Journal of Crop and Weed, 16(2): 254-257 (2020) ISSN- O : 2349 9400 ; P : 0974 6315

http://cwssbckv.org
www.cropandweed.com

Effect of integrated nutrient management on growth and fruit yield of cucumber (*Cucumis sativus* L.)

P. SAHU, P. TRIPATHY, G. S. SAHU, [1]S. K. DASH, [2]S. K. PATTANAYAK, [1]S. SARKAR, B. TRIPATHY, N. J. NAYAK AND S. MISHRA

Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar, Odisha
[1]AICRP on Vegetable Crops, [2]Department of Soil Science and Agricultural Chemistry
OUAT, Bhubaneswar, Odisha

Received : 11.11.2019 ; Revised : 04.03.2020 ; Accepted : 15.06.2020

DOI : https://doi.org/10.22271/09746315.2020.v16.i2.1346

ABSTRACT

Field experiment was conducted at AICRP on Vegetable Crops of OUAT, Bhubaneswar, Odisha during summer, 2018 to study the efficacy of different sources of nutrients on growth and yield of cucumber. The experiment was laid out in RBD replicated thrice having twelve INM modules including absolute control.The results revealed significant variations among different treatments for growth and yield in cucumber. Invariably, integrated application of 50% of RDF + FYM @ 10 t ha^{-1} + vermicompost @ 2 t ha^{-1} + biofertilizer recorded not only significantly highest vine length (1313.00 cm), primary branches vine^{-1} (3.00), fruit length (19.79 cm), fruit girth (15.13 cm), average fruit weight (194.13 g) and fruit vine^{-1} (11.07) but also fruit yield (214.05 q ha^{-1}) than rest of the treatments. Similarly, the module also showed significantly lowest sex ratio (3.43) and maximum extended period of fruit harvesting (41.00 to 68.00 days). On the other hand, significantly lowest vegetative growth (i.e., vine length of 550.67 cm and primary branches vine^{-1} of 1.93), delayed in 1st fruit harvest (44.33 days), lowest yield attributing parameters (i.e., fruit length : 12.76 cm, fruit girth : 10.57 cm, average fruit weight : 92.00 g, fruits vine^{-1} : 4.20) and total fruit yield (53.70 q ha^{-1}) in plots without any fertilizer and biofertilizer. The next better treatment was integrated application of 100% RDF + FYM @ 10 t ha^{-1} + biofertilizer for growth and yield in cucumber.Thus, it may be concluded that integrated application of 50% RDF + FYM @ 10 tha^{-1} + Vermicompost @ 2 t ha^{-1} + biofertilizer not only increases vegetative growth but also fruit yield in cucumber.

Keywords: Bio-fertilizer, cucumber, FYM, growth, INM, vermicompost and yield

Cucumber (*Cucumis sativus* L.) is one of the early maturing most popular vine vegetable of Cucurbitaceae family. It is said to be native of northern India (De Candolle, 1882). The crop is the fourth most important vegetable crop after tomato, cabbage and onion in Asia (Singh *et al.*, 2017). It is mainly grown for its edible tender fruits, used for salad and pickles. Fruits have cooling effect and also very effective to prevent jaundice, indigestion and constipation (Mohan *et al.*, 2016).

Being an important salad vegetable, cucumber in general, responded well to both manures and fertilizers. However, indiscriminate use of synthetic fertilizer for a long period of time, the soil become loses their fertility status day by day. Thus there is urgency in orientation of research towards efficient and judicious utilization of available nutrient resources to increase the production, productivity and profitability per unit area to meet out the food and other demands of ever increasing population. The purpose of INM is to integrate the use of all natural and man-made sources of plant nutrients, so that crop productivity increases in an efficient and eco-friendly manner, without sacrificing soil productivity of future generation (Maruthi *et al.*, 2014). Keeping these in view, the present field experiment was conducted to study the efficacy of different nutrient sources on growth and yield of cucumber.

