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Effect of integrated nutrient management on yield, plant and soil nutrient status in bottle gourd

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Abstract
The present study entitled on "Effect of Integrated nutrient management on yield, plant and soil nutrients status in bottle gourd" at Main Garden, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, (MH) during the year 2012-13. The experiment conducted in Randomized Block Design with three replications using bottle gourd cultivar Samrat, with thirteen treatments, two kinds of organic manures (FYM and vermicompost) alone and in combination with bio-fertilizers viz. *Azotobacter* and PSB and reduced doses of chemical fertilizers were tested in comparison with control absolute.
On the basis of results obtained, the application of 50 % RDF (50:25:25 NPK kg ha^{-1}) +FYM 2.5 t ha^{-1} + vermicompost 1.65 t ha^{-1} and *Azotobacter*, *PSB* @ 5 kg ha^{-1} to the crop found sound integrated practice, in which it recorded maximum fruit per vine, yield per vine (7.61 kg), yield per hectare (380.61q). According to the plant and soil nutrient status the treatment was found to have maximum total leaf nitrogen (3.50%), Phosphorus (0.55%) and Potash (3.05%) and maximum available soil nutrient status (N-225.68kg ha^{-1}, P-25.13kg ha^{-1}, and K-381.81kg ha^{-1}) after harvest was found in the same treatment.

Keywords: Bottle gourd, vermicompost, FYM, azotobacter, integrated nutrient management, yield

Introduction
Cucurbitaceous family is a large group of vegetable crops, cultivated extensively in tropical and subtropical parts of the world. This group consists of a wide range of vegetables viz. cucumbers, biter gourd, melons, pumpkins, squashes and gourds. Among gourds, bottle-gourd (*Lagenaria siceraria* L.) commonly known as lauki, kaddu or dudhi is cultivated extensively in India. Bottle gourd is cultivated as a field crop in *kharif* and summer seasons throughout the country. However, it is grown throughout the year, where the winters are mild. Fertilizer application plays a major role in harnessing optimum and good quality fruits in bottle-gourd. Although chemical fertilizers particularly nitrogenous and phosphatic fertilizers contribute a lot in fulfilling the nutrient requirement but their excessive, regular and unbalanced use may lead to health and ecological hazards and deteriorate physicochemical properties of soil. Hence, there is a need to find an alternate or complementary source of nutrients that may enhance the yield without having adverse effects on soil properties and fruit quality.
Organic manures and biofertilizer produce organic acids which have the capacity of holding cation and anions so integration of nitrogenous fertilizers with organic manures and biofertilizer is more beneficial in releasing cations slowly to the plants. Addition of organic manures and biofertilizer can buffer soil pH making more availability of nutrients to the plants. So the trial was laid out to find out the integrated effect of chemical fertilizers in combination with organic manures and biofertilizer to achieve the maximum yield of bottle gourd and improving soil health and nutrient status.

Material Methods
The study was carried out at the Main Garden and analytical work was carried out at Analytical Laboratory, Department of Horticulture, Dr. PDKV., Akola during the year 2012-2013, soil of the Dr. PDKV, experimental plots was loamy in texture, low in available nitrogen (161.4 kg ha^{-1}) and medium in phosphorus (19.2 kg ha^{-1}) and potassium (332.4 kg ha^{-1}).

Treatment details

Treatment No.	Treatment details
T_1	100:50:50 N:P:K kg ha^{-1}.(Recommended Dose of fertilizers)
T_2	FYM 10 t ha^{-1}.
T_3	Vermicompost 6.6 t ha^{-1}.
T_4	FYM 10 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_5	Vermicompost 6.6 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_6	RDF 75% + FYM 2.5 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_7	RDF 75% + Vermicompost 1.65 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_8	RDF 50% + FYM 5 t ha^{-1} + *Azotobacter* 5kg ha^{-1} + PSB 5kg ha^{-1}.
T_9	RDF 50% + Vermicompost 3.3 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_{10}	RDF 25% + Vermicompost 4.95 t ha^{-1} + *Azotobacter* 5kg ha^{-1} + PSB 5 kg ha^{-1}.
T_{11}	RDF 25% + FYM 7.5 t ha^{-1} + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_{12}	RDF 50% + FYM 2.5 t ha^{-1} + 1.65 t ha^{-1} Vermicompost + *Azotobacter* 5 kg ha^{-1} + PSB 5 kg ha^{-1}.
T_{13}	Control.

A plot size of 4x4 m^2 was maintained and plants were spaced at 1.0 x 1.0 m thereby keeping 16 plants per plot. The cultivar Samrat was used for experiment. Sowing was done at ridges and furrow at spacing of 1.0 x 1.0 m. All standard package of practices for cultivation were followed for irrigation, weeding and plant protection. All the characters studied like Yield per vine (kg), Yield per hectare (q), Total leaf nitrogen, phosphorus and potash (%), Available soil nitrogen, phosphorous and potash (kg ha^{-1}) after harvest was subjected to statistical analysis using variance technique as described by Panse and Sukhatme (1967) [6].

