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Original article

Effect of drought stress on some morphophysiological characteristics and phenolic compounds of rosemary plant (*Rosmarinus officinalis* L.)

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Abstract

Existence of environmental abiotic stresses, especially drought stress, is one of the most important problems in arid and semi-arid regions. Drought stress occurs when the plant receives less water than its losses. This research was carried out to investigate the effect of drought stress on morphological traits, proline content and phenolic compounds of rosemary herb in a completely randomized design with 3 replications in Department of Natural Resources, Fars Agricultural and Natural Resources Research Centre. Drought stress was applied at four levels (100%, 75%, 50%, and 25% field capacity). The measured traits were fresh and dry weight of aerial and root organs, leaf area, leaf number, plant length, leaf proline content and phenolic compounds. In this research, rosemary plants were found to have no significant difference in terms of fresh and dry weight of shoot, root fresh weight, shoot length, and normal conditions (FC 100%) in drought stress conditions with 75% field capacity. Also, under drought stress conditions with an intensity of 75% of the field capacity, root length increased to 27.67 centimeters. Root dry weight, leaf area and leaf number decreased significantly under drought stress conditions. In drought stress conditions with a 25% field capacity, the amount of Quercetin (439.04 mg/L), Trans-ferulic acid (72.48 mg/L), Hesperedin (407.62 mg/L), Eugenol (65.36 mg/L), Hesperetin (107.34 mg/L), Rosmarinic acid (1133.34 mg/L) significantly increased. Proline content in drought stress conditions of 25% field capacity was 79.72 µm/g.

***Keywords*:** Crop capacity, Phenolic compounds, Shoot, Water deficiency

Table 1. Comparison of the mean of measured traits in drought stress conditions in rosemary

drought stress	Fresh weight shoot	Fresh weight root	height shoot	height root	dry weight shoot	dry weight root	leaf area	number leaf
	---------- gr ----------		---------- cm ----------		---------- g ----------		cm^2	
100% FC	29.67^{a}	14.33^{a}	57.33^{a}	17.67^{b}	11.15^{a}	7.09^{a}	1.0^{a}	296.0^{a}
75% FC	27.00^{a}	13.33^{ab}	53.67^{ab}	27.67^{a}	9.27^{ab}	4.88^{b}	0.75^{b}	197.0^{b}
50% FC	19.67^{b}	11.67^{bc}	49.00^{b}	30.33^{a}	7.52^{bc}	4.41^{bc}	0.75^{b}	125.0^{c}
25% FC	15.33^{b}	10.67^{c}	40.67^{c}	29.33^{a}	6.76^{c}	3.35^{c}	0.75^{b}	111.0^{d}

The meanings of the same letters in each column do not have a significant difference in Duncan test at 5% probability level

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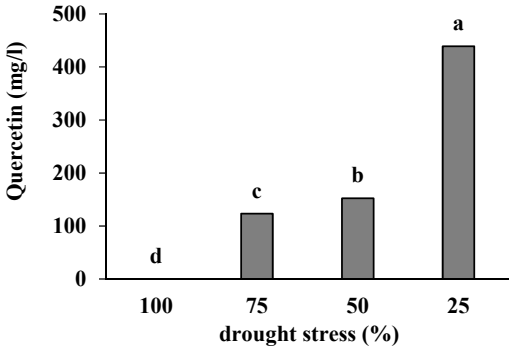

