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BREEDING ARRACACHA (*ARRACACIA XANTHORRHIZA*) AT CNPH-EMBRAPA, BRAZIL

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Abstract

Arracacha is an important vegetable in Brazil; it has a cultivated area of 10,000 ha/y and a market value of US$100 million. Its roots, which are used in salty preparations of soups and baby food, are appreciated for their pleasant taste and easy digestibility. This crop is a significant source of vitamins A (87.0 RE/100 g) and C (23.7 mg/100 g). Few clones are cultivated in Brazil, creating a genetic uniformity that is not only a serious threat in terms of attack from pests and diseases, but also limits the expansion of cultivated area to other environments. Since 1989, the CNPH-EMBRAPA has been conducting a breeding programme, using botanical seed harvested from original clones introduced to Brazil some decades ago. Wide variation has been observed in the segregating progenies originated from seed lots obtained from these clones. Phenotypical variation includes leaf size, shape, and colour; root production, colour, shape, and flavour; vitamin A content; and plant earliness and architecture.

Introduction

Arracacha or Peruvian carrot (*Arracacia xanthorrhiza* Bancroft) is an asexually propagated vegetable, grown commercially in Venezuela, Colombia, Ecuador, Peru, Bolivia, and Brazil. Currently, most of the Brazilian crop is produced in the states of Paraná, Espírito Santo, and Minas Gerais. The area devoted to arracacha production is increasing annually, with a total cultivated area of 10,000 ha/y. Genetic uniformity exposes the crop to attack from pests and diseases, and limits expansion of the cultivated area to other environments. Clones were introduced by the Instituto Agronômico de Campinas (IAC) some years ago, but, although these showed wide variation in root colour (Normanha and Silva 1965), only yellow-rooted clones were commercialized in Brazil.

Breeding Activities at CNPH-EMBRAPA

Centro Nacional de Pesquisa de Hortsliças (CNPH) of EMBRAPA, Brasília, Brazil.

Since 1989, a breeding programme, with the goal of developing high-quality cultivars that can be produced at low cost, has been conducted by the Centro Nacional de Pesquisa de Hortaliças (CNPH, or the National Vegetable Crop Research Centre) of the Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA). Improved cultivars were to have high yield, plant earliness, desirable root colour, good culinary qualities, and other traits necessary for efficient production and marketing such as disease and insect resistance, good storage characteristics, and better field performance.

The reduced number of introductions maintained in our germ plasm collections is a major limitation to establishing an effective breeding programme. Arracacha collections in Brazil have a narrow genetic base (Casali and Sediyama 1984). The usual approach to breeding clonal crops such as arracacha is to generate segregating populations that allow selection. Given the lack of techniques for artificial hybridization in this crop, our breeding programme is first working with segregating populations originated from open-pollinated seeds harvested in fields cultivated for commercial production. Genotypes originating from these seeds are probably highly heterozygous, and the outstanding clones may represent favourable heterotic combinations (Simmonds 1979).

Commercial clones—when cultivated at higher altitudes (>900 m) in Minas Gerais, Santa Catarina, and Paraná—set flowers regularly in August and September. Seeds can be harvested during December and January. Great variation in leaf size, shape, and colour; root colour, shape, and flavour; plant earliness and architecture; and root production has been found in those clones originating from seed produced by commercially cultivated clones. Clone breeding is easy and quick because the genetic variability is instantly fixed.

In 1993, 154 clones, originating from segregating seed produced by a commercial clone (90134) grown in Minas Gerais State, were evaluated for total root production in a randomized complete block design with four replicates. One-fourth of the clones (38) produced >860 g/plant, the average root production per plant of the original clone (90134) at 10 months after planting (MAP). Plant earliness was observed in 6% of these clones, which had an average root production of 954.9 g/plant at 6 MAP. The commercially cultivated clone produced only 240.6 g/plant at early harvesting.

Considerable research effort is necessary to improve and develop methods of artificial hybridization for this crop to facilitate working with a broader genetic base, and thus increase the possibility of selecting superior clones.

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