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RESPONSE OF SWEET POTATO PLANT TO THE SAME SOURCES OF ORGANIC MANURE AND APPLICATION METHODS OF POTASSIUM HUMATE UNDER SANDY SOIL CONDITIONS.

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ABSTRACT

Two field experiments were performed during two consecutive summer seasons of 2014 and 2015 at El-Kassasien Hort. Res. Station, Ismailia Governorate, Egypt, to study the effect of organic manure sources (recommended chemical fertilizers, FYM, compost and chicken manure) and potassium humate (without, soil application and foliar application) at the rate of 2 g/L ,as well as, different combination between them on plant growth, chemical constituents, yield and its components and storage root quality of sweet potato (Ipomoea batatas, L.) cv. Abees grown under sandy soil condition with drip irrigation system.

Application of organic manure fertilizers caused significant increases in growth parameter, yield and its components and mineral contents compared to control treatment (without organic fertilization). meanwhile, application of chicken manure at the rate of 5 m^3/fed. achieved highest values of all aforementioned parameters, followed by the application of compost at the rate of 15 m^3/fed and FYM at the rate of 15 m^3/fed, in a descending order, respectively.

Spraying sweet potato plants with potassium humate significantly enhanced plant growth, yield and its components and mineral contents (NPK content in tuber root TSS, reducing and total sugar as well as total carbohydrate contents). In this respect, spraying plants with 2 g/L potassium humate attained the superiority impacts comparing the other treatments.

Hence, it can be concluded that fertilizing sweet potato plants by chicken manure at the rate of 5 m^3/fed. in combined with spraying plants by potassium humate at the rate of2 g/L gave the highest values of growth, yield and its components and chemical constituents as compared to other interaction treatments.

***Conclusively,** this study showed that the highest yield of sweet potato storage roots and storage roots quality were obtained from chicken manure at 5 m^3/fed., foliar application was potassium humate*

(2 g/L). The interaction between 5 m^3 chicken manure and potassium humate as foliar application at the rate of2 g/L.

Key words. Sweet potato, organic manure, potassium humate, growth, yield and chemical constituents

INTRODUCTION

Sweet potato (*Ipomoea balatas*, L.) produces highest amount of calories per unit land area than most of the energy yielding crops (Agata, 1979). This makes sweet potato crop have a high potential as raw material for industrial products such as starch, flour, alcoholic beverages and confectionery, natural food colorings too (like anthocyanin and carotene from purple and orange flesh sweet potato, respectively) have been processed from certain genotypes (Yoshinage, 2000).

A great attention has been directed towards the use of organic fertilizers to reduce plant and soil contaminations with mineral fertilizers, improve the fertility of soil and reduce nutrient losses. In addition, the organic fertilizers were considered good sources of plant nutrient supply and good soil conditioners. Addition of organic matter, can improve all soil properties especially sand soil; such as water holding capacity, soil aggregation, aggregation stability, soil fertility, and increase cation exchange capacity. Also, organic fertilizers were used to decrease soilpH and increasing the availability of major and minor nutrients (Tahoun *et al*, 2000).

Application of humic acid (HA) has several benefits. Agriculturists all over the world are accepting HA as an integral part of their fertilizer program. It can be applied directly to the plant foliage in liquid form or to the soil in the form of granules alone or as fertilizer mixture. Humic acid is one of the major components of humus. Humates are natural organic substances, high in HA and containing most of known trace minerals necessary to the development of plant life cycle (Poksoy *et al.*, 2010).

Several investigators reported that addition of specific amount of humic substances as soil application can enhance the growth of roots, shoots and leaves, and encourage nutrient absorption by plants

Some investigators studied the effect of potassium rates on vegetative growth, yield and chemical constituents, Majumdar *et al.*, (2000), Sangakkara and Frehner (2001), Balliu and Ibro (2002), Chandra *et al.*, (2003), Gent(2004) and Liu *et al*., (2008) showed that application of K fertilizers significantly improved vegetative growth, yield and chemical constituents of tested vegetable crops.

