ATTRACTANCY OF A TOBACCO MOTH LURE FOR THREE PYRALID MOTH SPECIES

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Summary

Lures of almost all the pheromone traps for tobacco moth *Ephestia elutella* contain two sex pheromone components, (Z,E)-9,12-tetradecadien-1-ol acetate (ZETA) and (Z,E)-9,12-tetradecadien-1-ol (ZETOH). The two components are also used as sex pheromones of *Plodia interpunctella*, *Cadra cautella* and *Ephestia kuehniella*, which are species closely related to the tobacco moth. We examined the attractancy of a tobacco moth lure with ZETA and ZETOH for the four moths in a laboratory.

The tobacco moth lure attracted all four moths. Attractancy for *E. elutella* was the highest. Attractancies for the other moths were 0.32 for *P. interpunctella*, 0.15 for *C. cautella*, and 0.24 for *E. kuehniella*. Unmated two-day-old males of all the four moths manifested the highest attractant activity. The result indicated that they were simultaneously caught by pheromone traps with ZETA and ZETOH when they inhabited the same factories and warehouses. In such cases, it is necessary to identify the moth species.

1. Introduction

Tobacco moth *Ephestia elutella* (Lepidoptera: Pyralidae) is a serious pest of stored tobacco. The species has a female-produced sex pheromone. The pheromone components were identified as (Z,E)-9,12-tetradecadien-1-ol acetate (ZETA) and (Z,E)-9,12-tetradecadien-1-ol (ZETOH) (Brady and Nordlund, 1971; Kuwahara and Casida, 1973). Pheromone traps with both components have been developed and used to monitor the species in tobacco factories and warehouses.

Indian meal moth *Plodia interpunctella*, almond moth *Cadra* (*Ephestia*) *cautella*, and Mediterranean flour moth *Ephestia* (*Anagasta*) *kuehniella* belong to the pyralidae family like the tobacco moth. The former three moths are pests of mills and food-processing plants and do not feed on cured tobacco. They also have a female sex pheromone. The pheromone components are ZETA, ZETOH, and three more in *P. interpunctella* (Kuwahara et al., 1971a; Dahm et al., 1971; Brady et al., 1971; Kuwahara and Casida, 1973; Teal et al., 1995; Zhu et al., 1999), ZETA and ZETOH in *E.*

kuehniella (Kuwahara et al., 1971b; Kuwahara and Casida, 1973), ZETA, ZETOH and another in *C. cautella* (Brady et al., 1971; Kuwahara et al., 1971a; Kuwahara and Casida, 1973). The four pyralid moths have ZETA and ZETOH as common components.

It is generally not necessary to identify species of insects caught by pheromone traps because of the species specificity of pheromones. However, when the four moths inhabit the same place, it is possible that they become caught by the same pheromone trap with the two components. In the present study, we clarified the attractancy of a tobacco moth lure (GACHON) with ZETA and ZETOH for the four pyralid moths in a laboratory.

2. Materials and methods

Individuals used for experiments were reared under the conditions of 25.0±0.5°C, 16L8D, and 55.0±5.0%RH.

1) Age-specific attractant activity and survival rate

The following experiments were conducted to determine age-specific attractant activities and survival rates for the four pyralid moths.

Plastic cages with pheromone traps (Fig. 1) were placed in a room controlled at 30°C in the dark. Ten unmated males (0, 2, 4 and 6 days after emergence) were released into the cage. The number of catches on a trap was counted 24h after the release. These experiments were replicated four times each.

