



Effect of Different Organic Fertilizers on Growth, Yield and Total Soluble Solid of the Onion (*Allium cepa L.*) variety Baftaim-s

Hanaa M. Gadelrab* and S.M. ELAmin

Dept. of Horticulture, College of Agricultural Studies, Sudan University of Science & Technology

*Corresponding Author: hanaa_mohamed7220@yahoo.com; saif@sustech.edu

Article history: Received: 28 March 2013

Accepted: 8 September 2013

Abstract: This study was conducted at the experimental farm of the College of Agricultural Studies, Sudan University of Sciences and Technology at Shambat with the objective of evaluating the impact of using different organic fertilizers (Compost Elshomokh, Compost Alkhaseeb, Compost Elkhyrat and Liquid Organic Fertilizer (OsaratEltabya)) on growth, yield and quality of onion (Baftaim cultivar) during the winter season of 2010/2011 and 2011/2012. The studied growth and yield parameters were number of leaves per plant, leaf length, bulb diameter, bulb TSS and bulb yield/ha. The results showed that plants dressed with organic fertilizers gave increases in number of leaves and leaf length compared to the control in both seasons. Compost Elshomokh gave the highest number of leaves per plant in both seasons. Compost Alkhaseeb recorded the highest leaf length in season one and compost Elshomokh gave the highest leaf length in season two. Addition of organic fertilizers affected bulb diameter positively and resulted in high percent of medium diameter bulbs from compost Elshomokh in season one and compost Alkhaseeb in season two. The study showed that application of organic fertilizer resulted in significant differences in bulb TSS in both seasons. Compost Elshomokh gave the highest bulb yield (19.4t/ha) in first season and Compost Alkhaseeb gave the best result (11.3 t/ha) in second season.

Keywords: Compost, liquid organic fertilizer, Onion, Bafteam, Shambat

© 2013 Sudan University of Science and Technology. All rights reserved

Introduction

Onion (*Allium cepa*) is presently grown almost in all parts of the world. It is an importance economic vegetable in Sudan (Abu-sara, 2001). Onion is widely used as a vegetable by almost all classes of the society (FAO, 2005).

FAO, (1999) defined organic agriculture as 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 the

use of off-farm inputs, taking into account that regional conditions require locally systems.

The use of chemical fertilizer alone generate several deleterious effects to the environment and human health and they should be replenished in every cultivation season because, the synthetic N,P and K fertilizers are rapidly lost by either evaporation or by leaching (Ali *et al.*, 2007).

The use of manure as a source of plant nutrients in soil is of great importance, as long as it is a cheaper source of nutrients than commercial fertilizers. The manure also

provides balanced nutrients to the plant and therefore can prevent the harmful effects resulting from shortage or excess of addition of particular nutrients (AbdElrahman, 1997). The main objectives of this study were to evaluate the impact of different organic fertilizers on productivity and quality of onion.

Materials and methods

Two field experiments were carried out during the winter season of 2010/2011 and 2011/2012 at the experimental farm of the College Agricultural Studies Sudan university of Sciences and Technology at Shambat, Khortoum North. In this study, three composts (Elshomokh, Elkhyrat and Alkhaseeb) were used at a rate of 20 ton/ha in addition to liquid organic fertilizer (OsaratEltabya) at the rate of 160L/ha. Compost were while applied 20 days before transplanting Osarat Eltabya was added after transplanting by spraying every two weeks till maturity stage.

The data recorded included the following parameters, plant growth as number of leaves per plant and leaf length (cm). Yield characters bulb diameter measured by veriner caliper (mm), bulb TSS measured by refracto meter and bulb yield (ton/ha).

The collected data were statistically analyzed using statistic analysis system (SAS) software and means separated using duncan.

Result and Discussion

Number of leaves

Application of organic fertilizers increased the number of leaves per plant. The highest number of leaves per plant was obtained by compost Elshomokh in week 15 in the first season (12 leaves per plant). Compost Elshomokh was followed by compost Alkhaseeb, compost Elkhyrat, OsaratEltabya and the control respectively (Figure 1). The results on number of leaves per plant in the second season indicated that highest number of leaves per plant was obtained by compost

Elshomokh (11 leaves per plant) in week 13, followed by compost Elkhyrat, compost Alkhaseeb, Osarat Eltabya and control respectively (Figure 2).

