

Analysis of free fatty acids in food substrates and in the dust and frass of stored product pests: Potential for species discrimination?

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Abstract

The larger grain borer, *Prostephanus truncatus*, is a serious beetle pest that tunnels extensively to produce large quantities of dust and frass. The natural enemy *Teretrius nigrescens* is an important biological control beetle which is known to exploit at close-range solvent-extractable chemical cues in the dust and frass. The objective of the current study was to analyse quantitatively and qualitatively, the free fatty acid mixtures in different food-substrate materials both before and after insect attack by a range of stored product pests to determine whether differences in the blends can explain the *T. nigrescens* selectivity to *P. truncatus* dust/frass over that of other species irrespective of food substrate. By TLC, GC and GC-MS we found triglyceride and five free fatty acids were the most abundant chemicals in dust/frass (palmitic acid (C16:0), stearic acid (C18:0), oleic acid (C18:1), linoleic acid (C18:2) and linolenic acid (C18:3)). Relative to maize flour, *Sitophilus* species did not significantly change free fatty acid concentrations whereas for *P. truncatus*, *Rhyzopertha dominica* and *Dinoderus minutes* there were 4-6-fold increases, and, for *Tribolium* species there were over 20-fold increases. These differences provide interesting insights to tunnelling/feeding habits and are correlated with known feeding preferences within grain. Using Principal Component Analysis (PCA) we demonstrated that free fatty acid ratios in dust/frass of different species are linked to the food-substrate and confer little discriminatory information that could be used to distinguish between different species. Although increases in free fatty acid concentrations are good indicators of pest infestation and this may contribute behaviorally in an additive or synergistic way, we conclude that other chemical(s) are present and are key to *T. nigrescens* recognition of *P. truncatus* on different substrates.

Key words: Arrestant, arrestment, cassava, fatty acid, kairomone, maize, predator, *Prostephanus truncatus*, *Teretrius nigrescens*, triglyceride.

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