Effect of Planting Material on Plant Characters, Yield, and Yield Components of Tanier (*Xanthosoma caracu* Koch and Bouché) in Southern Florida[1]

A. Beale, V. E. Green, Jr. and J. L. Parrado[2]

ABSTRACT

The effect of the type of vegetative planting material on white fleshed tanier (*Xanthosoma caracu* Koch & Bouché) plant characters, yield, and yield components was determined at 10.5 and 12.5 months after planting. No statistically significant differences were found between yields of plants propagated from apical (crowns) or nonapical main corm sections or from small whole secondary cormels. However, cormels and crowns produced plants with larger yields of total and of marketable cormels at 10.5 months, and larger yields at 12.5 months after planting than plants from sections.

Sections yielded less, produced fewer cormels per hectare and developed more multiple shoots per plant than crowns or cormels. Sections produced the lowest number of plants per hectare and the lowest number of plants with one shoot per seed piece per hectare. Cormels produced fewer sprouts at 2 months after planting than sections or crowns, and yielded more at 10.5 and 12.5 months than sections, but did not increase in yield between 10.5 and 12.5 months after planting as did the crowns or sections. Thus, plants propagated from cormels required a shorter growing season from planting to harvest. There were more marketable cormels per plant when cormels were used for planting. Crowns yielded slightly less (0.6 metric tons/ha) than cormels at 10.5 months, and slightly more (0.5 metric tons/ha) at 12.5 months, after planting.

INTRODUCTION

Tanier is the second most important starchy root crop in Puerto Rico. Production during the 1976–77 season amounted to 12.9 thousand metric tons valued at $5 million (4). In Florida, production for the 1977–78 season was 15.8 thousand metric tons worth approximately $12 million (11).

Tanier is propagated commercially by vegetative means (9, 10). Puerto Rico and Florida growers prefer to use apical (crown) sections of the

[1] Submitted to Editorial Board January 15, 1980.

[2] Assistant Agronomist, Agricultural Experiment Station, University of Puerto Rico, Río Piedras, Puerto Rico; Professor (Agronomist), Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida; and Laboratory Technician, IFAS/UF Agricultural Research and Education Center, University of Florida, Homestead, Florida.

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[3] Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this mention a statement of preference over other equipment or materials.

main corm as planting material. They claim crowns sprout sooner and that plants grown from crowns require a shorter growing season to produce the same yield as plants from nonapical sections of the main corm (sections) or from small secondary cormels. Although one hectare of harvested tanier yields enough vegetative material to plant 10 hectares, crowns represent less than 10% of the total.

Under Florida conditions, the basal part of the main corm is cut off and discarded. However, research by Barrios (2) and Enyi (5, 6) showed that the basal part of the main corm produced higher yielding plants than other sections of the main corm or other types of planting material. Cunliffe (3) compared small-, medium- and large-sized cormels of the short or of the long form. He reported that large cormels of both the short and long form outyielded the medium or small size cormels, and cormels of the short form of the large, medium, or small form outyielded those of the long form. In another study, Cunliffe found that plants from main corm sections outyielded those from small, medium, or large cormels. Averre (1) commented that higher yields were associated with the use of larger seed pieces.

If it were found that one type of planting material is superior to the others, it would be beneficial for the grower to use it; if not, all types of planting material would be equally desirable, and instead of producing enough planting material per hectare to plant an additional hectare, enough material per hectare would be available to plant 10 ha.

The research reported here was conducted to determine the effect of apical or nonapical main corm sections and of secondary cormels on sprouting 2 months after planting, and on plant characters, yield, and yield components 10.5 and 12.5 months after planting.

MATERIALS AND METHODS

An experiment was planted in a Rockland soil (7) in Homestead, Florida, March 3, 1977. It consisted of three types of planting material replicated eight times in a randomized complete block design. Each plot consisted of three rows 1.2 m apart and 30.5 m long. There were 300 seed pieces per plot. Planting distances were 31 cm within the row and 122 cm between rows. The seed pieces were placed in the bottom of a furrow and covered into a bed. Weeds were controlled by a preemergence broadcast spray of paraquat[3] (1,1′-dimentyl L-4,4′ bipyridinium) 1 month after planting, and subsequently either mechanically between the rows or by hand. Plots were fertilized 1 month and 4 months after planting with a 6-12-9 fertilizer. A total of about 80 kg/ha N, 10 kg/ha K was applied. The taniers were cultivated three times; the third time 4 months after planting.

The soil had a pH of 7.7 at planting. In the top 100 mm of soil, according to sufficiency standards for this crop, there were high amounts of nitrate-

N (85 p/m), adequate amounts of P (8 p/m) and adequate amounts of K (95 p/m). The plots were irrigated once a month.

RESULTS AND DISCUSSIONS

Two months after planting, more sprouting was found when the apical or nonapical sections of the main corm were used as planting material than when the secondary cormels were used (table 1). No differences in yield were found at 10.5 and 12.5 months after planting among the plants arising from the three types of planting material. At 10.5 months, no differences were found among the plants grown from the three types of planting material with respect to the average weight of all the cormels of the yield of marketable cormels, the average weight per cormel of both the marketable and the nonmarketable size, the total number of cormels per plant, the marketable cormel weight per plant, or the number of marketable cormels per plant (table 1).

Where secondary cormels were used as planting material, the resulting plants produced more total cormels and marketable cormels per hectare than when the apical or non-apical sections of the main corm were used (table 1). When the non-apical main corm sections were used the number of shoots per hectare was higher, while the total number of plants per hectare and the number of plants per hectare with only one shoot was lower than when the other types of planting materials were used.