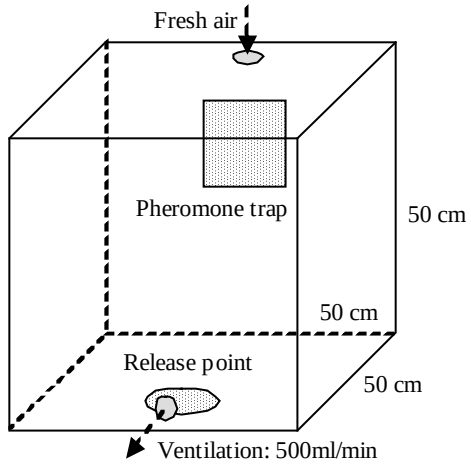

Fig. 1. Plastic cage used in release experiments.

Ten newly emerged unmated male moths were introduced into a transparent plastic case (13cm in diameter and 7cm in height) without food. The number of dead males was then checked every day. These experiments were carried out at 25°C in the dark and were replicated four times.

2) Attractancy of tobacco moth lure

We investigated the attractancies of a tobacco moth lure separately for the four pyralid moths using unmated males with the highest attractant activity (2 days after emergence).

A new pheromone trap was placed on the wall of a plastic cage as depicted in

Fig. 1, with the following differences: the length of the side was 2m, there were eight inlets and outlets, and ventilation was 8L/min. Thirty unmated male moths were released into the plastic cage. The number of catches was counted 24h after the release. These experiments were conducted at 30°C in the dark and were replicated four times each.

3. Results

1) Age-specific attractant activity and survival rate

Age-specific attractant activity is represented by the ratio of capturing efficiency (%) for each day after emergence to that obtained immediately after emergence.

Unmated two-day-old males of all the four pyralid moths manifested the highest attractant activity (Fig. 2). The activity was the highest in *C. cautella*. Activities

