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Research Article

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON FRUIT QUALITY PARAMETERS OF CAPE-GOOSEBERRY (PHYSALISPERUVIANAL.)

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ABSTRACT

The present investigation was carried out during 20015-16 to study the impact of integrated nutrient management on fruit quality parameters of Cape gooseberry genotype 'Aligarh'. The experiment was laid out in Randomized Block Design with seven treatments replicated three times. The treatments consisted of application of biofertilizers (Azotobacter and Azospirillum) applied alone or in combination with 50%,75% and 100%NPK +0.70, 1.0, 1.25 and 2.0 t/acre. Results revealed that the seeds inoculated with Azotobacter and Azospirillum+50% NPK+0.70t/a FYM gave maximum fruit size, fruit weight, TSS %, Reducing sugars and Ascorbic acid with minimum acidity % respectively.

INTRODUCTION

Cape gooseberry (*Physalisperuviana* L.) of family Solanaceae is an important minor tropical fruit crop of India. It is commonly known as Rasbhari and resembles tomato in shape (Girapu and Kumar, 2006). It is used in making jam, sauce, pies, puddings, chutneys and ice cream, and eaten fresh in fruit salads and cocktails. It is an excellent source of Vitamin A and C among other minerals (Chaves *et al.*, 2005). This potential cash crop can also be grown as an intercrop (Sandhu and Gil, 2011). In spite of numerous beneficial aspects of Cape gooseberry it is restricted to the limited area in our country. Thus there is a great scope to increase production and productivity of Cape gooseberry. Fertilizer application plays an important role in harnessing optimum and good quality fruits in Cape gooseberry. Although chemical fertilizers particularly nitrogenous and phosphatic fertilizers contribute a lot in fulfilling the nutrient requirement but continuous use of these fertilizers adversely affects the soil health and deteriorate physicochemical properties of soil. Hence, application of biofertilizers in judicious combination to chemical fertilizers facilitates profitable and sustainable crop production along with maintenance soil fertility (Singh and Sinsinwar, 2006). Biofertilizers are natural fertilizers containing carried based micro-organisms which help to enhance productivity by biological nitrogen fixation, producing vitamins and other growth factor required for plant growth (Bhattacharya *et al.*, 2000). Biofertilizers and organic fertilizers not only play an important role in maintaining good health of the plant but also serve as a natural source of plant nutrition to increase productivity. Hence, the present investigation was carried out to study the integrated effect of chemical fertilizers in combination with organic manures and biofertilizers on fruit characteristics and quality parameters of Cape gooseberry.

MATERIALS AND METHODS

The study was carried out at an experimental orchard and laboratory of Department of Horticulture, Khalsa College, Amritsar during 2015-16. The seeds of Cape gooseberry genotype 'Aligarh' were sown in the last week of June 2015 on raised nursery beds measuring 1m x 1m. Seedlings were transplanted a month after sowing i.e., in last week of July (when these attained a height of 20cm) on well-prepared field beds measuring 4m x 2m. Plant-to-plant and row-to-row spacing were 1m x 1m. The experiment was laid out in Randomized Block Design. The experiment consisted of 7 treatments and 3 replications. FYM was applied according to the treatments 20 days before transplanting. Non-symbiotic biofertilizers (*Azotobacter*and *Azospirillium*), well known for their broad-spectrum utility in various crops, were applied @ 10g/plant by mixing with 1kg FYM during the time of transplanting. The standard dose of NPK (10,10 and 5g/plant) and FYM (1 Kg/plant) was used as the control. Effect of different combinations of biological and chemical fertilizers on crop was recorded in terms of fruit size, fruit weight, fruit

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volume and for fruit quality parameters as TSS, titrable acidity, reducing sugars and ascorbic acid content.

Treatment details

T_1- 100% NPK
T_2 - 75% NPK + 1.25 t/acre FYM
T_3- 50% NPK + 0.70t/acre FYM + biofertilizers (Azotobacter and Azospirillum @ 10g/plant)
T_4- 1.0 t/acre FYM + biofertilizers (Azotobacter and Azospirillum @ 10g/plant)
T_5- 2.0 t/acre FYM
T_6- Biofertilizers (Azotobacter and Azospirillum@10g/plant)
T_7- Control (Recommended dose of NPK and FYM)

Maximum fruit size (6.51 cm^2) and fruit weight (11.31 gm) were recorded under plants treated with T_3 (50% NPK + 0.70t/acre FYM + biofertilizers) and minimum fruit size and fruit weight was recorded in untreated plants (Table-1). Treatment with 100 %NPK (T_1) was found to be on par with T_3. These results might be due to the better nutritional environment in the root zone for growth and development of plant which accelerated the process of cell division which in turn show luxuriant vegetative growth of the plant and increased the size of fruits by application of nitrogen, organic manures, and biofertilizers. These results are in close conformity with the results of Umar *et al* (2009) in strawberry and Sharma *et al* (2010) in tomato respectively.

Maximum fruit volume (11.69 cc) was observed in the treatment (50% NPK + 0.70t/acre FYM + biofertilizers). The increase in fruit volume is directly correlated with the increase in weight and size of fruit with the advancement of the maturity. The results of the present study are in conformity with the findings of Binepal *et al* (2013).

