

Studies on Genetic Variability and Correlation between Economic characters in *Dioscorea floribunda*. Mart and Gal.

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Variability was estimated for 30 clones of *Dioscorea floribunda*. The genotypic coefficient of variability was higher in diosgenin yield per plant, number of fingers per tuber and diosgenin percentage. Heritability was observed to be moderate to high in almost all the characters and high values of heritability were associated with higher genetic advance expressed as a percentage of mean for diosgenin yield and diosgenin percentage. The genotypic correlation coefficients between diosgenin yield per plant and diosgenin percentage, dry tuber weight, fresh tuber weight, girth of tuber at lower portion was observed to be positively significant. Diosgenin percentage was negatively, but weakly correlated to dry tuber weight per plant, fresh tuber weight per plant, girth of tuber at lower portion and to number of fingers per tuber. Dry tuber weight per plant, fresh tuber weight per plant, girth of tuber at lower portion and number of fingers per tuber were positively significant among each other.

Dioscorea tuber is the chief raw material for the production of diosgenin which is utilized by pharmaceutical industries for the bulk manufacture of steroid hormones and oral contraceptives. A programme for breeding high yielding varieties requires information on the nature and magnitude of variation in the available material. Yield, being a complex polygenic character is dependent on a number of quantitative attributes. A knowledge of the genetic association among components of economic worth is invariably of considerable help in planning effective breeding programme. In the present investigation an attempt has been made to find out the magnitude of variability in *Dioscorea flori-*

bunda and the heritable component with genetic parameters, such as genetic coefficient of variation, heritability estimates, genetic advance and inter-relationship among various traits.

MATERIAL AND METHODS

A trial consisting 30 clones of *Dioscorea floribunda* developed from seeds was laid out in a randomized block design with three replications in 1977-78 at Regional Research Laboratory, Jorhat. In order to provide identical plants, the tubers were divided into pieces weighing approximately from 50 to 80 g. The plot consisted of three rows spaced 60 cm apart and plant to plant 45 cm of each

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2.25 metre long. One year old plants were harvested. From each plot five plants were selected at random in every replication and observations were recorded for six characters, viz., number of fingers per tuber, girth of tuber at lower portion, fresh tuber weight per plant, dry tuber weight per plant, diosgenin percentage and diosgenin yield per plant.

The tubers were analysed for diosgenin percentage by the method of Chauduri (1977). The phenotypic, genotypic coefficient of variation, heritability in broad sense and the expected genetic gain by selecting five percent superior clones were calculated according to Burton and de Vane (1953). The phenotypic and genotypic correlation coefficients were calculated according to Al Jibouri *et al.* (1958).

RESULTS AND DISCUSSION

The range, mean, phenotypic and genotypic coefficient of variability, heritability, genetic advance and genetic advance as percentage of mean are presented in Table 1. Phenotypic and genotypic correlation coefficients between different pairs of characters are presented in Table 2.

A wide range of phenotypic variability was found in almost all the characters (Table 1). The genetic coefficient of variation measures the range of genetic variability in plant characters and is helpful to compare the genetic variability in various characters. High Gcv estimates obtained for diosgenin yield per plant, number

of fingers per tuber and diosgenin percentage indicated that these traits are potentially variable. The genetic coefficient of variability reported here for fresh tuber weight is in agreement with the findings of Bammi *et al.* (1957). The genetic coefficient of variation ranged from 20.27 to 28.95 for dry tuber weight to diosgenin yield per plant.

High heritability estimates are helpful in making selection of superior genotypes on the basis of phenotypic performance of quantitative characters. But Johnson *et al.* (1955) have reported that heritability estimates along with genetic advance will be more useful than heritability value alone in selecting the best genotypes. In the present study, all the characters showed moderate to high heritability. Heritability ranged from 62.50 to 96.55 for dry tuber weight to diosgenin percentage. The heritability values reported here are in conformity with the results of Martin and Cabanillas (1967) as far as diosgenin percentage and fresh tuber weight are concerned. However, they have reported low value for diosgenin yield.

