Yield of two yam (*Dioscorea alata*) cultivars with three planting dates and two planting systems[1,2]

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ABSTRACT

The production potential of yams cv. Binugas and Gunung was determined by using three planting dates and two planting systems. The yams were planted in March, May and July 1990 on raised and flat rows without vine support at the close spacing of .91 by .30 m. Regardless of planting date and planting system, these cultivars performed similarly with respect to marketable and premium weights, tuber size and non-marketable weight. Planting system has no significant effect on cultivar performance. The best planting date was March, with a marketable production of 70,590 kg/ha. About 88.2% or 62,254 kg/ha was highly graded tubers. The delay in planting from March to July significantly reduced yields by 44.8%.

RESUMEN

Rendimiento de dos cultivares del ñame *Dioscorea alata* sembrados en tres épocas y dos sistemas de siembra

Se estudió el comportamiento agronómico de los ñames 'Binugas' y 'Gunung' en siembras de marzo, mayo y julio de 1990 con bancos y sin bancos, sin soportes y a la corta distancia de .91 m entre surcos y .30 m entre plantas. Irrespectivo de la época y el sistema de siembra, ambos cultivares se comportaron similarmente con respecto al rendimiento, el tamaño y la forma de los tubérculos vendibles y la producción no mercadeable. El sistema de siembra no afectó significativamente el comportamiento de los cultivares. La mejor época de siembra fue marzo, con un rendimiento máximo de 70,590 kg/ha. El retrasar la siembra hasta julio redujo substancialmente el rendimiento en un 44.8%.

INTRODUCTION

Local yam production declined from 15,450 metric tons in 1979-80 to 10,880 metric tons in 1989-90 (7). About 4,900 metric tons is imported annually to satisfy the local demand. Local consumption for year 2000 is

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[2]This paper covers work carried out cooperatively between the Agricultural Research Service-USDA and the Agricultural Experiment Station, University of Puerto Rico (UPR-AES), Río Piedras, Puerto Rico.

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estimated at 17,700 metric tons (9). The drop in production is mainly caused by low yields, disease problems and high production inputs.

The availability of superior cultivars such as Binugas (P.I.390072) and Gunung (P.I.390102) offers growers an opportunity to increase production at a reduced cost. These yams have a proven yielding capacity of 60,000 to 72,500 kg/ha per growing season (2, 4), possess field resistance to virus and foliar diseases (3, 6), and can be successfully grown with the vines creeping on the soil or without support (4, 5). This low input management practice saves growers about 21% of the total cost of production. However, when these yams are not properly managed, they often produce oversized and off-shaped tubers which bring lower prices at the farm gate.

The local recommended planting date for yams grown on traditional raised rows with vine support is January through April (1). However, there is no published data available in support of this recommendation. This paper reports on the yield potential of 'Binugas' and 'Gunung' yams when planted bimonthly from March through July on raised and flat rows without vine support.

MATERIALS AND METHODS

Three experiments were planted on March and 15 May and 13 July 1990 at the Corozal substation of the AES-UPR. The research center is located in the humid north-central region at an elevation of about 200 m. Throughout the experiments minimum and maximum mean monthly temperatures were 18.7 and 30.1° C, respectively. Average monthly rainfall was 165.9 mm and pan evaporation 119.0 mm. However, during the months of April and July evaporation exceeded rainfall.

The soil is a Corozal clay (Aquic Tropudults, clayey, mixed, isohyperthermic). In the top 30 cm of soil the pH was 4.8, and contained 2.7 mg/kg of available phosphorus (Bray Method II) and an exchangeable base capacity of 6.4 cmol (+)/kg. Before planting, limestone was incorporated into the upper 20 to 25 cm of soil at the rate of 4.5 t/ha.