Result and Discussion

The results obtained in respect to yield parameters like the number of fruit per vine, yield per vine (kg) and yield per hectare (q), treatments shown significant differences. The maximum number of fruits per vine (13.10) were found in treatment T_{12} i.e. application of 50 kg N, 25 kg P_2O_5, 25 kg K_2O ha^{-1} dose of fertilizers in combination with the application of FYM 2.5 t ha^{-1}, vermicompost 1.65 t ha^{-1}, Azotobacter 5 kg ha^{-1} and PSB 5 kg ha^{-1}. However, a minimum fruits (4.56) per vine were recorded in T_{13} i.e. Control. While treatments T_7 and T_6 were found at par. So, the results clearly indicate the necessity of application of inorganic fertilizers in combination with the said bio-fertilizers. Besides, quick availability of plant nutrient from inorganic source, balanced C/N ratio, synthesis of auxin, growth substances, antifungal due to inoculation of *Azotobacter* and conversion of insoluble phosphate to soluble form by PSB perhaps helped to increase fruit yield of bottle gourd in T_{12}. In addition to these factors growth and yield attributing characters may reasoned to such results. The results of the present investigation are in apparent with the finding by Karuthmani (1995) [3] and Broadbent *et al.*, (1977) [2].

Maximum yield per vine (7.61 kg) recorded in treatment T_{12} was found to be at par with T7 (7.35 kg) and T6 (7.17 kg). The minimum yield per vine (3.4 kg) was recorded in T_{13}. The maximum yield per hectare (380.61 q) recorded in the treatment T_{12} i.e. 50:25:25 Kg NPK ha-1 + FYM 2.5 t ha-1 + Vermicompost 1.65 t ha-1 + treatment with PSB @ 5 kg ha-1 and Azotobacter @ 5 kg ha-1. The minimum yield per hectare (170.16q) was found in T_{13}.

This may be due to the application of organic, inorganic and biofertilizers, Organic manures were efficient than inorganic fertilizers, whereas the combined use of organic with inorganic fertilizers was considered to be superior to the use of organic fertilizers alone. Use of vermicompost would have facilitated better aeration, adequate drainage and created a favorable soil environment for deeper penetration of roots and higher nutrients extraction from soil. The role of organic manure in enhancing the growth and yield characters is well known and they have positive relationship with yield and growth of crop as indicated in the present study, similar result obtained by Kumar *et al*., (2012) [4] and Prabhu *et al*., (2006) [8].

The results obtained in respect to total leaf nitrogen, phosphorus and potash, treatment shown significant differences. The maximum total leaf nitrogen (3.50 %), phosphorus (0.55 %) and potash (3.05 %) was found in treatment T_{12} i.e. 50:25:25 Kg NPK ha-1 + FYM 2.5 t ha^{-1} + Vermicompost 1.65 t ha-1 + treatment with PSB @ 5 kg ha-1 and *Azotobacter* @ 5 kg ha^{-1}, which was at par with treatment T_7, T_6, and T_9. The minimum total leaf nitrogen (2.86 %), phosphorus (0.32 %) and potash (1.97 %) was observed in T_{13}.

The results shown in respect to available soil nitrogen, phosphorus and potash after harvest (kg ha^{-1}).The maximum available soil nitrogen (225.68 kg ha^{-1}), phosphorus (25.13 kg ha^{-1}) and potash (381.81 kg ha^{-1}) was found in treatment T_{12} i.e. 50:25:25 Kg NPK ha-1 + FYM 2.5 t ha^{-1} + Vermicompost 1.65 t ha-1 + treatment with PSB @ 5 kg ha-1 and *Azotobacter* @ 5 kg ha^{-1}, which was at par with treatment T_7 and T_9 followed by treatment T_{10}, T_{11} at par with each other. The minimum available soil nitrogen (178.19 kg ha^{-1}), phosphorus (14.09 kg ha^{-1}) and potash (306.82 kg ha^{-1}) was observed in T_{13}.

There was an overall increase in the available NPK in soil with the combined application of inorganic fertilizer, organic manures and biofertilizers. Improvement in the status of available nutrients in the soil after harvest of the crop was due to addition of these nutrients through application of organic manures, inorganic fertilizers and biofertilizers, similar result were reported by Mali *et al*., (2004) [5] and Singh *et al*., (2006) [9].

