Studies influenced by bio-fertilizers and organic manures on flowering behaviour and yield attributes of Dragon fruit

ABSTRACT

Dragon fruit (*Hylocereus* spp.) is a exotic and newly introduced super fruit crop of India. The flowering behavior of this plant is crucial for breeding and hybridization. As a fact, there are no such scientific studies has been conducted, the current research is focused on the flowering behavior and yield of red and white fleshed dragon fruit types. From the year 2019 to 2021, the experiment was carried out in the field of a progressive farmer**.** Treatments consisted of $\mathbf{T_1}$ - Control, $\mathbf{T_2}$ - 100% N through FYM, $\mathbf{T_3}$ - 100% N through FYM + PSB @ 10kg/ha, $\mathbf{T_4}$ - 100% N through FYM + VAM @ 10kg/ha, $\mathbf{T_5}$ - 100% N through FYM + PSB @ 10kg/ha + VAM @ 10 kg/ha, $\mathbf{T_6}$ - 100% N through poultry manure, $\mathbf{T_7}$ - 100% N through poultry manure + PSB @ 10 kg/ha, $\mathbf{T_8}$ - 100% N through poultry manure + VAM @ 10kg/ha, $\mathbf{T_9}$ - 100% N through poultry manure + PSB @ 10kg/ha + VAM @ 10kg/ha, $\mathbf{T_{10}}$ - 100% N through vermicompost, $\mathbf{T_{11}}$ - 100% N through vermicompost + PSB @ 10kg/ha, $\mathbf{T_{12}}$ - 100% N through vermicompost + VAM @ 10 kg/ha, $\mathbf{T_{13}}$ - 100% N through vermicompost + PSB @ 10kg/ha + VAM @ 10kg/ha. The data was pooled for two successive years on red fleshed and white fleshed type dragon fruit and the results revealed that treatment T_{13} comprising of 100 per cent N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1} had significantly greater impact on flowering and yield parameters.

Keywords: *Hylocereus* spp, Bio-fertilizers, Organic manures, Dragon fruit, PSB, VAM

1. INTRODUCTION

"*Hylocereus* spp, often known as dragon fruit and native to Central South America, is a newly introduced super fruit in India that belongs to the family Cactaceae. It is a perennial climbing cactus known as the Scaly Fruit, Strawberry Pear, Honourable Queen, Jesus in the Cradle, Queen of Night, Belle of Night and Night Blooming Cereus, which only blooms at night and has a strong smell that lasts for only one night" (Martin *et al*., 1987). It is a long-day plant that blooms from April to November, occasionally until December, and in four to six flushes, sometimes seven (Perween *et al*., 2018). Young stems and fresh flower buds are consumed as vegetables, while dried stems and flowers are employed in homemade medicine as well as the flowers contains fragrance which is used in aromatherapy (Ortiz-Hernandez, 1999).

The blooms of dragon fruit were originally employed for ornamental purposes, but with the creation of edible fruit rich in nutrients, fruit cultivation began all over the world. Dry flowers are eaten as vegetables in Taiwan (Mizrahi and Nerd, 1999). There is a scarcity of literature on the morphology of dragon fruit in general, as well as on flowering and yield characteristics. The flower of red dragon fruit [*Hylocereus polyrhizus* (F.A.C Weber) Britton and Rose] has an average length of 25-30 cm with borders on the outer reddish perianth segments, especially at the terminals and very small and yellowish stigma lobes. Its scarlet fruit (length: 10-12 cm; weight: 130-350 g) is rectangular and coated in small scales having red flesh with many small black seeds, pleasant flesh texture and good taste.

White type of dragon fruit botanically known as [*Hylocereus undatus* (Haworth.) Britton and Rose] plant has long and green stems that are horny in the age margins. Flowers are quite long (up to 29 cm), with green or yellow-green outer perianth segments and pure white inner perianth segments. Its rosy-red fruit (length: 15-22 cm; weight: 300-800 g) is rectangular and covered in large and long scales that are red and green at the tips. It has white flesh with numerous small black seeds, a pleasing flesh texture, and a decent taste.

Organic farming, often known as eco-farming or biological farming, is an environmentally benign alternative to traditional farming. The use of organic sources such as FYM, vermicompost, poultry manure, sheep manure, goat manure, compost, in conjunction with liquid organic manures such as cow urine, panchagavya, vermiwash, bio-digested liquid, jeevamruta, PSB, VAM, azotobacter, rhizobium, and so on, deserves priority for long-term production and better on-farm resource utilisation. Its principles can be found in ecology, a study that studies the interactions between living creatures and their surroundings (Singh *et al*., 2004).

In India, there is no such scientific data available on the impact of organic manures and bio fertilizers on flowering and yield of the red and white dragon fruit types. The goal of the current experiment was to determine how organic manures and bio-fertilizers affected the flowering and yield of the red and white dragon fruit types.

2. MATERIAL AND METHODS

An investigation was conducted on flowering and yield attributes of two types of dragon fruit with the influence of organic manures and bio-fertilizers. The experiment was carried out in the field with thirteen treatments and three replications. “Treatments comprising *viz*.. **T_1** - Control, **T_2** - 100% N through FYM, **T_3** - 100% N through FYM + PSB @ 10kg/ha, **T_4** – 100% N through FYM + VAM @ 10kg/ha, **T_5** - 100% N through FYM + PSB @ 10kg/ha + VAM @ 10 kg/ha, **T_6** - 100% N through poultry manure, **T_7** - 100% N through poultry manure + PSB @ 10 kg/ha, **T_8** - 100% N through poultry manure + VAM @ 10kg/ha, **T_9** - 100% N through poultry manure + PSB @ 10kg/ha + VAM @ 10kg/ha, **T_{10}** – 100% N through vermicompost, **T_{11}** – 100% N through vermicompost + PSB @ 10kg/ha, **T_{12}** – 100 % N through vermicompost + VAM @ 10 kg/ha, **T_{13}** – 100% N through vermicompost + PSB @ 10kg/ha + VAM @ 10kg/ha”. [22] Two year’s data *i.e.* 2019-20 and 2020-21, for various parameters were pooled and analysed for analysis of variance according to Gomez and Gomez (1984) with the help of SAS software using RCBD design further pooled and given ranks according to Duncan Multiple Range Test.

