



Background

According to the Food and Agriculture Organization (FAO), pesticides are substances used to control pests and regulate plant growth. The use of pesticides has been largely adopted by farmers to maintain their crops' quality. Over the past decade nearly 50% more pesticides have been used compared to the 1990s, according to official reports from FAO.

The use of pesticides poses risks to human health due to chemical residues in food and causes environmental damage by contaminating soil, water, and non-target organisms, threatening biodiversity and sometimes even reducing crop yields.

Plant viruses are responsible for nearly half of all plant diseases globally, resulting in approximately \$30 billion in annual economic losses and posing a serious threat to food security. In light of this evidence, the European Commission set legally binding targets in 2022 to reduce chemical pesticide use and risk by 50% by 2030, promoting safer and more sustainable alternatives and limiting pesticides to a last-resort option.

Objective

The overall objective of the project is to provide a structured approach for the development of novel biopesticides aimed at enhancing passive immunity in plants against viral infections by applying multidisciplinary technological strategies.



TO ACCOMPLISH THIS GOAL, THE PROJECT IS STRUCTURED AROUND THE FOLLOWING SPECIFIC OBJECTIVES:

Design, chemical synthesis and study of the biophysical properties of novel nanobodies against the Cucumber Mosaic Virus (CMV)

Determination of the optimal expression system for the production of functional nanobodies for CMV

Assessment of the potential toxicity of the nanobodies in different systems and organisms

Development of novel techniques to enhance plant resistance to viral infections

WORK PACKAGES

Work Package 1



Design, in vitro production and biophysical characterization of nanobodies

Work Package 2



Application of nanobodies as a means of prevention or response to plant viral infections and in vivo production

Work Package 3



Comprehensive analysis of the efficiency of the developed nanobodies

Work Package 4



Sustainability analysis, exploitation strategy and business plan

Work Package 5



Communication, dissemination and impact strategy

Work Package 6



Project Coordination and Management

EXPECTED IMPACTS

- Development of effective antiviral solutions for **improved agricultural productivity**, thus reducing the need for chemical pesticides and improving crop resistance
- **Cost-effective production of cheaper alternative biopesticides** through techniques that use plants or other organisms that are relatively inexpensive to cultivate
- The development and usage of the proposed biopesticides is expected to reduce reliance on synthetic pesticides, thereby contributing to **improved food safety**
- Adaptation of the project's methodology to generate more nanobodies aiming to **target other harmful pathogens and viruses** related to diverse diseases
- Generate **high-quality new scientific knowledge** about nanobodies' application as antiviral agents in agriculture



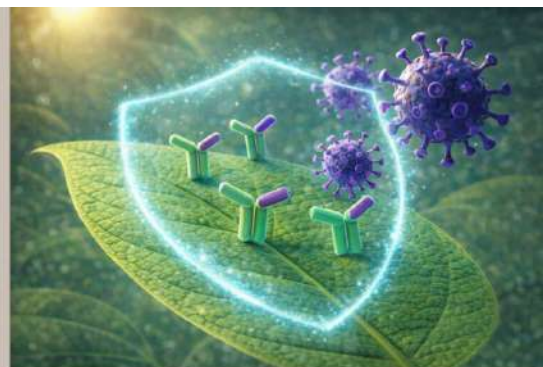
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Study of Novel Generation
nanobodies for agri-food
applications

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