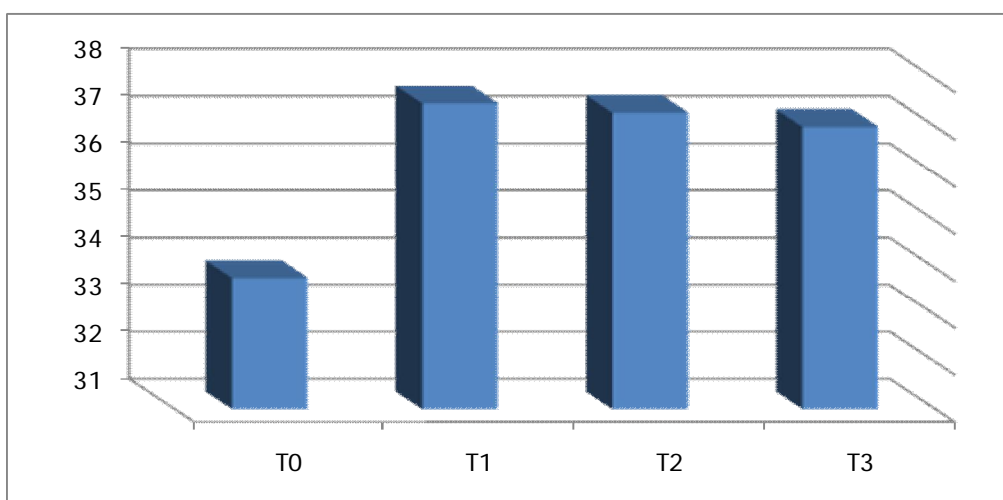


Figure 2. Length of leaves/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month

Yield:

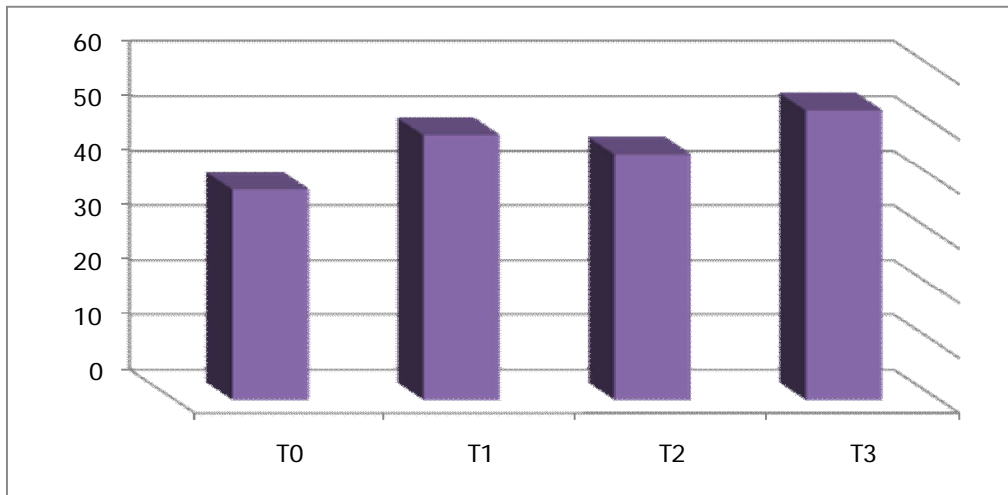


Figure 3. Yield/ plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month

CHAPTER FIVE

Discussion:

The reason for the absence of significant differences in the length of leaves is:

Irregularity of periods of irrigation, sometimes absent.

- Insufficient provision of irrigation water.
- Soil cracking, this leads to the inability of the plant to absorb nutrients.

However, although there was no significant difference between the coefficients of leaf length, the T3 coefficient could be compared with other parameters.

Conclusion:

1. Results showed that there was no significant difference among fertilizer treatment used in length leaf per plant of Onion variety Baftaim.
2. Results showed that there was significant difference among fertilizer treatment used in number of leaves and yield per plant of Onion variety Baftaim.

Recommendation:

- Compost + Urea (T3) was a perfect treatment use. Its use on Onion var. Baftaim, it has a good effect on number of leaves and yield.

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- البصل في السودان إنتاج-تخزين-تربية جعفر حسين محمد علي 2009م. الطابعون, مطبعة
جامعة الخرطوم

APPENDICES

Appendix (1) Show the rows of number of leaves /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month in the field.

Row					Σ
R1	T0 9	T1 9	T2 11	T3 9	38
R2	T1 7	T0 9	T3 11	T2 8	35
R3	T2 6	T3 9	T0 9	T1 7	31
R4	T3 6	T2 8	T1 8	T0 7	29

Appendix (2) Show the mean and total of treatments, culms and of number of leaves /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month.

TREATMENT	C1	C2	C3	C4	Σ	\bar{Y}
T0	9	9	9	7	34	8.5
T1	7	9	8	7	31	7.8
T2	6	8	11	8	33	8.3
T3	6	9	11	9	35	8.8
Σ	28	35	39	31	133 Grand Total	
\bar{Y}	7	8.8	9.8	7.8		

Appendix (3) Show the rows of length of leaves /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month in the field.

Row					Σ
R1	T0 33	T1 93	T2 41	T3C41	154
R2	T1 41	T0 28	T3 44	T2 39	152
R3	T2 33	T3 31	T0 39	T1 33	136
R4	T3 32	T2 36	T1 37	T0 35	140

Appendix (4) Show the mean and total of treatments, culms and of number of leaves /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month.

TREATMENT	C1	C2	C3	C4	Σ	\bar{Y}
T0	33	28	39	35	135	33.8
T1	41	39	37	33	150	37.5
T2	33	36	41	39	149	37.3
T3	32	31	44	41	148	37
Σ	139	134	161	148	582 Grand Total	
\bar{Y}	34.8	33.5	40.3	37		

Appendix (5) Show the rows of yield/plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month in the field.

Row					Σ
R1	T0 42	T1 45	T2 50	T3 54	191
R2	T1 51	T0 38	T3 58	T2 40	187
R3	T2 48	T3 48	T0 43	T1 50	189
R4	T3 52	T2 42	T1 48	T0 31	173

Appendix (6) Show the mean and total of treatments, culms and of number of leaves /plant of Onion variety Baftaim as affected by Urea and Compost fertilization at 5 month.

TREATMENT	C1	C2	C3	C4	Σ	\bar{Y}
T0	42	38	43	42	154	38.5
T1	51	45	48	50	194	48.5
T2	48	42	50	40	180	45
T3	52	48	58	54	212	53
Σ	193	173	199	175	740 Grand Total	
\bar{Y}	48.3	43.5	49.8	43.8		

Appendix (7) Compost Quick Green have:

MN	39(MG/KG)
FE	9961.2(MG/KG)
ZN	102.9(MG/KG)
CU	103.9(MG/KG)
CA	12(MG/KG)
MG	2268(MG/KG)
CD	82.1(MG/KG)
NA	<0.001(MG/KG)
B	3.19(%)
P	0.64(%)
K	0.48(%)
NA	0.11(%)