Highest specific gravity (0.97cc) was found under treatment with T_3 (% NPK + 0.70t/acre FYM + biofertilizers). Minimum specific gravity was noted under treatment T_6 and T_7. This increase or decrease in the specific gravity of the fruit is directly proportional to the weight of the fruit and is inversely proportional to the volume of water displaced by the fruit. These results are in conformation with the findings of Binepal *et al (*2013).

observations have been reported by Sepat *et al* (2012) in tomato. Application of biofertilizers with NPK and FYM might have exhibited regulatory role on absorption and translocation of various metabolites, in which most important carbohydrates affect the quality of fruits. During ripening of fruits, the carbohydrates reserves of the root and stem are drawn upon heavily and hydrolyzed into sugars (Umar *et al*.2009).

Minimum acidity (0.91%) was analysed in fruits produced by plants treated with T_3 which was followed by treatment T_2 with acidity 0.92%. Both these treatments were found to be significant. Maximum acidity (0.95%) was found in fruits produced by plants under control. Results of these findings are in conformation with results of Dutta *et al* (2009) who found that acid content decline with inoculation of biofertilizers. Results of these findings are also in conformation with the results of Binepal *et al* (2013). Meena *et al* (2013) also reported maximum acidity under control in tomato.

Maximum TSS: acid ratio of 16.60 was found in treatment T_3 than all other treatments. This might been due to the fact that combined application of fertilizers resulted in an increase in TSS content and decrease in acidity level of fruit than control, thereby TSS: acid ratio of fruits was increased. Results of these findings are confirmed by Dutta *et al* in guava (2009) who observed increased TSS: acid ratio in the plant's fruits from treated with combined application of biofertilizers and inorganic fertilizers. Findings of Singh *et al* (2015) in strawberry are also in conformation with these results.

The plants under treatment T_3 yielded fruits with maximum reducing sugars 4.06 per cent and proved to be significantly higher than all other treatments except T_4 (3.81). Minimum reducing sugars 2.89 per cent was observed in control (T_7). The combination of organic and inorganic fertilizers increased the nitrogen, phosphorous and potassium levels which promote sugars accumulation in berries and balance of N, P and K is essential for the proper availability of those nutrients to plants. These findings are confirmed by Binepal *et al* in guava (2013) and Umar *et al* in strawberry (2009).

Maximum ascorbic acid 65.68mg/ 100gm pulp content was found in fruits produced by plants treated with T_3 followed by T_2 and T_1 with 64.38 and 63.29 mg/100 gm pulp.

Table 1 Effect of integrated management on fruit characteristics of Cape gooseberry

Treatments	Fruit size (cm^2)	Fruit weight (gm)	Fruit volume (cc)	Specific gravity (gm/cc)
100 %NPK	5.81	9.74	10.15	0.96
75% NPK + 1.25 t/acre FYM	6.25	9.53	10.60	0.90
50% NPK + 0.70t/acre FYM + biofertilizers	6.51	11.31	11.69	0.97
1.0 t/acre FYM + biofertilizers	6.03	9.61	10.28	0.93
2.0 t/acre FYM	6.29	9.47	11.05	0.86
Biofertilizers	6.51	8.91	10.25	0.87
Control (No fertilizers)	5.55	8.75	10.19	0.85
Mean	**5.97**	**9.62**	**10.60**	**0.91**
CD (P=0.05)	0.198	0.167	0.195	0.036

The maximum TSS i.e. 15.37 per cent were found in fruits produced by plants in treatment T_3 and it was followed by T_4 with TSS 15.12 per cent, both the treatments were found to be at par with each other and proved to be significantly higher than all other treatments. The fruits under control recorded13.85 percent TSS after 105 days of fruit set. Similar

All of these were found to be at par to each other. Minimum ascorbic acid content 57.19 mg/100 g pulp was found under control treatment. Similar observations have also been reported by Sepat *et al* in tomato (2012), Umar *et al* in strawberry (2009) and Dutta *et al (2009)* in guava.

Table 2 Effect of integrated nutrient management on fruit quality of Cape gooseberry

Treatments	TSS%	Acidity%	TSS: acid ratio	Reducing sugars(%)	Ascorbic acid (mg/100g)
100 %NPK	14.52	0.94	16.39	3.62	63.29
75% NPK + 1.25 t/acre FYM	14.87	0.92	15.95	3.31	64.38
50% NPK + 0.70t/acre FYM + biofertilizers	15.37	0.91	16.60	4.06	65,68
1.0 t/acre FYM + biofertilizers	15.12	0.94	15.68	3.81	62.37
2.0 t/acre FYM	14.97	0.94	15.76	3.74	58.11
Biofertilizers	14.87	0.91	15.75	2.98	58.85
Control (No fertilizers)	13.85	0.95	14.48	2.89	57.19
Mean	**14.80**	**0.940**	15.80	3.48	57.19
CD(p= 0.05)	0.235	0.031	0.152	0.077	0.758

Organic fertilizers are hydrophilic in nature and absorb moisture and nutrients which persist longer thus improving the soil structure and indirectly enhancing fruit quality and ascorbic acid contents.

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