Therefore, this work was conducted to find out the optimum combination between organic manure sources and potassium humate rates on soil application and foliar spray that maximizes the tuber roots yield characters and improves tuber roots quality of sweet potato cv. Abees grown in sandy soil conditions under drip irrigation system.

MATERIALS AND METHODS

Two field experiments carried out during the two successive summer seasons of 2014 and 2015 at El-Kassasien Hort. Res. Station, Ismailia Governorate, Egypt, to study the effect of organic manure sources (recommended chemical fertilizers, FYM, compost and chicken manure) and potassium humate (without, soil application and foliar application) at the rate of 2 g/L as well as, all possible combination between them on growth, chemical constituents and yield and its components, as well as, storage root quality of sweet potato (*Ipomoea balatas*, L.) cv. Abees cultivar grown in sandy soil conditions under drip irrigation system.

The physical and chemical analysis of the experimental soil are presented in Table 1. Samples of the soil were obtained from depth of 25 cm entail soil surface layer.

Table 1. The physical and chemical properties of the experimental soil field.

Physical properties		**Chemical properties**	
Sand	91.10	Organic matter	0.46
Silt	6.70	pH	8.4
Clay	2.20	Available N (ppm)	8.2
Texture	sandy	Available P (ppm)	52
		Available K (ppm)	53

Samples of soil were obtained from depth of 25cm entail soil surface layer.

The source of potassium humate was Union for Agriculture Development Company under commercial name (Hammar), which contained humic acid, fulvic acid and K_2O at rate of 86 %, 17 % and 6 %, respectively.

This experiment included 12 treatments which were the combinations between four organic manure sources and three potassium humate application, treatments were arranged in split plot design with three replicates, organic manure sources treatments were assigned randomly in the main plots, while sub plots were devoted to potassium humate application.

Table 2. The chemical properties of organic sources during 2014 and 2015 seasons.

Chemical properties	Organic sources					
	FYM		Compost		Chicken	
	2014	2015	2014	2015	2014	2015
OM %	13.36	13.65	25	30	44.53	49.82
Total N (%)	0.78	0.74	0.8	1.2	3.57	3.46
Total P (%)	0.14	0.11	0.4	0.6	1.18	1.15
Total K (%)	0.61	0.65	0.8	1.4	1.69	1.87
Available Zn (ppm)	34.01	30.53	30	40	176	193
Available Mn (ppm)	40.88	39.13	88	120	198	183
Available Fe (ppm)	70.18	71.66	100	120	289	336

Treatments:

A- Organic manure sources:

1- Control (recommended chemical fertilizers),
2- Farm yard manure at the rate of 15 m^3/fed,
3- Compost at the rate of 15 m^3/fed,
4- Chicken manure at the rate of 5 m^3/fed.

B- Potassium humate:

1- Without (sprayed water),
2- Soil application (2g/L),
3- Spray application (2g/L).

The plot area was 12.6 m^2.(three dripper lines with 6 m length each and 70 cm distance between each two drippers lines). One line was used to measure the morphological parameters and the other two lines were used for yield measurements.

Sweet potato stem cuttings, of about 20 cm lengths were planted at 25 cm apart, in April 20th and 24nd in the 1st and 2nd seasons, respectively. Abees' sweet potato cultivar stem cuttings was obtained from El-Kassasien Horticultural Research Station, Ismailia Governorate, Egypt.

Each experimental units received two liters solution of potassium humate using sprayed agent (super film), the untreated plants (check) was sprayed with spreading agent.

The conventional agricultural practices of sweet potato under drip irrigation system were followed according to the recommended practices by Ministry of Egyptian Agricultural.

Data recorded

1. *Plant growth*: A random sample of three plants from each plots were randomly taken at120 days after trans planting in the two growing seasons to measure, Vine length (cm), number of branches, and number of storage roots/plant, as well as, shoot and tube roots dry weight /plant (g)**.**

2. ***Plant Chemical Constituents of N, P and K (%):*** The dry weight of shoots and storage roots at 120 days after trans planting were finely ground and wet digested for N, P and K determination, total nitrogen, phosphorus and potassium were determined according to the methods advocated by A.O.A.C., 1995.

