APPLICATION METHOD OF POTASSIUM HUMATE ON GROWTH AND YIELD OF GREEN ONION (*ALLIUM CEPA L.*)

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ABSTRACT:

The experiment was carried out during October 2011 at the vegetative research farm, Faculty of Agriculture and Forestry, University of Duhok on onion (*Allium cepa L.*)., bulbs were planted in November - 2011 .**RandomizeCompleteBlock design (R.C.B.D.) was used in this experiment. Each treatment was replicated three times with 10 plants per each. The factors included the following; two concentrations of Potassium humate (0 and 1.8 gm.L^{-1}) and application methods (foliar and fertigation),.Results showed that Potassium humate caused significant increase in most of vegetative growth characteristics .The dual interaction treatments among the tested factors at both fertilization methods especially by fertigation at the high levels revealed significant increase in vegetative characters. and significant increase occurred in the yield characters (bulbs weight, yield of a square meter kg.m^{2}).**

KEY WORDS: Potassium humate, Application Methods , Onion.

INTRODUCTION

Onion (*Allium cepaL.*) belongs to the family Amaryllidaceae which is one of the most important mono-cotyledonuscrop. It is an important crop in all condiment and used of flavouring the food, both at mature and immature bulb stages besides being used as salad and pickles. It can be eaten as green leaves, bulbs can be eaten as fresh and also can be used in preparation of different dishes, Onions are the fourth most consumed vegetable in Iraq after tomatoes, potatoes and cucumbers., Onions are good for human health(Shanmugavelu, 1990).

Onion bulb is strongly contracted subterranean shoot with thickened, fleshy leaves as food organs and the nutritional value of it per 100gm is recorded:Carbohydrates (11.0 g), proteins (1.2 g), fiber (0.6 g), moisture (86.8 g) and energy (38 cal). Apart from these, vitamins like vitamin 'A' (0.012 mg), vitamin 'C' (11 mg), thiamine (0.08 mg), riboflavin (0.01 mg) and niacin (0.2 mg), and the minerals like phosphorus (39 mg), calcium (27 mg), sodium (1.0 mg), iron (0.7 mg) and potassium (157 mg) (Anonymous., 1978).Potassium humate contains organic C (51-57%), N (4-6%) and P (0.02%). It is believed that these acids improve crop yield due to its capability of applying nitrogen and P to the plants which added as a fertilizers in the amount of 1-2kg.h^{-1} [Brannon, 1985].The excessive use of agrochemical has polluted the environment to a great extent and the food produced under such a farm management may not be safe or of a good quality therefore public awareness of these problems has shafted the approach toward some alternative measurement (Shaxson, 2006).Organic fertilizers which include humic materials are one of the natural amendments which to increase the rate of organic matter in soil associated with improving the physical ,chemical and biological properties of the soil and consequently improve plant growth and development and the application of humic substances affect the plant growth which result in productive and fertile soil, and lead to increase the water holding capacity of the soil., it plays a pivot role in improving germination of the plant the plant resistance against drought stress, and reduces the requirement to the other fertilizers(Phelps, 2000). It also increases crop yield, soil aeration, and drainage can also be enhanced byhumic, in addition to establishment of desirable environment for the development of microorganisms,potassium humate as organic acid also play an important role which promote physical and chemical charecters of the soil through the vigore of these materials with soil mineral (Matoroiev 2002). Potassium humate is considered as an organic fertilizers it increase product quality and plant tolerance to drought stress salinity, heat cold, diseases and pest it increase also potato tuber yield (Hassan*et al*., 2008). Hafez (2004) reported that the application of humic substances improved plant growth, increase fruit yield and quality in squash plant (*cucrbbitapepo L.)*. Abd El- Aal*ea al. (2005)* revealed that application of potassium humate with irrigation water (14.28L.ha) significantly increased onion bulbs, dry weight of (*Allium*

cepa L.). Aays and Gulser (2005) studied different doses of sulphur and humic acid on yield components in squash (*Spinaciaoleracea* L.), the application of humic acid increased the total yield and the relation between doses of sulphure and humic acid with the total yield was found significant. Treatment of tomato seed with 0.01% potassium humate solution before planting for 24hours lead to increasing the yield about 20-25%., also pre-planting seed treatment of cucumber by 0.01%potassium humate solution for 24hours lead to increasing the yield about 38%. Jarien*et al*. (2007).Abd-El Moueam. (2013) carried out a field experiment on green onion in Mousel., he appear that adding organic fertilizers improve vegetative growth vharecters(leaves numbers, fresh weight and dry weight) also he showed significant different in yield charecters.

