

**THE RELATIONSHIP BETWEEN PHEROMONES AND PHYTONCIDES AS A
PROSPECT FOR AN ENVIRONMENTALLY FRIENDLY METHOD OF
COMBATING AGRICULTURAL PESTS*****Khonkhodjaeva Nodira Bakhtiyarovna****associate professor of the Tashkent State Pedagogical
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Abstract: This review article presents information on biologically active substances: pheromones and phytoncides, in the context of the prospects for their joint integration into modern agriculture as a pest control. The most widespread methods of pest control in agriculture today have an extremely negative impact on the environment, in this regard, there is a need to consider more environmentally friendly methods.

Keywords: phytoncides, pheromones, agriculture, greening, traps, insect pests, environmental safety

INTRODUCTION

Agriculture is an integral part of the economy of any state, since it carries the main task of providing the population with food. At the same time, the intensive development of agriculture poses a threat to the environment.

One of the most significant problems of the modern world is the pollution of living environments with various chemicals. To ensure a regular rich harvest, it is necessary to protect plants from pests and diseases. Synthetic pesticides cope with this task today. Chemicals occupy almost the most important place in the fight against agricultural pests of various etiologies, but at the same time their action is very ambiguous. Indeed, they provide effective protection from biotic factors affecting crops, but at the same time they are a powerful factor in environmental pollution.

Modern pesticides are various chemical compounds that are toxic to pests, but they can also be toxic to other living beings that do not harm agriculture, including humans. The purpose of human use of pesticides is harmful organisms, but they make up no more than 0.5% of the total population of the biosphere, and the influence of pesticides extends to other organisms.

Natural remedies based on the natural immunity of plants are much inferior to chemicals and, as a rule, are more expensive. Based on this, the search for environmentally friendly methods of pest control, effective enough to minimize agricultural losses, is becoming increasingly relevant. One of such methods is presented in this article.

MAIN PART

Insect pheromones were discovered more than 50 years ago and now they can become a safe alternative to chemical pesticides and other harmful, but necessary today for the control of insect pests, substances, since such insects cause significant harm to agriculture. The use of various biologically active substances of plants to combat pests is also one of the promising methods of protecting agricultural crops, which is becoming increasingly popular in organic farming and integrated plant protection systems. Accordingly, the possibility of using these natural and environmentally friendly substances in tandem to combat pests is permissible [3].

Let's look at the concept of pheromones. These are biologically active substances that are released into the environment by any living organism. In the context of our topic, it is the pheromones secreted by insects that are of interest. Pheromones are volatile compounds that perform a signaling function, thereby ensuring communication between individuals. Pheromones are capable of controlling the neuroendocrine reactions of insects, subsequently changing the physiological and emotional state, metabolism and behavior of individual individuals of the species. In this way, they can affect the behavior, reproduction, nutrition and development of insects. Currently, insect pheromones are considered the most studied [1]. Phytoncides are biologically active substances that plants secrete to protect themselves from pests, pathogens and competitors. These substances have antiseptic, antibacterial, antifungal and insecticidal properties. The specifics of their use are similar to the use of pheromones. The effect of plant phytoncides on various types of pests is quite broad, so their classification by functional purpose is considered the most effective [4].

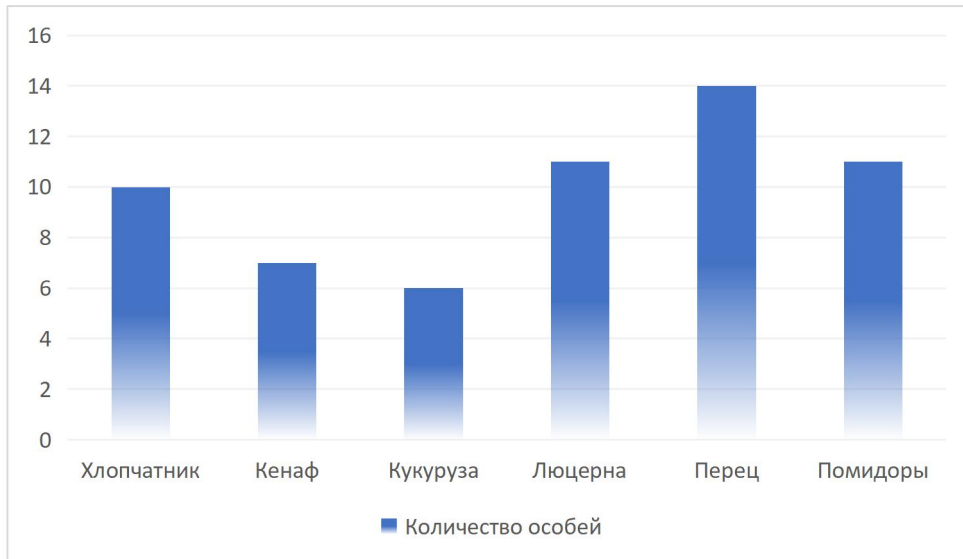
№	Класс феромонов	Назначение
1	фитоаттрактанты	используются для привлечения особей
2	фитоарестанты	используются для формирования скоплений
3	фитостимуляторы	используются для активизации процессов
4	фитореpellенты	используются для отпугивания
5	фитодезориентанты	используются для дезориентации

Table. Classification of phytoncides by functional purpose

The connection between phytoncides and pheromones is that both types of substances are volatile organic compounds that play an important role in communication and protection in nature. The method of using these substances in agriculture is of considerable scientific interest today.

