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REVIEW ARTICLE

INFLUENCE OF INTEGRATED NUTRIENT MANAGEMENTON FLOWERING, YIELD AND YIELD COMPONENTS OF CUCUMBER ON FIELD CONDITION

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ABSTRACT

An experiment was carried out on influence of organic, inorganic and bio fertilizers on yield and economics of cucumber grown under field condition during spring and autumn 2013. The results revealed that the plants treated with 100% RDF + AZT + PSB + TD (T2) registered lowest number of days for female (48.0; 53.0) flower appearance, highest sex ratio (1.42; 1.18 %), highest fruit length (21.0; 20.3 cm), l), fruit diameter (38.0; 36.0 mm), fruit weight (150.0; 138.3 g), fruit yield vine-1 (2.41; 1.83 kg), Yield early (5.46; 2.76 t ha-1) and total fruit yield hectare-1 (64.2; 48.9 t ha-1) Spring and Autumn 2013 respectively, While the results show that less Agawam standards flowers and winning above recorded in the control treatment (without any fertilization)The results also showed that reducing the proportion of mineral fertilizers added by a brother% and 50% and compensated the same proportions of organic fertilizer with the same combination of bio-fertilizer (75%RDF+ 25% org + + AZT + PSB + TD and 75%RDF+ 50% org + AZT + PSB + TD) gave the results did not differ significantly from the treatment of 100% RDF + AZT + PSB + TD.The results confirm that the fertilization system offers an alternative to the integrated systems and organic fertilization Chemical and bio individually and achieve higher production yields not differ significantly from the full treatment dose of mineral fertilizers and less environmental damage.

INTRODUCTION

Cucumber (*Cucumis sativus*) it is one of important economic crops in Iraq and Middle East countries, according to statistical of F.A.O. (2013) the cultivated area reached to273000 Ha with low productivity. There is essentially a warm season crop mainly grown in tropical and subtropical regions where it is cultivated in the field. Cucumber responds well to manuring and fertilization. The use of expensive commercial fertilizers as per the requirement of the crop is not much affordable to the average farmers. The application of high input technologies such as chemical fertilizers, pesticides, herbicides improved the production but there is growing concern over the adverse effects of the use of chemicals on soil productivity and environment quality (Hanna *et al.,*1999 and Tekale *et al.,* 2014). Modern Integrated nutrient supply system has become an accepted strategy to bring about improvement in soil fertility and protecting the environment and strategy has shifted its focus towards the concept of sustainability and eco friendliness (Luu *et al.,* 2002) and (Islam *et al.,* 2011). Intensive use of only chemical fertilizers to achieve high production has created a various problems (Naidu *et al.,*1999 and Harman, 2000). Continuous application of heavy doses of chemical fertilizers without organic manures or bio-fertilizers has lead to a deterioration of soil health in terms of physical and chemical, properties of soil, declining of soil microbial activities, reduction in soil humus, increased pollution of soil, water and air (Naidu, 1999). Hence, integrated supply of nutrients through organic, inorganic and bio-fertilizers is the need of the hour for sustainable productivity and to maintain better soil health (Purbhu *et al.,* 2006). Hence, there is a need to standardize the integrated nutrient management practices for cucumber growing under open condition to get early yield and higher productivity and quality of produce (Anjannapa *et al.,* 2012, Isfehany *et al.,* 2012). *Trichoderma* which is a naturally occurring saprophytic soil fungi which is used as cellulose decomposer, phosphate solubilizer, phytohormon production (Saeed *et al.,*2014) and biological control to many, among which *T. viridae* and *T. harzianum* are most important (Saeed *et al.,* 2011 and Molla *et al.,* 2012). The phosphate solubilizing microorganism phosphobacteria like pseudomonas bacteria which can solubilize insoluble forms of phosphorous by secreting organic acids. These microbes help in solubilizing the phosphorous from rock phosphate and other sparingly soluble forms of soil phosphorous by decreasing their particle size (Karnwal 2009).

The aim of this study to evaluate the ability of organic, inorganic and bio fertilizers and interaction between them in

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on same flowers and yield parameters of cucumber grown under field.

