

**Development of a strategy to prevent the growth of seed potato
(*Solanum tuberosum* L.) phytopathogens based on ecological biotechnological
solutions**

mgr inż. Aleksandra Steglińska

Supervisor

prof. dr hab. Beata Gutarowska

prof. dr hab. inż. Dorota Kręgiel

Abstract

Potato (*Solanum tuberosum* L.) is the fourth most important crop in the world, with a harvest of 376 million tonnes in 2021. Poland is the third largest potato producer in the European Union and the ninth in the world. Current national data indicate a decrease in potato production from year to year, however, the growing demand for processed potato products and favourable changes in the legal field regarding potato exports suggest that the observed decreasing trend may be reversed.

A significant threat to potato production is the activity of phytopathogenic bacteria and filamentous fungi, which results in global potato harvest losses estimated at 17.2%. Currently, the basic method of combating potato diseases is the use of synthetic pesticides, which, despite their high effectiveness, are a factor negatively affecting both human health and the natural environment. The growing controversy over chemical pesticides creates a dynamic trend of developing biological formulations that are pro-environmental and non-toxic to humans, which are of particular importance to organic farming.

Innovative research including a doctoral dissertation was aimed at determining the chemical and physiological indicators of seed potato infection with phytopathogens, developing effective biopreparations containing live *Metschnikowia pulcherrima* yeast cells, lactic acid bacteria or active plant extracts, protecting against the development of phytopathogens. The effect of the developed preparations on the level of contamination with mycotoxins and the physiological state of plants obtained after seed potatoes treated with biopreparations was determined. Indicators of infection in the form of volatile organic compounds, specific for each tested phytopathogen, and markers of the physiological state of plants obtained from infected potatoes were determined. The selection and in vitro tests allowed for the selection of the yeast strain *M. pulcherrima* TK1 (strawberry flower isolate), the bacterial strain *Lactiplantibacillus plantarum* KB2 LAB 03 (sauerkraut isolate) and the water extract of garlic (*Allium sativum* L.) for the development of preparations that can be used as biocontrol agents for diseases of bacterial and fungal origin. Importantly, the application of the developed biopreparations to seed potatoes allowed to reduce the level of contamination of seed potatoes with mould metabolites and positively influence the growth and physiological activity of the obtained plants. This multi-factor antimicrobial strategy showed a broad spectrum of activity against phytopathogens, which allows it to be used both in potato cultivation and during storage.