

# Bio Control Lab



Department of Plant Pathology  
Chandra Shekhar Azad University of Agri. & Tech., Kanpur



## ABOUT THE LAB

*The state of Bio Control Lab, Department of Plant Pathology, C. S. Azad University of Agriculture and Technology, Kanpur was inaugurated in the 2012. The main objective of this lab the identification of potential bio agents, their effectiveness against different seed and soil borne diseases in various crops, development of cost effective and cheapest mass production technology of bio agents , development of crop specific technology and its validation, development of expert human resource, and development of a knowledge hub for Extension workers, students, personals , farmers and entrepreneurs interested in setting up bio-pesticide units.*

## VISION

*Eco-friendly management of seed and soil borne disease of crops through Bio Control Agents (BCAs)*

## MISSION

*Committed to provide simple, responsive and ecofriendly disease management solutions for good quality and disease free produce for sustainable agriculture and doubling of farmer's income.*

## AIM AND OBJECTIVES

*Committed to provide simple, responsive and ecofriendly disease management solutions for good quality and disease free produce for sustainable agriculture and doubling of farmer's income.*

- To identify potential bioagents, workout their effectiveness and develop novel strains for the management of seed and soil borne diseases.*
- To establish bankability of mass multiplication of bioagents in the laboratory and subsequent release to farmers for biological control of pests and diseases.*
- To develop crop specific biocontrol technology, validation and its dissemination at grass root level.*
- To increase the shelf life and bio-efficacy of selective bioagents like: Trichoderma, Pseudomonas and Beauveria sp. against seed and soil borne diseases.*
- Conduct research in order to improve crop productivity through biocontrol agents.*
- To develop specific marker for proper identification of the potential isolates.*
- To generate toxicological data under farmer's field condition for CIB registration.*
- To put effective isolates of Trichoderma and other bioagents in national and international repository for their future use.*
- To develop new technology for mass production of bioagents and its standardization.*
- To develop the new technology for agro-waste management through bio agents.*
- To develop human resource at various levels (farmers, students and scientists) in biologically disease management and production technology of important bio-agents.*
- To develop a knowledge hub for Extensions, personal and entrepreneurs interested in setting up bio-pesticide units.*



# ACHIEVEMENTS

The research activities in the Bio Control Lab units to find out better and more effective eco-friendly management strategies against the disease of agricultural crops.

## PATENTS FILED

- New methodology for “**Production of pure *Trichoderma* spore with increased shelf life**” has been developed and filed for patent (**Indian Patent 20161101429**). This is also proved one of the cheapest methods for their preparation of *Trichoderma* bio formulation.
- “Novel method for preparation of *Trichoderma* bio-formulation using colloidal chitin” has been developed and filed for patent (**Indian Patent File No201611014928**)
- Developed the “Cheapest medium for quantitative isolation of microbes” and filed for the patent (**Indian Patent File No201611014930**)

## VIDEO ON *TRICHODERMA* PRODUCTION TECHNOLOGY ON YOU TUBE

- A video entitled “***Trichoderma* Production Technology (Th. Azad)** developed under ICAR NAE Programme” uploaded on **YouTube** in August 2015 for the first time for farmers to learn the technology for the preparation of bioformulations. [\*\*https://www.youtube.com/ \*Trichoderma\* Production Technology \(Th. Azad\)\*\*](https://www.youtube.com/TrichodermaProductionTechnology(Th.Azad)) developed under ICAR NAE Programme (**more than 1.14 lakh viewers till date**).

## ट्राइकोडर्मा जैव उत्पादन निर्माण विधि



निश एरिया ऑफ एक्सीलेन्स परियोजना  
भारतीय कृषि अनुसंधान परिषद, नई दिल्ली  
बायोक्न्ट्रोल लैब  
पादप रोग विज्ञान विभाग  
चन्द्रशेखर आजाद कृषि एवं प्रौद्योगिक विश्वविद्यालय, कानपुर





# ACHIEVEMENTS

## LIBRARY OF *TRICHODERMA*

- *Trichoderma* Library was created for the first time with all possible parameters including production of secondary metabolites for identification and future reference of *Trichoderma* sp. and has been uploaded on University website- <http://www.csauk.ac.in/nae.html>



## NEW TECHNOLOGY FOR THE PRODUCTION OF PURE *TRICHODERMA* SPORE

Pure *Trichoderma* spores found to be most effective in maintaining spore viability thereby increasing the shelf life. Formulation prepared by this method has given shelf life  $2X 10^{12}$  even after 16 months and is cost-effective, which is a new finding. These spores when applied in field trial, given substantial amount of disease suppression and many fold increase in yield over control. These pure spores having better shelf life and are potential and effective for longer survival and better growth. **Pure spore harvesting methodology applied for patent.**



