EXECUTIVE SUMMARY
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A Symbiotic Approach for the Improvement of Salt Tolerance of Mustard (*Brassica juncea*) through *Piriformospora indica*: Role of Antioxidant Machinery

PRINCIPAL INVESTIGATOR

Dr. Sarvajeet Singh Gill
Centre for Biotechnology
Maharshi Dayanand University
Rohtak – 124 001, Haryana

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Piriformospora indica (*Serendipita indica*), a plant-root-colonizing novel basidiomycete fungal symbiont, tracked down in the Indian Thar desert and attracted the considerable attention of plant biologists due to its exceptional colonization potential, wide host range (with monocots and dicots), and role in stress tolerance, crop protection and improvement [Verma et al. (1998) Mycologia 90, 896-903]. Therefore, *P. indica* is now widely opted as bio-stimulant. Here, we investigated the bio-protection potential of *P. indica* against NaCl stress tolerance in Cruciferous Indian mustard [*Brassica juncea* L. cv. Pusa Jai Kisan (PJK)]. It has been reported that *P. indica* supplementation in mustard plants confers NaCl stress tolerance by enhancing the plant growth and ROS scavenging capacity due to an activation of the components of ascorbate-glutathione (AsA-GSH) cycle in comparison to the non-inoculated salt grown plants only. The Na^+/K^+ ratio and oxidative stress parameters in *P. indica* colonized mustard plants treated with different concentrations of NaCl (0, 100 or 200 mM) were lower in comparison to the plants grown in salt only under similar conditions. The higher concentration i.e. 200 mM NaCl significantly reduced the leaf area, plant dry mass, photosynthetic pigments in salt stressed plants as compared to the *P. indica* inoculated plants. The *P. indica* inoculated plants exhibited higher GSH and AsA contents under salinity stress. The significantly higher activities of the components of ROS scavenging machinery *viz.* superoxide dismutase (SOD), catalase (CAT), ascorbate peroxidase (APX), guaiacol peroxidase (GPX) and glutathione reductase (GR) suggests the existence of an efficient antioxidant defence system to cope with salinity-induced oxidative stress in *P. indica* inoculated mustard plants than non-colonized plants. The present investigation provides acumens into the role of *P. indica* arbitrated NaCl stress tolerance by regulating the stress induced oxidative burden, protecting the plant growth and development to sustain crop yield under adverse environment.

Reference

Verma S, Varma A, Rexer K-H, Hassel À, Kost G, Sarbhoy A, Bisen P, Buetehorn B, Franken P (1998) *Piriformospora indica*, gen. et sp. nov., a new root-colonizing fungus. Mycologia 90:896–903

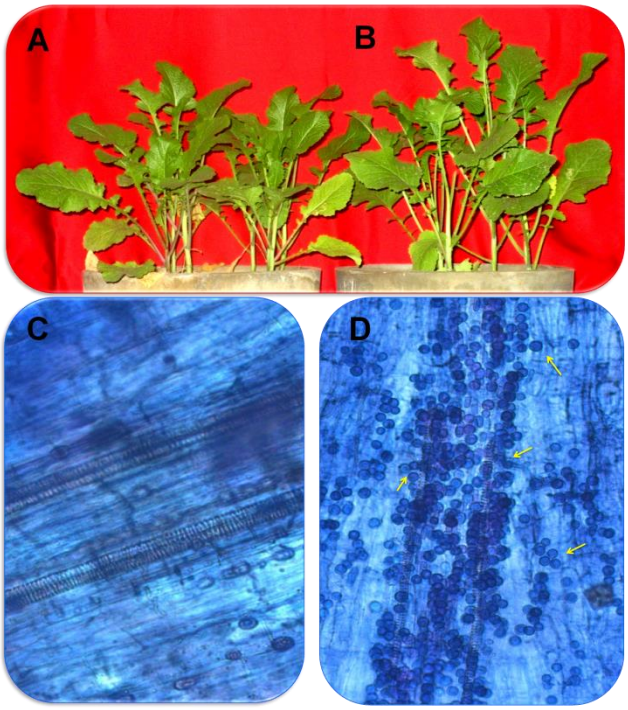

Fig. 1. *P. indica* colonization of Mustard roots. **A.** Mustard plants colonized with autoclaved *P. indica*. **B.** Mustard plants colonized with *P. indica*. **C-D.** Trypan blue staining of mustard plant roots. **C.** Roots of mustard plants colonized with autoclaved *P. indica* no chlamydospores. **D.** Roots of mustard plants colonized with *P. indica* showing intracellular *P. indica* chlamydospores. Arrows indicate chlamydospores.

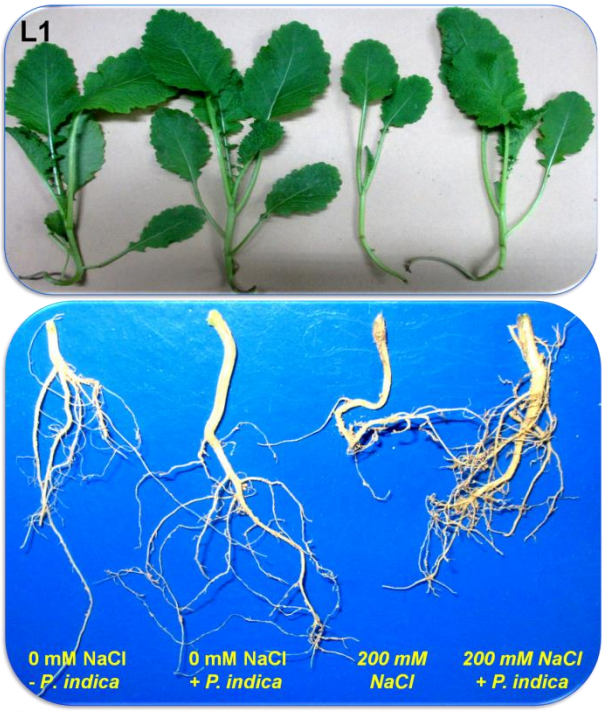

Fig. 2. Shoot and root of mustard plants under salinity stress (0 or 200 mM NaCl) in the presence and absence of *P. indica*. **LANE 1 (L1)** Non-colonized mustard plants (shoot & root). **LANE 2 (L2)** Mustard plants colonized with *P. indica*. **LANE 3 (L3)** Shoot & root of mustard plants under 0 or 200 mM NaCl. **LANE 4 (L4)** Shoot & root of mustard plants colonized with *P. indica* under 200 mM NaCl.

Publication acknowledged to UGC for UGC-MRP

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