The aim of this study was to improve the vegetative growth and yield of green onion by applying method potassium humate as soil and foliar application on green onion plants.

2. MATERIALS AND METHODS

The experiment was carried out in October2011 at the research farm, Faculty of Agriculture and Forestry, University of Duhokongreen onion (*Allium cepa L.*), TexsasGranocultivare., the land was ploughed for two perpendicular lines and the soil was well softed, thw whole area was divided in to the three blocks, each experiment units consist of three row of 2*1m . bulbs were planted at distances of 25cm in October, 2011.at the third upper par of the two side of the ridge the fertilizer process by adding animal manure before planting and the soil was irrigated then the bulbs was planted. Randomize Completely Block design (R.C.B.D.) was used in this study that experiment included two factor, the first one was the concentration of potassium humate (0 and 1.8 gm.L^{-1}) and the other one represent the method of application of it (foliar and fertigation), after one month of planting the plant were sprayed four times within ten intervals day on the other hand all needed agricultural and horticultural process was done regularly during this study, the obtained data was statistically analyzed by using SAS program, and the significant difference between means was evaluated according to Duncan multiple range test at 5 % level. both vegetative growth parameter which include (leaves length (cm.) , No. of leaves.$plant^{-1}$, total chlorophyll percentage (%), fresh and dry weight (gm)) and also yield parameters (bulbs weight and yield $kg.h^{-1}$) was recorded.

EXPERIMENTAL MEASUREMENTS WERE AS FOLLOWS:

1 –VEGETATIVE GROWTH CHARACTERISTICS: -

a) Leaves length (cm).)
b) No. of leaves .$plant^{-1}$.
c) Total chlorophyll content (SPAD).
d) Fresh weight of vegetative (gm).
e) Dry weight of vegetative (gm).

3- YIELD CHARACTERISTICS:-

a. Bulbs weight (gm).
b. Yield $kg.m^{2.}$

3. RESULTS AND DISSCUTION:

3. 1. VEGETATIVE GROWTH CHARACTERS:

Table (1) Refer to the effect of potassium humate , its application method and their interaction on vegetative growth characters, the data showed that there was significant differences according to the method of potassium huamte application in leaves length which reaches (50.45cm) in fertigation compared with 44.5cm in foliar method in the same time there was significant differences on leaves length as a result of the concentration of potassium humate on the other hand the effect of interaction between the treatment indicated that there was significant difference in the application method (fertigagation) and potassium humate at (1.8gm.L^{-1}) that gave high value of leves length (55.10 cm) compared with untreated one (control) 40.50cm and 45.8cm in both method).

Concerning the leaves numbers .plant-^{1} it also refers that the application method hawed significant increase in fertigation application method which reaches (16.15 leaves $plant^{-1}$) in fertigation compared with 14.05 leaves. Plant $^{-1)}$ in foliar method, in the same time there was significant differences on leaves numbers as a result of the concentration of potassium humate on the other hand the effect of interaction between the treatment indicated that there was significant difference in the application method (fertigagation) and potassium humate at (1.8gm.L^{-1}) that gave high value of leaves number.$plant^{-1}$ (17.10) compared with untreated one in foliar application method.

Table (1) also indicated the effect of potassium humate , its application method and their interaction on Chlorophyll content (SPAD), there was significant increase in chlorophyll

contentinfertigation application method (53.11) compared with foliar application method (51.71), in the same time there was significant differences on chlorophyll content as results of the adding 1.8gm.L^{-1} of potassium humate 56.55 compared with untreated once (control), regarding the interactions the interaction between fertigation application method and potassium humat with 1.8gm.L^{-1} gave higher value of chlorophyll % (57.18%) compared with control in both application method.

Increasing vegetative growth by the fertigationmethods of potassium humatemay be attributed to the role of potassium humate on improving the soil fertility and increasing the availability of nutrient elements and consequently increased plant growth . The plant growth characters may give the clear indicators on the size and dense of vegetative growth of onion plants, [AL-Mokhtar*et al* ., 1991; Basset, 1986].Or may be due to the role of potassium humatethat provides nutrient elements that share in bio efficiency and then increasing the growth [Abd-Almawgood*et al*., 2007].