Observations were recorded for Days to first flower open and were expressed in days. The tagged flowers were watched for flower bud opening and shutting. The time required was documented and reported in hours (hrs). The total number of flowers from each pillar was counted until the harvest, and the average number of flowers per plant was calculated and recorded. Using a 30 cm long stainless steel scale, the length of the flowers was tagged and measured from the base to the tip when the flower had fully opened. The mean results were represented in centimeters (cm). After the flower had fully opened, the width of the tagged flowers was measured from base to tip using a thick thread and the measurement was expressed in centimeters (cm). At the time of harvest, the number of fruits per pillar was physically counted and noted. It was calculated how many fruits there should be on each pillar. Each time fruit was harvested, the weight of the fruit per pillar was recorded. From this information, the total yield per plant was calculated and expressed in kilograms (Kg). The number of plants that may be accommodated in a hectare was multiplied by the yield per pillar to get the yield per hectare, which was then stated in tonnes per hectare (t ha^{-1}).

3. RESULTS AND DISCUSSION

3.1 Days to first flower open

3.1.1 Red fleshed type

It is evident from the pooled values (Table. 1), that the application of organic manures in combination with bio-fertilizers was significantly influenced on the days to first flowering. The lesser days taken for earliest flower open (418.74 days) was observed in plants treated with 100 per cent N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1} (T_{13}) while the maximum days taken (493.72) was recorded in treatment T_1 (Control).

3.1.2 White fleshed type

The data presented in Table. 1 on pooled analysis revealed that, the application of organic manures in combination with bio-fertilizers in combination was significantly influenced the days to first flowering. The least number of days required for earliest flower open (441.77 days) was observed in plants treated with 100 per cent N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}(T_{13}) while the highest number of days (508.67) taken to first flowering was recorded in treatment T_1 (Control).

The earliness in flowering may be due to the higher net assimilation rate on account of better growth leading to the production of endogenous metabolites released from earthworm castings (vermicompost) in optimum level enabling early flowering. These results are in conformity with the findings reported by Perween and Hasan (2018) in Dragon fruit.

3.2 Duration of flowering

3.2.1 Red fleshed type

The pooled data (Table. 1) of two successive years (2019-20 and 2020-21) showed non-significant with respect to duration of flowering. However, the maximum duration of flowering (9.61 hours) was observed in the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) while the minimum duration of flowering (9.02 hours) was noticed in treatment T_1 (Control).

3.2.2 White fleshed type

The pooled data (Table. 1) of both the years (2019-20 and 2020-21) showed non-significant with respect to duration of flowering, the maximum duration (9.32 hours) for flowering was observed in the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) while the minimum duration (8.85 hours) was noticed in treatment T_1 (Control).

This may be due to the longer availability of nutrients during the growth period from vermicompost might have enhanced the duration of flowering. Similar, results have been reported by Perween and Hasan (2018) in Dragon fruit.

3.3 Number of flowers per plant

3.3.1 Red fleshed type

From the pooled data (Table. 2) of two successive years of study, it was observed that, number of flowers per plant varied from 12.17 to 6.90. Among different treatments, plants treated with 100 per cent N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1} (T_{13}) has recorded higher number of flowers per plant (12.17), while the least number of flowers per plant (6.90) was recorded in T_1 (Control).

3.3.2 White fleshed type

The pooled data (Table. 2) of both the years showed maximum number of flowers per plant in the treatment T_{12} (100% N through vermicompost + VAM at 10 kg ha^{-1}) (9.83) while the minimum number of flowers per plant (5.61) was noticed in treatment T_1 (Control).

It may be due to availability of sufficient nutrients during the reproductive stage, provided by vermicompost and bio-fertilizers like VAM, which facilitated mobilization of micro nutrients and PSB supporting in solubilization of phosphate in soil, which ultimately reflected on flowering. Results obtained are in close conformity with the findings of Perween and Hasan (2018) in Dragon fruit, Yadav *et al*. (2011) in Mango.

3.4 Length of the flower

3.4.1 Red fleshed type

The pooled data (Table. 3) of two years of study also showed non-significant with respect to the length of flower, however recorded maximum length of flower (27.24 cm) in the treatment T_{13}

(100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) and the minimum length of flower (26.51 cm) was observed in treatment T_1 (Control).

3.4.2 White fleshed type

The pooled data (Table. 3) of two years of study also showed non-significant among the treatments with respect to length of the flower and it was observed maximum length (25.63 cm) in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) and the minimum value (25.05 cm) was recorded in treatment T_1 (Control).

This is due to genetic character of dragon fruit plant. However, the increased nutrient availability from the organic manures and bio-fertilizers have increased various endogenous hormonal level in the plant tissues which was present in worm castings (vermicompost) which might be responsible for enhanced tube growth, which ultimately little difference in the length of flower. The above results are in conformity with the findings of Perween and Hasan (2018) in Dragon fruit and Yadav *et al*. (2011) in Mango.

3.5 Breadth of the flower

3.5.1 Red fleshed type

The pooled data (Table. 3) of two years of study also showed non-significant among treatments with respect to breadth of flower, however it was observed maximum of 15.16 cm in the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) and the minimum breadth of flower (15.09 cm) was recorded in treatment T_1 (Control).

3.5.2 White fleshed type

The pooled analysis (Table. 3) of data also showed non-significant with respect to breadth of the flower, and it was observed higher (15.09 cm) in treatment T_5 (100% N through poultry manure + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) and the minimum (15.04 cm) was observed in T_1 treatment (Control).

