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Non-targeted metabolome profiling of green flower buds in oilseed rape: Screening for resistance against the pollen beetle

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The pollen beetle (Brassicogethes aeneus F.; Coleoptera: Nitidulidae) is one of the major insect pests of oilseed rape (Brassica napus L.; Brassicaceae), with the potential of causing significant reductions in seed yield. Since pollen beetles become increasingly resistant to pyrethroids, alternative control strategies within the framework of integrated pest management are needed to reduce the use of insecticides and the undesirable selection of beetles for insecticide resistance. One strategy is to use the natural variation in brassicaceous plants species to identify potential chemical resistance parameters that enable plant breeders to enhance the resistance of oilseed rape against adult pollen beetles.

In this project we have i) screened B. napus cultivars and related brassicaceous plant species for their effect on the feeding behaviour of adult B. aeneus and ii) analysed the metabolome profiles of green flower buds by liquid chromatography electrospray ionisation time-of-flight mass spectrometry.

The feeding response of the pollen beetle was dependent on sex and plant species. Males discriminated stronger between plant cultivars and species than females. The beetles preferred plants closely related to B. napus over distantly related ones like Sinapis alba, Eruca sativa or Barabarea vulgaris. To identify candidate compounds as potential chemical resistance parameters, we correlated metabolome profiles and beetle feeding behaviour. Positive and negative correlations of plant compounds with the beetles feeding behaviour have been detected. The metabolome profiles were plant species and variety-specific. Oilseed rape varieties could also be clearly separated statistically. Statistical models resulted in a candidate list for metabolite identification. Repellent effects of candidate compounds were tested in bioassays. Non-targeted metabolome profiling can be a first step to unravel plant resistance traits via a chemical ecology approach.