# ACHIEVEMENTS

## SPECIFIC AND ACCURATE PRIMERS DESIGNED

Molecular identification of ITS and *tef* markers were done with eighteen *Trichoderma species*, their submissions to National and International Data Bank are given below:

Name of Bioagents	Strain code	ITCC Accession No. New Delhi	NBAIM, Mau (UP) Accession No.	NCBI Gene Bank Accession No. (USA) with ITS marker	EMBL Data base Accession No. (Europe) with <i>tef</i> marker
<i>T. harzianum</i>	<i>Th azad</i>	6796	NAIMCC-F-03109	KC800922	LN849773
<i>T. viride</i>	01PP	8315	NAIMCC-F-03110	JX119211	LN811076
<i>T. asperellum</i>	T <sub>asp</sub> /CSAU	8940	NAIMCC-F-03108	KC800921	LN897310
<i>T. Koningii</i>	T <sub>K</sub> (CSAU)	5201	NAIMCC-F-03112	KC800923	LN897308
<i>T. atroviride</i>	71L	7445	NAIMCC-F-03107	KC008065	LN897307
<i>T. longibrachiatum</i>	21PP	7437	NAIMCC-F-03111	JX978542	LN897306
<i>T. virens</i>	T <sub>vi</sub> (CSAU)	4177	NAIMCC-F-03106	KC800924	LN897309
<i>T. reesei</i>	<i>Tr</i> (CSAU)	7284	NAIMCC-F-03185	KM999966	LN897311
<i>T. aggressivum</i>	T <sub>agg</sub> (CSAU)	7277	NAIMCC-F-03193	KU72885	LN897318
<i>T. aureoviride</i>	T <sub>avi</sub> (CSAU)	6131	NAIMCC-F-03194	KT337463	LN897319
<i>T. citrinoviride</i>	T <sub>cvi</sub> (CSAU)	7283	NAIMCC-F-03195	KT315921	LN897320
<i>T. erinaceum</i>	T <sub>eri</sub> (CSAU)	7287	NAIMCC-F-03192	KT315922	LN897321
<i>T. koningiopsis</i>	T <sub>kop</sub> (CSAU)	7291	NAIMCC-F-03191	KT337462	LN897322
<i>T. tomentosum</i>	T <sub>tos</sub> (CSAU)	7269	NAIMCC-F-03186	KT315920	LN897323
<i>T. minutisporum</i>	T <sub>mip</sub> (CSAU)	7280	NAIMCC-F-03187	KT626565	LN897312
<i>T. pubscenes</i>	T <sub>sce</sub> (CSAU)	7268	NAIMCC-F-03188	KT337461	LN897315
<i>T. saturnisporum</i>	T <sub>ssp</sub> (CSAU)	7274	NAIMCC-F-03189	KT626566	LN897313
<i>T. spirale</i>	T <sub>sp</sub> (CSAU)	7276	NAIMCC-F-03190	KT626567	LN897314

**Note:** *Trichoderma viride* strain code 01PP submitted at Microbial Type Culture Collection (MTCC), Chandigarh with accession No. MTCC-12450