3. ***Yield and its components*****:** At harvesting time; *i.e.* at 150 days after transplanting, the plants of each plot were separately, the storage roots were separated into three categories (marketable, unmarketable and culls), then weight and counted to determine the total yield per fed. (ton.) for each category and total yield (including the three categories) marketable (root weight with diameter between 3.5 and 6 cm),Unmarketable (root weight with diameter more than 6.0 cm and culls (root weight with diameter less than 3 cm).

In addition, number of storage roots/plant, average weight of storage root (g) and weight of storage roots per/plant (g)as tube marketable, unmarketable, culls and total yield per fed. (ton.) were determined.

4. ***Tuber root quality:*** At harvest, sample of 4 storage root from each experimental unit was randomly taken to determine; Total soluble solids (T.S.S. %) was determined in flesh juice of tuber roots by Carle Zeiss refractometer, Total, reducing and non-reducing sugars (%) and Total carbohydrates (%) was measured calorimetrically in tuber roots following the method described by A. O. A. C. (1995).

Statistical analysis*:*

Recorded data were subjected to the statistical analysis of variance according to Snedecor and Cochran (1980), and means separation were done according to LSD at 0.05 % level probability.

RESULTS AND DISCUSSION

1. Plant growth

1.1. Effect of organic manure sources:

Results given in Table 3 show the effect of organic manure sources under investigation on all studied plant growth parameters of sweet potato plants, *i. e.,* vine length, number of branches and storage roots/plant as well as dry weight of shoots and storage roots/plant. It is obvious from the data attained that plant growth was promoted with all organic manure application in both seasons compared to the control treatment. In this respect, fertilized

sweet potato plants with 5 m^3chicken manure/fed recorded the highest values of plant growth characteristics than the other organic manure or the control, meanwhile, plants fertilized with compost at rate $15m^3$/fed had a positive increase than FYM at rate application $15m^3$/fed. This may attribute to decomposition of chicken manure is relatively more rapid than compost or FYM manures, and it is rich in mineral contents as compared to the other organic manures (Table 2).

As the role of organic manure on plant. This may be due to that organic manure contains many species of living organisms, which release photohormonase such as GA3, IAA and CYT which stimulates plant growth, absorption of nutrients and photosynthesis processes (Reyndres and Vlassake, 1982), also application of organic manures led to increase organic matter, nitrogen fixation and increasing availability of major and minor nutrients (Tahoun *et al.,* 2000).as well as the increase in sweet potato plant growth after organic manure application may be due to the improving physic-chemical and biological properties of sandy soil, *i.e.,* increasing soil organic matter, cation exchange capacity, available water and mineral nutrients and this in turn stimulate plant growth and dry matter (Etman *et al,* 2002) on sweet potato plants. Moreover, it may be improved physical, chemical and biological properties of soil, *i.e.,* increasing the soil organic matter, cation exchange capacity, and water holding capacity, availability of water and mineral nutrients. This in turn increases plant growth parameters.

1.2. Effect of potassium humate

It is obvious from Table 3 that vegetative growth was gradually increased with foliar application of potassium humate as compared to the soil application and control treatments. These results may be due to potassium humate contains humic acid, fulvic acid and K_2O at rate of 86%, 17 % and 6%, respectively, which reflected a positive effect on vegetative growth. Moreover, potassium, present with in plants a cation K^+ that, plays an important role in regulation of the osmotic potential of plant cells and activates many enzymes involved in respiration and photosynthesis (Marschner, 1995 and Lincoln and Zeiger, 2002)

Enhancement of plant growth by using humic acid may be due to increasing nutrients uptake such as N, Ca, P, K, Mg, Fe, Zn and Cu (Adani *et al.,* 1998) and binding toxic elements, such as Al. Enhancement of photosynthesis, chlorophyll density and plant root respiration has resulted in greater plant growth with humate application (Chen1990). Application of humic acid and potassium simultaneously could be rapidly absorbed and incorporated into plant whether via foliar application methods (Lincoln and

Zeiger, 2002) Foliar application of HA (25 % active HA) dismutase's, and ascorbic acid concentrations in turf grass species (Zhang, 1997).