The present investigation was carried out at AICRP on Vegetable Crops of Odisha University of Agriculture and Technology, Bhubaneswar, Odisha, India during summer season of 2018. Twelve nutrient schedule along with absolute control was tested by adopting RBD replicated thrice. The treatments were T_1 – FYM @ 20 t ha^{-1}, T_2 – vermicompost @ 4 t ha^{-1}, T_3 – recommended NPK through fertilizer (100:60:60 kg ha^{-1}),T_4 – FYM @ 10 t ha^{-1} + biofertilizer (*Azosirillum, Azotobacter* and PSB), T_5 – vermicompost @ 2 t ha^{-1} + biofertilizer, T_6 – 50% recommended NPK (50:30:30 kg ha^{-1}) + biofertilizer,T_7 – 50% recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer,T_8 – 50% recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer, T_9 – recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer,T_{10} – recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer,T_{11} – 50% recommended NPK + FYM @ 10 t ha^{-1} + vermicompost @ 2 t ha^{-1} + biofertilizer and T_{12} – absolute control, without any source of nutrient. FYM were applied 15 days prior to sowing as per the treatment schedule. Inorganic fertilizers as urea, DAP, SSP were applied in both basal and split doses while biofertilizer (*Azospirillum*, *Azotobacter* and

Short communication

Email: priyanka.ouat6565@gmail.com

PSB) @ 4 kg ha^{-1} in 1:1:1 were applied as basal dose. Recommended package and practices were followed to raise a good crop. Seeds of cucumber variety "Seven Star" were sown in the field at 1.5 x 1.00 m in plots of 3.0 x 2.7 m^2 size on 11-04-2018. All the biometrical observations were recorded from randomly selected plants and subjected to statistical analysis (Panse and Sukhatme, 1985).

Vegetative and flowering parameters

The data presented in the table 1 revealed significant variation among nutrient treatments for vegetative growth, flowering and fruit yield parameters in cucumber variety "SevenStar". Invariably, integrated application of 50% recommended NPK + FYM @ 10 t ha^{-1} + vermicompost @ 2 t ha^{-1} along with biofertilizer recorded significantly highest vine length at final harvest (1313.00 cm), number of primary branches $vine^{-1}$ (3.00) with lowest sex ratio of (3.16) than rest of nutrient treatments along with absolute control. However, the nutrient treatments like FYM @ 20 t ha^{-1} (T_1),recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_9) and recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer (T_{10}) were *statistically atpar* for vine length (1243.67 – 1266.67 cm) and number of primary branches $vine^{-1}$ (2.83 – 2.92). The increase in vegetative parameters *viz*., vine length and number of primary branches $vine^{-1}$ might be due to the role of nitrogen in promoting vegetative growth, enhancing cell division and elongation as well as greater chlorophyll synthesis. Application of organic sources of nutrient improved soil physical properties, well developed root system resulting better absorption of nutrient and water which ultimately increases growth of plant. Application of biofertilizer consortia not only fixed atmospheric nitrogen, solubilizing unavailable phosphorous to available form but also releases some growth promoting substances there by increase vegetative growth. Similar reports of better efficacy of integrated approach of organic, inorganic and biofertilizer was reported by several scientists (Prabhu *et al*., 2006; Bindiya *et al.*,2014 ; Kanaujia and Daniel 2016; Mohan *et al*., 2016) in cucumber.The result data also revealed significant variations for sex ratio (male:female) which varied from 3.16 (50% recommended NPK + FYM @ 10 t ha^{-1} + vermicompost @ 2 t ha^{-1} + biofertilizer) to 5.77 (Absolute Control) with a mean value of 3.94. However, the nutrient treatmentslike 50% recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_8), recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_9) and recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer (T_{10}) recorded significantly lowest sex ratio (3.31 – 4.04) and were *statistically at par* with lowest value T_{11}. The lower sex ratio might be due to production of equivalent number of female flowers as that of male flowers due to balanced nutrition from organic, inorganic and biofertilizer. Similar results were also reported by Umamaheswarappa *et al*. (2005) and Anjanappa *et al.* (2012) in cucumber.