Conclusion

On the basis of results, the treatment T_{12} i.e. 50:25:25 kg NPK ha^{-1} + 2.5 t ha^{-1} FYM + 1.65 t ha^{-1} vermicompost + 5 kg ha^{-1} *Azatobacter* + 5 kg ha^{-1} PSB shown maximum result, which was at par with treatment T_7 (75:37.5:37.5 kg NPK +1.65 t ha-1 vermicompost +5 kg ha-1 *Azatobacter* + 5 kg ha-1 PSB) and T_6 (75:37.5:37.5 kg NPK +2.5 t ha-1 FYM + 5 kg ha-1 *Azatobacter* + 5 kg ha-1 PSB). Treatment T_{12} was found to be profitable and remunerative.

All the treatment in combination with *Azotobacter*, PSB, vermicompost and FYM were found significantly superior regarding yield, total leaf and available soil nitrogen, phosphorus and potassium content as compared to their corresponding doses of fertilizer alone.

Table 2: Effect of different organic, inorganic and biofertilizers on yield, leaf nutrient status on bottle gourd and available soil nutrient status after harvest.

	Yield contributing characters			Leaf nutrient status Total NPK			Available soil nutrient After harvest		
Treatment No.	**No. of fruit/vine**	**Yield per vine (kg)**	**Yield per hectare (q)**	**Total N (%)**	**Total P (%)**	**Total K (%)**	**Nitrogen (kg ha^{-1})**	**Phosphorus (kg ha^{-1})**	**Potassium (kg ha^{-1})**
T_1	8.98	6.01	300.71	3.4	0.45	2.6	208.51	21.88	361.23
T_2	6.12	3.65	182.56	3.16	0.34	2.30	184.41	19.49	338.48
T_3	6.86	4.60	230.12	3.22	0.35	2.46	189.34	20.22	342.59
T_4	7.13	5.00	250.29	3.28	0.37	2.51	197.49	20.81	351.10
T_5	7.45	5.28	267.34	3.37	0.38	2.55	202.03	21.05	354.57
T_6	11.12	7.17	358.82	3.48	0.53	2.91	216.91	24.11	377.75
T_7	11.64	7.35	365.91	3.49	0.54	2.99	219.00	24.84	377.90
T_8	10.16	6.98	349.45	3.44	0.52	2.78	214.54	23.44	371.19
T_9	10.86	7.17	353.71	3.45	0.51	2.85	215.03	23.98	372.11
T_{10}	9.89	6.70	335.13	3.43	0.48	2.69	212.21	22.99	368.01
T_{11}	9.26	6.52	325.89	3.41	0.46	2.62	209.39	22.45	366.53
T_{12}	13.10	7.61	380.61	3.50	0.55	3.05	225.68	25.13	381.81
T_{13}	4.56	3.4	170.16	2.86	0.32	1.97	178.19	14.09	306.82
-	Sig	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE(m)	0.68	0.43	16.36	0.10	0.02	0.14	9.00	1.23	10.61
C.D. at 5%	2.00	1.27	47.75	0.31	0.07	0.43	26.28	3.59	30.97

References

1. Bindiya YI, Reddy P, Srihar D, Narayanamma M, Subhash Reddy R. Effect of Integrated Nutrient Management on growth and yield of Cucumber. Indian Journal of Horticulture. 2006; 24(4):34-35.
2. Broadbent PK, Baker F, Franks N, Holland J. Effect of Bacillus spp. on increased growth of seedling in steamed and non-steamed soil. Phytoph. 1977; 67:27-34.
3. Karuthamani M, Natarajan S, Thamburaj S. Effect of inorganic and biofertilizers on growth, flowering and yield of pumpkin (*Cucurbita moschata*) cv. Co-2. South Indian Horticulture. 1995; 43:134-136.
4. Kumar V, Singh VK, Rani T. Effect of integrated nutrient management on economics in bottle gourd (*Lagenaria siceraria*). Environment & Ecology. 2012; 30(4A):1410-1412.
5. Mali MD. Effect of organic manures on yield quality of cucumber (*Cucumis sativus* L.). Cv. Himangi. M.Sc. (Agri.) Thesis unpublished submitted to M.P.K.V., Rahuri, 2004.
6. Panse VG, Suhatme PV. Statistical methods for Agricultural Workers, ICAR, New Delhi, 1967.
7. Patil SR. Effect of graded levels of nitrogen, phosphorus on growth fruiting and yield of bottle gourd cv. Samrat. M.sc. (Agri.) Thesis unpublished submitted to M.P.K.V. Rahuri, 1993.
8. Prabhu M, Natarajan S, Srinivasan K. Integrated nutrient management in cucumber. Indian J Agric. Res. 2006; 40(2):123-126.
9. Singh KP, Krishna Mohan. Integrated nutrient management for sustainable production of pointed gourd (*Trichosanthes dioica* Roxb.) under diara of Bihar. The Asian Journal of Horticulture. 2006; 2(1):99-101.