These antioxidants may play a role in the regulation physiology of plant. Moreover, foliar application of humate consistently enhanced antioxidants such as α- tocopheral, β-carotene, superoxide dismutase's, and ascorbic acid concentrations in turf grass species (Zhang, 1997)..In addition, these antioxidants may play a role in the regulation of plant growth similar results are agreement with those reported by. (El-Bassiony *et al.*, 2010 and Khalil *et al.*, 2012), they concluded that foliar spray with HA significantly increased dry weight/plant.

1.3. *Effect of the interaction between organic manure sources and potassium humate.*

Data Presented in Table 4 illustrated that all interactions between organic manure sources and potassium humate application had a significant effect on vine lengthy, number of branches /plant as well as dry weight shoots and storage roots/plant, on the other hands, it's had insignificant effect on number of roots/plant in both seasons.

The most increases in the vegetative growth was observed when plants fertilized with chicken manure (5 m^3/fed.) and sprayed with 2 g/L potassium humate as compared to the other interaction treatments. On the other hands, control treatment (without organic manure and potassium humate) showed the lowest values of vegetative growth characteristics, in two growing seasons of the study.

2. Plant chemical constituents NPK

2.1. Effect of organic manure sources.

It can be seen from the recorded data in Table 5 that all applications of organic manure had a significant enhancing effects on NPK contents in sweet potato plants comparing to untreated plants during the two growing seasons. However, plants fertilized with chicken manure at rate 5 m^3/fed. were the superior in NPK contents in sweet potato except application compost fertilizers increasing P in shoot and storage roots as compared to the other organic manure sources, meanwhile; plants fertilized with compost at rate 15 m^3/fed had a positive increase than FYM at the same rate. This may be attributed to that chicken manure decomposition is rich in mineral contents as compared to the other organic manures (Compost manure and FYM, Table 2).

These increases in NPK content might be due to that organic manure contains microorganisms have ability be supply the grown plants with fixed N and release phyotohormones, which could increase the growth and dry weight of sweet potato plants. This in turn increases NPK content in tissues of sweet potato plants. In addition, organic manure may play a favorable role in increasing nutrients availability in most soils, through the processes of chelating, biochemical processes and production of several organic acids during decomposition of organic manure as reported by Hammad *et al*., (1990).

These results coincided with those reported by El-Mansi *et al*., (1999), Nour (2004) and Atia and Bardisi, (2005) on pea and Carreraa *et al*., (2007) on tomato, who found that the application of organic manure to the soil increased NPK and contents in plants.

2.2. Effect of potassium humate:

Data in Table 5 clearly showed that potassium humate as foliar application rate of significantly enhanced NPK contents in tuber root as compared to soil application and control treatment. Highest values with

Maintenance of adequate potassium levels is essential for plant survival in saline habitats. Potassium is the most prominent inorganic plant solute, and as such makes a major contribution to low the osmotic potential in the style of roots that is a prerequisite for turgor-pressure-driven solute transport in xylem and the water balance of plants (Marschner, 1995). Enhancement of NPK and total protein contents by using humate may be due to increasing nutrients uptake such as N, Ca, P, K, Mg, Fe, Zn and Cu (Adani *et al.*, 1998) they added that binding toxic elements such as Al. Combination of potassium with humic acid can be rapidly absorbed and incorporated into plant whether via foliar application methods. These results coincided with those reported by Balliu and Ibro, (2002), Chandra *et al.*, (2003), Gent (2004), Abdel-Mawgoud *et al.,* (2007) Liu *et al.*, (2008), Khalil *et al.,* (2012)and Al-Easily and El-Naka (2013) on sweet potato.

