International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319 – 6505, Impact Factor: SJIF: 5.995
Available Online at www.journalijcar.org
Volume 6; Issue 6; June 2017; Page No. 4414-4417
DOI: http://dx.doi.org/10.24327/ijcar.2017.4417.0509

Research Article

EFFECT OF ORGANIC AND INORGANIC FERTILIZERS ON VEGETATIVE GROWTH, YIELD AND FRUIT CHARACTERISTICS IN CAPE-GOOSEBERRY (*PHYSALISPERUVIANAL.*)

Amarjeet Kaur and Maninderjit Singh

Department of Horticulture, KhalsaCollege, Amritsar143001, India

ARTICLE INFO

Article History:

Received 16th March, 2017
Received in revised form 8th April, 2017
Accepted 24th May, 2017
Published online 28th June, 2017

Key words:

Cape gooseberry, Aligarh, biofertilizers, Azotobacter, Azospirillum, NPK, FYM

ABSTRACT

An investigation was undertaken during 2015-16 to study the effect of organic and inorganic fertilizers on vegetative growth and fruit characteristics in Cape gooseberry cv.'Aligarh'. 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/acreFYM. The experiment was laid out in Randomized Block Design with seven treatments replicated four times. Results of the study revealed that the seedlings inoculated with (NPK 75% + 1.25 t/acre FYM) proved to be the best in terms of maximum plant height, shoot number, shoot length while the seeds inoculated with Azotobacter and Azospirillum+50% NPK+0.70t/a FYM gave maximum yield and took minimum days for fruit maturity.

INTRODUCTION

Cape gooseberry (*Physalisperuviana* L.) is an important tropical fruit crop under minor fruit category of India. It is known by different names like goldenberry (South Africa and UK), giant groundcherry, pervuviangoldencherry (US), poha (Hawaii), jamfruit (India) and uchuva (Colombia). It belongs to family Solanaceae (Girapu and Kumar 2006) and it is a potential underutilized fruit crop which is grown as perennial in tropics and as an annual in temperate and subtropical regions of the world (Morton 1987). It is native to tropical highlands in Peru and Chile in South America. The name of cape gooseberry was derived from Cape of Good Hope in South Africa (Klinac 1986), where it is commercially grown. It is widely grown in Australia, New Zealand, United States, Mexico, India, Sri Lanka, United Kingdom, China, South Africa, Kenya, Egypt, Caribbean, California and Hawaii. In China, India and Malaya, it is commonly grown but on a lesser scale. In Indiacape gooseberry is grown in Uttar Pradesh, Rajasthan, Punjab, Andhra Pradesh, West Bengal and Madhya Pradesh (Malla*et al* 2008). Inspite of numerous beneficial aspects of Cape gooseberry it is restricted to limited area in our country. Thus there is a great scope to increase production and productivity of Cape gooseberry. For getting higher yields and quality produce, soil health is a critical factor. It has been used as a medicinal herb for cancer, malaria, asthma, hepatitis, dermatitis, and rheumatism. It is also rich in chlorogenic acid which is known to destroy cancer cells. Also, it is a source of anti-clotting substances and is, therefore useful as blood thinner as well. In different regions of Colombia the fruit is used in the popular medicine for purification of blood and relief of throat problems (Chaves *et al* 2005). In recent days, consumers are becoming more and more health conscious and are ready to pay more prices for organically grown quality fruits, due to its taste, appearance, more shelf life and richness in nutritive parameters. Biofertilizers are natural fertilizers containing carried basedmicro-organisms which help to enhance productivity by biological nitrogen fixation, producing vitamins and othergrowth factor required for plant growth (Bhattacharya *etal*., 2010). Biofertilizers and organic fertilizers not only play an important role in maintaining good health of plant, but also serve as natural source of plant nutrition to increase productivity. The growers also have realized the importance of the same as the cost of chemical fertilizers is increasing day by day. Hence, keeping these views in mind and to know if the quantum of inorganic fertilizers can be substituted with organic manures and/or biofertilizers, without reducing the yield and deteriorating the quality of fruits (Sepat*et al* 2012). Therefore, chemical fertilizers must be integrated with organic fertilizers such as FYM and biofertilizers. Hence, the present investigation was carried out to study the integrated effect of chemical fertilizers in combination with organic manures and biofertilizers on growth and quality parameters of Cape gooseberry.

