Developing the concept of genetic stocks in cassava

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Introduction

The conservation and exchange of cassava germplasm is difficult and slow primarily due to quarantine regulations. Typically, *in vitro* plantlets must be produced and certified to be disease-free before they are moved from one country to another making this process costly, time consuming and labor intensive. To overcome these limitations, we propose to develop partially inbreed cassava genetic stocks as an alternative approach for germplasm exchange and conservation particularly when it is the source of the gene(s) for desirable trait(s).

Partially inbred germplasm as source germplasm for specific traits

If a given genotype is used as a source of one or more of the gene(s) controlling desirable trait(s), its value resides in the trait(s) [i.e. gene(s)] and not in the whole genotype. CIAT herein proposes that self-pollinations of elite germplasm (S_0) are made to produce S_1 genotypes as a means of reaching homozygosity for the gene(s) responsible for the trait. There are three different scenarios in which homozygous genotypes among the segregating S_1 progenies can be identified.

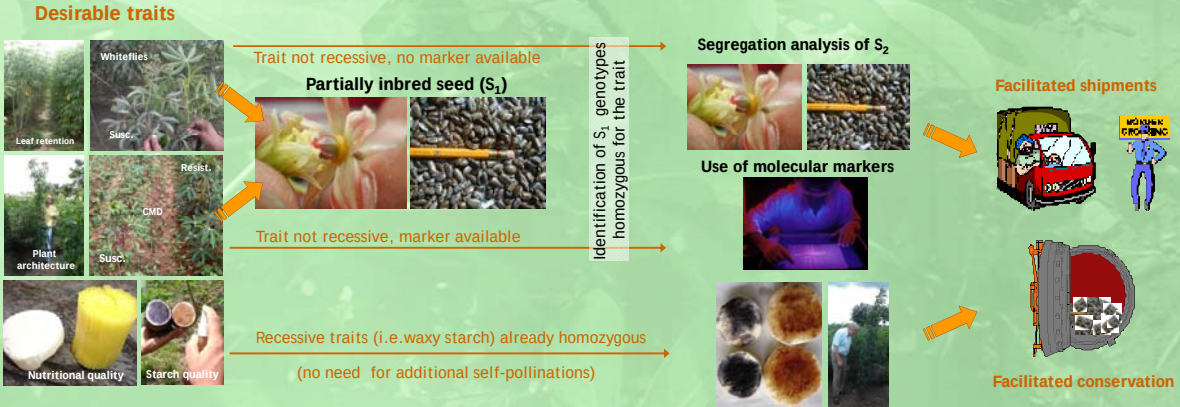
a. If the trait is recessive (i.e. amylose-free starch) only homozygous recessive genotypes will express it. Thus selection can be done based solely on the phenotype of the S_1 genotypes.

b. If the trait is dominant and molecular markers, such as SSRs (co-dominant type) are available, they can be used as surrogates to identify homozygous S_1 genotypes.

c. If the trait is dominant and no molecular marker is available for it, a second self-pollination would be necessary to identify S_2 progenies that do not segregate for the trait (indicating that the S_1 progenitor was homozygous).

Advantages of the proposed scheme

- The breeding value (for the trait) of these homozygous S_1 genotypes doubles (if the assumption of heterozygosity in the elite S_0 genotype is true). The selected S_1 genotypes could then be officially registered as a source for the desirable trait.
- The S_1 genotype could be self-pollinated to produce S_2 seeds which would also be homozygous for the desirable gene(s). The storage and exchange of these S_2 botanical seeds would be considerably less expensive and efficient than maintaining germplasm *in vitro* or in the field. Also, phytosanitary restrictions for the exchange of botanical seed are less limiting compared with the shipment of *in vitro* plants or vegetative cuttings.
- Finally, crosses of S_1 genotypes homozygous for different desirable traits can be made to produce (eventually) new S_1 genotypes combining more than one desirable trait in a homozygous form. Genetic stocks combining germplasm developed by the International Institute of Tropical Agriculture (IITA) in Africa, CIAT, EMBRAPA (Brazil) and other national programs in Africa, Asia and Latin America could then contribute to a more dynamic exchange of germplasm and a more efficient exploitation of cassava genetic resources.
- In the case of germplasm collections 30-50 S_1 genotypes could be used to represent accessions and kept as botanical seed as a back up. In this way, the original genotype would be lost but its genes would be maintained.



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