This may be due to the genetical character of dragon fruit plant for flower breadth. However, increase in photosynthate production and phosphorous content in farm yard manure and longer availability of nutrients during the reproductive period from vermicompost might have enhanced the cell elongation. This little increase in the breadth of flower may be due to direct role in plant nutrition as the poultry manure having high nitrogen that improves the reproductive growth and makes the nutrient available for the flower growth. The findings are in close conformity with Perween and Hasan (2018) in Dragon fruit, Marathe *et al*. (2017) in Pomegranate.

3.6 Number of fruits per plant

3.6.1 Red fleshed type

From the pooled analysis of two successive years (Table. 4), it was observed that number of fruits per plant varied between 11.00 and 37.50 respectively. Among the different treatments, plants which were imposed with the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) showed maximum number of fruits per plant (37.50) while the least number of fruits (11.00) noticed in treatment T_1 (Control).

3.6.2 White fleshed type

The pooled analysis of data (Table. 4) showed maximum number of fruits (33.42) per plant in the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1}) followed by treatment T_{12} (24.00), while the minimum number of fruits (7.50) was noticed in treatment T_1 (Control).

The increase in the number of fruits per plant was due to the fact that the vermicompost increased microbial activity in the soil which led to high soil fertility and these characters had beneficial effect on production of more number of fruits and also due to better metabolic activities in the plant which ultimately led to high protein and carbohydrate synthesis. These observations are in line with the report of Hoe (2014) in Dragon fruit, Binepal *et al*. (2013) in Guava, Singh *et al*. (2010) in Strawberry.

3.7 Number of fruits per pillar

3.7.1 Red fleshed type

The perusal of data depicted in Table. 4 with respect to number of fruits per pillar in red fleshed type dragon fruit differed significantly among the treatments with organic manures along with bio-fertilizers during both the years (2019-20 and 2020-21) as well as from pooled analysis.

"From the pooled data of two years of study, it was observed that highest number of fruits per pillar(150.00) was found in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) while the least fruits per pillar (44.00) was noticed in treatment T_1 (Control)". [22]

3.7.2 White fleshed type

The pooled analysis of data (Table. 4) showed maximum number of fruits per pillar (133.50) in treatment T_{13} (100% N through vermicompost + VAM at 10 kg ha^{-1}) while the minimum value (30.00) was noticed in treatment T_1 (Control).

The increase in the number of fruits per pillar may be due to the fact that the applied vermicompost increased microbial activity in the soil which led to better soil fertility and had beneficial effect on production of more number of fruits. It might be also due to better metabolic activities in the plant which might have ultimately increased protein and carbohydrate levels. These observations are in conformity with the findings of Hoe (2014) in Dragon fruit, Binepal *et al*. (2013) in Guava, Yadav *et al*. (2011) in Mango, Ghosh *et al*. (2014) in Orange, Singh *et al*. (2010)in Strawberry.

3.8 Fruit yield per plant

3.8.1 Red fleshed type

The pooled (Table. 5) results also showed significant variation with respect to fruit yield per plant, and the highest value(18.69 kg $plant^{-1}$) was noticed in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) while the least fruit yield (2.96 kg $plant^{-1}$) was observed in treatment T_1 (Control).

3.8.2 White fleshed type

The pooled analysis (Table. 5) of data showed maximum fruit yield (14.46 kg $plant^{-1}$) in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1}) followed by treatment T_{12} (10.11 kg $plant^{-1}$). The minimum yield of the fruit (2.28 kg $plant^{-1}$) was noticed in T_1 (Control).

This is due to increase in various endogenous hormonal levels in the plant tissues due to applied vermicompost along with bio-fertilizers which might be responsible for enhanced pollen germination and pollen tube growth, ultimately increased the fruit set as well as number of fruit per plant, which might have directly influenced the fruit yield. These results are in line with the observation made by Hoe (2014) in Dragon fruit, Ibe *et al*. (2011) in Citrus and Iqbal *et al*. (2009) in Strawberry.

3.9 Fruit yield per pillar

3.9.1 Red fleshed type

The pooled results of two years of study (Table. 5) also showed significant variation with respect to fruit yield. The highest value (74.73 kg $pillar^{-1}$) was noticed in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) followed by treatment T_{12} (68.03 kg $pillar^{-1}$) while the least (11.81 kg $pillar^{-1}$) was observed in treatmentT_1 (Control).

3.9.2 White fleshed type

"The pooled data (Table. 5) of both the years (2019-20 and 2020-21) showed maximum fruit yield (57.80 kg $pillar^{-1}$) in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1}) and the lowest fruit yield (9.13 kg $pillar^{-1}$) was noticed in treatment T_1 (Control)". [22]

This is due to increase in various endogenous hormonal levels in the plant tissues due to applied vermicompost along with bio-fertilizers which might be responsible for enhanced pollen germination and pollen tube growth, ultimately increased the fruit set as well as number of fruit per plant, which might have directly influenced the fruit yield. These results are in line with the observation made by Hoe (2014) in Dragon fruit, Ibe *et al*. (2011) in Citrus and Iqbal *et al*. (2009) in Strawberry.

3.10 Estimated fruit yield per acre

3.10.1 Red fleshed type

The data presented with respect to estimated fruit yield per acre of red fleshed type dragon fruit differed significantly among the organic manures and bio-fertilizers during both the years (2019-20 and 2020-21) as well as pooled analysis is furnished in Table 6. From the pooled data of two years of study, it was observed that, estimated fruit yield per acre varied between 5.90 t and 37.36 t. Among the different treatments imposed, plants which were treated with 100 per cent N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1} (T_{13}) recorded maximum yield (37.36 t $acre^{-1}$) followed by treatment T_{12} (34.01 t $acre^{-1}$), while least fruit yield (5.90 t $acre^{-1}$) was noticed in treatment T_1 (Control).

3.10.2 White fleshed type

The pooled data (Table. 6) of both the years (2019-20 and 2020-21) showed maximum estimated fruit yield (28.90 t $acre^{-1}$) in the treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1}) followed by treatment T_{12} (20.81 t $acre^{-1}$), while the minimum estimated fruit yield(4.57 t $acre^{-1}$)was noticed in treatment T_1 (Control).

