

The Impact of *Pseudomonas putida* and *Azotobacter chroococcum* Bio-Fertilizers on Seed Germination of *Calendula Officinalis* L.'s Takii and Little Ball Varieties

Fariadi Khosroshahi^{1*}, N., Kalatejari¹, S., Bahadori², F.

1. Department of Horticulture, Sciences and Research Branch, Islamic Azad University, Tehran. Iran.

2. Natural Resources and Livestock Affairs Research Centre of Semnan Province, Semnan, Iran.

Abstract

To evaluate the effect of inoculation of bacteria *Pseudomonas* and *Azotobacter* on seed germination and seedling growth of Takii and Little Ball varieties of Marigold (*Calendula officinalis* L.), an experiment with organic agriculture aims was carried out in 2009. The seeds were sterilized by NaClO 1% and bacteria solutions were diluted with water at a ratio of 1 to 5. The seeds were then inoculated with the treatments. The experiment included the following treatments: the seeds inoculated with *Pseudomonas putida* strain 1, *P. Putida* strain 2, *Azotobacter chroococcum* strain 1, *A. chroococcum* strain 2 and some of their combinations. The inoculated seeds were kept in germinator with 24°C temperature and 16h light for 3 weeks. During this period, the seeds were irrigated with distilled water and the required factors were recorded on a daily basis. The evaluated traits included: the percentage and rate of germination, wet and dry weight of the plantlet, the length of the shootlet, rootlet, and plantlet, and the vigor index. Results indicated that the application of *P. Putida* strain 2 was more effective for the rate and percentage of germination on *Calendula* seeds than the other treatments. According to the results, the application of two strains of *A. chroococcum* on Takii variety increased the length of rootlet and plantlet significantly. Furthermore, analyzing the interaction effect and the impact of the varieties, it was observed that the Takii V. was best variety in almost indices rather than Little Ball V. and can be effective and useful for better germination and growth of the plantlet.

Keywords: *Azotobacter chroococcum*, Germination, *Pseudomonas putida*, Bio-fertilizers, *Calendula officinalis*.

* Corresponding Author. (N_f_khosroshahi@yahoo.com)