MATERIALS AND METHODS

This study carried out in laboratories and fields of the Ministry of Science and Technology - Baghdad - Iraq, during Spring and Autumn 2013 The soil of the experimental field was sandy loam clay having 7.29 PH. Some soil chemical and physical properties are given on Table 1. The experiment was laid out in Randomized Completely Block Design with three replications involving 18 treatments. The plot size was 3.5 x 2.0 m. A spacing of 150 x 90 cm was followed. The recommended dose of Urea, triple super phosphate and potassium sulphate (260: 340 :100 kg/ha), tow level of Animal manure cows Degradable (5 and 2.5 v/v) and bio-fertilizers like Azotobacter (4 gm/plant), Phosphobacteria pseudomonas fluorescens (4 gm/plant) and Trichoderma (4 gm/plant) were applied as per the treatments, the bio fertilizers were mixed with soil and organic manure before transplanting seedling. Added fertilizer superphosphate and a single dose before the lines of agriculture and the mixing with the soil before planting the seedlings The urea and potassium sulphate was added in a manner feed and by four installments the first payment after 5 days of cultivation of seedlings, while payments are the second, third and fourth was added after 15.25, 35.45, days from planting seedlings and placing it in the bottom of the grooves plants developing a distance of 0.07 -0.1 m and then covered with soil. The cultivar used in this study was 'Gazeer', A genotype is characterized by good growth and high productivity and succeed grown under conditions of Agriculture convertibles in Iraq. The observations on flowering characters like days to first female flower appearance, sex ratio, and growth parameters like fruit length (cm), fruit volume (cc), fruit diameter (cm), fruit weight per vine (g), Early production plant, fruit yield (kg vine-1) and Total yield (t ha-1) was recorded and analyzed.

Data Analysis

All data were statistically analysed using the analysis of variance (ANOVA) procedure in the Genstat program to assess the effects of different treatments. Means were compared using the least significant difference (LSD) test when the ANOVA showed significant fertilizer effects ($P \leq 0.05$).

Combination of organic, inorganic and bio-fertilizers helped in enhanced uptake of nutrients which promotes faster plant growth leading to increase production of higher number of male and female flowers. The results are in conformity with the findings of Nirmala *et al*. (1999), Prabhu *et al.* (2006), Mahmoud *et al*. (2009), and anjanappa *et al.* (2012) in cucumber (Table 2).

For days taken to first female flower appearance, plants fertilized with 100% RDF + AZT + PSB + TD (F1+B2) recorded least number of days (48.00 ; 53.3 days) taken for first female and flower appearance which was *on par* with Treatments (F2+B2),(F3+B2),(F1+B1) and (F2+B1) during the summer and *rabi*2013 respectively. This could be attributed to vigorous growth of the plants due to balanced nutrient levels with bio-fertilizers. Phosphorus is an important element and essential for initiation of flowering, PSB along with NPK known to increase the availability of phosphorus resulted in early flowering. This finding is in line with Sharma *et al.* (1997), Patil *et al.* (1998) reported that application of 150 kg N plus 50 kg each of P and K per hectare produced significantly highest vine length (180 cm), number of branches per vine (5.50) and earlier female flower initiation in cucumber (Table 2).

The highest fruit length (21 ; 20.3cm) was recorded in plants provided with 100% RDF + AZT + PSB + TD (F1+B2) and which was *on par* with (F2+B2),(F3+B2),(F1+B1)and (F2+B1) during Spring and Autumn season 2013respectively. plants fertilized with 100% RDF + + AZT + PSB + TD (F1+B2) recorded highest fruit weight (150 ; 138.3 gm), which was *on par* with (F2+B2) and (F1+B1) during spring and Autumn 2013. Plants fertilized with 100% RDF + AZT + PSB + TD (F1+B2) recorded the highest fruit diameter (38; 36 cc) which was on par with treatment (F2+B2),(F3+B2), (F1+B1) and (F2+B1) during spring 2013 and (F2+B2)and (F3+B2) during Autumn 2013. While lowest fruit length, weight and diameter (9; 8.3cm), (37,29.3 gm) and (18, 15.3 cc) was noticed with control treatment during Spring and Autumn 2013 respectively (Table 3).

