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Effect of organic manures and biofertilizers on yield attributes and yield of cape gooseberry (*Physalis peruviana* L)

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Abstract
The present investigation entitled "Effect of organic manures and biofertilizers on yield attributes and yield of cape gooseberry (*Physalis peruviana* L.)" was carried out at the Main Experiment Station, Department of Horticulture, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) during the years 2014-15 and 2015-16. The experiment was laid out in Randomized Block Design with 13 treatments and 3 replications. The detail of treatments were as T_1- FYM 10 t/ha, T_2-Vermicompost 5 t/ha, T_3- Pressmud 10 t/ha, T_4- FYM 10 t/ha + *Azotobacter* 10 kg/ha, T_5- Vermicompost 5 t/ha + *Azotobacter* 10 kg/ha, T_6-Pressmud 10 t /ha+ *Azotobacter* 10 kg/ha, T_7- FYM 10 t/ha + PSB 10 kg/ha, T_8-Vermicompost 5 t/ha + PSB 10 kg/ha, T_9- Pressmud 10 t/ha + PSB 10 kg/ha, T_{10}- FYM 10 t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha, T_{11}- Vermicompost 5t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha, T_{12}- Pressmud 10 t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha and T_{13}- Control. The maximum number of fruits per plant (70.22 and 74.60), fruit weight (9.54 and 9.86 g), fruit volume (9.55 and 9.64 cm^3), fruit yield per plant (500.20 and 512.80 g) and fruit yield q/ha (88.88 and 91.16 q/ha) were recorded with application of vermicompost 5t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha (T_{11}) during years 2014-15 and 2015-16, respectively. However, the minimum values of all characters were recorded under the control.

Keywords: organic manures, biofertilizer, cape gooseberry, yield attributes

Introduction
The cape gooseberry (*Physalis peruviana* L.) is annual herbaceous plant belongs to family Solanaceae, bearing globular fruit, each include in inflated calyx, which become pepary on maturity and look like Chinese lantern. It is also commonly called as Poha or poha berry in Hawaii, Golden berry in South Africa and Rashbhari, Makoi or Tepari in India (Gupta and Roy, 1980, Morton, 1987, Sarangi *et al*., 1989) [5, 13, 18].

Cape gooseberry is an important crop for income, food, and medicinal applications. The plant is native to Latin America but has since been naturalized in other parts of the tropics. This is a very promising fruit in Egypt, because of its high nutritional value, flavor, and potential health benefits. The fruits are eaten fresh or can be prepared as a jam. Recently, the economic importance of cape gooseberry has risen due to high acceptance for local consumption and achieving a great success in Arabic and European markets.

The name "cape gooseberry" is most probably derived from the name of "Cape of God Hope" of South Africa, where it was commercially grown (Chattopadhyay, 1996) [2]. It is originated in Andean highland of Northern South America, in Colombia and reportedly native in Peru and Chile **(**Legge, 1974) [10] and widely introduced for cultivation into other tropical, sub-tropical and even in temperate areas. It is second highest fresh fruit export in Columbia because of its, nutritional and medicinal attributes. Columbia is the top producer of cape gooseberry world-wide followed by South Africa. In India, it is grown successfully in states like Uttar Pradesh, West Bengal, Madhya Pradesh, Haryana, Punjab, Nillgiri hills and other parts of the country.

Cape gooseberry has a high nutritional composition and biologically active health-promoting components (Ramadan, 2011) [15]. Cape goose berry is a potential underutilized fruit crop which is grown in tropical (as perennial) and subtropical (as annual) regions of the world (Morton, 1987) [13]. It is herbaceous in nature and reaches 2 to 3 feet in height under favorable growing conditions. The fruit is a berry with smooth, waxy, orange yellow skin (Legge, 1974) [10] and is rich in Vitamin A, B1, B2, and B12 and thus, has potential nutraceutical and pharmaceutical properties. The herbaceous nature of the plant permits its pot cultivation and presence of important bioactive molecules in fruit assign an

