Original Research Article

Influence of different organic sources of nutrients on yield and quality of pomegranate (*Punica granatum* L.) cv. Bhagwa

Abstract

A field experiment entitled, Influence of different organic sources of nutrients on yield and quality of pomegranate (*Punica granatum* L.) cv. Bhagwa. The present investigation was laid out in RBD with three replications consisting of twenty-two treatments with four different organic manures *viz.*, farmyard manure, vermicompost, poultry manure and neem cake as a source of nitrogen and recommended dose of manure and fertilizers based on plant age with or without biofertilizers (*Azotobacter,* PSB & KMB) and biopesticides (*Trichoderma viride* and and *Paecilomyces lilacinus*).

The results based on pooled data revealed that maximum number of fruits per plant (59.50), yield per plant (12.41 kg), yield per hectare (19.86 tonne), fruit weight (239.39 g), fruit diameter (7.55 cm), aril weight per fruit (147.70 g), juice content per fruit (97.55 ml), peel weight per fruit (91.69 g) along with peel: aril ratio (0.62) was significantly noted under treatment 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus*. The maximum net return (4,12,840/ha) and BCR (3.26) were also obtained in same treatment. Significantly maximum TSS (16.15°Brix), reducing sugar (14.44 %), non-reducing (2.04 %) and total sugar (16.48 %) along with minimum titrable acidity (0.41 %) were recorded with application of 37.5 % RDN through FYM + 37.5 % RDN through neem cake + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment. Whereas, maximum ascorbic acid content (16.72 mg/100 ml juice) was significantly found under treatment 100 % RDN through FYM + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus*.

Keywords:Pomegranate, organic manures, *Azotobacter,* PSB, KMB, *Trichoderma viride*, *Paecilomyces lilacinus*

INTRODUCTION

The pomegranate (*Punica granatum* L.) is an important and favorable table fruit due to its sweet acidic nature. It is very much liked for its cool refreshing juice and also valued for its medicinal properties. Pomegranate is a good source of protein, carbohydrate, minerals, antioxidants, vitamin 'A,' vitamin 'B' and vitamin 'C.' It is also utilizing in controlling diarrhoea, hyperacidity, tuberculosis, leprosy, chronic stomach ailment and fever. Its fruit rind is rich in tannin. Its barks and rinds are commonly used in dysentery and diarrhoea. The rind is also used as dyeing material for cloth. The seeds are rich in lipid, protein, crude fiber and ash (Singh and Chauhan, 1988). Due to its multipurpose medicinal uses, it is also known as "Dadima" in *Ayurveda* (Paranjpe, 2001) and as "Super fruit" in the global functional food industry (Martins *et al*., 2006). Pomegranate juice contains antioxidants such as soluble polyphenols, tannins, anthocyanins and may have antiatherosclerotic properties (Michel *et al*., 2005) and can be used in the treatment of cancer and chronic inflammation (Ephraim and Robert, 2007). Due to its immense utility as medicine, pomegranate fruit is regarded as 'medicinal miracle.'

In the recent time, there is growing demand for good quality fruits of pomegranate both for fresh and processed products like juice, syrup, grenadine, squash and wine besides, *anardana*, an acidulant product (Pruthi and Saxena, 1984). Several products such as candy, tuti fruity, squash, powder and ready to serve beverage can also be prepared and marketed in domestic as well as international markets. In Azerbaijan, citric acid and sodium citrate are prepared from juice of wild pomegranates (Venkatesha and Yogish, 2016). Due to the presence of chemical residues in the produce of fruit crops and looking to the food safety, many foreign countries are denying the import of such produce.

Its intensive cultivation involving indiscriminate use of chemical pesticides alongwith improper nutrient management is deleterious to the plant health and environment also. Due to these practices, the plants also become susceptible to several biotic and abiotic stresses. Due to farmers' perception that the productivity can be enhanced only using by such chemical fertilizers and pesticides, the use of such chemicals has reached to the hazardous limits. The quality attributes of pomegranate are badly affected due to indiscriminate application of inorganic agro-chemicals which results in quality deterioration (as color, size, shape, taste, *etc.*) with less consumer preference and low returns to the growers. It also causes soil health deterioration and disturbs the soil microorganisms.

