Sex Pheromone of Brinjal Shoot and Pod Borer *Leucinodis orbonalis* Guenèe (Lepidoptera: Pyralidae: Pyraustinae)

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(*E*)-11-Hexadecenyl acetate is the major volatile component of the sex pheromone gland of female *Leucinodis orbonalis* collected from Sri Lanka. (*E*)-11-hexadecen-1-ol was also found in trace quantities.

Leucinodis orbonalis Guenée is a serious economic pest in India and Sri Lanka. The larvae of *L. orbonalis* feed on leaves and tender shoots of brinjal (*Solanum melongena,* egg-plant), an important vegetable crop. In later stages, the larvae burrow into fruits making them unsuitable for human consumption. For the last two years we have been investigating the female sex pheromone of this species with the aim of using the results in integrated pest control. Recently, Pingchou *et al.* [1] identified (*E*)-11-hexadecenyl acetate as the major component of the sex pheromone of *L. orbonalis* from China. This made it necessary to present our analytical results, which are in complete agreement with those of Pingchou *et al.,* and additional electrophysiological evaluations as a confirmation of the identification. Our results show that the pheromone of the Sri Lankan strain is not significantly different from that of the Chinese strain.

The pupae were collected in Sri Lanka and sent by airmail to Erlangen. After emergence, the females were observed during the scotophase for their calling behaviour. The intersegmental membrane between the segments VIII and IX of calling females was excised and encapsulated in glass capillaries for gas chromatographic investigations by a solid-sampling technique [2, 3].

GC-MS analysis of volatiles from two intersegmental membranes showed the presence of a hexadecenyl acetate as the major component. Trace amounts of a hexadecen-1-ol was also found. The location of the double bond position was accomplished by the method of Horiike and Hirano [4]. The mass spectrum of the natural compound was compared with those obtained from a series of positional isomers of monounsaturated linear 16-carbon acetates [5, 6]. This showed the double bond is located at the 11-position. The configuration of the double bond was established as (*E*) by comparing the retention time on a SP-2340 fused-silica capillary column with those of authentic (*E*)- and (*Z*)-11-hexadecenyl acetates [7] (Fig. 1). A similar procedure was used for the identification of (*E*)-11-hexadecen-1-ol. The natural 11-hexadecen-1-ol isomer showed the same retention time as that of synthetic (*E*)-11-hexadecen-1-ol which elutes before the corresponding (*Z*) isomer on the SP-2340 column (Fig. 1).

Of a number of monounsaturated (*E*) and (*Z*) 16-carbon acetates, (*E*)-11-hexadecenyl acetate evoked the highest amplitude when EAG recordings were performed with male *L. orbonalis* antennae (Fig. 2).

For many species of pyralids of Pyraustinae subfamily, a precise *E*/*Z*-isomer ratio is essential for maximum attractivity. This phenomenon is clearly established for the pyralid *Ostrinia nubilalis,* and the exact ratio depends on the geographic origin of the moths [8]. Therefore we carefully searched for the presence of (*Z*)-11-hexadecenyl acetate but no significant peak corresponding to the (*Z*)-isomer was found (detectability, 0.1% of the (*E*)-isomer) (Fig. 1). Although it is difficult to generalize from the little data available, it appears that the pheromone of *L. orbonalis* from China is not significantly different from that of the samples from Sri Lanka.

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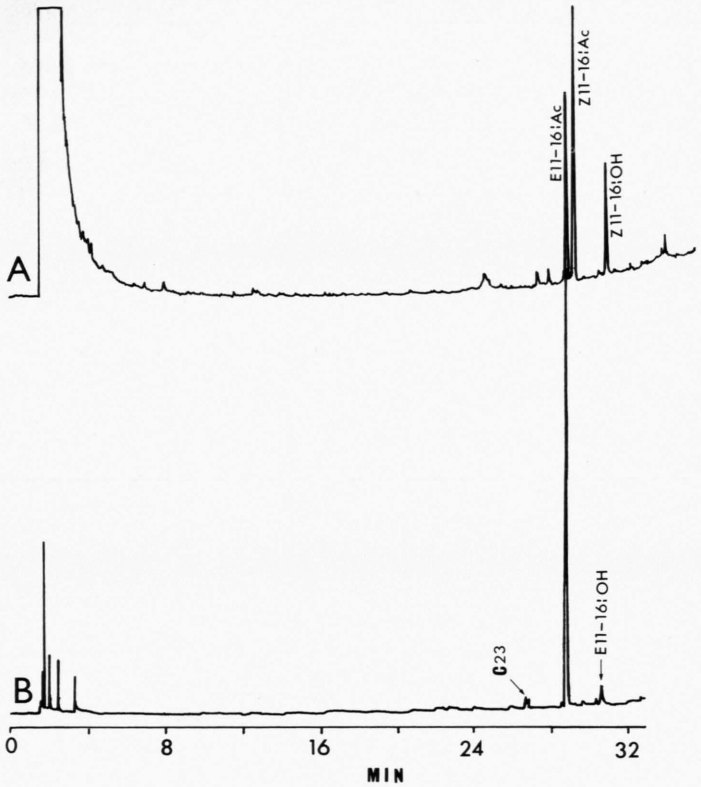

