Madras Agric. J., 85(10-12): 599 - 600 October - December 1998
https://doi.org/10.29321/MAJ.10.A00812

STUDIES ON HERITABILITY AND GENETIC ADVANCE FOR CERTAIN FRUIT CHARACTERS IN POMEGRANATE (*Punica granatum* L.)

A.R. KARALE[1] and U.T. DESAI[2]

Department of Horticulture
M.P.K.V., Rahuri.

ABSTRACT

Heritability estimates in narrow sense, varied from 32.80 per cent for TSS : acid ratio to 91.74 per cent for seed mellowness. Genetic advance as percentage of means was very high (124.08 %) for seed mellowness. The PCV was greater than GCV for all the characters under study. It is concluded that selection for characters having heritability with high genetic advance will be helpful. The characters exhibiting low to moderate heritability accompanies by low genetic gain indicate the non-additive gene action and such characters need higher selection pressure.

KEY WORDS: Pomegranate, Heritability, Genetic Advance

Pomegranate is an important fruit in tropical and sub-tropical countries, grown for its acid sweet fruits, mainly used for dessert purpose. It is mainly cultivated in Maharashtra, Rajasthan and Haryana. The information available on biometrical aspects of heritable components in pomegranate is scanty due to lack of systematic variability studies of various characters. The success of any breeding programme depends on the extent of genetic variability in the source population. The assessment of variability is therefore, basic requirement of the breeding programmes, since most of the plant characters of economic importance are governed by a group of genes and are highly influenced by environmental variation. It is difficult to judge whether the observed variability is heritable or due to environment. This necessiates the optimizing of phenotypic variation into its heritable and non-heritable components. An attempt is therefore made to estimate heritability and genetic advance in respect of various characters of pomegranate which may help in planning of breeding programme.

MATERIALS AND METHODS

Four lines viz., Ganesh, G-137, P-23 and P-26 and thirteen testers (viz., No.5, No.31, No.61, No.142, No.177, No.219, No.242, No.303, No.377, No.379, No.382, No.408 and No.462) were crossed using Line x Tester model. The resulted 52 cross combinations (718 F_1 hybrids) along with their parents were evaluated for yield and fruit quality components during ambia bahar of 1992-93 and 1993-94. The mean values were used for statistical analysis. Genotypic (GCV) and phenotypic (PCV) co-efficients of variation were calculated according to method suggested by Burton and Devane (1953). For the estimates of heritability (narrow sense) and genetic advance as percentage of means, the methods of Hanson *et al.*, (1956) and Johnson *et al.*, (1955) respectively were adopted. The categories of heritability viz., high (30 to 60 %) medium (10 to 30 %) and low (5 to 10 %) were used as suggested by Robinson (1966).

RESULTS AND DISCUSSION

The heritability (Table 1) was high for seed mellowness (96.74 %), rind thickness (69.16 %) and fruit diameter (61.80 %). While the yield per plant (35.36 %), fruits per plant (33.63 %), aril size (33.54 %) and TSS : acid ratio (32.80 %) showed a medium heritability. Genetic advance was very high for seed mellowness (124.08) ; high for rind thickness (51.46), juice weight per fruit (39.97), aril weight per fruit (38.28), fruit weight (34.15) and fruit volume (33.80), whereas, it was low for juice percentage on aril weight basis (6.67), TSS (7.97). TSS : acid ratio (9.55) aril percentage (10.48), aril size (11.49), fruit length (11.74) and fruit diameter (12.59). The PCV was greater than GCV for most of the characters. The estimates were very high for seed hardness (66.23 and 61.23 respectively). Both the estimates were moderate for rind thickness,

Part of the Ph.D. Thesis submitted to M.P.K.V., Rahuri

1. Associate Professor
2. Research Guide and Associate Professor

Table 1. Estimates of genotypic and phenotypic co-efficient of variability, heritability and genetic advance

Sr. No.	Character	PCV	GCV	Heritability	Genetic advance
1.	Fruit weight	28.90	21.89	57.36	34.15
2.	Fruit volume	28.26	21.54	58.07	33.80
3.	Fruit length	10.50	7.74	54.21	11.74
4.	Fruit diameter	9.89	7.78	61.80	12.59
5.	Aril weight/fruit	31.99	24.38	58.09	38.28
6.	Aril (%)	9.02	6.78	56.39	10.48
7.	Rind (%)	15.18	11.33	55.66	17.41
8.	Aril:Rind ratio	24.28	18.72	59.62	29.72
9.	Juice weight/fruit	4.02	25.69	57.02	39.97
10.	Juice % (FW basis)	12.37	8.92	51.81	25.47
11.	Juice % (AW basis)	7.29	4.86	44.39	6.67
12.	Aril/100 g	16.63	9.63	33.54	11.49
13.	Rind thickness	36.12	30.04	69.16	51.46
14.	Seed (%)	26.43	18.16	47.22	25.71
15.	Seed mellowness	62.23	61.23	96.74	124.08
16.	TSS	8.70	5.80	44.45	7.97
17.	Acidity	15.33	10.84	44.31	15.79
18.	TSS : Acid ratio	14.12	8.09	32.80	9.55
19.	Fruits / plant	30.32	17.58	33.63	21.00
20.	Yield / plant	35.56	21.14	35.36	25.87

yield per plant, juice weight per fruit, aril weight per fruit, fruit weight and fruit volume and low for remaining characters.

In the present study higher heritability in some characters may be due to relatively low environmental influence on the traits (Hanshe *et al.*, 1972). For these characters breeder can select a genotype on its own phenotypic performance. Thus, selection for soft seeded types, having more than 90 per cent heritability in the present case may be based on phenotype. Heritability estimate in conjuction with genetic advance are more helpful in predicting its resultant effect for selecting the best individuals (Johnson *et al.*, 1955). Selection for the characters with high heritability and high genetic advance will be helpful ; whereas for the characters with low genetic gain will not be effective. In the present study, the characters exhibiting comparatively low to moderate heritability accompanies by low genetic gain indicate that, for expression of these characters, non additive gene action played a definite role (Panse, 1957). Thus, improvement in these characters through selection will be relatively low or would need higher selection pressure. The higher values of PCV over the GCV for all the characters suggests that there was interaction between the genotype and the environment effect. Thus the population under study reveals scope for development of a new variety with improvement in characters such as seed mellowness, juice content, aril content, fruit size and yield which can be further perpetuated vegetatively.

REFERENCES

BURTON, G.W. and DEVANE, E.H. (1953). Estimating heritability in Tall fascue (*Festuca crudinancea*) from replicated clonal material. **Agron. J. 45(9)** : 478-481.

HANSHE, D.E., HESSE, C.O. and BERES, V. (1972). Estimates of genetic and environmental effects on several traits in peach. **J. Amer. Soc. Hort. Sci.** 97(1) : 76-79.

HANSON, G.W., ROBINSON, H.F. and COMSTOCK, R.E. (1956). Bio metrical studies of yield in segregating population of Korean lespedeza. **Agron. J. 48:** 268-272.

JOHNSON, H.W., ROBINSON, H.F. and COMSTOCK, R.E. (1955). Estimates of genetic and environmental variability in soyabean. **Agron. J.** 47: 314-318.

PANSE, V.G. (1957). Genetics of quantitative characters in relation to plant breeding. **Indian J. Genet and Pl. Breeding.** 17 : 318-328.

ROBINSON, H.F. (1966). Quantitative genetics in relation to breeding on the Centennial of Mendelism **Indian J. Genet.** 26(4) : 171-187.

(Received: January 1998 Revised: Feb. 1999)