

Variability in tree characters in F₁ hybrids of peach (*Prunus persica* L.)

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Peach (*Prunus persica* L.) is an important fruit crop valued for its fresh and canned fruits. It is native to China where its culture dates back at least 3000 years. It has wider climatic adaptability and now its cultivation has been successfully extended to various sub-tropical regions of the world. Peach is now commercially grown in USA, Italy, France, England, Australia and China. However, in India, Pakistan, Turkey, Japan, Germany and USSR its cultivation is on a small scale. In India, it is grown in the mid hills zone of Himalayas extending from Jammu and Kashmir to North Eastern States at an altitude of 1000-2000 m above MSL. As per FAO, the area and production of peach in the world was 15, 68,447 hectares and 20,315,245 tonnes; whereas, India produced 2,37,931 tonnes peach from an area of 35,531 hectares in 2009. Most of the peach cultivars have been bred in various countries suitable to their agro-climatic conditions. In India, attempts have also been made and some varieties have been developed through breeding. Authors have already studied variations in physical characters of fruits in F₁ hybrids of peach (Devi *et al.*, 2012). In the present study, the peach breeding programme has been initiated in 1997 in which crosses were made between July Elberta, Alton, J. H. Hale, Saharanpuri, Kanto-5 and Quetta with one local peach cultivar 'Kateroo' with an objective to develop cultivars which are suitable for local agro-climatic conditions, having different maturity period and resistance to insect pests and diseases.

The present studies were carried out during 2006 and 2007. The experimental area is having an altitude of 1220 meters above MSL. Recommended agronomic practices were followed for raising the trees. The tree characters such as tree girth, height, spread and volume were recorded in 76 hybrids of different crosses. The coefficient of variation was calculated to know the extent of variability in each character of each cross. The t-test was applied to test the significance of differences between the means of different crosses. The methods were followed as given by Panse and Sukhatme (1985).

The largest proportions of hybrid seedlings were thin (100%) in trunk girth in the cross Saharanpuri x Wild Peach. The crosses J. H. Hale x Wild Peach and Quetta x Wild Peach produced the

highest proportions (68.97 and 90.91%, respectively) of hybrids with medium trunk girth. The mean of the trunk girth in Kanto-5 x Wild Peach was found maximum (32.50 cm) followed by J. H. Hale x Wild Peach (31.48 cm). The coefficients of variation were between 3.01 to 36.99 in different crosses. The differences between the means of crosses were found significant in four of the 4 cross combinations (Table 1). In terms of height of the tree, the largest proportions of hybrid seedlings were found to have medium height in the cross Quetta x Wild Peach (63.64%). Whereas 50.0 per cent of the progenies were of medium height in other cross combinations except in J. H. Hale x Wild Peach which showed 44.83 per cent hybrid seedlings with medium height. The cross J. H. Hale x Wild Peach produced maximum hybrid seedlings (55.17%) with short height. The tall hybrid seedlings (30.00%) were observed only in Alton x Wild peach. The mean of the cross varied between 2.70 to 2.84m and coefficient of variation between 5.24 to 36.65%. The differences between cross means were non-significant with each other (Table 2). In respect of tree spread, the maximum proportions of hybrid seedlings were of medium spread in all the crosses except in Alton x Wild Peach which did not produce any of the hybrid seedling having medium height. However, in this cross 50 per cent seedlings with wide spread were obtained. The means of the crosses varied between 1.80 and 2.13m and coefficient of variation between 3.54 and 53.05 per cent.

The differences between means of cross July Elberta x Wild Peach and J. H. Hale x Wild Peach was found significant whereas others were non-significant from each other (Table 3). With respect to volume of the tree, the highest proportions of hybrid seedlings were of moderately vigorous in all the crosses. The hybrids with moderate vigour ranged from 50.0 per cent in Alton x Wild Peach to 100.00 per cent in Saharanpuri x Wild Peach. The vigorous hybrids to the tune of 24.13 per cent were obtained from the cross J. H. Hale x Wild Peach. The mean values of the cross ranged between 28.37 and 32.50 m³ and coefficient of variation between 3.01 and 36.99 per cent. The differences between means of different crosses were non-significant from each other (Table 4).