Fig. 1. Effect of drought stress on Quercetin content of Rosemary

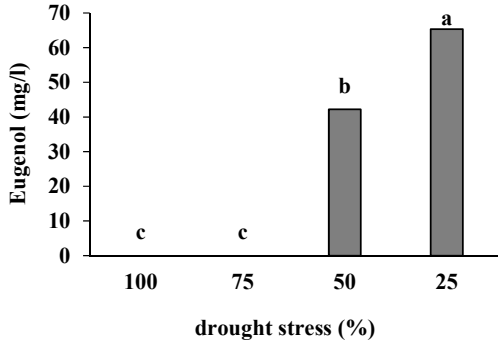

Fig. 4. Effect of drought stress on Eugenol content of Rosemary

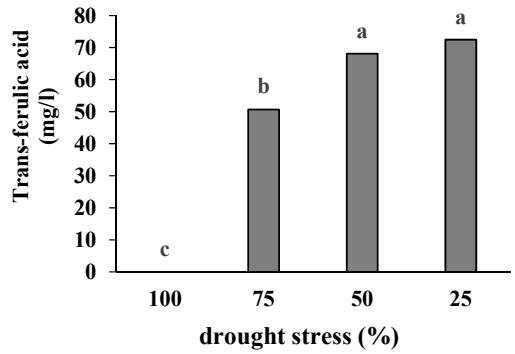

Fig. 2. Effect of drought stress on Trans-ferulic acid content of Rosemary

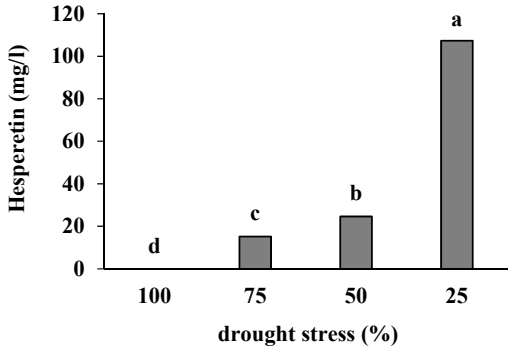

Fig. 5. Effect of drought stress on Hesperetin rosemary

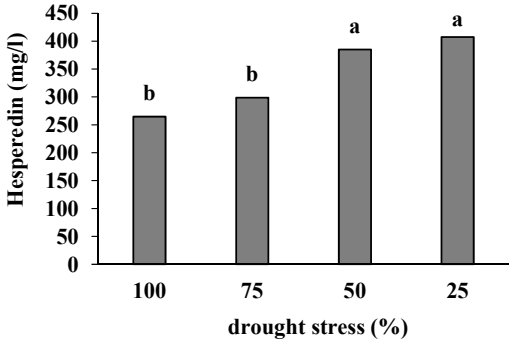

Figure 3. Effect of drought stress on Hesperedin content of Rosemary

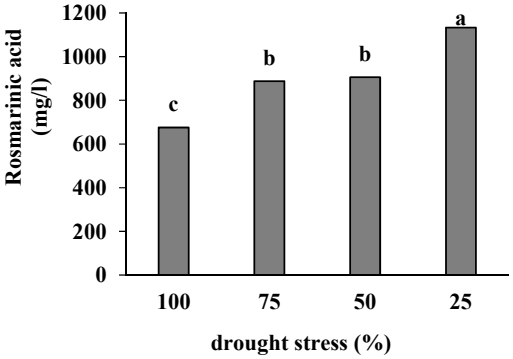

Fig. 6. Effect of drought stress on Rosmarinic acid content of rosemary

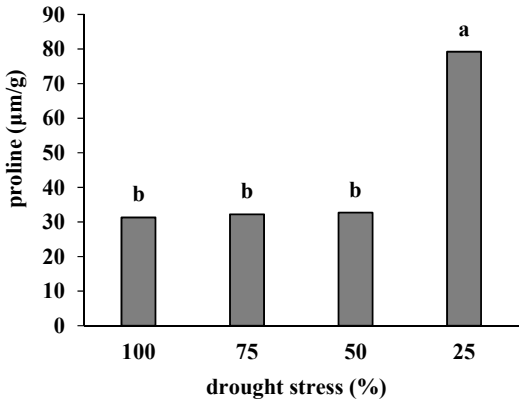

Fig. 7. Effect of drought stress on proline content of Rosemary

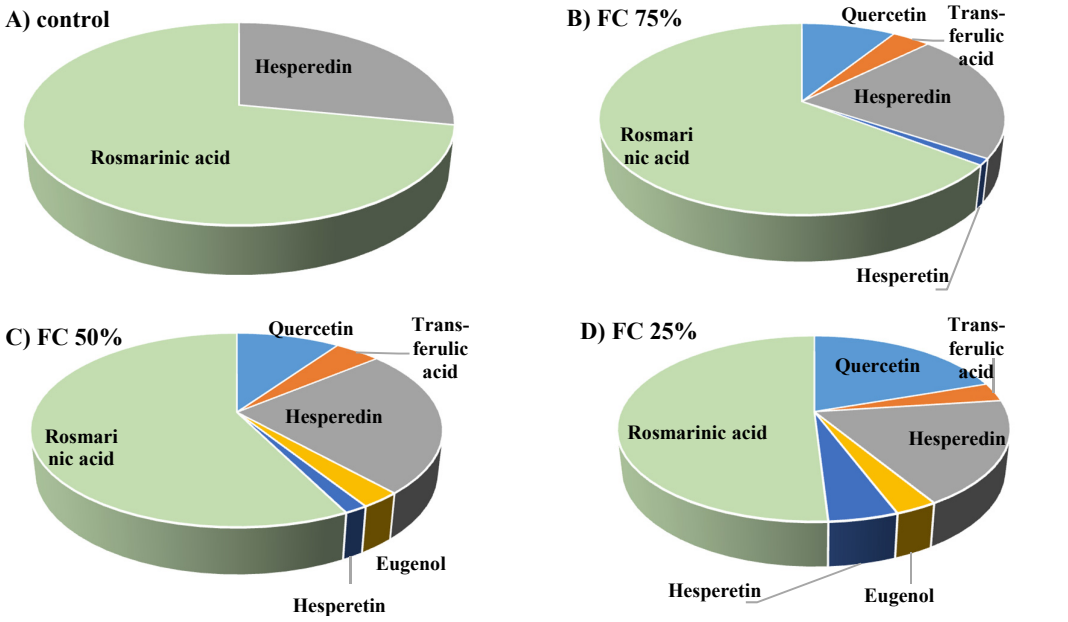

Fig. 8. Percentage of phenolic compounds in plants: (a) control, (b) 75% field capacity, (c) 50% field capacity, and (d) 25% field capacity