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PERFORMANCE OF CAPE GOOSEBERRY (*PHYSALIS PERUVIANA* L.) UNDER DIFFERENT SPACING AND ORGANIC MANURES

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ABSTRACT
A field experiment was conducted on the performance of Cape gooseberry (*Physalis peruviana* L.) under different spacing and organic manures at Horticulture Research Farm, Babasaheb Bhimrao Ambedker University, Lucknow during winter season in 2014-2015. Treatments consisted of two spacing and two sources of organic manures *i.e.* full and half dose each of farmyard manure and vermicompost applied on plants at two spacing S_1 (80×75cm) and S_2 (60×75cm). Among the two spacing under study the closer spacing 60×75 cm could be applied in preference to the wider spacing 80×75 cm since there was no significant effect of spacing on the performance. The result revealed that full dose of vermicompost had a significant effect on growth parameters *viz*., plant height (45.68cm), number of leaves (69.90), number of branches (9.51), and stem diameter (7.78mm). A similar effect was observed for the fruit physic-chemical parameters *viz*., fruit yield/ ha (66.81 q), fruit length (24.11mm), fruit width (23.96mm), fruit weight (137.33g), fruit volume (137.33ml) and specific gravity (0.99g/ml) was statistically significant overall the other treatments of manure applied. Further, it was recorded that there was no significant difference between application of full dose of FYM and 50% vermicompost on the parameters under study.

INTRODUCTION

Cape gooseberry (*Physalis peruviana* L.) of family Solanaceae, is an important annual herbaceous, minor, tropical fruit crop of India, which has potential for use as neutraceutical (Ramadan and Morsel, 2007). The crop deserves attention particularly for its seasonal, quick growing nature, non-perennial occupation of land in plains and comparatively dwarf nature. However, its cultivation is restricted to a limited area in India due to low production potential, poorly developed package of practices etc. (Girapu and Kumar, 2006). Besides the common sources of organic fertilizers are composted livestock manures, plant residues and industrial wastes for use in agriculture which increase the microbial activity, anion and cation exchange capacity, organic matter and carbon-content of soil (Liu *et al.,* 2007). Organic fertilizers increase the yield and quality of agricultural crops in ways similar to inorganic fertilizers (Arancon *et al.*, 2004; Heeb *et al.,* 2006; Tonfack *et al.,* 2009 and Lata *et al.,* 2013). Nutrient management and spacing run simultaneously in optimising proper agro-techniques for any crop (Girapu and Kumar, 2006), for optimum plant performance. Farmyard manure is bulky organic manure, which is a storehouse of major nutrients apart from containing considerable amount of macro and micro nutrients,(Sharma *et al.*,2013).Similarly, vermicomposting could be used as an excellent soil amendment (Chakraborty *et al.*, 2008) in crops and also in Cape gooseberry (Dwivedi *et al.,* 2014) since it could promote early and vigorous growth of seedlings, root formation, elongation of stem and production of biomass. We hypothesized that the use of organic manures in gooseberry could be helpful in inducing higher productivity and proper spacing also increases the branching and plant spread. Keeping all the above evidence and facts an attempt has been made to study the efficacy of organic manuring and plant spacing in cape gooseberry for optimum production using organic manures since the crop has potential nutraceutical value and organic manures may affect the bioactive principles of the crop.

MATERIALS AND METHODS

The experiment was conducted at Horticultural Research Farm, Department of Applied Plant Science,Babasaheb Bhimrao Ambedkar University, Lucknow during November 2014 to May 2015. The soil type of the experimental plot is estimated as saline having pH 8.2 and low organic carbon (Dwivedi *et al.*, 2012).