Higher yield response owing to application of organic manures along with bio-fertilizers ascribed to improved physical, chemical and biological properties of soil resulted in better supply of plant nutrients which was mobilised and solubilised, in turn led to good crop growth and yield. Similar results were reported by Hoe (2014) in Dragon fruit. Shivakumar (2012) in Papaya and Barne *et al*. (2011) in Guava.

3.11 Estimated fruit yield per hectare

3.11.1 Red fleshed type

From the analysis of pooled data (Table. 6) of two successive years indicated that estimated fruit yield per hectare varied between 14.77 t ha^{-1} and 93.42 t ha^{-1}. Among the different treatments imposed, plants which were provided with 100 per cent N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1} (T_{13}) provided maximum yield (93.42 t ha^{-1}while the lowest fruit yield (14.77 t ha^{-1}) was noticed in treatment T_1 (Control).

3.11.2 White fleshed type

The pooled data (Table. 6) of both the years (2019-20 and 2020-21) showed maximum estimated fruit yield (72.26 t ha^{-1}) in treatment T_{13} (100% N through vermicompost + PSB at 10 kg ha^{-1} + VAM at 10 kg ha^{-1}) while the minimum estimated fruit yield (11.41 t ha^{-1}) was noticed in treatment T_1 (Control).

The increased fruit yield may be due to the fact that the applied vermicompost enhanced microbial activity in the soil which led to high soil fertility and this had beneficial effect on better metabolic activities in the plant which ultimately increased protein and carbohydrate synthesis in turn obtained high crop yield. The observations made are in line with the findings of Hoe (2014) in Dragon fruit, Binepal *et al*. (2013) in Guava, Yadav *et al*. (2011) in Mango and Ghosh *et al*. (2014) in Orange.

4. CONCLUSION

From the present study it is concluded that the treatment consisting of $\mathbf{T_{13}}$ (100% N through vermicompost + PSB at 10 kg ha^{-1}+ VAM at 10 kg ha^{-1}) gave the best results followed by treatment $\mathbf{T_{12}}$ - 100% N through vermicompost + VAM @ 10 kg/ha on flowering and yield attributes. The combination effect of organic manures and bio-fertilizers can be suggested for organic cultivation of dragon fruits.

REFERENCES

1. Barne VG, Bharad SG, Dod VN, Baviskar MN. Effect of integrated nutrient management on yield and quality of Guava. Asian Journal of Horticulture. 2011;6(2):546-548.
2. Binepal MK, Rajesh T, Kumawat BR. Integrated approach for nutrient management in Guava cv. L-49 under Malwa plateau conditions of Madhya Pradesh. International Journal of Agriculture Sciences, (2013);9(2):467-471.
3. Ghosh B, Irenaeus TKS, Kundu S, Datta P. Effect of organic manuring on growth, yield and quality of Sweet orange. Acta Horticulture, (2014);104:121-126.
4. Hoe TK. Effect of compost application to improve the red pitaya yield under various mixture fertilizers rates. Acta Horticulture, (2014);1024(1):189.
5. Ibe RB, Lawal I, Olaniyan AA. Economic analysis of yields of Citrus as influenced by organo-mineral fertilizer treatments in Ibadan, Southwest Nigeria. World Journal of Agriculture Sciences, (2011);7(4):425-429.
6. Iqbal U, Wali VK, Kher R, Jamwal M. Effect of FYM, Urea and *Azotobacter* on growth, yield and quality on Strawberry cv. Chandler. Notulae Botanicae Horti Agrobotanici Cluj-Napoca, (2009);37(1):139-143.
7. Kanamadi VC, Bhavidoddi R, Shirol AM, Thammaiah N, Athani SI. Influence of organic and inorganic fertilizers on growth and yield characteristics of Banana cv. Rajapuri. Karnataka Journal of Horticulture, (2004);1(1):81-85.
8. Marathe RA, Sharma J, Murkute AA, Babu KD. Response of nutrient supplementation through organics on growth ,yield and quality of Pomegranate. Scientia Horticulturae, (2017); 214:114-121.
9. Martin FW, Camel CWA, Ruberte RM. Perennial edible fruits of the tropics: An invention. , *ARS Series: Agriculture Handbook,* Mayaguez, Puerto Rico, (1987);65-4612.
10. Mizrahi Y, Nerd A. New crops as a possible solution to the troubles Israeli export market. In: J Janick and Simon, J.E. (eds.), *Progress in new crops*. ASHS Press Alexandria, V A, (1996); pp 56-64.
11. Ortiz-Hernandez Hyd. Pitahaya unnuevo cultivopara México Ed Limusa-Grupo Noriega Editors México DF Mexicopp 111;(1999).
12. Ashokri, H. A. A., & Abuzririq, M. A. K. (2023). The impact of environmental awareness on personal carbon footprint values of biology department students, Faculty of Science, El-Mergib University, Al-Khums, Libya. In *Acta Biology Forum. V02i02* (Vol. 18, p. 22).

