Effect of Planting Season on Yield and Other Horticultural Traits of the Horn-Type Plantain Maricongo (*Musa acuminata* × *M. balbisiana*, AAB) in North-Central Puerto Rico[1]

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ABSTRACT

The influence of time of planting on yield and plant, bunch, and fruit characteristic of the Maricongo plantain was determined on bimonthly plantings at the Corozal Substation from May 1972 to March 1974. Time of planting affected bunch weight, number of marketable fruits, hands, and fruit size. A schedule of planting during the first half of January, July, September, November, and December is suggested for this area to reduce seasonal effects and avoid the usual summer surplus.

INTRODUCTION

Plantain (*Musa acuminata* × *M. balbisiana*, AAB) farming is usually a year-round operation in Puerto Rico, but there is surplus during summer and early autumn and scarcity during the winter and spring months. During the off-season, prices can double, and imports are necessary to satisfy the local demand.

Information on the effect of planting season on production can help to space production evenly throughout the year. Sánchez-Nieva et al.[3] suggested that summer production peaks are a seasonal effect. They recommended three planting schedules to make fruit production more uniform throughout the year.

This paper presents results of a study to determine the effect of planting season on time of harvest, yield, and plant, bunch, and fruit characteristics of the Maricongo cultivar.

MATERIALS AND METHODS

Two bimonthly planting cycles were tested during the first week of May, July, September, and November 1972–73, and of January and March 1973–74 at the Corozal Substation.The Substation is located 213 m above sea level with a mean temperature of 25° C and average annual rainfall of 187 cm. The soil is Corozal clay (Ultisol) with a pH of

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[3] Sánchez-Nieva, F., Hernández, I., Guadalupe, R., and Bueso, C., 1971. Effect of time of planting on yields and processing characteristics of plantains, J. Agric. Univ. P.R., 55(4): 399–404.

4.8 and a 40% slope. The field was plowed and limestone applied at the rate of 6.7 t/ha.

The six bimonthly plantings in each year-cycle were arranged in an incomplete randomized block design with four replicates. The experimental plots were 5.5 × 9.1 m with 18 plants spaced at 1.8 × 1.5 m, surrounded by border rows and 4 m wide alleys.

Suckers for planting were obtained from apparently virus-free plants with a tested yield capacity of 40 or more marketable fruits/bunch. The corms were peeled to remove old roots and necrotic tissue, and dipped for 5 min in a solution containing 11 ml DBCP 70–75 E.C. and 25 ml aldrin/ 3.8 l water.

Dasanit[4] (Fensulfothion) (10% granular) was applied at the rate of 56 g/plant, 6–8 weeks after planting and every 6 months thereafter. The plantains were sprayed every 21 days with Esso orchard oil at the rate of 9.4 l/ha starting 6 months after planting to control the Sigatoka disease caused by *Mycosphaerella musicola* (*Cercospora musae*).

All plots were fertilized with 10-5-20 containing 74.7 kg of MgO/t at the rate of 340 g/plant 2, 5, and 9 months after planting.

Weeds were controlled with paraquat applied at the rate of 2.3 l/ha and occasionally supplemented with 5.6 kg/ha of dalapon.

Monthly rainfall, and minimum and maximum air temperatures were recorded throughout the experiment. Number of functional leaves, plant height, and trunk diameter were determined at time of bunch-shooting. Height was measured from the base of the plant to the lower point of bunch initiation and diameter 1 m above the base of the trunk. Except for the September 1972 planting that was affected by gale-force winds, all bunches were harvested approximately 110 days from date of bunch-shooting. At harvesting, data were obtained on the following: Number of functional leaves and suckers/plant, weight and number of marketable fruits/bunch, number of fruits in the first and second hands, and total hands/bunch. Mean fruit weight, external length and minimum and maximum diameters, pulp:peel ratio, pulp content and texture were determined for fruits of the third hand using the procedures described by Sánchez-Nieva et al.[5]

[4] Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico or an endorsement over other equipment or materials not mentioned.

[5] Sánchez-Nieva, F., Colom-Covas, G., Hernández, I., Guadalupe, R., Díaz, N., and Viñas, C. B., 1968. Preharvest changes in the physical and chemical properties of plantains, J. Agric. Univ. P.R., 52(3): 241–55.

RESULTS AND DISCUSSION

Number of functional leaves at bunch-shooting and at harvest time, as well as number of suckers at harvest, were significantly affected by planting date (table 1). May, July, September, and November plantings had an average of 12 functional leaves at bunch-shooting, compared to 10 leaves for January and March plantings. At harvest, only plants from May to July plantings retained significantly more functional leaves than those of other planting dates.

May and July plantings bore a significantly larger number of suckers at harvest than did January and March plantings.

