



Variability of Peach Cultivars for Growth, Yield and Fruit Quality Traits

Akriti Chauhan, Krishan Kumar, D.S. Thakur and R.K. Dogra

*Department of Fruit Science, College of Horticulture
Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan-173 230, India
E-mail : chauhanakriti7@gmail.com*

Abstract: The aim of this study was assessment of variability among fifteen peach cultivars. The evaluation was carried out at Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during 2014-2016 and several morphological and biochemical characters were recorded. Tree height ranged between 1.28 m (Suncrest) and 3.78 m (Shan-i-Punjab). Trunk girth was maximum in Flordaprince and minimum in Saharanpur Prabhat. Tree yield per plant varied from 4.50 kg (Early Redhaven) to 10.83 kg (Saharanpur Prabhat) and yield efficiency from 0.18% (Early Redhaven) to 0.54% (Pratap), respectively. Paradelux recorded maximum inter-nodal length whereas, July Elberta recorded minimum. Fruit length was maximum in Early Redhaven (53.69 mm) and minimum (37.37 mm) in Saharanpur Prabhat, whereas, fruit breadth was maximum (54.38 mm) in Flordaprince and minimum (42.62 mm) in July Elberta. The TSS content in fruits ranged between 8.65°B to 13.02°B. The variability observed in these genotypes excelling in one or more horticulturally desirable characters can further be utilized for the genetic improvement of peach genotypes.

Keywords: Peach, peach genotypes, fruit quality

Peach is an important fruit crop of temperate region all over the world. The peach cultivars are divided into three groups namely, Northern, Southern and European or Persian group according to their geographical distribution. Furthermore they can also be divided on the basis of their chilling requirements as high chilling and low chilling. The chilling requirement of most of the peach cultivars lies between 500 to 1000 hours below 7.2° C to foliate and bloom, however cultivars with less than 100 hours of chilling requirement are known (Joshi et al 2017). Low chilling peach cultivars were developed in Florida during last three to four decades and have become very popular in the sub-mountainous Himalayan region. In India, Peach is generally grown over an area of 18,000 hectares with a production of 1,23,000 MT (Anonymous 2019). Low-chilling cultivars viz. Flordasum, Flordared, Shan-e-Punjab, Sharbati and Sunred (nectarine) have become popular in subtropical belts of U.P. and Punjab States. Most of the peach cultivars are exotic introduction acquiring local name or synonyms at different agroclimatic conditions. Over the year, a large number of cultivar have been evolved through breeding in many countries to take best advantage of its diverse climatic adaptability and to make available the fresh fruits over a longer season. However, in recent times, peach production has a declining trend mingled with a number of factors such as diseases, overdependence on a selective cultivars and global warming (Jana 2015). Keeping in view above factors,

variability in different tree growth, yield and fruit parameters were recorded to determine the possessed qualities that are desirable to consumers and growers with context to fruit quality characteristics and yield for commercial cultivation.

MATERIAL AND METHODS

In the present experiment, 6-7 years old bearing trees of fifteen peach accessions were evaluated in a randomized block design with three replications during 2014-2016 (Table 1). The data on tree growth, yield, foliage, floral and fruit quality parameters were recorded. Tree height was measured with the help of calibrated staff from ground level to the tip of tallest branch of the tree and it was expressed in meters (m). The spread of the tree was measured by calibrated staff in two directions i.e. North-South (N-S) and East-West (E-W) and expressed in meters (m). Thirty leaves from the middle portion of the current growth were selected during the last week of July for recording leaf characters. Leaf length was measured by a scale from tip of the apex to the base, whereas width of the leaf was measured with a scale at its broadest expand. The data on inter-nodal length was recorded at the end of growing season from the middle third of shoot and expressed in cm. Yield efficiency was calculated by the method suggested by Westwood (1993) as under:

$$\text{Yield efficiency (kg/cm}^2\text{)} = \frac{\text{Yield (kg)}}{\text{Tree Trunk cross-sectional area}}$$

To study physico-chemical fruit parameters, 15 fruit samples were taken randomly in three replicates from all directions at optimum maturity. Fruit length, diameter, depth of stalk cavity and width of stalk cavity were measured. Fruit firmness was determined with the help of effigi penetrometer using 7/16" plunger in kg/cm². Erma hand refractometer (0–32° Brix) was used to work out total soluble solids content in fruits. Titratable acidity was determined with the standard alkali solution and expressed in terms of malic acid (%).