Table 1: Classification of peach hybrids based on trunk girth

Crosses	Number of hybrids	Percentage			Mean of the cross (m)	Coefficient of variation (%)
		Thin (<25cm)	Medium (25-35cm)	Thick (>35cm)		
July Elberta x Kateroo	30	30.0	66.67	3.33	28.37	13.56
Alton x Kateroo	2	50.0	50.00	0.00	28.50	27.29
J. H. Hale x Kateroo	29	6.9	68.97	24.13	31.48	14.40
Kanto-5 x Kateroo	2	50.0	0.00	50.00	32.50	36.99
Saharanpur x Kateroo	2	100.0	0.00	0.00	23.50	3.01
Quetta x Kateroo	11	9.1	90.90	0.00	28.64	14.25
Test of significance						
Mean of pairs						t-value
July Elberta x Wild Peach and Alton x Wild Peach						0.023
July Elberta x Wild Peach and J.H.Hale x Wild Peach						2.867*
July Elberta x Wild Peach and Kanto-5 x Wild Peach						0.484
July Elberta x Wild Peach and Saharanpuri x Wild peach						5.638*
July Elberta x Wild Peach and Quetta x Wild Peach						0.191
Alton x Wild peach and J.H.Hale x Wild Peach						0.535
Alton x Wild Peach and Kanto-5 x Wild Peach						0.395
Alton x Wild Peach and Saharanpuri x Wild Peach						0.905
Alton x Wild Peach and Quetta x Wild Peach						0.025
J.H.Hale x Wild Peach and Kanto-5 x Wild Peach						0.119
J.H.Hale x Wild Peach and Saharanpuri x Wild Peach						8.146*
J.H.Hale x Wild Peach and Quetta x Wild Peach						1.906*
Kanto-5 x Wild Peach and Saharanpuri x Wild Peach						1.057
Kanto-5 x Wild Peach and Quetta x Wild Peach						0.449
Saharanpuri x Wild Peach and Quetta x Wild Peach						3.869

Table 2: Classification of peach hybrids based on height of the tree

Crosses	Number of hybrids	Percentage			Mean of the cross (m)	Coefficient of variation (%)
		Short (<2.70 m)	Medium (2.70-4.40m)	Tall (>4.40)		
July Elberta x Kateroo	30	50.00	50.00	0.00	2.75	17.37
Alton x Kateroo	2	20.00	50.00	30.00	2.70	36.66
J. H. Hale x Kateroo	29	55.17	44.83	0.00	2.79	13.80
Kanto-5 x Kateroo	2	50.00	50.00	0.00	2.80	30.30
Saharanpur x Kateroo	2	50.00	50.00	0.00	2.70	5.24
Quetta x Kateroo	11	63.64	63.64	0.00	2.84	11.18
Test of significance						
Mean of pairs						t-value
July Elberta x Wild Peach and Alton x Wild Peach						0.071
July Elberta x Wild Peach and J.H.Hale x Wild Peach						0.352
July Elberta x Wild Peach and Kanto-5 x Wild Peach						0.082
July Elberta x Wild Peach and Saharanpuri x Wild peach						0.378
July Elberta x Wild Peach and Quetta x Wild Peach						0.690
Alton x Wild peach and J.H.Hale x Wild Peach						0.128
Alton x Wild Peach and Kanto-5 x Wild Peach						0.108
Alton x Wild Peach and Saharanpuri x Wild Peach						0.000
Alton x Wild Peach and Quetta x Wild Peach						0.198
J.H.Hale x Wild Peach and Kanto-5 x Wild Peach						0.017
J.H.Hale x Wild Peach and Saharanpuri x Wild Peach						0.734
J.H.Hale x Wild Peach and Quetta x Wild Peach						0.414
Kanto-5 x Wild Peach and Saharanpuri x Wild Peach						0.164
Kanto-5 x Wild Peach and Quetta x Wild Peach						0.066
Saharanpuri x Wild Peach and Quetta x Wild Peach						0.289

