

## INTEGRATED NUTRIENT MANAGEMENT IN CUCUMBER

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### ABSTRACT

Present study was conducted during December 2003 in cucumber var. Green Long. The results revealed that application of 50 per cent recommended dose of fertilizers + vermicompost @ 2 t/ha + biofertilizers (2 kg in each of *Azospirillum* and *Phosphobacteria* @ 2 kg ha<sup>-1</sup>) increased the vine length, earliness in flowering, yield and yield components. The highest yield of 32.80 t/ha and B:C ratio of 2.24 was also recorded in the same treatment. Hence application of 50 per cent recommended dose of fertilizers + vermicompost @ 2 t ha<sup>-1</sup> + biofertilizers (2 kg in each of *Azospirillum* and *Phosphobacteria*) is recommended for cucumber crop.

### INTRODUCTION

The cucumber (*Cucumis sativus* L.) 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. Integrated nutrient supply system has become an accepted strategy to bring about improvement in soil fertility and protecting the environment. Vermicompost is rich in plant nutrients and it has been used in vegetable crops like tomato, carrot and brinjal (Kale *et al.*, 1991). Renuka and Ravisankar (2001) reported that application of vermicompost along with organic manures enhances earliness in flowering, maximum fruit size, more number of fruits per plant and yield in tomato.

However, no information is available on the effect of vermicompost along with organic manures on the productivity of cucumber. Hence the present investigation was carried out to study the effect in cucumber.

### MATERIAL AND METHODS

The experiment was conducted at the

Orchard, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during December 2003 and laid out in a randomized block design with nine treatments and replicated thrice. The seeds of the variety green long collected from MAHYCO were sown at a spacing of 1 x 1 m. The soil of the experimental plot was sandy clay loam of near neutral pH (8.14) having 0.84 per cent organic carbon, 150 kg ha<sup>-1</sup> of available N, 15 kg ha<sup>-1</sup> of available P<sub>2</sub>O<sub>5</sub> and 440.8 kg ha<sup>-1</sup> of available K<sub>2</sub>O.

The treatments consisted of recommended dose of fertilizers (RDF) @ 20:30:30 NPK kg/ha (T<sub>1</sub>), Farm yard manure (FYM) @ 20 t/ha (T<sub>2</sub>), Vermicompost (VC) @ 4 t/ha (T<sub>3</sub>), FYM @ 10 t/ha + VC 2 t/ha (T<sub>4</sub>), Legume green leaf manures (GLM) @ 5 t/ha+ Biofertilizers (*Azospirillum*+*Phosphobacteria*, each 2 kg /ha) (T<sub>5</sub>), FYM @ 10 t/ha+ Biofertilizer (T<sub>6</sub>), 50% RDF + FYM @ 10 t/ha+ biofertilizer (T<sub>7</sub>), 50% RDF + GLM @ 2.5 t/ha+ biofertilizers (T<sub>8</sub>) and 50% RDF + VC @ 2 t/ha+ Biofertilizers (T<sub>9</sub>). The NPK was given as urea, SSP and muriate of potash a week prior to sowing of seeds. FYM, VC and GLM were applied 10 days before sowing as per the treatment. Biofertilizers were given as a soil application. Recommended package of practices were followed to raise the crop under irrigated conditions. The growth and yield observations were recorded and analysed

statistically by Panse and Sukhatme, 1967.

### RESULTS AND DISCUSSION

The results revealed that there were significant differences on the vine length due to the application of different levels of organic manures, inorganic and biofertilizers (Table 1). The vine length was found increased to a significant effect with the application of organic manures. Application of 50% RDF + VC @ 2 t/ha + Biofertilizers recorded the maximum vine length. Use of vermicompost would have facilitated better aeration, adequate drainage and created a favourable soil environment for deeper penetration of roots and higher nutrient extraction from soils. The role of organic manures in enhancing the growth characters is well known and they have a positive relationship with growth as indicated in the present study. Vermicompost is rich in plant macro nutrients (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O), secondary elements (Ca, Mg) and vital micronutrients like Fe, B, Zn and Mo (Bano et al., 1987).

