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Extraction and Activity Determination of Pheromone from Beet Moth

Junhao Wang

Nanjing Foreign Language School Xianlin Campus, Nanjing Jiangsu, 210000, China

Abstract

Moth sex pheromones are released by females to attract males to mate and are essential for population reproduction. In pest control, insect sex pheromone can be effectively used in pest population monitoring and pest control. Compared with traditional chemical pesticides, it has the advantages of specificity, high efficiency and environmental protection. Beet Moth, belonging to the Lepidoptera Noctuidae, is one of the most important pests on crops. Chemical pesticides are the main control methods at present. In this study, the female pheromone of this insect was extracted by solvent extraction, and the behavioral response of male moth to pheromone extract was tested by direct stimulation. The results showed that when the filter paper strip containing pheromone extract was close to the male moths, the male moths showed courtship behavior responses such as activity, wing flapping and orientation.

Keywords

Beet Moth; Pheromone Extraction; Activity Determination of Pheromone.

1. Introduction

As the language of insects, insect pheromones are volatile chemicals synthesized by individual insects and released in vitro, which are felt by the same individual and produce specific tendency behaviors. Moth sex pheromones are released by females to attract males to mate and are essential for population reproduction. In pest control, insect sex pheromone can be effectively used in pest population monitoring and pest control[5]. Compared with traditional chemical pesticides, it has the advantages of specificity, high efficiency and environmental protection. Since the discovery of the first insect sex pheromone, nearly a thousand moth sex pheromones have been identified, and some of them have been successfully used in pest monitoring and green control of important crops such as rice, cotton, fruits and vegetables, and tea. With the increasing problems of ecological balance, environmental pollution and food safety, as well as the continuous improvement of the whole society's demand for pest control technology, insect pheromone control technology will play an increasingly important role in the comprehensive control of pests, especially in reducing the use of pesticides.It belongs to the Lepidoptera Noctuidae, which occurs in North China, Northeast China, northwest China and Yangtze River Basin provinces[2]. Its host is cabbage, cabbage, radish, pepper, string bean, cowpea, soybean and other more than 100 kinds of plants, most of which are vegetables. At present, the main control method of this pest is chemical control, but it also brings problems such as pest resistance and environmental pollution[3]. Finding new efficient and environmental protection control methods has become an urgent problem to be solved. Whether it is the biological control technology of natural enemies, breeding insect-resistant strains, or interfering with insect information communication, it will become an important way of comprehensive control of this insect[4]. However, if the method of interfering with insect information communication is adopted, the pheromone extraction and identification of this insect should be carried out first[1]. Therefore, this experiment mainly focused on the extraction and activity measurement of pheromone of Exigua exigua.

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2. Methodology

Extraction of pheromone from beet Armyworm: Solvent extraction method was adopted in this experiment, and the solvent used was hexane. 2 days after eclosion, dark period began after 3 hours, take 1 to 2 female moth, treat the hands of the pheromone gland overhanging gently squeezing the female moth abdomen, forcing it to completely out of the pheromone gland, camber of the glands with surgery, put glands in advance a sample bottle of 0.5 ml of n-hexane, remove glands, placed about half an hour at room temperature for pheromone leaching solution.

Behavioral response to pheromone extract of male Spodoptera exigua: Behavioral response was performed by direct stimulation. First, a 2-day-old male moth was removed and placed in a glass tube (3 cm in diameter, 15 cm in height). The pheromone bold drops were then added to the filter paper sheet (1 cm x 1 cm) with a pipette and left in the air for 1 minute. After the n-hexane volatilized, the filter paper strip was placed on the glass tube mouth with tweezers to observe the behavioral response of the male moths.

3. Results and Analysis

Through experimental observation, it was found that when the filter paper containing pheromone extract was close to the antennae of the stationary male moth, the antennae quickly sensed the signal with the help of volatilized and diffused sex pheromone, and the male moth immediately became excited and quickly showed a series of courtship behavior reactions, such as wing flapping, antennae constantly swinging and abdomen bending. The results showed that the extract contained sex pheromone active component, and it was the existence of this active component that made the male moth show obvious changes in behavior.

Figure 1. Male moths not exposed to female moth pheromones

Figure 2. Male moths exposed to pheromone

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4. Summary and Thinking

Through the experimental observation, the gland extract of the female moth can significantly induce the courtship response of the male moth, which indicates that the solvent extraction method successfully extracted the pheromone active component from the glands of the 2-day-old female moth after emergence. In the course of the experiment, why were female and male moths 2 days old after emergence selected for the experiment? Why can use hexane to extract sex pheromone, but not methanol, methylene chloride and other organic solvents? Since sex pheromones are the "language" of communication between male and female adults and play an important role in courtship and reproduction of insects, how to use sex pheromones to control pests, like traditional pesticides sprayed directly on plants? Through the thinking of these questions, combined with experiments and access to information to get the answer, so that the learning knowledge further sublimation and expansion.

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