Plant height and diameter were not affected by planting date. Mean plant height and diameter were 3.5 m and 16.8 cm, respectively.

TABLE 1.—*Mean number of functional leaves at bunch-shooting and at harvest, and number of plant suckers at harvest, as affected by planting date over a 2-year period at Corozal*

Planting date	Functional leaves at		Plant suckers at harvest
	bunch-shooting	harvest	
January	10.4 c[1]	5.1 b	5.3 bc
March	10.0 c	5.7 b	5.1 c
May	11.8 ab	7.5 a	7.3 a
July	11.8 ab	7.4 a	7.2 a
September	12.3 a	5.7[2]	7.1[2]
November	11.6 b	4.8 b	6.5 ab

[1] Values followed by one or more letters in common do not differ significantly at P = .05.

[2] 1972 data not available for statistical analysis.

Planting date affected bunch weight, number of marketable fruits and total hands/bunch (table 2). May plantings on the average yielded the largest bunches (44 marketable fruits weighing 12.9 kg), whereas March plantings produced the smallest bunches with only 39 marketable fruits and a mean weight of 10.3 kg. The largest numbers of hands/bunch were produced in May, July, September, and November plantings, averaging 7 hands.

Planting date did not influence number of fruits in the first and second hands, which averaged 9.3 and 8.1 fruits, respectively.

Fruits from May plantings had greater diameters than did those from March plantings (table 3). Comparisons among other planting treatments were not significant.

Fruits harvested from May and July plantings had a significantly softer texture (undesirable) than did those from November through March plantings.

Planting date did not affect mean weight, external length, pulp: peel ratio, and pulp content of the fruits. Mean values for those parameters were 260.3 g, 18.3 cm, 1.6 and 61.6%, respectively.

The reduced bunch weight, number of marketable fruits, hands/bunch, and fruit thickness obtained from March planting may be attributed to a reduction in number of functional leaves at the critical stage of bunch-shooting, and to low rainfall during bunch growth and

TABLE 2.—*Plantain production as affected by planting date during a 2-year period at Corozal*

Planting date	Mean bunch weight	Marketable fruit/bunch	Hands/bunch
	Kg	No.	No.
January	12.1 ab[1]	42.1 ab	6.5 bc
March	10.3 b	39.4 b	6.3 c
May	12.9 a	44.1 a	7.1 a
July	11.9 ab	43.2 a	6.9 ab
September	11.8[2]	43.9 a	7.0 ab
November	11.7 ab	42.8 ab	6.7 ab

[1] Values followed by one or more letters in common do not differ significantly at P = .05.

[2] 1972 data not available for statistical analysis.

TABLE 3.—*Fruit characteristics of the third hand as affected by planting date during a 2-year period at Corozal*

Planting date	Mean diameters of fruits		Mean fruit texture
	Minimum	Maximum	
	Cm	*Cm*	*Kg/cm²*
January	4.10 ab[1]	4.50 ab	42.96 a
March	3.95 b	4.35 b	41.62 a
May	4.15 a	4.53 a	38.18 b
July	4.10 ab	4.48 ab	37.19 b
September	4.13[2]	4.53[2]	43.99[2]
November	4.10 ab	4.48 ab	44.06 a

[1] Values followed by one or more letters in common do not differ significantly at P = .05.

[2] 1972 data not available for statistical analysis.

enlargement. Reduction in number of functional leaves from this planting may be attributed, in turn, to low rainfall and not to Sigatoka, since the oil sprays effectively protected all plants. Rainfall was scant following the bunch-shooting peak of the March planting (fig. 1). Average monthly rainfall for May, June, and July was only 6.7 cm, or 4.5 cm below normal. Sánchez-Nieva et al. reported a similar relationship between bunch weight and number of leaves in early-year plantings at this location, but they attributed it to plant health factors.

The main bunch-shooting peaks for each planting are presented in figure 1. These peaks occurred in a 3-month span for all planting dates. However, March, May, and July plantings exhibited a definite and sharp flowering peak and the latter two coincided in their highest flowering peak. The September through January plantings exhibited a more uniform distribution of flowering over the 3-month span. During this period, the bunch-shooting percentages for the September through July plantings were 59.2, 64.3, 55.9, 78.1, 69.0, and 60.9%, respectively.

