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The unique interaction between the summer annual desert plant *Salsola inermis* and weevil beetles residing on its roots: Mutualism or parasitism?

The outcome of an interaction between plants and insects is set by the balance of the costs and benefits to each partner and can range from antagonism to mutualism. We describe an interaction between a summer annual desert plant *Salsola*, weevils residing on its roots and nitrogen-fixing bacteria, in the Negev Desert of Israel. Specifically, (1) we examined the distribution, abundance and significance of this unique interaction throughout the Negev Desert, (2) we used 16S amplicon sequencing analyses to characterize spatial and temporal variations in bacterial composition, and to explore potential nitrogen fixing groups in the guts of weevils, and finally (3) we quantified the effect of a weevil larvae and adults on the plant experimentally. The results suggest a complex interaction with negative effects of the weevil on plant growth and biomass, combined with positive effects on plant nitrogen content.

