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Madan Lal
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Rajneesh Singh
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Aman Shrivastava
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Raj Pandey
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Hari Baksh Singh
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Corresponding Author:
Madan Lal
Department of Horticulture, Tilak Dhari Post Graduate College, Jaunpur, Uttar Pradesh, India

Response of integrated nutrient management on quality attributes of Cape gooseberry

Madan Lal, Rajneesh Singh, Aman Shrivastava, Raj Pandey and Hari Baksh Singh

Abstract
Cape gooseberry (*Physallis peruviana* L.) is an important minor tropical Solanaceous fruit crop of India which is also known as Rasbhari. An experiment was conducted at the Horticulture research farm (pili Kothi) of Department of Horticulture, Tilak Dhari post Graduate College, Jaunpur to study the response of integrated nutrient management on quality attributes of Cape gooseberry. The experiment comprised of twelve treatments T1 (100% NPK), T2 (100% NPK+FYM), T3 (100% NPK+FYM+AZB), T4 (100% NPK+FYM+PSB), T5 (75% NPK), T6 (75% NPK+FYM), T7 (75%NPK+FYM+AZB), T8 (75% NPK+FYM+PSB), T9 (50% NPK), T10 (50% NPK+FYM), T11 (50% NPK+FYM+AZB), T12 (50% NPK+FYM+PSB) and was laid out in randomized block design with three replications. The observation revealed that the application of 100%NPK+FYM+PSB(T4) and the treatment (T8) 75%NPK+FYM+PSB recorded the highest juice %, total soluble solid maximize with application of treatment T8 75% NPK+FYM+PSB and minimum total soluble solids was noted with treatment T5 75% NPK, titrable acidity maximize with treatment 100% NPK, ascorbic acid maximum noted with T8 75% NPK+FYM+PSB, treatment (T_8) 75% NPK+FYM+PSB had highest reducing and non-reducing sugar %, followed by treatment T4 100%NPK+FYM+PSB, maximum total sugar% noted by application of treatment T8 75%NPK+FYM+PSB whereas dry matter content was maximum with treatment T12 50%NPK+FYM+PSB.

Keywords: Cape gooseberry, FYM, NPK, PSB and ascorbic acid

Introduction
Cape gooseberry (*Physalis peruviana* L.) of family Solanaceae is an important minor tropical fruit crop of India. It is commonly known as Rasbhari resembling tomato in shape (Girapu and Kumar, 2006) [4]. *Physallis peruviana* was first formally named by Carl Linnaeus in 1763.It has been widely introduced in to cultivation in tropical, subtropical and temperate areas such as Australia, China, India, Malaya and the Philippines. The plant is readily grow from seeds, which are abundant (100 to 300 in each fruit), but with low germination rates, requiring thousands of seeds to sow a hectare. Year old stem cuttings treated with hormones to promote rooting are successful for planting, but have a lower rate of success than growing from seed. According to nutrient analysis by the USDA, a 100g serving of Cape gooseberries is low in food. It is an excellent source of Vitamin A and C(among other nutrients (Chaves *et al*., 2005) [6].

However, it's cultivation is restricted to a limited area in India due to low production potential, poorly developed package of practices, etc.

Major components of INM are organic manure, bio-fertilizer& Chemical ferlizer. Organic manure not only balances the nutrient supply but also improves the physical & chemical properties of soil. In the present Indian agriculture keeping in view the inadequate availability of organic sources of nutrients& expected yield decline at least in the initial years complete substitution for chemical fertilizers not necessarily warranted. The organic sources should be used as partial replacement of the chemical fertilizer.

Thus, a strategy for judicious combination of both organic & inorganic sources of nutrient is the most viable option for nutrient management. It will be economically viable & also help in attaining sustainability in production & maintaining soil health & environment. Keeping the above facts in mind, the present investigation entiled "Response of integrated nutrient management on quality attributes of Cape gooseberry (*Physallis peruviana L*".) was done. The objective of present study was to assess the impact of integrated nutrient management on quality attributes of Cape gooseberry.

Materials and Methods

The experiment was conducted at Horticulture research farm (pili Kothi) of department of Horticulture, Tilak Dhari post Graduate College, Jaunpur, during year 2020-2021 and 2021-2022. Jaunpur is situated in the eastern part of Uttar Pradesh with sub-tropical climate being often subjected to extremes of weather conditions, i.e., heat of summer and cold of winter. May and June months are the hottest months with mean maximum temperature ranging from 39 to 42°C.The experiment comprise of twelve treatments T1 (100%NPK), T2 (100% NPK+FYM), T3 (100% NPK+FYM+AZB), T4 (100% NPK+FYM+PSB), T5 (75% NPK), T6 (75% NPK+FYM), T7 (75% NPK+FYM+AZB), T8 (75% NPK+FYM+PSB), T9 (50% NPK), T10 (50%NPK+FYM), T11 (50% NPK+FYM+AZB), T12 (50% NPK+FYM+PSB) and was laid out in randomized block design with three replications. Organic manures were incorporated in the experimental plots before transplanting. Inorganic fertilizers applied in two split doses half as basal dressing and remaining half as top dressing. Azotobactor and PSB are applied as supplements. The observation on quality attributes were recorded as per standard methods on five plants selected randomly in each treatment. Juice percentage calculated by dividing the juice weight by total fruit weight& multiplying this by 100 to get the percentage, TSS was determined by using a hand refractometer, total acidity was estimated by titrating the juice against N/10NaOH Solution, ascorbic acid (vitamin c)mg/100g of husked fruits were determined by 2-6 dichlorophenel indophenol dye indicator method. Reducing sugar and non-reducing sugar (%) were also finds, total sugars(%) calculated by taking sum of reducing and non-reducing sugars, the dry matter content of every treatments was determined by drying of fresh sample in the oven at the 70 °C. The observed data were analysed statistically using analysis of variance as described by Cochran and Cox (1963) [7].

