

YIELD AND ITS COMPONENTS IN BEAN (*Phaseolus vulgaris* L.) GENOTYPES AS A FUNCTION OF POPULATION DENSITY

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INTRODUCTION

In the production systems of beans, the action of some factors determine the yield of the grain. Thus when populations density increases, so does the use of water, nutrients and a more favorable environment is created for diseases (Diaz and Aguilar, 1984). There is an optimum plant density for each genotype and each region in which it is grown. After this density yield and biomass can be constant (Muñiz, 1976). The components that determine yield, such as number of pods and grains per plant and seed size, may be altered as population density varies (Escalante and Kohashi, 1992). The objective of this study was to assess the effect of the different population densities on the yield components of different bean genotypes under irrigation in the Potosi Plateau.

MATERIALS AND METHODS

The experiment was done in the Agricultural Station of Agronomy at the University of San Luis Potosi, Mexico, located at 22° 14' 03'' N, 100° 53' 11'' W and 1835 m above sea level. The station has irrigation and soil of light texture and medium fertility. The results were analysed in a split plot array in a randomized block design with four replications. Factor A included three population densities: A1: 133 000 plants per ha⁻¹ (75 x 10 cm), A2: 108 000 plants per ha⁻¹ (93 x 10 cm) and A3: 200 000 plants per ha⁻¹ (50 x 10 cm). Factor B were the genotypes B1: Flor de Mayo Calera 82 (type IIIa), B2: Flor de Junio Marcela (type IIIa), B3: Delicias (type I), B4: Flor de Mayo Zacatecas 116 (type IIIa), and B5: Flor de Mayo RMC (type IIIa). In all cases fertilization was 60-60-00. The variables analysed were: number of pods per plant (NVP), number of grains per pod (NGV), straw production per plant (PPP), grain production per plant (PGP), biomass production per plant (PBP), seed size (SS), and harvest index (HI).

RESULTS AND DISCUSSION

In Table 1, the average of yield components are presented, as well as significance, and DSH ($P \leq 0.05$) for the two factors under study. Yield of grain correlated with the number of pods per plant ($r = 0.92$) and the number of grains per plant ($r = 0.85$). An increase in grain production was also favored by the increase of straw production per plant ($r = 0.94$). Individual seed weight had a significant correlation with the number of grain per pod ($r = 0.73$) and with the harvest index ($r = -0.62$). As assessment of grain yield in kilograms per ha showed that the genotypes Flor de Junio Marcela and Flor de Mayo RMC had a higher yield with a density of 108 000 plants per ha⁻¹. The genotypes Flor de Mayo Calera 82 and Flor de Mayo Zacatecas 116 had a higher yield with a density of 200 000 plants per ha⁻¹. The variety Delicias had a similar production with both densities. In general, the genotype with the most productive potential was Flor de Mayo Zacatecas 116 and the one with least potential was the variety Delicias, but with a shorter growing season.

Table 1. Averages for analyzed variables, significance and DSH of bean genotypes and population densities. School of Agronomy, University of San Luis Potosi. Spring-Summer, 1998.

Tratamiento	NGV	NVP	NGP	PGP g plant ⁻¹	PPP g plant ⁻¹	PBP g plant ⁻¹	SS g seed	HI
A1B1	4.054 ab	27.75 b	112.70 bc	22,92 b	25.50 b	58.25 b	0.287 b	0.55 c
A1B2	3.786 bc	19.65 b	73.55 c	18,09 b	19.80 bc	45.65 b	0.349 a	0.56 c
A1B3	3.240 c	24.00 b	78.30 bc	17,64 b	18.10 bc	43.30 b	0.327 a	0.58abc
A1B4	4.508 a	43.50 a	196.05 a	36,50 a	32.90 a	85.05 a	0.26 b	0.61 ab
A1B5	4.789 a	26.75 b	128.50 b	18,90 b	15.80 c	42.80 b	0.208 c	0.63 a
Average (A1)	4.075 AB	28.33	117.82	22.81 AB	22.42 AB	55.01 AB	0.287	0.59
A2B1	4.314 b	31.60 a	139.30 ab	31.67 a	28.35 a	73.60 a	0.326 a	0.60 ab
A2B2	3.799 b	34.60 a	135.00 bc	33.14 a	32.00 a	79.35 a	0.344 a	0.56 b
A2B3	3.878 b	30.40 a	119.20 c	29.15 a	27.60 a	69.25 a	0.348 a	0.60 ab
A2B4	4.479 b	40.05 a	181.70 ab	31.32 a	31.55 a	76.30 a	0.251 b	0.58 b
A2B5	5.911 a	32.75 a	189.50 a	29.75 a	25.45 a	67.95 a	0.225 c	0.62 a
Average (A2)	4.476 A	33.88	152.94	31.01 A	28.99 A	73.29 A	0.299	0.59
A3B1	3.687 bc	28.45 ab	107.05 bc	22,78 ab	23.30 ab	55.85 ab	0.302 b	0.57 abc
A3B2	3.078 c	18.80 b	58.70 c	13,51 b	18.60 bc	37.90 b	0.332 a	0.52 c
A3B3	3.137 c	22.65 b	73.20 bc	15,82 b	18.90 bc	41.50 b	0.313 ab	0.53 c
A3B4	3.997 ab	38.85 a	164.95 a	30,45 a	28.25 a	71.75 a	0.261 c	0.58 ab
A3B5	4.655 a	23.95 b	111.20 b	15,29 b	13.95 c	35.80 b	0.196 d	0.612 a
Average (A3)	3.711 B	26.54	103.02	19,57 B	20.60 B	48.56 B	0.281	0.56
D	*	Ns	Ns	*	*	*	Ns	Ns
G	*	*	*	*	*	*	*	*
D x G	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
DSHa (0.05)	0.5544			10.57	8.04	21.86		
DSHb (0.05)	0.7075	9.79	50.40	9.89	7.90	21.33	0.0261	0.0491

D= Densities (factor A), G= Genotypes (Factor B), *= P<0.05; Data with the same literal are statistically equal to P<0.05.

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