Yield and yield attributing parameters

The data presented in the table 2 revealed significant variations among allnutrient treatments for fruit yield and yield attributing parameters in cucumber variety "Seven Star". Days 1st and last harvest of cucumber was significantly influenced by various nutrient treatments, which ranged from 39 days (recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer) to 44.33 days (absolute control) for days to 1st harvest, while 57 days in absolute control to 68 days[FYM @ 20 t ha^{-1} (T_1), vermicompost @ 4 t ha^{-1} (T_2), FYM 10 t ha^{-1} + biofertilizer (T_4), 50 % NPK + vermicompost 2 t ha^{-1} + biofertilizer (T_7), 50% NPK + FYM @10 t ha^{-1} (T_8), recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_9) and 50% recommended NPK + FYM @ 10 t ha^{-1} + vermicompost 2 t ha^{-1} + biofertilizer (T_{11})] fordays to last harvest. Significantly earliest days to harvest recorded in nutrient treatments received as recommended NPK + vermicompost @ 2 t ha^{-1} + biofertilizer (39.00) was statistically *at par* with FYM @ 10 t ha^{-1} (T_1), vermicompost @ 4 t ha^{-1} (T_2), recommended NPK @ 100: 60:60 kg ha^{-1} (T_3), vermicompost @ 2 t ha^{-1} + biofertilizer (T_5), 50% NPK + FYM @10 t ha^{-1} + biofertilizer (T_8), 50% NPK + vermicompost 2 t ha^{-1} + biofertilizer (T_7) and recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_9). This might be due to better translocation of nutrients to the aerial plant parts. Similar results have also been reported by Umamaheswarappa *et al*. (2005) and Singh *et al*. (2017) in cucumber.

In cucumber the fruit yield is related with the duration of fruiting season hence days to last harvest will be a positive character to increase fruit yield. The present study indicated that either application of organic, inorganic and biofertilizer either alone or in combination enhance fruiting season than absolute control. Integrated application of 50% recommended NPK + FYM @ 10 t ha^{-1} + vermicompost 2 t ha^{-1} + biofertilizer (T_{11}) recorded significant highest fruit length (19.79 cm), girth (15.13 cm), average fruit weight (194.13 g) and number of fruits $vine^{-1}$ (11.07) than rest of other nutrient treatments. However, *statistical parity* was observed with module received recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer (T_9) 19.31 cm for fruit length only. On the other hand, significantly reduced fruit yield (53.70 q ha^{-1}) which was contributed by significantly lowest vine length (550.67 cm), fruit girth (10.57 cm), average fruit weight (92.00 g) and number of fruits $vine^{-1}$ (4.20) was recorded in absolute control. The similar effect of

Table 1: Effect of nutrient sources on vegetative and flowering parameters of cucumber cv. Seven Star

Treatment		Vine length (cm) at final harvest	Number of primary branches vine^{-1}	Sex ratio (male:female)
T_1	FYM @ 20 t ha^{-1}	1243.67	2.83	4.19
T_2	Vermicompost @ 4 t ha^{-1}	949.67	2.42	3.48
T_3	Recommended NPK through fertilizer	1091.67	2.67	3.56
T_4	FYM @ 10 t ha^{-1}+ biofertilizer	987.33	2.58	4.04
T_5	Vermicompost @ 2 t ha^{-1} + biofertilizer	789.67	2.25	4.44
T_6	Half Recommended NPK + biofertilizer	880.00	2.42	4.34
T_7	Half Recommended NPK + Vermicompost @ 2 t ha^{-1} + biofertilizer	977.67	2.42	4.12
T_8	Half Recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer	1160.00	2.75	3.50
T_9	Recommended FYM @ 10 t ha^{-1} + biofertilizer	1266.67	2.92	3.31
T_{10}	Recommended NPK + Vermicompost @ 2 t ha^{-1} + biofertilizer	1259.67	2.83	3.43
T_{11}	Half Recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer	1313.00	3.00	3.16
T_{12}	Absolute Control	550.67	1.93	5.77
	SEm (±)	**47.22**	**0.23**	**0.44**
	LSD (0.05)	**97.92**	**0.48**	**0.92**