Addition of organic fertilizer resulted in the release of more nutrients that resulted in number of leaves/plant. This agreed with the finding of Shams (2003) who found that the addition of organic manure improved vegetative growth of sweet pepper plants.

Leaf length

Addition of organic fertilizers increased leaf length. The highest leaf length was obtained by compost Alkhaseeb in first season. The leaf length was 60.0, 57.5, 56.4, 55.0 and 55.0 cm for compost Alkhaseeb, Osarat Eltabya, Compost Elshomokh, Compost Elkhyrat and Control respectively (Figure 3). Compost Elshomokh gave the highest leaf length. In season two the leaf length was 64.2, 62.9, 62.3, 58.4 and 57.4 cm for Compost Elshomokh, Compost Elkhyrat, Compost Alkhaseeb, Osarat Eltabya and Control, respectively (Figure 4).

Increase of leaf length was attributed to the added effect of nutrients in the compost this result agreed with AbdEl-mouty et al, (2001), Awad (2002) and Hafes *et al.*, (2004). They reported that the vegetative growth of plant was increased by using compost as organic fertilizers. Our results was also supported by Seran *et al.*, (2010) who showed high leaf length development in early stages with added compost. Improving the vegetative growth of onion plant with liquid organic fertilizers (Osarat Eltabya) application may be due to its content of nutrient elements in the available form, which led to improving the vegetative growth of onion plants. These findings are in agreement with results of Tafaghodinia and Kamalpour (2008). They showed that application of liquid organic fertilizer gave good vegetative growth.

Bulb diameter

Application of compost and liquid organic fertilizer affected bulb diameter. The high percent of medium diameter bulbs were obtained from compost Elshomookh in season one and compost Alkhaseeb in season two (Tables 1 and 2).

Organic fertilizers improved the chemical and physical properties of onion. This agreed with Ali *et al.*, (2007) and Abdelhakeem (2003) who reported that the organic fertilizers improved the onion bulb size and weight and fruit quality and fruit size and weight of sweet pepper.

Bulb TSS

The result of the analysis for bulb total soluble solids showed significant differences between treatments (Tables 3 and 4).

Application of organic fertilizers increased the TSS of onion bulbs this agreed with Ali *et al.*, (2007) who reported that addition of organic nitrogen increased bulb (TSS).

Bulb yield

There were no significant differences ($P \leq 0.05$) in yield between Compost Elshomokh (19.4t/ha), Osarat Eltabya (15.6t/ha) and Compost Alkhaseeb (15.1) they yielded higher than Compost Elkhayrat (11.4t/ha) and Control (11.1 t/ha) in season one. In second season only compost Elshomokh and Alkhaseeb were significantly better than the control (Table 5).

Generally high bulb yield and better size of onion bulb may be due to the increase in plant growth, which increased photosynthesis process rate and the assimilation of such products in plant tissues. Similar results were obtained by AbdElraoof (2001) who studied the effect of different rates of compost on growth and yield of basil plant. Maynard (1993) also reported increases in fruit yield of compost-amended plants compared with those grown in soil alone.