13. Perween T, Hasan MA. Effect of different dose of NPK on flower phenology of Dragon fruit. International Journal of Current Microbiology and Applied Sciences, (2018);7(5):2189-2194.
14. Perween T, Mandal KK, Hasan MA. Dragon fruit: An exotic super future fruit of *India.* Journal of Pharmacology and Phytochemistry, (2018);7(2):1022-1026.
15. Shivakumar BS. Integrated nutrient Management studies in Papaya *(Carica papaya L.) cv. Surya*. Ph.D. Thesis (Unpub.). University of Agricultural Sciences, Dharwad, Karnataka. (2018).
16. Singh AK. and Singh SP. Bio-fertilizers in fruit crops. Indian Journal of Horticulture. (2004);61:109-113.
17. Chauhan, A. P. S., Singh, D., Sharma, O. P., Kushwah, N., & Kumhare, A. Agronomic Practices for Enhancing Resilience in Crop Plants. *Plant Science Archives. V08i03*.
18. Singh R, Sharma RR, Singh DB. Effect of vermicompost on plant growth, fruit yield and quality of Strawberries in irrigated arid region of northern plains. Indian Journal of Horticulture, (2010);67(3):318-321.
19. Soorianathasundaram K, Kumar N, Shanthi A. Influence of organic nutrition on the productivity of Banana cv. Nendran. South Indian Journal of Horticulture, (2001);49: 109-113.
20. Bhakta, S., Sipra, B. S., Dutta, P., Sahu, E., Panda, S. K., & Bas-tia, A. K. Water silk (Spirogyra bichromatophora) as a natural resource for antimicrobial phyco-chemicals. *Acta Botanica Plantae. V01i03*, 08-14.
21. Yadav AK, Singh JK, Singh HK. Studies on integrated nutrient management in flowering, fruiting, yield and quality of Mango cv. Amrapali under high density orcharding. *Indian* Journal of Horticulture, (2011); 68(4):453-460.
22. Ayesha Siddiqua, Srinivasappa KN and Arshad Khayum. Effect of different organic manures and bio-fertilizers n growth of red and white fleshed dragon fruit under Bangalore conditions. The Pharma Innovation Journal 2022; 11(7): 2579-2586

Table 1. Days to first flower open and duration of flowering in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Days to first flower open (days)						Duration of flowering (hrs)					
	Red fleshed			White fleshed			Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	494.77^{a}	492.67^{a}	**493.72^{a}**	509.67^{a}	507.67^{a}	**508.67^{a}**	9.00	9.03^{e}	**9.02**	8.67	9.04^{d}	**8.85**

