

IN VITRO PRODUCTION OF CASSAVA SEED TO IMPROVE THE CROP COMPETITIVENESS IN THE DEPARTMENT OF CASANARE

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INTRODUCTION

The importance acquired by cassava in the last years, due to its multiple potential uses, especially for industrial purposes, has created the necessity to increase the cultivation area. One of the main limitations to achieve this objective has been the insufficient availability of plant material propagated by traditional methods. Besides the fact that plant systemic infections, such as virus, can be transmitted by the propagation material by successive generations; these organisms affect the yield of the local cassava cultivars, and they have become an important limitation for the maintenance of germoplasm banks and for the regional and international exchange of clones (Roca W; Mroginski L.A. 1991).

The potential of cassava propagation *in vitro* widely overcomes both the traditional method and the improved greenhouse techniques; applying *in vitro* techniques is possible to satisfy almost all of the current necessities of material multiplication and to solve the problem of seed scarcity.

The pilot Project in the Department of Casanare began regarding the cassava cultivation because of the expectations it offers for the consumption in fresh as well as for the industrial market. In Casanare, cassava cultivation has been promoted through organizations of producers, which request validated technological alternatives that allow them a true sustainable industrial development (Figure 1).

Therefore, the fundamental objective of the project is to transfer validated technologies to the producers, keeping in mind the agricultural and ecological conditions of the region; this allows a greater competitiveness, profitability and access to new markets, for both the fresh and the processed cassava, starting with planting healthy seed. It is important also to educate the technical personnel of the region on this biotechnological alternative, so that they know the potential and benefits that it has to offer.

MATERIALS AND METHODS

LOCALIZATION. To fulfill the expectations to increase the cassava planted area in the department and the supply of healthy seed, the project is being developed with the financial support of COLCIENCIAS, International University Fundation of the American Tropic UNITROPICO and the Centro Microempresarial del Llano CEMILLA. The headquarters are located at the Municipality of Yopal, in El Remanso Farm, where the tissue culture laboratory, the main greenhouse and the plots of mother plants are located.

METHODOLOGY. The project was developed in five Phases:

Phase I. Micropropagation. A tissue culture lab was set up. A protocol for the *in vitro* multiplication of cassava was adapted, standardized and applied. This protocol is based on the preparation of culture medium, based on the addition of basic *Murashige and Skoog salts (1962)*. The technique of nodal segments is being applied, using the varieties: Reina, Catumare, Chiroza, verdecita and secundina (indicative) and other clones provided by the International Center of Tropical Agriculture CIAT, as alternatives for the producers and this way being able to assist the seed demands by the cassava industry in Casanare. **Phase II. Hardening.** This process consists of the step by step adaptation of the plantlets to the external environmental conditions. For this purpose, a 252 square meters greenhouse was built, including

the irrigation systems, and a protocol was standardized considering the preparation and disinfection of the substrate, preparation of the humid chamber and addition nutrients and frequency and intensity of watering. **Phase III. Multiplication of superelite seed.** Under controlled conditions and main greenhouse sanitary isolation, hardened plants were used as source of strating material and are the base for an additional propagation cycle. The resulting seed (superelite seed) enables an important change of scale and cost reduction. **Phase IV. Production of elite seed.** Farms were selected in order to multiply this seed taking into consideration the soil potential for cassava production and the producers associations. At this stage, issues of adaptability and yield of the varieties are analyzed, according to the weather and soil conditions of the region. **Phase V. Establishment of observation plots.** Besides observing the behavior and development of the varieties, these plots are the source of explants for the micropropagation process.

RESULTS AND DISCUSSION

Throughout the achievement of the proposed objectives and goals in the project it was possible:

1. Set up of a tissue culture lab with an initial capacity to propagate 23.000 plants (Figure 2);
2. Adoption, estandarization and application of protocols for the preparation of tissue culture medium;
3. Adoption and application of *in vitro* techniques to regenerate whole plants (Figure 3); the potential to establish 50 hectare of cassava was obtained;
4. Build up of a main greenhouse, with capacity to harden 43.000 plants; to date, 320.000 plants were hardened successfully (Figure 4)
5. Establishment of observation plots for mother plants;
6. Establishment of cassava seed multiplication plots, superelite and elite (Figure 5); the current production will allow the planting of 14 cassava hectare; and
7. The development of a healthy cassava seed program throughout *in vitro* culture techniques.

CONCLUSIONS

Carrying out the project allowed the building and setting of the physical plant for the development of seed production processes throughout tissue culture. In turn, this enables an important technology deployment to education and productive sectors of the region, which represents large social and economical impacts for the Casanare Department, and an additional research tool for the purposes of knowing, preserving and rescuing the botanical biodiversity in the Colombian Orinoquia.

REFERENCES

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FIGURE 1. Cassava processing plant in the Municipality of Tauramena, Casanare



FIGURE 2. Tissue culture laboratory; area of growth



FIGURE 3. Application of *in vitro* culture techniques to regenerate whole plants



FIGURE 4. Hardening of plantlets in greenhouse



FIGURE 5. Cassava seed multiplication plots, superelite and elite