

Multitrophic interactions between insects, phytopathogens and plants: Phytoplasma manipulates vector behaviour by means of plant odour

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Plant sucking insects cause world-wide enormous loss of agricultural yield by direct damage of plant hosts and by transmission of diseases. The agents of economically important phytoplasmal diseases are transmitted by phloem-feeding insects. Apple proliferation (AP) is caused by the mycoplasma-like bacterium "*Candidatus* Phytoplasma mali" which is naturally transmitted by the apple leaf sucker *Cacopsylla picta* (Hemiptera: Psyllidae). Reproduction and juvenile development of this univoltine psyllid occurs on apple trees in spring, while the newly emerged adults emigrate to other hosts like spruce in early summer. Re-immigration on apple takes place in early spring of the following year. In the presented study, we investigated both host plant odours and behaviour of vector insects under influence of the apple proliferation phytoplasma (APP). Headspace samples collected from healthy and APP-infected apple trees were analyzed by GC-MS. The chemical analyses showed differences between the composition of volatiles from APP-infected and healthy plants. Female emigrants of *C. picta* were tested in a dynamic Y-shaped olfactometer. Tested psyllids were individually marked and used afterwards for DNA-extraction. PCR with APP-specific primers revealed which of tested leaf suckers had been previously infected by APP. It turned out that only one third of young leaf suckers (emigrants) which developed on APP-infected plants, had been infected by phytoplasmas, suggesting a partial resistance of *C. picta* against APP infections. Emigrants infected by APP significantly preferred volatiles of APP-infected plants, while resistant emigrants preferred volatiles of healthy plants. Moreover, healthy emigrants without previous contact to infected trees significantly preferred volatiles of infected trees to volatiles of healthy ones. The presented results implicate that the AP phytoplasma manipulates both the odour of infected plants and the behaviour of vector insects. Because the only way to control phytoplasma diseases is to control their vectors, the phytoplasma-manipulated plant kairomones may be used in traps in future, allowing environmentally friendly psyllid control.