important nutraceutical potential to the plant because of which it can be suitably exploited for peri urban culture. The importance of cape gooseberry is not less than any other fruit crops. The edible portion of berry contains 11.5% carbohydrates, 1.8% protein, 0.2% fat, 3.2% fibre, 0.6% mineral matter and 49 mg. ascorbic acid per 100 g. edible portion of fruit (Khan and Gowder, 1955). The fruit also contains carotene (as vitamin A 2380 IU) pectin 0.9% (Majumder and Bose, 1979) [11] and bioflavonoides (Hayes, 1966) [6]. It is used in making jam, sauce, pies, puddings, chutneys and ice cream and is eaten fresh in fruit salads and cocktails. It is an excellent source of Vitamin A and C among other nutrients (Chaves *et al*., 2005) [3]. The management of nutrients through organic manures and biofertilizers can improve physical condition and general health of the soil medium. The organic manures such as FYM, vermicompost and pressmud influence the physico-chemical as well as biological properties of the soil which improve soil fertility, structure, porosity, aeration, drainage and water relation capacity. Biofertilizers help in improving biological activities of desirable microorganisms in the soil and also improve the crop yield and quality of produce. The microorganisms like Azotobacter are considered important not only for their nitrogen fixing efficiency, but also for their ability to produce antibacterial, antifungal compound and growth regulators. Likewise, some phosphate solubilising microbes like PSB are found to be effective in improving phosphorous use efficiency. Moreover, traditional organic manures release the nutrients slowly, hence their effect is exhibited not only on the instant crop but it is also reflected on the performance of the other succeeding crops (Kumar and Srivastava, 2006) [9].

Materials and Methods

The present investigation entitled "Effect of organic manures and biofertilizers on yield attributes and yield of cape gooseberry (*Physalis peruviana* L.)" was carried out at the Main Experiment Station, Department of Horticulture, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.) India, during the years 2014-15 and 2015-16. The experiment was laid out in Randomized Block Design with 13 treatments and 3 replications. The detail of treatments were as T1- FYM 10 t/ha, T2-Vermicompost 5 t/ha, T3- Pressmud 10 t/ha, T4- FYM 10 t/ha + Azotobacter 10 kg/ha, T5- Vermicompost 5 t/ha + Azotobacter 10 kg/ha, T6-Pressmud 10 t /ha+ Azotobacter 10 kg/ha, T7- FYM 10 t/ha + PSB 10 kg/ha, T8- Vermicompost 5 t/ha + PSB 10 kg/ha, T9- Pressmud 10 t/ha + PSB 10 kg/ha, T10- FYM 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha, T11- Vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha, T12- Pressmud 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha and T13- Control. The experimental field was ploughed first prepared up to the depth of 20-25 cm with the help of cultivator. The field was kept open to sun for at least 15 days for destroying the weeds and eggs of insects by repeated ploughing followed by planking to obtain fine tilth. Required area was marked and prepared according to the layout. The organic manures viz., FYM, Vermicompost and Pressmud as well as biofertilizers viz. Azotobacter and PSB were applied as basal dose in their respective plots during last preparation of field and mixed thoroughly in soil. When the seedling attained height of about 20-30 cm, the transplanting was done by khurpi at spacing of 75×75 cm. and just after planting, watering was done by use of watering cane. The yield attributing characters such Number of fruits per plant, Fruit weigh, Fruit volume, Fruit yield per plant, and Fruit yield were recorded as following. Number of fruits per plant: The fruit were counted in tagged plants in each plot at the time of harvesting and their average was expressed in term of number of fruits per plant. Fruit weight (g): Weight of above sampled fruits was taken on physical balance and average was expressed as gram per fruit. Fruit volume: Fruit volume was measured by dipping the fruits in measuring cylinder and was computed by water displacement method. Fruit yield per plant (g): The weight of fruits was recorded at every harvesting under each treatment and total yield per plant was calculated in gram per plant at the final harvesting. Fruit yield (q/ha): The weights of fruits were recorded at every harvesting under each treatment and total yield per plant was converted in quintal/ha at the final harvesting. The statistical analysis of data was carried out as per method prescribed by Panse and Sukhatme (1985) [14].

Table 1: Effect of Organic Manures and Biofertilizers on Yield Attributes and Yield of Cape Gooseberry (*Physalis peruviana* L.).