2.3. ***Effect of the interaction between organic manure sources and potassium humate.***

Data in Table 6 showed that the interaction between organic manure sources and potassium humate had a significant effect on NPK contents in sweet potato plants, fertilized with 5 m^3/fed chicken manure combined with spraying by 2 g/L potassium humate recorded the highest values of NPK contents in sweet potato plants. On the other hand, control treatment (without organic manure and potassium humate) showed the lowest values of NPK contents.

3. Yield and its components

3.1. Effect of organic manure sources

The obtained results in Table 7 show that these were significant difference between all organic manures i.e., yield and its components except number of storage roots/ plant in both growing seasons, fertilized plants with 5 m^3/fed chicken manure gave the best values of average storage root /plant, yield/plant ,marketable, unmarketable, culls and total yield/fed. as compared to other organic fertilizers.

The beneficial effect of organic manure on yield may be not only due to that the organic manure improves the soil structure conditions which encouraged the plant to have a good root development by improving the aeration of soil, but also due to that mineral N fertilizer helps the living organisms in organic manure to multiply (El-Shafie and El-Shikha, 2003). Organic fertilizers have also, release nutrients slowly and they are considered sources of trace elements as well as they increase the soil organic matter content (Rumpel, 1998).These results are agreements with those reported by Cqrreraa *et el*. (2007).

3.2. Effect of potassium humate.

It is obvious from data in Table7 that application of potassium humat as foliar spray at the rate at the rate of 2 g/L had a significant effect on yield and its components, than soil application and untreated, except number of storage roots/ plant in both growing seasons.

The effect of potassium humate on yield and its components are also, shown in the same Table7, which had a significant increase in the average storage root, total yield / plant, marketable, unmarketable, culls and total yield/fed. in both seasons with foliar application as compared to other treatments.

On the other hand, soil application of potassium humate superior on control treatments in all characters studies. Bryan and Stark (2003) found that, application of humic acid increased total yield, marketable yield and gross return of potato crop. Shankle *et al*. (2004) indicated that application of humic acid plus nutrients to soil increased total and marketable yield of sweet potato than the standard fertility program.

Verlinden *et al.* (2009) found that tuber production of potato showed a high response to humic substances application. Total potato yield increased with 13 and 17% for Hum first liquid (liquid solution added to the soil) and hum first incorporated (solid incorporated in mineral fertilizers), respectively. These results agree with those reported by Khalil *et al.,* (2012).

3.3.Effect of the interaction between organic manure sources and potassium humate

Data in Table 8 show that, there were significant differences between interaction treatments on yield and its components, except number of storage roots/ plant in both seasons. The interaction treatment between 5 m^3/fed. Chicken manure and sprayed plants with potassium humate was the best treatment for increasing average storage roots weight, yield/ plant, and total yield/fed in both seasons under study

On the other side, the plants undecided organic manure and potassium humate gave the lowest values of all parameters of yield.

4. Storage root quality:

4.1. Effect of organic manure sources

Organic manure sources application chicken manure at rate 5 m^3/fed was the superior sources of Organic manure effect for increasing root chemical constituents (TSS, reducing sugar, nun reducing sugar, total sugar and carbohydrate) compared other treatments in both seasons. These results are agreements with those reported by Cqrreraa *et al*. 2007.

4.2. Effect of potassium humate

It is obvious from data in Table 9 that method foliar application at the rate of 2 g/L potassium humate had a significant effect on root chemical constituents and significantly increased N, P, K, starch, total sugars, and TSS and carotenoids contents in storage roots in both seasons. The soil application or unterminated Potassium helps translate sugars and starch from leaves to roots. These results agree with those reported by George *et al*. (2002), Abd El-Baky *et al.* (2010), Al-Easily, and El-Naka (2013) on sweet potato.

