

ANTAGONISTIC EFFECTS OF TRICHODERMIN-SC AND RIZOPLAN AGAINST WALNUT PATHOGENS

SCERBACOVA Tatiana^{1,*}, <https://orcid.org/0000-0002-2632-325X>

STINGACI Aurelia¹, <https://orcid.org/0000-0001-6621-9919>

SÜTYEMEZ Mehmet ², <https://orcid.org/0000-0003-0417-6495>

HARCIUC Oleg¹, <https://orcid.org/0000-0003-3488-5321>

*Moldova State University, Institute of Genetics Physiology and Plant Protection,
Chisinau, Republic of Moldova,*

*²Kahramanmaras Sutcu Imam University, Faculty of Agriculture, Department of
Horticulture, Kahramanmaras, Republic of Turkey*

**Corresponding e-mail: tatiana.scerbacova@sti.usm.md*

Biological plant protection provides an environmentally sound alternative to chemical control and is an important component of disease management in both conventional and organic agriculture. The potential of biopesticides based on *Trichoderma* fungi and rhizosphere-associated *Pseudomonas* bacteria for the control of walnut diseases remains insufficiently studied. This study aimed to evaluate the antagonistic activity of *Trichoderma lignorum* (viride) CNMN-FD-14 and *Pseudomonas fluorescens* AP-33 (V-3481), the active agents of the biological products Trichodermin-SC and Rizoplan, respectively, against pathogens associated with English walnut (*Juglans regia* L.).

Phytopathogens were isolated from fallen walnut leaves collected during the 2024 growing season, infected plant tissues collected in 2025, and seedlings that died during seed germination under laboratory conditions. The antagonistic activity of the bioagents was assessed on potato-sucrose agar and malt agar using the dual-culture method. Pathogens grown separately in Petri dishes served as controls. On day 10, colony diameters in the experimental and control treatments were measured, and the percentage inhibition of pathogen growth by each bioagent was calculated.

Pure cultures of *Alternaria* spp., *Botrytis cinerea*, *Cladosporium* sp., *Colletotrichum* sp., *Nothophoma juglandis*, and *Phyllosticta juglandina* were obtained from infected walnut leaves and fruits. *Phytophthora* sp. was isolated from a dead walnut seedling.

In antagonist-pathogen dual cultures, *T. lignorum* inhibited the growth of all tested pathogens. Growth inhibition reached 72.8% for *Alternaria* sp., 80.9% for

B. cinerea, 71.8% for *Cladosporium* sp., 71.5% for *Colletotrichum* sp., 69.4% for *N. juglandis*, 65.8% for *P. juglandina*, and 71.2% for *Phytophthora* sp. Two modes of antagonistic interaction were observed: territorial antagonism and fungistatic-alimentary antagonism.

When the isolated pathogens were co-cultured with *P. fluorescens* AP-33 (V-3481), antibiotic-type antagonism (antibiosis) was observed, as indicated by clear zones of inhibited pathogen growth. The inhibition zones measured 19.2 mm for *Alternaria* sp., 9.2 mm for *Cladosporium* sp., 22.5 mm for both *Colletotrichum* sp. and *Phytophthora* sp., and 10.0 mm for both *N. juglandis* and *P. juglandina*.

Conclusions. In vitro assays demonstrated that the bioagents contained in Trichodermin-SC and Rizoplan are active against several pathogens associated with walnut diseases. *T. lignorum* acted through territorial and fungistatic-alimentary antagonism, whereas *P. fluorescens* AP-33 (V-3481) expressed antibiosis. These findings support the potential use of both biopesticides in biological and integrated walnut disease management.

Keywords: antagonistic activity, biological control, dual-culture method, phytopathogens, walnut.

Acknowledgments. This research was conducted within the bilateral Moldovan-Turkish project No. 25.80013.5107 “Eco-farming for innovative protection of new walnut varieties: Harnessing methodologies and technologies,” and Subprogram 011103 “Development of ecologically harmless means of reducing the impact of harmful organisms of agricultural crops against the background of climate change”