Treatments	Number of fruit per plant		Fruit wt. (g.)		Fruit volume (cm^3)		Yield (g/plant)		Yield(q/ha)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
T_1: FYM 10 t/ha	50.42	51.56	7.00	7.04	6.44	6.52	345.22	348.48	61.33	61.96
T_2: Vermicompost 5t/ha	53.80	55.56	7.18	7.26	6.81	6.88	375.86	380.26	66.66	67.59
T_3: Pressmud 10 t/ha	52.62	54.20	7.08	7.15	6.65	6.75	360.44	366.82	63.00	65.20
T_4: FYM 10 t/ha + *Azotobacter* 10 kg/ha	56.80	58.63	7.35	7.45	6.82	6.84	385.76	390.20	68.44	69.36
T_5: Vermicompost 5 t/ha + *Azotobacter* 10 kg/ha	59.50	61.91	7.79	7.93	7.16	7.20	398.58	406.15	70.75	72.20
T_6: Pressmud 10 t/ha + *Azotobacter* 10 kg/ha	57.45	59.65	7.52	7.64	7.81	6.99	394.52	400.80	70.04	71.25
T_7: FYM 10 t/ha + PSB 10 kg/ha	61.10	63.46	7.96	8.11	7.38	7.45	412.77	417.78	75.24	74.26
T_8: Vermicompost 5 t/ha + PSB 10 kg/ha	64.53	67.86	8.26	8.48	7.81	7.85	435.68	438.60	75.32	77.96
T_9: Pressmud 10 t/ha + PSB 10 kg/ha	63.48	66.26	8.10	8.29	7.45	7.58	426.39	431.40	75.73	76.68
T_{10}: FYM 10 t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha	66.85	70.34	8.88	9.12	8.10	8.15	448.82	452.56	79.64	80.45
T_{11}:Vermicompost 5t/h + *Azotobacter* 10 kg/ha + PSB 10 kg/ha	70.22	74.60	9.54	9.86	9.55	9.64	500.20	512.80	88.88	91.16
T_{12}: Pressmud 10 t/ha + *Azotobacter* 10 kg/ha + PSB 10 kg/ha	68.31	72.19	9.20	9.60	8.60	8.72	465.51	471.20	82.66	83.76
T_{13}: Control	45.73	41.78	6.22	6.10	5.77	5.77	304.22	288.00	54.04	51.11
SEm ±	1.65	1.33	0.41	0.30	0.25	0.01	9.98	12.50	2.20	1.59
CD at 5%	5.00	4.00	1.22	0.91	0.77	0.04	32.77	37.56	6.60	4.95

Results and Discussion

The data of yield attributing characters of cape gooseberry fruits were affected by different treatments (Table-1).The data of number of fruits per plant revealed that all the treatments showed significant increase in number of fruits per plant over the control. The highest number of fruits per plant (70.22 and 74.60) were observed with vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T11) during years 2014-15 and 2015-16, respectively which was statistically at par with pressmud 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T12) in both years. The minimum number of fruits per plant (45.73 and 41.78) was noticed under the control (T13) during both the years of experimentation. It may possibly be due to the fact that vermicompost and biofertilizers application accelerated the development of inflorescence, leaf numbers in autumn, which are positively correlated with number of flowers as well as number of fruits. These results are also in close conformity with the finding of Singh *et al.* (2015) [8] with application of vermicompost + Azotobacter + PSB + AM, Mishra and Tripathi (2011) [12] with use of Azotobacter 6 kg/ha.+ PSB 6 kg/ha. and Soni *et al.* (2018) [21] with the application of 50% Vermicompost+50% FYM + Azotobacter in strawberry.

The maximum fruit weight (9.54 and 9.86 g) were recorded with application vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T11) during 2014-15 and 2015-16, respectively which was statistically at par withFYM 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T10) and pressmud 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T12) during the both years. Minimum fruit weight (6.22 and 6.10g) was observed under control (T13) during the years 2014-15 and 2015-16, respectively. Increase in fruit weight during the present investigation might be due to incresed photosynthetic ability of plant fertilized with vermicompost, Azotobacter and PSB, which in turn might have favoured and increased accumulation of dry matter. Fruit weight is highly correlated with dry matter content and balance level of hormones. Nitrogen fixers are also known for accumulation of dry matter and their translocation as well as favours different growth regulators. Similar result was also obtained by Gupta and Tripathi (2012) [4], Singh *et al*. (2015) [8], Soni *et al.* (2018) [21] in strawberry and Sharma *et al*. (2016) [19] in mango.

The maximum fruit volume (9.55 and 9.64 cm3) were found with combined application of vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T11) which was found significantly superior were these treatments during the years 2014-15 and 2015-16, respectively while, minimum fruit volume (5.77 and 5.77 cm3) were found with control (T13) the years of 2014-15 and 2015-16, respectively. The increase in fruit volume is directly correlated with the increase in weight and size of fruit with the advancement of the maturity. Similar result was recorded by Sanehu and Gill (2011) [17] in cape gooseberry, Gupta and Tripathi (2012) [4] and Singh *et al*. (2015) [8] in strawberry

