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Effect of Integrated Nutrient Management on the Fruit Quality Parameters and Yield of Peach (*Prunus persica* Batsch) cv. Shan-i-Punjab

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The present investigation entitled “Effect of Integrated Nutrient Management on the fruit quality parameters and yield of peach (*Prunus persica* Batsch) cv. Shan-i-Punjab” was conducted in the Department of Horticulture, Khalsa College, Amritsar during 2019-20. The investigation was laid out in Randomized Block Design (RBD) with six treatments which replicated thrice. The treatments were comprised of T₁ (100% N through RDF), T₂ (75% of N through RDF + 25% of N through vermicompost), T₃ (50% of N through RDF + 50% of N through vermicompost), T₄ (25% of N through RDF + 75% of N through vermicompost), T₅ (100% of N through vermicompost) and T₆ (Control). Among all treatments, trees treated with T₂ (75% of N through RDF + 25% of N through vermicompost) yielded fruits with maximum fruit size (6.38 cm x 6.16 cm), fruit firmness (5.19 Kg/cm²), fruit weight (90.50 g), fruit colour (9.26) and organoleptic rating (8.67), whereas, the fruit bio-chemical characters in terms of TSS (13.51%), total sugars (9.13%), reducing sugars (6.30%) were recorded under treatment T₂ (75% of N through RDF + 25% of N through vermicompost). The treatment T₂ advanced the maturity of fruits and also registered max fruit yield (75.82 Kg/ tree). Thus it can be concluded that T₂ (75% of N through RDF + 25% of N through vermicompost) was more effective than rest of treatments.

Introduction

Peach (*Prunus persica* L. Batsch) is an important stone fruit, belongs to the family Rosaceae, sub family Prunoideae and order Rosales. It is an economically potential fruit grown on commercial basis in the temperate and sub tropical regions of the world (Faust and Timon, 1995). The major peach producing countries are China, USA, Italy, Spain, Turkey, Argentina, Brazil, Mexico,

and Japan etc. The highest production of peach is confined to Italy, followed by USA and Spain. At present in India the peach cultivation is limited to Kashmir, Himachal Pradesh, Tamil Nadu, Madras, Punjab and Uttar Pradesh, with an annual production of 106 thousand MT from an estimated area of 18 thousand hectares (Anon 2016-17). Peach is a very delicious juicy fruit with high nutritive value being rich in proteins, sugars, minerals and vitamins. The protein present in

the fruit comprises of all essential amino acids. It is very low in saturated fats, cholesterol and sodium, however it is enriched with well anti-oxidants, dietary fibres, niacin and potassium. Peach starts bearing fruits after two years as compared to other fruit crops, which take a long time to bear fruiting on commercial level. It bears heavy crop every year and gives handsome economic returns with very little inputs (Dhillon 2013). Now-a-days per acre production of peach is decreasing due to improper and imbalanced nutrition. The orchardists apply chemical fertilizers to overcome this problem, but these are very expensive and most of farmers cannot afford them (Ahmad 2000).

On fertile soil, Nitrogen is often the only nutrient that needs to be supplied to peach trees on a regular basis (Chatzitheodorou *et al.*, 2004). The organic manures, when applied to soil increases the fertility status of soil and favorably influence the crop yield for several years. It has been reported that farm yard manure, vermicompost and poultry manure have increased growth, yield and quality in different crops (Ingle *et al.*, 2003).

The occurrence of multi-nutrient deficiencies and overall decline in productive capacity of soil has been widely reported due to non-judicious use of fertilizers (Chhonkar 2008). Nitrogen is a component of chlorophyll which is essential for photosynthesis (Malavolta *et al.*, 1989). It is the basic element of plant and animal protein, including the genetic material (DNA and RNA) and also considered to be important during the period of rapid growth by controlling various cellular activities. Plants use nitrogen by absorbing either in nitrate or ammonium form through their roots. It plays especially an important role in the structure of the roots. When the roots have adequate nitrogen, they perform more efficiently (Khan *et al.*, 1983), which allows

the plant to draw more water and other nutrients, and produce more growth. The basic goal of integrated plant nutrient system is the maintenance of soil fertility to an optimum level for sustaining the desired crop productivity by optimizing the benefits from all the sources of plant nutrients (Shah *et al.*, 2014).

