SHORT COMMUNICATION

Estimation of Genetic Divergence in Apricot (*Prunus armeniaca* L.)

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Genetic divergence was assessed in 30 apricot collected from various parts of Kashmir Valley on the basis of eight characters. The genotypes were grouped into four clusters on the basis of relative magnitude of D^2 values using Tochers method. Cluster I was the largest with 22 genotypes followed by cluster II consisting of four genotypes. Inter-cluster D value was maximum between cluster III (1621.03) and cluster II (83.41). Crossing between genotypes having high genetic distance should be used in hybridization. Mean yield/ tree, fruit weight, fruit length, fruit diameter and stone weight was found maximum in cluster III.

Key Words: *Prunus armeniaca*, Cluster, Divergence, Apricot, Genotypes, Mahalanobis

Apricot cultivation is an important source of income to the tribal people as they sell the sun dried apricots, their kernel and oil extracted from the kernel which contains 40-46% oil in Leh division of Kashmir. Table type apricot mainly grown in Kashmir Valley, due to tendency of growing high value crop (apple) with long shelf life, its plantation is shrinking and old plantations are being replaced. The Kashmir Valley witnesses lot of genetic variability in apricot with regard to shape, size, and yield as well as morpho-physiological attributes. Viewing above facts in mind, an exploration in genetic diversity region was conducted in order to conserve quality landraces for subsequent breeding programme. In exploration programme, some promising selections collected for the genebank were APS-8, most attractive having 51 kg/tree yields, 91 g fruit weight, symmetrical, yellow skin, TSS 133.5%; APS-9 yields 47.7 kg/tree, fruit weight 76.5 g, medium TSS, APS-3 also high yielder, fruit weight 58.4 g/fruit, TSS 15.5%, sweet kernel; APS-29, APS-25 and APS-30 yield 25 to 30 kg/tree, fruit weight 22-25 g/fruit, sweet kernelled with TSS 11 to 13%.

Understanding of the variability, grouping as well as appropriate scale is quite imperative. The information about the extent of genetic divergence is critical for the improvement of any crop in order to have high heterotic and desirable segregants (George, 1976; Valsakumari *et al.*, 1985). Selection of genetically diverse parents will enable the expansion of genetic base and development of superior types. Hence, an effort was made to estimate the magnitude of genetic divergence in apricot genotypes to identify genetically divergent parent which can be utilized in hybridization programme.

A survey for collection and evaluation of apricot genotypes were carried in Srinagar, Budgam, Baramulla, Anantnag, Pulwama and Doda districts of Jammu and Kashmir. At the time of maturity, fruit samples of 30 to 40 in numbers were collected randomly in three replications for recording observations on fruit weight, fruit length, fruit diameter, acidity, total soluble solids, total sugar and stone weight. The fruit yield was recorded per tree basis at the end of harvesting.

The Mahalanobis D^2 statistics was used to estimate the genetic divergence among the genotypes as suggested by Rao (1952), Chaudhary and Singh (1975) and George (1976). All the genotypes were grouped into clusters according to Tocher's method as described by Rao (1952).

The assessment of genetic divergence among the genotypes showed the presence of appreciable amount of divergence. The genotypes were grouped into four clusters (Table 1). Cluster I was the largest with as many as 22 genotypes, cluster II had four genotypes, while as cluster III and Cluster IV consisted two genotypes each. Zaffer *et al.* (2004) also observed similar genetic divergence among various genotypes of apricot in Kargil region. The grouping of genotypes of different geographical locations into one cluster may be due to presence of some common genes controlling the most important characters or through modifying effect of micro and macro environment affecting genetic diversity like adoption, selection procedure and environmental conditions. The grouping of genotypes into 4 clusters reveals that cultivars growing in different pockets of Kashmir division had no tendency to group together in cluster which may be the result of diverse agro-ecological

Table 1. Distribution of 30 apricot genotypes into clusters

Cluster Number	No. of Genotypes	Genotype(s)/ Accession number
I	22	APS-24, APS-1, APS-13, APS-12, APS-19, APS-18, APS-17, APS-22, APS-3, APS-14, APS-7, APS-16, APS-2, APS-23, APS-15, APS-4, APS-27, APS-21, APS-10, APS-28, APS-5, APS-24
II	04	APS-3, APS-25, APS-29, APS-30
III	02	APS-8, APS-9
IV	02	APS-1, APS-6