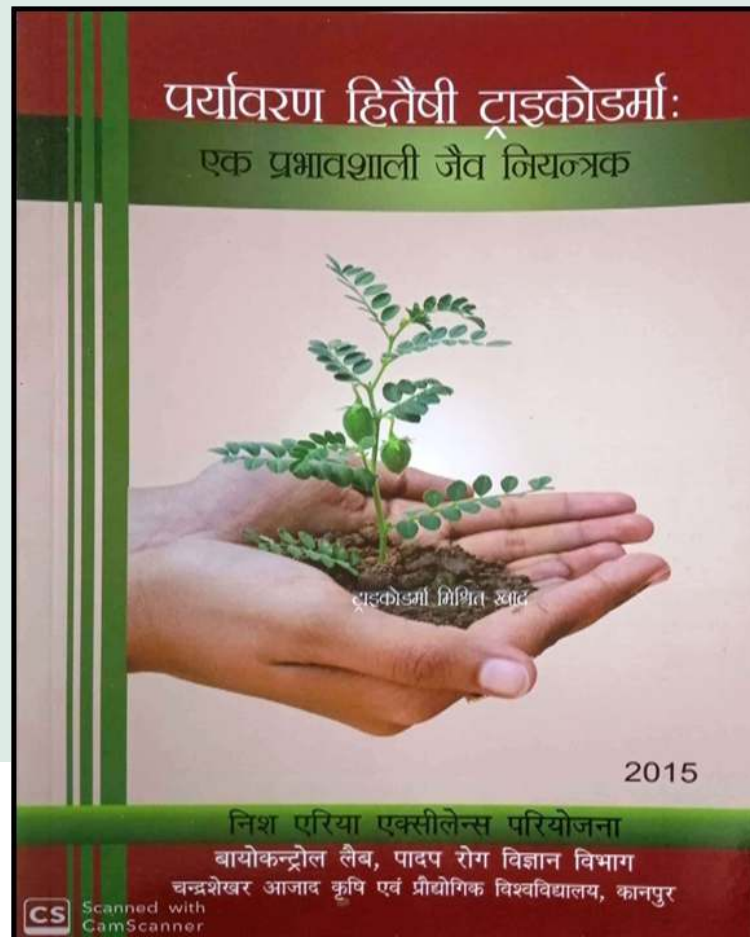
# PUBLICATIONS

## Research Publication

Year	Research Publication					
	International		National		Article	Abstract
	Below to 5 NAAS	Above to 5 NAAS	Below to 5 NAAS	Above to 5 NAAS		
2019	-	03	-	-	-	06
2018	-	03	-	-	-	11
2017	-	03	01	-	-	08
2016	12	01	03	-	02	-
2015	04	07	01	-	03	-
2014	20	10	06	-	02	-
2013	03	01	08	-	-	-
2012	05	01	01	-	-	-

## BOOK

A book of Trichoderma –Ek prabhavshali jaiv niyantrak published in 2015.





# PUBLICATIONS

## FOLDERS

- A folder of *Trichoderma* (Hindi and English) published in 2017.
- Training programme & analytical services folder published in 2019.

## TRAINING PROGRAMME



**Bio Control Lab**  
**Department of Plant Pathology**  
**C. S. Azad University of Agriculture and Technology, Kanpur**

### Bio Control Lab

The **Bio Control lab**, in the **Department of Plant Pathology** was established during the year 2011-12. It is well equipped with modern facilities to train Graduate/ Post graduate students and Research scholars. We



have a team of highly experienced scientists and technical staff having good knowledge of modern techniques in the field of Plant Pathology and specialized in Biological control.

### Training Programme

#### Module I

**Training Area:**

Detection and diagnosis of plant pathogens  
Operational methods of laboratory instruments used in detection and diagnosis of plant pathogens, Isolation, purification and maintenance of fungal plant pathogens

**Duration (Months):** 01

**Fee (Rs.):** 8,000/- month

**Qualification:** Agri-graduates/ Science-graduates or post graduates pursuing or completed

#### Module II

**Training Area:**

Phenotypic characterization  
Cultural, morphological, and physiological characterization of fungal plant pathogens and bio-agents

**Duration (Months):** 02

**Fee (Rs.):** 15,000/- month

**Qualification:** Agri-graduates/ Science-graduates or post graduates pursuing or completed

#### Module III

**Training Area:**

Biochemical aspects of Plant samples  
Estimation of Chlorophyll, Nitrogen and Protein (through Kelplus Nitrogen Estimation System, Protein estimation through Lowry or Bradford method, Phenol, Peroxidase (PO), Polyphenoloxidase (PPO), Malic acid etc in plant samples

**Duration (Months):** 03

**Fee (Rs.):** 15,000/- month

**Qualification:** Agri-graduates/ Science-graduates or post graduates pursuing or completed

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### Module II

#### Training Area:

Biological control of Plant Pathogens  
Operational methods of laboratory instruments, Isolation, purification and maintenance of fungal bioagents, Preparation of bioformulation, Antagonistic potential of fungal bioagents against different plant pathogens through Dual culture, Volatile & Non-volatile metabolites.

**Duration (Months):** 03  
**Fee (Rs.):** 15,000/- month  
**Qualification:** Agri-graduates/ Science-graduates or post graduates pursuing or completed

### Module I

#### Training Area:

Trichoderma production and its uses  
Isolation, purification, maintenance of bioagent culture, mass multiplication of Trichoderma, preparation of bioformulation and different applications

**Duration (Months):** 06 days  
**Fee (Rs.):** 1000/-



## Important Instructions

- Applications on the prescribed format (Annexure I, available at university website) with all the relevant documents will be received round the year. Selected applicants will be informed through e-mail or mobile and hence it is required to mention e-mail and mobile number in the application form.
- Duly filled application form (Annexure- I) along with a recent passport size photo and self attested photocopies of mark sheets and other certificates should be submitted to In-charge, Bio Control Lab, Department of Plant Pathology, C. S. Azad Univ. of Agri. & Tech., Kanpur-208002.
- Applications should be filled in block letters and Black/ Blue Ball Pen.
- Fee will be paid in the form of RTGS / NEFT/ Demand Draft in favour of "BIO CONTROL LAB REVOLVING FUND, CSAUA&T, Kanpur" payable at Kanpur after selection for training programme. The Bank Details for RTGS/ NEFT are given below:

