

Volatile compounds secreted by Brindley's glands of adult *Triatoma infestans*: identification and biological activity of previously unidentified compounds

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ABSTRACT: Volatile emissions of adult male *Triatoma infestans* were collected on non-polar SPME fibers and analyzed by gas chromatography linked to a mass spectrometer. A complex mixture of 16 short-chain esters and acids were identified. The composition of short-chain aliphatic acids (ethanoic to nonanoic acids) was similar to previously reported results. The most abundant aliphatic acid was 2-methylpropanoic acid, constituting 18% of the total volatile content. Also abundant were the esters 2- and 3-methylbutyl 2-methylpropanoate, which constituted 30% and 22%, respectively, of the total volatile content. A similar pattern of compounds was observed in the volatiles secreted by dissected male Brindley's glands; however, in this case, 2- and 3-methylbutan-1-ol were detected which were not found in live insect volatile emissions. Large variability in volatile composition was also observed among the glands excised from different insects. Electroantennographic (EAG) evaluation of the components of Brindley's gland showed significant responses for 2- and 3-methylbutyl 2-methylpropanoate compared to controls. The mixture of volatiles secreted by excised Brindley's glands and the isolated 2- and 3-methylbutyl 2-methylpropanoate had repellent effects on both male and female *T. infestans*, possibly associated with a defensive strategy. *Journal of Vector Ecology* 32 (1): 75-82. 2007.

Keyword Index: *Triatoma infestans*, Brindley's gland, repellency, EAG.

INTRODUCTION

The behavior of *Triatoma infestans* (Klug) has been studied extensively for many years (Schofield 1979). Many behaviors, such as aggregation, sexual communication, host location, and alarm responses, appear to be mediated by semiochemicals. Feces have been identified as the source of pheromones mediating aggregation in both nymphs and adults (Lorenzo Figueiras et al. 1994, Lorenzo and Lazzari 1996). Our laboratory has recently reported that 4-methyl and 2,4-dimethylquinazolines, present in feces, are *T. infestans* attractants (Alzogaray et al. 2006). A footprint assembling factor (substances present in the feces or cuticle that elicit aggregation in the tested insects), which acts in an intra-, as well as interspecific fashion, has been reported by Lorenzo Figueiras and Lazzari (1998). Electrophysiological studies have shown that copulating pairs release a pheromonal compound that attracts male *T. infestans* (De Brito Sánchez et al. 1995). Nonetheless, there is still scarce information on the actual chemicals that mediate these behavioral responses. In a previous study, we reported that volatiles emitted by male and female *T. infestans* collected on Porapak-Q were attractive to both sexes (Fontán et al. 2002). Several aldehydes were identified in extracts prepared from the Porapak-Q entrainments, which were then found to be attractive in an arena bioassay: hexanal

and benzaldehyde proved to attract females and nonanal attracted males. However, the pattern of release of these compounds was not consistent with the previously reported copulation pheromone (De Brito Sánchez et al. 1995).

Short-chained acids have been identified in secretions from disturbed adults (Juárez and Brenner 1981) and from extracts of Brindley's glands from males and females (Hack et al. 1980). Ward (1981) reported that short-chain acids, mainly 2-methylpropanoic acid, elicited an alarm response in adult *T. infestans*. Cruz Lopez et al. (1995) identified isobutyric acid as the main component in Brindley's gland together with isobutyl, isoamyl, and amyl alcohols, 2-phenylethanol and other carboxylic acids and esters. In addition, isobutyric acid, isobutyl, isoamyl, and amyl alcohols, and esters, were also found in volatile emissions of adult *T. infestans*, and the authors hypothetically related them to a mechanism of defense. However, it has also been shown that acids released by Brindley's gland elicit a dose-dependent behavioral pattern, with low doses inducing attractive effects on immature stadia instead of an alarm response (Guerenstein and Guerin 2001).

Recently, Rojas et al. (2002) performed a chemical, electrophysiological, and behavioral study of the volatile compounds of Brindley's gland in *Rhodnius prolixus*. Six compounds were found: acetic, isobutyric, and caproic acids, and three preliminary identified compounds: propionate,