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PHEROMONES AND THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THEM

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Abstract. This article discusses the prospects for using pheromones in agriculture as a method of pest control and their advantages over pesticides from an ecological point of view. This article shows the concept of pheromones, their specific meaning, their significance for biological species, ways of their possible use for human needs, and the influence of external physical environmental factors on pheromones. This issue is most acute in modern environmental conditions, and research in this area is very promising. Pheromones are one of the types of external stimuli that affect humans and animals' behavior and physiological state, a complex of special olfactory signals. These are biological markers of a kind, volatile chemo signals that control neuroendocrine, behavioral responses, developmental processes, and processes associated with social behavior and reproduction. Pheromones contribute to changing the behavior, physiological and emotional state, or metabolism of other individuals of the same species. Pheromones have found their application in agriculture. In combination with various types of traps, pheromones that lure insects can destroy a significant number of pests.[2]

Keywords: physical environmental factors, environment, pheromones, highly volatile substances, relizers, primers, stimulants, pesticides, agricultural chemicalization, agrocenosis, environmental problems, chemical pollution of the environment, research perspective, synthetic pheromones, pheromone signals, pheromone traps, pheromone monitoring of agriculture, chemosignals, lepidoptera insects, insect pests, species specificity, attractivity, insect flight, light, pest control methods, quantum theory methods, adsorption, temperature, energy, chemical formula of pheromones, atomic structure of the pheromone, pheromone geometry, electronic structure of pheromones, pheromone molecule, conformer, limiting epoxide, unsaturated hydrocarbons, unsaturated oxygen-containing pheromones, Coulomb interaction, disparity.

Introduction

In foreign countries of the 20th and 21st centuries , “the problem of environmental safety has gone beyond the national and regional and has become a global problem for all mankind. Humanity has really felt the threat it is facing, as a result of which there is an anthropogenic impact on the environment.” Intensive human economic activity has brought the world to the brink of an ecological catastrophe. The human impact on the environment is multifaceted. The main anthropogenic factors that destroy the habitat are: urban growth, mining, automobile transport, industry and the chemical change of agriculture.

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In the deterioration of the environment, chemical exposure is in the first place. The role of chemical objects in human life is difficult to overestimate. They are assigned one of the important places in the fight against pests, diseases and weeds of agricultural crops, but the actions of pesticides are never unambiguous. Pesticides used in agriculture are organic compounds that are toxic not only to pests, but also to humans and animals. Humans use pesticides to destroy a limited number of organisms that make up no more than 0.5% of the total number of species inhabiting the biosphere, while pesticides, when used, affect all living organisms. When carrying out protective measures, pesticides are always directed against the population.[2]

This article examines the influence of physical environmental factors on pheromones, provides examples of studies of this kind of influence on the pheromones of Lepidoptera insects, as well as prospects for the use of pheromones in agriculture.

Pheromones change the behavior, physiological and emotional state, and even the metabolism of different individuals of the same species. These substances are means of regulation, play an important role in the communication of many insect species, for example, ensuring the rapprochement of males and females during the breeding season, the concentration of insects on forage plants and in wintering areas, or controlling the behavior and physiological processes in working individuals of social insects. Pheromones are found in animals of various systematic groups, from invertebrates to mammals. Currently, insect pheromones are considered the most studied.

There are two main types of pheromones that differ in their effects: releasers and primers. The first type is relizers, capable of prompting an individual to take immediate action, for example, pheromones that transmit danger signals between individuals of the same species. Usually relizers are highly volatile substances that propagate through the air. The second type is primers, designed to form a special behavior and influence other individuals, an example is the pheromones secreted by the queen bee, in order to suppress the sexual development of female bees, turning them into ordinary worker bees. Primers are most often distributed by contact. Relizers are currently studied better than primers, using their example, several subtypes of pheromones can be distinguished, such as: attractants – these include sexual pheromones and aggregation pheromones that stimulate the accumulation of insects; repellents – repelling pheromones; stimulants – pheromones that cause activity, for example, anxiety pheromones; determinants – inhibiting reaction, etc. [5]