## Details for online transfer of fund

**Name of Account:** BIO CONTROL LAB REVOLVING FUND  
**Type of Account:** Saving Account  
**Bank Account Number:** 2024104000025878  
**Name of Bank:** IDBI Bank  
**Name of Branch:** IDBI Bank, The University Premises, CSAU, Company Bag Circle, VIP Road, Kanpur, Uttar Pradesh- 208002  
**IFSC Code:** IBKL0005024

## Terms and conditions

- Applications not in the prescribed format will not be considered.
- Certificate will be issued only after completion of training.
- Certificate should not be issued to the candidates remain absent during training period.
- Fee once paid will not be refunded.
- The selected candidates shall have to arrange boarding, lodging and transport of their own.
- Vice-chancellor, Head, Trainer or other supporting staff of the University will not be responsible for any kind of accident or hazards met by the trainee/ trainees during experimentation, handling of equipments or other infrastructure etc.
- The University reserves the right to reject admission without any assigning region.

## How to Apply

The candidate should apply in the prescribed format Annexure – I available at [www.csauk.ac.in](http://www.csauk.ac.in) with all relevant documents. Selected applicants will be informed through e-mail or mobile no. hence it is mandatory to mention e-mail and mobile number in the application form.

- Note**
1. Details of Training and relevant information is available at [www.csau.ac.in](http://www.csau.ac.in)
  2. The Schedule of training programme may be changed in special circumstances.



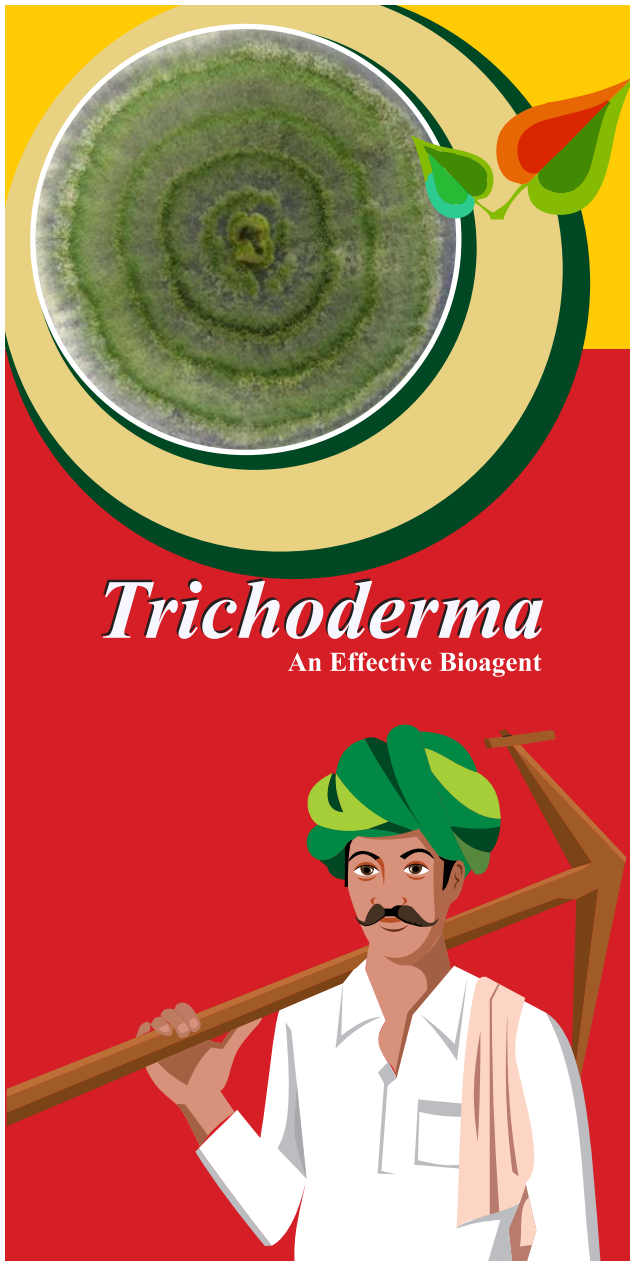
## Contact Details

In-charge  
**Bio Control Lab**  
Department of Plant Pathology  
C. S. Azad University of Agriculture and Technology, Kanpur-02  
Mobile: 9696033923  
E mail ID: [biocontrol.csa@gmail.com](mailto:biocontrol.csa@gmail.com)



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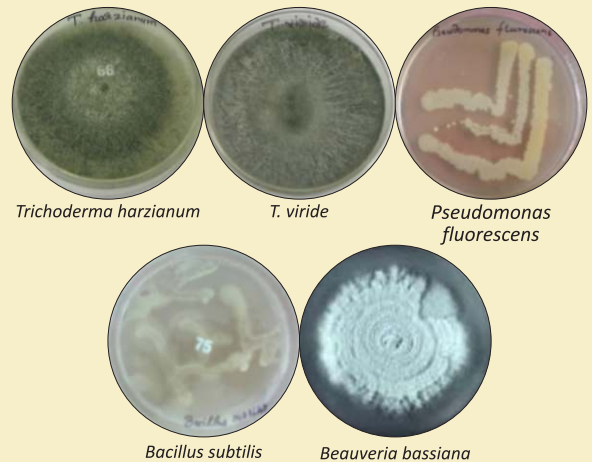
### *Trichoderma* An Effective Bioagent

