

Effect of increasing the solubility of phosphorus on seed quality of black seed (*Nigella sativa* L.)

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Abstract

In order to investigate the effects of nutritional role of maternal-plant phosphorus (P) on seed production and quality of black seed (*Nigella sativa* L.) in a calcareous soil, three experiments were conducted at research greenhouse of Ferdowsi University of Mashhad, Iran, in 2012 and 2013. The first and the second experiments were conducted as a complete randomized design based on factorial arrangement. Seven fertilizer treatments (control, vermicompost, sulfur, vermicompost + sulfur, vermicompost + *Thiobacillus* bacteria, sulfur + *Thiobacillus* and vermicompost + sulfur + *Thiobacillus*) and three levels of P (0, 30 and 60 kg/ha) were the first and the second experimental factors, respectively. The first experiment lasted 63 days, to biologically oxidize the sulfur, and at the end of this period, black seeds were sown. After determining the emergence percentage, the third experiment was conducted. In the third experiment, seed priming (distilled water, solution of 500 mM KH_2PO_4 and unprimed) was applied in the treatments with seed emergence of less than 60%, and a control treatment (selected treatment with the highest emergence from the second experiment) were considered. Based on the results of the first and the second experiments, application of vermicompost+ *Thiobacillus* bacteria and vermicompost+ sulfur + *Thiobacillus* bacteria had significant effects on increasing seed weight per plant and qualitative traits such as emergence percentage and seed vigor. In addition, a significant positive correlation was observed between qualitative traits of seeds and soil available P and P content of maternal plant. In the third experiment, P-priming with 500 mM KH_2PO_4 solution had significant effects on increasing emergence percentage and decreasing mean emergence time.

Keywords: Nutrient priming, Seed vigor, Radicle emergence (RE) test, Mean emergence time.

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