4.3. Effect of the interaction between organic manure sources and potassium humate.

Data in Table10 rivaled that, there were a significant differences between the interaction treatments on storage root quality in both seasons.
The interaction between5 m^3/fed. Chicken manure and foliar sprayed sweet potato plants with potassium humate was the best treatment for increasing tuber roots quality. Such as N, P, K and starch content.

Conclusively, this study showed that the highest yield of sweet potato storage roots and storage root quality were obtained from chicken manure at5 m^3/fed., foliar application was potassium humate (2g/L**).** The interaction between5m**^{3}** chicken manure and potassium humate as foliar application at of 2 g/L**.**

REFERENCES

A.O.A.C.(1995). *Association of Official Agricultural Chemists*. Official systems of analysis. 17th. Ed. A.O.A.C., Wash., D.C.

Abd El-Baky, M.M.H., A.A. Ahmed, M.A. El-Nemr and M.F. Zaki (2010) Effect of Potassium Fertilizer and Foliar Zinc Application on Yield and Quality of Sweet Potato. *Res. J. Agric. and Biol. Sci*., 6(4): 386-394.

Abdel-Mawgoud, A.M.R., N.H.M. El-Greadly, Y.I. Helmy and S.M. Singer (2007). Responses of tomato plants to different rates of humic-based fertilizer and PK fertilization. *J. Appl. Sci.*, 3(2): 169-174.

Adani, F., P. Genevini, P. Zaccheo and G. Zocchi (1998)the effect of commercial humic acid on tomato plant growth and mineral nutrition. *J. Plant Nutr*., 21: 561-575.

Al-Esaily, I.A.S. and E.A. El-Naka (2013) Effect of Magnesium and Humic Acid on the Productivity of Sweet Potato Grown in Sandy Soil. *J. Appl. Sci.*, 28 (9):615- 633.

Agata, W. (1979) The characteristics of dry matter and yield production of sweet potato under field condition. In: Villarreal, R.L., Griggs, T.D. (Eds.), *Proceedings of the First International Symposium on Sweet Potato*, pp. 119-127.

Atia, N.A. and A. Bardisi (2005).Response of pea plants to FYM and mixture spray of some micro-elements under sandy soil conditions. *The 6th Arabian Conference for Horticulture*, Ismailia, Egypt, 158-175.

Balliu, A. and V. Ibro (2002) Influence of different levels of potassium fertilizers on growth, yield and ascorbic acid content of tomato fruit grown in non-heated greenhouse. *Acta Horticultural*., 579: 385-388.

Bryan, H. and J. Stark (2003). Humic acid effects on potato response To phosphorus. Presented at the Idaho Potato Conference, January 22-23, 2003, College of Agriculture and Life Sciences, University of Idaho, Canellas, L. P., F. L.

Carreraa, L.M., J.S. Buyer, B. Vinyard, A.A. Abdul-Baki, L.J. Sikora and J.R. Teasdale (2007) Effects of cover crops, compost, and manure amendments on soil microbial community structure in tomato production systems. *Applied Soil Ecology*, 37: 247-255.

Chandra, P., A. K. Singh, T. K. Behera and R. Srivastava (2003) Influence of graded level of nitrogen, phosphorus and potassium on the yield and quality of playhouse-grown tomato (*Lycopersicon esculentum*) hybrids. *Indian J. Agr. Sci*., 73(9): 497-499.

Chen, Y. and T. Avaid (1990) Effects of humic substances on plant growth. Pp. 161- 186. In: American Society of Agronomy and Soil Science Society of America (eds.), humic substances in soil and crop science; Selected Readings. *American Society of Agronomy*, Madison, WI.

El-Bassiony, A.M., Z.F. Fawzy, M.M.H. Abd El-Baky and A. R. Mahmoud (2010). Response of snap bean plants to mineral fertilizers and humic acid application. *Res. J. Agric. and Bio. Sci*., 6 (2): 169-175.

El-Mansi, A.A., A. Bardisi, H.M. Arisha and E.M. Nour (1999) Studies on some factors affecting growth and yield of pea under sandy soil conditions using drip irrigation system. 2- Effect of farmyard manure and irrigation water quantity. *Zagazig J. Agric. Res.*, 26 (5): 1409-1428.