The increased fruit length, fruit weight and fruit diameter could be attributed to balanced nutrition, better nutrient uptake and synthesis of more carbohydrates by plants when provided with combinations of inorganic, organic and Bio fertilizers which

Table 1. Physical and chemical properties of the soil field

Character	Soil texture	Clay $g.kg^{-1}$ soil	Silts $g.kg^{-1}$ soil	Sandy $g.kg^{-1}$ soil	EC s/cm	O.M $g.kg^{-}$	availability elements ppm				
							N	P	K	Fe	Zn
Value	Sandy Silts Clay	50.42	33.62	15.95	872	0.75	42.1	18	113	7.56	0.29

RESULTS AND DISCUSSION

Plants provided with 100% RDF + AZT + PSB + TD (T F1B2) registered the maximum number (1.42 ; 1.18) sex ratio which was *on par* with plants provided with (F2+B2) The increased sex ratio may be due to the production of almost same or up number of female flowers as that of male flowers. The results could be attributed to vigorous vine growth which helped in synthesis of hormones like GA which induced production of more number of male and female flowers. influence the increased vine length, number of leaves and branches per vine and increased chlorophyll content in leaf resulting in higher photosynthesis leading to increased fruit length fruit diameter intern increased the fruit volume. The results are in conformity with the findings of Umamaheshwarappa *et al.* (2005), Eifediyi and Remison (2010), Shehata *et al*. (2012) and Abud *et al*. (2014) in cucumber.

Table 2. Effect of integrated nutrient management on days taken for first female flowers and sex ratio in cucumber grown under open condition

Treatments	Spring season 2013				Autumn Season 2013			
	Sex %							
	Biofertilizer			Average. Chm.+org.	Biofertilizer			Average. Chm.+org.
	B0	B1	B2		B0	B1	B2	
F0	0.4	0.85	0.860	**0.703**	0.320	0.81	0.830	0.653
F1	1.13	1.31	1.42	1.280	0.900	1.02	1.180	1.033
F2	1.07	1.21	1.40	1.123	0.833	0.92	1.150	0.967
F3	0.97	1.00	1.31	1.113	0.790	0.85	0.986	0.877
F4	0.82	0.996	1.19	1.002	0.686	0.79	0.890	0.788
F5	0.89	0.940	0.98	0.936	0.580	0.72	0.790	0.696
Average bio fertilizers	**0.88**	1.035	1.203		0.685	0.852	0.971	
L.S.D.bio at 5%			0.0239			0.0179		
L.S.D.chm.+org. at 5%			0.0338			0.0253		
L.S.D.chm.+org+bio. at 5%			0.0585			0.0438		
member day to first appearing female								
F0	55	53	53	53.7	60.0	59	58.3	59.1
F1	50	48.6	48	48.8	56.3	53.3	53.00	54.2
F2	51.0	49	48.3	49.4	57.0	53.9	53.3	54.5
F3	51.3	49.5	48.3	49.6	57.6	54.6	53.8	55.3
F4	52.0	50.3	49.6	50.6	58	55.0	54.3	55.7
F5	53.6	51.0	50	50.6	59.0	57.0	56.0	57.3
Average bio fertilizers	52.15	50.2	49.58		58	55.58	54.77	
L.S.D.bio at 5%			0.573			0.352		
L.S.D.chm.+org. at 5%			0.810			0.4989		
L.S.D.chm.+org+bio. at 5%			1.403			0.8642		

B0= control , B1= *Azotobacter c*+ *Pseudomonas F*, B2= *Trichoderma h* + *Azotobacter c* + *Pseudomonasf*, F1=100%NPK+0%org, F2=75%NPK+25%org, F3=50%NPK+50%org, F4=25%NPK+75%org, F5=100% org

Table 3. Effect of integrated nutrient management on fruit length, fruitb weight and fruit diameter of cucumber at harvest grown under open condition

