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Plant growth promoting rhizobacteria can minimize allelopathic effects of Rosmarinus officinalis on germination and growth of wheat

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Cultivation of medicinal plants with agricultural crops is a good concept to enhance the livelihood of the farmers. Rosemary (Rosmarinus officinalis) is an important medicinal plant with high economic value. Being a perennial crop, rosemary plants remain productive for 10-12 years. However, rosemary has shown allelopathic effects on some of the agricultural crops including wheat. In the present study, we assessed the potential of plant growth promoting bacteria to minimize the allelopathic effects of rosemary on wheat plants. Ten different plant growth promoting bacterial isolates belonging to Pseudomonas spp. and Bacillus spp. were screened during the study. Blotter paper test revealed three of these isolates (Pf-19, Pf-37 and BS-56) superior than others and were used for further study. Due to the allelopathic effect of rosemary leaf extract on wheat, a reduction in different plant growth parameters was recorded in the negative control (C2) in comparison to control (C1). Germination percentage of wheat seeds was reduced to 42.50 % in negative control, whereas the other growth parameters were also reduced up to 60% in comparison to control in comparison to control. However, this allelopathic effect was minimized when the wheat seeds were treated with selected bacterial isolates. Treatments showed the significant stimulatory effect on seed germination that was improved up to 39.13 % and seedling vigour indices up to 80.42% in bacterized seed in comparison to negative control (C2). The combined treatments [Pf-37+ Bs-56 (T-5)] gave best results to promote the wheat growth.

Results also suggest that the specific activity of catalse and peroxidase enzymes was affected significantly by seed treatment with selected bioagents and the stress imposed by rosemary leaf extract was reduced. Maximum CAT activity (0.56 μmol mg-1 min-1) was recorded in treatment T-5 (Pf-37+Bs-56) on 2nd day after radical emergence, whereas, highest POX activity was recorded in treatment T-7 (1.89 μmol mg-1 min-1). However, on the 6th day after radical emergence, a decrease in the specific activity was observed in different treatments. This suggests that the plant inoculated with the P. flouresence and B. subtilis strains felt less stress on the 6th day. The combination of Pf-37 and Bs-56 showed 100% reduction in the allelopathic effects therefore, the strains can be used to minimise the allelopathic effects of rosemary in wheat under field conditions.

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