Results indicate that both the apical and nonapical main corm sections are preferable to cormels with respect to early plant development since they had twice as many sprouts 2 months after planting than the cormels did. Although the sections had produced more shoots per hectare than the crowns or the cormels 10.5 months after planting, they had produced fewer total plants and fewer plants with only one shoot than the other types of planting material. Sections are approximately cubic. Five of their six sides consist of exposed inner tissues. No inner tissue is exposed to the environment when cormels are used; and when crowns are used, only one side is exposed to the environment. If the sections are not allowed to suberize properly before planting, disease-causing organisms are more severe on the exposed areas of the sections than on the crowns or cormels. More rotting of the sections occurs, and fewer plants per hectare survive. In addition, a physiological rot occurs in the sections of taniers not properly suberized and planted in marl soils of South Florida during January and February; this rot is due to the desiccation of the seed piece when irrigation is not practiced shortly after planting.

Prior to the experiment, the effect of multiple shoots per seed piece on yield was not known. One theory was that the more shoots produced, the more leaves. Since shoots tend to be of different sizes, leaf distribution is better for light interception, and more photosynthesis takes place. Under

TABLE 1.—*Effect of the type of planting material on the sprouting, plant characters, yield and yield components at two harvest dates*

Treatment	No. sprouts/ ha[1]	Total yield[2]	10.5 months after planting					Total yield 12.5 months after planting
			Total no. cormels/ha	Mean weight/ cormel	Mean weight of marketable cormels	Marketable yield	Marketable cormels/ha	
	10^3	*Metric tons/ha*	*10^3*	*10^3*	*g*	*Metric tons/ha*	*10^3*	*Metric tons/ha*
Whole secondary cormel	8.4 b[3]	8.6 a	73.9 a	116 a	155 a	6.0 a	38.5 a	9.4 a
Nonapical main corm section	17.3 a	6.7 a	54.3 b	124 a	171 a	4.9 a	28.3 b	8.7 a
Apical main corm section	16.3 a	8.0 a	66.3 ab	121 a	174 a	5.5 a	31.8 a	9.9 a

[1] Two months after planting at a density of 27,300 seed pieces per ha.

[2] Total yield includes the weight of both commercial and non-commercial secondary corms, but does not include the weight of the main corms.

[3] Means within a column followed by the same letters do not differ significantly at the 5% level according to Duncan's multiple range test.

this theory, early promotion of sprouting would increase an early crop canopy and lead to higher yields. However, some of the shoots may come from sprouted cormels, so they would exert their influence only during the latter part of the growing season. A second theory is that each sprout tends to develop its own main corm and root system. It behaves as a semi-independent plant. The sprouts would be in competition with each other and expend a greater amount of their photosynthate in main corm, leaf, and root development. Each sprout would be smaller than if only one sprout had developed from the seed piece. Due to less photosynthate available per sprout, most of the secondary cormels would not develop to commercial size, so yield would be reduced. An average of 1.10, 1.22, and 1.64 shoots per plant were produced by cormels, crowns, and sections, respectively. Results indicate that the higher the number of shoots per plant at 10.5 months of growth, the lower the yield.

In the 2-month period from the first to the second harvest, the plants from sections and from crowns increased in yield by 2.0 and 1.9 t/ha respectively; while the plants from cormels increased only 0.8 t/ha (table 1). The plants from cormels were not only slower to sprout, but also completed their growth cycle sooner. It has been shown that in yam, heavier seed pieces of the same type produce the highest yields (6). The reason given for the higher yields is that there is a greater supply of reserves available to the plant from the large seed piece as compared to the one from the small seed piece. Perhaps the same mechanism is involved in tanier. Although small crowns and sections were used to plant the experiment the cormels were always smaller than the crowns and sections used, so that they could supply the new plants with less reserve.

The total cormel weight, the marketable cormel weight, and the number of marketable cormels per hectare, as well as the total cormel weight and number and the marketable cormel weight per plant, were greatest when cormels were used and smallest when sections were used, although not significantly so. The total number of cormels per hectare was significantly greater for plants from cormels than from plants from sections.

RESUMEN

El efecto del tipo de material vegetativo de la yautia (*Xanthosoma caracu* Koch & Bouché) usado para la siembra se estudió con relación a las características de las plantas, el rendimiento, y algunos componentes de rendimiento a los 10.5 y 12.5 meses después de la siembra.

No hubo diferencias estadísticamente significativas en rendimiento entre las plantas provenientes de los distintos tipos de material vegetativo. Las secciones no apicales del cormo principal produjeron el menor número de plantas por hectárea y el menor número de plantas con un solo vástago por semilla vegetativa por hectárea que los otros tipos de

semilla vegetativa. Los cormelos secundarios produjeron menos tallos por semilla vegetativa a los 2 meses de sembrados que los otros tipos de semilla, pero no aumentaron de peso en el período de 10.5 a 12.5 meses después de la siembra como fue el caso con las secciones apicales o con las secciones no apicales. Los resultados indican que el tiempo para completar el ciclo de siembra a cosecha de las plantas provenientes de cormelos secundarios es más corto que la de los provenientes de los otros tipos de semilla. El número de cormelos comerciales producidos por planta fue mayor cuando se usaron cormelos secundarios para la siembra que cuando se usaron otros tipos de semilla vegetativa. Las porciones apicales del cormo principal produjeron plantas que produjeron algo menos (0.6 toneladas métricas/ha) a los 10.5 meses que cuando se usaron cormelos secundarios, y algo más (0.5 toneladas métricas/ha) a los 12.5 meses después de la siembra.

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