RESULTS AND DISCUSSION

Tree growth and yield parameters: Tree height in peaches ranged between 1.28 m in Suncrest and 3.78 m in Shan-i-Punjab with mean tree height of 2.58 m (Table 1) suggesting considerable variation and genotypic diversity in vigour of the tree. Such variation in growth characters has also been reported by Singh et al (2005) and Yepthomi (2011). Maximum (21.95 cm) trunk girth was in Flordaprince and minimum (12.80 cm) in Saharanpur Prabhat. All the peach accessions were statistically different from each other in respect of trunk girth. Maximum tree spread in North-South (N-S) direction was 1.26 m in Vallegrande and corresponding minimum was 0.90 m in Earligrande. Maximum tree spread in East-West (E-W) direction was 1.43 m in Vallegrande whereas minimum was 0.91m in Flordaglo. Tree yield per plant was maximum (10.83 kg) in Saharanpur Prabhat which was statistically at par with Tropic Beauty and minimum (4.50

kg) in Early Redhaven. Maximum (0.54%) yield efficiency was in Pratap and minimum (0.18%) in Early Redhaven (Table 1). The comparatively low yield efficiency can be attributed to young age of the plants under study.

Foliage parameters: Length of the stipule was maximum (1.25 cm) in July Elberta whereas, minimum (0.98 cm) in Earligrande. Statistical difference was found among all accessions for leaf length with value ranging between 13.8 cm (Glohaven) and 17.1 cm (TropicSweet and TropicBeauty). Leaf width was maximum (4.59 cm) in TropicSweet whereas minimum (2.32 cm) in Saharanpur Prabhat. Variation in width of peach leaves has been reported earlier also by Wolfe and Strang (2010). The length of the petiole was maximum in TropicBeauty (1.12 cm) and minimum in Earligrande (0.65 cm). Similarly, these characters are used by Bodh et al (2019) in order to distinguish between related varieties of the peach.

Floral parameters: The flowering shoot thickness was maximum (4.96 m) in TropicSweet and minimum (2.93 cm) in Suncrest (Table 3). Variation in inter-nodal length ranged from 2.39 cm (July Elberta) to 3.88 cm (Paradelux) and is in accordance, by and large with PPVFRA guidelines (Anonymous 2015). Similar variation in inter-nodal length has been observed in the past by Devi et al (2018). However, Pandey et al (2019) reported inter-nodal length to vary from 1.87 cm to 2.40 cm. Inter-nodal length of shoots is considered as a good indicator of darkness/compactness in a genotype.

Table 1. Variation in tree growth and yield parameters of peach accessions

Accessions	Tree height (m)	Tree spread (m)		Trunk girth (cm)	Tree yield (kg plant ⁻¹)	Yield efficiency (%)
		N-S	E-W			
Earligrande	2.36	0.90	1.13	20.67	9.17	0.45
Early Redhaven	2.67	1.11	1.00	16.00	4.50	0.18
Flordaglo	2.70	1.09	0.91	16.43	8.50	0.40
Flordaprince	2.25	1.07	1.21	21.95	8.67	0.22
Glohaven	3.21	0.95	1.22	16.27	6.33	0.30
July Elberta	2.90	1.17	1.05	18.70	8.03	0.29
Paradelux	2.60	0.98	1.30	16.47	5.83	0.42
Pratap	2.40	1.24	0.99	17.60	9.33	0.54
Suncrest	1.28	1.06	1.16	17.80	7.67	0.38
Saharanpur Prabhat	2.42	1.09	0.92	12.80	10.83	0.32
Shan-i-Punjab	3.78	1.01	1.17	14.70	7.20	0.29
TropicBeauty	2.21	0.97	1.17	18.60	10.50	0.38
TropicSnow	2.81	0.92	1.05	18.33	8.23	0.31
TropicSweet	2.70	1.21	1.04	18.93	7.65	0.27
Vallegrande	2.20	1.26	1.43	19.67	8.50	0.28
Mean	2.58	1.08	1.13	17.2	8.06	0.33
CD (p=0.05)	0.19	0.15	0.18	0.95	0.73	0.03

The width of petal was highest (1.51 cm) in Earligrande and lowest (1.03 cm) in Suncrest. All the accessions were statistically different from each other.

Biochemical parameters: In general, the domestic market has a likeness toward peach fruits which are large in size, sweet in taste, less acidic, juicy and flesh is easily separable from the stone. Several workers have worked on the physical

aspects of peach fruits (Cantin et al 2010, Forcada et al 2014) in the past and have reported considerable variation in fruits of different peach cultivars. Length of the fruit was maximum (53.69 mm) in Early Redhaven and minimum (37.37 mm) in Saharanpur Prabhat, whereas, fruit breadth was maximum (54.38 mm) in Flordaprince and minimum (42.62 mm) in July Elberta (Table 4). These results are in accordance with the

