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Top-Down and Bottom-up Effects in Rhizosphere-Plant-Aphid Interactions

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Abstract : Aphids are pests that can cause severe yield losses in field crops. Chemical control is currently widely used to control aphids, but this method is increasingly controversial. The pea is able to recruit bacteria that are beneficial to its development, growth and health. However, the effects of this microbial recruitment on plant-insect interactions have generally been underestimated. This study investigated the interactions between Pisum sativum, key bacteria of pea rhizosphere (Rhizobium and Sphingomonas species) and the pea aphid, Acyrthosiphon pisum. We assessed the bottom-up effects of single and combined bacterial inoculations on pea plant health and subsequent aphid performance, as well as the top-down effects of aphid infestation on soil functionality. The presence of S. sediminicola or S. daechungensis limited the fecundity of the pea aphid without strongly affecting its feeding behaviour. Nevertheless, these bacteria limited the effect of A. pisum on the plant phenotype. In addition, the aphid infestation decreased the soil functionality, suggesting a potential strategy to hinder the recruitment of beneficial microorganisms.

Keywords : Acyrthosiphon pisum, Pisum sativum, Sphingomonas, rhizobium, EPG, productivity
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