BEHAVIORAL RESPONSES OF MALE *Argyrotaenia velutinana* (LEPIDOPTERA: TORTRICIDAE) TO COMPONENTS OF ITS SEX PHEROMONE

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**Abstract**—Males of the redbanded leafroller, *Argyrotaenia velutinana* (Walker) (Lepidoptera: Tortricidae), were studied for their behavioral responses in laboratory olfactometers and in the field to the 3 components of the female-produced sex pheromone: *cis*-11-tetradecenyl acetate (*c11*-14:Ac), *trans*-11-tetradecenyl acetate (*t11*-14:Ac), and dodecyl acetate (*12:Ac*). Dodecyl acetate, when evaporated with *c11*-14:Ac (8% *trans*) in the field, modified the behavior of feral males nearby the chemical source, causing an increase in the frequency of landing and close approach to the pheromone dispenser. Apparently, an inflight behavioral modification concerning landing or not landing occurs within 60 cm of the source and is mediated by *12:Ac*. In laboratory olfactometers, *c11*-14:Ac (8% *trans*) demonstrated a lower threshold for male activation than pure *c11*- and *t11*-14:Ac and blends of the two isomers. Additionally, over a wide range of dosages, males responded with optimum wing-fanning response to *c11*-14:Ac (8% *trans*) compared to pure *c11*-14:Ac, *c11*-14:Ac (30% *trans*), and pure *t11*-14:Ac, suggesting that the *cis*: *trans* ratio rather than absolute amounts of either isomer, is a crucial factor in eliciting male response. When presented with *c11*-14:Ac (8% *trans*) (1:1), dodecyl acetate caused a significant prolongation of wing-fanning over *c11*-14:Ac (8% *trans*) alone and resulted in a greater percentage of males moving upwind to the source. Since the increase in wing-fanning and orientation occurred at higher concentrations of the 3-component mixture, the effect of *12:Ac* in the laboratory may reflect the close-range role of *12:Ac* in the field.

**Key Words**—*Argyrotaenia velutinana*, redbanded leafroller, sex pheromone, attractant, *cis*-11-tetradecenyl acetate, *trans*-11-tetradecenyl acetate, dodecyl acetate, male behavior, synergist, inhibitor.

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INTRODUCTION

The redbanded leafroller moth, Argyrotaenia velutinana (Walker) (Lepidoptera: Tortricidae), uses a female-produced sex pheromone comprised of 3 active components (Roelofs et al. 1975). The primary sex pheromone component of A. velutinana was identified as cis-11-tetradecenyl acetate (c11-14:Ac) by Roelofs and Arn (1968). Two other pheromone components, trans-11-tetradecenyl acetate (t11-14:Ac) and dodecyl acetate (12:Ac), were shown to be instrumental in increasing the trap catch of male A. velutinana in the field. The former was shown to be necessary for attractancy when present in low ratios to the cis isomer, and gave optimum attractancy when mixed in a trans: cis ratio of approximately 7:93 (Klun et al. 1973, Roelofs et al. 1975). At ratios higher than 7:93, trap catch of males was reduced. In field screening tests, dodecyl acetate was found to increase trap catch of A. velutinana males when evaporated with the other two components (Roelofs and Comeau 1968, 1971). Further tests showed that optimum attractancy was obtained with the addition of 12:Ac at ratios greater than 3:2 to the trans: cis (8:92) blend (Roelofs et al. 1975).

Recently, both t11-14:Ac and 12: Ac were isolated and identified from female A. velutinana abdominal tip extract and calling female effluvia (Roelofs et al. 1975). The former was found to be present in a ratio of about 9:91 to the cis isomer, whereas in airborne collection of calling female effluvia, 12: Ac was found to be emitted at a 5:4 ratio of 12:Ac to δ11-14:Ac.

The chemical requirements for optimum attractancy of males in the field had thus been defined, and the chemicals identified from female tip extract and effluvia, but the role of the 3 pheromone components in eliciting the appropriate behavioral responses culminating in trap catch—or, in the case of live females, copulation—remained undefined. In this paper, we describe some of the differences in male behavioral responses that can account for the dramatic increase in trap catch when all 3 components are present in their correct ratios.

METHODS AND MATERIALS

General

Adult redbanded leafrollers were reared on a pinto bean diet modified from Shorey and Hale (1965). Wax-coated drinking cups (5.2 cm diameter bottom, 12.5 cm long), containing pinto bean diet and covered with plastic snap-on lids, served as containers for developing larvae. Approximately 75 larvae were reared in each cup until pupation, when pupae were removed and sexed. Male pupae were placed in a screened cage (38 x 38 x 47 cm)