Editorial

Natural Pesticides and Pheromones for Natural Pest Control in Sustainable Agriculture

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Abstract: The use of synthetic pheromones and natural pesticides has proven to be a viable alternative to the use of pesticides. The pest control technique using pheromones consists of interfering with the reproduction of insects through sexual confusion or attracting them to a trap through mass collection.

Keywords: Pheromone, Sustainable agriculture, Natural pesticides, Sexual confusion, Mass collection.

1. The Importance of Agriculture and the Disadvantages of Using Pesticides

Agriculture seeks to meet the demand for food production, being an important economic activity in several regions. Monoculture favors the proliferation of specific pests, which, if not efficiently controlled, can compromise plantations, harming production and causing financial losses to producers. Pesticides are used to control pests, but they have several disadvantages: contamination of the soil, contamination of groundwater, contamination of the applicator (rural worker). There are some agricultural techniques for the controlled use of pesticides, the appropriate concentration to be sprayed, the use of individual protection equipment by workers and waiting for some time between application and harvest. When these techniques are not respected, damage to the environment and human beings can be greater. Pesticides can contaminate vegetables, and it is not possible to remove them from leaves and fruits by washing because these substances are inside the vegetables.

2. Sustainable Agriculture and Natural Pest Control Using Natural Pesticides and Pheromones

With evolution and natural selection, plants developed secondary metabolites with the function of protecting against herbivory. The action of these substances can be repellent (which repels), deterrent (which prevents feeding and oviposition) or lethal (killing) for insects. These substances can be used as natural pesticides, being less harmful to the environment and human beings. (Pinto-Zevallos and Zarbin, 2013; Mithofer and Boland, 2012).

3. Natural pesticides

Neem (*Azaridachta indica*) is a tree native to South Asia, used for wood production and medicinal purposes. This species contains more than 50 phytochemical limonoids in its tissues, with azaridactin, present in the seeds, being the compound of greatest interest, as it has a known effect on more than 600 species of insects. The seeds, bark and leaves can be used in the production of natural pesticides. The metabolites produced by plants act as direct defense inducers against attack by herbivores, such as protease inhibitors. Phytohormones such as jasmonic acid and salicylic acid are also involved in direct plant defense mechanisms (Vasanthakumar et al., 2013; Pinto-Zevallos et al., 2013).

The indirect defense mechanism of plants consists of the release of volatile compounds after the action of herbivores, these compounds attract enemies (predators) of insects. A commercial product that has this action is PredaLure, that attracts lady bugs and lacewings that prey on pest insects (Ton et al., 2006; Kaplan, 2012).

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4. Pheromones

Pheromones are substances secreted by an individual into the external environment and later received by another individual of the same species, as a form of communication. The first pheromone isolated was Bombicol, which comes from the silkworm (Arioli et al., 2013; Karlson and Luscher, 1959).

The action of the synthetic pheromone in pest control can occur in two ways: Sexual confusion or mass collection. In the first case, the substance prevents the insect from finding the opposite sex to reproduce, while in the second case, the insects are attracted into a trap and collected for later elimination. Insects from different regions may have differences in pheromone composition, so pheromones imported from other regions may not work in these cases (Pinto-Zevallose and Zarbin, 2013; Witzgall et al., 2010).

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