

## Inoculation effects of endophytic fungus (*Piriformospora indica*) on antioxidant enzyme activity and wheat tolerance under phosphorus deficiency in hydroponic system

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### Abstract

Information about the effect of endophytic fungus *Piriformospora indica* on wheat response to stress conditions is very limited and sometime contradictory. This greenhouse research was conducted in a hydroponic culture to investigate the inoculation effects of mycorrhizal-like fungus, *P. indica*, on enzymatic and non-enzymatic defense mechanisms of wheat (*Triticum aestivum* L., cv. Niknejad) at two levels of phosphorus (P) supply (deficient and sufficient). The experiment was factorial, based on a completely randomized design with three replications. Sixty days after applying the treatments, plants were harvested and shoot dry weight and concentration of P, iron, zinc and activity of antioxidant enzymes like catalase (CAT), ascorbate peroxidase (APX), guaiacol peroxidase (GPX) and chlorophyll a, b and carotenoids contents were measured. Results showed that P-deficiency reduced shoot dry weight and concentration of P and iron and increased concentration of zinc in the shoots. Inoculation of wheat roots with *P. indica* in P-deficiency condition resulted in significant increasing of shoot dry weight and P concentration. Also, chlorophyll a, b contents and concentration of carotenoids in P-deficiency condition was significantly higher than P-sufficiency condition. Inoculation of *P. indica* to wheat roots decreased chlorophyll a, b contents and concentration of carotenoids. Inoculation of *P. indica* in P-deficiency condition significantly decreased the activity of GPX and significantly increased the activity of CAT and GPX in P-sufficiency condition. In general, inoculation of fungus *P. indica* to wheat plant could be recommended as an effective method to alleviate deleterious effects of P-deficiency and increase its tolerance to this stress.

**Keywords:** Ascorbate peroxidase, Photosynthesis pigments, Catalase, Guaiacol peroxidase.

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