Note: *Significant at 5 per cent

Table 3: Classification of peach hybrids based on spread of the tree

Crosses	Number of hybrids	Percentage			Mean of the cross (m)	Coefficient of variation (%)
		Narrow (>1.5 m)	Medium (1.5-2.5 m)	Wide (>2.5 m)		
July Elberta x Kateroo	30	26.67	73.33	0.00	1.86	20.58
Alton x Kateroo	2	50.00	0.00	50.00	2.00	53.03
J. H. Hale x Kateroo	29	6.90	79.31	13.79	2.13	15.57
Kanto-5 x Kateroo	2	50.00	50.00	0.00	1.80	39.28
Saharanpur x Kateroo	2	100.00	100.00	0.00	2.00	3.54
Quetta x Kateroo	11	18.18	81.82	0.00	1.93	16.74

Test of significance

Mean of pairs	t-value
July Elberta x Wild Peach and Alton x Wild Peach	0.186
July Elberta x Wild Peach and J.H.Hale x Wild Peach	2.917*
July Elberta x Wild Peach and Kanto-5 x Wild Peach	0.118
July Elberta x Wild Peach and Saharanpuri x Wild peach	1.643
July Elberta x Wild Peach and Quetta x Wild Peach	0.589
Alton x Wild peach and J.H.Hale x Wild Peach	0.173
Alton x Wild Peach and Kanto-5 x Wild Peach	0.222
Alton x Wild Peach and Saharanpuri x Wild Peach	0.000
Alton x Wild Peach and Quetta x Wild Peach	0.093
J.H.Hale x Wild Peach and Kanto-5 x Wild Peach	0.652
J.H.Hale x Wild Peach and Saharanpuri x Wild Peach	1.650
J.H.Hale x Wild Peach and Quetta x Wild Peach	1.750
Kanto-5 x Wild Peach and Saharanpuri x Wild Peach	0.396
Kanto-5 x Wild Peach and Quetta x Wild Peach	0.254
Saharanpuri x Wild Peach and Quetta x Wild Peach	0.646

Table 4: Classification of peach hybrids in based on tree volume

Crosses	Number of hybrids	Percentage			Mean of the cross (m ³)	Coefficient of variation (%)
		Weak (<5 m ³)	Moderate (5-15 m ³)	Vigorous (>15m ³)		
July Elberta x Kateroo	30	30.00	66.67	3.33	28.37	13.56
Alton x Kateroo	2	50.00	50.00	0.00	28.50	27.29
J. H. Hale x Kateroo	29	6.90	68.97	24.13	31.48	14.40
Kanto-5 x Kateroo	2	50.00	0.00	50.00	32.50	36.99
Saharanpur x Kateroo	2	100.00	0.00	0.00	23.50	3.01
Quetta x Kateroo	11	9.09	90.91	0.00	28.64	14.25

Test of Significance

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Alton x Wild Peach and Saharanpuri x Wild Peach	0.905
Alton x Wild Peach and Quetta x Wild Peach	0.025
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Note: *Significant at 5 per cent

There was considerable variation in the hybrid seedlings in respect of tree characters in each cross made in the present study, which suggest that different parental combination in these crosses produced variable seedling proportions for trunk girth, height, spread and volume. Most of the parents were found medium in vigour but some seedlings with poor as well as vigorous in growth were also produced in each cross. The cultivar Kanto-5 although was tall in height and wide in spread but none of the hybrid progeny produced to have these characters. This suggests the highly heterozygous nature of the parents used in these studies which led to the transgressive segregation. Similar kind of observations for tree characters have also been reported by Ogasanovic *et al.* (2002), Sherman and Lyrene (2000) and Shao *et al.* (2002).

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