

Ants farm root aphid clones in subterranean rooms

July 2 2012



The yellow meadow ant, *Lasius flavus*, farms root aphids for sugar (honeydew) and nitrogen (protein). Credit: Aniek Ivens

The yellow meadow ant, *Lasius flavus*, farms root aphids for sugar (honeydew) and nitrogen (protein). In turn these species of aphids have developed distinctive traits never found in free living species such as the 'trophobiotic organ' to hold honey dew for the ants. New research published in BioMed Central's open access journal *BMC Evolutionary Biology* shows that over half of ant mounds contained only one of the three most common species of aphid, and two thirds of these has a single aphid clone. Even in mounds which contained more than one species of aphid 95% of the aphid chambers contained individuals of a single

clone.

Aphid farming by ants is considered to be mutualistic. The ants cultivate and protect the [aphids](#) which in turn provide food for the ants. In farming mutualism, monocultures may reduce competition and are perhaps the result of husbandry (caused by the ants selecting the best aphids for their needs).

Researchers from the University of Copenhagen, University of Groningen and Rockefeller University used DNA microsatellite analysis to look at the [genetic similarity](#) of the three most common [species](#) of root aphids (*Geoica utricularia*, *Tetraneura ulmi*, and *Forda marginata*) within *L. flavus* nests, [soil samples](#) within nests, and single aphid chambers.

Results indicated that while there was considerable aphid diversity within the 7 km test site at all sampling levels (ant mound, soil sample and chamber), monocultures occurred more frequently than expected. 52% of mounds and 99% of aphid chambers contained a single species and 60% of these contained a single clone. When multiple species or clones existed in the same mound they were kept separated.

Aniek Ivens, who led this research, explained, "Although two years later most ant mounds seemed to contain the same clones, two mounds had gained new clones of their species. It is possible that either these aphids have been brought in or that they were previously at a very low level in the mound and missed during an earlier survey."

The combination of underground nesting, aphid clones, and very low gene flow between aphid populations has allowed *L. flavus* to evolve an unusual form of symbiosis. Miss Ivens continued, "In a parallel with human farming methods this most likely gives colonies the possibility to actively manage the diversity and abundance of their livestock - allowing

maximal honeydew yield from mature aphids that are kept under optimal conditions of phloem feeding and ant care. Ants also secure dietary protein by eating the excess of young aphids, and replacement of their honeydew-producing livestock when adult aphids become less productive."

More information: Ants farm subterranean aphids mostly in clone groups: an example of prudent husbandry for carbohydrates and proteins?

Aniek BF Ivens, Daniel JC Kronauer, Ido Pen, Franz J Weissing and Jacobus J Boomsma, *BMC Evolutionary Biology* (in press)

Provided by BioMed Central

Citation: Ants farm root aphid clones in subterranean rooms (2012, July 2) retrieved 19 April 2024 from <https://phys.org/news/2012-07-ants-farm-root-aphid-clones.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.