

"OFF-TYPE" BANANA PLANTS OBSERVED IN A COMMERCIAL PLANTING OF GRAND NAIN PROPAGATED USING THE *in vitro* CULTURE TECHNIQUE

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Tissue culture plantlets of the Grand Nain cultivar were obtained from a private laboratory in the US and commercially grown in Puerto Rico. On the basis of the data obtained and the field observations made the percentage of abnormal plants varied from one shipped batch to another, ranging from 5 to 19%. The "off-type" plants exhibited either an abnormal dwarf or a tall pseudostem. Dwarfing was characterized by a disproportionate growth between pseudostem height and diameter, with leaves compressed together forming a rosette. The racemes were small, deformed, containing crowded hands with short, stout and curved fruits with the apex acute or strongly constricted. Suckers from these plants continued to show these undesirable characteristics in the ratoon crops.

INTRODUCTION

Puerto Rico does not export bananas, but has the soils, water, climate, and the infrastructure necessary to establish a modern banana industry.

In 1981, the U.S. Department of Agriculture-Agricultural Research Service, in cooperation with the Agricultural Experiment Station of the University of Puerto Rico, initiated a research program to determine the best techniques for producing high yields of good quality bananas. The first priority was to evaluate the best cultivars under different ecological conditions.

Since the establishment of the program the following has been accomplished: Pool (4) obtained yields of 48.4 t/ha of marketable fruits from the plant crop of Grand Nain grown with drip irrigation in the semi-arid region of Puerto Rico. On the other hand, Irizarry and Vicente-Chandler (2) evaluated the same cultivar at three locations in the humid region and reported yields of 33.6, 53.8 and 56.1 t/ha in the plant crop. In all cases, plantlets were obtained from a private tissue culture laboratory in the United States.

This paper reports some of the plant abnormalities (off-types) observed in a commercial field and in experimental plots.

MATERIALS AND METHODS

Various shipments of second-stage tissue culture banana plants of the Grand Nain cultivar were received from a private supplier, and planted in black poly-

ethylene plastic bags filled with peat-moss and sterilized soil. The explants were maintained in the greenhouse for 3 to 4 weeks under 40% shade and intermittent mist. Later the plants were placed in full sunlight for 2 weeks and then transplanted to the field at distances of 1.8 by 3.5 m, 1,590 plants/ha.

The commercial planting was established in the semi-arid region (South Coast) of Puerto Rico on a San Antón silty clay (Cumulic Haplustolls). Water was applied by drip irrigation at a weekly rate of 100 to 125 mm/ha. A total of 250 kg of N and 617 kg of K₂O were injected/ha into the drip irrigation system during a period of 40 weeks. Nematodes, the corm-weevil (*Cosmopolites sordidus*), foliar diseases and weeds were controlled following the recommendations of the Agricultural Experiment Station (1). Plant measurements were made at bunch shooting (210-225 days), and the bunches were harvested 90 to 115 days later.

RESULTS AND DISCUSSION

Phenotypic changes were not observed until the plants were approaching the bunch shooting stage. At this period, many plants produced deformed bunches with little or no commercial value (Fig. 1).

These off-types appeared at random among the explant population, and varied from one batch to another. In the first shipment of 1,000 explants 50 off-types were recorded, whereas in another group, 380 individuals exhibited various degrees of plant and bunch variability from a population of 2,000 explants. In all cases, suckers left to produce a ratoon crop or used for new plantings continued to show undesirable characteristics.

Calculated yields obtained from normal plants were 20 t/ha more than the production recorded from off-type individual (Table 1). Normal bunches were 38% heavier and contained more hands than off-type bunches. Plant growth habit was also variable.

Apparently, plants of the *Musa* genus propagated via meristem tips are subject to considerable somaclonal variation. With plantains, Irizarry *et al.* (3), Ramcharan and Knausenberger (5) and Ramcharan and González (6) reported 23 to 31% bunch reversion from Horn to French type when the Horn-Maricongo cultivar was propagated using meristem tips. On the other hand, Irizarry *et al.* (3) using conventional suckers propagation in the evaluation of Maricongo clones also recorded 0.2% bunch reversion and other fruit characteristic changes. They postulated that chimeras may be involved or responsible for the observed changes.



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Fig. 1. Abnormalities exhibited in off-type Grand Nain plant propagated via tissue culture:
A— Dwarf plant with an abnormal bunch emerging between compressed leaves, Bunches showing:
B— Crowded hands and deformed fruits, C— Short, stout and curved
fruits with the apex strongly constricted, and D— Widely spaced hands.

Table 1. Comparison between normal and off-type Grand Nain plants for yield and other bunch and plant characteristics

Characteristics	Normal	Off-type
Yield (t/ha)	51.7	31.8
Bunch weight (kg)	20.5-45.5 (Ave. 32.5)	11.4-27.3 (Ave. 20.0)
Hands/bunch (No.)	7.0-12.0 (Ave. 9.6)	5.0-9.0 (Ave. 7.1)
Plant height (M)	2.3-2.7	1.6-2.9
Pseudostem diameter (Cm)	15.4-21.4	10.0-17.8

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