Fig. 1. (A) Chromatogram of authentic chemicals. E11−16:Ac [(*E*)-11-hexadecenyl acetate], Z11-16:Ac [(*Z*)-11-hexadecenyl acetate], Z11-16:OH [(*Z*)-11-hexadecen-1-ol]. (B) Chromatogram obtained by solid-sampling GC of two intersegmental membranes of one-day-old females, 2.5 h after the onset of scotophase. Main constituent E11−16:AC. E11−16:OH [(*E*)-11-hexadecen-1-ol], C23 [tricosane].

Chromatographic Conditions: Fused-silica capillary column (SP-2340, 25 m × 0.22 mm); 60 °C for 2 min and 4 °C/min to 195 °C, splitless solid-sample injection.

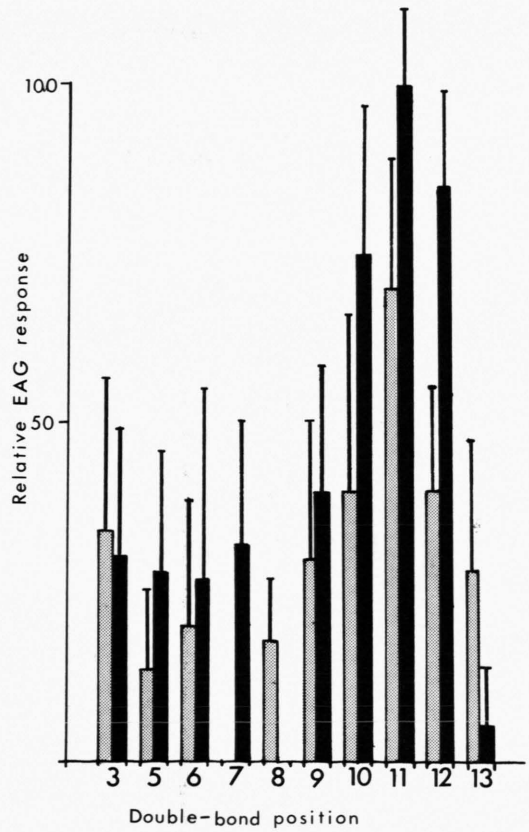

Fig. 2. Relative EAG responses of male antennae to hexadecenyl acetates: ▨ *Z* isomers, ■ *E* isomers. Results are the means of fifteen recordings for each test substance at a concentration of 0.2 µg at the source, and the vertical bars indicate the spread of results.

[1] Z. Pingchou, K. Fanlei, Y. Shengdi, Y. Yongquing, J. Shuping, H. Xinhua, and X. Jianwei, Z. Naturforsch. **42c,** 1347 (1987).
[2] E. D. Morgan and L. J. Wadhams, J. Chromatogr. Sci. **10,** 528 (1972).
[3] A. B. Attygalle, M. Herrig, O. Vostrowsky, and H. J. Bestmann, J. Chem. Ecol. **13,** 1299 (1986).
[4] M. Horiike and C. Hirano, Agr. Biol. Chem. **46,** 2667 (1982).
[5] B. S. Lanne, M. Appelgren, G. Bergström, and C. Löfstedt, Anal. Chem. **57,** 1621 (1985).
[6] B. A. Leonhardt, E. D. Devillbis, and J. A. Klun, Org. Mass Spectrom. **18,** 9 (1983).
[7] R. R. Heath and J. H. Tumlinson, in: Techniques in Pheromone Research (H. E. Hummel and T. A. Miller, eds.), p. 287, Springer-Verlag, Berlin 1984.
[8] J. A. Klun, Environ. Entomol. **4,** 891 (1975).