

Popular science abstract

Cereal production is one of the most important branches of agricultural production in the world. A large sowing acreage and high yielding make these crops particularly vulnerable to pests during plant vegetation and grain storage. Insect pests are responsible for destroying 1/5 of the world's annual plant production, some of which are caused by storage pests. An important issue in the process of spreading storage pests is an adaptation to eating various types of food. Reducing losses caused by storage pests in agriculture will contribute to better use of the food produced. This is especially important in the context of the continued growth of the human population on earth. In recent years, it has been proven that insects can digest e.g. plastic, and enzymes secreted by the digestive system and symbiotic microorganisms are responsible for their digestion. Unfortunately, only a few publications describe the functions of the digestive system of storage pests. The negative activity of storage pests made it necessary to develop methods of their identification and control.

The methods that are currently used are insufficient, therefore new solutions should be sought to ensure greater safety of stored food. Preventing the destruction of stored food and seeds has become a priority for many countries. To solve a problem, you need to know its nature. This is also the case with storage pests. Understanding how harmful insects digest grains will help you safely store plant seeds in the future. The presented research is theoretical. They were undertaken primarily to gain new knowledge and understand the mechanisms of action related to insect feeding. This project aims to investigate the effect of chemical properties of cereal kernels (wheat and barley) on the development, metabolism and microbiotics of the gastrointestinal tract of the lesser grain borer (*Rhyzopertha dominica* F.) and the rice weevil (*Sitophilus oryzae* L.).

In this research, we intend to investigate the chemical properties of various grain species and its varieties. By feeding stock insect pests with species and varieties of grain that differ in chemical properties and susceptibility to insect feeding, we want to identify changes in the development, physiology, and microbial community that help digest food for these pests. Combining the results of the above-mentioned assumptions with the amount of grain consumed will enable the description of the mechanisms of food digestion. Moreover, by understanding the different chemical characteristics of cereal varieties, it will be possible to study how they affect metabolism and the microorganisms of storage pests. The subject of the research will be the grains of winter and spring wheat varieties and spring barley, which are among the most popular cereals, and two species of storage pests: the lesser grain borer and the rice weevil, which are extremely difficult to control. The first one in recent years turned out to be a species capable of quick adaptation to unfavorable environmental conditions and, as a result, caused a dynamic migration to cooler world areas. The rice weevil, on the other hand, is a dangerous pest, the occurrence and requirements of which are not sufficiently known and described in Poland. The project is innovative because it combines a comprehensive approach to the issue and the use of innovative methods of storage pests at the breeding, microbiological and enzymatic level. The induced changes in the digestive system of the studied insects, caused by the use of food with different chemical properties, including the content of antioxidants, will allow to identify disturbances at the level of the microbiome and the metabolism of the insect. The obtained results of basic research will be the basis for setting new trends in application and development research, contributing to reducing the growing problem of food safety caused by pests.