

Comparison of osmotic stress tolerance in two durum wheat (*Triticum durum* Desf) cultivars during germination

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INTRODUCTION & AIM

Drought is a significant abiotic stress that affects crops, particularly cereals, with severe consequences in arid and semi-arid regions. To mitigate the effects of rainfall deficits and the uneven spatial and temporal distribution of precipitation, it is essential to manage available water resources efficiently and use drought-resistant plant varieties.

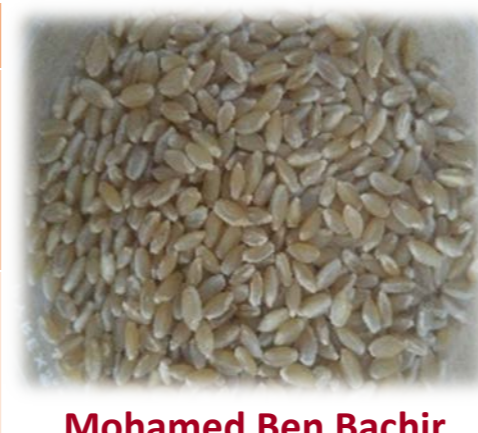
Germination, morphologically marked by the emergence of the radicle through the seed coat, results from the growth of meristematic root cells, driven by turgor pressure (Schiefelbein et al., 1997). However, water deficit disrupts these processes by impairing protein synthesis essential for embryonic development. Additionally, it limits the enzymatic breakdown of starch into simple sugars, which are critical for providing the energy needed for seedling growth. Thus, restricted water availability directly affects the mobilization of energy reserves, slowing or preventing optimal germination.

This study aims to compare the impact of moderate and severe osmotic water stress, induced by polyethylene glycol (PEG6000), on the germination of two durum wheat cultivars (Triticum durum Desf): Mohamed Ben Bachir and Oued El Bared.

MATERIAL AND METHODS

Plant Material: Seeds of two durum wheat cultivar (*Triticum durum* Desf.):

Varieties	Origin	Zone of adaptation
Mohamed Ben Bachir	Algeria	High Plateaus of Eastern Algeria
Oued El Bared	CIMMYT	High Plateaus and interior plains of Eastern Algeria



Mohamed Ben Bachir

Oued El Bared

Germination Conditions: 50 seeds per Petri dish (9 cm) lined with Whatman filter paper, with 4 repetitions per treatment. Incubation at $25 \pm 1^\circ\text{C}$, in the dark.

Treatments : Three osmotic treatments were applied: 0% PEG6000 (control, 0 bars), 10% PEG6000 (-1.37 bars), and 20% PEG6000 (-4.64 bars).

Duration of Experiment: 7 days.

Measured Parameters: Germination kinetics, germination speed, seedling vigor index (SVI), fresh seedling weight, seedling length.

CONCLUSION

The durum wheat cultivar Mohamed Ben Bachir shows remarkable tolerance to severe osmotic stress, while the cultivar Oued El Bared is particularly sensitive. These results highlight the importance of selecting cultivars adapted to water stress conditions to optimize cereal production in drought-prone areas.