Uniform shaped tubers of 'Binugas' and 'Gunung' yams were sectioned into pieces weighing about 112 g and submerged for 10 minutes in a solution containing 20 g of benlate per 3.8 L.[4] The suberized pieces were planted on raised and flat rows spaced .91 m between rows and .30 m apart in the rows, about 36,630 plants/ha. In the March experiment only 'Binugas' was evaluated with two planting systems and the treatments were organized in a randomized complete block design with six

[4]Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of materials by the USDA/ARS or the UPR-AES, nor is this mention a statement of preference over other materials.

replications. In May and July experiments, cultivars and planting systems were arranged in a split-plot design with six replications. There were 12 plots in the March experiment and 24 sub-plots in the May and July experiments. Each plot and sub-plot contained 48 experimental plants. At planting time each experiment was overhead irrigated at the rate of 30 mm.

The yams were grown creeping on the soil without vine support (fig. 1), and no foliar disease control program was implemented. However, as a preventive measure against soil-borne insects and nematode damage, temik 10 G was applied in a 15-cm wide band on top of the rows at the rate of 34 kg/ha 1 month after planting.

The plants received 2,000 kg/ha of a 10-5-20-5 (N, P_2O_5, K_2O, MgO) fertilizer supplemented with 24.5 kg/t of a minor elements mixture. The fertilizer was supplied in two equal applications, 1 and 2 months after planting.

Weed growth was suppressed with a preemergence application of ametryne at the rate of 4.5 kg/ha, followed by two selective hand weedings in each planting.

FIG. 1.—A 5-month-old commercial plantation of the 'Binugas' yam growing without vine support.

March, May and July experiments were harvested (14 and 15 February 1991) about 11, 9, and 7 months after planting, respectively. At that time the foliage had completed senescence and dried. At harvest, tubers in each plot were classified as marketable and non-marketable (undersized). The marketable tubers were further graded into premium (ovate shaped tubers with no rough, protuberant lobes) and non-premium (over-sized and off-shaped tubers). In each category the tubers were weighed, counted and mean weight and yield determined. The data were analyzed following the analysis of variance procedure. Treatment means were compared by using Duncan's multiple range test.

RESULTS AND DISCUSSION

Both Binugas and Gunung cultivars performed similarly in May and July planting averaging 58,750 and 38,997 kg/ha of marketable tuber weight, respectively. Planting system did not significantly affect cultivar performance in any of the experiments. However, it may be inferred from the following tabulation that flat row planting tended to increase tubers marketable and premium weights.

Planting system	Marketable weight	Premium weight
	kg/ha	*kg/ha*
Flat row	58,721	52,909
Raised row	53,503	48,473

This agronomic practice is less expensive and more convenient to implement than the traditional raised row planting, particularly on steepland where the use of farm machinery has limitations.

Planting dates significantly affected marketable and premium tuber weight, tuber size and shape, and non-marketable weight. The best planting date was March, with a production of 70,590 kg/ha of marketable tubers (fig. 2). Delaying planting by 2 and 4 months reduced yields by 16.8 and 44.8%, respectively. The 38,997 kg/ha of marketable weight obtained in the late July planting (a 7-month planting-to-harvest cycle) is still much higher than the yield reported for 'Guinea Negro' and 'Habanero ' *D. rotundata* cultivars grown during planting-to-harvest cycles lasting 8 to 10 months (8).

Premium weight production from total marketable weight in March, May and July plantings was 88.2%, 95.3% and 89.3%, respectively (fig. 2).

