



Selected research on sustainable plant protection related to bioeconomy in Poland

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Introduction

- Plants are essential to human and planetary health and one of the foundations of a sustainable and circular bioeconomy (<https://www.fao.org/in-action/sustainable-and-circular-bioeconomy/resources/news/details/en/c/1639330/>). A multitude of plants are subjected to a variety of factors, including pests and diseases, climate change, and the improper and excessive use of agrochemicals, such as pesticides and fertilizers.
- Many studies support agroecology and organic treatments by developing strategies to enhance biodiversity and biological crop protection methods.
- Studies conducted by the Institute of Plant Protection-National Research Institute focuses on practical solutions for organic farming and ecosystem stability through the use of beneficial microorganisms, natural and basic substances, flower strips located in agrarian lands.

Key research areas and Case studies

A. Strategies for sustainable plant development

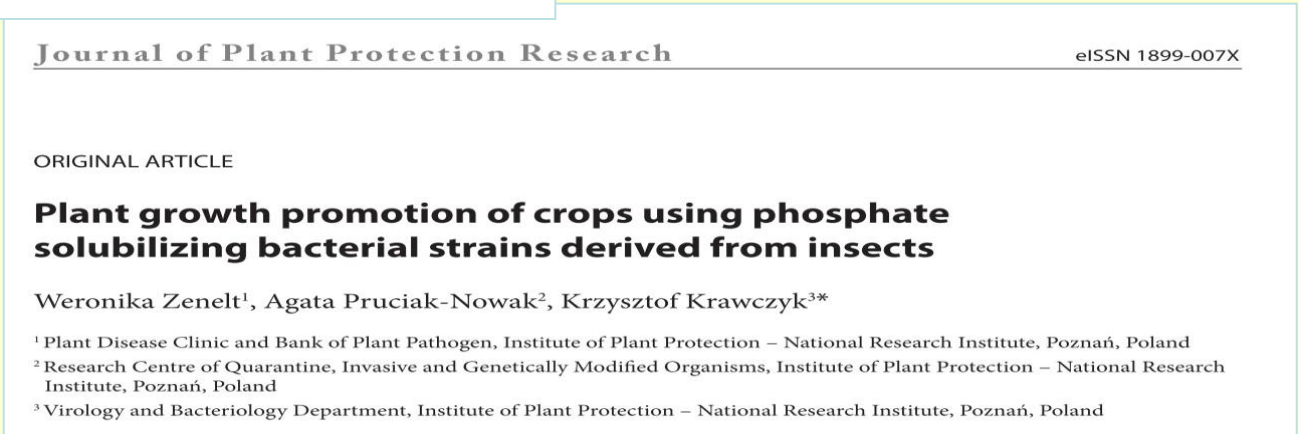
- Beneficial microorganisms: Utilizing Plant Growth-Promoting Bacteria (PGPB) to enhance plant resilience.



