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WATER STRESS IN BARLEY (*HORDEUM VULGARE* L.) I. EFFECT ON MORPOHOLOGICAL CHARACTERS

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Two barley cultivars, Jau-87 and S-84728, were grown in pots. After 25 days, half the seedlings from both the cultivars were subjected to 9 days water stress. Drought stress curtailed leaf area, stem length, fresh weight, dry weight, water contents (WC) and relative growth rate (RGR) of both the cultivars. Effects were more prominent in Jau-87.

INTRODUCTION

Water is the most important and vital commodity on which whole life depends. It constitutes 80-90% of living protoplasm and covers 75% area of the earth. Agricultural productivity is solely dependent upon water and it is essential at every stage of plant growth, from seed germination to plant maturation (Turner, 1991).

Due to water deficits, the physiology of crop is disturbed which causes a large number of changes in morphology and anatomy of plant. These changes have an extensive effect on growth and thus ultimate yield of the crop (Ashraf and O'Leary, 1996; Reisdorph and Koster, 1999). Present study was undertaken to determine the effects of soil moisture stress on two barley cultivars at the early stages of growth.

Incidentally rainfall during the barley crop duration is very low in plains of Pakistan and crop often suffers from water stress. The aim of this project was to select the plants for drought tolerance and to evaluate their tendency to endure water stress.

MATERIALS AND METHODS

Barley cultivars, Jau-87 and S-84728, were grown in seed germinator at 30°C in dark and after 3 days healthy population was transferred to earthen pots with 11 kg soil in each. Duration of the crop was from May to June 1989. Pots were kept in the net-house of the Department of Botany, University of Agriculture, Faisalabad. The soil moisture was maintained at field capacity for 25 days, after which half of the pots from each cultivar were exposed to moisture deficit by withholding water supply. Four harvests were taken with the interval of three days, and plants were separated into roots and shoots for further studies. Plant height, fresh weight, and dry weight were measured where as plant water content (PWC) and relative growth rate (RGR) of each part was calculated using the formulae of Turner (1981) and Meidner (1984), respectively.

RESULTS AND DISCUSSION

It is evident from the data given in Table 1 that water stress of 9 days caused a drastic decrease in leaf area and shoot length of both the cultivars. This was probably due to a decrease in cell enlargement (Hsiao, 1973) and leaf expansion (Sharp *et al.*, 1979; Schmidhalter *et al.*, 1998).

A consistent decrease in percent water content (% WC) of shoot and root also occurred immediately after the onset of stress and it decreased further as the drought progressed. This resulted in the curtailed fresh weight and fresh weight : dry weight ratio (FW : DW) of either of the organs or whole plant as compare to control plants, thus confirming the results of El-Monayeri *et al.* (1984). Relative growth rate (RGR) of both the cultivars declined steadily with the advancing stress period owing to inhibit biomass accumulation (Muchow *et al.*, 1986; Schmidhalter *et al.*, 1998; Reisdorph and Koster, 1999). After 9 days of water stress dry weight of both the plant parts was reduced to half of the control plants. This was in response to the internal water deficits, which impair the normal metabolic and physiological processes of plant.

A significant difference between cultivar means was observed. S-84728 possessed lower leaf area, but higher shoot length, fresh weight and percent water contents than Jau-87.

In the light of the above results it seems appropriate to recommend barley cv. S-84728 for rainfed water deficit areas of Pakistan.

Table 1. Effect of soil moisture deficit on plant growth parameters of two barley cultivars

S. No.	Plant characters	Cultivars means		Treatment means	
		S-84728	Jau-87	Water stressed	Irrigated
1.	Leaf area (cm^2 $plant^{-1}$)	10.1442 a	10.3738 b	8.5700 a	11.9479 b
2.	Shoot length (cm^2 $plant^{-1}$)	6.8558 b	5.9446 a	5.9654 a	6.8350 b
3.	Fresh weight of shoot (g $plant^{-1}$)	0.8874 b	0.6520 a	0.4074 a	1.1320 b
4.	Fresh weight of root (g $plant^{-1}$)	0.0531 b	0.0483 a	0.0326 a	0.0687 b
5.	Dry weight of shoot (g $plant^{-1}$)	0.1562 a	0.1477 a	0.1499 a	0.1540 a
6.	Dry weight of root (g $plant^{-1}$)	0.0359 a	0.0350 a	0.0266 a	0.0444 b
7.	% of WC of shoot	80.2938 b	75.0925 a	70.1817 a	85.2067 b
8.	% of WC of root	28,2954 b	24.095 a	18.2329 a	34.1575 b

Means sharing the same letter do not differ significantly at 5 % probability.

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