High heritability value coupled with high genetic advance as percentage of mean in diosgenin percentage, girth of tuber at lower portion, diosgenin yield per plant and number of fingers per tuber show that the variation is attributable. High heritability along with high genetic advance may be due to predominance of additive gene effects (Panse, 1957). Hence these characters can be improved by phenotypic selection.

Phenotypic and genotypic correlation coefficients between the different pairs of characters were estimated. All the characters studied, showed significant positive association with diosgenin yield per plant except number of fingers per tuber at phenotypic and genotypic level. The association of diosgenin percentage with diosgenin yield is in agreement with those of Bammi *et al.* (1975), but not for fresh tuber weight and dry tuber weight. Diosgenin percentage was negatively but weakly correlated with number of fingers per tuber, girth of tuber at lower portion, fresh tuber weight and dry tuber weight at both the levels. These results are in accordance with those of Martin and Cabanillas (1967) particularly for dry tuber weight and diosgenin percentage. Dry tuber weight was found to be positively correlated with number of fingers per tuber, girth of tuber at lower portion and fresh tuber weight. Similarly, fresh tuber weight was observed to have positive significant correlations with number of fingers per tuber and girth of tuber at lower portion. Girth of tuber at lower portion was found to have positive correlation with number of fingers per tuber.

These results suggest that more emphasis should be given during selection on high diosgenin percentage, as small tubered plants could be grown in less space than larger plants, yielding the same amount of diosgenin per plant. A breeding programme to obtain such plants could be based on initial selection

of single plants for diosgenin percentage in the field.

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Table 1. Genetic parameters for different characters in *Dioscorea floribunda*.

Characters	Range	Mean	Phenotypic coefficient of variation (%) (PCV)	Genotypic coefficient of variation (%) (GCV)	Heritability (%)	Genetic Advance	G. A. as % of mean
Number of fingers per tuber	4.00-13.00	8.19	26.86	23.85	76.71	3.56	43.55
Girth of tuber at lower portion (cm)	42.38-72.45	54.31	23.30	21.74	87.06	22.72	41.83
Fresh tuber weight per plant (kg)	0.166-0.533	0.335	25.33	21.42	71.42	0.12	37.33
Dry tuber weight per plant (kg)	0.060-0.183	0.168	25.63	20.27	62.50	0.03	32.13
Diosgenin percentage	1.35-3.82	2.23	23.61	23.20	96.55	1.07	46.97
Diosgenin yield per plant (g)	1.17-5.12	2.83	32.48	28.95	79.45	1.40	53.44

Table 2. Phenotypic (P) and genotypic (G) correlations between different pairs of character in *Dioscorea floribunda*.

Character	No. of finger per tuber	Girth of tuber at lower portion	Fresh tuber wt. per plant	Dry tuber wt. per plant	Diosgenin percentage	Diosgenin yield per plant
Number of fingers per tuber	P 0.391 ^a G 0.482	0.481 ^{aa} 0.579	0.468 ^{aa} 0.538	0.258 0.144	-0.161 -0.221	0.571 ^{aa} 0.425
Girth of tuber at lower portion (cm)	P - G -	0.773 ^{aa} 0.813	0.757 ^{aa} 0.805	0.727 ^{aa} 0.527	-0.048 -0.081	0.425 0.735 ^{aa}
Fresh tuber weight per plant (kg)	P - G -	- -	0.991 ^{aa} 0.999	0.727 ^{aa} 0.527	-0.081 -0.137	0.735 ^{aa} 0.527
Dry tuber weight per plant (kg)	P - G -	- -	- -	0.735 ^{aa} 0.527	-0.077 -0.130	0.735 ^{aa} 0.527
Diosgenin percentage	P - G -	- -	- -	- -	- -	0.582 ^{aa} 0.768

Note:

aa Significant at 1 percent level.

a Significant at 5 percent level.