T_2	466.96^{b}	479.67^{ab}	**473.31^{b}**	496.67^{b}	499.33^{b}	**498.00^{b}**	9.33	9.06^{e}	**9.20**	9.00	9.05^{cd}	**9.03**
T_3	464.32^{bc}	477.00^{bc}	**470.66^{b}**	494.33^{b}	498.33^{b}	**496.33^{bc}**	9.33	9.07^{e}	**9.20**	9.00	9.06^{cd}	**9.03**
T_4	463.00^{c}	475.33^{bc}	**469.17^{bc}**	492.33^{bc}	495.00^{b}	**493.67^{cd}**	8.67	9.15^{cde}	**8.91**	8.33	9.11^{cd}	**8.72**
T_5	458.62^{d}	464.33^{bcd}	**461.48^{cd}**	488.00^{c}	496.33^{b}	**492.17^{d}**	8.67	9.22^{bcd}	**8.94**	8.33	9.11^{cd}	**8.72**
T_6	455.63^{de}	462.67^{cd}	**459.15^{d}**	482.33^{d}	487.67^{c}	**485.00^{e}**	9.33	9.22^{bcd}	**9.28**	9.00	9.14^{bcd}	**9.07**
T_7	451.83^{ef}	457.67^{de}	**454.75^{de}**	480.07^{d}	480.33^{d}	**480.20^{f}**	8.67	9.15^{de}	**8.91**	8.67	9.10^{cd}	**8.89**
T_8	448.13^{fg}	452.00^{def}	**450.07^{ef}**	480.67^{d}	475.00^{e}	**477.83^{fg}**	9.67	9.24^{bcd}	**9.45**	9.33	9.18^{bc}	**9.26**
T_9	445.43^{gh}	447.00^{ef}	**446.22^{fg}**	478.67^{de}	472.67^{e}	**475.67^{g}**	9.33	9.15^{cde}	**9.24**	9.00	9.11^{cd}	**9.05**
T_{10}	441.98^{h}	441.33^{f}	**441.66^{gh}**	474.67^{e}	466.33^{f}	**470.50^{h}**	9.00	9.29^{bc}	**9.15**	9.33	9.26^{ab}	**9.30**
T_{11}	435.48^{i}	438.33^{fg}	**436.91^{h}**	469.07^{f}	452.67^{g}	**460.87^{i}**	9.33	9.30^{b}	**9.32**	9.00	9.06^{cd}	**9.03**
T_{12}	429.07^{j}	423.00^{gh}	**426.04^{i}**	454.77^{g}	445.67^{h}	**450.22^{j}**	9.33	9.46^{a}	**9.40**	9.00	9.04^{d}	**9.02**
T_{13}	421.14^{k}	416.33^{h}	**418.74^{i}**	445.53^{h}	438.00^{i}	**441.77^{k}**	9.67	9.56^{a}	**9.61**	9.33	9.31^{a}	**9.32**
Mean	452.03	455.95	**453.99**	480.52	478.08	**479.30**	9.18	9.22	**9.20**	8.92	9.12	**9.02**
S.Em±	1.33	5.25	**2.78**	1.78	1.64	**1.20**	0.38	0.05	**0.19**	0.45	0.04	**0.22**
C.D. @ 5%	3.88	15.33	**7.90**	5.21	4.80	**3.40**	NS	0.14	**NS**	NS	0.13	**NS**
C.V. (%)	0.51	2.00	**1.50**	0.64	0.60	**0.61**	7.21	0.93	**3.61**	8.81	0.83	**4.20**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Table 2. Number of flowers per plant in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Number of flowers/plant					
	Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	5.33^{d}	8.47^{g}	**6.90^{h}**	4.00	7.22^{g}	**5.61^{g}**
T_2	6.33^{cd}	9.59^{fg}	**7.96^{fgh}**	5.00	9.00^{f}	**7.00^{ef}**
T_3	5.67^{d}	9.61^{fg}	**7.64^{gh}**	4.33	9.20^{ef}	**6.77^{f}**
T_4	6.67^{bcd}	9.77^{efg}	**8.22^{efg}**	5.67	9.22^{ef}	**7.45^{def}**
T_5	7.67^{abc}	9.97^{efg}	**8.82^{def}**	5.33	9.74^{ef}	**7.54^{def}**
T_6	8.00^{ab}	10.23^{ef}	**9.12^{de}**	5.67	10.19^{de}	**7.93^{cde}**
T_7	7.33^{abc}	10.30^{ef}	**8.82^{def}**	6.00	10.26^{de}	**8.13^{cde}**
T_8	8.00^{ab}	10.47^{ef}	**9.24^{de}**	6.67	10.30^{de}	**8.49^{bcd}**
T_9	8.33^{a}	11.33^{de}	**9.83^{cd}**	5.67	11.33^{cd}	**8.50^{bcd}**
T_{10}	8.00^{ab}	12.67^{cd}	**10.33^{c}**	5.00	12.67^{ab}	**8.83^{abc}**
T_{11}	8.00^{ab}	13.67^{bc}	**10.83^{bc}**	6.00	13.00^{ab}	**9.50^{ab}**
T_{12}	8.33^{a}	14.82^{ab}	**11.58^{ab}**	6.00	13.67^{a}	**9.83^{a}**
T_{13}	8.67^{a}	15.67^{a}	**12.17^{a}**	6.33	12.33^{bc}	**9.33a^{b}**
Mean	7.41	11.27	**9.34**	5.51	10.63	**8.07**
S.Em±	0.53	0.55	**0.38**	0.68	0.41	**0.35**
C. D @ 5%	1.54	1.61	**1.08**	NS	1.19	**1.02**
C.V. (%)	12.30	8.45	**10.00**	14.42	6.64	**7.53**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Table 3. Length and breadth of the flower in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Length of the flower (cm)						Breadth of the flower (cm)					
	Red fleshed			White fleshed			Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	27.00	26.02	**26.51**	25.00	25.10	**25.05**	15.127	15.060	**15.093**	15.047	15.033	**15.040**
T_2	27.34	26.22	**26.78**	25.00	25.10	**25.05**	15.143	15.120	**15.132**	15.067	15.077	**15.072**
T_3	27.30	26.14	**26.72**	25.22	25.42	**25.32**	15.143	15.103	**15.123**	15.067	15.063	**15.065**
T_4	27.18	26.10	**26.64**	25.22	25.53	**25.37**	15.160	15.110	**15.135**	15.083	15.067	**15.075**
T_5	27.22	26.14	**26.68**	25.44	25.44	**25.44**	15.117	15.133	**15.125**	15.113	15.067	**15.090**
T_6	27.81	26.20	**27.01**	25.22	25.45	**25.34**	15.093	15.120	**15.107**	15.050	15.080	**15.065**
T_7	27.44	26.16	**26.80**	25.19	25.45	**25.32**	15.137	15.097	**15.117**	15.057	15.060	**15.058**
T_8	27.84	26.03	**26.94**	25.21	25.44	**25.33**	15.147	15.160	**15.153**	15.053	15.063	**15.058**
T_9	27.26	26.18	**26.72**	25.22	25.48	**25.35**	15.143	15.157	**15.150**	15.077	15.050	**15.063**
T_{10}	27.77	26.18	**26.98**	25.21	25.42	**25.32**	15.147	15.120	**15.133**	15.057	15.057	**15.057**
T_{11}	27.65	26.49	**27.07**	25.44	25.44	**25.44**	15.137	15.127	**15.132**	15.077	15.057	**15.067**
T_{12}	27.62	26.29	**26.96**	25.22	25.44	**25.33**	15.143	15.143	**15.143**	15.073	15.070	**15.072**
T_{13}	27.95	26.52	**27.24**	25.67	25.59	**25.63**	15.157	15.160	**15.158**	15.060	15.057	**15.058**
Mean	27.49	26.21	**26.85**	25.25	25.41	**25.33**	15.138	15.124	**15.131**	15.068	15.062	**15.065**
S.Em±	0.21	0.30	**0.19**	0.17	0.16	**0.12**	0.019	0.024	**0.015**	0.167	0.014	**0.083**
C. D @ 5%	NS	NS	**NS**	NS	NS	**NS**	NS	NS	**NS**	NS	NS	**NS**