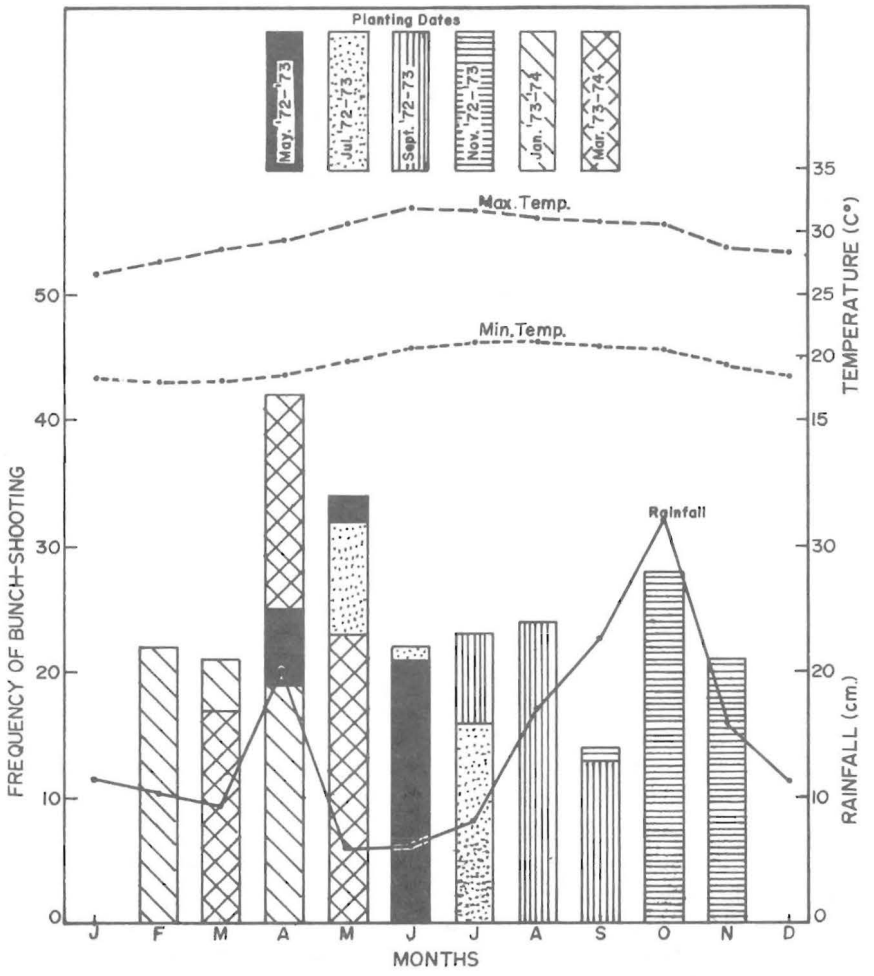

FIG. 1. – Number of plants shooting, average monthly rainfall, and maximum and minimum air temperatures recorded at the Corozal Substation from May 1, 1972 through August 31, 1975.

Since all bunches matured about 3.5 months from the bunch-shooting date, harvest peaks can be predicted from flowering dates.

Under Corozal conditions, January through May plantings took 15 to 19 months to yield a peak production, January planting being the latest with 17 to 19 months. On the other hand, July through November plantings took only 14 to 16 months to reach peak production. Since plantings during the first half of the year were also affected by drought during the early stage of plant growth, the lateness of the crop may be attributed to this condition.

None of the plantings resulted in appreciable bunch-shooting peaks during the months of December and January (fig. 1). The March and May plantings, however, greatly contributed to the summer production peaks. The data suggest that the establishment of plantings during the first or second week of January, July, September, November, and December would reduce the summer surplus and result in more uniform production throughout the year. The exclusion of March and May plantings should reduce the March-throughout-June flowering peaks and therefore the June-throughout-September harvest. On the other hand, the addition of a December planting should promote bunch-shooting peaks during the following December and January with a peak production expected from February to April when plantains are scarce and prices are attractive.

RESUMEN

Dos ciclos de siembras bimestrales de plántanos se establecieron en la Subestación de Corozal, comenzando en mayo de 1972 y terminando en marzo de 1974, con el propósito de determinar el efecto de la época de siembra sobre la producción y otras características de la planta, el racimo y el plátano del cultivar Maricongo (*Musa acuminata* × *M. balbisiana*, AAB).

Aunque todos los racimos se cosecharon a la misma edad a partir de la fecha de inducción, la siembra de marzo produjo racimos de menos peso y frutas pequeñas de baja calidad. Se atribuye este hecho al reducido número de hojas funcionales que tenían las plantas durante el tiempo crítico de la inducción y a la poca lluvia que se registró en el área durante los 3 meses subsiguientes.

Para evitar que toda la producción venga en los meses de verano, se recomienda que en esta área se establezcan siembras escalonadas durante la primera o segunda semanas de enero, julio, septiembre, noviembre y diciembre. Siguiendo este plan de siembra se podrían reducir las fluctuaciones en producción y obtener un producto de calidad todo el año.