Table 2: Effect of nutrient sources on fruit yield and yield attributes of cucumber cv. Seven Star

Treatments		Days to 1st harvest	Days to last harvest	Fruit length (cm)	Fruit girth (cm)	Average fruit weight (g)	Fruits vine^{-1}	Fruit yield q ha^{-1}
T_1	FYM @ 20 t ha^{-1}	40.00	68.00	17.87	13.72	155.53	8.10	152.15
T_2	Vermicompost @ 4 t ha^{-1}	39.33	68.00	15.74	12.97	101.33	6.78	119.41
T_3	Recommended NPK through fertilizer	40.00	65.67	17.23	13.50	139.13	7.80	137.38
T_4	FYM @ 10 t ha^{-1}+ biofertilizer	42.00	68.00	17.07	13.47	120.67	7.17	132.18
T_5	Vermicompost @ 2 t ha^{-1} + biofertilizer	40.33	65.67	15.51	12.69	95.70	5.70	104.00
T_6	Half Recommended NPK + biofertilizer	41.00	62.67	15.53	12.93	98.87	6.06	118.48
T_7	Half Recommended NPK + Vermicompost @ 2 t ha^{-1} + biofertilizer	39.33	68.00	16.95	13.31	102.93	6.93	122.03
T_8	Half Recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer	39.67	68.00	17.70	13.61	153.27	7.98	146.21
T_9	Recommended FYM @ 10 t ha^{-1} + biofertilizer	40.00	68.00	19.31	13.88	169.60	9.74	183.07
T_{10}	Recommended NPK + Vermicompost @ 2 t ha^{-1} + biofertilizer	39.00	65.67	18.26	13.81	158.40	8.52	157.66
T_{11}	Half Recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer	41.00	68.00	19.79	15.13	194.13	11.07	214.05
T_{12}	Absolute Control	44.33	57.00	12.76	10.57	92.00	4.20	53.70
	SEm (±)	**0.92**	**1.82**	**0.28**	**13.30**	**4.49**	**0.60**	**8.43**
	LSD (0.05)	**1.92**	**3.77**	**0.59**	**0.52**	**9.31**	**1.24**	**17.48**

integrated approach of organic, inorganic and biofertilizer on fruit yield attributes in cucumber was reported by several scientists (Anjanappa *et al.*, 2012; Prabhu *et al.*, 2006; Kanaujia and Daniel, 2016; Hamdi *et al.*, 2017; Singh *et al.*,2017 and Ghayal *et al.*, 2019) in cucumber. Total fruit yield of cucumber varied significantly ranging from 53.70 q ha^{-1} (absolute control, T_{12}) to 214.05 q ha^{-1} (50% recommended NPK+ FYM @ 10 t ha^{-1} + vermicompost 2 t ha^{-1} + biofertilizer, T_{11}). However, significantly highest fruit yield of 214.05 q ha^{-1} was recorded with integrated application of 50% recommended NPK + FYM @ 10 t ha^{-1} + Vermicompost 2 t ha^{-1} + biofertilizer (T_{11}). Increased yield was also related with balanced nutrition, better uptake of nutrients by plants which helps in better fruit length, girth, weight of fruits. This might be due to significantly highest vine length, number of primary branches, days to last harvest, fruit length, fruit girth, average weight of fruits $vine^{-1}$ and lowest sex ratio. The next best treatment was Recommended NPK + FYM @ 10 t ha^{-1} + biofertilizer with fruit yield 183.05 q ha^{-1} which might be due to better vegetative growth and yield attributing parameters. The above findings are in accordance with Narayanamma *et al*. (2010) and Parmar *et al*. (2011) in cucumber.The results obtained from the study showed that integrated application of organic, inorganic and biofertilizer applied to cucumber was more effective for obtaining better vegetative growth, fruit yield attributing parameters and fruit yield. Thus, it may be concluded that integrated application of 50% RDF + FYM @ 10 t ha^{-1} + vermicompost @ 2 t ha^{-1} + biofertilizer not only increases vegetative growth but also fruit yield in cucumber.

