

7,11,13-Hexadecatrienal identified from female moths of the citrus leafminer as a new sex pheromone component: synthesis and field evaluation in Vietnam and Japan

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(7Z,11Z)-7,11-Hexadecadienal (Z7,Z11-16:Ald), which has been identified from female moths of the citrus leafminer (*Phyllocnistis citrella*, Lepidoptera: Gracillariidae), strongly attracts conspecific males in Japan. Recently, in addition to the dienyl aldehyde, a trienyl derivative, (7Z,11Z,13E)-7,11,13-hexadecatrienal (Z7,Z11,E13-16:Ald), was found as another sex pheromone component of females collected in Brazil and California. Thus, we synthesized Z7,Z11,E13-16:Ald and its isomer (Z7,E11,E13-16:Ald) to evaluate their effects on males inhabiting Asia. Starting from 1,7-heptanediol, two corresponding alcohols with trienyl structures were prepared by two applications of the Wittig-coupling reaction and then oxidized to yield objective aldehydes after separation by HPLC with an ODS column. In a citrus orchard in Can-Tho City, Vietnam, *P. citrella* males could not be caught by a lure baited only with Z7,Z11-16:Ald, but were successfully attracted with a 1:3 mixture of Z7,Z11-16:Ald and Z7,Z11,E13-16:Ald. On the other hand, in citrus orchards in Ogasawara (Bonin) Islands and Ehime Prefecture, Japan, neither trienals showed a synergistic effect on male capture by the dienal. Far from being reinforced, the attraction activity of the dienal was diminished by mixing in Z7,Z11,E13-16:Ald. These results indicated that the sex pheromone of the Vietnamese strain is similar to that of Brazilian and Californian strains, but the Japanese strain has established a different communication system from those of the foreign strains. © Pesticide Science Society of Japan

Keywords: *Phyllocnistis citrella*, lepidopteran sex pheromone, male attraction, field test, synthesis of trienyl aldehyde, chemical ecology.

Introduction

The citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae), is a harmful citrus pest. The larvae

mine into the epidermis of young leaves and shoots and induce a plant disease, citrus canker by *Xanthomonas citri*. In random screening tests of known pheromone components and their derivatives, *P. citrella* males were specifically attracted to (7Z,11Z)-7,11-hexadecadienal (Z7,Z11-16:Ald).¹⁾ We then confirmed that virgin females actually secrete Z7,Z11-16:Ald.²⁾ Analysis of the pheromone gland extract showed no other pheromonal components, indicating that this species utilizes a single-component pheromone for mating communication. The dienyl aldehyde, however, attracted no *P. citrella* males outside of Japan, and a trienyl derivative, (7Z,11Z,13E)-7,11,13-hexadecatrienal (Z7,Z11,E13-16:Ald),

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