Int.J.Curr.Microbiol.App.Sci (2026) *15*(6): 45-52

EXCELLENT PUBLISHERS

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 15 Number 6 (2026)**
Journal homepage: http://www.ijcmas.com

Review Article https://doi.org/10.20546/ijcmas.2026.1506.004

Trichoderma: Lab to Land Plant Disease Management

Nikita Kumari[1*], S. K. Goyal[1], S. Godika[1], Pinki[1] and Govind Tikiani[2]

[1]*Department of Plant Pathology, Sri Karan Narendra Agriculture University, Jobner, Jaipur, India*
[2]*Department of Genetics and Plant Breeding, Agriculture University, Kota (Rajasthan), India*

**Corresponding author*

Keywords

Trichoderma, soil borne, pathogen, abiotic, mycoparasite

Article Info

Received: 15 April 2026
Accepted: 28 May 2026
Available Online: 10 June 2026

A B S T R A C T

Trichoderma, is a well-known bio-agent against many soil-borne pathogens comes under fungal kingdom. *Trichoderma* species are naturally found in all agricultural soils that helps the plant in basically two ways *viz*., by secretion of some enzyme that affect the cell wall of pathogen and by feeding on the pathogen by their haustoria. *Trichoderma* also helps in inducing systemic resistance in plants. *Trichoderma*, quoted by elders 'killing two birds with one stone' fits perfectly because along with controlling soil-borne disease causing agents, *Trichoderma* also develops resistance power in plants. This review enlightens previously published information of pathogen-*Trichoderma* & plant-*Trichoderma* interaction, impact of abiotic stresses on *Trichoderma*, physiological requirements and ability to tolerance and biodegradation of *Trichoderma* spp. against chemical fungicides.

Introduction

In view of the increasing population, a lot of fertilizers and fungicides were used in the green revolution to increase production. Such excessive use of chemical fertilizers and fungicides hindered sustainable agriculture and had negative impact on soil health and environment.

In view of these problems, researchers focused on the use of bio-control agents. According to researchers, the use of biological fungicides instead of chemical fungicides is a better solution to improve soil health, maintain soil quality and sustainable development of agriculture. Among these biological fungicides, *Trichoderma* is currently the best biological solution for controlling various soil-borne diseases. *Trichoderma* spp. is the most effective bio fungicide used in modern agriculture; over 60% of bio fungicides licensed globally is derived from formulations including *Trichoderma* (Verma *et al.,* 2007). A few Trichoderma species have surfaced as a chemical-free option for managing stresses pressures (Pandey *et al.,* 2021).

Trichoderma reduces the growth of pathogen by producing various mechanisms such as antibiosis, mycoparasitism and create competition for nutrients. Farmers are becoming more interested in ecological and sustainable disease management because biological control is a crucial component of integrated disease management. The *Trichoderma* genus, which includes the species *T. viride, T. hamatum, T. harzianum, T. resseyi, T. asperellum*, and *T. virens*, has good biological control qualities. In addition to lowering disease rates and promoting plant development, *Trichoderma* sp. can be employed in the breakdown of organic waste and waste materials as well as the detoxification of contaminated areas (Zin and Badaluddin 2020).

Trichoderma species in controlling various diseases in different crops

Free-living fungus called *Trichoderma* species exhibit significant levels of interaction in root, soil, and foliar habitats. Thus, research into the use of fungi capable of plant disease biocontrol has expanded over the past 20 years due to the shift toward environmentally friendly farming techniques (Pandey *et al.,* 2021).

The prior study discovered that when plants were treated with conidial suspensions of *Trichoderma* spp., the disease known as seed rot, damping off, root rot of sunflower and mungbean caused by *Sclerotium rolfsii* was avoided and plant development was promoted (Yaqub and Shahzad 2008).