Treatment	Spring season 2013				Autumn Season 2013			
	length cmfruit							
	Biofertilizer			Average.	Biofertilizer			Average.
	B0	B1	B2	Chm.+org.	B0	B1	B2	Chm.+org.
F0	9	12.3	13	11.44	8.3	12.3	12.6	11.11
F1	17	20	21	19.33	17.0	20.0	20.3	19.22
F2	17	20	20	19.00	16.6	19.0	20.3	18.55
F3	16.6	19.3	20	18.63	16.3	18.6	20.0	18.33
F4	15	19	19.3	17.66	15.0	18.0	18.6	17.22
F5	14	18.1	18.5	16.86	13.3	18.0	18.0	16.55
A. bio fertilizers	14.7	18.11	18.58		14.38	17.77	18.33	
L.S.D.bio at 5%			0.570				**0.3892**	
L.S.D.chm.+org. at 5%			0.806				**0.5504**	
L.S.D.chm.+org+bio. at 5%			1.396				**0.9533**	
frout Wight								
F0	37.0	40.0	43.0	40.00	29.3	34.6	40.3	**34.73**
F1	127.0	145.0	150.0	140.0	124.3	130.9	138.3	**131.2**
F2	115.3	138.0	145.0	132.76	99.3	130.0	136.0	**121.78**
F3	104.6	130.6	135.0	122.11	92.0	129.0	134.3	**118.44**
F4	101.3	117.3	128.0	112.22	82.0	115.3	125.0	**107.44**
F5	67.0	110.0	112.0	96.33	49.3	108.0	109.3	**88.88**
Average bio fertilizers	92.0	113.4	121.50		79.38	107.98	11	
L.S.D.bio at 5%			2.620				3.699	
L.S.D.chm+org. at 5%			3.706				5.231	
L.S.D.chm+org+bio. at 5%			6.419				9.061	
Demeter fruits								
F0	18	27.0	29	24.33	15	26	27	**22.26**
F1	33.3	37	38	35.78	30.0	33	36	**33.1**
F2	32	36	37	35.00	29.3	33	34.6	**32.33**
F3	30	35	35.6	33.50	29.0	32	33.6	**31.56**
F4	28.3	33	34	31.7	29	31.2	26.6	**30.60**
F5	25	30	32	35.78	25	30	32	**28.60**
Ave. bio fertilizers	27.7	33	34.26		26.26	30.86	32.46	
L.S.D.bio at 5%			0.866				**1.016**	
L.S.D.chm.+org. at 5%			1.224				**1.437**	
L.S.D.chm.+org+bio. at 5%			2.120				**2.488**	

B0= control B1= *Azotobacter c*+ *Pseudomonas F*, B2= *Trichoderma h* + *Azotobacter c* + *Pseudomonasf* , F1=100%NPK + 0%org , F2=75% NPK+25%org , F3=50%NPK + 50%org , F4=25%NPK+75%org, F5=100% org

Table 4. Effect of integrated nutrient management on number of fruits per vine and fruit yield of cucumber grown under open condition

Treatment	Spring season 2013				Autumn Season 2013			
	Yield early t ha-1							
	Biofertilizer			Average. Chm.+org.	Biofertilizer			Average. Chm.+org.
	B0	B1	B2		B0	B1	B2	
F0	0.2	0.23	0.23	0.22	0.12	0.21	0.22	0.18
F1	3.6	5.45	5.46	4.83	2.61	2.71	2.76	2.69
F2	3.06	4.80	5.3	4.38	2.58	2.7	2.72	2.66
F3	3.0	4.30	5.1	4.13	2.53	2.62	2.64	2.59
F4	2.29	3.36	3.5	3.38	2.48	2.45	2.58	2.50
F5	1.47	1.60	2.0	1.61	1.59	1.82	1.85	1.75
Average bio fertilizers	2.43	3.29	3.59		1.987	2.086	2.127	
L.S.D.bio at 5%		0.4410				0.1666		
L.S.D.chm.+org. at 5%		0.6237				0.2356		
L.S.D.chm.+org+bio. at 5%		1.0803				0.4080		
	Yield plant kg							
F0	0.82	0.974	0.98	0.925	0.67	0.850	0.862	0.794
F1	1.86	2.302	2.410	2.191	1.141	1.733	1.836	1.660
F2	1.781	2.177	2.330	2.096	1.390	1.606	1.752	1.582
F3	1.707	1.961	2.291	1.986	1.342	1.515	1.720	1.525
F4	1.621	1.801	1.855	1.759	1.281	1.411	1.640	1.471
F5	1.453	1.841	1.853	1.716	1.181	1.354	1.510	1.348
Average bio fertilizers	1.540	1.843	1.953		1.212	1.411	1.470	
L.S.D.bio at 5%		0.07				0.078		
L.S.D.chm.+org. at 5%		0.099				0.111		
L.S.D.chm.+org+bio. at 5%		0.171				0.191		
	Total yield t ha-1							
F0	21.70	25.7	26.1	24.5	17.8	22.6	22.9	21.60
F1	51.2	61.3	64.20	58.9	37.6	46.2	48.9	44.23
F2	47.4	58.05	62.10	55.85	37.0	42.8	47.3	42.37
F3	45.5	52.30	60.77	52.86	35.7	40.3	45.7	40.57
F4	43.2	48.02	49.46	47.6	34.1	39.7	43.7	39.17
F5	38.70	49.09	49.41	45.56	31.4	36.1	40.2	35.90
Average bio fertilizers	41.28	49.42	51.93		32.27	37.9	41.45	
L.S.D.bio at 5%		2.511				2.314		
L.S.D.chm.+org. at 5%		3.552				3.273		
L.S.D.chm.+org+bio. at 5%		6.151				5.669		