Therefore, in recent times, organic manures such as FYM, vermicompost, poultry manure, press mud, crop residues, green manuring, animal and human waste are becoming popular and essential in growing fruit crops alongwith the use of oil cakes (neem, karanj, mahua and castor cake). Therefore, the use of organic sources of nutrients help to conserve the soil health by maintaining the equilibrium of organic matter and soil microflora ultimately helping to improve physical, chemical and biological properties of the soil (Walia and Kler, 2009).

Looking into these circumstances, an approach based on different organic sources of nutrients was initiated by tapping all possible sources of organic and biofertilizers along with common application of *Trichoderma viride* and *Paecilomyces lilacinus* in a judicious manner to maintain soil fertility and plant nutrient supply for sustaining the desired crop productivity with less chemical load to the soil and fruit.In view of above, the experiment has been planned to find out the "Influence of different organic sources of nutrients on yield and quality of pomegranate (*Punica granatum* L.) cv. Bhagwa".

MATERIALS AND METHODS

The field experiment was conducted during *Mrigbahar*2017-18 and 2018-19 at the College Farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, District: Mehsana, Gujarat on two years old uniform plants of pomegranate cv. Bhagwa which were planted at spacing of 2.5 m x 2.5 m. Jagudan is geographically situated on 23°53' North and 74° 43' East longitude at an altitude of 90.6 metres above mean sea level. The experiment was laid out in a randomized block design comprising of 22 treatments with 3 replications having 2 plants per replication. Various treatments were- T_1 – Recommended dose of FYM and NPK applied through chemical fertilizers (Control), T_2 – T_1 + *Trichoderma viride* @ 5 g and *Paecilomyces lilacinus* @ 5 ml per plant, T_3 – 100 % RDN through FYM, T_4 –100 % RDN through vermicompost, T_5 – 100 % RDN through poultry manure, T_6 – 100 % RDN through neem cake, T_7 – 50 % RDN through FYM + 50 % RDN through vermicompost, T_8 – 50 % RDN through FYM + 50 % RDN through poultry manure, T_9 –50 % RDN through FYM + 50 % RDN through neem cake, T_{10} – 50 % RDN through vermicompost + 50 % RDN through poultry manure, T_{11} –50 % RDN through vermicompost + 50 % RDN through neem cake, T_{12} –50 % RDN through poultry manure + 50 % RDN through neem cake, T_{13} –75 % RDN through FYM, T_{14} – 75 % RDN through vermicompost, T_{15} – 75 % RDN through poultry manure, T_{16} – 75 %

RDN through neem cake, T_{17} –37.5 % RDN through FYM + 37.5 % RDN through vermicompost, T_{18} –37.5 % RDN through FYM + 37.5 % RDN through poultry manure, T_{19} – 37.5 % RDN through FYM + 37.5 % RDN through neem cake, T_{20} –37.5 % RDN through vermicompost + 37.5 % RDN through poultry manure, T_{21} – 37.5 % RDN through vermicompost + 37.5 % RDN through neem cake and T_{22} – 37.5 % RDN through poultry manure + 37.5 % RDN through neem cake. Biofertilizers (50 ml PSB and 25 ml KMB) along with ccommon dose of *Trichoderma viride* @ 5 g and *Paecilomyces lilacinus*@ 5 ml per plant were applied in the treatment T_3 to $T_{22.}$ While, *Azotobacter* culture @ 50 ml per plant was applied in the treatment T_{13} to $T_{22.}$ Application of RDN through different organic manures was also given on the basis of plant age as per treatment which was computed on the inherent availability of nitrogen for the year 2017-18 and 2018-19. The recommended dose of manure and chemical fertilizers were applied in the T_1 and T_2 treatments in the present investigation according to age of pomegranate plant because recommended dose of manure and chemical fertilizers varies from year to year recommended by National Research Centre on Pomegranate in Table 1 (Sharma *et al.*, 2011). For both these treatments, full dose of FYM and half dose of N, P and K were applied at desired leaf fall stage on 20th June and rest of N, P and K were applied through chemical fertilizers after 60 days of first split in each year of experiment.