REFERENCES

Anjanappa, M., Venkatesh, J. and Suresh, K.B. 2012. Influence of organic, inorganic and bio-fertilizer on flowering, yield and yield attributes of cucumber (cv. Hassan Local) in open field condition. *Karnataka J. Agril. Sci.*, **25**(4): 493-497.

Bindiya, A, Prabhakar, R.I. and Srihari, D. 2014. Response of cucumber to combined application of organic manures, biofertilizers and chemical fertilizers. *Veg. Sci.*, **41**(1): 12-15.

De Candolle. 1882. *Origin of Cultivated Plants.* Kegal, Paul, Trenchand Company, London.

Ghayal, R.G., Vaidya, K.P. and Dademal, A. A. 2019. Effect of different organic and inorganic fertilizers on growth and yield of cucumber (*Cucumis sativus* L.) in lateritic soil of Konkan (M.S.). *International J. Chem. Stud.*, **6**(2): 3452-3454.

Hamdi, E.I., Mosa, A.A., EL-Shazly, M.M. and Hashish, N.R. 2017. Response of cucumber (*Cucumis sativus* L.) to various organic and biofertilization treatments under an organic farming system. *J. Soil Sci. Agril. Eng.*, **8**(5): 189-194.

Kanaujia, S.P. and Daniel, M.L. 2016.Integrated nutrient management for quality production and economics of cucumber on acid alfisol of Nagaland. *Ann. Plant Soil Res.*, **18**(4): 375-380.

Maruthi, B., Paramesh, R., Kumar, T.P. and Hanumanthappa, D. 2014. Maximization of crop growth and seed yield through integrated nutrient management approach in vegetable soybean (*Glycine max* (l.)Merrill) cv. Karuna. *Ecoscan*, VI (Special Issue): 397-401.

Mohan, L., Singh, B.K., Singh, A.K., Moharana, D.P., Kumar, H. and Mahapatra, A.S. 2016. Effect of integrated nutrient management on growth and yield attributes of cucumber (*Cucumis sativus* L.) cv. Swarna Ageti under poly house conditions. *Bioscan*, **12**(1): 305-308.

Narayanamma, M., Chiranjeevis, C.H., Ahmad, R. and Chaturvedi, A. 2010. Influence of integrated nutrient management on yield, nutrient status and quality of cucumber (*Cucumis sativus* L.).*Veg. Sci.*, **37**(1) : 61-63.

Panse, V.G., and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers*. New Delhi, ICAR, pp. 381.

Parmar, M.K., Patil, B.N. and Mane, S.R. 2011. Response of cucumber (*Cucumis sativus* L.) to chemical fertilizers and biofertilizer. *Veg. Sci.*, **38**(2): 235-236.

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

Singh, V., Prasad, V. M., Kasera, S., Singh, B.P. and Mishra, S. 2017. Influence of different organic and inorganic fertilizer combinations on growth, yield and quality of cucumber (*Cucumis sativus* L.) under protected cultivation. *J. Pharma. Phytochem.*, **6**(4): 1079-1082.

Umamaheswarappa, P., Gowda, V.N., Murthy, P.V. and Muthu, M.P. 2005. Effect of varied levels of nitrogen, phosphorus and potassium on flowering, fruit set and sex ratio of cucumber. *Karnataka J. Agril. Sci.*, **18**(3): 744-747.