**Biocontrol Lab**  
Department of Plant Pathology  
C. S. Azad University of Agriculture & Technology,  
Kanpur



### What is Bioagent

A bio-agent or biological agent is any microorganism that can be used purposefully as a weapon in biological warfare. It may be bacteria, virus, fungus, or a protozoan. Some important biological agents are *Trichoderma harzianum*., *T. viride*, *Pseudomonas* sp., *Bacillus* sp., *Beauveria bassiana* etc.



### Benefits

- Environmentally friendly.
- Leaves no chemical residue.
- Acts against many plant pathogenic fungi.
- Easy and inexpensive to produce.
- Reduces the need for harsh and expensive chemical fungicides.
- Reduces crop losses and increases yields.
- A potential source of income.

### Trichoderma

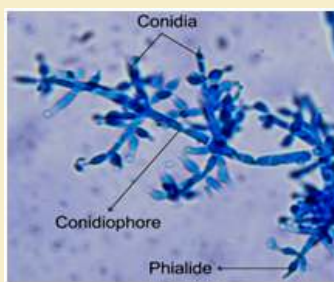
*Trichoderma* is a common filamentous fungi act as an avirulent plant symbiont that occurs naturally in all agricultural and forest soils and root ecosystems. It is also highly competitive, displaying antagonism against various phytopathogenic fungi. *Trichoderma* species are,



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capable of hyper parasitizing plant pathogenic fungi and are highly efficient antagonists. They have a rapid growth rate, sporulate abundantly, compete well with other soil microorganisms, show resistance to chemical pesticides and produce various antibiotics (e.g., gliotoxin and viridin). *Trichoderma* spp. have been investigated for the control of soil and seed borne fungal pathogens such as *Fusarium* sp., *Rhizoctonia* sp., *Pythium*, *Sclerotium rolfsii*, *Sclerotinia sclerotiorum*, and *Phytophthora* in several crops.



### Trichoderma species

The genus *Trichoderma* includes more than 80 species that can be used to control phytopathogenic fungi. Among them *T. harzianum*, *T. viride* and *T. hamatum* are considered as most potential biocontrol agents.

### Mechanism of biological control with *Trichoderma* spp

- Mycoparasitism
- Antibiosis
- Competition for nutrients or space
- Tolerance to stress through enhanced root and plant development
- Induced resistance
- Inactivation of the pathogen's enzymes



### Preparation of *Trichoderma* Bioformulation

*Trichoderma* is commonly used in the form of talc based bioformulation. Solid state fermentation is a popular method for the production of *Trichoderma* based bioformulation.

### Solid state fermentation

Various cheap cereal grains like sorghum, millets and ragi are used as substrates for mass multiplication of *Trichoderma*. The grains are moistened, washed thoroughly and sterilized. After sterilization these grains are inoculated with spore suspension of *Trichoderma* sp. @  $2 \times 10^8$  cfu/ml and incubated at  $25 \pm 1^\circ\text{C}$  for 10-15 days. After 15 days *Trichoderma* produces dark green colour spore coating on the grains. These spores then powdered and mixed in pre sterilized Talc powder @ 1:9. At the time of packing Carboxy Methyl Cellulose (CMC) @ 5g/Kg is added as adjuvant.



Sorghum grains washed & moistened in 2% sucrose solution



Sorghum grains (250 g) packed IPP bags



Sterilization of grains in Autoclave



*Trichoderma* spore suspension ( $2 \times 10^8$  cfu/ml)



*Trichoderma* multiplied on sorghum grains



Crushed sorghum grains containing *Trichoderma*



Sterilization of Talc in Autoclave



Mixing of *Trichoderma* containing sorghum grains in presterilized talc



Packing of *Trichoderma* bioformulation

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### Mode of Application

#### Seed Application

##### A. Seed Treatment

Use 5-10g *Trichoderma* powder for the treatment of 1 Kg moistened seed before sowing. Seed treatment is highly effective against damping off and root rots.



##### B. Seed Biopriming

Seed biopriming is treatment of seed with *Trichoderma* bioformulation (@5g/Kg) and incubating under warm and moist conditions until just prior to radical emergence. After radical emergence sow the bioprimed seeds in the field. Seed biopriming is beneficial for tomato, brinjal, soyabean and chickpea crops.



##### Soil Application

*Trichoderma* bioformulation (1Kg) is added in 25 Kg Farm Yard Manure (FYM). Mixed thoroughly and kept for one week in shade. After one week apply *Trichoderma* based FYM to the field before 15 days of sowing. This mixture is sufficient for 1 hectare field.



