Himachal Journal of Agricultural Research 33 (2):195-200, 2007

Variability in foliage characters of F_1 hybrids of peach

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Abstract

In the present studies on the variation of foliage characters in progenies of different crosses, it was observed that the time of leaf emergence was early in the seedlings of J.H. Hale x Wild Peach whereas Quetta x Wild Peach produced hybrids with late leaf emergence. The colour of the emerging leaves was almost yellow green in all hybrid seedlings except few hybrids with green colour were obtained in a cross between J.H. Hale x Wild Peach. The values for leaf length and breadth varied from 10.15 to 13.80 cm and 3.10 to 3.95 cm, respectively in different crosses. The leaf area was between 19.86 to 25.71 cm^2 in progenies of different crosses. The petiole length varied between 0.80 to 1.05 cm and foliage density from 12.00 to 13.55 per 15 cm shoot length in different crosses. The time of leaf fall was early in J.H. Hale x Wild Peach hybrids and late in July Elberta x Wild Peach hybrids. The mean values for number of glands varied from 2.00 to 3.00 in different progenies in the present studies.

Introduction

In India, peach is cultivated mostly in the sub-Himalayan regions extending from Jammu and Kashmir to North Eastern hills. Over the years, a large number of cultivars 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. Many well known cultivars grown in other countries have not yet become available because lack of their systematic introduction and comparative evaluation. The leaf characters play an important role in the identification and have correlation with the fruit quality. Hence the present investigations were undertaken to study the variability in foliage characters of F_1 hybrids of peach evolved through hybridization work undertaken in the Department of Fruit Breeding & Genetic Resources, of the University.

Material and Methods

The present studies were carried out during the year 2003 and 2004 in the experimental orchard of the Department of Fruit Breeding & Genetic Resources of Dr YS Parmar University of Horticulture & Forestry, Nauni-Solan. The experimental orchard is located at an altitude of 1220 meters above sea level and located at 31°N latitude and 77°E longitude. The climatic conditions are mild temperate. Six female parents July Elberta, Alton, J.H. Hale, Kanto-5, Saharanpuri and Quetta were crossed with local wild peach as male parent. The crosses were made during 1997 and seeds were stratified and sown to raise hybrid seedlings in 1998. A total of seventy six hybrids were evaluated for foliage characters in 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).

Results sand Discussion

Time of leaf emergence and colour of emerging leaves

The highest proportions of hybrids in all the crosses except Quetta x Wild Peach initiated their leaf emergence during the first week of March. The cross J.H.Hale x Wild Peach initiated leaf emergence in mid March only in 6.89% hybrid seedlings whereas maximum value for leaf emergence in mid March was 81.81% in Quetta x Wild Peach cross. The late leaf emergence i.e. after 15th March was

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obtained only in 9.09% hybrid seedlings in a cross between Quetta x Wild Peach whereas none of the hybrids was late for this character in other crosses (Table 1). The highest proportions of hybrid seedling were having green 143A group which ranged between 46.67% in July Elberta x Wild Peach to 100.00% in Kanto-5 x Wild Peach. The proportions having green 144A group varied from 18.18% in Quetta x Wild Peach to 100.00% in Alton x Wild Peach cross. None of the crosses have yellow green 144A group except J.H. Hale x Wild Peach cross, which had only in 3.45% hybrid seedlings of this colour.

Table 1.Classification of peach hybrids in respect of time of leaf emergence and colour of the emerging leaves

Crosses	Number of hybrids	Time of leaf emergence			Colour of the emerging leaves		
		Early (before 8th March) (%)	Mid (8th-15 March) (%)	Late (after 15 March) (%)	Green 143A group (%)	Green 144A group (%)	Yellow green 144A group (%)
July Elberta x Wild Peach	30	86.67	13.33	0.00	46.67	53.33	0.00
Alton x Wild Peach	2	100.00	0.00	0.00	0.00	100.00	0.00
J.H. Hale x Wild Peach	29	93.10	6.89	0.00	62.07	34.48	3.45
Kanto-5 x Wild Peach	2	50.00	50.00	0.00	100.00	0.00	0.00
Saharanpuri x Wild Peach	2	100.00	0.00	0.00	50.00	50.00	0.00
Quetta x Wild Peach	11	10.10	81.81	9.09	81.82	18.18	0.00