Corresponding author:* **AmarjeetKaur
Department of Horticulture, KhalsaCollege,
Amritsar143001, India

MATERIALS AND METHODS

The present investigation was carried out at in an experimental orchard and laboratory of Department of Horticulture, Khalsa College, Amritsar during 2015-16. For raising a nursery, seeds of Cape gooseberry genotype 'Aligarh' were sown on 15 June 2015 in raised nursery beds measuring 1m x 1m. Seedlings were transplanted a month after sowing i.e., in mid July (when these attained a height of 20cm) in well-prepared field beds measuring 4m x 2m. Plant-to-plant and row-to-row spacing was 1m x 1m. The experiment was laid out in Randomized Block Design. The experiment consisted of 7 treatments with 4 replications. FYM was applied according to the treatments 20 days before transplanting. Nitrogen was applied in the form of urea and phosphorous in the form of SSP before transplanting. There was no need of applying potash according to soil test report. Non-symbiotic biofertilizers (*Azotobacter*, *Azospirillium*), well known for their broad spectrum utility in various crops, were used in the experiment. These were applied @ 10g/plant by mixing with 1kg FYM during the time of transplanting. Effect of different combinations of biological and chemical fertilizers on crop was recorded in terms of plant height, apparent fruit maturity, organoleptic rating, juice percentage, yield /plant from randomly selected plants from each replication.

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 (No fertilizers)

Observations recorded

The observations on the growth characters in terms of plant height, stem thickness, shoot thickness, average shoot length and average leaf area of the plants were made a month before and after the spray of the growth regulators.

Plant height (cm)

Plant height was measured with the help of measuring tape in centimeters.

Stem girth (cm)

Stem thickness of the plants was measured in centimeters at 3cm above the ground level with the help of Vernier'scalliper.

Shoot number/plant

Number of shoots were counted from randomly selected plants in each treatment and expressed as an average.

Average shoot length (cm)

Average shoot length of four healthy tagged branches from eight randomly selected plants was calculated under each treatment in centimeters with the help of measuring tape.

Leaf area (sq.m)

The observations on leaf area were recorded at the end of the growing season where five leaves per plant were collected randomly from five plants per treatment and out of the pooled 25 leaves, five leaves were further selected at random for measuring leaf area. The leaf area was studied on a graph paper and average leaf area was calculated by counting squares in square centimeter (cm^2). The total leaf area was worked out by multiplying number of leaves with an average leaf area and expressed in square meter.

Apparent fruit maturity

Fruit maturity was determined on the basis of size, colour, taste and flavour. Maturity was also indicated by the change in colour of the calyx from green to golden brown and when it becomes papery in texture. Time of maturity was thus recorded when first sign of colour change becomes visible. The results were expressed in number of days taken for maturity of the fruits after flower bud differentiation.

Organoleptic rating

The cape gooseberry fruits were evaluated for organoleptic tests by a panel of the five judges on a scorecard (maximum score: 10 points) based on general appearance, taste and flavor and were awarded scores. The fruits were given rating as excellent (8.0-10.0), good (6.5-8.0), fair (5.0-6.5) and poor (below 5.0).

Juice percentage

Juice of the fruits is extracted and weighed. For calculating juice percentage weight of juice is divided by the weight of fruits and expressed as percentage.

Yield per plant (kg)

The total number of fruits picked per plants was counted and weighed. The yield (kg/plant) was calculated on the basis of product of average fruit weight and the total number of fruits per plant.

