

Relationships between plants and insects are in the focus of modern crop protection

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Restrictions on the use of chemical pesticides necessitate the development and implementation of alternative means for pest control. Products inspired by the naturally existing relationships between plants and pests will appear increasingly often on the market. Plants and phytophagous (plant-feeding) insects have coexisted throughout the millions of years of the history of planet Earth. In practice, plants are the only group of living organisms that can generate their own energy. Something we often fail to realize is that all other organisms in the food chain are either directly or indirectly dependent on plants. We do not think of lions or of some bird species as being dependent on plants, but they feed on organisms that depend on plants in order to obtain

energy. For this reason, over millions of years of evolution, plants have been subject to enormous selective pressure to develop a defense system for avoiding or neutralizing insect attack.

There is ample evidence that many plant characteristics, such as a specific life cycle, leaf shape, or secondary defensive compounds, have evolved at least partially as adaptations against insect attack. The pungent taste of horseradish, for example, is due to compounds called glucosinolates, which are believed to have arisen through natural selection for protection against insects. Nicotine is a neurotoxin in tobacco plants that has developed as a result of natural selection for protection against insects. In the course of evolution, plants have not only developed a complex defensive apparatus but also continuously refine it, thereby maintaining ecological balance. Knowledge of these complex relationships provides valuable ideas for the most environmentally sound approaches to pest control. The strategies that plants employ against attack by insects and other pests in order to ensure their survival are used very successfully in modern crop protection as well.

Plant defense mechanisms against insect attack

The defense mechanisms of plants against insect attack are extremely diverse and can be grouped in different ways depending on the criterion used:

- physical (morphological) and chemical;
- acting at a distance and acting upon contact;
- constitutive (continuously present) and induced (arising upon insect attack);
- direct (when the plant is directly involved in the defense) and indirect (when another organism is involved in the defense).

A physical or chemical defense mechanism may act at a distance or upon contact, may be permanently present or induced, and may be defined as direct or indirect.