The Bonsai as an alternative safety duplication system of the world cassava collection preserved at CIAT

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INTRODUCTION

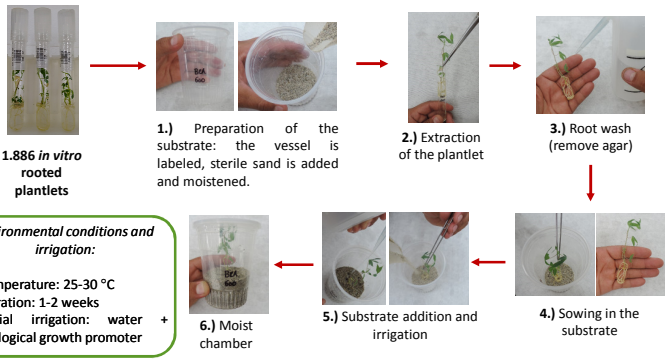
The germplasm bank of CIAT houses more than 6,000 accessions of cassava (*Manihot esculenta* Crantz) constituting the most important collection for this crop. In order to guarantee the safety of the materials, the collection has an international duplicate kept at the International Potato Center (CIP) in Peru under *in vitro* conditions. However, due to the difficulties in having this system of duplication sustained for long periods of time, it was decided to keep the backup on a slow-growth scheme under greenhouse conditions. *In vitro* plants must undergo a hardening or acclimatization phase of approximately four weeks, which takes into account factors such as substrate, control of environmental conditions and pathogens to prevent loss of material. In this work, the use of a methodology for the establishment of materials in greenhouse was evaluated and compared with four systems previously used for this purpose. Modification in the substrate, the use of a biological inoculant, moist chamber conditions and fertilization allowed the establishment of 1,818 accessions with a loss rate of less than 4%, compared to the initial number of plants (1,886) which indicates that the methodology evaluated is adequate for their hardening. The plants were obtained from the *in vitro* cassava collection and were tested and found free from three diseases considered of quarantine for the Americas: Cassava common mosaic virus, Cassava frogskin agent and Cassava virus "X". These materials have also been tested and found to be free of *Reovirus, Luteovirus, Torradovirus and Potexvirus*. The bonsai copy allows to safeguard a greater percentage of accessions for prolonged periods, since, by restricting the growth of the root in plastic containers and with controlled prunings, it is possible to maintain the plants for more than two years, time greater than achieved with the duplication system with *in vitro* techniques.

OBJECTIVE

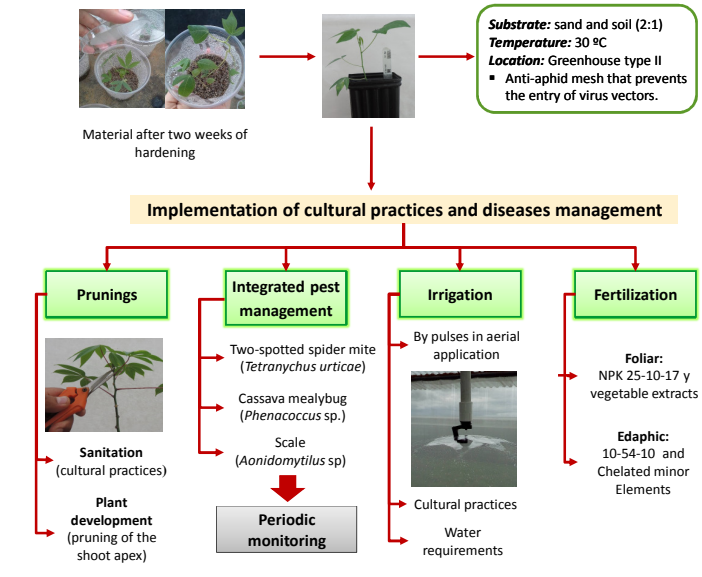
Establish the complete copy of the world cassava collection under slow-growth conditions in the greenhouse.

MATERIALS AND METHODS

1. Acclimatization of *in vitro* material



2. Transplant to plastic container



RESULTS AND DISCUSSION

In vitro material hardening

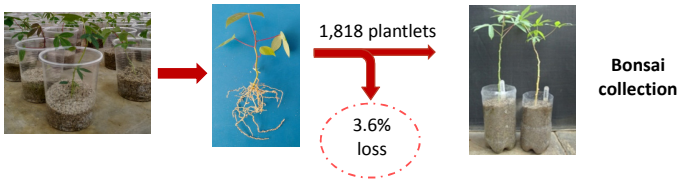


Figure 1. Diagram of hardening process of material in greenhouse.

The acclimatization procedure resulted in the establishment of 1,818 healthy plants with a material loss of 3.6% (Figure 1). This result indicates that the implemented methodology provides a better adaptation to the conditions of the greenhouse by promoting the root development in the material, the cuticle formation and the photosynthetic activity. Additionally, the use of microbial inoculants in the process allows the assimilation of major elements such as Nitrogen (N) and Phosphorus (P), contributing to the production of phytohormones, organic acids and phosphatases, which improves protection against pathogenic fungi (Puente *et al.*, 2010), adapting the plantlets to the humidity chamber, thus increasing the survival of the materials (Figure 2).

Figure 2. Safety duplicate in greenhouse under slow-growth conditions.

CONCLUSIONS

- With the hardening methodology implemented, a greater number of materials with a loss rate of less than 4% was achieved, indicating that the process gradually provides adequate environmental conditions for the development of vitroplants, avoiding the appearance of phytosanitary problems.
- With the implementation of the irrigation system in aerial application the reduction of the temperature and the increase of the relative humidity was achieved, interrupting the biological cycle of the insect and reducing its incidence without causing the appearance of other sanitary problems.
- The maintenance of the bonsai collection represents an alternative and robust system to the *in vitro* conservation system, which guarantees the safety of the collection while other methods are developed (cryopreservation).

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