Is it possible to prevent ant tending of aphids using companion plants?

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Résumé

The rosy apple aphid is a major pest of apple orchards with no alternative treatment to pesticides until now, even in organic farming. Because of the detrimental effect of pesticides on environment and on human health, as well as resistance phenomena among pests, development of novel control strategy is needed, and conservation biological control strategy favoring settlement and activity of natural enemies' population are among the most promising solutions.
Yet natural biological control of the rosy apple aphid is complicated due to an early spring development of the rosy apple aphid, when only rare other sugar sources are available in the environment, and hence constituting a valuable food source for ants in particular. Indeed, the rosy apple aphid is an ant tended species, benefiting protection against natural enemies in exchange for honeydew supplied to ants that are known to rely heavily on sugar resources to enhance activity of workers and develop the colony. As a consequence, ants may decrease the efficiency of natural biological control of the rosy apple aphid at least during this critical period. Hence, developing biological control strategy can be challenging owing to these complex trophic and mutualistic interaction network and still need to be improved. However, ants are known to use extrafloral nectar as an alternative source of sugar that may compete with honeydew sources. Thus, extrafloral nectariferous companion plants already used to provide alternative resources to natural enemies might also act as an alternative source of sugar for ants and inhibit ant-aphid interactions.

The attract and reward strategy combines herbivores induced plant volatile emission to attract natural enemies and companion plants to provide them additional resources, and most frequently nectar. Based on a sentinel plant experiment in 2023 with or without ant exclusion (glue), we found that the presence of mutualistic interactions between ants and aphids conditions the efficiency of an attract and reward strategy tested against the rosy apple aphid.

*Intervenant

In 2024 we tested the potential of extrafloral producing plant sown in the border of apple orchard to enhance biological control of aphids by attracting more natural enemies and by diverting ant from aphid honeydew.
An experimental orchard with the attract and reward strategy implemented was used and biological control as well as ant presence/absence and density were measured and recorded at different distance from the companion plants, and at different position within the orchards (center vs edge). This experiment will allow us to determine whether companion plant in border modify spatial distribution of ants, their occurrence in the rosy aphid colonies and in fine improve the biological control.

Mots-Clés: biological control, companion plants, attract and reward strategy, rosy apple aphid, ants