



University of Zabol

Graduate school

Faculty of Basic Sciences

Department of Biology

**The Thesis Submitted for the Degree of M.Sc (in the field
of plant physiology)**

**Evaluation of phenological,
morphological and physiological traits
affected by biological fertilizers in two
cultivars of *Antirrhinum majus***

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Abstract

Snapdragon is one of the most important garden plants, which, in addition to its ornamental use, is also widely used as a medicinal plant. In medicine, it is used to treat liver disorders, tumors and wounds. This research was carried out in order to investigate the effect of biofertilizers on morphological, phenological and physiological traits in two cultivars of Snapdragon on 2021 in the greenhouse of Agriculture Institute of Research Institute of Zabol. Two cultivars (yellow and red) were cultivated in 4 treatments of supermycoplasma fertilizers, mycorrhizal fungi (*G. intraradices*, *G. mossaea*) and control. Morphological factors: plant height, length of the largest root, root volume, number of main and secondary root and branch, number of open flowers, number of flower buds, fresh and dry weight of organs and stem diameter; Phenological factors: the time of emergence of the first seedling, the time of four leaves and the time of flowering; Physiological factors: phenol, flavonoid and antioxidant in different organs such as: flower, leaf and root. The results of this study showed that the effect of cultivar on morphological traits: height, length of the largest root, root volume, number of main roots, number of sub-branches, number of open flowers, number of buds and stem diameter had a significant effect; While, in addition to these traits, biofertilizer treatments were significant on the number of secondary roots, the number of main branches, fresh and dry weight of the spike, fresh and dry weight of the root, fresh and dry weight of the leaves, and it did not have a significant effect only on the length of the spike. Biofertilizer treatments were significant on all 4 phenological traits: emergence time of first seedling, formation time of first leaf, formation time fourth leaf and flowering time, but the cultivar had no significant effect on the formation time of fourth leaf. Cultivar, biofertilizer treatment and their interaction were significant only on leaf and root phenol, leaf and flower flavonoid, but did not show significant effect on other physiological traits. In general, the results showed that the red cultivar was superior to the yellow cultivar in most of the measured traits. The effect of biological fertilizers on root traits has been greater. The amount of leaf phenol was higher in the red cultivar and the root phenol in the yellow cultivar. Regarding leaf phenol, supermycoplasma had a positive effect on increasing this trait, while biofertilizers had a negative effect on root phenol. Antioxidant activity did not show any significant differences with control affected by biofertilizers. In general, biofertilizers caused an increase in flavonoids in the three organs of leaf, root and flower compared to the control. So the choice of the cultivar depends on It will be according to the type of target and desired trait; But in general, according to the results of this study, the use of biofertilizers, especially supermycoplasma, is recommended due to it has mycorrhizal fungi, bacteria, algae, etc.

Key words: mycorrhiza, *G. mossaea*, *G. intraradices*, phenol, flavonoid