Leaf length and breadth

The hybrids were categorized as having short, medium and long leaves. Maximum proportions of hybrid seedlings had short leaves varying from 66.67 to 100.00 per cent in different crosses. However, in Saharanpuri x Wild Peach cross, 100.00% seedlings had medium length of leaves. The hybrid seedlings with long leaves was obtained only in July Elberta x Wild Peach (6.67%) whereas none of the other cross combinations produced long leaved seedlings. The mean value varied from 10.15 to 13.80 cm and coefficient of variation from 0.0 to 17.42%. The significant differences between the mean values were observed in case of seven cross combinations (Table 2). Maximum proportions of hybrid seedlings were medium in leaf breadth; however, Saharanpuri x Wild Peach produced 100.00% seedlings having broad leaves. The mean values of the cross varied between 3.10 to 3.95 cm and coefficient of variation ranged from 1.79% in Saharanpuri x Wild Peach cross to 14.86% in Quetta x Wild Peach cross combination (Table 3).

Table 2. Classification of peach hybrids in respect of leaf length

Crosses	Number of hybrids	Short (<13 cm) (%)	Medium (13-14 cm) (%)	Long (>140 cm) (%)	Mean of the cross (cm)	Coefficient of variation (%)
July Elberta x Wild Peach	30	66.67	26.67	6.66	12.31	9.94
Alton x Wild Peach	2	100.00	0.00	0.00	10.80	0.00
J.H. Hale x Wild Peach	29	68.96	31.04	0.00	11.41	14.84
Kanto-5 x Wild Peach	2	100.00	0.00	0.00	10.15	17.42
Saharanpuri x Wild Peach	2	0.00	100.00	0.00	13.80	1.02
Quetta x Wild Peach	11	90.91	9.09	0.00	11.52	13.20

Leaf area

The most of the hybrid seedlings were medium in leaf area in different cross combinations. The large leaf area was obtained only in 6.67% hybrid seedlings of the cross between July Elberta x Wild Peach. None of the seedling produced leaves with large area in other crosses. The mean values of the cross ranged between 19.86 to 25.71 cm^2 and the coefficient of variation ranged between 1.99% in Saharanpuri x Wild Peach to 16.76% in July Elberta x Wild Peach (Table 4).

Petiole length

The medium petiole length was in largest proportion in all the crosses which ranged between 50.00 to 100.00%. Short petiole length was in 10.00% seedlings both in J.H. Hale x Wild Peach and Quetta x Wild Peach crosses and 16.67% in July Elberta x Wild Peach. Similarly long petiole length was observed in 3.33 to 50.00% progenies of different crosses. Alton x Wild Peach and Kanto-5 x Wild Peach had no seedling with short and long petiole length. · The mean of the cross ranged between 0.80 to 1.05 cm and the coefficient of variation varied between 6.73 to 17.68% in different cross combinations (Table 5).

Table 3. Classification of peach hybrids in respect of leaf breadth

Crosses	Number of hybrids	Narrow (<3.0 cm) (%)	Medium (3.0-3.5 cm) (%)	Broad (>3.5 cm) (%)	Mean.of the cross (cm)	Coefficient of variation (%)
July Elberta x Wild Peach	30	10.00	53.33	36.67	3.41	9.94
Alton x Wild Peach	2	0.00	100.00	0.00	3.35	2.11
J.H. Hale x Wild Peach	29	37.94	34.48	27.58	3.22	11.24
Kanto-5 x Wild Peach	2	50.00	50.0	0.00	3.10	4.56
Saharanpuri x Wild Peach	2	0.00	0.00	100.00	3.95	1.79
Quetta x Wild Peach	11	27.28	36.36	36.36	3.18	14.86

Table 4. Classification of peach hybrids in respect of leaf area

Crosses	Number of hybrids	Small (<20 cm^2) (%)	Medium (20-30 cm^2) (%)	Large (>30 cm^2) (%)	Mean of the cross (cm^2)	Coefficient of variation (%)
July Elberta x Wild Peach	30	13.33	80.00	6.67	23.47	16.76
Alton x Wild Peach	2	50.00	50.00	0.00	21.61	15.44
J.H. Hale x Wild Peach	29	20.68	79.32	0.00	22.22	14.63
Kanto-5 x Wild Peach	2	0.00	100.00	0.00	22.18	8.13
Saharanpuri x Wild Peach	2	50.00	50.00	0.00	19.86	1.99
Quetta x Wild Peach	11	9.09	90.91	0.00	25.71	11.77

