SEX PHEROMONE TRAPS: A BREAKTHROUGH IN CONTROLLING BORERS OF ORNAMENTAL TREES AND SHRUBS

by D.G. Nielsen

Borers have been the most damaging and difficult to control group of insect pests attacking shade trees and shrubs. But now after more than 5 years of experimenting with synthetic sex attractants, pheromone traps have been developed to revolutionize control of one important group of borers, the clearwing moths.

The problem

Clearwing moths usually lay eggs on bark surfaces, and larvae hatching from the eggs tunnel into the bark. Consequently, borers are vulnerable to insecticides only from the time they hatch until they chew their way under the bark surface. It is during this short time period that a lethal pesticide residue must be present on bark surfaces to prevent attack and damage.

Before cancellation of DDT and dieldrin registrations, landscape managers applied these materials in the spring before adult emergence began and lethal residues persisted throughout the hatching period of borer larvae. These highly residual insecticides are no longer available, so other insecticides with shorter residual life must be used. To use these effectively, it is essential to know when adult borer emergence begins so a short-lived residual spray can be applied just before larvae begin to hatch. Until now there has been no economical way to predict seasonal borer emergence.

Clearwing moths

Clearwing moths include some of the most common and destructive borers of trees and shrubs (Fig. 1). Although most moth species fly at night, clearwing moths fly during the day. They resemble wasps or bees in both physical appearance and behavior, but they cannot sting. They feed only on nectar, if at all, and probably live no more than a week. Consequently, they do not cause damage themselves.

Soon after female clearwing moths emerge from host trees or adjacent soil, they begin to emit a sex attractant (pheromone) into the air. Males detect the pheromone with their antennae and fly upwind towards the female until they locate and mate with her. After mating, the female usually deposits her eggs in cracks and crevices on tree bark. Larvae hatch several days later and bore beneath the bark where they construct galleries. Feeding and tunneling by growing larvae damage the plant by weakening limbs and trunks and destroying tissues that transport food and water throughout the tree.

The chemical composition of two clearwing moth sex attractants was discovered in 1973. United States Department of Agriculture personnel identified basic pheromone components and we discovered that blends of 2 or more components are required to attract some species. Since that time, synthetic attractants have been developed for several destructive species, including lilac borer (ash borer), dogwood borer, peachtree borer, lesser peachtree borer, and sequoia pitch moth (Fig. 1). These attractants are used inside sticky traps to capture male clearwing moths as they search for nonexistent females. Research to develop attractants for males of other clearing moth pests is continuing in several parts of the United States and throughout the world.

Using pheromone traps

Clearwing moth males are capable of sensing and responding to pheromones at distances up to at least half a mile. Therefore, a pheromone trap need not be located directly in a suspected infestation, but can be placed at a site more convenient for the pesticide applicator or landscape manager. Nurserymen and orchardists can place a trap in a tree near their home or office where it can be inspected daily with minimum effort. This reduces costs associated with using the traps and