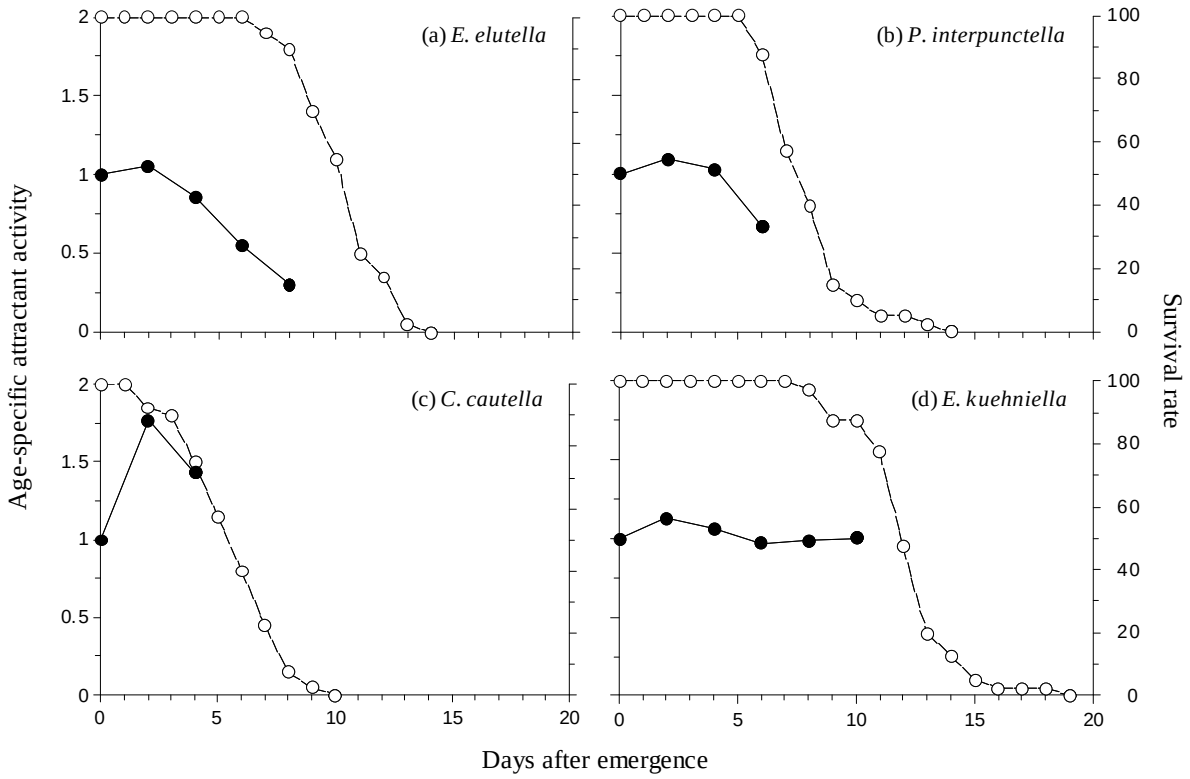

Fig. 2. Age-specific attractant activity (○) and survival rate (●) of four pyralid moth males.

decreased rapidly in *E. elutella* and *P. interpunctella*, although high survival rates were maintained (Fig. 2-a and b). In *C. cautella*, activity decreased with the decrease in survival rate (Fig. 2-c). In *E. kuehniella*, high attractant activity was maintained to 10 days after emergence, similar to the survival rate (Fig. 2-d). Average longevities (mean days±SD) were 10.6±1.7 for *E. elutella*, 8.2±1.8 for *P. interpunctella*, 5.9±2.0 for *C. cautella*, and 12.4±2.0 for *E. kuehniella*.

2) Attractancy of a tobacco moth lure

The attractancy of a tobacco moth lure for the four pyralid moths is represented by the ratio of capturing efficiency (%) for each moth species to that for *E. elutella*.

The attractancy for *E. elutella* was the highest (Fig. 3). Attractancies for the other moths were 0.32 for *P. interpunctella*, 0.15 for *C. cautella*, and 0.24 for *E. kuehniella*.

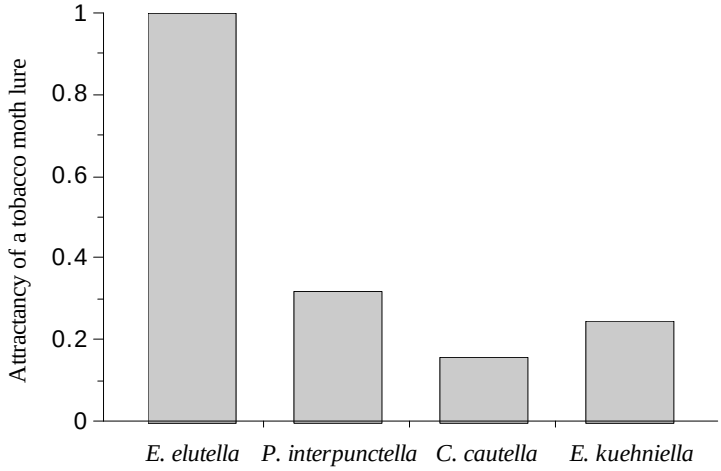

Fig. 3. Attractancy of a tobacco moth lure for four pyralid moth males.

4. Discussion

This study clarified that a tobacco moth lure (GACHON) with ZETA and ZETOH attracted all four pyralid moths. Attractant activities of the two-day-old male moths (unmated) were the highest. However, the number of *E. elutella* attracted by the lure was the most, and the numbers for the three other moths were thirty percent or less of that of *E. elutella*.

One pheromone trap usually catches a specific insect, so it is unnecessary to identify the insect species. This is one of the advantages of using pheromone traps for monitoring. The current results indicated that the four pyralid moths were simultaneously caught by pheromone traps with ZETA and ZETOH when they inhabited the same factories and warehouses. In this case, it is necessary to identify moth species, in contrast to the normal advantage of pheromone traps, and it is very important to collect information on the kind of pyralid moth present.

In nature, an insect male is not attracted to another insect female. This suggests that they have a mechanism to exactly differentiate among species. Clarification of this mechanism could lead to the development of pheromone traps with higher selectivity.

5. References

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