Regarding the fresh and dry weight.The results indicated that fertigation had high significant effects on fresh weight, than foliar. The fresh weight was also significantly affected by potassium humate levels. The plant treated with 1.8gm.L^{-1} potassium humate had high fresh weight (38.26gm) as compared with the untreated plant (36.6gm). It also indicates that fertigtionapplication method with potassium humateat level (1.8gm.$^{L-}$1) significantly affected the fresh weight as compared with untreated plant in foliar application method.

Regarding the dry weight there was significant difference among the two application method fertigation application method gave hight value of fresh weight compared with foliar application method, and there are significantly affected by potassium humate levels,treating plant with 1.8gm..L^{-1} potassium humateget high dry weight (10.7gm) as compared with the untreated plant. The application method × potassium humate interaction showed significant effects on the dry weight of vegetative growth, this may be as a result to the adding potassium humate that helped the soil to ventilation which permite the root respiration and, easily penetrate in the soil then lead to increase the root growth whose positively increases the vegetative growth through water and nutrient absorption (Garcia et al .,2008)The effect of potassium humate on plant growth could be due to the presence of plant growth regulators, which are produced by increasing the activity of microbes such as fungi, bacteria, yeasts, actinomycetes and algae that potassium humate make the activation of macroorganism better by adding nutrient element and reduce the loss of it [Arancon et al 2004; Molivko, 2001].

The enhancing of the plant growth using potassiumhumate had been reported to be due to increasing nutrients uptake such as N, Ca, P, K, (A.O.A.C. 2000).The beneficial effects of potassium humate on plant growth may be referred to its acting as source of plant growth hormones(Abd El-Aal*et al*., 2005).

The leave length Increased due to the application of potassium humate since the acid have the ability to provide an acidic medium and correlate with positive ions to form a complex which is very important for trace elements (micronutrients) as these micronutrients are seized (cohered) tightly and protected from precipitation by these compounds. The potassium humate is also a source of Nitrogen hence increasing the availability of nutrients (Phelps, 2000).

3.2. YIELD CHARACTERISTICS:

Table (2) Refer to the effect of potassium humate , its application method and their interaction on yield characters (bulbs weight (gm) and yield kg.m^2) the data showed that there was significant differences according to the application method of potassium huamte in fertigation method significantly increased which reaches (17.75gm) compared with 15.75gm in foliar application method in the same time there was significant differences on bulbs weight as a result of the concentration of potassium humate on the other hand the effect of interaction between the treatment indicated that there was significant difference in the application method (fertigagation) and potassium humate at (1.8gm.L^{-1}) that gave high weight of bulbs which reached (21.1gm) compared with untreated plants treatments.

Concerning the yield (kg.m^2) of onion it also refers that the application method showed significant increase in fertigation application method which reaches (20.2kg. mt^{-2}) in fertigation compared with 16.1 kg. mt^{-2} in foliar method, in the same time there was significant increase on yield as a result of the concentration of potassium humate on the other hand the effect of interaction between the treatment indicated that there was significant difference in the application method (fertigagation) and potassium humate at (1.8gm.$L^{-1)}$

that gave high value of yield kg.m^2 (22 kg.m$^{2)}$compared with the other treatment..

Increasing yield and weight of bulbsmay be attributed to that the potassium humates are considered as an important source of organic matter and their effects on yield and its components could be through their enhancing effect on increasing soil moisture holding capacity, improving soil texture as well as promoting the uptake of nutrients leading to stimulation of plant growth, and consequently on yield and its components (Zhange*et al* ., 2003).

Ghoname*et al*. (2009) who state that the highest yield were obtained when hot pepper plants were sprayed with potassium humate as a biostimulation. Rotenberg *et al*. (2005) reported that addition of organic amendment (composts to agricultural soils lead to improved soil quality and reduce severity of crop diseases as well as increased cucumber yield., and is in harmony with[Azrami and Giglo, 2009]on cucumber; [selim , *et al* 2009]

We can concluded from this study that ability enhancing the growth and yield of green onion by using some of organic fertilizer asalternative to chemical fertilizers and their negative effect to soil , environment and health.

Table (1): Effect of application methods and Potassium humate, and their interactions on the Vegetative growth of green onion characters.

