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# ПРОБЛЕМИ ТА ДОСЯГНЕННЯ СУЧАСНОЇ БІОТЕХНОЛОГІЇ

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Modern phytopathology is based on the integration of genetic engineering, molecular marking (SNP, SSR), and proteomics to develop resistant genotypes, significantly accelerating traditional breeding processes. The primary strategies for enhancing plant immunity involve activating systemic acquired resistance through the expression of regulatory genes (e.g., *NPRI*), PR-group proteins, and antimicrobial peptides. Particular attention is given to viral control via the concept of pathogen-derived resistance, specifically through the introduction of coat protein genes or the use of RNA interference technology for targeted gene silencing.

Complementing these approaches, mass spectrometry and 2D electrophoresis enable the identification of proteomic profiles in pathogens such as *Xylella fastidiosa*, paving the way for the development of inhibitors that block tissue colonization without inducing microbial resistance.

In conclusion, the integration of biotechnological tools into plant pathology is radically transforming plant protection strategies. Highly sensitive diagnostics (PCR, NGS), accelerated selection, and a deep understanding of molecular interactions ensure the creation of resilient agroecosystems. The future of sustainable agriculture depends on the ability to combine these cutting-edge methods with traditional agronomic expertise.

### **Prospects for application in biotechnology *Onopordum acanthium***

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Given the ecological state of the planet, the prospects for biotechnological developments based on natural compounds, cells, and plant tissues are certainly significant. *Onopordum acanthium* is being studied in detail by researchers from Eurasia, in particular Italy, Bulgaria, and Iran, as a source of biologically active compounds with relevant and diverse types of pharmacological activity. This is a

common plant of the domestic flora, which is an excellent honey plant and at the same time a malicious weed and has been little studied in pharmacognostic terms.

The aim is to clarify the prospects for using *Onopordum acanthium* material in biotechnological areas.

In terms of food biotechnology, the presence of the enzyme onopordin in the flowers of the plant, which exhibits the ability to curdle milk and can become an alternative option for use in cheese production as a replacement for animal rennet enzymes, attracts attention.

The native composition of the compounds of the roots, leaves, grass, flowers and fruits of *Onopordum acanthium* demonstrates a powerful potential of lignans, phenolic acids, flavonoids, etc. This indicates the possibility of using explants for cloning both biomass and plants themselves with a high content of compounds selected by the researchers. Aspects of proven pharmacological action (cardiotonic, antihypertensive, anti-inflammatory, oncoprotective) only confirm the relevance of this direction of research.

Conclusion. Raw materials of *Onopordum acanthium* are an available source of phenolic compounds with therapeutic potential, which can be used, in particular, in the treatment of oxidative stress, diabetes and neurodegenerative disorders. At present, it is interesting to use the plant as a molecular farm for the production of enzymes.

### **Обґрунтування складу адгезивного гідрогелю для регенерації меніска**

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**Вступ.** Травми меніска, особливо у його аваскулярній («білій») зоні, залишаються однією з найскладніших проблем ортопедії через відсутність природного потенціалу до загоєння. Традиційні методи лікування часто обмежуються симптоматичною терапією або деструктивною меніскектомією.