



University of Zabol  
Graduate school  
Faculty of Agriculture  
Department of Horticulture science and Landscape

The Thesis Submitted for The Degree of Master of Science  
(In The Field of Horticulture science)

**Title**

Effect of seaweed extract, mycorrhiza fungi and growth-promoting  
bacteria biofertilizers on morphological and biochemical characteristics  
of Iranian Borage (*Echium amoenum*)

**Supervisor:**

Dr. Mehdi Aran

**Advisors:**

Dr. Abdrahman Rahimian Booger

**By:**

Masoumeh Sayyad Arbabi

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**Abstract:**

In order to investigate the effect of biofertilizers on improving the morphological and biochemical traits of Iranian borage in ٢٠٢١ in a farm in Kalaleh city located in Golestan province was carried out factorially in a randomized complete block design with ٣ replications. In this study, the first factor included seaweed extract at four different levels of ٠, ٠,٥, ١ and ٢ ml / l and the second factor included inoculation of seeds before planting with two species of mycorrhizal fungi (*Glomus mosseae* and *Glomus intrradices*), two Bacterial type (*Azetobacter chroococcum* and *Azospirillum brasilense*) and control (no seed inoculation). According to the results, the experimental treatments had a significant effect on traits such as number and dry flower yield, number of lateral branches and shoot dry weight of Iranian borage. The highest yield and number of flowers were related to ٠,٥ ml / l algae extract and Azetobacter and the lowest yield and number of flowers were related to control treatment (without inoculation and foliar application). Also, the effect of seaweed extract, mycorrhizal fungi, growth-promoting bacteria and their interaction on traits such as flavonoids, phenols, anthocyanins and soluble sugars was significant. The simple effects of seaweed extract, mycorrhizal fungi and growth-promoting bacteria on plant height and shoot fresh weight were significant. The amount of potassium, phosphorus and nitrogen also increased significantly under the influence of treatments. The highest amount of nitrogen in the treatment of ٠,٥ ml / l of algae extract and Azospirillum bacteria, the highest amount of phosphorus in the treatment of ١ ml / l of the algae and fungus *Glomus intrradices* and the highest amount of potassium in the treatment of ٢ ml / l of the algae and Azetobact bacterium. The lowest levels of nitrogen, phosphorus and potassium were related to the control treatment.

**Keywords:** Growth promoting bacteria, medicinal plants, mycorrhizal fungi, yield