Table 2. Variation in foliage parameters of peach accessions

Accessions	Stipule length (cm)	Leaf blade length (cm)	Leaf blade width (cm)	Leaf blade length/width ratio	Petiole length (cm)
Earligrande	0.98	14.3	2.89	3.98	0.65
Early Redhaven	1.15	15.1	2.81	3.90	0.93
Flordaglo	1.15	14.3	3.27	3.95	1.09
Flordaprince	0.99	14.1	3.12	3.89	0.98
Glohaven	1.01	13.8	3.68	4.15	1.01
July Elberta	1.25	15.2	2.67	3.89	1.12
Paradelux	1.03	14.6	3.08	3.80	1.04
Pratap	1.12	14.2	3.65	4.21	0.97
Suncrest	1.02	14.4	2.74	3.91	0.72
Saharanpur Prabhat	1.13	15.6	2.32	4.18	0.83
Shan-i-Punjab	1.02	16.1	2.38	4.14	0.95
TropicBeauty	1.18	17.1	4.03	3.99	1.12
TropicSnow	0.99	14.1	3.88	4.23	1.03
TropicSweet	1.03	17.1	4.59	3.74	1.07
Vallegrande	1.04	15.3	2.69	3.86	1.03
CD (p=0.05)	0.03	0.80	0.11	0.18	0.10

Table 3. Variation in floral parameters of peach accessions

Accessions	Flowering shoot thickness (cm)	Length of the inter-nodes (cm)	Petal width (cm)	Number of petals
Earligrande	4.49	3.42	1.51	5
Early Redhaven	4.67	3.35	1.25	5
Flordaglo	4.74	2.58	1.48	5
Flordaprince	4.66	3.36	1.37	5
Glohaven	4.74	3.50	1.23	5
July Elberta	4.85	2.39	1.20	5
Paradelux	4.33	3.88	1.39	5
Pratap	4.68	3.39	1.09	5
Suncrest	2.93	3.52	1.03	5
Saharanpur Prabhat	4.68	3.09	1.21	5
Shan-i-Punjab	4.69	3.51	1.34	5
TropicBeauty	4.58	3.28	1.16	5
Tropic Snow	4.53	2.48	1.36	5
Tropic Sweet	4.96	2.93	1.28	5
Vallegrande	4.58	3.31	1.29	5
CD (p=0.05)	0.58	0.59	0.08	-

Table 4. Variation in biochemical parameters of peach accessions

Accessions	Fruit length (mm)	Fruit breadth (mm)	Depth of stalk cavity (cm)	Width of stalk cavity (cm)	Titratable acidity (%) as malic acid	Total soluble solids (°B)	Firmness (psi)
Earligrande	39.84	49.30	0.41	0.93	0.64	9.32	13.33
Early Redhaven	53.69	44.09	0.50	1.29	0.59	12.03	13.01
Flordaglo	38.49	49.04	0.21	0.77	0.65	9.99	13.85
Flordaprince	48.61	54.38	0.59	1.57	0.73	10.89	13.47
Glohaven	43.76	50.36	0.55	1.37	0.54	10.77	13.65
July Elberta	42.99	42.62	0.47	1.21	0.55	10.42	13.45
Paradelux	41.90	49.20	0.74	1.43	0.52	10.34	13.29
Pratap	47.25	51.30	0.81	2.01	0.80	8.65	13.19
Suncrest	44.55	47.02	0.48	1.09	0.57	9.94	13.07
Saharanpur Prabhat	37.37	50.26	0.47	1.43	0.48	8.98	13.59
Shan-i-Punjab	48.71	50.25	0.53	1.78	0.56	9.93	13.89
TropicBeauty	47.17	51.27	0.37	1.34	0.49	11.11	13.23
TropicSnow	47.13	50.35	0.56	1.40	0.62	10.21	14.01
TropicSweet	46.39	50.54	0.48	1.04	0.56	13.02	13.41
Vallegrande	44.00	52.50	0.39	1.13	0.71	10.56	13.18
CD (p=0.05)	2.43	1.71	0.05	0.10	0.04	0.41	0.51

study of Devi et al (2012) in which fruit length and breadth of different peaches varied from 43.64 to 58.10 mm and 43.88 to 61.34 mm, respectively. However, Singh et al (2014) reported maximum fruit length (56.18 mm) and breadth (59.30 mm) in 'Flordaglo', whereas, minimum fruit length (36.01 mm) and breadth (40.52 mm) in 'Vallegrande'. Fruit firmness varied between 13.01 psi and 14.01 psi among different peach accessions (Table 4.). This is an important factor taken into consideration where the fruit has to be transported over long distances and local markets are not available. However, Singh et al (2014) reported fruit firmness varied a little between 1.02 kg/cm² and 1.18 kg/cm² in different peach accessions. The TSS content in fruits was found to be ranging between 8.65°B in Pratap to 13.02°B in TropicSweet (Table 4) Singh et al (2014) observed TSS content in TropicSweet was 15.33 °B, whereas Jana (2015) reported 13.8°B TSS in Pratap. The highest acidity (0.80%) was in Pratap and lowest in Saharanpur Prabhat (0.48%). Rouse et al (2006) recorded highest acidity in TropicBeauty followed by UF Gold and lowest in Flordaprince. However, Singh et al (2009) observed highest acidity in Flordaprince followed by Earligrande and least in Saharanpur Prabhat. Such variations may be due to different agro-climatic conditions influencing synthesis of biochemical constituents in the developing fruits and the duration of fruit development period.