Results and Discussion

Adoption of INM had a considerable impact on the berry, s juice content. Data shown in table. 1clearly demonstrate that the treatment (T4) 100%NPK+FYM+PSB and the treatment (T_8) 75% NPK+FYM+PSB recorded the highest juice %. As for as titrable acidity of Cape gooseberry is concerned, it was determined to be statistically comparable to treatment (T_7) 75% NPK+FYM+AZB and maximum was observed under application of (T1)100% NPK than the other treatments. By utilizing various integrated nutrient management strategies, the reducing sugar and non-reducing sugar of berries were notably different. The treatment (T8) 75% NPK+FYM+PSB had the highest reducing and non-reducing sugar % followed by treatment (T4) 100% NPK+FYM+PSB. The improvement in nutrient accessibility and uptake by plant roots, as well as an enhanced source - sink connection by boosting the flow of carbohydrates from leaves to the fruit may be the cause of the increasement in the juice percentage, titrable acidity, reducing sugar percentage and non-reducing sugar percentage of berries. It might be because organic manure additives have been added, which offer essential nutrients, moisture, and growth promoting elements that boost plant metabolism and hormonal activity and encourage the generation of more photosynthesis, which are stored in fruit as starch and carbs. The outcome was very similar to Srinu *et al.* 's (2017b) [8] findings.

By using INM, the TSS, ascorbic acid, total sugar, and dry matter contents of berries were all dramatically raised. The average results shown in table. 1 made it abundantly evident that treatment (T8) was associated with the highest levels of TSS, ascorbic acid, total sugar, and dry matter, followed by treatment (T12) with 50% NPK+FYM+PSB. The use of Biofertilizer in combination with less inorganic fertiliser may have had a regulating effect on the translocation and absorption of different metabolites, the most significant of which are carbohydrates and which impact berry quality. The root and stem, s carbohydrate stores significantly move during the berry ripening process and become hydrolyzed in to sugars, improving the quality of the fruit. The outcomes are consistent with Ram *et al.* (2007) [1], s findings in guava and Madhavi *et al.* (2008) [2], s findings in mango.

Table 1: Effect of integrated nutrient management on quality attributes of cape gooseberry.

	Juice percentage of fruits	Total soluble solids	Titrable acidity (%)	Ascorbic acid (Vit-c) mg/100g	Reducing sugar%	Non-reducing sugar (%))	Total sugar (%)	Dry matter content)
T_1:100% NPK	62.15	8.68	1.124	38.76	2.63	2.50	4.25	9.63
T_2:100%NPK+FYM	65.00	11.81	0.968	44.46	3.22	3.08	5.42	10.75
T_3:100% NPK+FYM+AZB	67.15	9.71	1.066	39.14	2.70	2.58	4.40	9.98
T_4:100% NPK+FYM+PSB	69.65	12.59	0.762	40.57	4.09	3.79	6.89	11.98
T_5:75% NPK	61.50	8.46	1.006	37.09	2.37	2.20	3.69	9.46
T_6:75% NPK+FYM	63.65	12.51	0.941	41.09	3.74	3.57	6.43	11.68
T_7:75% NPK+FYM+AZB	66.13	9.16	1.017	47.19	2.52	2.31	3.96	9.70
T_8:75% NPK+FYM+PSB	67.66	14.32	0.659	50.20	5.22	4.91	9.25	13.57
T_9:50% NPK	59.30	10.59	1.009	37.78	2.90	2.75	4.76	10.69
T_{10}:50% NPK+FYM	60.35	12.23	0.862	42.78	3.53	3.41	6.16	11.25
T_{11}:50% NPK+FYM+AZB	61.09	11.84	1.002	44.85	3.14	2.89	5.15	10.72
T_{12}:50% NPK+FYM+PSB	63.11	13.68	0.732	47.89	3.81	3.63	7.55	12.57
F- test	S	S	S	S	S	S	S	S
SE(m)	1.930	1.085	0.064	2.113	0.229	0.265	0.398	0.490
C. D. (P = 0.05)	3.984	2.240	0.132	4.361	0.472	0.547	0.821	1.010

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