TOMATOES THAT REPEL WHITEFLIES

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The world-wide spread of pest insects has locally led to large economic losses in crop production. We study the interaction between tomato (*Solanum lycopersicum*) and whiteflies (*Bemisia tabaci*) with the aim to increase the plant's repellence through modification of natural volatile emission and related toxins, specifically in glandular trichomes (leaf- and stem hairs). Plant semiochemicals play an important role for insects in locating a host plant and we investigated which volatile cues might be in involved in attraction/repellence of the phloem-feeding pest-insect *B. tabaci*. We first tested the preference of *B.tabaci* for a collection of wild tomato accessions and introgression lines, and determined the volatiles in the plants's headspace. Correlation analysis revealed that several terpenes were putatively unattractive for whiteflies. Terpenes are plant-produced compounds with a wide variety of functions, but well-known for their role in plant insect interactions and for their role in plant defence. Several of these candidate compounds conferred repellence to otherwise attractive tomato plants when applied to the plant. In particular the tomato-produced sesquiterpenes 7-epizingiberene and *R*-curcumene were shown to be active as semiochemicals to *B. tabaci* adults. However, the stereo-isomers zingiberene and *S*-curcumene, isolated from ginger oil, did not evoke a repellence response.

Glandular trichomes are specialized plant tissues, well equipped for the production, storage and emission of terpenes. In order to clone the relevant sesquiterpene synthases we analyzed the transcriptomes of trichomes of relevant tomato lines by means of high-throughput sequencing (GS Titanium, 454 Life Sciences, USA) of ESTs. This allowed us to identify not only terpene synthases but also the genes involved in precursor biosynthesis. Moreover, to control/modify the production of relevant sesquiterpenes, we cloned several glandular trichome-specific promoters in order to drive these precursor genes and terpene synthases in transgenic tomato lines. We have now obtained several stable transgenic lines over-expressing different precursor genes in glandular trichomes. These lines have higher levels of precursors for terpene biosynthesis and will be crossed with transgenic lines that overexpress specific terpene synthases. Preliminary data show that this approach can indeed lead to the production of volatiles in cultivated tomatoes that act as repellents to whiteflies.

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