Table 1: Recommended manure and chemical fertilizer dose/plant/year

Age of plant (Years)	FYM (kg)	Nitrogen (g)	Phosphorus (g)	Potash (g)
1	10	250	125	125
2	20	250	125	125
3	30	500	125	125
4	40	500	125	250
5 and above	50	625	250	250

The farm yard manure (FYM), vermicompost, poultry manure and neem cake used in present experiment were analyzed for N, P and K content (%) by using standard methods (Jackson, 1973) before application in field which was given in Table 2. As per treatment, 50 per cent nitrogen of RDN was applied in the form of FYM, vermicompost, poultry manure and neem cake at desired leaf fall stage on 20th June and remaining dose after 60 days of first splitin each year of experiment. Application of RDN through different organic sources of nutrients was given on the basis of plant age in the treatment T_3 to T_{22} as per treatment.

Table 2: N, P and K content (%) of different organic manures for the year 2017-18 and 2018-19

Sr. No.	Organic manures	N (%)		P_2O_5 (%)		K_2O (%)	
		2017-18	2018-19	2017-18	2018-19	2017-18	2018-19
1	FYM	0.65	0.61	0.28	0.26	0.55	0.51
2	Vermicompost	1.53	1.48	0.45	0.41	0.62	0.59
3	Poultry manure	2.35	2.44	2.60	2.67	1.98	2.16
4	Neem cake	5.22	5.15	1.12	1.08	1.50	1.47

For application of organic manures, a ring having 20 cm depth with 15 cm width was made around the plant canopy and manures were uniformly mixed into the ring which was then leveled.The biofertilizers (*Azotobacter* culture, phosphate solubilizing bacteria and potash mobilizing bacteria) and biopesticides (*Trichoderma viride* and *Paecilomyces lilacinus*) were mixed thoroughly with different organic manures as per treatment before its application. The full dose of biofertilizers and biopesticide were applied at desired leaf fall stage on 20th June in each year of experiment as per treatment. The plants were moderately pruned during the first fortnight of June in each year of experimentation period. Other cultural practices such as weeding and plant protection were done as and when required. Irrigation was applied immediately after treatment application. Plants were irrigated daily with drip irrigation system as per water requirement except rainy season. Observations on yield and quality of pomegranate were studied. The statistical analysis of the data was carried out as per method described by Cochran and Cox (1963). The treatment effects were tested at 5 per cent level of significance.

RESULT AND DISCUSSION

Influence of different organic sources of nutrients on yield and yield attributes

The data pertaining to number of fruits per plant, yield per plant (kg) and yield per hectare (t) as influenced by different organic sources of nutrients are presented in Table 3. Significantly maximum number of fruits per plant (59.50) was noted in 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment which was at par with T_6 treatment. Yield per plant (12.41 kg) and yield per hectare (19.86 t) were significantly recorded in same treatment. Whereas, minimum number of fruits per plant (38.50), yield per plant (6.61 kg) and yield per hectare (10.58 t) were recorded in 75 % RDN through FYM + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment. Maximum number of fruits per plant in pomegranate might be due to a greater number of productive flowers and higher fruit set. More uptake of P and K in plants applied with 100 % RDN through poultry manure along with biofertilizers which might have helped in increased the number of fruits and yield. These might be due to availability of essential nutrients for better flowering and higher fruit set. In addition to, maximum yield per plant in pomegranate might be due to the cumulative effect of increase in number of fruits and higher fruit weight by the application of poultry manure and biofertilizers might have affected the physiological process resulting into higher production. These results are in conformity with the findings of Baviskar *et al*. (2011) in sapota, Kurer *et al.* (2017) and Kirankumar *et al*. (2019) in pomegranate. These results are in conformity with Marathe*et al.* (2017) who reported that nutrients in organic manures were released slowly and made available throughout the growth period and resulted in better uptake of nutrients, plant vigour, number of fruits and yield in pomegranate.

Influence of different organic sources of nutrients on physical parameters

The data pertaining to fruit weight (g) and fruit diameter (cm) as influenced by different organic sources of nutrients are presented in Table 3. Significantly maximum fruit weight (239.39 g) and fruit diameter (7.55 cm) were recorded in 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment followed by $T_{6,}$ T_{19} and T_2 treatments. Whereas, minimum fruit weight (200.13 g) and fruit diameter (6.27 cm) were noted under treatment 100 % RDN through FYM + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus*. Maximum fruit weight and fruit diameter are associated with higher nutritional availability for pomegranate plants supplied through poultry manure and biofertilizers might have increased photosynthetic activity which in turn increased the production of metabolites. These results are in accordance with the findings of Dattatraya (2019) in pomegranate. The increase in fruit weight and fruit diameter might be due to contribution of poultry manure, biofertilizers and biopesticides on more C/N ratio and greater uptake of nutrients. This may have led to better metabolic activities in the tree which ultimately led to high protein and carbohydrate synthesis which was also supported by findings of Sharma *et al.* (2016) in guava.

