Identification of the Sex Pheromone of the False Codling Moth (*Argyroploce leucotreta*)

By J. S. READ and F. L. WARREN*

(*C.S.I.R. Natural Products Research Unit, University of Cape Town, Rondebosch, C.P., South Africa*)

and P. H. HEWITT

(*Department of Entomology, University of the Orange Free State, Bloemfontein*)

STUDIES on the sex pheromone of the female false codling moth, *Argyroploce leucotreta* Meyr. (Lepidoptera, Eucosmidae), which is a pest in the citrus plantations in South Africa, have resulted in the isolation of a crude concentrate containing four major components only one of which, separated by gas–liquid chromatography (g.l.c.), showed biological activity. The activity of the crude extract was destroyed by alkaline hydrolysis and by catalytic hydrogenation; and the activity of the hydrolysed product was restored on acetylation. The active peak in the g.l.c. disappeared on hydrogenation, and its retention time was unchanged in the acetylated product. The active component, over ethylene adipate (polar) and methyl silicone gum rubber (nonpolar) as stationary phases, had a retention time midway between methyl dodecanoate and methyl tetradecanoate; and the retention time of the active peak in relation to that of dodecyl acetate was slightly greater on the polar phase and slightly less on the nonpolar phase. These results were indicative of an unsaturated C_{12} straight-chain acetate.[1–3]

Berger, working on the female cabbage looper moth, *Trichoplusia ni*, (Lepidoptera, Noctuidae) isolated the pheromone which was shown to be *cis*-dodec-7-en-1-yl acetate.[4] A sample of this synthetic acetate kindly donated by Dr. R. S.

Berger (Auburn University, Alabama) and samples of both the *cis*- and *trans*-form of this acetate[5] supplied by Dr. M. Jacobson (U.S. Department of Agriculture) showed identical retention time on both the nonpolar and polar phases. The mass spectrum of an isolated active fraction from g.l.c. had fragments of *m/e* **43** (base peak), **61**, **82**, **166**, and **266** (M^+) with similar relative intensities as the peaks in the mass spectra of the synthetic acetates. The pheromone and synthetic *trans*-dodecenyl acetate, after oxidation with periodate–permanganate solution, esterification, and subsequent g.l.c. analysis of the methyl esters, gave a peak corresponding to methyl pentanoate and identical chromatograms.

Bioassay of samples (1 μg.) of these acetates, using essentially Shorey's elegant procedure,[6] showed that the *cis*-isomer had almost two-thirds the activity of the *trans*-isomer. The reported contamination of the *cis*-isomer by the *trans*-isomer[5] was estimated at approximately 10% from the i.r. spectrum. The pure *cis*-form, prepared by thin-layer chromatography on silica gel impregnated with silver nitrate, was not active whereas the *trans*-form retained activity.

It is concluded that the sex pheromone of *Argyroploce leucotreta* is *trans*-dodec-7-en-1-yl acetate and is not inhibited in biological activity by the presence of the *cis*-isomer.

We gratefully acknowledge the supply of pupae by the Fruit and Food Technology Research Institute, Stellenbosch, and financial assistance from the Department of Agriculture and Technical Services, and the South African Co-operative Citrus Exchange Limited.

(*Received, December 28th*, 1967; *Com.* 1389.)

[1] J. W. Farquhar, W. Insull, jun., P. Rosen, W. Staffel, and E. H. Ahrens, jun., *Nutr. Rev. Suppl.*, 1959, **17**, 1.
[2] J. K. Haken, *J. Chromatog.*, 1967, **26**, 17.
[3] G. R. Jamieson and E. H. Reid, *J. Chromatog.*, 1967, **26**, 8.
[4] R. S. Berger, *Ann. Entomol. Soc. Amer.*, 1966, **59**, 767.
[5] N. Green, M. Jacobson, T. J. Henneberry, and A. N. Kishaba, *J. Medicin. Chem.*, 1967, **10**, 533.
[6] H. H. Shorey, L. K. Gaston, and T. R. Fukuto, *J. Econom. Entomol.*, 1964, **57**, 252.