

## SUMMARY

Production of safe foodstuffs of high quality is the most important aim of the agriculture. With technological advancements targeting at increasing production effectiveness, problems associated with the use of synthetic chemicals in the agriculture increase; including their toxic influence on human health and the environment, and development of resistance to plant pathogens and pests. To reduce risks related to the use of pesticides, actions promoting implementation of integrated plant protection systems were developed. They aim at a correct use of plant protection products, focusing on actual hazards to crops. In 2014, the Integrated Pest Management was introduced, in which biological methods have priority over chemical ones. The study evaluates the influence of micro-organisms used in biological preparation on degradation of selected active substances of chemical plant protection products.

The aim of the research was to determine in the laboratory conditions (*in vitro*) a degree of degradation of fungicide active substances (fluopyram, tebuconazole, boscalid, pyraclostrobin and penthiopyrad) by strains of bacteria, *Bacillus subtilis* PCM 486, and fungus, *Trichoderma harzianum* KKP 534, and by a mixed culture of bacteria and fungi, as well as to establish in field conditions (*in vivo*) whether the use of a commercially available preparation Zumba Plant® containing bacteria and fungi strains influences degradation of fungicide active substances in apples.

Beside determining the degree of degradation, the laboratory studies also evaluated levels of the studied active substances that were inhibiting/biocidal to *B. subtilis* and reference yeast, *S. cerevisiae*, as well as viability of *B. subtilis* cells. Following exposure of bacteria, fungi, and the mixed culture of used micro-organisms to tested pesticide active substances, the noted degree of degradation was the highest (99%) for pyraclostrobin degraded by the fungus *T. harzianum*, and the lowest (0.2–0.5%) for tebuconazole degraded by *B. subtilis*.

The field experiments concerning degradation of active substances used in chemical preparations Luna Experience 400 SC, Bellis 38 WG and Fontelis 200 SC by the commercially available formulation Zumba Plant® were conducted in five varieties of apple trees in a three-year research cycle. The degree of degradation was the highest (52%) for boscalid in apples of the Gloster variety, and the lowest (0.5%) for tebuconazole in the Gala variety. Furthermore, dissipation kinetics and half-lives in apples were also established for the studied active substances.

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