RESULTS AND DISCUSSION

Maximum plant height (127.5 cm) was recorded in T_2 treatment(NPK 75% + 1.25 t/acre FYM) followed by T_4 , T_3 and T_5 which recorded 127.00 cm, 126.50 cm, 124.02 cm respectively. The height of plants under control was recorded minimum (102.75 cm). The maximum plant height in T_2 might be due to the synergic effect of organic manures along with inorganic fertilizers. Similar findings were also reported by Sahu (2014) in guava, Pal *et al* (2015) in tomato. The minimum plant height in control might be due to non application of nutrients and ultimately due to the supply of insufficient quantity of nutrients needed for the growth of the plant as also reported by Garg and Singh (2010) in cape gooseberry. Addition of biofertilizers (*Azotobacter and Azospirillum*) might have helpful in nitrogen fixation and quicker source for plant absorption. Sepat*et al* (2012)in tomato also reported positive effect of combination of organic fertilizers and farmyard manure on plant height in tomato. The greatest plant height has also been reported with the addition of FYM by Khan and Begum (2007) in acid lime.

The data regarding number of shoots as influenced by organic and inorganic fertilizers depicted that maximum number of shoots (6.75) per plant were obtained in treatment T_2 followed

by (6.25), (6.24) and (6.00) in T_5, T_4 andT_3. This increase might be due to the availability of major as well as minor nutrient elements at optimum proportion in the soil and assimilation of food material within the plant (Atom 2013). Mohankumar andGowda (2010) found that the number of branches were highest in the treatment of 150% recommended FYM in brinjal plants due to steady and adequate supply of nutrients from FYM alone or with mixture of FYM and NPK. The minimum number of shoots (5.00) per plant was reported under control T_7. These results are also in agreement with the findings of Pal *et al* (2015) in tomato.

It is evident from the data that maximum average shoot length (92.28cm) was found in treatment T_2 followed by T_5 (83.67cm), T_4 (82.96cm), T_1 (80.74cm). The maximum length of shoots could be attributed to the easily availability of required quantity of nutrients and improved soil conditions due to the addition of FYM for releasing the different macro and micro nutrients at proper stage required for plant growth which might have manifested in enhancing the growth in terms of shoot length. The lower values of these traits (73.58cm) in control treatment (T_7) could be attributed to non-availability of required quantum of nutrients (Atom 2013). Similar findings were also reported by Sahu (2014) in guava.

The perusal of data regarding stem girth indicated that the maximum stem girth (2.96cm) was obtained in plants treated with T_2 followed by T_4, $T_3$and T_1 with stem girth of 2.47 cm, 2.34 cm and 2.31 cm respectively. These results do not differ significantly from each other. The minimum stem girth (2.02 cm) was found in treatment under control T_7. The maximum stem girth (2.69 cm) might be due to the increase in shoot length and number of leaves which might have resulted to production of more quantum of carbohydrates and subsequently their translocations towards the stem. While, the minimum values of stem girth in control might be due to the poor availability of nutrients required for better plant growth. These findings are well supported with the findings of Dutta*et al* (2010) in papaya andSahu (2014) in guava plants, respectively.

The data with regard to leaf area as influenced by organic and inorganic fertilizers treatments showed maximum leaf area ($0.358m^2$) found under T_2 followed by T_1 with leaf area of 0.277 m^2. Treatment under control had minimum leaf area (0.229 m^2) followed by T_6 which have leaf area of $0.250m^2$. All these results do not show significant difference among them. Increase in leaf area by combined application of inorganic fertilizers with FYM might be due to the easily availability of required quantity of nutrients and improved soil conditions which promoted the vegetative growth and also the leaf area. It can be inferred that biofertilizers, along with NPK and FYM, helps proliferation of roots which, ultimately, resulted in sturdy and healthy plants showing resistance to biotic and abiotic stresses. Moreover, this also promoted better nutrient uptake and carbohydrate accumulation in leaves, resulting in healthy leaf growth. These results are in accordance with the findings of Sandhu and Gill (2011) in cape gooseberry.

The data regarding apparent fruit maturity indicated that the minimum days (100.75) for apparent fruit maturity were found in T_3 followed by T_6 with (103.00), T_5 with (104.25) and T_2 with (104.75) days respectively. These treatments were found to be at par with each other. This might be due to the ellaboration of small quantities of growth promoting substances like GA, IAA, cytokinins, Vitamin B, etc or by *Azotobacter,* which, along with NPK and FYM might have improved the physiology of plants causing a shift from the vegetative to the reproductive phase. These results are in accordance with the findings of Sandhu and Gill (2011) in cape gooseberry.