Physical factors those are suitable for maximum growth of *Trichoderma*

Every microbe external stimuli alter both the morphological features and physiological activities including *Trichoderma*. According to most significant environmental parameter influencing the mycoparasitic activity of *Trichoderma* strains among these variables is most likely pH. To determine the maximum growth at which these biocontrol agents may multiply and the pathogen can be controlled, a certain pH value is needed. *Trichoderma* isolates exhibited optimal growth and sporulation rate at pH values ranging from 2 to 7.5 and 25-30°C temperature.

Suitable media for optimum growth of *Trichoderma* sp.

The biomass that is produced for biological control needs to be cheap. It should have a long shelf life, be resistant to changes in temperature and humidity, and be able to be dried while retaining a high concentration of propagules that may germinate. The goal of using this antagonist (*Trichoderma* species) commercially is to generate the most suitable biomass at the lowest possible cost. Therefore, it's critical to look for affordable and appropriate medium for *Trichoderma* species growth.

Trichoderma sp. as a bioremediation biological agent

Contamination, primarily soil and water contamination, were occurred due to blind use of chemicals caused by the agriculture industry's overuse of synthetic fertilizers and pesticides. The pace at which chemicals decompose after being discharged varies based on their physio-chemical characteristics.

Regretfully, these substances do not break down quickly; they might attach to soil particles, leak into water bodies or beneath the root zone, or be absorbed by crops before volatilizing in the atmosphere.

Chemical or biological methods can be used to remove chemical substances (Zin & Badaladin, 2020).

In conclusion, *Trichoderma* is a well-known, efficient antagonist biocontrol agent that suppresses the growth of pathogen by mycoparasitism, antibiosis and competition for nutrients mechanism. Along with this, it helps in resistance increases in the plants, plants growth and sustainable development of plants. *Trichoderma* mainly secretes various enzymes and hormones against soil borne pathogens and prevents diseases caused by them.

Different species of *Trichoderma* grow the optimum at temperature 20 - 30°C and pH 4 - 7 along with this the growth of different *Trichoderma* species is seen the most on PDA media. It has been found in research that *Trichoderma* also helps in the degradation of various chemical fungicides such as carbendazim, endosulfan, chlorothalonil etc. The use of *Trichoderma* biocontrol agent is very useful for sustainable agriculture.

Author Contributions

Nikita Kumari: Investigation, formal analysis, writing—original draft. S. K. Goyal: Validation, methodology, writing—reviewing. S. Godika:—Formal analysis, writing—review and editing. Pinki: Investigation, writing—reviewing. Govind Tikiani: Resources, investigation writing—reviewing.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Table.1 Trichoderma strains against different pathogens

