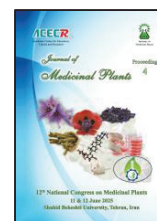




## 12<sup>th</sup> National Congress on Medicinal Plants

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



Poster Presentation ID: 1181

### Evaluating the Role of *Bacillus subtilis* in Alleviating Salt Stress in *Linum usitatissimum*

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#### ARTICLE INFO

##### Keywords:

*Bacillus subtilis*  
*Linum usitatissimum*  
Medicinal plants  
Salt Stress

#### ABSTRACT

Flax (*Linum usitatissimum*), cultivated for millennia, remains one of the most versatile crops due to its seed-derived oil and fiber-based linen fabric. The seeds, known for their high nutritional value, possess significant medicinal properties, making flax an important plant in both agricultural and pharmaceutical industries. As an annual plant, flax grows up to 90 cm tall and produces striking blue flowers. Although flax is mainly grown commercially, it can also be successfully cultivated in smaller home gardens. To evaluate the impact of *Bacillus subtilis* on flax's tolerance to salinity, a factorial experiment was conducted under greenhouse conditions using a randomized complete block design (RCBD). The study included 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. Key physiological and biochemical parameters—including plant height, fresh and dry biomass, seed yield, oil percentage in seeds, and fatty acid composition—were measured to assess flax's response under varying salinity conditions. Results indicate that flax's tolerance to salinity significantly improves in the presence of *Bacillus subtilis*, reaching an optimal threshold of 10 dS/m. Quantitative assessments reveal that bacterial inoculation positively influences biomass accumulation, seed yield, and oil content under saline conditions. Notably, variations in fatty acid composition suggest that *Bacillus subtilis* enhances the quality and stability of flaxseed oil. These findings emphasize the potential of biological inoculants in mitigating salt stress, offering a sustainable approach for the cultivation of medicinal and industrial plants in Iran.

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