Table 2. Intra-cluster (diagonal) and inter-cluster distances among grouped apricot clusters

Cluster Number	I	II	III	IV
I	244.91 (15.65)	274.12 (16.56)	1095.49 (33.10)	471.98 (21.86)
II		83.41 (9.43)	1621.03 (40.26)	668.88 (25.86)
III			398.96 (19.97)	1007.19 (31.74)
IV			0.00	0.00

▪ Parenthesis: D value, Outside parenthesis: D^2

conditions in the area of adoption. Another feature that genotypes from same location were placed in separate cluster indicating wide diversity among genotypes from same place. These findings are in general agreement with Prasad *et al.* (1993, 2001).

The intra and inter-cluster D^2 values among the four clusters are presented in the Table 2. The cluster III had the maximum intra-cluster distance 398.96 followed by cluster I with a distance of 244.91. The inter-cluster distance was the maximum between cluster III (1621.03) and II (83.41) followed by cluster III (398.96) with cluster IV (1007.19) on the other hand minimum distance (244.91) was recorded between cluster I and cluster II (274.12) indicating minimal diversity between these clusters. Genotypes belonging to the clusters separated by the high genetic distance should be used in hybridization to obtain a wide spectrum of variation among the progenies *i.e.* cluster III APS-8 and APS-9 and cluster II APS-3, APS-25, APS-29 and APS-30 as such the inter-cluster distance was registered the highest. It is advisable to make crosses between genotypes selected from the cluster with high mean performance to get desirable transgressive segregates (Dwivedi and Mitra, 1996).

The existence of diversity among the genotypes was also assessed by the amount of variation in cluster means for different characters (Table 3). Average yield per tree (49.50 kg), fruit weight (63.75 g), fruit length (5.90 cm), fruit diameter (5.13 cm) and stone weight (4.35 g) was found maximum in cluster III followed by cluster IV exhibited fruit weight, fruit length and fruit diameter. Total sugar was found superior in cluster IV (15.70° brix). Mean fruit yield/tree, fruit weight, fruit length, diameter, total sugar and stone weight was found the lowest in cluster II. As far as acidity was concerned, cluster II exhibited the maximum acidity (0.68%). Thus, by involving the genotypes of outstanding mean performance from these cluster as potential parents in crosses, hybrids with high yield and quality can be developed. Sardana *et al.* (1997) observed that cluster means represented an interesting picture of the nature of existing diversity among the material under study.

The per cent contribution of each character in grouping the genotypes was worked out and presented in Table 3. Total 435 D^2 values were obtained and based on these D^2 values, per cent contributions of different characters towards divergence were obtained. Stone weight ranked first *i.e.* 143 times with a maximum contribution of 32.64 per cent followed by fruit length 100 times (22.10%) contribution. These characters can be given greater importance in selection of potential parents for hybridization. De *et al.* (1988) proposed that

Table 3. Mean values for different characters of 4 clusters in apricot

Traits	Clusters				Per cent contribution towards divergence	Number of times appearing as first in the ranks
	I	II	III	IV		
Average yield/ tree	34.14	25.00	49.50	32.67	8.30	36
Fruit wt. (g)	33.40	26.87	63.75	53.07	8.51	37
Fruit length (cm)	4.00	3.70	5.90	4.51	22.98	100
Fruit diameter (cm)	4.30	3.00	5.13	4.60	0.00	0
Acidity (%)	0.42	0.68	0.07	0.15	0.92	4
T.S.S. (° Brix)	14.02	12.30	11.93	13.50	4.60	20
Total sugars (%)	10.50	9.30	10.90	15.70	22.10	96
Stone wt. (g)	2.43	1.37	4.35	2.00	32.64	142

traits contributing the maximum towards the D^2 values need to be given greater emphasis for deciding on the cluster to be chosen for the purpose of further selection and choice of parents for hybridization.

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