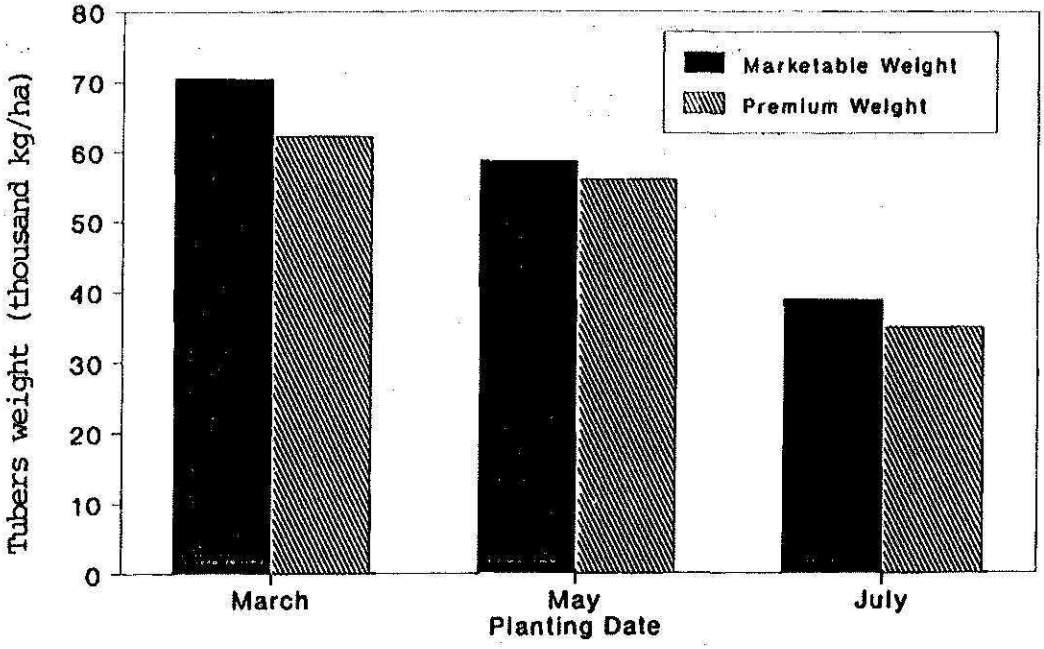

FIG. 2.—Marketable and premium yields obtained from 'Binugas' and 'Gunung' yams bimonthly planted on raised and flat rows at Corozal substation.

The 2- and 4-month delay in planting substantially reduced individual tuber size and consequently increased non-marketable weight (fig 3.). Marketable tuber mean weight for March, May and July plantings was 1.56, 1.24 and 0.85 kg, respectively.

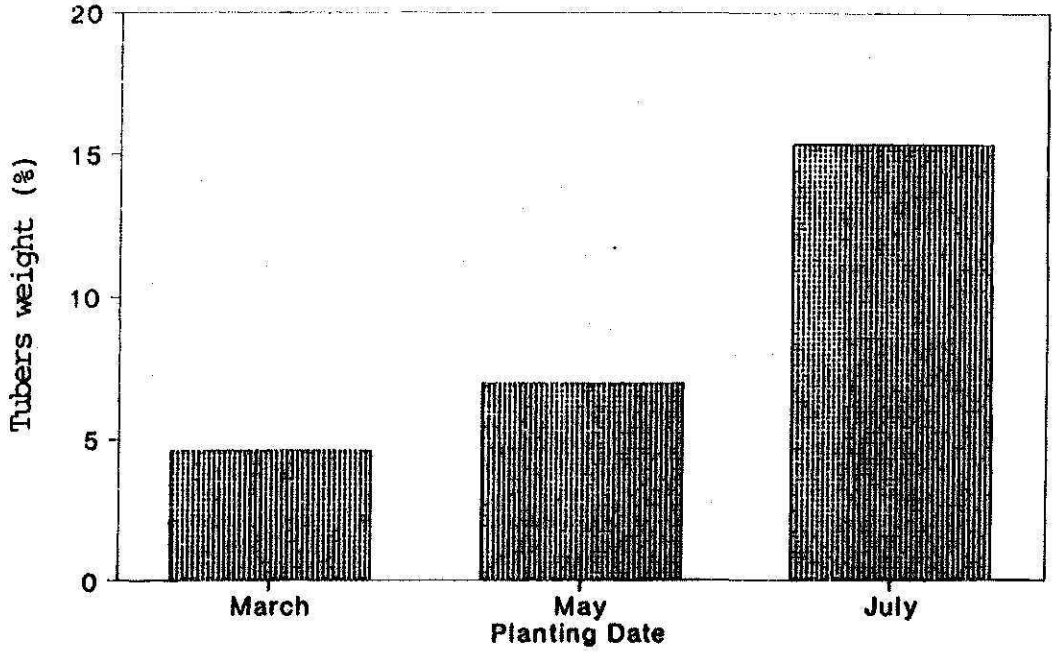

FIG. 3.—Non-marketable weight obtained from 'Binugas' and 'Gunung' yams bimonthly planted on raised and flat rows at the Corozal substation.

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