The extensive use of chemical fertilizers adversely affects the soil health and results in decreased crop productivity and quality (Lata *et al.*, 2013). Hence incorporation of organic fertilizers is an important practice to improve the yield of many fruit crops. The organic fertilizers also limit the chemical intervention and finally minimize the negative impact on the wider environment (Singh *et al.*, 2012).

Materials and Methods

The present investigation entitled “Effect of Integrated Nutrient Management on the fruit quality parameters and yield of peach (*Prunus persica* L. Batsch) cv. Shan-i-Punjab” was conducted in the Department of Horticulture, Khalsa College, Amritsar during 2019-2020. The field is located at Peach orchard of Khalsa College, Amritsar and falls at 31-38°N latitude and 75-52°E longitude with an elevation of 744 feet above the sea level. A total number of 18 trees were selected for the experiment and uniform cultural practices, were followed during the study.

The investigation was laid out in Randomized Block Design (RBD) with six treatments which replicated thrice. The treatments were comprised of T₁ (100% N through RDF), T₂ (75% of N through RDF + 25% of N through vermicompost), T₃ (50% of N through RDF + 50% of N through vermicompost), T₄ (25% of N through RDF + 75% of N through vermicompost), T₅ (100% of N through vermicompost) and T₆ (Control) (Table 1-3).

Results and Discussion

Fruit physical parameters

Apparent maturity (days)

From the data 1 it has been observed that peach trees fertilized with 75% of N through RDF + 25% of N through vermicompost (T_2) took minimum days (68.00 days) for maturation of fruits.

Also the above treatment was found to be followed by the treatment T_1 (100 % N through RDF) with 69.67 days. Whereas, the trees under control took maximum days i.e. 77.00 days for maturation. The present results are in line with the findings of Kaur and Kaur (2017) in guava.

Fruit size (cm)

Maximum fruit length (6.38 cm) was recorded in the fruits obtained from the trees treated with treatment T_2 (75% N through RDF + 25% N through vermicompost). However minimum fruit length (4.89 cm) was recorded under control, which was found to be significantly inferior to all other treatments. The trees treated with the treatment T_2 (75 % N through RDF + 25 % N through vermicompost) yielded the fruits with maximum fruit breadth i.e. 6.16 cm. Whereas minimum fruit breadth (4.50 cm) was recorded under the control.

Significant increment in fruit size with the application of RDF and vermicompost might be due to the high availability of nutrients due to better solute uptake from rhizosphere, which increased the accumulation of dry matter and translocation as well as favour the synthesis of different growth regulators (Sharma *et al.*, 2016). The present results are in accordance with Sahu *et al.*, (2017) in guava and Patil and Naik (2010) in sapota.

Fruit firmness (Kg/cm²)

From the data, it has been found that the fruit yielded from peach trees supplied with T_2 (75% N through RDF + 25% N through vermicompost) attained minimum fruit firmness i.e. 4.98 Kg/cm². The reduction of fruit firmness with the use of fertilizers and manures might be due to intensive solubilization of pectins from cell wall to starch breakdown and reduction of turgor (Tucker, 1993). The present results are in line with the findings of Kaur and Kaur (2017) in guava and Kumar *et al.*, (2017) in apple cv. Oregon Spur-II. However, the highly firmed fruits were found under control with fruit firmness of 6.21 Kg/cm².

Fruit weight (g)

The maximum fruit weight (90.50 g) was registered in fruits harvested from the trees treated with T_2 (75% N through RDF + 25% through vermicompost). The increase in average fruit weight by the integrated use of organic sources of nutrients might be due to the accelerated mobility of photosynthates from source to sink (Sharma *et al.*, 2013).

However the trees under control yielded fruits with minimum weight (69.14 g). The results obtained from the present study also get support from the findings of Baviskar *et al.*, (2011), Sharma *et al.*, (2016) and Verma *et al.*, (2017).

Fruit colour

The fruits obtained from the trees treated with T_2 (75 % N through RDF + 25 % N through vermicompost) attained excellent colour with scoring of 9.26. Whereas the fruit harvested from unfertilized trees (T_6) exhibited least colour development. Results were found by Kaur and Kaur (2017) on guava.

