

INVESTIGATION OF LONG-RANGE FEMALE SEX
PHEROMONE OF THE EUROPEAN TARNISHED PLANT
BUG, *Lygus rugulipennis*: CHEMICAL,
ELECTROPHYSIOLOGICAL, AND FIELD STUDIES

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Abstract—The European tarnished plant bug, *Lygus rugulipennis*, is an important pest of agricultural and horticultural crops throughout Europe. Adult male *L. rugulipennis* were previously shown to be attracted to traps baited with live virgin females, which suggests the females produce a sex pheromone. Volatiles produced by virgin female *L. rugulipennis* were shown to contain three components, hexyl butyrate, (*E*)-2-hexenyl butyrate, and (*E*)-4-oxo-2-hexenal which elicited electroantennographic (EAG) responses from males in analyses by linked gas chromatography–electroantennography (GC-EAG). They were produced in 1.5:1:0.08 ratio, respectively, by single females. Collections from 1, 2, or 4 virgin females showed the proportions of hexyl butyrate and (*E*)-4-oxo-2-hexenal to increase relative to that of (*E*)-2-hexenyl butyrate with increasing number of females. Although these compounds were found in body extracts of both male and female *L. rugulipennis*, they were not detected in volatiles released by virgin males. EAG dose–response studies showed that both males and females responded to these chemicals with minimal differences in sensitivity between the sexes or to the three components, except that males were more responsive than females to (*E*)-4-oxo-2-hexenal at the two highest doses tested. Release rates of the compounds from rubber septa, polyethylene vials, and polyethylene sachets were measured under laboratory conditions. Four field tests were carried out using sticky traps baited with all possible binary and

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tertiary combinations of the three chemicals using different combinations of dispensing systems. Catches of male *L. rugulipennis* in baited traps were similar to those in unbaited traps. Significantly fewer females were caught on traps baited with blends containing hexyl butyrate than on traps without hexyl butyrate or unbaited traps in one test and overall. The roles of the three compounds and possible reasons for their failure to attract males are discussed.

Key Words—*Lygus rugulipennis*, Heteroptera, Miridae, tarnished plant bug, pheromone, electroantennography, repellence, hexyl butyrate, (*E*)-2-hexenyl butyrate, (*E*)-4-oxo-2-hexenal.

INTRODUCTION

The European tarnished plant bug, *Lygus rugulipennis* Poppius (Heteroptera: Miridae), is an important pest of agricultural and horticultural crops throughout Europe, including lucerne (Erdelyi et al., 1994), wheat (Holopainen, 1989), and strawberries (Taksdal and Sorum, 1971). It has been recorded on over 320 host plants in 57 families (Holopainen, 1989). On strawberries, adults and nymphs feed in the flowers, resulting in the malformation of fruit (Taksdal and Sorum, 1971; Cross and Easterbrook, unpublished), and significant damage is caused at population densities of less than one bug per 20 plants (Cross, unpublished). Growers previously used short-persistence, broad-spectrum organophosphate insecticides such as malathion or heptenophos in mid- and late summer to control the pest, but these materials have recently been withdrawn from use. As part of a program to develop alternatives and a more integrated approach to management of this pest, improved methods of monitoring are being investigated. Populations of *L. rugulipennis* can be assessed by beating or suction sampling, but these methods are time consuming and are not likely to be used widely by growers. Pheromone-baited traps could provide a practical alternative. Initial studies showed that traps baited with live, virgin female *L. rugulipennis* attracted conspecific males in greenhouses (Innocenzi et al., 1998). This indicated that the females produce a sex pheromone and in a preliminary communication we reported identification of three compounds in volatiles produced by virgin females of this species (Innocenzi et al., 1998). In this paper, we describe details of the identification of these chemicals, comparison of their electroantennographic activity toward male and female *L. rugulipennis*, and field trapping experiments with blends of the chemicals.

METHODS AND MATERIALS

Insect Material. *L. rugulipennis* were reared at 20°C under a 16L:8D photoperiod in perspex plant propagators (80 × 30 × 40 cm; B&Q, Kent, UK).