

## Whitefly-induced plant defences in cucumber and their impact on biological control of spider mites

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**Abstract:** Whiteflies are known to induce plant responses, which have physical and chemical effects on herbivores and their natural enemies. Possibly because of the importance of whiteflies as pest species, research has mainly focused on the impact of these responses on whiteflies (herbivore-induced direct defence). The indirect defences through herbivore-induced plant volatiles that promote the activity of natural enemies of whiteflies have also been studied widely. The impact on other (non-whitefly) herbivores has been relatively overlooked. We studied plant-mediated effects of the greenhouse whitefly *Trialeurodes vaporariorum* (Westwood) on the spider mite *Tetranychus urticae* (Koch) infesting cucumber. We observed a reduction in spider mite population growth of up to 30% on whitefly-infested plants. The two pest species were spatially separated on the plants, so the effects were indirect and thus plant-mediated. The consequences of these plant responses for biological control of spider mites were substantial: both the phytoseiid predators *Phytoseiulus persimilis* (Athias-Henriot) and *Neoseiulus californicus* (McGregor) reduced spider mites to low levels much quicker on whitefly-treated plants than on control plants. Inhibition of spider mite development did not occur on cucumber plants treated with the cabbage whitefly *Aleyrodes proletella* (Linnaeus). The adults of this species easily survive and oviposit on cucumber plants, but crawlers were observed to die shortly after egg hatching. We therefore suggest that the indirect plant responses to whiteflies are caused by feeding of the nymphs but not by feeding of adults. Plant responses to whiteflies are supposed to be specific by inducing specific genes that transcribe pathogenesis-related proteins (Walling, 2000). The exact mechanism in our study is not clear yet, but might be comparable. To our knowledge, this study is the first to report whitefly-induced plant responses on spider mites. Reciprocal effects were observed in cotton, where an early infection with *Tetranychus turkestanii* (Ugarov & Nikolskii) reduced the population level of whiteflies later on in the season (Agrawal *et al.*, 2000). Future research will focus on possible applications for pest control as well as on the elucidation of the underlying mechanisms.

**Key words:** induced resistance, cucumber, *Tetranychus urticae*, *Trialeurodes vaporariorum*

### References

- Agrawal, A.A., Karban, R. & Colfer, R.G. 2000: How leaf domatia and induced plant resistance affect herbivores, natural enemies and plant performance. – *Oikos* 89: 70-80.
- Walling, L.L. 2000: The myriad plant responses to herbivores. – *Journal of Plant Growth Regulation* 19: 195-216.