C.V. (%)	1.31	1.96	**1.71**	1.17	1.06	**1.18**	0.220	0.275	**0.241**	1.922	0.166	**1.348**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Table 4. Fruit yield on count basis in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Number of fruits per plant						Number of fruits per pillar					
	Red fleshed			White fleshed			Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	7.00^{h}	15.00^{h}	**11.00^{j}**	5.00^{f}	10.00^{i}	**7.50^{k}**	28.00^{h}	60.00^{j}	**44.00^{k}**	20.00^{f}	40.00^{k}	**30.00^{l}**
T_2	9.00^{g}	23.00^{g}	**16.00^{i}**	10.00^{e}	12.00^{h}	**11.00^{j}**	36.00^{g}	92.00^{i}	**64.00^{j}**	40.00^{e}	48.00^{j}	**44.00^{k}**
T_3	12.00^{f}	25.00^{g}	**18.50^{h}**	10.00^{e}	14.00^{g}	**12.00^{i}**	48.00^{f}	100.00^{h}	**74.00^{i}**	40.00^{e}	56.00^{i}	**48.00^{j}**
T_4	12.00^{f}	25.00^{g}	**18.50^{h}**	12.00^{d}	15.00^{g}	**13.50^{h}**	48.00^{f}	100.00^{h}	**74.00^{i}**	48.00^{d}	60.00^{h}	**54.00^{i}**
T_5	12.00^{f}	25.00^{g}	**18.50^{h}**	12.00^{d}	15.00^{g}	**13.50^{h}**	48.00^{f}	100.00^{h}	**74.00^{i}**	48.00^{d}	60.00^{h}	**54.00^{i}**
T_{60}	14.00^{e}	28.00^{f}	**21.00^{h}**	12.00^{d}	18.00^{f}	**15.00^{g}**	56.00^{e}	112.00^{g}	**84.00^{h}**	48.00^{d}	72.00^{g}	**60.00^{h}**
T_7	14.00^{e}	30.00^{ef}	**22.00^{g}**	14.00^{c}	18.00^{f}	**16.00^{f}**	56.00^{e}	120.00^{f}	**88.00^{g}**	56.00^{c}	72.00^{g}	**64.00^{g}**
T_8	14.00^{e}	32.00^{e}	**23.00^{f}**	14.00^{c}	19.00^{ef}	**16.50^{ef}**	56.00^{e}	128.00^{e}	**92.00^{f}**	56.00^{c}	76.00^{f}	**66.00^{f}**
T_9	16.00^{d}	37.00^{d}	**26.50^{e}**	14.00^{c}	20.00^{e}	**17.00^{e}**	64.00^{d}	148.00^{d}	**106.00^{d}**	56.00^{c}	80.00^{e}	**68.00^{e}**
T_{10}	16.00^{d}	43.00^{c}	**29.50^{d}**	14.00^{c}	26.00^{d}	**20.00^{d}**	64.00^{d}	172.00^{c}	**118.00^{c}**	56.00^{c}	104.00^{d}	**80.00^{d}**
T_{11}	21.00^{c}	45.00^{bc}	**33.00^{c}**	16.00^{b}	30.00^{c}	**23.00^{c}**	84.00^{c}	120.00^{f}	**102.00^{e}**	64.00^{b}	120.00^{c}	**92.00^{c}**
T_{12}	22.00^{b}	47.00^{b}	**34.50^{b}**	16.00^{b}	32.00^{b}	**24.00^{b}**	88.00^{b}	180.00^{b}	**134.00^{b}**	64.00^{b}	128.00^{b}	**96.00^{b}**
T_{13}	25.00^{a}	50.00^{a}	**37.50^{a}**	20.83^{a}	46.00^{a}	**33.42^{a}**	100.00^{a}	200.00^{a}	**150.00^{a}**	83.00^{a}	184.00^{a}	**133.50^{a}**
Mean	14.92	32.69	**23.81**	13.06	21.15	**17.11**	59.69	125.54	**92.62**	52.23	84.62	**68.42**
S.Em±	0.16	0.75	**0.39**	0.02	0.56	**0.28**	0.16	2.56	**1.28**	0.16	0.54	**0.28**
C.D. @ 5%	0.47	2.19	**1.11**	0.07	1.64	**0.79**	0.47	7.48	**3.64**	0.47	1.57	**0.80**
C.V. (%)	1.86	3.97	**4.03**	0.31	4.59	**3.99**	0.46	3.54	**3.39**	0.53	1.10	**1.01**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Table 5. Fruit yield on weight basis in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Fruit yield (Kg/plant)						Fruit yield (Kg/pillar)					
	Red fleshed			White fleshed			Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	1.63^{i}	4.28^{l}	**2.96**^{m}	1.24^{g}	3.32^{k}	**2.28**^{l}	6.52^{l}	17.10^{l}	**11.81**^{l}	4.96^{k}	13.30^{k}	**9.13**^{m}
T_2	3.13^{h}	8.32^{k}	**5.73**^{l}	2.99^{f}	4.28^{j}	**3.63**^{k}	12.53^{k}	33.29^{k}	**22.91**^{k}	11.96^{j}	17.13^{j}	**14.54**^{l}
T_3	4.46^{g}	9.31^{j}	**6.88**^{k}	3.14^{f}	5.05^{i}	**4.10**^{j}	17.84^{j}	37.25^{j}	**27.55**^{j}	12.56^{j}	20.18^{i}	**16.37**^{k}
T_4	4.70^{g}	9.94^{j}	**7.32**^{j}	3.86^{e}	5.47^{h}	**4.67**^{i}	18.80^{i}	39.74^{j}	**29.27**^{j}	15.44^{i}	21.89^{hi}	**18.66**^{j}
T_5	4.89^{g}	10.94^{i}	**7.92**^{i}	4.02^{e}	5.67^{h}	**4.85**^{i}	19.57^{h}	43.76^{i}	**31.66**^{i}	16.07^{h}	22.68^{h}	**19.38**^{i}
T_{60}	5.69^{f}	12.52^{h}	**9.10**^{h}	4.20^{e}	6.90^{g}	**5.55**^{h}	22.79^{g}	50.07^{h}	**36.42**^{h}	16.81^{g}	27.62^{g}	**22.22**^{h}
T_7	6.33^{e}	13.77^{g}	**10.05**^{g}	4.96^{d}	7.07^{g}	**6.01**^{g}	25.30^{f}	55.08^{g}	**40.19**^{g}	19.85^{f}	28.28^{fg}	**24.07**^{g}
T_8	6.50^{e}	14.93^{f}	**10.71**^{f}	5.21^{cd}	7.56^{f}	**6.39**^{f}	26.01^{e}	59.71^{f}	**42.86**^{f}	20.84^{e}	30.26^{f}	**25.55**^{f}
T_9	7.47^{d}	17.59^{e}	**12.53**^{e}	5.32^{cd}	8.12^{e}	**6.72**^{e}	29.89^{d}	70.35^{e}	**50.12**^{e}	21.27^{e}	32.47^{e}	**26.87**^{e}
T_{10}	7.55^{d}	20.89^{d}	**14.22**^{d}	5.49^{c}	10.65^{d}	**8.07**^{d}	30.22^{d}	83.55^{d}	**56.88**^{d}	21.94^{d}	42.59^{d}	**32.27**^{d}
T_{11}	10.08^{c}	22.10^{c}	**16.09**^{c}	6.40^{b}	12.43^{c}	**9.41**^{c}	40.34^{c}	88.42^{c}	**64.38**^{c}	25.58^{c}	49.73^{c}	**37.65**^{c}
T_{12}	10.72^{b}	23.30^{b}	**17.01**^{b}	6.58^{b}	13.63^{b}	**10.11**^{b}	42.88^{b}	93.18^{b}	**68.03**^{b}	26.33^{b}	54.52^{b}	**40.43**^{b}
T_{13}	12.43a	24.94^{a}	**18.69**^{a}	8.88^{a}	20.03^{a}	**14.46**^{a}	49.71^{a}	99.75^{a}	**74.73**^{a}	35.50^{a}	80.10^{a}	**57.80**^{a}
Mean	6.58	14.83	**10.71**	4.79	8.48	**6.63**	26.34	59.33	**42.83**	19.16	33.90	**26.53**
S.Em±	0.16	0.22	**0.13**	0.13	0.08	**0.07**	0.16	1.31	**0.65**	0.21	0.71	**0.34**
C.D. @ 5%	0.46	0.65	**0.37**	0.37	0.24	**0.20**	0.46	3.82	**1.84**	0.61	2.07	**1.00**
C.V. (%)	4.13	2.59	**2.08**	4.56	1.66	**1.80**	1.04	3.82	**3.70**	1.88	3.62	**2.24**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Table 6. Total fruit yield per acre and per hectare in red and white fleshed dragon fruit during the years 2019-20 and 2020-21 as influenced by bio-fertilizers and organic manures.

