

BREEDING FOR DROUGHT RESISTANCE IN DRY BEAN IN BULGARIA

Lozan Mitranov

Dobroudja Agricultural Institute, General Toshevo, 9520, Bulgaria

Introduction

At least 40 % of dry bean (*Phaseolus vulgaris* L.) annual production in big region Dobrich is limited by moisture stress (drought; Petrova, Mitranov, Todorov, 1986). Dry bean in Bulgaria usually is not irrigated and in 2001 the lowest yield was 5,2 kg/ha. In favorable years, like 1979 the maximum of yield was 33,7 kg/ha. (table1). The objective of this study was to confirm the drought resistance of some crosses and to select the best genotypes.

Table 1. Mean yields from varietal trials with dry bean during 1978-2002 .

Year groups by dry climate	Kg/ha	Individual year
I. Favorable years - over 25 kg/ha	33,7-29,7-26,5-31,8-26,8-27,3-28,3-26,0	1979,1982,1983,1986,1987,1989,1991,1998.
II. Normal years -20-25kg/ha	22,3-21,1-22,3-21,4-21,5-23,2-21,8-24,2	1988,1992,1993,1995,1997,1999.
III. Dry years - 15-20 kg/ha	17,5-15,9-18,6	1984,1865,1994
IV. Very dry years -10-15 kg/ha	13,9-14,0-11,0	1990,1996,2002.
V. Extremely dry years-less than 10 kg/ha	7,2-5,2	2000,2001

Material and Methods

A comparative varietal trial was carried in the field of DAI-General Toshevo during 1999-2001. The year 2001 was chosen as a standard of drought for the last 23 years (table 1). This is the year with minimum yield of 5,2 kg/ha. The maximum productivity was 33,7 kg/ha in 1979. Relatively dry years with productivity lower than 16,0 kg/ha were 1985, 1990, 1996 and 2002. The year 2001 had the lowest rainfall during the vegetation period (table 2).

Table 2. Precipitation in the vegetation period of dry bean (mm)

Years/ months	April mm	May mm	June mm	July mm	Total mm	Winter Store mm
1999	40,9	33,2	122,2	35,3	246	255,5
2000	45,8	42,1	40,4	6,7	153	210,6
2001	18,4	28,9	35,0	4,8	106	145,2

For characters showing significant differences an injury index (Blum, 1988) was calculated:

$$\% \text{ of injury (depression)} = [(C - T)/C] * 100; C = \text{Control}, T = \text{Treatment Means}$$

Discussion

The first step of this study was to determine the negative influence of water stress on the field yields in dry bean (*P. vulgaris* L.). In this case it is determined by depression coefficient, that express the degree of injury of all reproductive system. The depression coefficient for yields in kg/ha is ranged 39,3-71,0 % (table 3).

Table 3. Influence of drought on yields of some indeterminate crosses in dry bean.

Crosses	Kg/ha 2001	Kg/ha 1999	±D Kg/ha	Depression, %
Vulkan x Astor	8,9	24,2	15,2	62,8
Astor x Bianco INIA	7,9	14,9	7,0	47,0
Avans x Chapi 11	7,4	12,2	4,8	39,3
Gambit x Vulkan	6,4	17,3	10,9	63,0
Ipanema x Rousse 13	8,0	22,5	14,5	64,4
Turnovo 13 x Astor	5,1	16,4	11,3	68,9
Slavena x Dobrodja 7	7,2	22,3	15,0	67,3
Rico 23 x Prima	8,6	25,7	17,1	66,5
Gracia x Arestuben	9,4	17,0	7,6	44,7
P.Tetovac x Vulkan	7,6	22,0	14,4	65,4
A56 x Gracia	5,8	19,2	13,4	70,2
Vulkan x Lacer	8,3	23,2	14,9	64,2
Burgas x Ruen	5,8	20,0	14,2	71,0
Pindac x Vulkan	8,3	26,2	17,8	67,7
Gracia x Debut	8,1	25,8	17,7	68,6
Avans x Zagor	9,6	18,7	9,2	48,9
Tetovac x Vulkan	8,1	16,3	8,1	50,3
Rio Grande x Avans	8,3	23,6	15,3	64,8
Average	-	-	-	65.2

Good resistance for water stress was found in the genotypes Astor x Blanco INIA, Gracia x Arestuben and Avans x Chapi 11. Lower resistance was found in Bourgas x Ruen (71,0 %). Average resistance of all genotypes was 65,21 %.

In the future we will study the influence of water stress on number of pods, number of seeds/plant and 1000 seeds weight.

Conclusions: The severe drought in 2001 provided the possibility for effective selection of resistant lines in a natural challenging background.

References:

1. Petrova D., L. Mitranov, T. Todorov. 1986. -SSN Sofia, No 5.
2. Blum A. 1988. Plant breeding for stress environments, pp.1-223, CRC Press, USA.