From that data presented in Table 3, maximum aril weight per fruit and juice content per fruit were significantly recorded in 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment with the values of 147.70 g and 97.55 ml, respectively which was statistically at par with T_6 treatment. Whereas, minimum aril weight per fruit and juice content per fruit were noted under treatment 100 % RDN through FYM + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* with the values of 119.32 g and 77.68 ml, respectively. The nutrients supplemented with poultry manure along with biofertilizers increased aril weight. It might be due to optimum supply of proper plant nutrients through building of organic matter in soil resulted in enriching soil fertility and ultimately production of more photosynthates that accelerates the metabolic activities of the plants. These results are in conformity with the findings of Vessey (2003), Mohamed *et al.* (2018) and Kirankumar *et al.* (2018) in pomegranate. Higher fruit weight and aril weight in this treatment might have resulted in maximum juice content per fruit. The combined application of poultry manure, biofertilizers and biopesticides could be related to increased biological activities in the soil, better soil aggregation and nutritional availability (Manickam, 1993).

Maximum peel weight per fruit was significantly recorded in 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment with the value of 91.69 g which was statistically at par with all the treatments except $T_{3,}$ $T_{7,}$ $T_{8,}$ $T_{10,}$ T_{12} andT_{13} treatments (Table 3). Whereas, minimum peel weight per fruit was recorded in 50 % RDN through FYM + 50 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment with the value of 80.11 g. The higher fruit weight and fruit size were responsible for higher peel weight and aril weight. Maximum peel weight of pomegranate fruits related with higher nutritional availability supplied through poultry manure and biofertilizers might have increased photosynthetic activity which in turn increased the production of metabolites. These results are in accordance with the findings of Dattatraya (2019) in pomegranate and Sharma *et al*. (2016) in guava.

From that data presented in Table 3, statistically minimum peel: aril ratio was recorded in 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment with the value of 0.62 which was statistically at par with $T_{8,}$ $T_{6,}$ $T_{10,}$ $T_{12,}$ $T_{7,}$ $T_{2,}$ T_{11} andT_{19} treatments. Whereas, maximum peel: aril ratio was recorded under 75 % RDN through vermicompost + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* and 75 % RDN through poultry manure + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatments with the value of 0.71. Application of poultry manure along with biofertilizers and biopesticides favour higher amount of juice content in the arils which leads to lower value of peel aril ratio. Its application might also have produced optimum micronutrients which is responsible to lower peel: aril ratio in pomegranate. These results are in line with the findings of Hasani *et al*. (2012) and Ahmed *et al.* (2014) in pomegranate.

Influence of different organic sources of nutrients on chemical parameters

The data pertaining to TSS (°Brix) as influenced by different organic sources of nutrients are presented in Table 4. Statistically maximum total soluble solids were recorded in 37.5 % RDN through FYM + 37.5 % RDN through neem cake + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g Trichoderma *viride* + 5 ml *Paecilomyces lilacinus* treatment with the value of 16.15 °Brix followed by T_5, T_6, T_9, T_{21}, T_{18} T_{20}, T_8, T_{11}, T_{15}, T_{12} and T_{10} treatments. Whereas, it was statistically noted minimum under recommended dose of FYM and NPK applied through chemical fertilizers treatment (Control) with the value of 15.26 °Brix. An increase in TSS with application of FYM and neem cake along with biofertilizers and biopesticides might be attributed due to balance fertilization improved better root development which promotes absorption of the nutrients and helps in the quick metabolic transformation of starch and pectin into soluble compounds. These results are in accordance with the findings of Sharma (2015) in mango, Babhulkar *et al.* (2017) in Nagpur Mandarin, Vanilarasu and Balakrishnamurthy (2014) and Sangeeta *et al*. (2017) in banana and Meena*et al*. (2018) in pomegranate.