Treatments	Estimated fruit yield (t acre^{-1})						Estimated fruit yield (t ha^{-1})					
	Red fleshed			White fleshed			Red fleshed			White fleshed		
	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**	2019-20	2020-21	**Pooled**
T_1	3.25^{m}	8.55^{l}	**5.90**^{m}	2.48^{i}	6.65^{k}	**4.57**^{l}	8.15^{h}	21.38^{j}	**14.77**^{j}	6.20^{i}	16.62^{k}	**11.41**^{l}
T_2	6.26^{l}	16.64^{k}	**11.45**^{l}	5.98^{h}	8.56^{j}	**7.27**^{k}	15.64^{g}	41.61^{i}	**28.63**^{i}	14.96^{h}	21.41^{j}	**18.18**^{k}
T_3	8.92^{k}	18.63^{j}	**13.78**^{k}	6.28^{h}	10.09^{i}	**8.18**^{j}	22.30^{f}	46.57^{hi}	**34.44**^{h}	15.70^{h}	25.23^{i}	**20.47**^{j}
T_4	9.40^{j}	19.87^{j}	**14.64**^{j}	7.72^{g}	10.94^{hi}	**9.33**^{i}	23.48^{f}	49.68^{gh}	**36.58**^{h}	19.30^{g}	27.36^{h}	**23.33**^{i}
T_5	9.78^{i}	21.88^{i}	**15.83**^{i}	8.04^{fg}	11.34^{h}	**9.69**^{i}	24.46^{f}	54.70^{g}	**39.58**^{h}	20.09^{fg}	28.34^{h}	**24.21**^{i}
T_{60}	11.39^{h}	25.04^{h}	**18.22**^{h}	8.41^{f}	13.81^{g}	**11.11**^{h}	28.47^{e}	62.59^{f}	**45.53**^{g}	21.02^{f}	34.52^{g}	**27.77**^{h}
T_7	12.65^{g}	27.54^{g}	**20.09**^{g}	9.92^{e}	14.14^{g}	**12.03**^{g}	31.63^{de}	68.85^{ef}	**50.24**^{fg}	24.81^{e}	35.34^{g}	**30.08**^{g}
T_8	13.01^{f}	29.85^{f}	**21.43**^{f}	10.42^{d}	15.13^{f}	**12.77**^{f}	32.52^{d}	74.63^{e}	**53.57**^{fg}	26.05^{d}	37.82^{f}	**31.94**^{f}
T_9	14.94^{e}	35.17^{e}	**25.05**^{e}	10.64^{cd}	16.24^{e}	**13.44**^{e}	37.36^{c}	87.93^{d}	**62.64**^{e}	26.59^{cd}	40.59^{e}	**33.59**^{e}
T_{10}	15.11^{d}	41.77^{d}	**28.44**^{d}	10.97^{c}	21.30^{d}	**16.13**^{d}	37.77^{c}	104.43^{c}	**71.10**^{d}	27.43^{c}	53.24^{d}	**40.34**^{d}
T_{11}	20.17^{c}	44.21^{c}	**32.19**^{c}	12.79^{b}	24.87^{c}	**18.83**^{c}	50.42^{b}	110.52^{bc}	**80.47**^{c}	31.98^{b}	62.17^{c}	**47.08**^{c}
T_{12}	21.44^{b}	46.59^{b}	**34.01**^{b}	13.16^{b}	27.26^{b}	**20.21**^{b}	53.60^{b}	116.48^{b}	**85.04**^{b}	32.91^{b}	68.15^{b}	**50.53**^{b}
T_{13}	24.85^{a}	49.87^{a}	**37.36**^{a}	17.75^{a}	40.05^{a}	**28.90**^{a}	62.14^{a}	124.69^{a}	**93.42**^{a}	44.38^{a}	100.13^{a}	**72.26**^{a}
Mean	13.17	26.66	**21.41**	9.58	16.95	**13.27**	32.92	74.16	**53.54**	23.96	42.38	**33.17**
S.Em±	0.02	0.43	**0.22**	0.13	0.30	**0.17**	1.31	2.26	**1.31**	0.35	0.61	**0.35**
C.D. @ 5%	0.06	1.27	**0.61**	0.38	0.88	**0.47**	3.83	6.59	**3.81**	1.02	1.78	**0.98**
C.V. (%)	0.25	2.53	**2.47**	2.34	3.07	**3.07**	6.90	5.27	**4.22**	2.52	2.49	**2.55**

NS: Non-significant

NOTE: Mean values in a column having dissimilar letter/s indicate significant differences and similar letters indicate statistically non-significant at 0.05 levels of significance

Fig . 1 Length of the flower

Fig . 2 Breadth of the flower

Various flower parameters recorded during experimentation

Yield of white type

Yield of red type

Yield of red and white type

Fig . 3 Packaging

Fruit yield and packaging