***Trichoderma* strain**	**crop**	**Pathogen**	**Disease**	**Type of Experiment**	**References**
T. zelobreve	Apple	*Diplodia bulgarica*	Tree Decline	*in vivo*	Nourian *et al.*, 2024
Trichoderma Z2-03	Rice	*Rhizoctonia solani*	Sheath Blight	*in vivo*	Intana *et al.*, 2024
T. bevicrassum	Common bean	*Meloidogyne incognita*	Root Knot	Both *in vitro* and *in vivo*	Ibrahim *et al.*, 2024
Trichoderma. cf. asperellum	Barley	*Bipolaris sorokiniana*	Spot blotch	*in vivo*	Metwally *et al.*, 2024
Trichoderma strain E29	Cocoa	*Moniliophthora roreri*	Moniliasis	*in vivo*	Guevara *et al.*, 2024
Trichoderma asperellum	Chickpea	*Fusarium oxysporum*	Wilt	*in vivo*	Pandey *et al.*, 2021
T. harzianum	Onion	*F. oxysporum f. sp. cepae*	Basal rot	*in vivo*	Yagmur *et al.*, 2024
T.ghanense and T. citrinoviride	Cucumber	*Pythium aphanidermatum*	Damping off	*in vitro* and *in vivo*	AI -Shuaibi *et al.*, 2024
Trichoderma asperellum	Sarpagandha	*Alternaria sp.*	Minor leaf spot	*in vitro*	Rai and Singh 2023
T.atroviride and T. longibrachiatum	Red Pepper	*Colletotrichum acutatum*	Anthracnose	*in vitro* and *in vivo*	Kim *et al.*, 2023
T. asperellum and T. harzianum	Pigeonpea	*Fusarium udum E.J. Butler*	Fusarium wilt	*in vitro* and *in vivo*	Mishra *et al.*, 2023
T. asperellum	Maize	*Exserohilum turcicum*	Northern corn leaf blight	*in vitro* and *in vivo*	Ma *et al.*, 2023
Trichoderma harzianum	Tomato	*Fusarium oxysporum f. sp. lycopersici*	Wilt	*in vivo*	Zehra *et al.*, 2023
Trichoderma asperellum and T. harzianum	Chilli	*Colletotrichum truncatum*	Anthracnose	*in vivo*	Yadav *et al.*, 2023
Trichoderma viride and Trichoderma harzianum	Maize	*Fusarium proliferatum and Fusarium verticillioides*	Stalk rot	*in vitro*	Yassin *et al.*, 2021
Trichoderma harzianum	Chilli	*C. capsici and C. gloeosporioides*	Anthracnose	*in vitro*	Miftahurrohmat *et al.*, 2021
Trichoderma atroviride, T. hamatum, T. harzianum, and T. koningii	Chickpea	*Fusarium oxysporum f. sp. ciceri and Ascochyta rabiei*	Fusarium wilt and Ascochyta blight	*in vitro*	Poveda 2021
Trichoderma strains T16 and T23)	Soybean	*Phakopsora pachyrhizi*	Asian soybean rust	*in vitro* and *in vivo*	Hasan *et al.*, 2022
Trichoderma virens	Mungbean	*Rhizoctonia solani*		*in vivo*	Inayati *et al.*, 2020
Trichoderma longibrachiatum	Lentil	*Macrophomina pseudophaseolina*	Charcol rot	*in vitro*	Kouadri *et al.*, 2023
T. harzianum	Sugarcane	*Fusarium spp*	Pokkah boeng	*in vitro*	Tiwari *et al.*, 2021
T. harzianum	Groundnut	*Sclerotium rolfsii*	Stem rot	*in vivo*	Raja *et al.*, 2023
T. harzianum* and *T. asperellum	Castor	*Botryotinia ricini*	Grey mold	*in vivo* and *in vitro*	Yamuna *et al.*, 2021

Table.2 Physical parameters for optimal growth of *Trichoderma* species

***Trichoderma* species**	**pH**	**Temperature**	**References**
T. harzianum, T. viride, T. asperellum, T. koningi, T. atroviride, T. longibrachiatum* and *T. virens	5.5-7.5	25-30	Singh *et al.,* 2014
T. harzianum, T. viride, T. asperellum* and *T. hamatum	4.6-7.6	25-40 25-35	Zehra *et al.,* 2023
***Trichoderma* species**	5.5	25	Andres *et al.,* 2022
T. asperellum	4.5-6.5	30	Pandey *et al.,* 2021
T. harzianum* and *T. asperellum	5-7	25-30	Ghazanfar *et al.,* 2018
Trichoderma atroviride	<8	25	Longa *et al.,* 2008
T. harzianum	6.5	25	Singh *et al.,* 2014
***Trichoderma* species**	4	25	Mishra *et al.,* 2024
T. harzianum* and *T. pleuroticola	5-7	25	Lombardi *et al.,* 2023
T. longibrachiatum	6.5-7.5	25-30	Shahid *et al.,* 2011