The data presented in Table 4showed that application of 37.5 % RDN through FYM + 37.5 % RDN through neem cake + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment statistically showed the lowest titrableacidity (0.41 %) which was followed by T_{21} treatment. Whereas, the highest acidity (0.46 %) was statistically found with treatment 50 % RDN through FYM + 50 % RDN through vermicompost + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus*. The lowest acidity in pomegranate fruits may be the fact that treatment application improves the soil condition and performed regulatory role on absorption of nutrients, translocation of carbohydrates into sugars and their derivatives by the reaction involving reversal of glycolytic pathway. These results are in accordance with findings of Sharma (2015) in mango,Kundu *et al*. (2015) in ber, Babhulkar *et al.* (2017) in Nagpur Mandarin and Meena *et al*. (2018) in pomegranate.

Significantly maximum ascorbic acid content was recorded in 100 % RDN through FYM + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride*+5 ml *Paecilomyces lilacinus* treatment with the value of 16.72 mg/100 ml juice which was statistically at par with T_{13}, T_{19}, T_9 and T_6 treatments (Table 4). Whereas, minimum ascorbic acid content (14.35 mg/100 ml juice) was recorded in recommended dose of FYM and NPK applied through chemical fertilizers treatment (Control). The increase in ascorbic acid content might be due to the fact that application of FYM along with PSB improves plant conditions, increases photosynthetic activity by efficient functioning of leaf area and increases efficiency of microbial inoculants for increasing availability of phosphorus and secretion of growth promoting substances which accelerate the physiological process like carbohydrate synthesis, *etc*. These results are in accordance with the findings of Dey *et al*. (2005), Maity *et al*. (2006) in guava, Garhwal *et al.* (2014) in kinnow mandarin and Kundu *et al*. (2015) in ber.

It is clear from the Table 4 that treatment 37.5 % RDN through FYM + 37.5 % RDN through neem cake + 50 ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus s*produced fruits with significantly maximum values of reducing sugar (14.44 %), non-reducing sugar (2.04 %) and total sugar (16.48 %). The treatment $T_{19}$was at par with T_9, T_{21} and T_{11} treatments in term of reducing sugar, with T_{21}, T_{13}, T_{14}, T_{11}, T_9 and T_{12} treatments in case of non-reducing sugar and with T_{21}, T_9 and T_{11} treatments with respect to total sugar. Whereas, minimum reducing sugar and total sugar were observed in recommended dose of FYM and NPK applied through chemical fertilizers treatment (Control) with the values of 12.63 % and 14.49 %, respectively. Minimum non-reducing sugar (1.79 %) was recorded under treatment 50 % RDN through FYM + 50 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus.* Application of different organic manures and biofertilizers along with biopesticides increased sugar contents *i.e.*, reducing, non-reducing and total sugars. These could be associated with biosynthesis enhancement and translocation of carbohydrate into fruits. Besides, availability of nutrients from different organic sources might have enhanced vegetative growth with higher synthesis of assimilates. Such effects have been associated with increasing rate of translocation of photosynthetic products from leaves to developing fruits. These findings are in concordance with the results of Vanilarasu and Balakrishnamurthy (2014) and Sangeeta *et al*. (2017) in banana, Meena *et al*. (2018) in pomegranate and Dey *et al.* (2005) in guava. From the forgoing discussion, it could be concluded on the basis of pooled data that the application of 100 % RDN through poultry manure + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* was significantly found beneficial for obtaining higher yield with enhanced fruit physical parameters. Whereas, total soluble solids, reducing sugar, non-reducing sugar and total sugar were significantly noted under treatment 37.5 % RDN through FYM + 37.5 % RDN through neem cake + 50ml *Azotobacter* culture + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* along with the lowest titrable acidity. Significantly ascorbic acid was recorded in 100 % RDN through FYM + 50 ml PSB + 25 ml KMB + 5 g *Trichoderma viride* + 5 ml *Paecilomyces lilacinus* treatment.

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Table 3: Influence of different organic sources of nutrients on yield, yield attributes and Physical parameters of pomegranate cv. Bhagwa (2 years pooled data)