### Seedlings Application

Dissolve 4-5 g *Trichoderma* powder in 1 liter water. Dip roots of seedlings into this suspension for 5-6 hours before transplanting. Root dipping is effective against damping-off disease in vegetables.



### Precautions

- Don't use chemical fungicide after application of *Trichoderma* for 4-5 days.
- Maintain sufficient moisture in *Trichoderma* treated soil.
- Do not keep *Trichoderma* treated seeds in direct sun light.

### Facilities available in the University

- Selling of *Trichoderma harzianum* bioformulation (*Azadderma*)

Pack	Cost (Rs.)
1Kg	127/-
5Kg	635/-
10Kg	1270/-

- Quality checking of Biopesticides (Approved by UP Govt.)

**Fee:** Rs. 500/- sample

- A video entitled "*Trichoderma* Production" is available on **YouTube** for the farmers to learn the technology for the preparation and application of *Trichoderma* bioformulation.

(<https://www.youtube.com>)

Project "In-silico approaches in improvising novel strains of *Trichoderma* spp." funded by UP Council of Science and Technology (CST), Lucknow

### Contact

#### Vice-Chancellor / HOD

(Biocontrol Lab, Department of Plant Pathology)  
C. S. Azad University of Agri. & Tech., Kanpur-208002  
email: vc@csauk.ac.in



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### ट्राइकोडर्मा

एक प्रभावशाली जैवनियंत्रक



### जैव नियंत्रण प्रयोगशाला

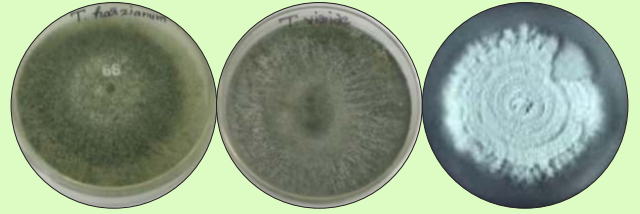
### पादप रोग विज्ञान विभाग

वन्दुशेखर आजाद कृषि एवं प्रौद्योगिक विश्वविद्यालय,  
कानपुर



### जैविक रोग नियंत्रक

वे सूक्ष्म-जीव जो रोग कारकों के नियंत्रण या मारने के लिये प्रयुक्त होते हैं, जैविक रोग नियंत्रक कहलाते हैं। ये प्रतिपक्षी सूक्ष्म-जीव, रोग कारकों की संख्या को कम कर, रोग कारकों द्वारा रोग उत्पन्न करने में रोक लगाकर एवं संक्रमण के बाद रोग विकास को रोककर, पादप रोगों को नियंत्रित करते हैं। जैसे ट्राइकोडर्मा हरजियानम, ट्राइकोडर्मा विरिडी, ब्यूवेरिया बेसियाना (फफूँद) तथा स्यूडोमोनास एवं बैसिलस प्रजाति (बैक्टीरिया)।



ट्राइकोडर्मा हरजियानम

ट्राइकोडर्मा विरिडी

ब्यूवेरिया बेसियाना



स्यूडोमोनास प्रजाति

बैसिलस प्रजाति

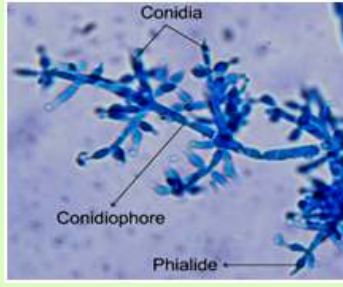
### ट्राइकोडर्मा

ट्राइकोडर्मा एक जैविक फफूँद प्रतिनिधि है जो पौध रोगों की रोकथाम के साथ-साथ पौधों की तेजी से वृद्धि में भी सहायता करता है। ट्राइकोडर्मा इन्ही विशेषताओं के कारण प्रमुख जैविक रोग नियंत्रक के रूप में अपनी पहचान बना चुका है। ट्राइकोडर्मा प्रजाति लगभग सभी प्रकार की मृदा तथा विभिन्न प्राकृतिक अवस्थाओं में पाया जाने वाला एक ऐसा फफूँद है जो फफूँद जनित रोगों जैसे, जड़ विगलन, उकठा, भूरा विगलन, पत्ती का झुलसा रोग तथा अन्य भूमि जनित रोगों से पौधों की रक्षा करते हैं। यह सभी प्रकार की फसलों जैसे गन्ना, कपास, धान, दलहन, तिलहन, सब्जियाँ, केला, मिर्च, नींबू चाय, कॉफी, रबड़, फूलों तथा मसालों आदि के लिए विशेषकर उपयोगी हैं। इसी कारण यह एक सक्षम जैविक फफूँदीनाशक के रूप में प्रचलित है।