Table.3 Suitable media required for different *Trichoderma* species

***Trichoderma* species**	**Suitable Media**	**Unsuitable media (Out of total media studied)**	**No. of Total Media Used**	**References**
T. harzianum	Potato Dextrose Agar	Water agar	5	Jahan *et al.,* 2013
T. harzianum	PDA	TSM + M	3	Askew and Laing 1993
T. viride	PDA, Oat meal agar, Malt extract agar and SYMA	TSM	7	Chaithra *et al.,* 2024
T. viride	PDA	Beef extract agar medium	10	Mishra *et al.,* 2023
T. atroviride	PDB	Rice straw	8	Chandel and Chauhan 2023
T. viride	PDA	Czapek Dox Broth	4	Maurya *et al.,* 2017
Trichoderma longibrachiatum	PDA (Culture growth) PDB (Avg. Mycelial weight)	Czapek Dox agar	6	Shahid *et al.,* 2011
T. harzianum	Bagasse medium	rice and bagasse (2:1)	5	Chatri *et al.,* 2018
Trichoderma harzianum* and *Trichoderma viride	PDA	V8 Juice Agar	5	Sinha *et al.,* 2018

Table.4 Commercial formulation of different *Trichoderma* species those are commonly used

Trichoderma Formulation	Species	Against
F Stop	*T. harzianum*	Root rot
Trichogourd	*T. viride*	Damping off
Gliogard	*T. virens*	Root rot
Tricho-X	*T. viride*	Root rot
Dfence-SF	*T. viride*	Collar rot, stem rot
T 35	*T. harzianum*	Wilt

Table.5 *Trichoderma* strategies to supress the various pathogen

Trichoderma species	Activities	Against
T. viride	Volatile metabolites	*Sclerotium rolfsii* (Collar rot of tomato) and *Sclerotinia Sclerotiorum* (Web blight of beans)
Trichoderma harzianum and T. asperellum	Produce β-1,3-glucanase, NAGAse, chitinase, acid phosphatase, acid proteases and alginate lyase.	*Fusarium solani*, *Rhizoctonia solani* and *Sclerotinia sclerotiorum*
Trichoderma viride, T. virens and *T. harzianum*	Chitinase and ß-1, 3-glucanase	*Rhizoctonia bataticola* (dry root rot of chickpea) and *Fusarium oxysporum* f. sp. *ciceris* (wilt of chickpea)
T. viride **and** ***T. harzianum***	Mycoparasitism or secretion of antibiotics	*Curvularia lunata, Fusarium oxysporum, Alternaria alternata, Colletotrichum gloeosporioides* and *Rhizoctonia solani*
T. polysporum	Produce extracellular cellulase and pectinase	*Cladosporium herbarum*
T. harzianum, T. asperellum, T. virens **and** ***T. reesei***	Mycoparasitism	*Fusarium oxysporum* f. sp. *cubense* (Panama disease) and *Mycosphaerella fijiensis* (black Sigatoka) on banana, as well as *Moniliophthora roreri* (frosty pod rot) and *Moniliophthora perniciosa* (witches' broom disease) on cacao
T. viride **and** ***T. harzianum***	Chitinase and β-1,3-glucanase activities	*Sclerotium rolfsii, Colletotrichum gloeosporioides* and *C. capsici*
T. virens	Volatile compounds	*Fusarium moniliforme* var. *subglutinans*

Table.6 Biodegradation of chemicals by *Trichoderma* species

Trichoderma species	Chemical
T. harzianum and T. asperellum	Fluoroquinolone antibiotics namely ciprofloxacin (CIP) and ofloxacin (OFL) as well as the fungicide climbazole (CLB)
Trichoderma isolate T1	Chlorothalonil
Ralstonia pickettii L2 and *Trichoderma viride* LW-1	Mono-chlorobenzene (CB)
Trichoderma harzianum Rifai T-22	Clomazone, fluazifop-P-butyl, and metribuzin
T. atroviride, *Trichoderma harzianum*, *T. viride*	Carbendazim
Trichoderma harzianum	Endosulfan
Trichoderma harzianum	Penthiopyrad
Trichoderma harzianum strain T22	Aflatoxin B1 (AFB1) and Ochratoxin A (OTA)
Pre-mixed sterilized SMS mixed with Trichoderma spp.	Carbendazim and Mancozeb

Declarations

Conflict of Interest: The authors declare that they have no conflict of interest.