Table 5. Classification of peach hybrids in respect of petiole length

Crosses	Number of hybrids	Short (<0.5 cm) (%)	Medium (0.5-1.0 cm) (%)	Long (>1.00 cm) (%)	Mean of the cross (cm)	Coefficient of variation (%)
July Elberta x Wild Peach	30	10.67	80.00	3.33	0.87	10.00
Alton x Wild Peach	2	0.00	100.00	0.00	0.80	17.68
J.H. Hale x Wild Peach	29	10.00	86.56	3.44	0.84	11.42
Kanto-5 x Wild Peach	2	0.00	100.00	0.00	0.85	8.32
Saharanpuri x Wild Peach	2	0.00	50.00	50.00	1.05	6.73
Quetta x Wild Peach	11	10.00	80.91	9.09	0.91	9.14

Foliage density

The foliage density was recorded on a 15 cm shoot length randomly selected and means values were calculated. The medium foliage density was in highest proportion in all the crosses except Kanto-5 x Wild Peach which produced no seedling with this type of foliage density. In this case 100.00% seedlings produced dense foliage. The mean of the cross ranged between 12.00 to 13.55% and the coefficient of variation varied between 5.24 to 13.69% in different crosses (Table 6).

Time of leaf fall

The highest proportion of hybrids in all the crosses was early in leaf fall except in Alton x Wild Peach and Saharanpuri x Wild Peach. The percentage of hybrids having early leaf fall ranged from 89.65% hybrids having early leaf fall ranged from 89.65% in J.H. Hale x Wild Peach to 100.00% in Kanto-5 x Wild Peach. The proportions of hybrids with mid leaf fall were minimum in all the crosses. The crosses Kanto-5 x Wild Peach, Quetta x Wild Peach and Saharanpuri x Wild Peach did not produce any hybrid seedling having mid leaf fall. The crosses having late leaf fall ranged from 6.89% in J.H. Hale x Wild Peach to 100.00% in Saharanpuri x Wild Peach (Table 7).

Number of glands

The proportion of hybrids in all the crosses having few number of glands ranged between 30% in July Elberta to Wild Peach to 100% in Saharanpuri x Wild Peach. The proportion of hybrids with many glands was maximum (50.0%) both in Kanto-5 x Wild Peach and Alton x Wild Peach. The proportions of hybrids were between 18.18 to 63.33% but crosses Alton x Wild Peach, Kanto-5 x Wild Peach and Saharanpuri x Wild Peach did not produce any hybrid seedling having average number of glands. The mean values ranged between 2.0 to 3.0% and coefficient of variation between 0.0 to 32.45%. Three cross combinations had significant differences from each other (Table 8). The foliage characters besides having direct relationship with physical and chemical characters of the fruits also play an important role in the identification of different cultivars and hybrids.

There was considerable variability in foliage characters in different cross combinations (Table 9).

Table 6. Classification of peach hybrids in respect of foliage density

Crosses	Number of hybrids	Sparse (<11) (%)	Medium (11-13.) (%)	Dense (>13.) (%)	Mean of the cross	Coefficient of variation (%)
July Elberta x Wild Peach	30	26.67	73.33	0.00	12.00	9.13
Alton x Wild Peach	2	50.00	50.00	0.00	12.00	11.79
J.H. Hale x Wild Peach	29	17.24	51.72	31.04	12.94	10.92
Kanto-5 x Wild Peach	2	0.00	0.00	100.00	15.50	13.69
Saharanpuri x Wild Peach	2	0.00	50.00	50.00	13.50	5.24
Quetta x Wild Peach	11	9.09	36.36	54.55	13.55	11.13