Organic manures were efficient than inorganic fertilizers, whereas the combined use of organic with inorganic fertilizers was considered to be superior than the use of organic fertilizer alone (Sharma, 1991). In the present study also, the combined use of vermicompost inorganic and biofertilizers significantly increased the vine length in cucumber. The better efficiency in combination with inorganic fertilizers and biofertilizers (T<sub>7</sub>, T<sub>8</sub>, T<sub>9</sub>) might be due to the fact that organic manures would have provided the micronutrients such as zinc, iron, copper, manganese, etc., in an optimum level. Zinc is involved in the biochemical synthesis of the most important plant hormone, Indole Acetic Acid through the pathway of conversion of tryptophan to IAA. Iron is involved in the chlorophyll synthesis path way. Application of organic manure would have helped in the plant metabolic activity through the supply of such important micronutrients in the early crop

growth phase, which in turn encouraged early vigorous growth (Anburani and Manivannan, 2002).

The *Azospirillum* apart from its role in nitrogen fixation from the atmosphere, also involved in the production of phytohormones like IAA, GA and cytokinin like substances (Govindan and Purushothaman, 1984). Besides that *Azospirillum* increased the uptake of nutrients such as phosphorus and potassium. The biological activity of the microorganisms would have helped the soil status to become a ready to serve zone for essential nutrients to plant root system. The N availability and N content of plants is enhanced due to the application of plants is enhanced due to the application of vermicompost, FYM, GLM and *Azospirillum*. This increased uptake of available N influence the growth characters. Since N is the chief constituent of protein, essential for the formation of protoplasm, which leads to cell division, cell enlargement and ultimately resulting in increased plant growth (Bakly, 1974).

Phosphobacteria would have helped in the conversion of unavailable phosphorus form to available form especially in early crop growth phase. This would have helped in the absorption of all major and micronutrients required for the plants to put forth early vigorous vegetative growth especially when an organic manures like vermicompost, FYM, GLM was applied. Another mechanism by which phosphobacteria augment the plant growth is due to the biosynthesis of growth promoting substances like vitamin B<sub>12</sub> and Auxin (Sankaran, 1960).

Earliness is an important character in cucumber. Though earliness is considered as a genetically controlled trait, other factors like environmental, cultural practices and nutrition of plants can also influence it to an appreciable extent. Among the major nutrients, P plays a vital role in imparting earliness. In the present study the plants treated with organics showed

**Table 1.** Effect of organic manures on growth parameters of cucumber

Treatments		Vine length (cm)	Days to first flowering	Fruit length (cm)	Fruit girth (cm)
T <sub>1</sub>	- RDF 20:30:30 kg/ha	2.39	35	22.70	15.80
T <sub>2</sub>	- FYM 20 t/ha	2.52	35	23.20	16.00
T <sub>3</sub>	- VC 4 t/ha	2.63	32	23.60	16.20
T <sub>4</sub>	- FYM 10 t/ha + VC 2 t/ha	2.94	31	27.50	17.80
T <sub>5</sub>	- GLM 5 t/ha + Biofertilizers	2.76	33	24.00	16.70
T <sub>6</sub>	- FYM 10 t/ha + Biofertilizers	2.82	32	24.20	16.90
T <sub>7</sub>	- 50% RDF + FYM 10 t/ha + Biofertilizers	3.15	30	30.10	20.10
T <sub>8</sub>	- 50% RDF + GLM 2.5 t/ha + Biofertilizers	3.01	31	29.20	19.70
T <sub>9</sub>	- 50% RDF + VC 2 t/ha Biofertilizers	3.25	29	32.50	21.70
	Mean	2.83	32	26.33	17.88
	CD (5%)	0.15	2.34	2.43	1.58

