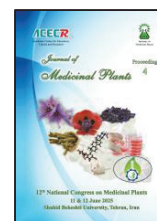




## 12<sup>th</sup> National Congress on Medicinal Plants

11 & 12 June 2025  
Shahid Beheshti University, Tehran, Iran



Poster Presentation ID: 1191

### Evaluating the Role of *Bacillus subtilis* in Alleviating Salt Stress in *Echium amoenum*

Faezeh Tashtari<sup>1</sup>, Arefeh Ebrahimi<sup>1</sup>, Pejman Ghaseminejad<sup>1,2</sup>

<sup>1</sup> Baharavaran Nastaran Agricultural Applied Scientific Training Center, Applied Scientific University, Qom, Iran

<sup>2</sup> Department of Agronomy and Plant Breeding, College of Agriculture, Isfahan University of Technology, Isfahan, Iran

E-mail: Pejman\_Ghaseminejad@yahoo.com

#### ARTICLE INFO

##### Keywords:

*Bacillus subtilis*  
*Echium amoenum*  
Iranian Borage  
Medicinal plants  
Salt Stress

#### ABSTRACT

Borage (*Echium amoenum*), an annual plant of the Boraginaceae family, possesses significant medicinal, industrial, and fodder properties. Several studies have suggested that this plant exhibits resistance to salinity and has a high capacity for salt absorption. Given its adaptability to various environmental conditions across Iran and the challenges posed by soil salinity in many regions, improving its tolerance to salinity through biological interventions could enhance its cultivation potential. To investigate the impact of *Bacillus subtilis* on the salinity tolerance of Iranian Borage, a factorial experiment was conducted under greenhouse conditions using a randomized complete block design (RCBD). The study consisted of 14 treatments, integrating seven salinity levels (0, 2, 4, 6, 8, 10, and 12 dS/m) and two bacterial conditions (presence and absence of *Bacillus subtilis*), with four replications per treatment. The bacterial inoculation was applied via irrigation water to potted plants. Key physiological and biochemical parameters—including biomass accumulation (fresh and dry weight), plant height, leaf area, chlorophyll content, ion uptake (Na<sup>+</sup> and K<sup>+</sup>). Results demonstrated that the presence of *Bacillus subtilis* significantly enhances borage's tolerance to salinity, enabling it to sustain growth at salinity levels up to 10 dS/m. Quantitative analyses revealed improvements in biomass production, leaf expansion, chlorophyll retention, and ion balance in inoculated plants compared to non-inoculated controls. These findings highlight the potential of biological amendments, such as bacterial inoculation, in mitigating salt-induced stress and promoting the sustainable cultivation of medicinal plants in Iran.

#### References

1. Darijani, S., Afsahi, M. M., Akhavan, H. R., & Goharrizi, A. S. (2025). Drying of borage (*Echium amoenum*) flowers extract: Optimization of encapsulation and spouted bed drying. *Applied Food Research*, 5(1), 100836.
2. Rivera, D., & Obón, C. (2025). Exploring the world of herbal teas. *Tea in Health and Disease Prevention*, 89–103. <https://doi.org/10.1016/B978-0-443-14158-4.00028-2>
3. Tewari, D., Bawari, S., Patni, P., & Sah, A. N. (2019). Borage. *Nonvitamin and Nonmineral Nutritional Supplements*, 165–170.