Table 7. Classification of peach hybrids in respect of time of leaf fall

Crosses	Number of hybrids	Early (Before 5th Nov.) (%)	Mid (5th-15th Nov) (%)	Late (After 15th Nov) (%)
July Elberta x Wild Peach	30	96.67	3.33	0.00
Alton x Wild Peach	2	0.00	50.00	50.00
J.H. Hale x Wild Peach	29	89.65	3.46	6.89
Kanto-5 x Wild Peach	2	100.00	0.00	0.00
Saharanpuri x Wild Peach	2	0.00	0.00	100.00
Quetta x Wild Peach	11	100.00	0.00	0.00

Table 8. Classification of peach hybrids in respect of number of glands

Crosses	Number of hybrids	Percentage			Mean of the cross	Coefficient of variation (%)
		Few (2)	Average (3)	Many (4)		
July Elberta x Wild Peach	30	30.00	63.33	6.67	2.77	20.20
Alton x Wild Peach	2	50.00	0.00	50.00	3.00	47.14
J.H. Hale x Wild Peach	29	34.48	44.83	20.69	2.82	25.79
Kanto-5 x Wild Peach	2	50.00	0.00	50.00	3.00	47.14
Saharanpuri x Wild Peach	2	100.00	0.00	0.00	2.00	0.00
Quetta x Wild Peach	11	45.46	18.18	36.36	2.91	32.45

Table 9. Test of significance of peach hybrids in respect of different characters

Mean of pairs	t-value					
	Leaf length	Leaf breadth	Leaf area	Petiole length	Foliage density	No. of glands
July Elberta x Wild Peach and Alton x Wild Peach	6.891*	0.763	0.755	0.700	0.000	0.230
July Elberta x Wild Peach and J.H. Hale x Wild Peach	2.453*	2.171*	1.382	0.886	2.983*	0.309
July Elberta x Wild Peach and Kanto-5 x Wild Peach	1.700	2.665*	0.886	0.388	2.315*	0.230
July Elberta x Wild Peach and Saharanpuri x Wild Peach	6.197*	6.870*	4.747*	3.492*	2.780*	7.656*
July Elberta x Wild Peach and Quetta x Wild Peach	1.555	1.491	1.940	1.425	3.055*	0.466
Alton x Wild Peach and J.H. Hale x Wild Peach	2.073*	1.628	0.251	0.497	0.915	0.179
Alton x Wild Peach and kanto-5 x Wild Peach	0.519	2.259	0.212	0.452	1.944	0.000
Alton x Wild Peach and Saharanpuri x Wild Peach	30.305*	8.571	0.736	2.259	1.344	1.003
Alton x Wild Peach and Quetta x Wild Peach	1.571	1.133	1.619	1.080	1.408	0.087
J.H. Hale x Wild Peach and Kanto-5 x Wild Peach	0.980	1.024	0.029	0.000	1.685	0.179
J.H. Hale x Wild Peach and Saharanpuri x Wild Peach	7.700*	9.141*	3.731*	3.812*	1.002	0.453*
J.H. Hale x Wild Peach and Quetta x Wild Peach	0.202	0.258	3.248*	2.017*	1.156	0.290
Kanto-5 x Wild Peach and Saharanpuri x Wild Peach	2.907	7.680*	1.779	2.857	1.265	1.003
Kanto-5 x Wild Peach and Quetta x Wild Peach	1.028	0.463	2.253*	1.090	1.240	0.087
Saharanpuri x Wild Peach and Quetta x Wild Peach	4.863*	5.130*	6.117*	2.543*	0.073	3.211*

* Significant at 5 per cent

This variability could be attributed to the highly heterozygous nature of cultivars used in the present crosses which led to this variability. In such studies, Kramer (1959) identified peach cultivars using length and width of leaf. Weaver and Stroud (1969) described Harbella peach as having globose glands. Sherman *et al.* (1972) reported two leaf colour characters, solid red and variegated red which are associated with early fruit ripening in peach (*Prunus persica* L.). While working with

the seven year old peach hybrid seedlings Zhang *et al.* (1997) observed variation in time of leaf emergence, leaf area and foliage density. Similar results with respect to time of leaf emergence, colour of emerging leaves and other foliage characters were noted in nine year old F1 peach hybrids (Scorza and Pooler, 1999). These colour characters appears in leaves approaching senescence and can be scored in one year old seedling.

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