The source of pheromone in insects can be individual secretory cells scattered throughout the body or groups of them that form a special organ – the pheromone gland. The ducts of the pheromone glands open on the surface of the body or in cavities communicating with the external environment. Insects secrete a pheromone in micro quantities: Thus, the female apple moth (Cydiapomonella) secretes only 9 Nano grams of pheromone per hour. However, this amount is enough for the male fruit worm to be able to smell and find a female in the crown of the tree. Insects perceive the smell of pheromones with the help of chemoreceptor sensors – special

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receptors in the form of hairs, bristles or bumps located on the antennae; their number on one antenna can reach 15 thousand. The presence of a very small amount of pheromone in the air is sufficient for the insect's response.[4]

Usually pheromones are not a single substance, but a mixture of the main, predominant component by weight with small additives (minor components): they may contain more than 10 components. One substance can have several different functions. Pheromone molecules are highly volatile; decompose rapidly under the influence of oxygen in the air, moisture and light. By chemical composition, insect pheromones belong to various classes of organic compounds, such as alcohols, esters, terpenoids, steroids, aldehydes, heterocyclic compounds and others.

Knowing the chemical composition of the insect pheromone, it is possible to synthesize it in the laboratory. It is these synthetic analogues of sexual and aggregation pheromones that can be used to protect plants from pests. The advantage of synthetic pheromones, which are used in microdoses, is high species specificity and attractiveness. They are completely harmless to humans and the environment, and also act directly on the target insect pest species.

There are two main areas of application of synthetic pheromones against harmful insects: The first is monitoring. This suggests that the use of pheromones provides an opportunity to record such processes as the number of pests, to obtain data on their numbers, or even the ability to determine the range of quarantine pests. The second is pest control. Having saturated the air with synthetic pheromone, it is possible to prevent males from finding females, attract insects and catch or destroy them before they can detect the natural source of the pheromone. In both cases, the reproduction of pests is blocked.

However, in addition to the influence of pheromones on pests, it is necessary to consider the influence of environmental factors on the pheromones themselves. Taking into account the huge species diversity of insect pests and the complexity of the composition of pheromones, an urgent task is to develop universal methods for the study of pheromone communication, which allow saving material, labor and time resources. It is important to pay attention to another aspect of the possible use of pheromones - the establishment of the species composition of insects in a particular area. This is most clearly seen in the example of a scoop. Analogues of sexual pheromones of many types of scoops have been synthesized.

A sample of the synthesis of VNIIHSZR was selected. Observations were carried out in the cotton crop rotation of three farms of the Yangiyul district, as well as in the fields of the research Institute of vegetable and melon crops of the Tashkent district of the Tashkent region. We used pheromones of the two- and three-component scoops (Agrotissegetum) (OC-77 and OC-8), exclamation scoops (Agrotisexclamationis) (BK-23 and BK-137), C-black scoops (Xestia c-nigrum)(SCH-72), loach scoops (Emmeliatrabealis) (Cons-21), cotton scoops (Helicoverpaarmigera)(CS), meadow scoops (Mythimnaunipuncta) (MS).

Dispensers with pheromones were placed in triangular traps made of laminated paper, which were placed in the fields at the rate of 1 trap per 1 hectare at a height of 25 cm above the plants. The dispensers were updated every 10 days. Observations

