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A SYNTHETIC SEX PHEROMONE FOR THE LARGE ASPEN TORTRIX IN ALASKA

by

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ABSTRACT

Cis-11-tetradecenal was found to be the specific attractant for adult male large aspen tortrix, Choristoneura conflictana (Walker), populations in quaking aspen, Populus tremuloides Michx., forests of interior Alaska. The attractant was dispersed from polyethylene caps in Pherocon® -2 traps placed 1.5 m above ground.

Keywords: Attractants (chemical) (-forest pest control, pheromones, large aspen tortrix, Choristoneura conflictana, quaking aspen, Populus tremuloides, Alaska (interior).

METRIC EQUIVALENTS

1 centimeter = 0.3937 inch
1 meter = 39.37 inches
1 kilometer = 0.62137 mile

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INTRODUCTION

The large aspen tortrix, Choristoneura conflictana (Walker), is a serious pest of quaking aspen, Populus tremuloides Michx., throughout northern regions of North America including Alaska. An extensive outbreak covering 26 000 km^2 of aspen type occurred in Alaska from 1966 to 1969 (Beckwith 1973). Since this time C. conflictana populations have been extremely low in Alaska. Repeated defoliation for a 2-yr period can cause reduced radial and terminal growth but 3-or-more-year defoliation usually results in tree mortality.

A synthetic sex pheromone was desired to monitor C. conflictana populations in order to predict population fluctuations. Field studies by Weatherston et al. (1976) indicated that various concentrations of cis-11-tetradecenal attracted male C. conflictana in Ontario. Field tests conducted in Fairbanks, Alaska, in 1976 and 1977 showed that certain synergistic effects were produced by various mixtures of cis-11-tretradecenal-l-ol and trans-11-tetradecenal (Weatherston et al. 1978). These same tests indicated that a 95/5 mixture of cis/trans-11-tetradecenal also appeared to be attractive to C. conflictana males. A more refined field test using concentrations and mixtures of those chemicals that were found most attractive in the 1978 tests was further evaluated.

MATERIALS AND METHODS

Field trapping was conducted in a 70-yr-old pure aspen stand 16 km west of Fairbanks. Pherocon®-2 (Zoecon Corp.)[2] traps (50 each) were baited with either 100% cis-11-tetradecenal or a 95/5 mixture of cis/trans-11-tetradecenal and were used to trap recently emerged moths. Pheromones were released from polyethylene caps (100 µg/cap) placed within the trap on the upper surface. Empty check traps were used in the test. Traps were attached 30 m apart to a wire stretched horizontally between two trees 1.5 m above the ground. Traps were inspected, changed, and rerandomized weekly from June 27 to August 8, 1978. The two treatments and control were treated as a completely random design. The two treatment means were contrasted at each time measurement with Duncan's new multiple range test. The controls were excluded from the analysis because all traps produced zero insects.

[2]Mention of products, trade names, or companies does not imply endorsement by the U.S. Department of Agriculture.

The pheromones were either prepared on a polymer support (Fyles et al. 1977) or purchased from Chemical Samples Corporation. The two chemical materials were purified by chromatography on Adsorbosil CABN (50/100-mesh). Chemical purity and isomer composition were determined by gas-liquid chromatography (GLC) on a 5.1-m × 0.25-cm column of 10% Silar 10C on Gas Chrom Q (60/80-mesh) at 175°C with a carrier gas flow of 15 ml/min N_2.

RESULTS AND DISCUSSION

It is evident from the results of the 1978 field test (Table 1) that cis-11-tetradecenal is highly attractive to C. conflictana males. Pure cis-isomer-baited traps caught 95 percent more males than the 95/5 cis/trans mixture throughout the test period. In the 1977 field test conducted in the same area, the cis-isomer catch was 89 percent higher than the 95/5 cis/trans mixture. C. conflictana population levels appear to be increasing since captures of males in cis-11-tetradecenal-baited traps (100 µg/trap) increased from 2.3 males per trap in 1977 to 23.4 per trap in 1978. The use of this sex pheromone to monitor C. conflictana populations appears to be most effective, but further field tests are needed in which trapping data can be compared with larval sampling data from both endemic and epidemic levels.

Table 1—Numbers of male C. conflictana captured in traps baited with cis-11-tetradecenal and cis/trans-11-tetradecenal

Attractant (100 µg)	Mean catch per trap[1,2]				Total number per test
	July 4	July 11	July 18	July 25	
cis-11-tetradecenal	24.6$_b$	112.8$_a$	4.4$_c$	0.1$_c$	1174
cis/trans-ll-tetradecenal	0.0$_c$	4.7$_c$	1.0$_c$	0.0$_c$	52
Unbaited trap	0.0$_c$	0.0$_c$	0.0$_c$	0.0$_c$	0

[1]Mean of 50 traps each per attractant.

[2]Values followed by the same letter are not significantly different at the 5-percent level as determined by Duncan's new multiple range test.

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