

SEASON OF THE YEAR ON YIELDS OF SEVEN MEDIUM-GRAIN VARIETIES OF RICE^{1, 2}

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ABSTRACT

The yield of seven medium-grain rice varieties was determined in bimonthly plantings at Gurabo. Chontalpa 16, Brazos, and Vista were the highest yielding varieties averaging 5,700 kg of rough rice/ha, but yields of Brazos varied more with season of the year. Yields were highest for February plantings and lowest for October plantings, followed by those for August. Similar yields for all seven varieties averaging about 5,100 kg/ha, were produced when the rice was planted in April, June or December. Varieties and season of the year affected the time required from planting to harvest, which averaged from 101 to 125 days. Lodging was most prevalent in the August plantings, averaging 34%. Nato and Saturn were the most prone to lodging, averaging 21 and 43%, respectively.

INTRODUCTION

Puerto Rico consumes around 180,000 metric tons of rice yearly, about 65% of which is short grain, 25% medium grain, and 10% long grain. Consumption of medium grain rice has increased considerably during the last 2 years.

The effect of planting season on yields of short and long grain varieties of rice has been studied in Puerto Rico, but little work has been conducted with medium grain varieties. Abruña and Lozano found that season did not appreciably affect yields of long grain varieties⁴ and Lozano and Abruña found that for short grain varieties yields were highest for June plantings and lowest for September plantings.⁵ Abruña and Lozano⁶ found that medium grain varieties, especially Vista and Brazos, are more drought tolerant than the short grain varieties tested.

The present study determined the effect of season on productivity of seven medium-grain rice varieties for bimonthly plantings over a 2-year period at Gurabo.

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⁴ Abruña, F. and Lozano, J., 1974. Effect of season of the year on yields of 13 varieties of rice growing in the humid region of Puerto Rico, *J. Agric. Univ. P.R.* 58 (1):11-17.

⁵ Lozano, J. and Abruña, F., 1977. Effect of planting season on yields of eight short-grain varieties of rice under irrigation, *J. Agric. Univ. P.R.* 61 (1):6-10.

⁶ Abruña, F. and Lozano, J., 1977. Productivity of 25 varieties of rice grown under conditions of limited moisture, *J. Agric. Univ. P.R.* 61 (1):1-5.

MATERIALS AND METHODS

The experiment was conducted at the Gurabo Substation of the Agricultural Experiment Station, located about 80 m above sea level and with a mean annual temperature of 27° C. The soil is Coloso clay (Aeric Tropic Fluvaquents) with an organic matter content of 2.3%, a pH of 6.6, and a cation exchange capacity of 21 meq/100 g of soil.

Seven medium grain rice varieties were tested. Vista, Nato and Saturn are commercial varieties, extensively planted in the southern United States. Brazos⁷ has a very high yield potential. Chontalpa 16, developed in Mexico, has a high yield potential as well as disease resistance. Sequial, developed in Spain, is early maturing and resistant to lodging⁸. B.M.T. (RU 7403025) is an experimental selection from the breeding program in Beaumont, Texas.

All varieties were planted about mid-month during February, April, June, August, October and December for two consecutive years (1978 and 1979).

Plots were 4 × 4 m, replicated five times, and arranged in a randomized block design. The experimental area was surrounded by levees and permanently flooded, starting about 3 weeks after seeding.

Seed of the different varieties was broadcast at a rate of 110 kg/ha and covered with about 2 cm of soil by hand raking. All plots were fertilized at the rate of 60 kg of N, 25 kg of P, and 40 kg of K/ha 2 weeks after germination and again about 40 days after seeding. Weeds were controlled with Propanil⁹ at the rate of 15 l/ha. Insects and diseases were controlled by periodic spraying with pesticides approved by EPA. Rats were controlled with poison bait.

The rice was harvested at about 20% moisture, threshed and dried to 12% moisture; and yield determined.

RESULTS AND DISCUSSIONS

Table 1 shows that yield differences among varieties as well as planting seasons were significant. Chontalpa 16, Brazos and Vista produced the highest overall yields, averaging 5,700 kg/ha of rough rice, followed by Nato, Sequial and B.M.T., averaging 4,500 kg/ha; and Saturn averaging only 4,000 kg/ha. Chontalpa 16 was among the highest yielding for five of the six plantings, and Brazos and Vista for four.

⁷ Bollich, C. N., Scott, J. E., Webb, B. D., and Atkins, J. G., 1974. New high yield medium-grain variety released in Texas, *The Rice Jan.* Vol. 77 No. 3.

⁸ López-Campos, G., Ballesteros, R., Castells, J. and Batalla, J. A., 1970. Variedades de arroz cultivadas en España, Estación Arroceras (I.N.I.A.) Publicado por Federación Sindical de Agricultores Arroceros, Valencia, España.

⁹ 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.

Planting season had a marked effect on grain yields, which generally decreased steadily from February to October. Highest monthly yields were produced in the February plantings, followed by those in April and December, which averaged 5,330 kg/ha. The October planting produced the lowest yields.