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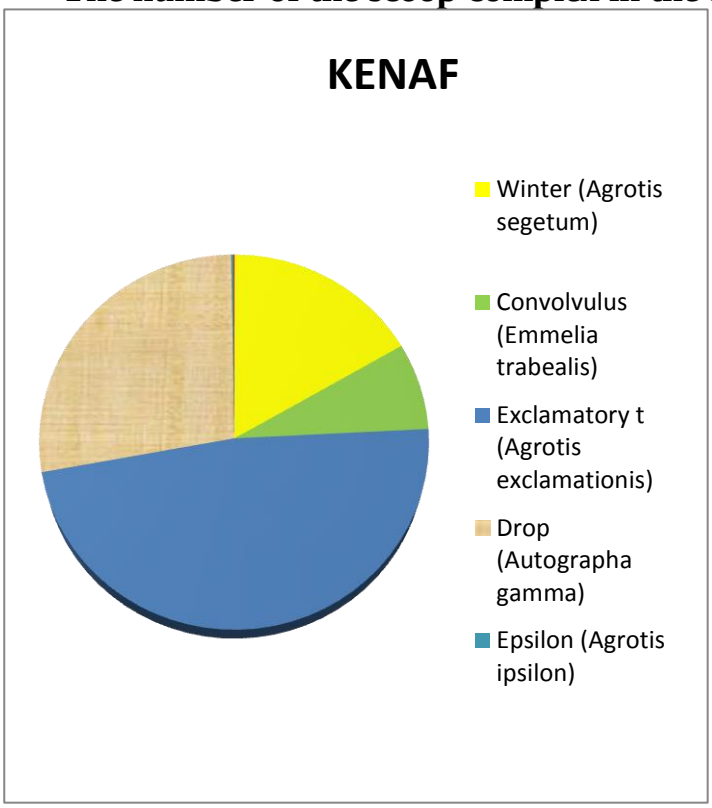
were carried out for three years in the fields of cotton, kenaf, corn, alfalfa, red pepper, tomatoes and pumpkin. Based on the number of males of each species trapped in pheromone traps, we calculated the relative abundance of the species [4].

The number of the scoop complex in the agro cenoses of cotton crop rotation



In the surveyed cotton crop rotation fields (cotton, kenaf, corn, alfalfa), the scoop complex, determined by the presence of pheromones, is usually of the same type. However, in some years there were differences that mainly concerned small species. So, in all districts the dominant species was the bindweed (Emmeliatrabealis), the subdominant - exclamation (Agrotisexclamationis) and winter (Agrotissegetum). In the fields of corn and cotton, there were no caradrina scoops (Spodopteraexigua) and leafy corn scoops (Spodopterafrugiperda). Loach scoops (Emmeliatrabealis), winter scoops (Agrotissegetum), exclamation scoops (Agrotisexclamationis), cotton scoops (Helicoverpaarmigera), meadow scoops (Mythimnaunipuncta), as well as gamma scoops (Autographagamma), C-black scoops (Xestia c-nigrum), ypsilon scoops (Agrotisipsilon). The species diversity of the scoops in the cornfield was somewhat less: there was no cotton scoops (Helicoverpaarmigera) and there was no scoops-epsilon (Agrotisipsilon).

In the alfalfa field, all kinds of scoops were identified, the pheromones of which were used. In the fields of vegetable crops, all types of scoops were also found, whose pheromones were used during observations, with the exception of caradrins (Spodopteraexigua) and leafy corn scoops (Spodopterafrugiperda). On the vegetable crops of the Tashkent district, the number of scoops was generally higher than in the cotton crop rotation fields in the Yangiyul district. In vegetable crops, as in the agrocenoses of cotton crop rotation, the dominant species was the convolvulus (Emmeliatrabealis), the subdominant - exclamation (Agrotisexclamationis) and winter (Agrotissegetum) scoops.

So, a day after installing pheromone traps, 14.7 individuals were caught on red pepper, and 11 individuals were caught on tomatoes and alfalfa. At the same time, in the fields of alfalfa, tomatoes and red pepper, it was found on traps with winter pheromones of 6, 7.7 and 10.7 individuals, respectively. According to available data, the generalized economic threshold of harmfulness is considered to be catching, on