Maximum organoleptic scores 9.12 and 9.07 were awarded to the fruits from the plants under T_3 and T_1 respectively. Both of these treatments were found to be at par with each other. It was also observed that the fruits from treatments T_2, T_4 and T_6 scored 8.50, 7.75 and 7.62 organoleptic ratings, respectively, which differ significantly. Fruits yielded from control got minimum 7.00 organoleptic scores.

Table 1 Effect of organic and inorganic fertilizers on vegetative characteristics of Cape gooseberrycv.Aligarh

Treatments	Plant height (cm)	Shoot number/plant	Average shoot length (cm)	Stem girth (cm)	Leaf area (sq.m)
T_1- 100% NPK	126.75	5.50	80.74	2.49	0.277
T_2- 75%NPF+1.25t/a FYM	127.65	7.5	93.87	2.78	0.262
T_3-50%NPK+ 0.7t/a FYM+ biofertilizers	127.00	5.75	81.91	2.60	0.358
T_4 – 1t/a FYM+ biofertilizers	127.40	6.00	82.24	2.6	0.255
T_5 – 2t/ a FYM	119.5	5.00	74.78	2.44	0.251
T_6 - biofertilizers	112.87	4.25	73.66	2.37	0.250
T_7 – Control	108.00	3.75	73.62	2.08	0.229
MEAN	121.14	5.39	80.12	2.48	0.26
CD at 5% level	14.40	2.18	12.09	0.28	NS

Table 2 Effect of organic and inorganic fertilizers on yieldandfruit characteristics of Cape gooseberrycv.Aligarh

Treatments	Fruit maturity(days)	Juice Percentage (%)	Organoleptic rating	Yield/plant (kg)
T_1- 100% NPK	105.50	73.4	9.07	1.04
T_2- 75%NPF+1.25t/a FYM	104.75	73.36	8.50	0.94
T_3-50%NPK+ 0.7t/a FYM+ biofertilizers	100.75	74.05	9.12	1.30
T_4 – 1t/a FYM+ biofertilizers	104.74	72.56	7.75	1.01
T_5 – 2t/ a FYM	104.25	71.05	7.62	0.77
T_6 - biofertilizers	103.00	70.98	7.61	0.76
T_7 – Control	107.25	68.31	7.00	0.72
MEAN	104.32	71.95	8.10	0.936
CD at 5% level	1.716	2.809	1.102	0.542

Results of the study revealed that the combined application of organic and inorganic fertilizers enhanced the fruit quality of capegooseberry. Plants treated with 50% NPK + 0.7 t/acre FYM + biofertilizers produced fruits of better quality with high organoleptic characters. Results of these findings are confirmed by Umar *et al* (2009) in strawberry, Sepat*et al* (2012) in tomato, Gosavi*et al* in tomato (2010) and Binepal*et al* (2013)in guava. They observed positive effect of combined application of FYM, biofertilizers and inorganic fertilizers on quality of capegooseberry fruits.

The data relating to juice percentage as affected by organic and inorganic fertilizers generated maximum percentage of juice (74.05%) found in fruit of plants treated with T_3 followed by T_1, T_2 and T_4 with 73.40, 73.36 and 72.56 per cent juice, respectively. All of these results were found to be at par with each other. Minimum juice percentage (68.31%) was found in the treatment under control (T_7).

It was noted that plants treated with T_3 registered maximum fruit yield (1.30 kg), it was followed by T_1, T_2 treatments with fruit yield of 1.04 kg and 0.94 kg per plant respectively. T_3 differ significantly from all other treatments. Minimum yield (0.72 kg) was found in the treatment under control which is found to be at par with T_6 with yield of 0.76 kg. Increase in yield due to application of organic manures, fertilizers and biofertilizers together was might be responsible for synthesis of plant growth hormone, development of root system and therefore high nutrient utilization by crop plants. Similar findings have been reported by Sepat *et al* (2012) and Singh and Singh (2013) in tomato.