Treatment	Number of fruits per plant	Yield per plant (kg)	Yield per hectare (t)	Fruit weight (g)	Fruit diameter (cm)	Aril weight per fruit (g)	Juice content per fruit (ml)	Peel weight per fruit (g)	Peel: aril ratio
T_1	45.83	8.67	13.86	224.92	7.06	134.51	87.93	90.41	0.67
T_2	48.17	9.25	14.80	228.55	7.20	137.47	89.73	91.09	0.66
T_3	42.00	7.05	11.27	200.13	6.27	119.32	77.68	80.81	0.68
T_4	51.67	9.92	15.87	224.65	7.07	134.66	88.13	89.99	0.67
T_5	59.50	12.41	19.86	239.39	7.55	147.70	97.55	91.69	0.62
T_6	54.00	10.82	17.31	233.51	7.36	142.20	93.16	91.31	0.64
T_7	43.83	7.72	12.36	218.27	6.86	132.34	84.84	85.93	0.65
T_8	45.50	7.82	12.51	206.83	6.47	126.72	81.34	80.11	0.63
T_9	50.50	9.67	15.48	227.70	7.17	136.98	89.55	90.72	0.67
T_{10}	52.50	9.84	15.75	219.33	6.89	134.31	86.71	85.02	0.64
T_{11}	48.50	9.28	14.85	223.63	7.04	134.64	88.24	88.99	0.66
T_{12}	52.17	9.70	15.52	219.82	6.91	134.49	85.72	85.34	0.64

T_{13}	38.50	6.61	10.58	206.61	6.48	124.26	80.44	82.35	0.67
T_{14}	45.17	8.19	13.10	215.46	6.77	125.76	81.92	89.70	0.71
T_{15}	46.17	8.46	13.54	216.18	6.79	126.46	82.47	89.72	0.71
T_{16}	44.50	8.18	13.09	218.32	6.86	128.88	83.26	89.44	0.70
T_{17}	42.17	7.60	12.15	217.62	6.83	129.24	83.00	88.38	0.69
T_{18}	42.33	7.78	12.45	220.53	6.93	130.37	83.59	90.16	0.69
T_{19}	50.17	9.73	15.57	229.18	7.22	138.00	90.08	91.19	0.66
T_{20}	44.67	8.21	13.14	218.61	6.88	130.17	84.08	88.44	0.68
T_{21}	48.50	9.31	14.89	224.50	7.09	133.87	87.97	90.63	0.68
T_{22}	44.00	8.08	12.92	218.64	6.87	128.77	82.12	89.87	0.70
S.Em. ±	2.13	0.44	0.71	4.08	0.13	2.93	2.14	1.61	0.01
C.D. at 5%	5.96	1.24	1.99	11.45	0.37	8.21	6.00	4.53	0.04
C.V. %	12.04	13.18	13.18	5.06	5.24	6.05	6.81	5.00	5.31

Table 4: Influence of different organic sources of nutrients on chemical parameters of pomegranate cv. Bhagwa (2 years pooled data)

Treatment	TSS (°Brix)	Titrable acidity (%)	Ascorbic acid (mg/100 ml juice)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)
T_1	15.26	0.45	14.35	12.63	1.86	14.49
T_2	15.31	0.44	14.44	12.69	1.85	14.54
T_3	15.36	0.44	16.72	13.32	1.92	15.24
T_4	15.55	0.45	15.12	13.07	1.87	14.94
T_5	16.03	0.44	15.93	12.93	1.88	14.80
T_6	16.00	0.44	16.13	13.06	1.93	15.00
T_7	15.57	0.46	15.13	12.89	1.83	14.72
T_8	15.76	0.45	15.35	12.78	1.79	14.57
T_9	15.99	0.44	16.18	14.16	1.95	16.10
T_{10}	15.68	0.45	15.29	12.81	1.80	14.61
T_{11}	15.74	0.44	15.41	14.09	1.96	16.04
T_{12}	15.71	0.45	15.27	13.21	1.95	15.16
T_{13}	15.37	0.44	16.32	13.56	1.98	15.54

T_{14}	15.60	0.45	14.88	13.47	1.97	15.43
T_{15}	15.74	0.45	14.69	12.93	1.82	14.75
T_{16}	15.64	0.44	15.29	13.35	1.85	15.19
T_{17}	15.51	0.45	15.01	13.38	1.84	15.22
T_{18}	15.81	0.44	15.16	13.37	1.81	15.17
T_{19}	16.15	0.41	16.24	14.44	2.04	16.48
T_{20}	15.78	0.44	15.28	13.19	1.93	15.12
T_{21}	15.98	0.42	15.46	14.15	2.00	16.15
T_{22}	15.64	0.44	15.31	13.17	1.93	15.10
S.Em. ±	0.17	0.01	0.27	0.22	0.03	0.24
C.D. at 5%	0.49	0.02	0.75	0.62	0.09	0.67
C.V. %	3.02	4.62	4.73	4.53	4.52	4.34