The combined use of pheromones and phytoncides in pest control can be a very effective method. These two technologies act at different levels: pheromones affect the behavior of insects, and phytoncides affect their physiological state. Pheromones can help keep pests within control boundaries, and phytoncides will provide additional protection for plants.

Pheromones are often used in traps to attract insect pests. Such traps consist of synthetic pheromones that imitate odors that attract specific pests. This is most clearly seen in the example of the cutworm. In our previous studies, analogs of sex pheromones of many types of cutworms were synthesized. The sample of the synthesis of the All-Russian Research Institute of Plant Protection was chosen. Observations were carried out in the cotton crop rotation of three farms in the Yangiyul district, as well as in the fields of the Research Institute of Vegetable and Melon Crops in the Tashkent district of the Tashkent region. We used pheromones of the winter moth, two- and three-component (OC-77 and OC-8), exclamatory moth (BK-23 and BK-137), black moth (SC-72), convolution moth (Minusy-21), cotton moths (KS), and meadow moths (MS). The dispensers with pheromones were placed in triangular traps made of laminated paper, which were placed in the fields at a rate of 1 trap per 1 ha at a height of 25 cm above the plants. The dispensers were renewed every 10 days. Observations were carried out for three years in the fields of cotton, kenaf, corn, alfalfa, red pepper, tomatoes and pumpkin. Based on the number of males of each species caught in pheromone traps, we calculated the relative abundance of the species [2].



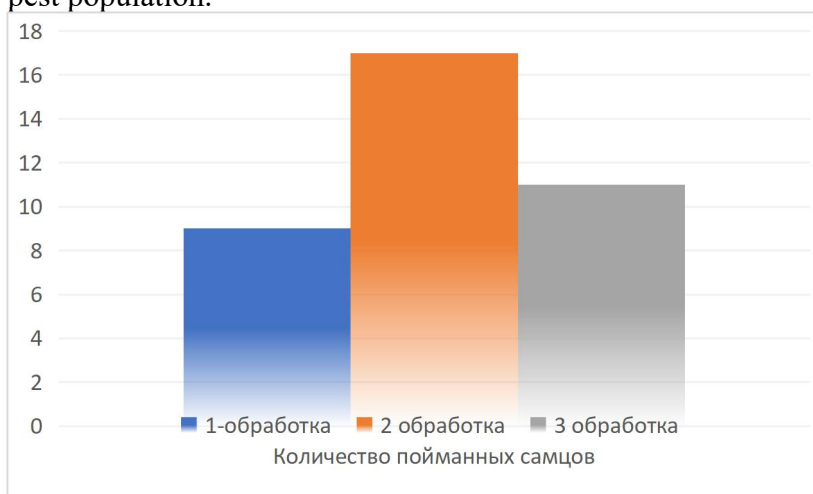
Graph. Number of individuals caught in pheromone traps per day

Based on these data, the use of analogues of insect sex pheromones can help to establish the species composition of cutworms in fields sown with various agricultural crops, as well as monitor the number of pests in the fields and signal their activity and the need to introduce additional protective measures. Then, when attracting insects to traps, phytoncides can be used in the same area to prevent the spread of these types of pests.

For example, phytoncides of such plants as burdock, chamomile, yarrow, basil are effective against cutworms.

Most often, phytoncides are used to combat pests in the form of tinctures, extracts, oils, smokes, aerosols, suspensions and powders. In addition, planting phytoncidal plants along the perimeter of fields with the most vulnerable types of crops is effective [6].

One of the effective areas of using pheromones is their ability to disrupt the reproductive cycles of insects. Synthetic pheromones can be sprayed in a field so that the opposite sexes cannot locate each other and mate. This reduces the number of offspring and thus controls the pest population.



Graph 2. Males caught in traps with sex pheromones

The efficiency of information transfer using pheromone molecules is determined by a number of factors, such as the resistance of pheromones to the effects of the external environment, that is, to their physical and chemical characteristics. The purpose of pheromones and the principle of their action is based on preserving their composition and structure for a certain period of time, which should be sufficient for spreading in the air and reaching individuals that must receive the chemical signal. And the use of highly resistant molecules as pheromones can lead to clogging of the information channel and disorientation of individuals receiving the signals [2].

Some plants also secrete pheromones that can serve as a signal to other plants about the presence of a threat. These substances can activate defense mechanisms in the plant or warn other plants about a possible attack by pests. For example, in some cases, plants can secrete pheromones that repel insects or cause them to behave aggressively, which interferes with their feeding. Phytoncides are one of many factors that affect the air microflora. Volatile plant phytoncides significantly reduce the number of pathogenic microorganisms in the air. It has also been proven that plant phytoncides play a major role in the gas-protective function of plants, that is, they can be considered not only as an alternative to chemical pesticides, but also reduce the negative effects of their use [6]. Pheromones and phytoncides can also be combined with biological means of protection. For example, pheromones can help direct predators (wasps, smelts, predatory beetles, praying mantises) to specific areas where pests are active, and phytoncides will enhance protection against pests that predators will not destroy.

The ecological advantage of using pheromones to control pests is that pheromones only affect specific pests without disturbing the ecosystem as a whole. As for phytoncides, their effect is broader and less targeted, but no less effective. When using both types of biologically active plant substances, the need for chemical insecticides is reduced, making agriculture more sustainable and environmentally friendly.

CONCLUSION

Thus, pheromones and phytoncides can work together, reinforcing each other in pest control, reducing the need for chemical pesticides and promoting more sustainable plant protection methods. Such a tandem is quite effective and environmentally friendly.

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