# PUBLICATIONS

## FOLDERS



### जैविक नियन्त्रण में प्रयुक्त ट्राइकोडर्मा की कुछ प्रमुख प्रजातियाँ:

ट्राइकोडर्मा हरजियानम, ट्राइकोडर्मा विरिडी, ट्राइकोडर्मा हेमेटम, ट्राइकोडर्मा लॉगीब्रैकेटम, ट्राइकोडर्मा वाइरेन्स, ट्राइकोडर्मा एट्रोविरिडी, ट्राइकोडर्मा एसपैरेलम, ट्राइकोडर्मा कॉननगाई तथा ट्राइकोडर्मा रेसी की कुछ प्रचलित प्रजातियाँ हैं जो पौध रोगकारकों विशेषकर भूमि जनित रोगकारकों को नियंत्रित करने में महत्वपूर्ण भूमिका निभाते हैं।

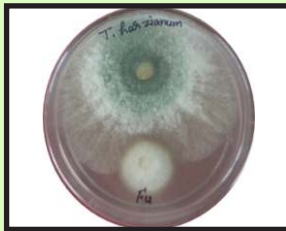
### लाभ

- ये कम लागत के जैव नियंत्रक हैं जो फसलों के रोगों विशेषकर भूमि जनित रोगों के नियन्त्रण में प्रभावी हैं।
- प्राकृतिक रूप से पर्यावरण के लिये उत्तम हैं।
- यह पौधों को रोगों से रक्षा करने के लिये प्रतिरोधक क्षमता प्रदान करता है।
- ट्राइकोडर्मा द्वारा स्रावित किये जाने वाले कुछ विषैले स्राव (एण्टीबायोटिक) जैसे, ग्लाइकोटॉक्सिन, विरिडिन और ट्राइकोडर्मिन भी फफूँद रोगकारकों को नष्ट करने का काम करते हैं।

### ट्राइकोडर्मा द्वारा नियन्त्रण की क्रिया विधि:

ट्राइकोडर्मा द्वारा पादप रोगों विशेषकर भूमिजनित रोगों के प्रभावी नियन्त्रण में निम्न क्रिया विधि अपनायी जाती है-

- (क) **परजीविता:** इस कार्यविधि में ट्राइकोडर्मा रोगकारक जीव के शरीर (माइसीलियम तथा स्केलेरोशियम) से चिपककर कुछ प्रतिजैविक पदार्थों द्वारा उसकी बाहरी परत को गलाकर उसके अन्दर का सारा पदार्थ उपयोग कर लेता है, जिससे रोगकारक जीव नष्ट हो जाता है।



- (ख) **प्रतिजैविकता:** इस कार्यविधि में ट्राइकोडर्मा द्वारा उत्सर्जित विभिन्न प्रकार के प्रतिजैविक पदार्थ रोगकारकों के लिये विष का कार्य करते हैं।

- (ग) **प्रतिस्पर्धा:** इस कार्यविधि में जैव नियन्त्रक वातावरण में उपलब्ध पोषक पदार्थों, जल एवं स्थान के उपयोग के लिये रोगकारकों से प्रतिस्पर्धा करते हैं।



### ठोस किण्वन विधि द्वारा ट्राइकोडर्मा उत्पादन

ठोस किण्वन विधि द्वारा ट्राइकोडर्मा उत्पादन के लिए मातृ संवर्ध तथा टाल्क पाउडर की आवश्यकता होती है जिसके लिए प्रयोगशाला में मातृ संवर्धन तैयार कर लेते हैं तथा मातृ संवर्धन की वृद्धि ज्वार के दानों पर कराते हैं, जिसके लिए ज्वार के दानों को 2 प्रतिशत सुक्रोज के घोल में 6 घण्टों तक भिगो देते हैं। अतिरिक्त पानी को निकाल देते हैं। भीगे हुए 250 ग्रा० दानों को निर्जमीकृत पोली प्रोपीलीन (पी०पी०) थैलों में डालकर रुई अवरोधक की सहायता से बंद करते हैं। थैलो को 95 वर्ग इंच के दबाव पर 30-40 मिनट तक आटोक्लेव करते हैं। आटोक्लेव से निकले हुए पी०पी० थैलों को ठण्डा होने के लिए रख देते हैं। मातृ संवर्धन से 5 मिली० ट्राइकोडर्मा सांद्रित द्रव ( $2 \times 10^8$  सी०एफ०यू०/ मि०लि०) को लेकर निवेशित सुई द्वारा पी०पी० थैले में निवेशित करते हैं। निवेशित थैलों को टेप द्वारा बंद करते हैं तथा बी०ओ०डी० इन्क्यूबेटर में 25° 2° से० तापमान पर 95 दिनों के लिये रख देते हैं। पूर्ण वृद्धि होने के पश्चात ज्वार के दानों को बारीक पीस कर पाउडर के रूप में प्राप्त कर लेते हैं तथा इस पाउडर को निर्जमीकृत टाल्क पाउडर के साथ 95:5 के अनुपात में अच्छी तरह मिला देते हैं।



