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Variation among cassava clones in relation to seed germination

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ABSTRACT

Seeds from 51 cassava clones were screened for germination at 15 and 30 days after planting (DAP) The germination for 44 entries that represented both common and diverse Brazilian clones was low, ranging from 0 to 30% by 15 DAP and from 10 to 56% by 30 DAP. The germination for clones selectede as early and good in germination ranged from 35 to 48% by 15 DAP and 60 to 80% by 30 DAP. The lack of variability among seeds of a given clone adds to the blief that there is considerable homozygosity within clones. Selected clones demonstrating early seed germination are being grown at the Universidade de Brasília.

Index words: *Manihot esculenta, cassava, seed germination, evolution, germplasm.*

Cassava (Manihot *esculenta* Crantza) seed dormancy hás bem a well documented problem for breeders and other scientist (Martin, 1976; Narty, 1978; Ellis and Roberts, 1979; Nassar, 1979). Seed scarification and other mechanical methods of removing the hard seed-coat have been shown to be of litle or no value im improving germination (Martin, 1976) yet no effort has been made to investigate sources variation for this character. The need for early germination and low dormancy requirement is needed in several areas of cassava research. This is particulary true for beeding programmes, including the production of interspecific hybrids where valuable hybrid seed may be lost due to non-germination.

Since cassava is vegetatively propagated by means of stem cutting, it is considered to be a labour intensive crop. Vegetative cutting also are often responsible for the spread of diseases and pests throughout the tropics. The use of true seed in place of stem cutting for cassava production would eliminate these problems and potentially reduce production costs. One limiting factor though, is lack of quick and uniform seed germination. The development of cassava clones with early germinating seed will permit the use of plant breeding thecniques such as mass selection to gradually modify cassava population characteristics. Variation within a given population is the basis on which selection can be made for specific desirable characteristics. Little is known about variation among cassava clones for their germination chacacteristics. Knowledge of the variation in cassava seed germination, would be useful in determining the potential for

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Genetic improvement of this character through breeding and selection. Since Brazil is the assumed country of origin, this is most likely the place to find maximum variation (Nassar, 1978).

MATERIALS AND METHODS

Fifty-one cassava clones were selected for evaluation in this experiment. Among these, 44 were provided by the germplasm bank of the Notional Centre of Agriculture Research of Cerrado (CPAC), Brasilia. These represented cassava collected from various parts of brazil. Among these, Mantiqueira, Graxupe and branca Santa Catarina represent the most common clones found in Brazil. The remaining six clones were selected from the germplasm banck of the University of Brasilia for early germination six clones were selected from the germplasm bank of the University of brasilia for early germination, by the first author, they represent the parent clone which was selected in 1978, and 5 clones which were its 1980 open-polinated progeny. These too were selested for early germination. These were labelled ESBI 1, 11, 12 ,13, 14 and 15.

Four hundred seeds of esch clone were planted in the nursery of the University of brasilia in September, 1983. seeds varied in age from 60 to 70 days. The predominant temperatures were approximately (26-29°C) day and (17-20°C) night. Germination was scored every three days to assure that no seedlings were lost due to diseases or pests.

Data were analyzed with Statistical Analysis Systems least squares regression analysis of covariance (Anonymous, 1982).

RESULTS AND DISCUSSION

None of the clones from the CPAC colletion had more than 30% germination 15 days after planting (DAP), while the germination in the selected clones ranged from 35 to 51% (Table 1 and Fig. 1). Thus, there appears to be genetic variation in seed germination. The low level of germination in the non-selected CPAC clones can be explained by the fact that there probably has been no selection pressure for early and uniform seed germination. Once selected, cassava of only high ylelding types has probaly resulted in a narrowing of the gene pool and loss of potentially valuable germplasm.

Among all clones, 38% of the variability in seed germination by 30 DAP was explained by variation in seed germination by Dap (p=0.0001). An additional 13% of the variability was explained by dividing the

Clones into those that were selected for better germination and those that were not (p=0.0001)

(see Table 1 Click here).

Thus, it is possible to make selection for uniform and early germination in cassava seeds by 15 DAP. Mean germination of the non-selected seeds was 10 and 41% by 15 and 30 DAP, respectively, while mean germination in the selected ESB1 group was 44 and 76% by 15 and 30 DAP, respectively.

The five ESB1 clones were the surviving plants after an attack of cassava bacterial blight (*Xanthomonas manihotis*) in the seedling nusery. Others had been selected for early germination, but were lost due to disease.

Even though five clones were from open-pollinated seed of ESB1, there was very low segregation among the progeny from these five clones in respect to germination, both in terms of earliness and uniformity. This is unusual in the case of a plant that is considered by many to be allogamous with a high degree of heterezygosity. To the contrary, there are a number of scientists who have observed true breeding clones in cassava. Pereira *et al*. (1981) reported non-segregating progeny from Guaxupe and Mantiqueira. Also the first author of this papers that cassava may not be the typically heterozygous allogamous plant. The three principal factors attributed to this belief are: (1) its growth habit, (2) its norm of cultivation and (3) the mode of evolving present clones.

Male and famale flowers often open at the same time among older plants within a given clone. Since no self-imcompatibility. Sytems exists in cassava, it is likely that self-pollination has occurred often in older in older plants and in plantings where only one clone was represented. It is believed that the majority of the present clones appared as selected seedings plants within plantings of cloned cassava plants. Thus, they are libely to be the product of self-pollination. If this continued for several generations, one would expect to find a large amount of homozygosity whithin the soodling population of various cassava clones.

Several clones, EAB 81. EAB 484, CM 4241, Orelha do Onca, Licona, FAB 650 and Castelinho, had not germinated by 15 DAP. However, by 30 DAP germination hard progressed to the point where they where not distinguish-able from the other CPAC clones (Table). Thus, this delay can be attributed to dormancy factors. Eventhough the seeds two parameters results in adequate cause to climinate them in future breeding for early and high percentege of seed germination. On the other hand, CPAC 77 and EAB 9081 germinated well by 15 DAP and would be good canditates for a breeding programme. An added advantage for the latter clone is high level of cassava bacterial blight resistance.

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