Variation in Dry Matter Content of Tuber in Seedling Population of Three Crosses of Cassava

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Abstract

When parent tubers having high, medium and low dry matter content were crossed in three combinations, higher frequency of seedlings containing more dry matter than the parents was observed when both the parent tubers had high dry matter. A wide range varying from 19.2 to 66.4% in dry matter content was reported.

Introduction

Cassava (*Manihot esculenta* Crantz) is an important calorie-producing crop in the tropics. The crop is efficient in carbohydrate production. The major accents in breeding are to evolve high yielding, high starch, good quality disease and pest tolerant varieties.

Dried cassava chips are extensively used as an animal feed (Roa and Cock, 1973). So dry matter content of tuber also forms one of the important criteria in the breeding program. A maximum dry matter was obtained during 8th to 10th month of plant growth. Afterwards, it decreased and the values remained constant (Maini *et al.* 1977)

Cassava is a highly heterozygous species. An understanding of the pattern of variation for different traits in the F_1 population enables the breeder to select suitable parents to meet specific requirements and to direct the breeding programme in the right line. Three crosses of cassava involving four parents having different dry matter content of tuber were studied and the patterns of variation in the F_1 population are reported herein.

Materials and Methods

The materials were of three exotic collections, Ce 22, Ce 110, Ce 177; one indigenous collection Ci 776 and three crosses involving the above parents viz. Ce 22 x Ce 177 (Cross No. 1), Ce 22 x Ce 110 (Cross No. 2), Ce 22 x Ci 776 (Cross No. 3). Controlled hybridizations were made between the parents in the above combinations during September-December 1977. Around four hundred seeds of each cross were sown in the field on a spacing of 1 x 1 m in May 1978. One hundred and fifty-six seedlings of Cross 1, 223 seedlings of Cross 2 and 311 seedlings of cross 3 were available for the study.

Fifty cuttings of each parent were also grown in an adjacent field. The recommended cultural practices were adopted. At ten-month stage, one mature, well developed tuber was harvested from each plant and the dry matter was determined on oven-dry

basis. During the time of collections of samples, there was a dry spell of over a month.

Results and Discussion

The parents Ce 22 and Ce 177 had high dry matter content while Ce 110 had medium and Ci 776 had low dry matter content (Table 1).

In all the three crosses the means of the seedling population were lower than the mid parental values. This was expected because of the high heterozygocity of the crop. The highest population mean was obtained in Cross 1. In this cross, there were many individuals surpassing the better parent (Fig. 1). The cross gave the highest value for mean of top ten plants which was much higher than the value observed in both the parents. The upper and lower limits of range were higher in cross I compared to the other two crosses and individuals with 66.4% dry matter content of tuber was present. Magoon *et al.* (1973) had reported a consolidated range of 20.0 to 47.2% dry matter in crosses between one female parent and three different high yielding male parents. The consolidated range in the present study is 19.2 to 66.4 which is much higher than the one reported above.

The higher values obtained for seedling mean, range and mean of top 10 plants of Cross 1 where both the parents had high content of dry matter in tubers suggest that for only the superior parents should be involved the improvement of this trait.

When high and medium parents were crossed (Cross 2) none of the progeny exceeded the superior parental value whereas in Cross 3 which involved crossing high and low parents few progeny exceeded the superior parental value, the upper range being 54.6% (Figs. 2 and 3).

References

MAGOON, M. L., MAINI, S. B. and KRISHNAN, R. 1973: Breeding for tuber quality in cassava. Tropical Root and Tuber Crops Newsletter, No. 5: 27-29.

MAINI, S. B., INDIRA, P. and MANDAL, R. C. 1977: Studies on maturity index in cassava. J. Root Crops, 3(2):33-35.

ROA, G. and COCK, J. H. 1973: Natural drying of cassava. Paper presented at 3rd International Symposium on Tropical Root Crops, Ibadan, Nigeria.

Table 1. Mean and variation in dry matter content in parents and progeny of three different crosses of cassava.

