YIELD RESPONSE TO DROUGHT IN COMMON BEAN (Phaseolus vulgaris L.) VARIETIES

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Improved rainfed bean varieties have been developed for the semiarid temperate region of Mexico. The adaptation to water-limiting conditions is assumed to be due to genetic resistance which allows a variety to exhibit a rather good yield potential under water-limiting conditions. Muñoz (1990), proposed a model for the evaluation of crop resistance to drought, as follows: **R = G + GxS**, where **G** is the average yield of each variety under both irrigated and droughted conditions, and was called the **generic**; **GxS** represents the yield reduction of a variety due to drought stress and is called the **specific** component. A drought resistant variety should exhibit a high value for the **generic** and a low value for the **specific** component. The objective of the present work was to determine the drought resistance of four bean varieties (growth habit type III), based on their **generic** and **specific** response in yield and its components, using the formula proposed by Muñoz (1990).

MATERIALS AND METHODS. Varieties: Bayo Madero (**BM**), Bayo Victoria (**BV**), Flor de Mayo Bajío (**FMB**) and Pinto Villa (**PV**), **of similar phenology**, were grown in a greenhouse using 8 lt capacity pots in 1991 at Chapingo state of Mexico, and in the field in 1992 at Chapingo (**CH**) and Tecamac (**T**), state of Mexico. In the greenhouse and field the varieties were grown under two treatments: irrigated (control) and droughted. In the greenhouse, pots of control plants were watered to field capacity as needed to replace the water lost by evapotranspiration. In the field, control treatment was irrigated as needed.

In the droughted treatment, watering was withheld for 16 days in the greenhouse and 30 days in field, from the beginning of flowering to the date when plants exhibited permanent wilting condition (when they did not regain turgor overnight). The experimental design was a completely randomized with four replications for the greenhouse experiment, and a randomized complete block with four replications for the field experiments.

RESULTS. None of the four varieties exhibited **generic** effects in the field at **CH**. In contrast, those effects were detected in the greenhouse in **BM** and **FMB** for No. of pods/plant; in **FMB** and **PV** for No. of seeds/plant. **Generic** effects for seed yield and its components were registered in **T**. The highest values for **G** were obtained by **PV** and **BV** for seed yield; **PV** and **FMB** for No. of pods/plant, seeds/plant and seeds/pod; and in **BV** for 100-seed

weight (Table 1).

Table 1. Generic (**G**) and specific (**GxS**) effects of drought resistance in four bean varieties grown under irrigated and droughted conditions at two locations.

	G				GxS			
TRAIT	**BM**	**BV**	**FMB**	**PV**	**BM**	**BV**	**FMB**	**PV**
				GREENHOUSE				
YIELD*	20.1	17.7	16.6	17.2	20.5	20.1	11.2	15.9
NPPT	16.9	12.7	15.2	12.4	17.1	14.9	7.0	14.4
NSPT	42.2	37.4	68.4	46.0	44.6	50.2	63.9	36.5
NSP	2.5	2.8	4.5	3.6	0.1	0.7	0.9	0.0
SW (g)	45.7	42.1	21.9	35.8	0.3	0.0	0.2	0.0
				FIELD CHAPINGO				
YIELD	10.0	10.2	8.4	9.9	6.2	6.5	2.6	2.6
NPPT	9.4	7.6	9.5	9.4	6.2	4.0	3.1	2.7
NSPT	25.8	21.3	35.5	29.5	17.6	12.0	15.4	11.2
NSP	2.8	2.8	3.7	3.1	0.0	0.2	0.4	0.3
SW (g)	37.1	43.3	23.6	29.6	0.0	2.7	0.0	0.4
				FIELD TECAMAC				
YIELD	15.5	16.8	13.5	18.5	16.4	15.8	10.1	13.9
NPPT	11.3	10.7	13.4	14.4	9.8	8.2	7.0	7.3
NSPT	36.8	33.4	51.1	56.3	36.1	25.8	36.2	30.6
NSP	3.2	3.3	3.9	3.9	0.4	0.0	0.0	0.1
SW (g)	41.7	46.4	25.6	31.9	3.2	9.7	3.5	7.3

* YIELD (g/plant); NPPT = No. of pods/plant; NSPT = No. of seeds/plant; NSP = No. of seeds/pod and SW = 100-seed wt.

Responses for the **specific** effects (reduction in seed yield and its components) were detected in both greenhouse and field-grown materials. The lowest values observed were: for seed yield in **PV** and **FMB** (greenhouse; field, **CH** and **T**); for pods/plant in **FMB** (greenhouse) and **PV** and **BV** (field, **CH** and **T**); for seeds/pod in **PV** and **BM** (greenhouse and field **CH**) and **FMB** and **BV** (**T**); for 100 seeds weight in **PV** (greenhouse) and **FMB** and **BM** (field, **CH** and **T**).

CONCLUSIONS. Based on the model proposed by Muñoz (1990), variety Pinto Villa was identified as drought resistant due to its high **generic** and low **specific** effects. On the other hand, Bayo Madero was the least resistant to drought stress.

LITERATURE CITED

Muñoz-Orozco, A. 1990. Modelo matemático para evaluar la resistencia a sequía casos uno a seis. Evolución Biológica. 4: 93-106.