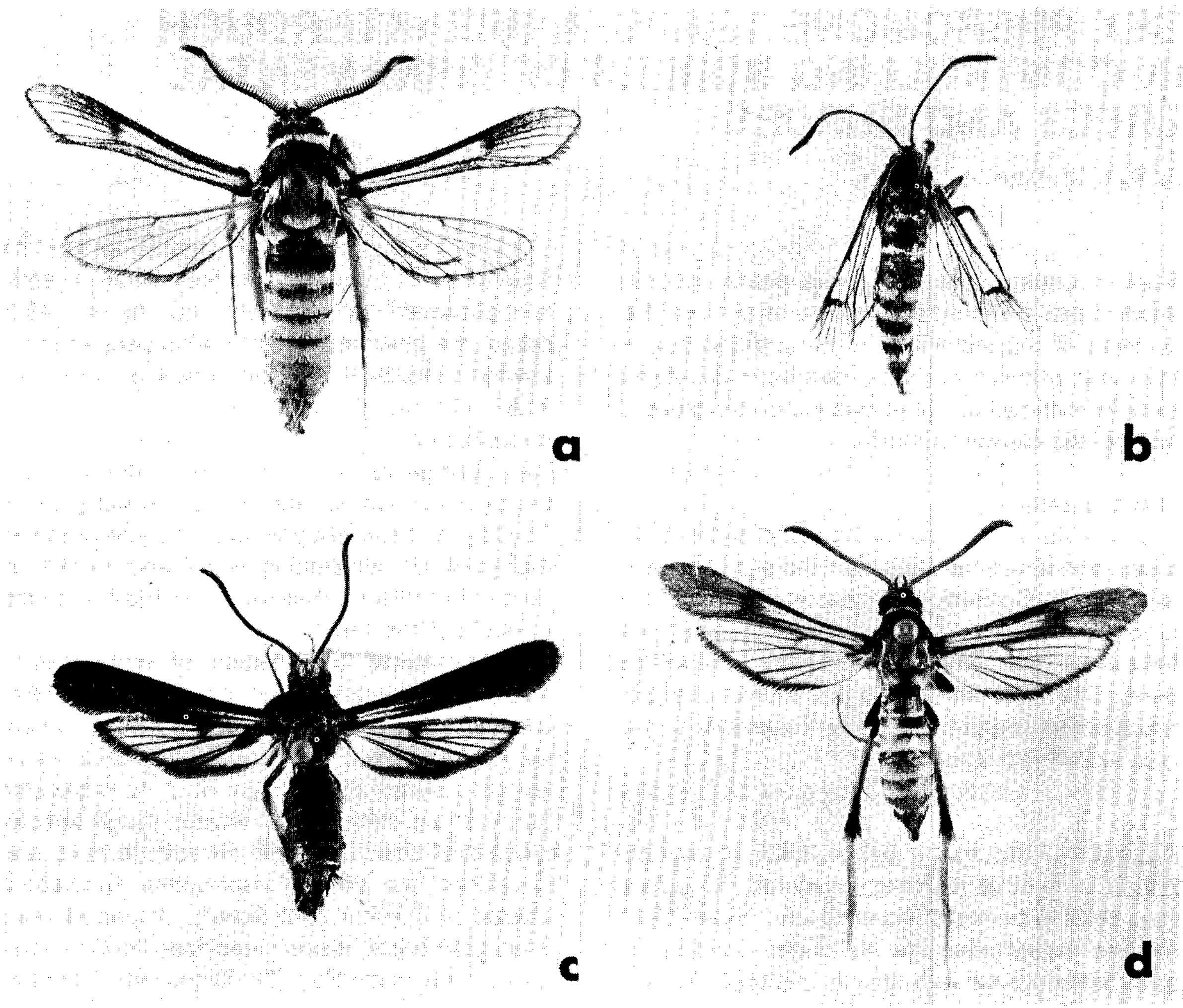

Fig. 1. Adult forms of tree and shrub borers: (a) oak borer, (b) Sequoia pitch moth, (c) lilac borer (=ash borer) eastern form, (d) lilac borer (=ash borer) Madison, Wisconsin and west.

maximizes chances of pinpointing first emergence of borer adults.

Pest control operators are encouraged to use four or more traps distributed throughout their operating area for a given borer species. Traps should be deployed at least 2 weeks before emergence is expected to begin.

Male clearwings of all species begin emerging before females. Females mate and typically begin egg laying the day they emerge. Approximately 10 days elapse between egg deposition and larval hatch. A spray to control a clearwing moth borer species should be applied 10-14 days after the first male moth is captured in a pheromone trap.

Clearwings that emerge during a relatively short time-period (6 weeks or less) can be controlled with a single insecticidal spray. (Consult your state cooperative extension office or land grant university to obtain information regarding insecticides approved for use against specific borers.) If emergence continues after 6 weeks following the first application, a second application may be required. Duration of the flight period can be measured by removing captured males from the trap at weekly intervals to determine if a second spray is necessary.

Future of perhomones

Clearwing moth borer pheromone traps (Fig. 2) usher in a new era in borer control. Traps will be available for demonstration purposes in 1978 and on a commercial basis in 1979. Trap capture information takes the guesswork out of timing borer sprays and reduces probability of unnecessary applications. This scientific approach to pest control introduces landscape managers to the principles and practice of integrated pest management, using all available control tactics to maximize pest control while minimizing impact on the environment.

In the future, we may be able to use pheromones more directly to control certain insect pests. Perhaps enough pheromone traps can be used in a given area to capture all male moths before they can inseminate females. Unfertilized females will then deposit only infertile eggs which, of course, never hatch. We are evaluating this so-called "mass-trapping" approach to borer control in North Dakota shelterbelt ash trees.

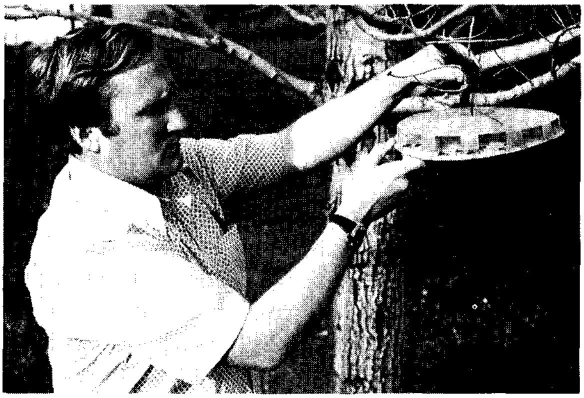

Fig. 2. The borer trap is exhibited by Phil Williams, golf course superintendent of Wooster, Ohio.

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ABSTRACT

Smith, R.F. 1978. **Development of integrated pest management in California.** California Agriculture 32(2): 5.

The term integrated pest management was coined in the early 1970's. The earliest use of the term integrated control, at least in the context of pest control, dates from 1954. Most discussions of the origins of integrated control have centered on the over-dependence on and the over-use of chemical pesticides after World War II and the unfavorable consequences that resulted: the development of pest populations resistant to pesticides, rapid resurgence of target pest populations following treatment, and outbreaks of secondary pests. As the agricultural experiment stations emerged in the United States in the late nineteenth century, entomologists and plant pathologists began to discover biological explanations for the earlier, empirically developed pest control methodology. Some crop protection specialists continue to discredit the IPM concept as representing only new jargon applied to long-established crop protection practices. We acknowledge that IPM is not a disjunct development in crop protection, it is an evolutionary stage in pest control strategy, but it represents a new conceptual approach that sets crop protection in a new context within a crop production system. IPM as now conceived, integrates multidisciplinary methodologies in developing agro-ecosystem management strategies that are practical, effective, economical, and protective of both public health and the environment.