Of the three highest yielding varieties, yields of Brazos varied most with season of the year (fig. 1). Chontalpa 16 produced the highest yields (5,190 kg/ha) in the October plantings, when yields of all other varieties decreased sharply.

Figure 2 shows the average monthly daylength and rainfall during the experiments. During the growing season, (1 to 3 months after planting) for rice planted in December and February, sunlight was sufficient for the production of high yields because even though days were rather short,

TABLE 1.—*Effect of planting season on monthly and yearly yields of seven medium grain rice varieties at Gurabo, Puerto Rico*

Variety	Kg/ha of rough rice planted in						Variety average
	February	April	June	August	October	December	
Vista	6,350b,c ¹	5,830a,b,c	5,460a,b	4,790a	4,520b	6,590a,b	5,590a
Brazos	6,980a,b	6,530a	5,900a	5,030a	3,080d,e	5,850b	5,569a
Nato	6,040c	5,340b,c	4,940c,b	4,700a	2,650e,f	3,810c	4,580b
Saturn	6,690a,b,c	4,380d	4,400c	3,910b	2,080f	2,520d	3,997c
Chontalpa 16	7,470a	6,120a,b	4,940c,b	5,080a	5,190a	6,940a	5,958a
Sequal	5,190d	4,810c,d	4,670c	3,040c	3,350c,d	5,970b	4,505b
B.M.T. (RU 7403025)	4,080e	5,370b,c	4,840c	4,000b	3,810c	4,550c	4,442b
Monthly average	6,114a	5,484b,c	5,021b,c,d	4,364d	3,526e	5,176b,c	4,948

¹ Values in columns with one or more letters in common do not differ statistically (Duncan multiple range).

there was little cloudiness; rainfall during this period was low (fig. 2). During the growth period of the April and June plantings, the days were cloudy but long, with sufficient light for the production of high rice yields. However, during August and especially the October growing period, days were becoming shorter and were cloudy, so yields were low (fig. 1 and 2), probably as a result of insufficient light; although high rainfall may also have affected yields in other ways, such as reducing flower set.

Table 2 shows that the number of days required from planting to harvest varied with planting season and with varieties. The Sequal variety was the earliest maturing, requiring only an average of 102 days from seeding to harvest, and ranging in growing season from 89 days for the August planting to 120 days for the December planting. Chontalpa 16 was the latest maturing, requiring an average of 122 days. Except for the

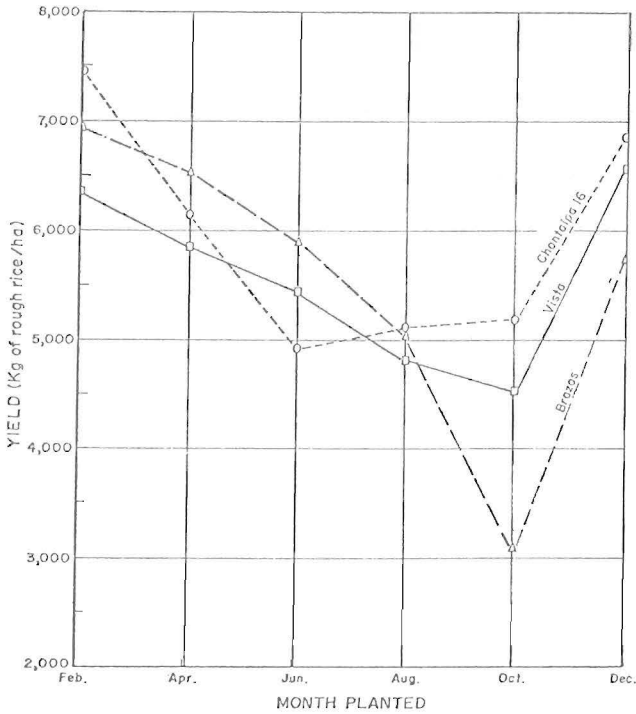


FIG. 1.—Effect of season of the year on yields of the three highest yielding medium grain rice varieties at Gurabo. All values are average of 2 years (1978 and 1979).

