

DROUGHT RESISTANCE IN BEAN (*Phaseolus vulgaris* L.)

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The present field study was conducted to examine the possible mechanisms for drought adaptation of three bean lines. Two of them (BAT 477 and Carioca) had being classified as resistant to drought stress and one (CNF 0010), as susceptible. The experiment was composed of three replications which received optimum irrigation water from planting until two weeks after emergence. Following three soil moisture treatments were established: (1) low, receiving 3 mm water, (2) moderate, receiving 188 mm water, and (3) optimum, receiving 316 mm water, using the "line source sprinkler method" as described by Hanks et al. in 1976. Root density from surface to 80 cm deep, at 20 cm intervals, leaf water potential and leaf diffusive resistance were studied at low and optimum soil moisture treatments.

Drought resistant lines had lower root density in the 0-20 cm soil layer than the susceptible one, under optimum soil moisture. However, they had higher root density in the 20-60 cm soil layer (Figure 1) as well as higher leaf water potential than the susceptible one under drought stress (Table 1). This indicates that the drought resistance of these lines is due to the avoidance mechanisms of deeper roots and water retention in the plant. Of the two tolerant lines the resistance of "Carioca" is apparently due to higher root density in deeper soil layer, 20-40 cm (Table 2), while the line BAT 477 had higher leaf diffusive resistance (Table 1).

These results indicate that the lines studies have different drought resistance mechanisms, and through a breeding program both mechanisms may be incorporated into one line.

Table 1. Leaf water potential (MPa) and leaf diffusive resistance (seg/cm) at flowering, under drought stress (treatment 1), of the drought resistant (BAT 477 and Carioca) and susceptible (CNF 0010) lines.

Cultivars	Leaf water potential	Leaf diffusive resistance
Carioca	-0,93	1,57
BAT 477	-0,87	2,14
CNF 0010	-1,03	1,78

Table 2. Root density (cm/cm^3) at flowering, under drought stress (treatment 1), of the drought resistant (BAT 477 and Carioca) and susceptible (CNF 0010) lines, from the surface to 80 cm deep, at 20 cm intervals.

Cultivars	Soil depths (cm)			
	0-20	20-40	40-60	60-80
Carioca	2,28	1,25	0,66	0,32
BAT 477	3,40	0,87	0,63	0,33
CNF 0010	2,81	0,78	0,35	0,40

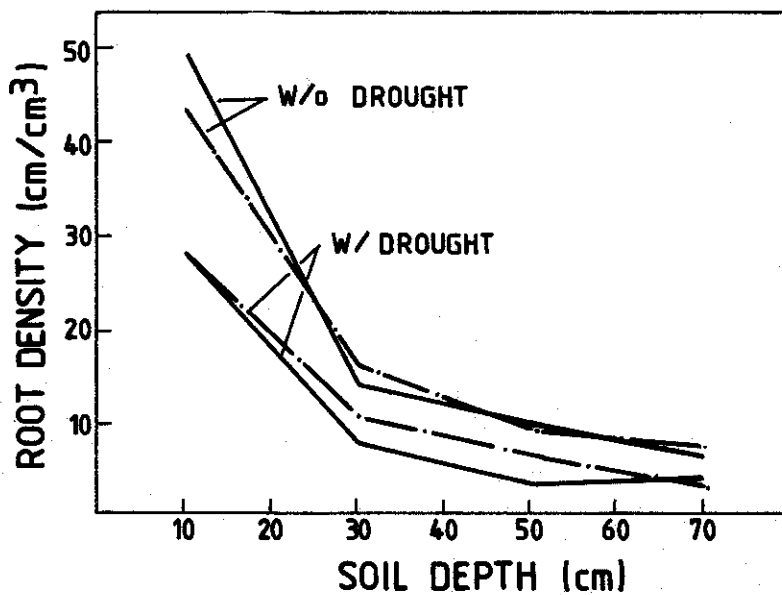


Fig. 1. Root density average of the drought resistant lines, BAT 477 and Carioca (— · — · —), and root density of the susceptible line, CNF 0010 (—), with (treatment 1) and without (treatment 3) drought stress.