

Title Gas chromatography for detection of citrus infestation by fruit fly larvae (Diptera: Tephritidae)
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Abstract

Tephritid fruit flies are serious economic pests worldwide. As larvae, they feed and develop within the pulp of host fruits, making infestation difficult to detect by visual inspection. At U.S. ports of entry, incoming produce shipments are checked for infestation by manually cutting open a small sample of fruit and searching for tephritid larvae. Consequently, there is a need for more sensitive, high-throughput screening methods. This study evaluated gas chromatography (GC) as a potential technology for improved detection of hidden infestation. Grapefruits (*Citrus × paradisi* Macfad.) infested with immature stages of the Caribbean fruit fly *Anastrepha suspensa* (Loew) (Diptera: Tephritidae) were examined to determine if infested fruit emitted a chemical profile distinct from that of non-infested fruit. Peaks identified by GC analysis were grouped into three classes. Chemicals detected in similar quantities in all samples, or slightly elevated in infested samples, were regarded as non-diagnostic background volatiles. Chemicals highly elevated after oviposition, during the last instar exit stage, and in experimentally-pierced fruit were interpreted to be indicators of citrus peel injury, and included D-limonene and β -ocimene. Chemicals elevated exclusively in the larval infestation stages were considered indicators of feeding damage and potentially diagnostic of infestation, and included hexyl butanoate and an unidentified compound. The peaks associated with injury and feeding were also detectable with a portable ultra-fast GC analyzer that required less than 80 s per sample. Further studies will investigate the potential application of these results for development of a rapid, non-destructive screening method for detection of tephritid infestation.