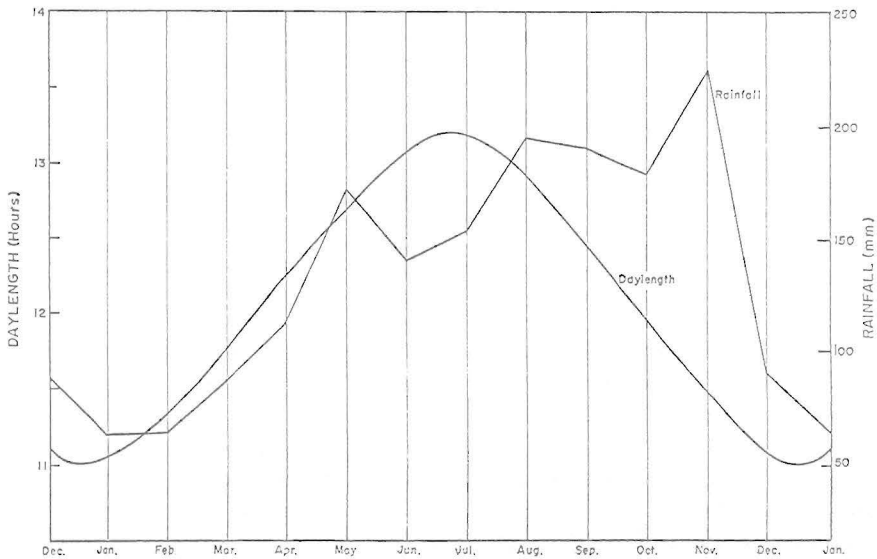


FIG. 2.—Average monthly day length and rainfall for 1978 and 1979 at Gurabo.

December plantings, the U.S. varieties generally produced a crop within a considerably shorter period in Puerto Rico than they do in Louisiana, Texas or Arkansas, where most of these varieties were developed.

The April to August plantings were the earliest maturing, and the December planting was the latest.

Table 3 shows that the varieties tested varied considerably in their susceptibility to lodging. Saturn was by far the most susceptible to

TABLE 2.—*Effect of planting season on number of days from planting to harvest of seven medium grain rice varieties growing at Gurabo*

Variety	Number of days from planting to harvest for rice planted in						Yearly average
	February	April	June	August	October	December	
Vista	108	100	99	101	117	122	108
Brazos	115	110	107	103	120	128	114
Nato	114	108	107	103	116	129	113
Saturn	117	112	100	104	118	126	113
Chontalpa 16	136	127	118	110	116	126	122
Sequial	103	98	98	89	102	120	102
B.M.T. (RU 7403025)	104	96	100	98	114	126	106
Averages	114	107	104	101	115	125	—

TABLE 3.—*Effect of planting season on lodging of seven medium grain rice varieties grown at Gurabo*

Variety	Percent lodging in rice planted						Yearly average
	February	April	June	August	October	December	
Vista	0	5	0	20	0	0	4
Brazos	0	30	0	40	0	0	12
Nato	25	30	40	30	0	0	21
Saturn	50	45	60	100	0	0	43
Chontalpa 16	5	10	35	30	0	0	13
Sequial	25	0	20	20	0	0	11
BMT (RU 7403025)	0	0	0	0	0	0	0
Monthly average	15	17	22	34	0	0	0

lodging, followed by Nato. Brazos, Chontalpa 16 and Sequial were similar in their susceptibility to lodging. Vista and BMT were the most resistant to lodging.

None of the varieties in the October and December plantings lodged. However, lodging was more severe in the August plantings. The heavy lodging in the August planting may have been caused by the heavy rainfall and winds during the growing season.

In addition to average yearly yields, which were similar for the Brazos, Vista and Chontalpa 16 varieties, other factors must be considered in deciding which variety to plant. Yields of Chontalpa 16 varied less seasonally than did the others; Chontalpa 16 is apparently very disease resistant. However, Chontalpa 16 grains did not meet the exacting U.S. quality standards, in terms of cooking quality.

Brazos produced high yields of excellent quality rice during most of the year but yields for fall plantings were very low (fig. 2) and it is more susceptible to blast (*Piricularia oryzae*) under some conditions. Vista produces good quality rice, is apparently resistant to lodging (table 3), and outyielded Brazos in the fall plantings.

RESUMEN

Por dos años consecutivos, en siembras bimestrales en Gurabo, se investigó el efecto de la época de siembra sobre el rendimiento y comportamiento de siete variedades de arroz de grano intermedio. Las variedades Chontalpa 16, Brazos y Vista fueron superiores en rendimiento a las demás, logrando una producción media de 5,700 kg/ha y cosecha. De estas tres variedades, la Brazos fue la que más varió en rendimiento durante el año.

Los mayores rendimientos se lograron en las siembras efectuadas a mediados de febrero, alcanzando un promedio de 6,114 kg/ha, mientras que las más bajas se registraron en las siembras de octubre con un promedio de sólo 3,526 kg/ha. Se lograron rendimientos superiores a los 5,000 kg/ha en las siembras de febrero, abril, junio y diciembre. La siembra de agosto produjo un rendimiento medio de 4,363 kg/ha.

Tanto las variedades como la época de siembra afectaron la duración del período de crecimiento. La variedad Sequial requirió un promedio de 102 días desde la siembra hasta la cosecha, mientras que la Chontalpa 16 requirió 122 días. La siembra de agosto requirió un promedio de sólo 101 días, mientras que la siembra de diciembre necesitó 125 días.

La variedad Saturn fue la más sensitiva al encamado, con un promedio de 43% para todo el año, mientras que las Vista y B.M.T. (RU 7403025) apenas fueron afectadas. El porcentaje mayor de encamado se registró en las siembras de agosto, mientras que en las de octubre y diciembre apenas lo hubo.