Table.1 Effect of Integrated Nutrient Management on fruit physical parameters of peach (*Prunus persica* Batsch) cv. Shan-i-Punjab

Treatments	Apparent maturity (Days)	Fruit size		Fruit firmness (Kg/cm ²)	Fruit weight (g)	Fruit color	Organoleptic rating
		Length (cm)	Breadth (cm)				
T ₁ (RDF 100% NPK)	69.67	5.98	5.59	5.19	89.65	9.03 (Yellow with red blush)	8.33
T ₂ (75% of N through RDF + 25% of N through vermicompost)	68.00	6.38	6.16	4.98	90.50	9.26 (Yellow with red blush)	8.67
T ₃ (50% of N through RDF + 50% of N through vermicompost)	71.30	5.95	6.01	5.46	87.72	8.38 (Yellow)	7.67
T ₄ (25% of N through RDF + 75% of N through vermicompost)	73.00	5.60	5.50	5.42	84.54	7.49 (Light yellow)	7.33
T ₅ (0% of N through RDF + 100% of N through vermicompost)	73.67	5.35	5.30	5.92	79.58	7.66 (Light yellow)	7.10
T ₆ (Control)	77.00	4.89	4.50	6.21	69.14	7.35 (Light yellow)	6.33
Mean	72.11	5.69	5.51	5.53	83.52	8.19	7.57
CD (p=0.05)	0.79	0.77	0.60	0.62	0.84	0.14	1.05

Table.2 Effect of Integrated Nutrient Management on fruit bio-chemical parameters of Peach (*Prunus persica* Batsch) cv. Shan-i-Punjab

Treatments	TSS (%)	Titratable acidity (%)	TSS:acid ratio	Total sugars (%)	Reducing sugars (%)	Non reducing sugars (%)
T₁ (RDF 100% NPK)	12.83	0.88	14.54	8.89	5.96	2.92
T₂ (75% of N through RDF+ 25% of N through vermicompost)	13.51	0.81	16.63	9.13	6.30	2.85
T₃ (50% of N through RDF + 50% of N through vermicompost)	12.41	0.89	13.91	8.37	5.31	3.06
T₄ (25% of N through RDF + 75% of N through vermicompost)	12.03	0.97	12.38	7.91	5.08	2.83
T₅ (0% of N through RDF + 100% of N through vermicompost)	11.89	0.98	12.13	7.57	4.99	2.58
T₆ (Control)	10.59	1.17	9.07	6.89	4.50	2.39
Mean	12.21	0.95	13.11	8.13	5.36	2.77
CD (p=0.05)	1.13	0.04	1.61	1.27	0.800	NS

Table.3 Effect of Integrated Nutrient Management on yield characters of peach (*Prunus persica* Batsch) cv. Shan-i-Punjab

Treatments	Fruit yield (Kg/ tree)
T₁ (RDF 100% NPK)	72.71
T₂ (75% of N through RDF+ 25% of N through vermicompost)	75.82
T₃ (50% of N through RDF + 50% of N through vermicompost)	69.88
T₄ (25% of N through RDF + 75% of N through vermicompost)	66.82
T₅ (0% of N through RDF + 100% of N through vermicompost)	62.05
T₆ (Control)	59.13
Mean	67.74
CD (p=0.05)	2.72

Organoleptic rating

The maximum organoleptic points (8.67) were awarded to the fruits obtained from plants supplied with 75% N through RDF + 25% N through vermicompost (T_2). The increased palatability of peach fruits with the application of combined sources of fertilizers (organic and inorganic fertilizers) might be due to the fact that the vegetative parameters of peach trees improved significantly with the fertilization, which in turn accelerates the photosynthetic rate and better translocation of metabolites to the fruits, that leads to significant acceptability of fruits (Naik and Haribabu, 2007). The present findings are in line with the results obtained by Kaur and Kaur (2017) in guava. While least organoleptic rating (6.33) was observed under control.

Fruit bio-chemical parameters

Total soluble solids (%)

Maximum TSS i.e. 13.51 per cent was observed in fruits obtained from the trees treated with T_2 (75% N through RDF + 25% N through vermicompost) which was followed by the treatments T_1 (100% N through RDF) and T_3 (50% N through RDF + 50% N through vermicompost) with TSS content of 12.83 and 12.41 per cent respectively. Nitrogen stimulates the functioning of various enzymes, which might have improved the total soluble solid content of fruits (Sharma *et al.*, 2013).