B0= control , B1=*Azotobacter c + Pseudomonas F*, B2= *Trichoderma h + Azotobacter c + Pseudomonasf*, F1=100%NPK + 0%org, F2=75% NPK+25%org, F3=50%NPK + 50%org, F4=25%NPK+75%org, F5=100% org

Application of 100% RDF + AZT + PSB + TD (F1+B2) recorded maximum early fruit yield per hectare (5.46 ; 2.76 t ha-1) which was *on par* with Treatments (F1+B1), (F2+B2), (F3+B2) and (F2+B1) respectively in both the seasons.For the character fruit yield per vine, maximum fruit yield per vine (2.41 ; 1.836) kg vine-1) was recorded in plants fertilized with 100% RDF + AZT + PSB + TD (F1+B2) which was *on par* with Treatments F2+B2(2.33;1.75 kg vine-1) F3+B2(2.29; 1.72kg vine-1) and F1+B1 (2.30 ; 1.73kg vine-1) during Spring and Autumn 2013 respectively. Plants fertilized with 100% RDF + + AZT + PSB + TD (F1+B2) recorded highest total fruit yield per hectare (64.2; 48.9 t ha-1), which was *on par* with treatments F2+B2, F3+B2 and F1+B1 respectively during spring and autumn 2013.

While lowest fruit yield per vine, early fruit yield per hectare and total fruit yield per hectare (0.82 ; 0.67 kg), (0.2,0.12 t ha-1) and (21.7, 17.8 t ha-1) was noticed with control treatment during Spring and Autumn 2013 in both the seasons 2013 (Table4), Increased fruit yield in these treatments could be attributed to lowest number of days taken for male and female flower appearance, production of more number of female flowers, number of fruits and fruit weight which were positively contributed towards fruit yields. Increased yield was also related to balanced nutrition, better uptake of nutrients by the plants which helped for better fruit set and fruit yield. More yield of cucumber in present study could be due to the influence of bio-fertilizers in combination with NPK and Organic material enhanced the synthesis of photosynthates by increasing the synthesis of growth regulators like IAA, GA, amino acids, and vitamins. More number of fruits per plant and fruit weight per plant ultimately resulted in more fruit yield per hectare. Present findings are in conformity with the reports of Choudhari and More (2002), Prabhu*et al.* (2006), Olaniyi *et al.* (2009), Abud *et al.* (2014) and in cucumber.

REFERENCES

Aboud, H. M., A. Hashim and R.M. Abed. 2014. Interaction of *Bacillus subtilis* and *Trichoderma harzianum* with Mycorrhiza on growth and yield of cucumber. *International Journal of Current Research* 6(8):7754-775.,

Anjanappa M.venkatesh and b. suresh kumara.2012.Influence of organic, inorganic and bio fertilizers on flowering, yield

and yield attributes of cucumber (cv. Hassan Local) in open field condition.*Karnataka J. Agric. Sci*.,25 (4) : (493-)

Choudhari, S. M. and More, T. A., 2002, Fertigation, fertilizer and spacing requirement of tropical gynoecious cucumber hybrids. *Acta Hort.,* 588: 233-240.

Eifediyi, E. K. and Remison, S. U. 2010. Growth and yield of cucumber (*Cucumis sativum*L.) as influenced by farm yard manure and inorganic fertilizer.*Journal of Plant Breeding and Crop cience* 2(7): 216-220.

F.A.O. 2013.World Food and Agriculture organization of United Nations. Book Rome, Italy.

Hanna, H. Y. and Adams, A. J., 1991. Yield increase of staked cucumber by supplemental drip irrigation reducing plant spacing and higher NPK rates. *Proc. Florida State Hort. Soc.,* 104: 240-244.

