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Effect of Two Planting Systems on Density and Yield of Snap Beans (*Phaseolus vulgaris L.*)[1]

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ABSTRACT

The paired row planting system increased the plant stand in all treatments and registered a 48% increment over the conventional single row system. The best planting distance in the paired row system seems to be 0.30 m between paired rows and 0.60 m between sets of paired rows. With this system it is possible to obtain 6,464 kg/ha in a simulated once-over harvest.

INTRODUCTION

Low yields in snap beans may be attributed to various factors; being low plant density among the leading ones. Other causes may be related to the spacing between rows, the quality and quantity of seed planted, and the loss in plant stand due to diseases common to this crop caused by fungi, bacteria and viruses.

According to Ortega and Barrios (3) experiments have shown that a stand of 166,000 plants/ha, obtained by a spacing of 0.60 m between rows and 0.10 m between plants within the row, produced good yield only when the plants attained their maximum development and the environmental conditions were the most favorable. This plant density, naturally, produces low yields when these conditions are not possible.

Montalvo in Peru (2) mentions a close relation between plant stand and yield per unit area, the latter increasing as plant density increases up to a limit of around 300,000 plants/ha.

Tompkins et al. (5) planted three snap bean varieties in rows 23 and 102 cm apart and from six to twelve plants/30 cm within the row. Yields were from 34 to 68% higher in the rows 23 cm apart as compared with those 102 cm apart.

A way to increase plant density consists in modifying the system, planting in double rows instead of using the traditional single rows planting.

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The purpose of this study was to compare two planting systems; paired rows against single rows. The latter system is the one used in Puerto Rico.

MATERIALS AND METHODS

A snap bean planting was established with commercial variety Blue Lake 47 December 18, 1979 at the Isabela Agricultural Experiment Substation, in northwestern Puerto Rico, in a Coto clay, an Oxisol, in a Latin square design with seven replicates. The treatments are shown in table 1.

Seed was sown by hand in rows 6 m long. Ten plants per lineal meter were used in all treatments.

Dacthal 75 W[3] was applied as a preemergent herbicide immediately after planting, at the rate of 11.25 kg/ha of the active ingredient. Overhead irrigation was applied twice during the first week and once a week afterward, until flowering. Also, furrow irrigation was used as necessary.

A weekly spraying program was followed; mixing Diazinon AG 500 and Dithane M-45 at the rate of 1,200 ml and 2.25 kg/ha, respectively, to reduce damage by insects and diseases.

Plots consisted of four pairs of rows from where the four central ones were harvested for the experimental data. The check plots consisted of eight consecutive rows.

All plants were pulled out, counted and then stripped of pods in a simulated once-over picking 50 days after planting.

RESULTS AND DISCUSSIONS

Table 1 shows the treatments as well as the areas of each plot and the expected plant density for each treatment. A 72% increase in population was noted when using the paired row system over the conventional single system.

Table 2 shows that the treatments in paired rows exceeded the single row treatments in plant density and yield by 48%.

As in the Ortega and Barrios trials (3), 0.60 × 0.30 m spacing seems to be about the best planting distance. With this spacing field operations can be carried out more easily than with closer spacings.

The yields obtained in this trial confirm those reported by Sánchez-Nieva (4) for the once-over harvest for a population of 180,000 plants/ha using variety Blue Lake 47. He stated that the yield was undoubtedly too low for commercial production of snap beans for processing. Furthermore,

[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.

TABLE 1.—*Treatments, surface area and plant population expected for each treatment*

Treatment	Plot Surface		Plants/ha	% over check
	Total	Effective		
m	m^2	m^2	*Thousands*	
0.50 × 0.20	14.0	7.0	285	171.7
0.50 × 0.25	15.0	7.5	266	160.2
0.50 × 0.30	16.0	8.0	250	150.6
0.60 × 0.20	16.0	8.0	250	150.6
0.60 × 0.25	17.0	8.5	235	141.6
0.60 × 0.30	18.0	9.0	222	133.7
0.60 (check)	24.0	12.0	166	100.0

TABLE 2.—*Yield, mean values in kg/ha, actual population and percentage over check*

Distance (m)			Yield	Population found	% over check
Double Row		Pair of rows			
			Kg/ha	*Plants/ha*	
0.50	×	0.20	6,399 a[1]	243,890	148.35
0.60	×	0.30	6,464 a	210,513	134.13
0.60	×	0.25	3,908 b c	221,940	135.00
0.50	×	0.25	5,209 a b	229,211	139.42
0.60	×	0.20	4,426 b c	224,105	136.31
0.50	×	0.30	4,738 b c	216,720	131.82
0.60 (check)			3,388 c	164,400	100.00

[1] Mean values followed by the same letter do not differ significantly at the 0.05 probability level.

he added that unless yields could be substantially increased through plant density, snap bean production for processing could not be feasible in Puerto Rico.

It is evident from the results obtained in this trial that by increasing plant density, an increase in yield can be obtained.

According to Mangual-Crespo (1) other commercial varieties, namely Contender and Wade, when planted at Isabela at a plant density of 144,000 plants/ha yielded 7,376 and 5,336 kg/ha, respectively, in a simulated once-over harvest.

The paired row planting system at 0.60 m × 0.30 m should be adopted for snap bean plantings mainly to increase plant density and obtain higher yields.

RESUMEN

En la Subestación Experimental de Isabela se estableció una siembra de habichuelas tiernas el 18 de diciembre de 1979 para comparar el sistema de siembra de hileras dobles contra el sistema tradicional de hileras sencillas.

Se obtuvo un aumento de 48% en rendimiento cuando se usó el sistema de hileras dobles.

La mejor distancia de siembra parece ser 0.30 m entre las hileras dobles y 0.60 m entre los pares de hileras dobles. Con este sistema es posible obtener un rendimiento de 6,464 kg/ha en un solo pase.

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