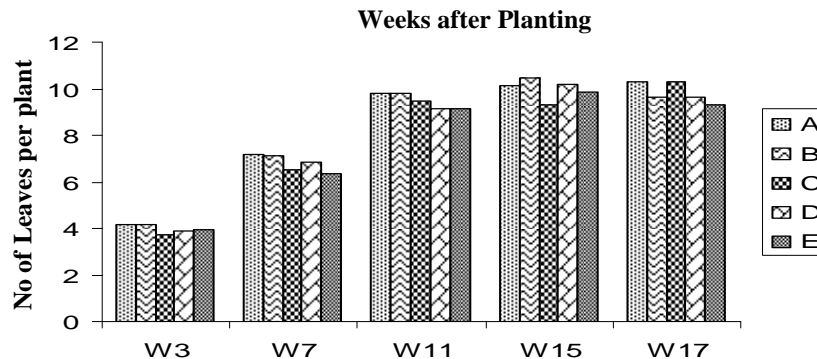
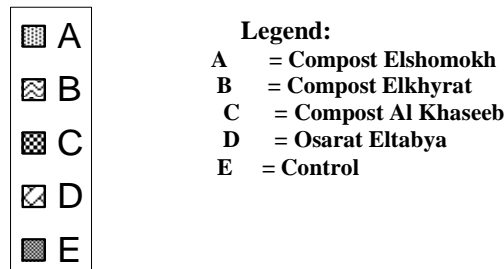


Figure1: Mean number of leaves per plant of onion under different organic fertilization at Shambat (2010 - 2011)



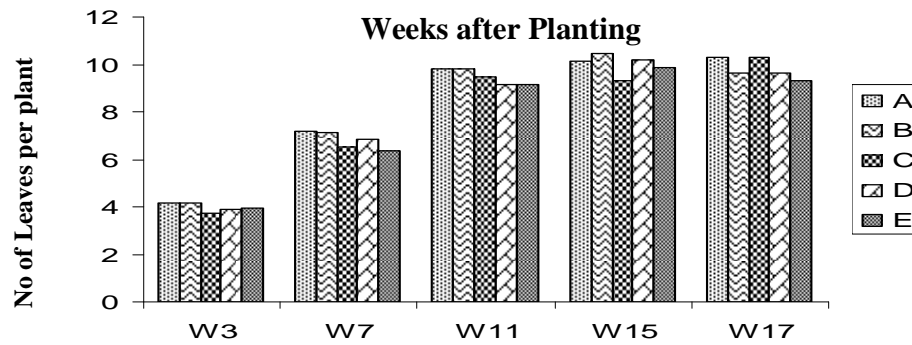


Figure 2: Mean number of leaves per plant of onion under different organic fertilization at shambat (2011 - 2012)

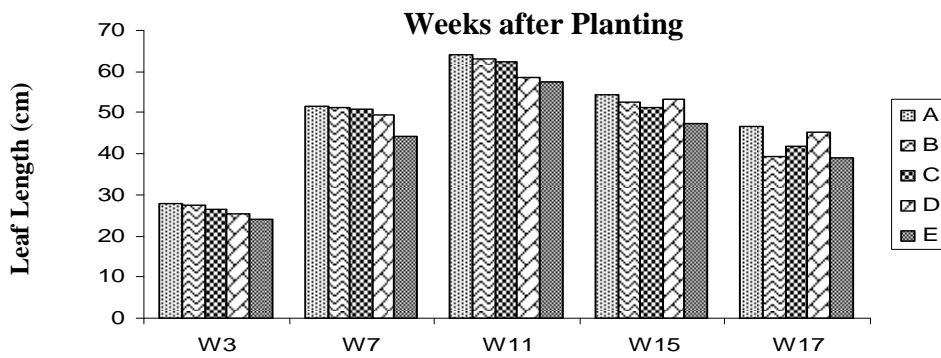


Figure 3: Mean leaf length (cm) of onion under different organic fertilization at Shambat (2010 – 2011)