El-Shafie, F. S. and S. A. El-Shikha (2003). Productivity and nutrients uptake of wheat and faba bean grown on calcareous soil as affected by organic manure and saline irrigation water. *Minufiya J. Agric. Res*., 28 (3): 1025-1048.

Etman, A.A., N.A. Hassan, M.M. Saffan and Sharaf El-Din (2002). Response of sweet potato growth and productivity to varying fertilizer levels and transplanting. *2nd Inter. Conf. Hort. Sci*., 10-12 Sept.

Gent, M. P. N. (2004) Yield of greenhouse tomato in response to supplemental nitrogen and potassium. *Acta Horticultural*, 633: 341-348.

George, M. S., L. Guoquan and Z. Weijun.(2002) Genotypic variation for potassium uptake and utilization efficiency in sweet potato *(Ipomoea batatas* l.). *Filed Crops Research*, 77: 7-15.

Hammad, S.A., E.E. Kaoud, K. Matter and M.A.Khamis (1990). Effect of soil and water management practices on broad bean in sandy soil. *Egypt J. Soil Sci.*, 30 (1): 341-355.

Khalil A. M., Soha E. Khalil and T.B. Ali (2012). Effect of water stress, antioxidants and humic acid on *capsicum annuum*,L. growth, yield and active ingredient under sandy soil conditions. *Egypt. J. of Appl. Sci*., 27 (1): 35-56.

Lincoln T. and E. Zeiger (2002). Plant physiology, Publisher, Sinauer Associates; 3 Edition. Pb.690.

Liu, Z.H., J.L. Hua, L.X. Lin, R. Härdter, Z.W. Jun, Z.Y. Lan and Z.D. Feng (2008). Effect of N and K fertilizers on yield and quality of greenhouse vegetable crops. *Soil Science Society of China*, 18(4): 496–502.

Marschner, H. (1995) *Mineral Nutrition Of Higher Plants*. 2nd(ed.), Academic Press Limited, Text Book.

Majumdar, S. P., R.L. Meena and G. D. S. Baghel (2000) Effect of levels of compaction and potassium on yield and quality of tomato and chili crops growth on highly permeable soils. *J. Indian Soc. Soil Sci*., 48(2): 215-220.

Nour, E.M.E. (2004) Physiological studies on pea crop under sandy soil conditions. Ph.D. Thesis, Fac. Agric., Zagazig University, Egypt.

Poksoy, M. ; O. Turkmen and A. Dursun (2010) Effect of potassium and humic acid on emergence, growth and nutrient contents of okra (*Abelmoschus esculentus* L.) seedling under saline soil conditions. *Afr. J. Biotechnol*.,9: 5343- 5346.

Rumpel, J. (1998) Effect of long-term organic and mineral fertilization on soil properties and development of tomato, carrot and onion. *International Seminar, Warszawa*, Poland, 10-15 June Fundacja, 63-64.

Reyndres, L. and K. Vlassake (1982) Use of *Azospirillum brasilense* asbio fertilizer in intensive wheat cropping. *Plant and Soil* , 66: 217-223.

Sangakkara, U. R. and M. Frehner (2001) Influence of soil moisture and fertilizer Potassium on the vegetative growth of Moonbeam (*Vigna radiate* L. Wilczek) and Cowpea (*Vigna unguiculata* L. Walp). *J. Agron. Crop Sci.*, 186: 73-81.

Shankle, M.W. ; T.F. Garrett and J. L. Main (2004). *Humic Acid Nutrient Trial*. Mississippi Agriculture and Forestry Experiment Station Bulletin. 405. 218-219.

Snedecor, G.W. and W.G. Cochran (1980). *Statistical Methods*" 7th ed. Iowa state , Univ., Iowa, USA.

Tahoun, S.A., E.A. Abdel-Bary and N.A. Atia (2000) A greenhouse trial in view of organic farming in Egypt. *Egypt. J. Soil Sci*., 40 (4): 469-479.