Isfahani,F.M.,H.Moshabaki.2012. Effect of bio ferttilizers on yield and yield components of cucumber plant.*Journal of Biology and Earth Sciences* 2, (2):

Islam M. M., N M. Majid, A. J. M. S. Karim, M. Jahiruddin, M. S. Islam and M. A. Hakim 2011. Integrated nutrient management for tomato-okra-stem amaranth cropping pattern in homestead area.*J. of Food, Agri. And Envi*. Vol.9 (2) : 4 3 8 - 4 4 5

Karnwal A.2009. Production of indole acetic acid by fluorescent *pseudomonas* in the presence of l-tryptophan and rice root exudate. *Journal of Plant Pathology*, 91 (1), 61-63.

Luu H. M., Nguyen Ngoc Ha1, Pham Sy Tan1 T. Kon, H. Hiraoka and H. Kobayas. 2002. Integrated nutrient management for a sustainable agriculture at OMon, Vietnam.Omonrice 10: 87-93 (2002).

Mahmoud, E.; N. A. Kader and P. Robin 2009.Effect of different organicand inorganic fertilizers on cucumber yield and some properties.*World Journal of Agricultural Sciences* 5 (4) : 408- 414.

Molla, A. H., M. M. Haque., M .A. Haque and G.N.Ilias.2012.*Trichoderma*-Enriched Bio fertilizer Enhances Production and Nutritional Quality of Tomato (*Lycopersicon esculentum* Mill.) and Minimizes NPK Fertilizer Use. Agricultural research 1(3):265-272.

Naidu, A. K., Kushwah, S. S. and Dwivedi, Y. C., 1999.Performance of organic manures, bio fertilizers and chemical fertilizers and their combinations on microbial population of soil and growth and yield of okra. *JNKVV Res. J.,* 33 (1): 34-38.

Nirmala, R., Vadivel, E., Azakiamanavalan, R. S., 1999. Influence of organic manures on fruit characters and yield of cucumber Cv. Local. *South Indian Hort.,* 47 (1/6): 65-68.

Olaniyi, J.O; Ogunbiyi, E. M. and Alagbe, D. D.2009.Effects of organo-mineral fertilizers on growth, yield and mineral nutrients uptake in cucumber.*Journal of Animal & Plant Sciences,* 5(1): 437 - 442

Patil, S. D., Keskar, B. G. and Lawande, K. E., 1998.Effect of varying levels of N, P and K on growth and yield of cucumber (*Cucumis sativus* L.) Cv. Himangi, *J. Soils Crops,* 8 (10): 11-15.

Prabhu, M., S.Natarajan and L.Pugalendhi.2006. Integrated nutrient management in Cucumber. *Indian J.Agric.Res.*40(2):123-126.

Saeed, F. H.,H. M. Aboud., and K. D.Hasan**.** 2014.The detection of auxin and cytokinin hormones in culture filtrate of some bio fetilizeragente. Women's Conference Scientific - The Ministry of Science and Technology Baghdad – Iraq.

Saeed, F.H., Hade, M.A. and Usama, A.A. 2011. Effect of *Trichoderma harzianum* on delivery in enhancing seeds germination and growth of sour orange (*Citrus aurantium*). Integrated Control in Citrus Fruit Crops IOBC/wprs Bulletin Vol.62. p.30.

Sharma, S. K., Mehta, B. S. and Rastogi, K. B., 1997, Effect of planting dates and nitrogen levels on yield and quality attributes of cucumber. *Indian J. Hort.,* 54 (2): 160-162.

Shehata, S.A., Yasser, M. Ahmed, Youssef T. Emam and Mahmoud A. Azoz.2012 .Influence of Some Organic and Inorganic Fertilizers on Vegetative Growth, Yield and Yield Components of Cucumber Plants.*Research Journal of Agriculture and Biological Sciences*, 8(2): 108-114, 2012

Tekale C. D., Tumbare A. D., Tekale G. S., Danawale N. J. and Tambe S.2014. Effect of different fertigation levels and schedules on cucumber under polyhouse condition. *International Journal of Current Research*. 6(7):7353-7355

Umamaheshwarappa, P., Nachegowda, V. and Murthy, P. V., 2005, Uptake of nitrogen, phosphorous, potassium and fruit size of cucumber Cv. Poinsette as influenced by different levels of NPK fertilizers. *Karnataka J. Hort.,* 1(3): 76-80.

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