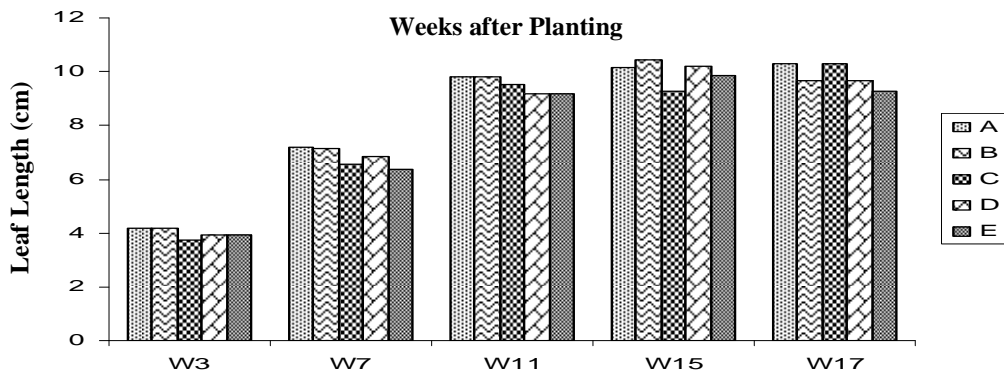


Figure 4: Mean leaf length (cm) of onion under different organic fertilization at Shambat (2011 - 2012)

Table 1: Effect of different organic fertilizers on bulb size distribution (%) of onion in season 2010 - 2012

Treatments	Size%		
	Large	Medium	Small
Compost Elshomokh	16.3	78.6	4.0
Compost Elkhyrat	0.0	48.3	50.6
Compost Alkhaseeb	11.0	75.0	46.6
OsaratEltabya	0.0	68.3	30.0
Control	1.3	55.0	37.0

Table 2: Effect of different organic fertilizers on bulb size distribution % of onion in season 2011 - 2012

Treatments	Size%	
	Medium	Small
Compost Elshomokh	56.2	43.5
Compost Elkhyrat	57.7	41.7
Compost Alkhaseeb	58.0	41.2
OsaratEltabya	43.0	56.2
Control	21.5	77.2

Table 3: Effect of different organic fertilizers on bulb total soluble solids (TSS) of onion in season 2010 - 2011

Treatments	TSS%
Compost Elshomokh	14.4 ^{ab}
Compost Elkhyrat	13.4 ^c
Compost Al Khaseeb	15.0 ^a
OsaratEltabya	13.0
Control	13.6 ^{bc}
S.E(±)	0.17
C.V	7.0

Means having different superscript letters in each column are significantly different $P \leq 0.05$

Table 4: Effect of different organic fertilizers on bulb total soluble solids (TSS) of onion in season 2011 - 2012

Treatments	TSS%
Compost Elshomokh	13.1 ^a
Compost Elkhyrat	13.0 ^a
Compost Al Khaseeb	12.8 ^a
OsaratEltabya	12.7 ^a
Control	12.0 ^b
S-E(±)	0.13
C.V	7.5

Means having different superscript letters in each column are significantly different $P \leq 0.05$

Table 5: Mean yield of onion bulb under different organic fertilizer, for the growing season of 2010-2011 and 2011-2012

Treatment	Season 2010 - 2011	Season 2011 – 2012
Compost Elshomokh	19.4 ^a	11.1 ^a
Compost Elkhyrat	11.4 ^b	9.3 ^{ab}
Compost Al Khaseeb	15.1 ^{ab}	11.3 ^a
OsaratEltabea	15.6 ^{ab}	9.9 ^{ab}
Control	11.1 ^b	6.8 ^b
C.V%	16.8%	18.2%
<i>Lsd</i> _{0.05}	4.61 ^{**}	3.27 ^{**}
<i>SE</i> ±	1.41	1.06

Means having different superscript letters in each column are significantly different $P \leq 0.05$

