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The role of plant volatiles in prediction of floral resource suitability: chemical ecology to enhance conservation biological control

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Plants emit substantial amounts of volatile organic compounds (VOCs) which represent a decisive communication channel, governing essential decisions insect have to make, such as choice of food. Understanding these interactions is critically important in Habitat Management and in a broader view Conservation Biological Control. Suitable flower species must enhance the survival and fecundity of natural enemies but in addition they also need to be highly attractive and thus frequently visited. To date few examples exist that have considered both criteria. In this study we tested the effects of the flowering plants alyssum (Lobulariamaritima), buckwheat (Fagopyrumesculentum), French marigold (Tagetespatula) and sweet basil (Ocimumbasilicum) on the fecundity and olfactory attractiveness of the egg parasitoid Trissolcus basalis, which is an important biological control agent of the stink bug Nezaraviridula. Our results showed that access to buckwheat and basil flowers increased the number of parasitoid offspring. However, in olfactometer experiments where T. basalis was allowed to choose between flowering and non-flowering plants, only buckwheat floral scent was attractive. Headspace analyses of the odour emitted by the four plant species revealed very distinct VOC profiles with little overlap in compounds. Buckwheat floral scent was characterised by the presence of short-chain carboxylic acids. Headspace extracts of buckwheat flowers and a reconstituted blend of their major components were significantly attractive when tested in the olfactometer. Furthermore, electrophysiological experiments showed that two main compounds, 3-methylbutanoic acid and 2-methylbutanoic acid, elicited consistent responses in the antennae of T. basalis. Integrating chemo-ecological methods into conservation biological control allowed us to identify a potential resource plant and attractive compounds for field studies.