Ethical Approval: The authors bear all the ethical responsibilities of this manuscript

Funding: No funding for this review paper

Authors Contributions

Conceptualization, writing original draft done by Nikita Kumari, S.K. Goyal & S. Godika; Formatting, editing this review paper & references in accordance with the guidelines of journal was done by Govind Tikiani.

References

Al-Shuaibi BK, Kazerooni EA, Al-Maqbali DA, Al-Kharousi M, Al-Yahya'ei MN, Hussain S & Al-Sadi AM. 2024. Biocontrol potential of *Trichoderma ghanense* and *Trichoderma citrinoviride* toward *Pythium aphanidermatum*. *Journal of Fungi*, 10(4): 284.

Andrés PA, Alejandra PM, Benedicto MC, Nahuel RI & Clara BM. 2022. A comparative study of different strains of *Trichoderma* under different conditions of temperature and pH for the control of *Rhizoctonia solani*. *Agricultural Sciences,* 13(6): 702-714.

Askew DJ & Laing MD. 1993. An adapted selective medium for the quantitative isolation of *Trichoderma* species. *Plant Pathology,* 42(5): 686-690.

Chaithra M, Pankaja NS, Mahadeva J & Supriya S. 2024. Extensive intra-species comparative assessment of nutrient media for growth between rhizospheric and non-Rhizospheric *Trichoderma* isolates. *International Journal of Advance Biochemistry Research,* 8(4): 80-87.

Chandel S & Chauhan P. 2023. Evaluation of solid and liquid substrates for mass proliferation of *Trichoderma* spp. *Journal of Eco-friendly Agriculture,* 18(1): 188-192.

Chatri M, Handayani D & Septiani J. 2018. Influence of media (mixture of rice and sugar cane) on *Trichoderma harzianum* growth and its resistance to *Fusarium oxysporum* by *in vitro*. *Bioscience,* 2(1): 50-60.

Ghazanfar MU, Raza M & Raza W. 2018. Effect of physiological parameters on mass production of *Trichoderma* species. *Pakistan Journal of Phytopathology,* 30(1): 61-67.

Guevara-Viejó F, Valenzuela-Cobos JD, Noriega-Verdugo D, Garcés-Moncayo MF & Basurto Quilligana R. 2024. Application of biplot techniques to evaluate the potential of *Trichoderma* spp. as a biological control of Moniliasis in Ecuadorian Cacao. *Applied Sciences,* 14(13): 5481.

Hasan A, Walker F, Klaiber I, Schöne J, Pfannstiel J, Voegele RT. 2022. New approaches to manage

Asian soybean rust (*Phakopsora pachyrhizi*) using *Trichoderma* spp. or their antifungal secondary metabolites. *Metabolites,* 12(6): 507.

Ibrahim I, Ali M, Rehman A, Khattak B, Shuja MN & Anees M. 2024. Biological control of root-knot nematodes in common beans using putative nematocidal species of *Trichoderma* indigenous to Pakistan. *Biocontrol Science and Technology,* 34(2): 148-165.

Inayati A, Sulistyowati L, Aini LQ & Yusnawan E. 2020. *Trichoderma virens*-Tv4 enhances growth promoter and plant defense-related enzymes of mungbean (*Vigna radiata*) against soil-borne pathogen *Rhizoctonia solani*. *Journal of Biological Diversity,* 21(6).

Intana W, Suwannarach N, Kumla J, Wonglom P & Sunpapao A. 2024. Plant growth promotion and biological control against *Rhizoctonia solani* in Thai local rice variety "Chor Khing" using *Trichoderma* breve Z2-03. *Journal of Fungi,* 10(6): 417.

