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Optimization and Validation for Determination of VOCs from Lime Fruit Citrus aurantifolia (Christm.) with and without California Red Scale Aonidiella aurantii (Maskell) Infested by Using HS-SPME-GC-FID/MS

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Abstract : An optimum technic has been developed for extracting volatile organic compounds which contribute to the aroma of lime fruit (Citrus aurantifolia). The volatile organic compounds of healthy and infested lime fruit with California red scale Aonidiella aurantii were characterized using headspace solid phase microextraction (HS-SPME) combined with gas chromatography (GC) coupled flame ionization detection (FID) and gas chromatography with mass spectrometry (GC-MS) as a very simple, efficient and nondestructive extraction method. A three-phase 50/30 μm PDV/DVB/CAR fibre was used for the extraction process. The optimal sealing and fibre exposure time for volatiles reaching equilibrium from whole lime fruit in the headspace of the chamber was 16 and 4 hours respectively. 5 min was selected as desorption time of the three-phase fibre. Herbivorous activity induces indirect plant defenses, as the emission of herbivorous-induced plant volatiles (HIPVs), which could be used by natural enemies for host location. GC-MS analysis showed qualitative differences among volatiles emitted by infested and healthy lime fruit. The GC-MS analysis allowed the initial identification of 18 compounds, with similarities higher than 85%, in accordance with the NIST mass spectral library. One of these were increased by A. aurantii infestation, D-limonene, and three were decreased, Undecane, α-Farnesene and 7-epi-α-selinene. From an applied point of view, the application of the above-mentioned VOCs may help boost the efficiency of biocontrol programs and natural enemies’ production techniques.

Keywords : lime fruit, Citrus aurantifolia, California red scale, Aonidiella aurantii, VOCs, HS-SPME/GC-FID-MS
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