Heritability Studies of Some Cassava Genotypes

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Abstract

Three traits, namely root number (RTNO), root weight (RTWT), and fresh yield (FYLD) of some cassava genotypes were scored and analyzed for heritability. The genotypes differed significantly for each of the three traits. Generally, heritability per replicate was above 50% indicating that the additive portion of the genetic variance might be high. Heritability per plot ranged between 69% and 86% which might indicate that non-additive effect of the genotypic variance might be small. Phenotypic and genotypic variances differed significantly, which reflects an environmental influence on the genotypes. By assuming a 5% differential selection of the top population, an advance of 46.5%, 41.5% and 33.5% can be arrived at for RTNO, RTWT and FYLD, respectively, over their population means. Correlation between the three traits was highly significant and positive.

Introduction

Estimates of genetic variance and heritability are of great importance in plant breeding programmes. Plant breeders have made efforts to use heritability estimates as an indication of selection pressure to a segregating population (Burton & Devane, 1955). High genetic variation in germplasm pool is a strong indication of significant genetic variability. The range or magnitude of this genetic variability within the germplasm can be quantified by broad sense heritability estimate among other genetic parameters (Dudley & Mall, 1969). The broad sense estimate, however, has some environmental component. Some breeders estimate the environmental component of the total population variance by using non-segregating population since variation in such populations is environmental. Kalton *et al.*(1952) and McDonald *et al.* (1952) assessed the variances between propagules of a clone (V_{SO}) as a measure of the ratio of the difference between the variance of the S_1 population (V_{S1}) and the environmental variance to the S_1 population variance expressed as a percentage by the formula:

$$[(V_{S1} - V_{SO}) \times 100]/V_{S1}$$

Burton (1951) used the variance of the F_1 generation in pearl millet to measure environmental variance. Working with soybeans, Mahmud & Kramer (1951) estimated environmental variance by the formula:

$$(VP_1 + VP_2 + VF_1)^{1/2}$$

where VP_1 and VP_2 are variances for the two parents and VF_1 is the F_1 variance. Weber (1950) reported that the best estimate of environmental variance for calculating heritability for characters in interspecific cross of soybeans was the formula:

$$(VP_1 \times VP_2 \times F_1)^{1/3}$$

where VP_1 and VP_2 are variances for the two parents and VF_1 is the F_1 variance.

Realistic choices among selection approaches must be based on gain per unit input of time and cost. For particular populations, relative gain from different selection procedures can be predicted if