

Response of Pole Beans (*Phaseolus vulgaris* L.) to Various Plant Densities¹

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ABSTRACT

The effect of four spacings within the row (8, 15, 23 and 30 cm) on the marketable yield of four commercial pole bean varieties, (McCaslan 42, Romano, Kentucky 191 and Blue Lake S-7 Stringless), was evaluated on a winter planting at the Adjuntas Experiment Substation.

At the 8 cm spacing, variety Romano was the highest yielder (12,523 kg/ha) while Kentucky 191 had the lowest (9,542 kg/ha). At 15 cm, Kentucky 191 yielded 10,004 kg/ha; and McCaslan 42 only 8,297 kg/ha. At 23 cm, Blue Lake S-7 was highest in yield (11,587 kg/ha) while Romano had the lowest (5,928 kg/ha). At 30 cm, Kentucky 191 was the highest yielder (9,442 kg/ha) while McCaslan 42 was the lowest (4,659 kg/ha).

INTRODUCTION

Low plant populations per unit area are probably among the main factors conducive to low yields of various crops (3, 4, 5, 6, 7, 9).

Pole bean production in the United States has been declining during the past years mainly because harvesting is done manually and labor costs are exceedingly high. Very specific areas like Dade County in Florida (1) planted 3,600 acres of pole beans in 1972. In Puerto Rico, pole bean production on a commercial basis is almost nil; and the current demand for this crop is very low although some pole beans of good quality might be marketed if proper promotion could be given.

The purpose of the study herein reported was to determine the best row spacing for four pole bean varieties in west-central Puerto Rico.

MATERIALS AND METHODS

A pole bean planting was established on December 20, 1977 at the Agricultural Experiment Substation farm, Adjuntas, at 675 meters above sea level on a Humatas soil, Typic Tropohumults, clayey, kaolinitic, isohyperthermic. A split plot design was used with four replications of commercial varieties McCaslan 42, Romano, Kentucky 191 and Blue Lake S-7 Stringless.

The main plots were assigned to row distances and the subplots to varieties. Plant densities corresponded to 8, 15, 23 and 30 cm between plants in the row, with 90 cm between rows, equivalent to theoretical densities of 141,116, 70,558, 47,039 and 35,279 plants/ha. Seed was sown by hand in rows 6 m long.

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Poles two meters long were spaced 6.1 meters apart along each row. Wire no. 12 was nailed at 60 cm intervals from the ground up. A piece of string was tied to each plant as soon as it was approximately 30 cm tall and was guided to the wire for support.

Dacthal 75W³ was applied as a preemergent herbicide immediately after planting at the rate of 11.25 kg of the active ingredient/ha. Overhead irrigation was applied twice during the first week and once a week afterwards, until flowering. Also furrow irrigation was used as necessary. A weekly spraying program was followed, mixing Diazinon AG500 and Dithane M-45 at the rate of 1200 ml and 2.25 kg/ha, respectively, to reduce damage by insects and diseases.

An evaluation as to rust susceptibility was made during the growing cycle, classifying the varieties as follows: Susceptible, slightly susceptible or highly susceptible.

TABLE 1.—*Marketable yields of four pole-bean varieties at various spacings at Adjuntas, 1977*

Varieties	Yields within the indicated row spacings (cm)			
	8	15	23	30
	<i>T/ha</i>			
McCaslan 42	11.1a ¹	9.1a	9.2a	5.1b
Romano	13.8a	9.2b	6.5b	5.9b
Kentucky 191	10.5a	11.0a	10.0a	10.4a
Blue Lake S-7 Stringless	10.9a	10.0a	12.7a	6.9b

¹ Means in a row with one or more letters in common do not differ significantly at the 5% probability level.

Harvesting was done at weekly intervals beginning 58 days after planting for Kentucky 191 and 63 days after planting for McCaslan 42, Romano and Blue Lake S-7 Stringless.

RESULTS AND DISCUSSIONS

Table 1 and figure 1 show the marketable yields of the four varieties.

The tendency was for higher yields as plant density increased. This has also been reported, among others, by Mangual (4, 5) with snap beans and by González Ríos and Riollano (2) with field beans.

Yields in this trial were much higher than those obtained by Ramírez and Vélez (8) who studied two of the varieties herein included. This is more probably due to the closer spacings utilized in this case in contrast with those used by Ramírez and Vélez.

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.

