

EFFECT OF SOWING DATE ON SEED YIELD OF EARLY AND LATE DRY BEAN CULTIVARS AT THE HIGHLANDS OF MEXICO

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INTRODUCTION

Dry beans are an important source of protein in the diet of most people in Mexico. Currently, the average consumption is about 12 kg per person per year. Thus, common bean is the second most important crop in our country. However, almost 65% of the total area planted with dry beans is cultivated under rainfed conditions, where precipitation is limited during crop cycle. Therefore, crop is generally subjected to drought stress, which in turn affect grain yield. On the other hand, the area cultivated with dry beans under irrigated conditions has declined during the last 10 years because scarcity of irrigation water. In the states included in the Highlands of Mexico, about 80 thousand hectares were sowed with dry beans in the summer of 2000, as compared to only 58 thousand sowed in 2007 (1). For this reason, it is important to evaluate different agronomic practices to increase water use efficiency, as well as using new genotypes to maintain dry bean productivity. The objective of the present study was to evaluate the effect of different sowing dates on the seed yield of early and late dry bean cultivars under irrigated conditions.

MATERIALS AND METHODS

The study was conducted at the Experimental Station of Pabellón (22° 09' N; 102° 17' W and 1912 masl) located in Aguascalientes state, during the summer of 2003 and 2004. Sowing dates evaluated were: May 12th and June 5th in 2003 and April 29th and June 22^{ed} in 2004. The dry bean cultivars included in the study were: Flor de Mayo Sol "FMSol" and Negro Vizcaya "NGViz", the former is considered as early cultivar with about 90 to 95 days to maturity and neutral response to photoperiod, while the second is a late cultivar with 110 to 115 days to maturity and it is sensible to photoperiod. Both cultivars were obtained at the dry bean genetic improvement program of INIFAP having a Type III habit and are suitable to be used at the semiarid highlands (2). The experimental unit consisted of ten rows of 30.0 m long and 0.76 m apart. Meteorological data (rainfall and temperature) were registered at daily bases from a near climatological station in each growing season. Plant traits recorded in each plot were days to flowering "DF" and maturity "DM", total aerial biomass (leaves excluded), seed yield and harvest index (HI=grain yield/total aerial biomass). Leaf area index (LAI) was also measured during the growth cycle using a lineal ceptometer (DECAGON DEVICES INC. ACCUPAR Ver. 4.1) which provides the LAI values directly.

RESULTS AND DISCUSSION

Considering the four environments, average days to flowering and maturity were 45.7 and 91.7 in FMSol, while in NGViz were of 53.3 and 109.5, respectively. It was observed a reduction of the growth cycle in the second sowing date in both cultivars. NGViz showed the most drastic reduction of the growth cycle in 2004, having 112 days to maturity in the first sowing date and only 100 days to maturity in the second sowing date. Maximum values of LAI were observed in NGViz, with an average of 5.6, as compared to 4.0 in FMSol. Several authors reported previously (3) that critical

values of LAI to reach 95% of light interception are between 3.0 and 4.0. This suggests that the dry bean cultivars did not have restriction on this physiological component. Nevertheless, regression coefficients were not significant for the relationship between LAI and seed yield (data no shown). Total biomass and seed yield were higher in NGViz than in FMSol, however HI showed greater values in the second cultivar (Table 1).

Table 1. Seed yield and seed yield components of two dry bean cultivars evaluated under different sowing dates at the Experimental Station of Pabellón in Aguascalientes, Mexico.

Genotype	Year	Sowing date	Total biomass kg ha ⁻¹	Seed yield kg ha ⁻¹	HI %	W100 seeds g	DF	DM	Maximum LAI
FMSol	2003	May 12	5770	3503	60.4	28.0	44	95	4.85
		June 05	6877	4018	58.4	25.3	42	90	3.29
	2004	April 29	4379	2827	64.7	23.5	52	95	3.97
		June 22	5803	3389	58.3	25.7	45	87	--
	Mean		5707	3432	60.5	25.6	46	92	4.0
NGViz	2003	May 12	11087	5349	48.2	30.8	52	116	5.96
		June 05	9324	4534	48.5	27.6	50	110	4.22
	2004	April 29	7604	4066	53.5	24.1	61	112	6.63
		June 22	6204	3229	51.8	29.2	50	100	--
	Mean		8554	4294	50.5	28.0	53	109	5.6

HI= Harvest Index; W100 seeds= Weight of 100 seeds; DF= Days to Flowering; DM=Days to Maturity

It was observed a differential effect of the sowing dates on seed yield of both dry bean cultivars. Flor de Mayo Sol showed an increase on the seed yield at the second sowing date in both years, whereas NGViz, had an opposite response showing higher seed yield in the first sowing date (Table 1). These results suggest that late cultivars such as NGViz, could have greater seed yield when sowed during first half of May. In contrast, an early cultivar such as FMSol seems to have better response when sowed at the begging of June. These findings are important because the establishment of the rainy season at the region of study is usually at the end of June. Then, irrigation water can be saved by avoiding one or two irrigations, without decreasing seed yield. On the other hand, early sowing dates besides not to increase seed yield, crops need more water. Thus water use efficiency may be increased by managing sowing date along with the use of improved dry bean cultivars best adapted to that environment.

REFERENCES

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