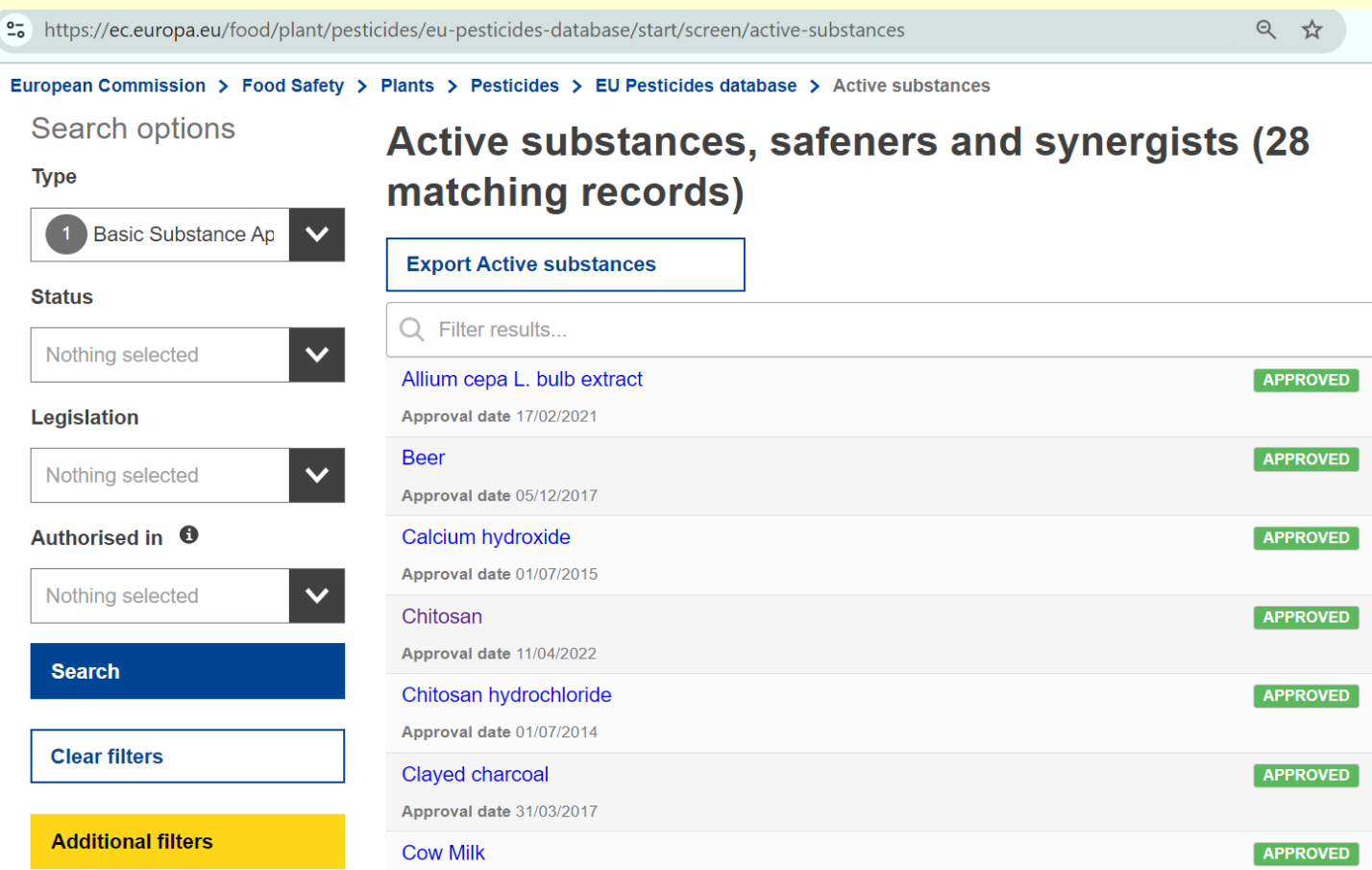
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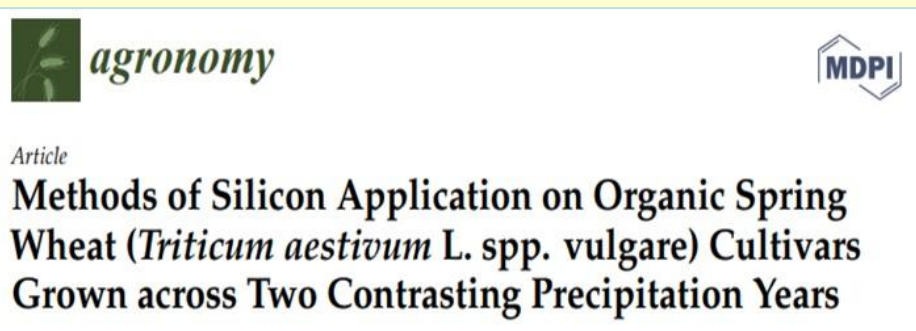
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- Basic substances in agriculture: Evaluating natural compounds such as sunflower oil, chitosan, and onion bulb extract for potato protection.



Organic farming - research towards extending plant protection methods with special purpose for organic farming - **use of natural substances, approved basic substances (BSs) and candidates as BSs, beneficial microorganisms - including yeasts** in order to develop strategies for their use in a comprehensive manner, combining them together or with permitted plant protection products.



Cinnamon powder: an in vitro and in vivo evaluation of antifungal and plant growth promoting activity

Jolanta Kowalska · Józef Tyburski · Joanna Krzyńska · Magdalena Jakubowska



- Biological control methods: Testing entomopathogenic fungi and nematodes as alternatives to chemical pesticides.

Treatments	Yield (t/ha)			
	Lilly	Vineta	Tajfun	MEAN t/ha
1 Cu	18,33	21,46	16,29	18,69 b
2 Cu/sunflower oil	22,,60	23,02	18636,67	21,42 a
3 Cu/onion	18,42	24,37	17830,00	20,20 ab
4 onion 25%	19,86	24,11	15886,67	19,95 ab
5 Sunflower oil	18,79	23,86	18906,67	20,52 ab
6 Cu/chitosan	22,09	22,50	16980,00	20,52 ab
7 Chitosan 1%	22,36	25,46	17860,00	21,89 a
8 Untreated	14,34	16,54	13350,00	14,74 c
MEAN	19,60 b	22,66 a	16967,50 c	



<https://rolnictwo-ekologiczne.ior.poznan.pl>



B. Biodiversity Enhancement

- Flower strips as green infrastructure - Promoting pollinator and arthropod diversity.
- Monitoring biodiversity impacts - Tracking species richness over time to assess ecological benefits.



Conclusion & Future perspectives

- Results demonstrate that biological solutions can **increase yields while reducing environmental impact**.
- Future research will focus on **scaling up** these solutions and ensuring it`s **application in bioeconomy**.