Full dose of FYM was applied @ 20 tonnes per hectare (Chattopadhyay, 1996) since the dose of vermicompost has not been reported for cape gooseberry hence, the same dose as recommended for FYM (Chattopadhyay, 1996) was applied during the trial. The experiment was laid out in a two factor randomized block design with following treatments replicated thrice C_0S_1 – Control, C_0S_2 – Control, F_1S_1 - Full dose of FYM + 80×75 cm spacing, F_1S_2 - Full dose of FYM + 60 × 75 cm spacing, F_2S_1 - Half dose of FYM + 80 × 75 cm spacing, F_2S_2 - Half dose of FYM + 60×75 cm spacing, V_1S_1 - Full dose of vermicompost + 80×75 cm spacing, V_1S_2- Full dose of vermicompost + 60×75 cm spacing, V_2S_1 Half dose of vermicompost + 80×75 cm spacing, V_2S_2 -Half dose of vermicompost + 60×75cm spacing. Seedling were transplanted on 15th October, 2015. Organic manures were

incorporated in the experimental plots before transplanting. Standard package of practices for cape gooseberry (Chattopadhyay, 1996) were followed for the entire crop season. The observation on growth, flowering, fruiting and yield of were recorded on four and six plants each in the spacing (80×75cm) and (60×75cm) respectively, selected randomly in each treatment. The data were subjected to statistical analysis using Fisher's method of analysis of variance (Chandel, 2012).

RESULTS AND DISCUSSION

The application of organic manures on Cape gooseberry plants planted at different spacing has clearly revealed that among the two factors (Factor A: organic manure and factor B: plant spacing) under study it was only the organic manures which have been found to affect the growth parameters significantly. There was no significant variation observed in the performance of the plants planted at the two spacing under study *viz*, 80×75cm and 60×75 cm. Further, there is no significant impact of the interaction of the two factors. Thus, it is clear that the performance of the crop is independent of the effect of spacing under study and its interaction with the manure applications and has responded only to the organic manures applied. The result is as per the principle that within a given crop, the better the individual plants which are able to spread and intercept light, the lower the optimum population per unit area *i.e.* plant density does not need to be higher than that which provides full ground cover (completely shading the ground surface) at maturity (Hargreaves and Merkley, 2004). Thus, in the present study, among the two different spacing's, closer planting (60×75 cm) may well be followed since it will ensure optimum utilisation of resources.

Among the organic manure, the effect of farm yard manure and vermicompost at different doses was studied on the performance of Cape gooseberry. Results obtained indicate that both the manures at all doses under study improved the vegetative performance as well as fruit physico-chemical parameters of Cape gooseberry significantly over the control. It was also recorded that treatment V_1S_1 (vermicompost 100%) showed the maximum impact on plant height (45.68cm), number of leaves (69.90), stem diameter (7.05mm), number of branches (9.51), fruit yield/ha (85.68 kg), average fruit length (26.32mm), fruit width (25.78mm), fruit weight (141.33g), fruit volume (142.66ml) and specific gravity (1.05g/ml) significantly over FYM at all doses of organic manures applied (Table 1 and 2).

Vermicompost has proved to be a richer form of organic manure since application of 10 t/ha has shown an effect parallel to application of double the amount of farm yard manure (@ 20 t/ha) for the vegetative parameters studied.

Table 1: Effect of spacing and organic manures on performance of growth and yield of Cape gooseberry

Parameters Treatments	Plant height(cm)	Number of leaves	Stem diameter(mm)	Number of branches	Fruit yield /ha(q)
C_0S_1	27.81	55.09	5.58	7.22	38.26
C_0S_2	30.83	51.26	4.98	6.74	38.88
F_1S_1	39.08	66.51	7.00	8.37	58.16
F_1S_2	40.69	60.81	6.99	8.53	67.19
F_2S_1	31.77	58.22	6.67	7.79	56.16
F_2S_2	36.88	58.78	6.68	7.61	62.07
V_1S_1	45.68	69.90	7.78	9.51	85.68
V_1S_2	41.33	66.59	7.05	9.19	82.30
V_2S_1	38.19	61.24	7.17	8.26	60.81
V_2S_2	39.02	67.67	6.05	7.94	67.58
C.D.					
Factor A	3.53	4.61	0.36	0.51	8.57
Factor B	N.S.	N.S.	0.22	N.S.	N.S.
Factor A×B	N.S.	N.S.	N.S.	N.S.	N.S.

