Initial description of a mutation affecting plant architecture in cassava

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Introduction

Several years ago CIAT initiated a systematic process of self-pollinating accessions from the germplasm bank, improved clones and mutagenized populations. As a result several useful recessive traits were identified and are reported elsewhere in this meeting (i.e. tolerance to post-harvest physiological deterioration, amylose-free or high-amylose starch mutations, sugary cassava, etc.)[1,2]. A peculiar phenotype, characterized by absence (MVEN331) or very short petiole (MVEN332) was known to cassava scientists at CIAT.

Results

MVEN331 was self-pollinated and produced 16 genotypes of which 12 developed into vigorous plants. Half of these 12 plants showed absence of petioles but the other half showed normal leaves with long petioles. This finding would suggest that absence of petiole is at least partially dominant, which is surprising. DNA fingerprinting is underway to confirm that the 12 plants are indeed self-pollinations of MVEN331. MVEN331 is a tall plant with profuse branching. In few cases, however, the segregating S1 genotypes did not branch, resulting in a plant type architecture that projects a shadow on the ground of a circle of less than 50 cm in diameter (Figure 1).

Conclusions

1. The plant architecture of some of the plants carrying this mutation would allow growing this type of plant at much higher plant densities allowing, perhaps, for an impact in cassava similar to the green revolution in rice and wheat or the progress attained in maize productivity over the years. Perhaps as many as 30,000 plants / ha can be planted taking advantage of this particular phenotype.

2. In addition, this plant type could facilitate the production of cassava foliage. Stems can be cut above the ground and processed with a simple machine to "peel off" the leaves. This would reduce considerably the costs of harvesting the foliage. Since one of the problems for the use of cassava foliage as animal feed is the high fiber that is mostly in the petiole, this mutation could also improve the quality of cassava foliage.

3. Crosses among these mutant plant (in few of them there was a very late flowering) with those accessions in the germplasm collection that show the petioles trait are currently underway. CIAT hopes to initiate a breeding project with this gene pool characterized by absence of petioles, and a non-branching phenotype. These crosses will recover the vigor lost as a result of the inbreeding depression typical of S_1 genotypes.

Figure 1. Illustration of a plant type mutation resulting in absence of petioles and very erect architecture. This plant type offers interesting possibilities for the future of cassava.

References

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