Parents/crosses	Overall Mean	Mean of top ten plants	Range
Ce 22	48.1	49.1	45.9 – 49.5
Ce 117	48.4	51.2	41.4 – 52.6
Ce 110	36.2	37.4	34.3 – 38.7
Ci 776	28.9	31.3	25.4 – 33.2
Ce 22 x Ce 177	41.7	57.1	28.0 – 66.4
Ce 22 x Ce 110	31.8	42.3	19.2 – 45.8
Ce 22 x Ci 776	35.4	47.5	20.8 – 54.6

VARIATION IN DRY MATTER CONTENT IN THREE SEEDLING POPULATIONS OF CASSAVA
(Parental value is shown with standard deviation)

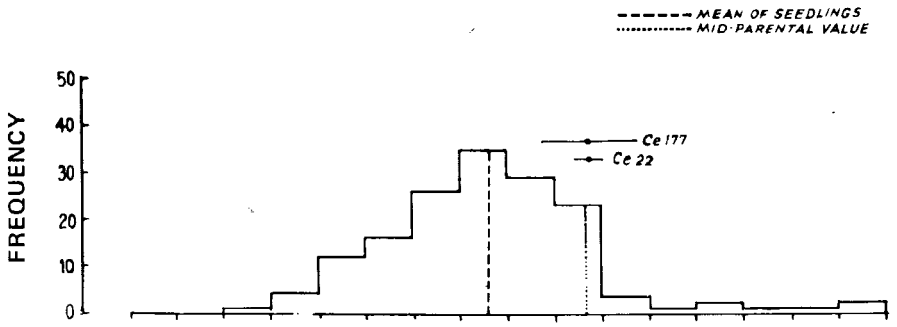

Figure 1. Cross 1 (Ce22 x Ce177)

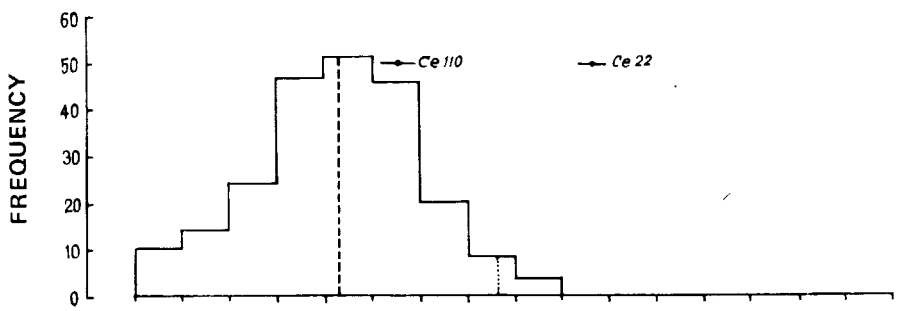

Figure 2. Cross 2(Ce22 x Ce110)

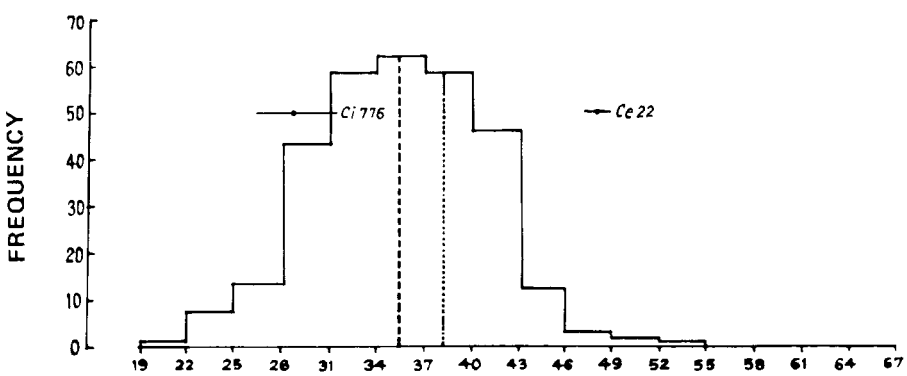

Figure 3. Cross 3 (Ce22 x Ci776)

DRY MATTER PERCENTAGE