Table 2: Effect of spacing and organic manure on performance of physical parameters of fruit of Cape gooseberry

Parameters Treatments	Fruit length(mm)	Fruit width(mm)	Fruit weight(g)	Fruit volume(ml)	Specific gravity
C_0S_1	21.40	21.83	128.00	127.66	0.94
C_0S_2	21.70	21.50	126.66	133.00	0.93
F_1S_1	24.95	23.52	136.66	137.66	1.01
F_1S_2	23.32	23.91	137.33	135.00	0.98
F_2S_1	22.87	22.15	131.33	133.66	0.97
F_2S_2	22.67	23.84	134.33	134.33	0.94
V_1S_1	26.32	25.78	141.33	142.66	1.05
V_1S_2	25.70	24.86	138.00	139.33	1.00
V_2S_1	23.82	23.96	137.33	135.00	0.99
V_2S_2	24.11	23.95	136.33	137.33	0.97
C.D.					
Factor A	1.22	1.74	6.09	6.05	0.03
Factor B	N.S.	N.S.	N.S.	N.S.	0.02
Factor A×B	N.S.	N.S.	N.S.	N.S.	N.S.

Treatments with 50% vermicompostat the two different spacing's (V_2S_1 and V_2S_2) applied for all the above parameters under study *viz*., plant height (38.19 cm and 39.02 cm respectively), number of leaves (61.24 and 67.67 respectively), stem diameter (7.17 mm and 6.05 mm respectively), number of branches (8.26 and 7.94 respectively), fruit yield/ ha (66.81q and 67.58q respectively), fruit length (23.82mm and 24.11mm respectively), fruit width (23.96mm and 23.95mm respectively), fruit weight (137.33g and 136.33g respectively), fruit volume (135.00ml and 137.33ml respectively) and specific gravity (0.99 and 0.97 respectively) (Table 1 and 2) was parallel to the effect of treatments F_1S_1 and F_1S_2 (100% FYM with different plant spacing) recorded plant height (39.08 cm and 40.69cm, respectively), number of leaves (66.51 and 60.81 respectively), stem diameter (7.00mm and 6.99mm respectively), number of branches (8.37 and 8.53 respectively).These results are in accordance with findings of Patil *et al*.(2004).The findings clearly indicated that vermicompost played a significant role in enhancing the growth, yield and quality parameters which can be attributed to improved nutrient availability and improvement in physical condition and biochemical fertility of the soil which provides a balanced nutritional environment both in the soil rhizosphere and plant system (Singh *et al.,* 2013 and Reddy *et al*., 1998). Earthworms stimulate microbial populations and as a consequence more available nutrient and microbial metabolites are released into the soil. The increase in yield and yield attributing characters over control might be due to application of organic manure due to greater presence of essential plant nutrients and balanced C/N ratio for better physiological performance of the plant (Hari Krishna *et al.,* 2002 and Sengupta *et al.*, 2002). Vegetative parameters under discussion *viz*., plant height, number of leaves, number of branches and stem thickness are also affected by the microbial colonies build up in the presence of increased organic manure inoculates and their subsequent growth promoting effects. This increase in vegetative growth may also be attributed to enhanced availability of nutrients in the soil at vital periods of growth and improved water status of plants. The significant improvement may be due to increased cell metabolism resulting from enhanced enzyme activity, chlorophyll content and photosynthesis process also reported by (Kumar *et al.*, 2006). This has also been reported for peach seedling (Awasthi *et al.,* 1996)**,** Cape gooseberry (Girapu and Kumar, 2006), tomato (Hari krishna *et al.,* 2002) and marigold (Kumar *et al.,* 2006).The results are in close proximity with earlier report of (Arancon *et al*., 2003; Verma *et al*., 2012).