Minimum TSS content (10.59 %) was noticed under the control. The results obtained from the present study are in conformation with the findings of Singh *et al.*, (2008) on strawberry, Singh *et al.*, (2010) on apricot, Nasreen *et al.*, (2014) on mango, Bavisker *et al.*, (2011) in sapota and Narayan *et al.*, (2015) in peach.

Titratable acidity (%)

The fruits harvested from trees treated with the treatment T_2 (75 % N through RDF + 25 % N through vermicompost) contained minimum acidic content i.e. 0.81 per cent. However, the maximum titratable acidity i.e. 0.98 per cent was found in control (T_6), NPK fertilization might helps in the uptake of other nutrients which helps in improving the fruit quality significantly (Sharma *et al.*, 2014). The results of the present study are in accordance with the earlier findings of Ram *et al.*, (2017) in guava, Dutta *et al.*, (2009) in guava and Narayan *et al.*, (2016) in peach.

TSS: acid ratio

Significantly higher TSS: acid ratio (16.63) was found in fruits harvested from the trees treated with T_2 (75% N from RDF + 25% N from vermicompost). This may pertain to the fact that the application of fertilizers increased the TSS level of fruits and decreased the acidic content; thereby TSS: acid ratio has increased. Whereas the minimum TSS: acid ratio (9.07) was observed under the control treatment. Results of these findings are also confirmed by Sharma *et al.*, (2013) on guava, Sharma *et al.*, (2016) in mango and Kaur and Kaur (2017) in guava.

Sugars (%)

Maximum total sugars (9.13%) were found in fruits harvested from the trees treated with T_2 (75% N through RDF + 25% N through vermicompost). Minimum total sugars (6.89 %) were recorded under control. Highest percentage of reducing sugars (6.30%) were recorded in the fruits yielded from trees fertilized with treatment T_2 (75% N through RDF + 5 0% N through vermicompost) Whereas minimum reducing sugars i.e. 4.50 per cent were observed in treatment T_6 (Control). The maximum non-reducing sugars

i.e. 2.93 per cent were observed in the fruits obtained from trees applied with treatment T₁ (100 % N through RDF). However minimum non reducing sugars (2.39 %) were noticed under the Control (T₆). The increased of sugar content of fruits by the use of NPK fertilizers along with vermicompost might be due to the enhancement in uptake of nutrients that leads to increased catalytic activities by which the complex substances (starch) degrade into simple sugars and thereby improves the fruit quality (Kaur *et al.*, 2016). The present results are in accordance with the earlier finding of Dutta *et al.*, (2009), Shukla *et al.*, (2009), Benipal *et al.*, (2013), Kaur and Kaur (2017) in guava.

Fruit yield (Kg/tree)

The data revealed that the peach trees treated with treatment T₂ (75 % N through RDF + 25 % N through vermicompost) gave the significant fruit yield i.e. 75.82 Kg per tree. The maximum yield in the combined application of organic and inorganic fertilizers is a result of the interaction between them, which helped in increasing the soil nutrient availability and their uptake by plants that resulted in better vegetative growth, which have produced the higher quantum of carbohydrates needed for the development of the fruits thereby, increasing the number, size and weight of fruits which ultimately leads towards getting higher yield (Sahu *et al.*, 2014). These observations are also in agreement with the findings of Yadav *et al.*, (2013) in peach, Mohit *et al.*, (2017) in apricot. While the minimum fruit yield (59.13 Kg/ tree) was noticed in peach trees under the control.

It is concluded from the present study that the fruit quality and yield characters of peach cv. Shan-i-Punjab has improved significantly with the integrated nutrient management. The trees fertilized with 75 % N through RDF +

25 % N through vermicompost (T₂) took minimum days for maturation and also had maximum fruit yield. Also the trees under treatment (T₂) yielded fruits with significant size and weight with excellent colour. Moreover the fruit bio-chemical characters in terms of sugars, TSS, TSS: acid ratio also enhanced significantly under treatment (T₂), with minimum titratable acidity, than all the other treatments.

Hence, the treatment T₂ (75 % N through RDF + 25 % N through vermicompost) considered to be best for enhancing yield and fruit quality of peach fruits cv. Shan-i-Punjab.

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