

Chemical mimicry of an aphid to mutualistic ants

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Ant-aphid interaction is one of the most famous examples of mutualism in which ants attend aphids for their honeydew and protect them against enemies. However, ants also often hunt the aphids they attend. To explain the proximate factor causing ants' hunting behavior, Sakata (1994) proposed "marking hypothesis" which posits that ants mark something to the aphids providing ample honeydew and the nestmate ants tend to hunt those aphids with less marks (providing less honeydew). Recently, Endo and Itino (in press) found that the ants' cuticular hydrocarbons (CHCs), which are ants' nestmate recognition signals, work as the real marking substances in the *Stomaphis-Lasius* system.

Thus aphid needs to provide much honeydew to avoid ant's predation, however it is costly to produce much honeydew. Therefore, aphid may use chemical mimicry, which is used in many insects parasitic to ants, as an alternative strategy to avoid ant's predation.

Based on the fact that the CHCs work as marks, we hypothesize that the aphids mimic chemically to the ants' CHCs as a counter-adaptation against the ants' predation using CHC marks. To elucidate the resemblance of the aphids' and ants' CHCs in non-contact conditions, we reared the aphid *Stomaphis yanonis* in the absence of attending ants, analyzed their CHCs by GC-MS, and compared their CHC profiles with the attending ants' in the wild. We found that the CHC profiles of the non-ant-attended aphids (Figure (c)) resemble those of the mutualistic *Lasius fuji* ants (Figure (a)). This suggests that the aphids mimic chemically to the ants' CHCs.

Keywords: ant-aphid mutualism, chemical mimicry, cuticular hydrocarbons (CHC), *Lasius fuji*, *Stomaphis yanonis*

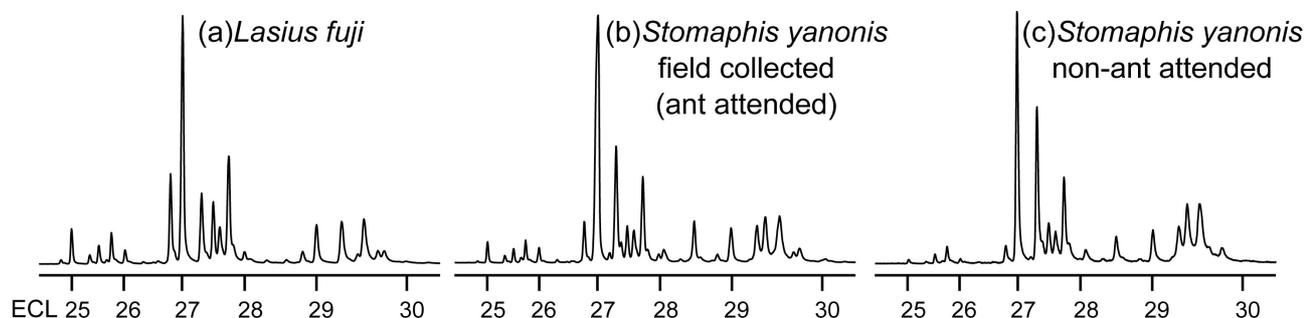


Figure Cuticular hydrocarbon profiles of (a) the ant *Lasius fuji*, (b) the aphid *Stomaphis yanonis* (field collected), and (c) *S. yanonis* (non-ant attended).