In the present study significant variations among treatments with respect to growth and yield of Cape gooseberry clearly indicate the importance of vermicompost. The excellent result of both growth and yield parameters in V_1S_1, $V_2S_1$and F_1S_1 treatment plots supports the hypothesis that nutrient supply, in the form organic manure and vermicompost, brings excellent biochemical changes in soil structure, which ultimately promotes plant growth and production (Garcia *et al*., 2008)**.**Among the organic manures applied, overall physical and early initiation of bud, flower and fruiting was found best in full dose of vermicompost.

It is concluded from this study that only organic manures has significant effect on the growth and biochemical parameters whereas no significant variation was observed in spacingand interaction between organic manure and spacing. Vermicompost(10 t/ha) has proved to be a richer form of organic manure and could replace the treatment with double amount of farm yard manure (20 t/ha) applied. On the basis of results presented it can be concluded that application of full dose of vermicompost was most effective in enhancing yield per plant. However, further detailed studies are still required find out the more improved result and standardise the dose of vermicompost as a source of organic manure for cape gooseberry. (*Physalis peruviana* L.)

REFERENCES

Arancon, N. Q., Edwards, C. A., Bierman, P., Metzger, J. D., Lee, S. Welch, C. 2004. Effects of vermicomposts on growth and marketable fruit of field-grown tomatoes, peppers strawberries. Pedobiologia, **47(5-6):** 731-735.

Arancon, N. Q., Edwardsa, C. A., Biermanb, P., Metzgerc, J. D. and Luchtd,C. 2003. Effects of vermicomposts produced from cattle manure, food waste and paper waste on the growth and yield of peppers in the field. *Pedobiologia*.**49:** 297-306.

Awasthi, R. P., Godara, R. K. and Kaith, N. S. 1996. Interaction effect of VAM mycorrhizae and Azotobacter inoculation on peach seedlings. *Indian J. Hort*. **53:** 8-13.

Chakraborty, B., Chandra, A. K. and Chakraborty, S. K. 2008. Effect of integrated nutrient supply and growth, leaf yield and field performance of mulberry (*Morus alba*) under semi irrigated lateritic soil condition of west midnapore district, West Bengal. *J. Environ. Socio biol*. **5(2):** 221-226.

Chandel, S. R. S. 2012. A handbook of agriculture statistics.

Chttopadhay, T. K. 1996. A text book on pomology (tropical fruits) Vol. **II**Kalyani Publishers.

Dwivedi, D. H., Yadav, A. K., Kumar, P. and Gautam, S. K. 2014. Integrated Nutrient Management in Cape gooseberry (*Physalisperuviana* L.) for Peri Urban Horticulture. *Indian J. Applied Research*. Vol.**4: 12**, 2249-555X.

Dwivedi, Deepa, H., Lata, R., Ram, R. B. and Babu, M. 2012. Effect of bio- fertolizer and organic manure on yield and quality of 'Red Fleshed' Guava.*Acta Hort.***933:** 239-244.

Fisher, R. A. 1932. Statistical Methods for Research Workers, Oliver & Boyd,Edinburgh, 4th Edition.

Fisher, R. A. 1932. Statistical Methods for Research Workers, Oliver & Boyd,Edinburgh, 4th Edition.

Garcia-Ruiz, R., Ochoa, V., Hinojosa, M. B. and Carreira, J. A. 2008. Suitability of enzymatic activities for the monitoring of soil quality improvement in organic agricultural systems. *Soil Biol. Biochem*. **40:**2137-2145.

Girapu, R. K. and Kumar, A. 2006. Influence of nitrogen and spacing on growth, yield and economics of cape- gooseberry (*Physalisperuviana* L.) Proceeding of national symposium on production, utilization and export of underutilized fruits with commercial potentialities held at BidhanChanraKrishiViswavidyalaya, West Bengal, pp.22-24.

