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EFFECT OF PLANT SPACING AND FERTILIZER LEVELS ON YIELD AND DRY BULB WEIGHT OF ONIONS *(ALLIUM CEPA* L.*)* CV. TEXAS GRANO 502 [1]

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INTRODUCTION

Onion annual per capita consumption in Puerto Rico increased from 3.87 kg in 1950-51 to 6.12 kg in 1972-73 (3). With a 3.2 million population in the island, the apparent total consumption for 1972-73 was 19, 428 metric tons.

Onions have been planted in Puerto Rico in a very low scale for many years, mainly in small, marginal plots not suitable for mechanization. The total onion production was 46.5 metric tons from 1960 through 1967 in Puerto Rico (4).

During 1973-74 Puerto Rico imported more than 11,000 metric tons of onions from the United States and 35 metric tons from the Dominican Republic. The net value of imports was approximately 2.4 million (2).

The ideal climatic conditions prevailing in the island from November through March, suggest the possibility of producing good quality onions to reduce imports.

The objectives of the work herein reported were to provide information dealing with the best plant density and fertilizer level for producing onions comercially under the conditions of southern Puerto Rico.

MATERIALS AND METHODS

The experiment was established in a San Anton soil, Cumulic Haplustolls, fine-loamy, mixed, isohyperthermic (6) at the Fortuna Substation in southern Puerto Rico on November 15, 1976 following a split-plot design with five replications.

The mean maximum temperature during the experimental cycle was 30.5°C and the mean minimum was 20°C. Rainfall was 45 mm ; it was supplemented with 356 mm aplied as sprinkle irrigation.

Pelleted seed of the Texas Grano 502 cultivar was hand sown 8 cm apart within the row in plots 6 x 10 meters. Each plot had 3 beds, two meters wide from which the center one was harvested to obtain the experimental data.

The treatments were 2, 3, 4 5 and 6 rows per bed, which corresponded to 90, 60, 45, 38, and 30 cm between rows and two fertilizer levels : 111 and 222 kg/ ha each of N P_2O_5 and K_2O. The fertilizer was sidedressed in one application immediately after planting.

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Dacthal W-75(°) was applied right after planting at the rate of 8.9 kg/ha as a preemergent herbicide. One hoe cultivation was necessary before applying Tok E-25 (nitrofen) as a postmergent herbicide at the rate of 4.5 kg/ha.

A preventive weekly spraying program was followed applying 1168 ml/ha of Diazinon AG 500 and 2.2 kg/ha of Dithane M-45 to control insects and diseases.

A sample of 25 dry bulbs per plot was collected to measure bulb diamter. Onions were harvested on March 15, 1977 and their fresh weights taken. After cured for ten days, onions were weighted again.

RESULTS AND DISCUSSION

Plant Density

Table 1 shows the number of dry onion bulbs and the weight obtained from the various plant densities. Yields obtained from 30 cm distance were statistically higher than those from the 38,45 and 90 cm distances, (358, 644, 286, 915 and 143,458 plants/ha, respectively) but not more than the 60 cm (215,186 plants/ha) one.

The results agree in general with those obtained by other investigators (1,5, 7, 9) who reported that 30 cm between rows was the best planting distance for onions. At the 60 cm spacing only half, of the seed required at 30 cm spacing is used less labor is necessary and cultivation can be mechanized to some extent.

Because not all the varieties and hybrids behave in the same manner, probably in variety Texas Grano 502 many plants do not develop at higher plant densities, but the surviving ones, on account of the additional space available, develop well as measured by dry bulb weight and diameter.

Weed competition for soil moisture, and nutrients and light reduces onion yields (10). Therefore, effective pre and post emergent herbicides should be conducive to higher yields. Also, at closer spacing, weeds are effectively smothered by the onion crop.

Higher plant densities did not affect dry bulb size. For instance, at 30 cm between rows (highest plant density), 88 % of the onions had diameters of 6.4 cm or more with 17 % in the 8.9 cm diameter bracket ; at 90 cm between rows (lowest plant density), 83 % had 6.4 cm or more, 20 % had 8.9 cm. Considering all treatments, 39 % of the total dry bulb yield was 7.6 cm in diameter.

Fertilizer Level

Significant higher yields were obtained with 111 kg each of N, P_2O_5 and K O/ha all sidedressed in one application right after planting than with 222 kg/ ha.

According to Davis (1) light textured soils should receive 130 kg each of N, P_2O_5/ha ; the P_2O_5 in one application at planting or trasplanting and one third of the N at either planting or trasplanting. The rest, two months later. In heavier soils, all the fertilizer should be placed in one application 10 cm under and 8 cm to the side of the seed.

Riekels (8) reports lower yields with each N increment at low levels of irrigation, although maturity was not affected. The decrease in yields was originally attributed to ammonium toxicity ; but it was suggested that high salt concentrations could have harmed the plant.

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

Table 1 - Plant spacing, yield and mean dry bulb weitht of cv. Texas Grano 502 under two fertilizer levels at Fortuna, Puerto Rico. November 1976.

Treatment		Theoretical plant density	Total	Yield	Mean dry bulb weight
Rows/bed	cm	Plants/ha	Bulbs/ha	Kg/ha	Grams
2	90	143,458	115,663	21,882 bc[1]	186 a
3	60	215,186	147,781	26,344 ab	182 a
4	45	287,915	113,272	21,613 c	195 a
5	38	358,644	123,315	22,577 bc	182 a
6	30	430,373	145,789	27,913 a	191 a

(1) Figures followed by one or more letters in common in the column do not differ significantly at the 5 % level.

With plenty of rain, yields increased linearly with each N level and 267 kg N/ha were needed for normal growth and maturity. Onions receiving less than 134 kg N/ha grew deficiently and did not mature properly.

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ABSTRACT

The effect of five row spacings (90, 60, 45, 38 and 30 cm) and two fertilizer levels (111 and 222 kg/ha) each of N, P_2O_5 and K_2O on yield, dry bulb weight and diameter of onion cultivar Texas Grano 502 were evaluated on a San Anton loam (Cumulic Haplustolls) on the southern irrigated coastal plain of Puerto Rico. The fertilizer was side-dressed in one application immediately after planting.

The results were was follows :

1°/ Yields from the 30 cm spacing were statistically superior to those from all other treatments, except the 60 cm spacing.

2°/ Sixty cm spacing required half the amount of seed, less labor and allowed more mechanical weeding than closer spacings.

3°/ The lower fertilizer level produced significantly higher yields than the higher level.