The data respect to fruit yield per plant revealed that the all the treatments showed significant increase in fruit yield than control. The maximum fruit yield (500.20 and 512.80 g per plant) were recorded with use of vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T11) during 2014-15 and 2015-16, respectively followed by pressmud 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T12). The minimum fruit yields (304.22 and 288.00 g per plant) were recorded in control (T13) during the both year of experimentation. The data of fruit yield q/ha showed that all the treatments significantly increased in fruit yield during the both the years of study. However, the maximum fruit yield (88.88 and 91.16 q/ha) were obtained with application of vermicompost 5t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T11) followed by pressmud 10 t/ha + Azotobacter 10 kg/ha + PSB 10 kg/ha (T12) during the years 2014-15 and 2015-16, respectively. The treatments of FYM, vermicompost and pressmud individually showed significant also over control. When FYM, vermicompost and pressmud applied with PSB showed marked increase in fruit yield than individual applications. Minimum yield (54.04 and 51.11 q/ha) were found under control (T13) during the both the years 2014-15 and 2015-16. The vermicompost, Azotobacter and PSB improve the number of fruit and fruit size which ultimately increased the fruit yieid. Similar result was recorded by Sanehu and Gill (2011) [17] recorded high fruit yield under integrated nutrient management in cape gooseberry, Gupta and Tripathi (2012) [4], Singh *et al.* (2015) [8], Soni *et al*. (2018) [21] in strawberry and Kumar *et al.* (2015) [8] in Potato.

References

1. Anonymous. The Wealth of India, (CSIR), 1969; 8:38-40.
2. Chattopadhyay TK. A Text Book of Pomology. Kalyani Publishers, New Delhi, 1996, 2.
3. Chaves AC, Schuch MW, Erig AC. In vitro establishmemt and multiplication of *Physalis peruviana* L. Scientia of Agritechnology. 2005; 29:1281-1287.
4. Gupta AK, Tripathi VK. Efficiency of Azotobacter and vermicompost alone in combination on vegetative growth, flowering and yield of strawberry. cv. Chandler. Progressive Hort. 2012; 44(2):256-261.
5. Gupta SK, Roy SK. Multipurpose Cape gooseberry. Indian Journal of Hort. 1980; 24(4):11.
6. Hayes WB. Fruit growing in India. 3rd revised ed. Kitabistan, Allahabad, 1966, 415-416.
7. Khan KF, Gowder RB. South Indian Horticulture, 1995; 3(4):104-107.
8. Kumar A, Singh A, Hooda V, Singh RK, Singh M. Effect of organic manure, biofertilizers and mulching on growth and yield of potato (*Solanum tuberosum* L.). Bioscan. 2015; 10(1):403-406.
9. Kumar R, Srivasava VK. Residual effect of integrated nutrient management on growth, yield attributes and yields of tomto. Indian Journal of Hort. 2006; 63(1):98-100.
10. Legge AP. Notes on the history, cultivation and use of *P. peruviana* L. Journal of Royal Horticultural Society, 1974; 99:310-314.
11. Majumdar BC, Bose TK. Analysis of cape gooseberry fruits. Plant Science, 1979; 11:101.
12. Mishra AN, Tripathi VK. Effect of biofertilizers on vegetative growth, Flowering, yield and quality of strawberry. Proceeding of the International Symposium on minor fruit and medicinal plants for health Ecological security (ISMF&MP), West Bengal India, 2011, 211-215.
13. Morton JF. Fruits of Worm Climates. Creative Resource Centre Inc. Miami, 1987, 431-434.
14. Panse VG, Sukhatme PV. Statistical method for agricultural workers, ICAR, New Delhi, 1985.
15. Ramadan MF. Bioactive phytochemicals, nutritional value, and functional properties of cape gooseberry (*Physalis peruviana* L.). An overview Food Res. Int. 2011; 44:1830-1836.
16. Ramadan MF, Morsel JT. Oil goldenberry (*Physalis peruviana* L.). J Agric. Food Chem. 2007; 51:969-974.

17. Sanehu S, Gill BS. Effect of integrated nutrient management on cape gooseberry. Journal of Horticulture Science, 2011; 6(1):29-32.
18. Sarangi D, Sarkar Roy AK, Jana SC, Chattopadhyay TK. Physico-chemical changes during growth of cape gooseberry fruits (*Physalis peruviana* L.). Progressive Horticulture. 1989; 21(3-4):225-228.
19. Sharma R, Jain PK, Sharma TR. Effect of inorganic sources of nutrients on physico-chemical composition of mango (*Mangifera indica* L.) cv. Amrapali. Economic Affairs, 2016; 61(4):677-682.
20. Singh AK, Beer K, Pal AK. Effect of vermicompost and biofertilizers on growth, flowering and yield of strawberry. Annals of Plant and Soil Research. 2015; 17(2):196-199.
21. Soni S, Kanawjia A, Chaurasiya R, Chauhan PS, Kumar R, Dubey S. Effect of Organic Manure and Biofertilizers on Growth, Yield and Quality of Strawberry (Fragaria X ananassa Duch) cv. Sweet Charlie. Journal of Pharmacogonsy and Phytochemistry. 2018; 2:128-132.