2 Reciprocal rewards stabilize cooperation in the mycorrhizal symbiosis.

Kiers ET, Duhamel M, Beesetty Y, Mensah JA, Franken O, Verbruggen E, Fellbaum CR, Kowalchuk GA, Hart MM, Bago A, Palmer TM, West SA, Vandenkoornhuyse P, Jansa J, Bücking H

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Recommendations:

Very Good 10 Oct 2011

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CONFIRMATION | NEW FINDING

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Toby Kiers and colleagues have provided an elegant proof that nutrient exchanges between plants and arbuscular mycorrhiza (AM) are not controlled by the plant alone but obey the rules of reciprocity, whereby plants donating more carbon received more phosphorous, and the fungi donating the most phosphorous received the most carbon in return. This is particularly interesting, because AM fungi create networks of contacts with several individual plants, and each plant (or possibly even a single root of a plant) is colonized by multiple networks of AM fungi. The research team showed that the plant can discriminate between different AM fungi along the same root segment.

Probably, these symbiotic partners have no equal control over nutrient exchange, because the plant can acquire phosphorous in other ways than via AM, whereas AM fungi completely depend on the plant for carbon. Moreover, plants and AM fungi do not only trade carbon against phosphorous, but AM fungi may also provide nitrogen or they may improve soil conditions for the plant. Thus, it remains to be shown how plants respond to nutrient gifts depending on the environmental situation.

Disclosures
None declared

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Abstract:

ABSTRACT

Plants and their arbuscular mycorrhizal fungal symbionts interact in complex underground networks involving multiple partners. This increases the potential for exploitation and defection by individuals, raising the question of how partners maintain a fair, two-way transfer of resources. We manipulated cooperation in plants and fungal partners to show that plants can detect, discriminate, and reward the best fungal partners with more carbohydrates. In turn, their fungal partners enforce cooperation by increasing nutrient transfer only to those
roots providing more carbohydrates. On the basis of these observations we conclude that, unlike many other mutualisms, the symbiont cannot be "enslaved." Rather, the mutualism is evolutionarily stable because control is bidirectional, and partners offering the best rate of exchange are rewarded.

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