Application	Leaves length (cm)		Mean effect of application	Application	No. of leaves. Plant^{-1}		Mean effect of application
	Potassium humate				Potassium humate		
	0	1.8.L			0	1.8gm.L	
Foliar	40.50b	48.6b	44.55b	Foliar	14.02b	14.08b	14.05b
Fertigation	45.8b	55.10a	50.45a	Fertigation	15.2ab	17.10a	16.15a
Mean effect of P.H	43.15b	51.85a		Mean effect of P.H	14.61b	15.59a	

Application	Chlorophyll content(SPAD)		mean effect of application
	Potassium humate		
	0	1.8gm.L	
Foliar	47.5b	55.93ab	51.71b
Fertiigation	49.09b	57.18a	53.13a
Mean effect of P.H	48.29b	56.55a	

Application	Fresh weight (gm.)		Mean effect of application	Application	Dry weight (gm.)		Mean effect of application
	Potassium humate				Potassium humate		
	0	1.8gm.L			0	1.8gm.L	
Foliar	32.4b	34.30b	33.35b	Foliar	9.9c	10.2ab	10.05b
Fertigation	40.8a	42.23a	41.51a	Fertigation	10.1b	11.2a	10.65a
Mean effect of P.H	36.6b	38.26a		Mean effect of P.H	10b	10.7a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

Table (2): Effect of application methods and potassium humate, and their interactions on the yield characters of greenOnion.

Application	Bulbs weight gm.plant^{-1}		Mean effect of application	Application	Yield kg. m^{2}		Mean effect of application
	Potassium humate				Potassium humate		
	0	1.8gm.L			0	1.8gm.L	
Foliar	13.5b	18ab	15.75b	Foliar	15c	17.2b	16.1b
Fertigation	14.4b	21.1a	17.75a	Fertigation	18.4ab	22a	20.2a
Mean effect of P.H	13.95b	19.55a		Mean effect of P.H	16.7b	19.6a	

Means within a column, row and their interactions followed with the same letters are not significantly different from each other according to Duncan's multiple range test at 5% level.

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ریکا بکائینانا پوتاسیوم هیوماتی لسەر کەسکاتی و بەرهەمی پیڤازا کەسێك (*Allium cepa* L)

پوختە :

ئەڤ ڤەکولینە هاتە بجهئینان د زەڤێن زەرزەواتی ل پشکا بیستانکاری فاکولیتیا جاندن و دارستان زانکویا – دهوك د مەها دھ دە دا سالا ٢٠١١یێ ل سەر پیفازی (*Allium cepa* L) ڤەکولین هاتە ریّکخستن ل دویڤ دیزاینێ (Randomized Complete Block Design, R.C.B.D.) هەر موئامەلەك هاتە دوبارەکرن سی جارا دکەل دھ رووەکان بو هەر یەکی فاکتەر پێك هاتیی بوو زُڤان : ریزەین دیارکری(٠، ١.٨ گرام.لتر) وهەرواسا ریّکا بکائینانی(روشاندن و ریکا لسەر ئاخی) ئەنجام هاتن دیارکرن کو هیوماتین بوتاسیومی زیدەبونەکا بەرجاف دیارکر د برانیا ساخلەتین کەسکاتی دە . هەرواسا تیکەل بوون دنافبەرا موئامەلاتین هاتین کرین زیدەبونەکا بەرجاف دیارکر د هەردوو ریکین کارکری تایبەتی د ریکا ل سەر ئاخێ و ب ریزین بلند ز هیوماتین بوتاسیومی دیارکری لسەر ساخلەتین بەرهەمی (کیشەی بیقازی، و بەرهە می دەەجای مەتر کغم\ متر٢)

طريقة اضافة هيومات البوتاسيوم على نمو وحاصل البصل الاخضر (*Allium cepa* L)

الخلاصة:

اجريت هذه التجربة في حقول الخضروات، التابعة لفاكوليتي الزراعة والغابات جامعة دهوك لعام ٢٠١٢. على نبات البصل(*Allium cepa* L) حيث زرعت الابصال في تشرين الاول–٢٠١١ واستعمل تصميم القطاعات العشوائية الكاملة (R.C.B.D) ، في هذه التجربة . كررت كل معاملة ثلاث مرات لعشر نباتات لكل معاملة. تضممت المعاملات الاتي: تركيزين من بوتاسيوم هيومات (٠، ١.٨ غم\لتر$^{-1}$) . وطريقة الاضافة (الرش على الاوراق و الاضافة للتربة) . اظهرت النتائج بان هيومات البوتاسيوم سببت زيادة معنوية في اغلب صفات المجموع الخضري.اما فما بخص التداخلات الثنائية بين العوامل المدروسة استخدم كلتا الطريقيتين وبشكل خاص طريقة الاضافةللتربة فقد بينت حصول زيادة معنوية في الصفات الخضرية ، كما وجد حصول زيادة معنوية في كمية الحاصل (وزن البصل والانتاج في وحدة المتر المربع كغم.متر^{2}).