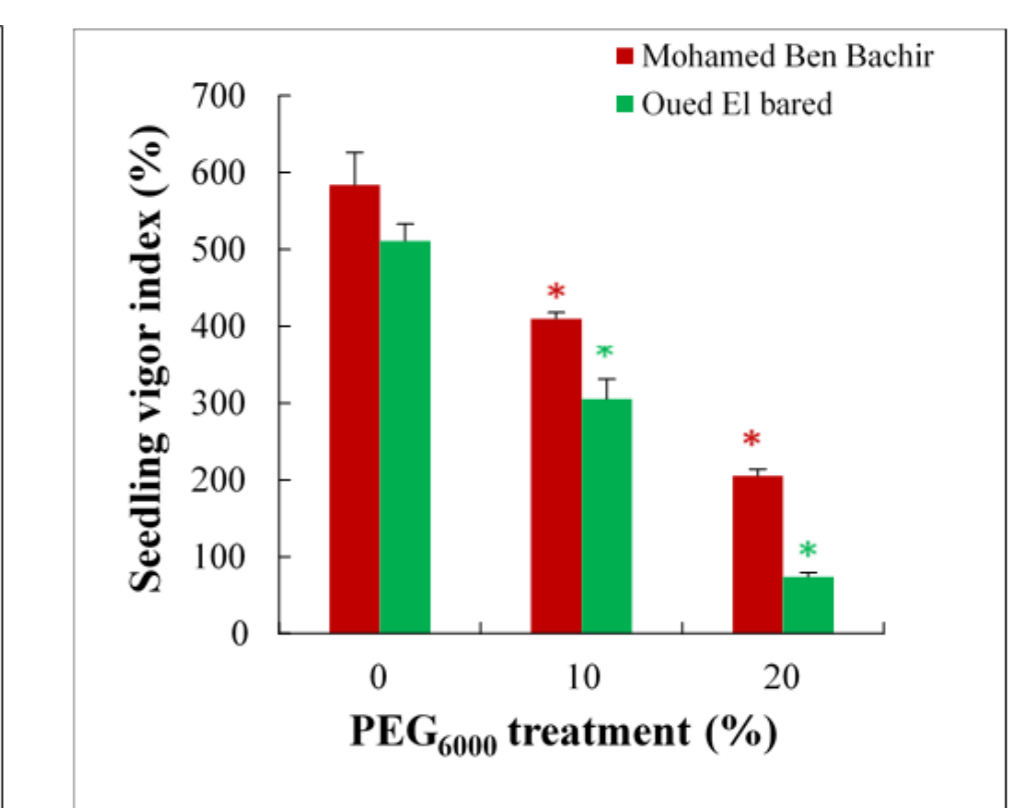
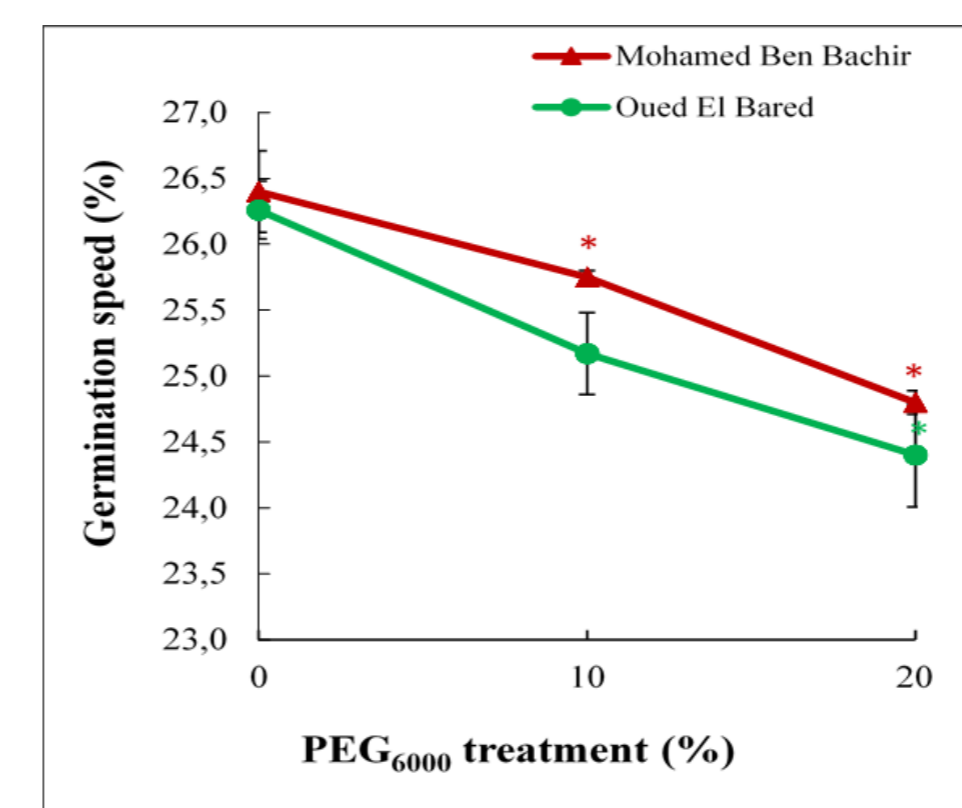
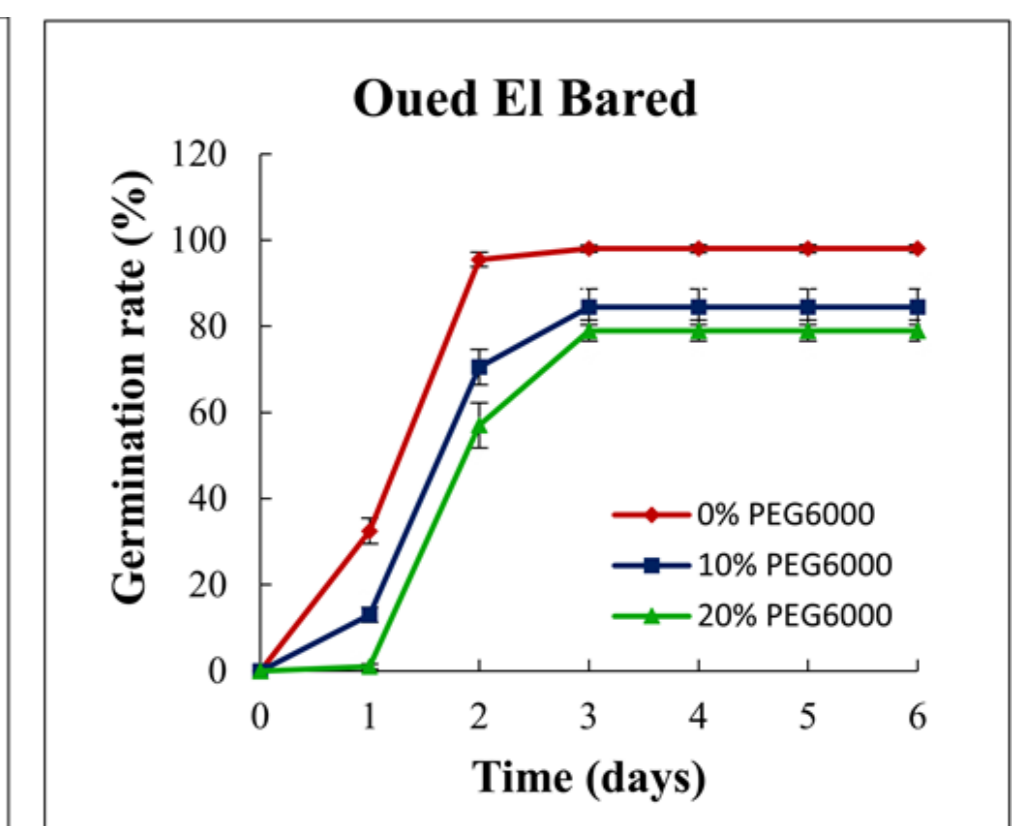
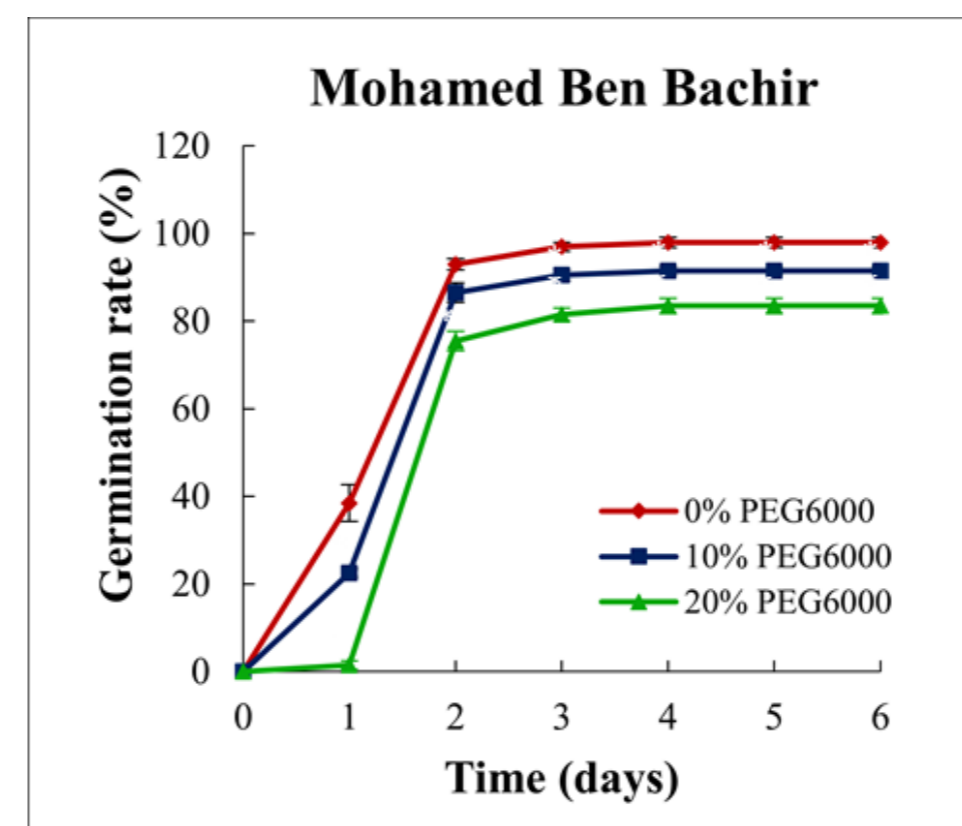
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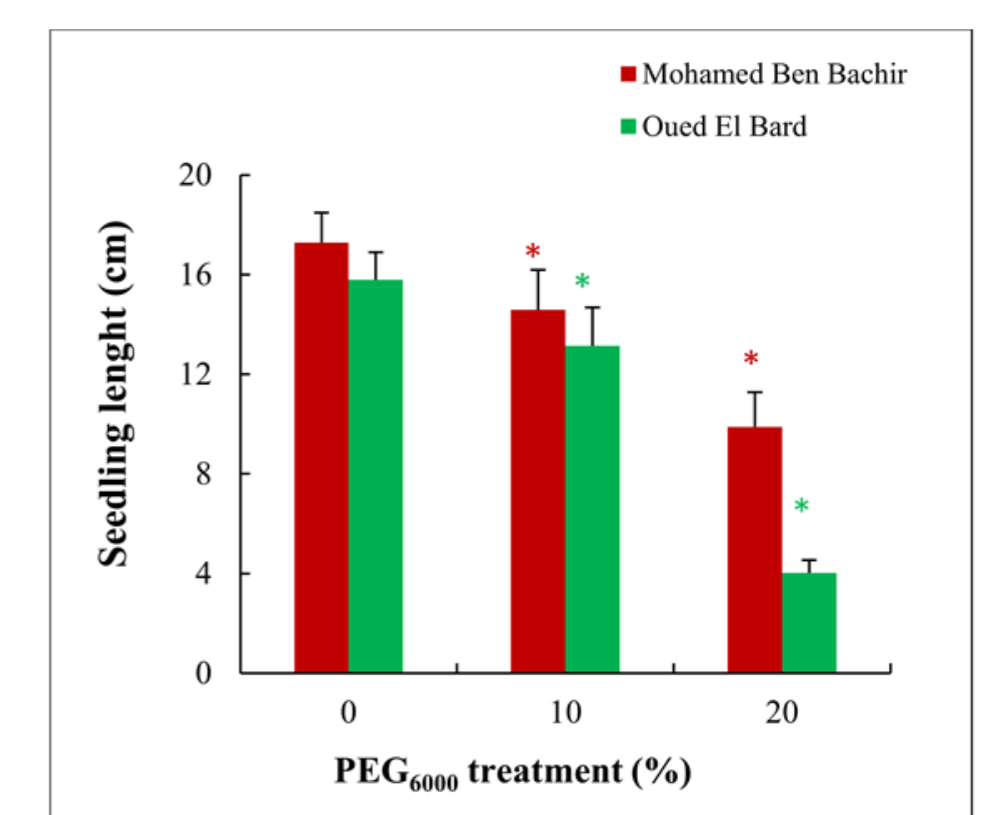
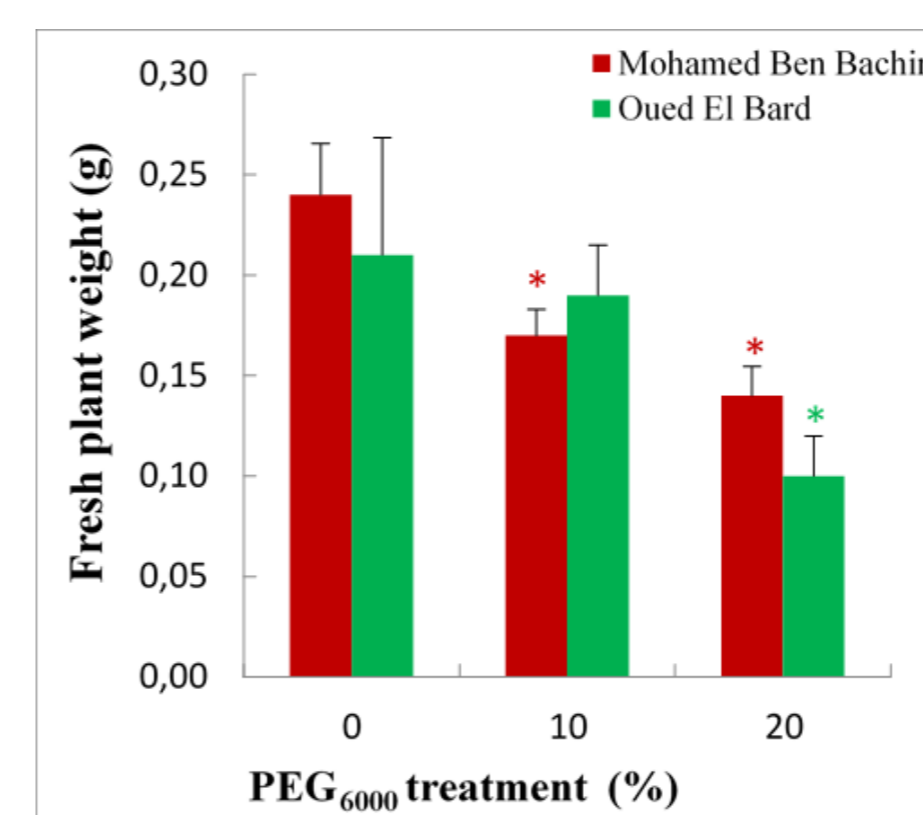
RESULTS & DISCUSSION

1. Effect of osmotic stress on germination parameters



- The results indicated that osmotic water stress significantly reduced germination parameters (germination kinetics, germination speed, seedling vigor index) and initial growth parameters (fresh seedling weight, seedling length) in both cultivars, with varying tolerance depending on the intensity of the stress.

2. Effect of osmotic stress on early growth parameters



- Under moderate stress (10% PEG₆₀₀₀), germination and growth parameters are similarly affected in both cultivars, Mohamed Ben Bachir and Oued El Bared. However, under severe stress (20% PEG₆₀₀₀), the reduction in germination and growth parameters is much more pronounced in the Oued El Bared cultivar.
- The negative effect of osmotic stress on germination is explained by a slowdown in the mobilization of reserves due to the inactivation of hydrolase synthesis and/or the inhibition of the transfer of hydrolysis products from the endosperm to the embryo (Hafeez et al., 2017).