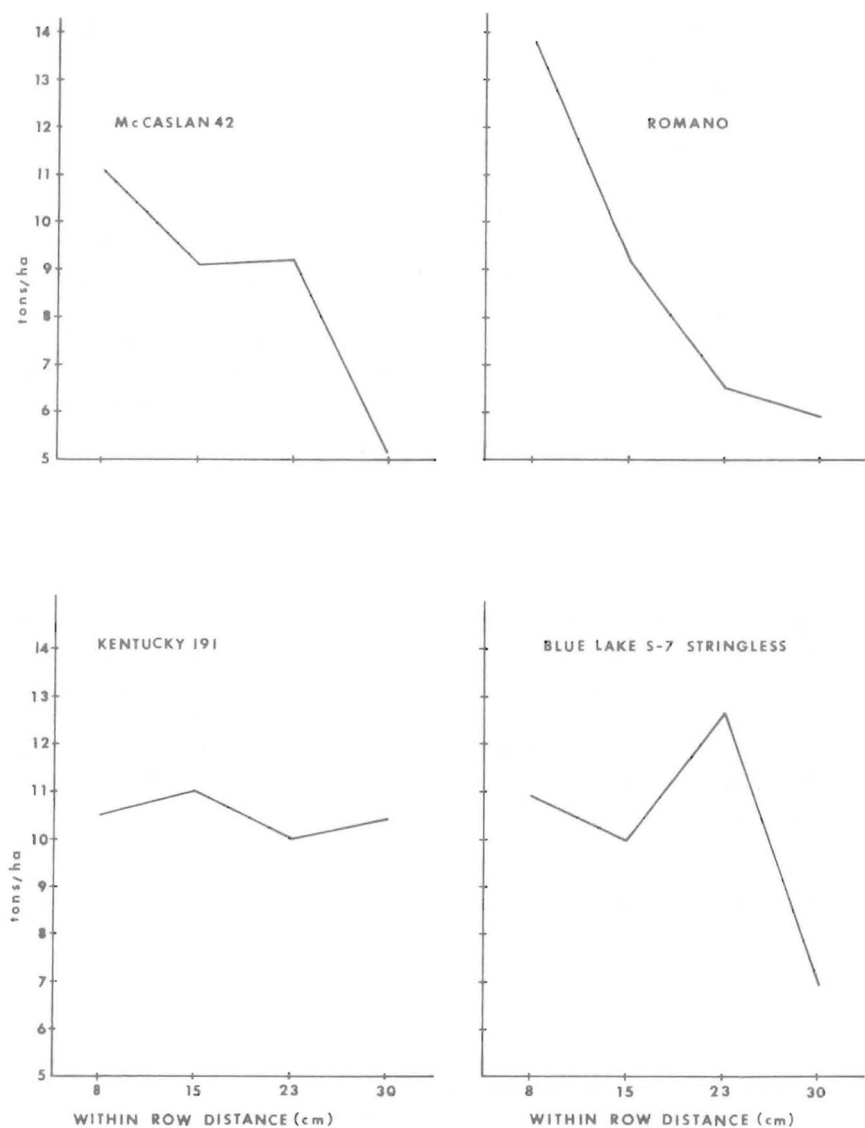


FIG. 1.—Pole bean yields at various plant densities.

At wider spacings, Ramírez and Vélez obtained 6.2 tons/ha with their lowest yielder. However, in all of the spacings Kentucky 191 almost doubled this amount.

There were no significant differences between varieties, but yield differences attributable to spacing were significant.

The highest yield was scored by Romano at the 8 cm spacing, being

significantly different from those of the same variety at wider spacings. Yields at the 8 cm spacing were statistically superior to yields from the 30 cm spacings in all varieties, except Kentucky 191.

Irrespective of variety, the tendency was for higher yields from the 8 cm spacing with a mean of 11.6 t/ha as against the lowest in the 30 cm spacing, with a mean of 7.01 t/ha.

Varieties Kentucky 191 and McCaslan 42 were highly susceptible to rust, *Uromyces phaseoli*, a characteristic which disqualified these varieties for commercial use. Blue Lake S-7 is susceptible while Romano is slightly susceptible.

Mean pod length was 19, 18 and 14 cm for McCaslan 42, Kentucky 191 and Blue Lake S-7, respectively, while Romano averaged 11 cm. Romano's pod is not as eye-appealing as those of the other varieties.

RESUMEN

En la Subestación Experimental Agrícola de Adjuntas se estableció una siembra con cuatro variedades comerciales de habichuelas trepadoras con el propósito de determinar el efecto de cuatro distancias entre plantas en la hilera sobre el rendimiento.

A 8 cm entre plantas la variedad Romano produjo rendimiento máximo (12,523 kg/ha), mientras que Kentucky 191 produjo el mínimo (9,542 kg/ha). A 15 cm Kentucky 191 registró 10,004 kg/ha mientras que McCaslan 42 solo dio 8,297 kg/ha. A 23 cm, Blue Lake S-7 fue la de rendimiento máximo (11,587 kg/ha) y Romano el mínimo (5,928 kg/ha). A 30 cm, Kentucky 191 produjo el rendimiento máximo (9,442 kg/ha) y McCaslan 42 el mínimo (4,659 kg/ha).

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