Refrences

Atom, A (2013). Effect of inorganic and biofertilizers on growth, yield and quality of Sardar Guava (*Psidiumguajava*L.). M.Sc. Thesis, College of Agriculture, Latur.

Bhattacharya P, Jain R K and Paliwal M K 2010.Biofertilizers for vegetables. *Indian journal of Horticulture*.44:12-13.

Binepal M K, Tiwari R and Kumawat B R (2013). Effect of integrated nutrient management on physic- chemical parameters of guava under malwa plateau conditions of Madhya Pradesh. *Annals of Plant and Soil Res* 15(1): 47-49.

Chaves AC, Schuch MW, Erig AC (2005) In vitro establishment and multiplication of *Physalispeuviana* L. *Ciencia 2 e Agrotecnolgia* 29(6):1281-1287.

Dutta (2010) Effect of biofertlizers on homestead fruit production 0f papaya cv. Ranchi. *ISHS Acta Horticulturae* 11: 851

Garg RC and Singh SK (2010) Primary nutrient deficiency in cape gooseberry. *Prog.Hort*7: 53-58

Girapu R C and Kumar A (2006) Influence of nitrogen and spacing on growth, yield and economics of cape gooseberry (*Physalisperuviana*L.) production. Proceeding of national symposium on production, utilization and export of underutilized fruits with commercial potentialities held at Bidhan Chandra KrishiViswavidyalaya West Bengal

Gosavi PU, Kamble AB and Pandure BS (2010) Effect of organic manures and biofertilizers on quality of tomato fruits.*The Asian J Horti* 5(5): 376-378.

Khan MAA, Begum H (2007) Effect of organic, inorganic and biofertilizer on plant growth and chlorophyll content of acid lime. *Asian J of Horti* 2(1): 161-165.

Klinac, D C (1986).Cape gooseberry (*Physalisperuviana* L.) production systems.*New Zealand J. Exptl. Agri*14(4): 425-430

Malla, AA, Sharma, R M, Singh, A K and Masoodi, F A (2008). Propagation and pinching studies in cape gooseberry (*Physalisperuviana* L.). *J. of Res.,* SKUAST-J7(1): 1-8.

Mohankumar AB and GowdaNarase NC (2010) Effect of different organic manures and inorganic fertilizers on growth and yield of brinjal. *The Asian J of Horti* 5(2): 444-449.

Morton J F (1987) Fruits of warm climates. Edited by Morton J F. Winterville NC: *Creative Resource system Inc*: 430-434

Pal A, Maji S, Govind, Kumawat R, Kumar S and Meend DC (2015) Efficacy of various sources of nutrients on growth, flowering, yield and quality of tomato cv Azad T-6. *An Int Quarterly J of Life Sci* 10(1): 473-447.

Sandhu S and Gill B S (2011) Effect of integrated nutrient management strategies on growth and yield of capegooseberry. *J HortSci* 6(1): 29-32

Sahu PK (2014) Studies on effect of integrated application of chemical fertilizers, organics and biofetilizers on growth, yield and quality of guava under Chhattisgarh plains. M.Sc. thesis Indira Gandhi KrishiVishwavidyalaya, Raipur

Sepat N K, Kumar A, Yadav J and Shrivastava R B (2012). Effect of integrated nutrient management on growth, yield and quality of tomato in trans Himalayan. *Ann Pl Soil Res* 14 (2): 120-123

Umar I,Wali V K, Kher Rand Jamural M (2009) Effect of FYM, urea and Azotobacter on growth, yield and quality of strawberry cv. Chandler. *Not Bot HortAgrobatCluj* 37 (1): 139-143

How to cite this article:

Amarjeet Kaur and Maninderjit Singh (2017) 'Effect Of Organic And Inorganic Fertilizers On Vegetative Growth, Yield And Fruit Characteristics In Cape-Gooseberry (Physalisperuvianal.)', *International Journal of Current Advanced Research,* 06(06), pp. 4414-4417. DOI: http://dx.doi.org/10.24327/ijcar.2017.4417.0509

****