earliness in flowering. Application of vermicompost along with 50 per cent of recommended doses of inorganic fertilizers, biofertilizers induced early flowering. This might be due to better nutritional status of the plants which was favoured by the treatments. Increased production of leaves might help to elaborate more photosynthates and induce flowering stimulus, thus affecting early initiation of flower bud. Early vigorous growth seen in treatments with organic manures would have helped to synthesize more cytokinin by these plants which might have helped to the translocation of these synthesized cytokinin as well as more quantity of available phosphorus through xylem vessels and accumulation of cytokinin and phosphorus in these axillary buds would have favoured the plants to enter into reproductive phase (Amrithalingam and Balakrishnan, 1988).

The number of fruits per plant is the most important determinant of yield in cucumber, which is greatly influenced by the application of various levels of organic manures, inorganic fertilizers and biofertilizers. The number of fruits were increased in the treatment combination of VC @ t/ha + 50 per cent of the recommended dose of inorganic fertilizers + biofertilizers (Table 2). The increased nutrient availability from

vermicompost, the organic phosphorus through phosphobacteria and IAA from *Azospirillum* might have increased the various endogenous hormonal levels in the plant tissue, which was responsible for the enhanced pollen germination and tube growth, which ultimately increased the number of fruits per plant. The higher number of fruits per plant may also be due to higher percentage of productive flowers in these treatments (Rajagopal and Rao, 1974).

Yield attributing parameters such as length, girth and weight of the fruit were found highest in the treatments with combination of organic manures, inorganic fertilizers and biofertilizers. These yield attributes increased in proportion to yield. Similar results have been reported by Barekar, 2000 by applying organic, inorganic and biofertilizers. The treatment 50 per cent recommended dose of fertilizer + vermicompost @ 2 t/ha + biofertilizers resulted in highest yield in terms of yield per plant and yield per hectare. The same treatment also recorded the highest benefit cost ratio of 2.24.

Reduction in the inorganic fertilizer levels was made-up with the vermicompost application without any loss of field which may be due to higher P fertilization by a symbiotic mycorrhizal association as reported by Kale *et al.*, 1991 and due to the presence of N

**Table 2.** Effect of organic manures on yield and yield attributes of cucumber

Treatments	Mean fruit weight (g)	Number of fruits/plant	Yield/plant	Yield (t/ha)	Expenditure (Rs.)	Gross income (Rs.)	BCR
T <sub>1</sub> - RDF 20:30:30 kg/ha	277.00	5.60	1.55	15.50	55,000	62,000	1.13
T <sub>2</sub> - FYM 20 t/ha	280.00	5.70	1.60	16.00	56,000	64,000	1.14
T <sub>3</sub> - VC 4 t/ha	290.00	6.50	1.88	18.80	62,000	75,200	1.21
T <sub>4</sub> - FYM 10 t/ha + VC 2 t/ha	340.00	7.50	2.55	25.50	59,000	1,02,000	1.73
T <sub>5</sub> - GLM 5 t/ha + Biofertilizers	295.00	7.00	2.06	20.60	50,600	82,400	1.63
T <sub>6</sub> - FYM 10 t/ha + Biofertilizers	310.00	7.10	2.20	22.20	53,100	88,800	1.67
T <sub>7</sub> - 50% RDF + FYM 10 t/ha + Biofertilizers	380.00	7.90	3.00	30.00	55,600	1,20,000	2.16
T <sub>8</sub> - 50% RDF + GLM 2.5 t/ha + Biofertilizers	360.00	7.50	2.70	27.00	53,350	1,08,000	2.02
T <sub>9</sub> - 50% RDF + VC 2 t/ha Biofertilizers	390.00	8.40	3.28	32.80	58,600	1,31,200	2.24
Mean	324.67	7.02	2.31	23.15			
CD (5%)	11.97	0.39	0.17	3.37			

fixers, growth substances and essential nutrients. Similar findings were reported by Kulkarni *et al.* (1996).

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