Verlinden, G.; B. Pycke ; J. Mertens ; F. Debersaques ; K. Verheyen ; G. Baert, J. Brifs and G. Haesaert(2009) Application of humic substances results in consistent increases in crop yield and nutrient uptake. *J. Plant Nutria*., 32: 1407-1426.

Yoshinage, M. (2000) Varietals differences in anthocyanin content and compositionof sweet potato tops. In: *Proceedings of the 12th Symposium of the International Society for Tropical Root Crops (ISTRC).* Book of Abstracts, 129 pp.

Zhang, X. (1997). Influence of plant growth regulators on turfgrasss growth, antioxidant status, and drought tolerance. Ph.D. Thesis, Faculty of Virginia Polytechnic (Institute and State University).

استجابة نباتات البطاطا لبعض مصادر التسميد العضوي وهيومات البوتاسيوم تحت ظروف الارض الرملية

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1-معهد بحوث البساتين – مركز البحوث الزراعية -الجيزة – مصر

أجرى هذا البحث خلال الموسمين الصيفيين المتتاليين لعامي 2014 ، 2015 بمزرعة محطة بحوث البساتين بالقصاصين، بمحافظة الإسماعلية، ويهدف الى دراسة استجابة نباتات البطاطا لبعض مصادر التسميد العضوي وكانت المعاملات كما يلي: (الموصي به من السماد الكيماوي –والسماد البلدي 15م3 للفدان –والكمبوست 15م3 للفدان – وسماد الدواجن 5م3 للفدان) وهيومات البوتاسيوم (بدون أضافة -إضافة أرضية -وإضافة عن طريق الرش) بمعدل 2 جرام للتر تحت ظروف الأرض الرملية وباستخدام نظام الري بالتنقيط، وكانت النتائج كما يلي:

أوضحت النتائج أن: التسميد العضوي بسماد الدواجن بمعدل 5م3 /فدان أدى إلى زيادة معنوية في طول النبات وعدد الافرع وعدد الجذور المخزنة للنبات والوزن الجاف لكل من العرش والجذور المخزنة للنبات والمحتوى الكيماوي للنبات والمحصول الكلى للنبات والمحصول الصالح للتسويق والكلى للفدان كما أدت إلى زيادة معنوية في المواد الصلبة الدائبة الكلية والسكريات الكلية والكربوهيدرات في الجذور المخزنة للنبات البطاطا.

أدى رش نباتات البطاطا بهيومات البوتاسيوم بمعدل 2 جرام للتر إلى زيادة معنوية في كل الصفات الخضرية المدروسة وكذلك محتوى الجذور المخزنة من السكريات المختزلة والسكريات الكلية والكربوهيدرات الكلية مقارنة بمعاملة الكونترول في كلا الموسمين باستثناء عدد الجذور النبات في كلا الموسمين.

كانت أفضل معاملة تفاعل لزيادة النمو الخضري و الوزن الجاف للعرش وكذلك محتوى العرش من كل من النتروجين والفوسفور والبوتاسيوم والمحصول الكلى للنبات والمحصول الصالح للتسويق والكلى للفدان كما أدت إلى زيادة في المواد الصلبة الدائبة الكلية والسكريات الكلية والكربوهيدرات في الجذور المخزنة عند تسميد نباتات البطاطا بمعدل 5م3/فدان من سماد الدواجن ورش النباتات بهيومات البوتاسيوم بمعدل 2 جرام للتر0

التوصية: يوصى بتسميد نباتات البطاطا بسماد الدواجن بمعدل 5م3 /فدان مع رش النباتات بهيومات البوتاسيوم بمعدل 2 جرام للتر حيث أدى لزيادة النمو الخضري والوزن الجاف للعرش والمحصول الصالح للتسويق والكلى للفدان وكذلك محتوى الجذور المخزنة من السكريات المختزلة والسكريات الكلية والكربوهيدرات الكلية.