References

- Abd El-hakeem, (2003). Response of Sweet Pepper Crop to Organic and Biofertilizer Application. Msc. Thesis, Department of Horticulture, Faculty of Agriculture, Moshtohor, Zagazig University (benha branch).
- Abd El-Raouf, M., (2001). Productivity of sweet basil cultivated in newly reclaimed land as well as estimation the effect of different organic fertilization levels and plant densities. M.Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt.
- Abdel-Mouty, M. M., Ali, A.H. and Rizk F. A. (2001). Potato yield as affected by the interaction between bio and organic fertilizers. *Egypty.J. Appl. Sci.*, **16** (6):267-286.)
- AbdELRahman M.A.E.(1997).Effect of Organic and in Organic Fertilizers, Soil Types on Different Chemical Element and Calcium- Magnesium Ratio (Ca:Mg).M.Sc. thesis, Fac. Agric., Khartoum Univ. Sudan.
- Abu-Sara, A.F., Abedel Rahim, A.A., and Idris, M.A.M. (2001a). Yield response of tomato to different forms of nitrogen fertilizers in the central clayplain of Sudan. Proceedings of the crop husbandry committee, October
- Ali. A.H., Rizk, F.A., Shaheen, A.M and Abdel- Mouty, M.M. (2007). Onion plant growth, bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. *Research Journal of Agriculture and Biological Sciences* **3**(5):380-388.
- Awad, E.M. (2002). Effect of compost and some bio-fertilizers on growth, yield and quality of potato crops (*Solanum tubersum*, L.). *J. Agric. Sci, Mansoura, Univ.*, **27** (8).5525-5537.
- FAO (1999). Production Year Book, vol, 53, Food and Agricultural Organization of the United Nation., Rome. pp.78-80
- FAOSTAT(2005).<http://faostat.fao.org/site/567/default.aspx>.
- Hafez, Magda and Mahoud, R. Asmaa, (2004): Response of snap bean (*Phaseolus vulgaris* L.). tonitrogen fertilizer source. *Annals of Agric. Sci., Mashtohor*, **42**(1):261-270.
- Maynard, A.A. (1993). Evaluating the suitability of MSW compost as a soil amendment in field-grown tomatoes. *Compost Science and Utilization* **1**(2):34-36.
- Shams, A.S.A. (2003): Response of sweet pepper crop to organic and biofertilizer application. M.Sc Thesis Fac. Agric.

- Moshtohor, Zagazig Univ., Egypt, pp 148.
- Seran.T.H., Srikrishnah. S and M.M. ZAhmed (2010) Effect of different levels of inorganic fertilizers and compost as basal application on the growth and yield of onion (*Allium cepa* L.) *Journal of Agricultural Sciences*, vol. 5, No 2.
- Tafaghodinia, B., Kamalpour M, (2008). Compost tea, sepehr publication, Tehran, Iran, 75p,

أثر أسمدة عضوية مختلفة في نمو صنف البصل بافطيم - S إنتاجه والمواد الصلبة الذائبة الكلية فيه

هناء محمد جاد الرب و سيف الدين محمد الأمين

جامعة السودان للعلوم والتكنولوجيا- كلية الزراعة

المستخلص:

أجريت هذه الدراسة في المزرعة التجريبية لكلية الدراسات الزراعية جامعة السودان للعلوم والتكنولوجيا بشمبات بهدف تقييم أثر استعمال أنواع مختلفة من الأسمدة العضوية (كمبوست الشموخ، كمبوست الخصب، كمبوست الخيرات وسماد عضوي سائل (عصارة الطبيعة) على نمو، إنتاج وجودة البصل (صنف بافطيم) خلال شتاء 2010-2011م، 2011-2012م درست مقاييس النمو والمحصول التي تشمل عدد الأوراق للنبات الواحد، طول الأوراق، قطر البصلة، المواد الصلبة الذائبة ووزن البصل طن/ هكتار. أوضحت النتائج أن النباتات المعاملة بالأسمدة العضوية أعطت زيادة في عدد أوراق النبات وطول الأوراق في الموسمين، أعطى كمبوست الشموخ أكثر عدد لأوراق النبات في الموسمين وسجل كمبوست الخصب أعلى طول للأوراق في الموسم الأول وأعطى كمبوست الشموخ أعلى طول للأوراق في الموسم الثاني. إضافة الأسمدة العضوية أثر إيجاباً على حجم البصلة حيث سجل كمبوست الشموخ أعلى نسبة للأحجام المتوسطة في الموسم الأول وكمبوست الخصب في الموسم الثاني، أوضحت النتائج وجود فروقات معنوية في المواد الصلبة الذائبة بين المعاملات في الموسمين، أعطى كمبوست الشموخ أعلى إنتاجية في الموسم الأول (19,4 طن/هكتار) وأعطى كمبوست الخصب أفضل نتيجة (11,3 طن / هكتار) في الموسم الثاني.

