

## Effect of *Bacillus subtilis* on morphology and bioactive compounds of saffron

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*Bacillus subtilis* is a plant growth-promoting rhizobacterium (PGPR) in the soil rhizosphere which has been shown to be one of the endophytes of saffron (stigmas of *Crocus sativus* L.). This plant is the most valuable medicinal food product in Iran and has a nutraceutical potential in industry. The pharmacological effects of saffron are associated with two major bioactive components, crocin and safranal.

In this study, the effects of *B. subtilis* ATCC 6633 on morphology and bioactive compounds of saffron has been investigated using two types of soils including clay and peat/perlite mixture. Three different bacterial suspensions (102, 105 and 108 cfu/ml) were used in the 14-day-interval treatments of saffron planted in either sterile or unsterile soils. Flowering time was recorded and then the stigmas were collected and weighed. The amounts of  $\alpha$ -crocin and safranal in the stigma extracts were quantified using high performance liquid chromatography (HPLC).

The longest stigma, petal and leaf were observed in the treated group with 105 and 108 cfu/ml in both sterile and unsterile soils. The highest weight of stigma per corm belonged to the treated groups with 102 cfu/ml in unsterile soil and 105 cfu/ml and 108 cfu/ml in sterile soil. Treatment with 102 and 108 cfu/ml caused 1.077 and 1.149-fold increase of safranal production in sterile peat/perlite and 2.270 and 1.851-fold increase in unsterile peat/perlite compared to the control group (no treatment). While upon treatment with 105 and 108 cfu/ml 1.092 and 1.120-fold increase of  $\alpha$ -crocin was measured in sterile peat/perlite and 102 cfu/ml caused 8.87-fold increase in  $\alpha$ -crocin in unsterile peat/perlite soil.

In conclusion, the data of this study showed that *B. subtilis* triggers the morphological and physiological processes in saffron. *B. subtilis* suspension can be used in agricultural settings to induce the production of important bioactive components,  $\alpha$ -crocin and safranal.