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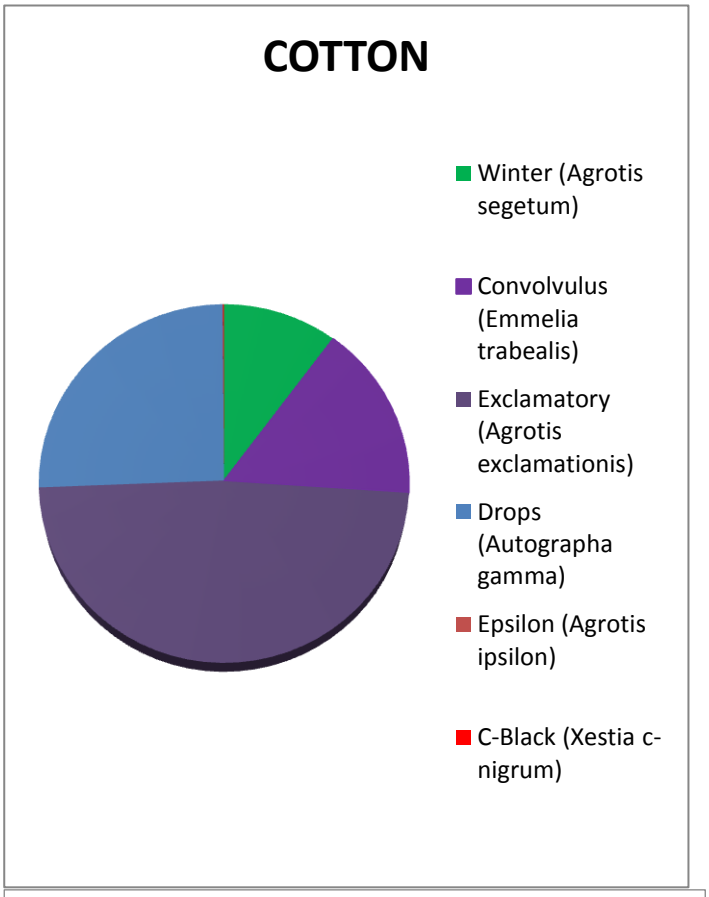
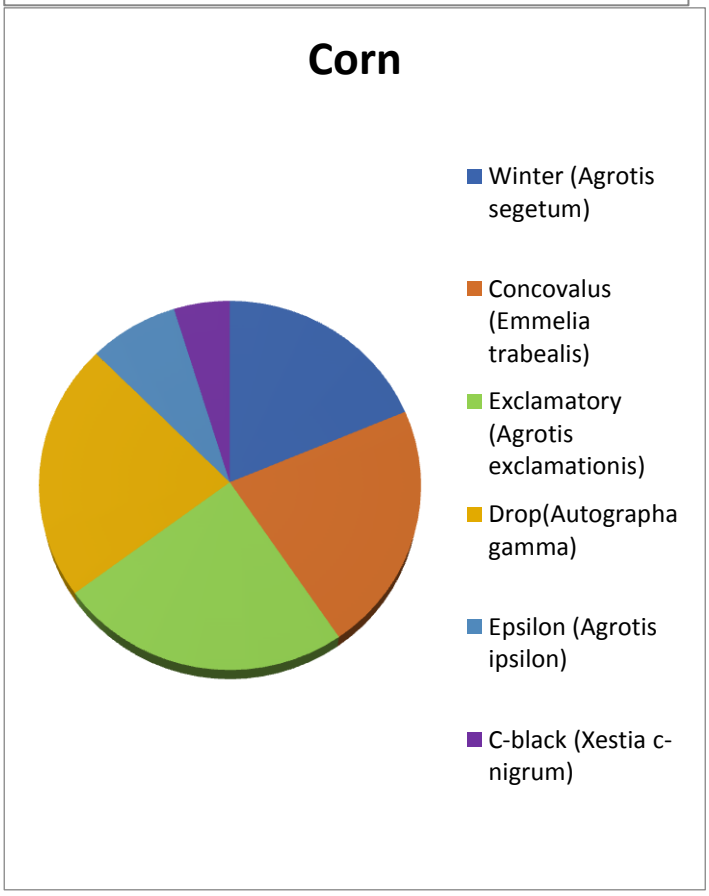
average, 5 or more winter scoop butterflies (Agrotissegetum) per day (night), which corresponds to a caterpillar density of 2.6 - 4.0 individuals per 1 m2.





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In the fields of vegetable crops studied by us, the number of winter owl butterflies (Agrotissegetum) exceeded the above-mentioned EVP. With the help of pheromones of other scoops, a large number of other species were identified that are not inferior to the winter scooper (Agrotissegetum); the total number of detected scoops significantly exceeded the generalized damage threshold set for only one species.

Conclusion

The efficiency of information transmission using pheromone molecules is determined by a number of factors, for example, such as the resistance of pheromones to the effects of the external environment on them, that is, to their physico-chemical characteristics. The purpose of pheromones and the principle of their action is based on their preservation of their composition and structure, for a certain time, which should be enough to spread in the air, and to reach individuals who should receive a chemical signal. And the use of highly resistant molecules as pheromones can lead to clogging of the information channel and disorientation of individuals receiving signals.

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