Optimal Population Density on Determinate Growth Habit Faba Bean for Immature Green Pod Production

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Summary

The effects of population density on immature green pod yield were studied during two seasons in southern Spain. The plants were grown at three densities (11, 17 and 33 plants/m^2). Immature green pod yields generally increased as population density increased. The optimum density for these varieties is 33 plants/m^2.

Key words

population density; determinate growth habit; faba bean; *Vicia faba*

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Introduction

On faba bean, seed yield is closely correlated with number of pods per area (De Costa et al., 1997). Thus, increasing the number of plants per area in order to increase the number of pods, might be a sustainable way of improving yield.

There is a lot of available information about optimal population density on indeterminate forms of *Vicia faba* for dry seed production (field beans). Aguilera-Diaz and Recalde-Manrique (1995) recommend 10-16 plants/m^2; Day et al. (1979), 18 plants/m^2; Castro (1987) and Seitzer and Evans (1973) reported 40 plants/m^2. However, little is known about population density necessary for horticultural crop (faba bean), green fresh pod (and seed) production or immature green seed production ("baby" type), especially when managing determinate growth habit of faba bean.

Objectives

Objectives of the present study were to determine the effect of different population densities on horticultural faba beans cultivar of different habit growth, and to identify optimum number of plants/m^2 for immature green pod production by determinate growth habit cultivars.

Material and methods

The plant material consisted of three new horticultural cultivars with determinate growth habit: "Retaca", "Alargá" and "Verde Bonita"; and "Reina Blanca", an excellent horticultural faba bean with indeterminate habit (Fitó Seeds).

Field experiments were carried out in Southern Spain (Mengibar, Jaén) during the 2000-2001 and 2001-2002 growing seasons. The design was a randomised complete block with three replicates using plots of 5 x 3 m. There were three population densities (in both years) 11, 17 and 33 plants/m^2. Inter-row spacings were 90, 60 and 30 cm, respectively. Intra-row spacing was the same (10 cm) in all plots. In both years immature green pod (immature seed diameter around twelve mm) was taken, by hand, from the centre of plots.

The combined analysis of variance was applied to the data. "Year" was considered a random effect; whereas "population density", and "habit" were considered fixed. When an interaction was significant, each year was analysed separately. Least Significant Differences (LSDs) were used for mean separation with a significance level of 0.005.

Results and discussion

Significant differences were found for "year", "population density", and "year x habit interaction" in the combined analysis, but not for the effect of the "habit" or "year x population density interaction" by immature green pod yield (Table 1). The comparison of mean immature green pod yield by population density (LSD 0.05) showed three groups in which the means are significantly different from one another (11.874 kg/ha, 7.464 kg/ha and 5.268 kg/ha by 33, 17 and 11 plants/m^2, respectively) (Figure 1).

Table 1.
Means squares form the combinated analysis of variance to test significance among years, blocks, densities, forms and interactions, for inmature green pod yield.

Source	D.F.	MS	F
Year	1	1.601E+08	73.15*
Block	2	7758477	3.10
Density	2	4.074E+08	50.93*
Habit	1	3.410E+07	0.47
Year x Block	2	2188390	0.87
Year x Density	2	7998886	6.11
Year x Habit	1	7.257E+07	55.49*
Density x Habit	2	2565519	1.96
Year x Density x Habit	2	1307586	

* – significant at 5%.

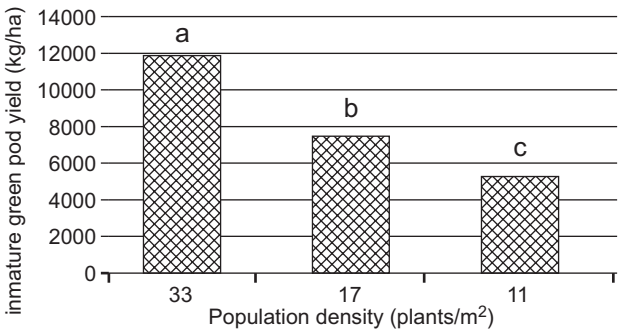

Figure 1.
Effect of population denstity on immature green pod yield (bar with different letter are statisticaly different, LSD´s test P<0.05)

The season 2000-2001 did not show differences between determinate and indeterminate habit growths, or among cultivars (Figure 2). The season 2001-2002 showed differences between habits although not among cultivars; determinate habit had a bigger production of green pods than the indeterminate check (8366 and 5603 kg/ha for determinate and indeterminate habit growth, respectively). Significant differences were found for population density among cultivars (Figure 3).

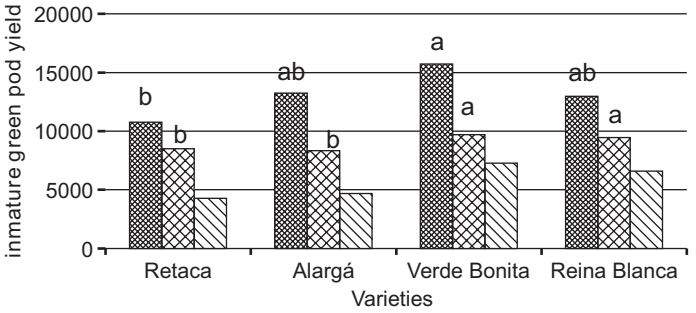

Figure 2.
Effect of population density on immature green pod yield (2000-2001 season) (in same population density, bar with different letter are statisticaly different, LSD´s test P<0.05)

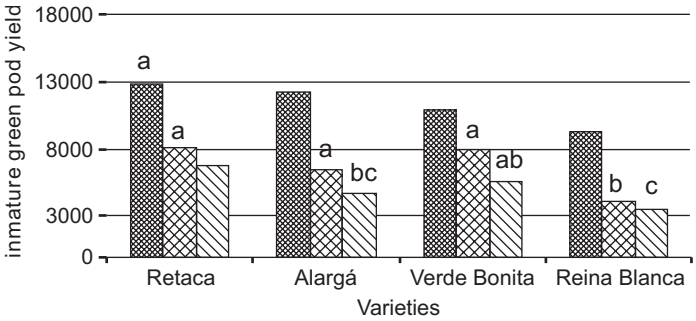

Figure 3.
Effect of population density on immature green pod yield (2001-2002 season) (in same population density, bar with different letter are statisticaly different, LSD´s test P<0.05)

The higher population density studied resulted in higher immature pod yield. Therefore, a significant advantage of narrow spacing has been obtained, in agreement with McEwen and Yeoman (1989) that reported the positive effect of narrow rows.

Thus, as a practical result, we recommend for determinate growth habit cultivars when immature green pods (or "baby" seed) are sought, population densities higher than for standard culture.

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