CONCLUSION

The large amount of genetic variability was observed

among peach cultivars for different morphological and physico-chemical traits. TropicSweet (High TSS and yield), Saharanpur Prabhat (thick flowering shoot, large sized fruit and firm), Flordaprince (High yield, trunk girth, large and firm fruits). These variations can further be utilized in future breeding and genetic improvement programmes for yield and fruit quality traits.

REFERENCES

- Anonymous 2015. *Guidelines for the conduct of test for distinctiveness, uniformity and stability on peach [Prunus persica (L.) Batsch]*. Protection of Plant varieties and Farmer's Rights Authority, Government of India, New Delhi, pp. 1-10. (www.plantauthority.gov.in/peach/pdf)
- Anonymous 2019. *Horticultural Statistics at a Glance*. Department of Agriculture, Ministry of Agriculture & Farmers Welfare. www.agricoop.nic.in
- Bodh S, Singh D, Dogra RK and Chauhan N 2019. Comparative response of some peach [*Prunus persica* (L.) Batsch.] accessions for tree, foliage and floral traits. *International Journal of Economic Plants* **6**(3): 116-121.
- Cantin CM, Gogorcena Y and Moreno MA 2010. Phenotypic diversity and relationships of fruit quality traits in peach and nectarine [*Prunus persica* (L.) Batsch] breeding progenies. *Euphytica* **171**: 211-26.
- Devi I, Singh H and Thakur A 2018. Morphological characterization and hybridity confirmation of low chill peach (*Prunus persica*) hybrids using SSR markers. *Indian Journal of Agricultural Sciences* **88** (6): 889-94.
- Devi YI, Sharma SD and Roy SS 2012. Variation in physical characters of fruit in F₁ hybrids of peach [*Prunus persica* (L.) Batsch]. *Journal of Crop and Weed* **8**: 34-39.
- Forcada CFI, Gradziel TM, Gogorcena Y and Moreno MA 2014. Phenotypic diversity among local Spanish and foreign peach and nectarine [*Prunus persica* (L.) Batsch] accessions. *Euphytica* **197**: 261-277

- Jana BR 2015. Performance of some low chill peach [*Prunus persica* (L.) Batsch] under eastern plateau regions of India. *International Journal of Current Microbiology and Applied Sciences* **4**: 752-57.
- Joshi M, Kumar K, Chauhan N and Kumari M 2017. Selection and performance of peach [*Prunus persica* (L.) Batsch] cultivars for hybridization in Himachal Pradesh, India. *International Journal of Current Microbiology and Applied Sciences* **6**(12): 3714-3722.
- Pandey S, Thakur A, Singh H and Vikal Y 2019. Intraspecific hybridization of low chill peach cultivars for superior fruit quality and their hybridity confirmation by SSR markers. *Indian Journal of Horticulture* **76**(2): 199-205.
- Rouse RE, Libran MDC, Hernandez E and Cardona L 2006. Low chill peaches adapted to subtropical Florida and tropical Puerto Rico. *Proceedings of the Florida State Horticultural Society* **119**: 25-28.
- Singh DB, Singh D and Sharma RR 2009. Studies on suitability of low chilling peach cultivars for irrigated arid ecosystem. *Asian Journal of Horticulture* **4**(1): 44-46.
- Singh D, Yephthomi G and Kumar K 2014. Performance of some low chill peach [*Prunus persica* (L.) Batsch] germplasm accessions for fruit quality traits in Himachal Pradesh. *International Journal of Farm Science* **4**: 72-80.
- Westwood MN 1993. *Temperate zone pomology, physiology and culture*. 3rd ed, Timber Press, Portland, Ore.
- Wolfe D and Strang J 2010. *Peach cultivar performance*. University of Kentucky, cooperative Extension Service HO-6. <http://www.ca.wky.edu>.
- Yephthomi GI 2011. *Characterization and evaluation of low chilling peach [*Prunus persica* (L.) Batsch.] germplasm*. M.Sc. Thesis. Dr. Y.S. Parmar University of Horticulture and Forestry, Solan.

Received 02 March, 2022; Accepted 22 May, 2022