Hargreaves, G. H., and Merkley, G. P. 2004. Irrigation fundamentals. Water resource publications, LLC.

Harikrishna, B. L., Channel, H. T., Hebsur, N. S., Dharmatti, P. R. and Saranganath, P. A. 2002. Yield and economic analysis of tomato as influenced by integrated nutrient management. Karnataka *J. Agric. Sci*. **15(2):** 373-374.

Heeb, A., Lundegardh, B., Savage, G., Ericsson, T. 2006. Impact of

organic and inorganic fertilizers on yield, taste, and nutritional quality of tomatoes. *J. Plant Nutritional and Soil Science* Vol. **1699(4):** 535-541.

Kumar, V., and Singh, O. P. 2006. Effect of organic manures, nitrogen and zinc fertilization on growth, yield, yield attributes and quality of rice (*Oryzasativa* L.). *Inter. J. of Plant Sci.* (Muzaffarnagar). **1(2):** 311-314.

Kumar, R., Sood, S., Sharma, S., Kasana, R. C., Pathania, V. L., Singh, B. and Singh, R. D. 2014. Effect of plant spacing and organic mulch on growth, yield and quality of natural sweetener plant stevia and soil fertility in western Himalayas. *International J. Plant Production.* **8(3):** 311-334.

Lata, R., Dwivedi, D. H., Ram, R. B., Meena, M. L. and Babu, M. 2013. Impact of integrated nutrient management on growth parameters of strawberry cv. chandler under subtropical conditions of lucknow. *International J. Advanced Biological Research.* Vol.**3(3):** 418-421.

Liu, B., Gumpertz, M. L., Hu, S., Ristaino, J. B. 2007. Long-term effects of organic and synthetic soil fertility amendments on soil microbial communities and the development of southern blight. *Soil Biol. Biochem.* **39:** 2302-2316.

Patil, M. B., Mohammed, R. G., Ghadge, P. M. 2004. Effect of organic and inorganic fertilizers on growth, yield and quality of tomato. *J. Maharashtra Agricultural Universities.* **29(2):** 124-127.

Ramadan, M. F. and Mörsel, J. T. 2007. Impact of Enzymatic Treatment on Chemical Composition, Physicochemical Properties and Radical Scavenging Activity of Golden berry (*Physalisperuviana* L.) Juice. *J. the Science of Food and Agriculture*, Vol. **87(3):** 452-460.

Reddy, R., Reddy, M., Reddy, N. S. and Anjnappa, M. 1998. Effect of organic and inorganic sources of NPK on growth and yield of pea (*pisumsativum*). *Legume Research.* **21(1):** 57-60.

Sharma, A., Wali, V. K., Bakshi, P. and Jasrotia, A. 2013. Effect of organic and inorganic fertilizers on quality and shelf life of guava (*psidiumguajava*l.) cv. Sardar. *The Bioscan.* **8(4):** 1247-1250.

Sengupta, S. K., Dwivedi, Y. C. and Kushwah, S. S. 2002. Response of tomato (*Lycopersiconesculentum*Mill.) to bio inoculation at different levels of nitrogen. *Vegetable Sciences.* **29:** 186-188.

Singh, A., Gulati, I. J., and Chopra, R. 2013. Effect of various fertigation schedules and organic manures on tomato (*lycopersiconesculentum*mill.) yield under arid condition. *The Bioscan.* **8(4):** 1261-1264.

Tonfack, L. B., Bernadac, A., Youmbi, E., Mbouapouognigni, V.P., Ngueguim, M. andAkoa, A. 2009. Impact of organic and inorganic fertilizers on tomato vigour, yield and fruit composition under tropical and soil conditions. Fruits. **64:** 167-177.

Verma, S., Chaudhary, M. R., Yadav, B. L. and Jakhar, M. L. 2012. Effect of vermicompost and sulphur on growth, yield and quality of garlic var. G-41. *J. Spices and Aromatic Crops.* **22(1):**20-23.