Jahan N, Sultana S, Adhikary SK, Rahman S & Yasmin S. 2013. Evaluation of the growth performance of *Trichoderma harzianum* (Rifai.) on different culture media. *Journal of Agriculture and Veterinary Science,* 3: 44-50.

Kim SH, Lee Y, Balaraju K & Jeon Y. 2023. Evaluation of *Trichoderma atroviride* and *Trichoderma longibrachiatum* as biocontrol agents in controlling red pepper anthracnose in Korea. *Frontiers in plant science,* 14: 1201875.

Kouadri MEA, Bekkar AA & Zaim S. 2023. First report of using *Trichoderma longibrachiatum* as a biocontrol agent against *Macrophomina pseudophaseolina* causing charcoal rot disease of lentil in Algeria. *Egyptian Journal of Biological Pest Control,* 33(1): 38.

Lombardi N, Pironti A, Manganiello G, Marra R, Vinale F, Vitale S & Woo SL. 2023. *Trichoderma* species problematic to the commercial production of pleurotus in Italy: Characterization, identification, and methods of control. *Microbiology Research,* 14(3): 1301-1318.

Longa CMO, Pertot I & Tosi S. 2008. Ecophysiological requirements and survival of a *Trichoderma atroviride* isolate with biocontrol potential. *Journal of Basic Microbiology,* 48(4): 269-277.

Ma Y, Li Y, Yang S, Li Y & Zhu Z. 2023. Biocontrol potential of *Trichoderma asperellum* strain 576 against *Exserohilum turcicum* in *Zea mays*. *Journal of Fungi*, 9(9): 936.

Maurya MK, Srivastava M, Singh A, Pandey S & Ratan V. 2017. Effect of different temperature and culture media on the mycelia growth of *Trichoderma viride* isolates. *International Journal of Current Microbiology and Applied Sciences,* 60: 266-269.

Metwally RA, Soliman SA, Abdalla H & Abdelhameed RE. 2024. *Trichoderma* cf. *asperellum* and plant-based titanium dioxide nanoparticles initiate morphological and biochemical modifications in *Hordeum vulgare* L. against *Bipolaris sorokiniana*. *BioMed Central Plant Biology,* 24(1): 118.

Miftahurrohmat A, Nurmalasari IR & Prihatinnigrum AE. 2021. *In vitro* evaluation of the inhibitory power of *Trichoderma harzianum* against pathogens that cause anthracnose in chili. *Journal of physics: conference series,* 1764(1): 12-26.

Mishra RK, Pandey S, Hazra KK, Mishra M, Naik SS, Bohra A & Singh NP. 2023. Biocontrol efficacy and induced defense mechanisms of indigenous *Trichoderma* strains against *Fusarium* wilt [*F. udum* (Butler)] in Pigeonpea. *Physiological and Molecular Plant Pathology,* 127: 102-122.

Nourian A, Salehi M, Safaie N & Khelghatibana F. 2024. Biocontrol of *Diplodia bulgarica*, the causal agent of apple canker, using *Trichoderma zelobreve*. *Archives of Microbiology,* 206(3): 120.

Pandey RN, Jaisani P & Yadav DL. 2021. *Trichoderma* spp. in the management of stresses in plants and rural prosperity. *Indian Phytopathology,* 74(2): 453-467.

Poveda J. 2021. Biological control of *Fusarium oxysporum* f. sp. *ciceri* and *Ascochyta rabiei* infecting protected geographical indication Fuentesaúco-Chickpea by *Trichoderma* species. *European Journal of Plant Pathology* 160(4): 825-840.

Rai D & Singh N. 2023. Efficacy of *Trichoderma asperellum* against different pathogens of selected medicinal plants. *Indian Journal of Experimental Biology,* 61(4): 303-310.

Raja M, Sharma RK, Jambhulkar PP, Thava Prakasa Pandian R & Sharma P. 2023. Comparative evaluation of native *Trichoderma* species from groundnut rhizosphere against stem rot caused by *Sclerotium rolfsii* Sacc. *Indian Phytopathology*, 76(2): 459-471.

Shahid M, Singh A, Srivastava M, Mishra RP & Biswas SK. 2011. Effect of temperature, pH and media for growth and sporulation of *Trichoderma* *longibrachiatum* and self-life study in carrier based formulations. *Annals of Plant Protection Sciences,* 19(1): 147-149.

Singh A, Chaturvedi R & Singh SK. 2014. To study the variation in growth of *Aspergillus* and *Trichoderma* strains under the effect of metal ions, pH, temperature and solvents. *Research in Biotechnology,* 5(5).

Sinha A, Singh R, Rao SG & Verma A. 2018. Comprehensive evaluation of *Trichoderma harzianum* and *Trichoderma viride* on different culture media & at different temperature and pH. *Pharma Innovation Journal,* 7: 193-195.

Tiwari R, Shukla SK, Jaiswal VP, Sharma L, Joshi D, Chandra K & Tiwari RK. 2021. Bio-control potential of *Trichoderma* spp., against *Fusarium* spp., the incitants of Pokkah boeng disease of sugarcane under *in-vitro* conditions. *Indian Phytopathology,* 74: 691-701.

Verma M, Brar SK, Tyagi RD, Surampalli RY & Valero JR. 2007. Antagonistic fungi, *Trichoderma* spp.: panoply of biological control. *Biochemical Engineering Journal,* 37:1-20.

Yadav M, Divyanshu K, Dubey MK, Rai A, Kumar S, Tripathi YN & Upadhyay RS. 2023. Plant growth promotion and differential expression of defense genes in chilli pepper against *Colletotrichum truncatum* induced by *Trichoderma asperellum* and *T. harzianum*. *BioMed Central microbiology,* 23(1): 54.

Yağmur A, Demir S, Canpolat S, Rezaee Danesh Y, Farda B, Djebaili R & Pellegrini M. 2024. Onion *Fusarium* basal rot disease control by arbuscular mycorrhizal fungi and *Trichoderma harzianum*. *Plants,* 13(3): 386.

Yamuna C, Varma PK & Prasad RD. 2021. Management of castor grey mold using *Trichoderma* species. *Journal of Pharmacognosy and Phytochemistry,* 10(1): 111-115.

Yaqub F & Shahzad S. 2008. Effect of seed pelleting with *Trichoderma* spp. and *Gliocladium virens* on growth and colonization of roots of sunflower and mungbean by *Sclerotium rolfsii*. *Pakistan Journal of Botany,* 40: 947-963.

Yassin MT, Mostafa AAF, Al-Askar AA, Sayed SR & Rady AM. 2021. Antagonistic activity of *Trichoderma harzianum* and *Trichoderma viride* strains against some fusarial pathogens causing stalk rot disease of maize, *in vitro*. *Journal of King Saud University-Science,* 33(3): 101363.

Zehra A, Aamir M, Dubey MK, Ansari WA, Meena M, Swapnil P & Lee J. 2023. Enhanced protection of tomato against *Fusarium* wilt through biopriming with *Trichoderma harzianum*. *Journal of King Saud University-Science,* 35(2): 102-466.

Zin NA & Badaluddin NA. 2020. Biological functions of Trichoderma spp. for agriculture applications. *Annals of Agricultural Sciences,* 65(2): 168-178.

How to cite this article:

Nikita Kumari, Goyal S. K., Godika S., Pinki and Govind Tikiani. 2026. Trichoderma: Lab to Land Plant Disease Management. *Int.J.Curr.Microbiol.App.Sci.* 15(6): 45-52 **doi:** https://doi.org/10.20546/ijcmas.2026.1506.004