ज्वार के दानों को 2% सुक्रोज विलयन में भिगोये



धुले हुए 250 ग्रा० ज्वार के दानों को पी०पी० थैलों में भरे



ज्वार के दानों को निर्जमीकृत करें



ट्राइकोडर्मा सांद्रित द्रव ( $2 \times 10^8$  सी०एफ०यू०/ मि०लि०)



ट्राइकोडर्मा निवेशित ज्वार के दानें



ट्राइकोडर्मा निवेशित पिसे हुए ज्वार के दानें

# PUBLICATIONS

## FOLDERS



टाल्क पाउडर का निर्जमीकरण



ट्राइकोडर्मा निवेशित ज्वार के दानों का टाल्क पाउडर में मिश्रण



ट्राइकोडर्मा बायोफार्मुलेशन की पैकिंग

### ट्राइकोडर्मा का उपयोग

**बीज शोधन:** बीज उपचार के लिये जैव नियन्त्रण पाउडर (ट्राइकोडर्मा) को ४-५ ग्राम प्रति किग्रा० के हिसाब से पानी में घोल बना लेते हैं फिर बीज को इस घोल में डाल देते हैं। जिससे बीज अच्छी तरह से ट्राइकोडर्मा पाउडर द्वारा उपचारित हो जायें। बीज उपचार के उपरान्त लगभग ४-६ घंटे तक छाया में सुखाकार बीजों को बोना चाहिये।



**भूमि शोधन:** एक किग्रा० ट्राइकोडर्मा पाउडर को २५ किग्रा० सड़ी गोबर की खाद में अच्छी तरह मिलाकर एक सप्ताह के लिए ढक कर रख दिया जाता है। यह मिश्रण एक एकड़ खेत के उपचार के लिये पर्याप्त होता है। उपचार करते समय खेत में नमी हो होना आवश्यक है।



**पौध शोधन:** सब्जियों जैसे गोभी, मिर्च, टमाटर, बैंगन इत्यादि के लिये पौध की रोपाई से पहले उसकी जड़ को ४-५ ग्राम ट्राइकोडर्मा पाउडर के १ लीटर जल में घोलकर जड़ों को इस घोल में ३० से ५० मिनट तक उपचारित करने के पश्चात लगाना चाहिये।



### प्रयोग करते समय सावधानियाँ:

- ट्राइकोडर्मा को निर्धारित समय सीमा के अन्दर ही उपयोग में लाना चाहिए। यह मुख्यतः बनाने के दिन में १० से १२ महीने के अन्दर उपयोग में लाया जा सकता है।
- कवकीय जैव नियन्त्रक हल्की अम्लीय मृदा के लिए अधिक उपयुक्त होते हैं जबकि जीवाणुवीय जैव नियन्त्रक क्षारीय मृदा में अच्छा असर दिखाते हैं।
- जैव नियन्त्रकों का प्रयोग करने के समय खेत में उचित नमी होनी चाहिए।

### विश्वविद्यालय द्वारा प्रदत्त सुविधायें

ट्राइकोडर्मा हरजियानम बायोफार्मुलेशन का विक्रय

पैक (कि०ग्रा०)	लागत (₹०)
१	१२७/-
५	६३५/-
१०	१२७०/-

बायो पेस्टीसाइड गुणवत्ता परीक्षण (उत्तर प्रदेश सरकार द्वारा अनुमोदित)

परीक्षण शुल्क:

₹० ५००/- नमूना

किसानों के लिए ट्राइकोडर्मा उत्पादन एवं प्रयोग विधि का चलचित्र ट्राइकोडर्मा प्रोडक्शन यू ट्यूब पर उपलब्ध है।

<https://www.youtube.com/watch?v=TruIZMdlMVY>

इन-सिलिको एपरोचेज इन इम्प्रोवाइजिंग नोवल स्ट्रेन्स ऑफ ट्राइकोडर्मा स्पेशीज परियोजना

वित्तपोषित: यू०पी० काउन्सिल ऑफ साइंस एण्ड टेक्नोलोजी (सीएसटी), लखनऊ

सम्पर्क :

कुलपति/विभागाध्यक्ष

;जैव नियन्त्रण प्रयोगशाला, पादप रोग विज्ञान विभाग

चन्द्रशेखर आजाद कृषि एवं प्रौद्योगिक विश्वविद्यालय, कानपुर

मउंसरसु अब/बेनागंबणपद

# AWARDS

1. **Dr. Shubha Trivedi**, Women Scientist (DST WOS-A) got **Young Scientist Associate Award 2017 in field of Plant Pathology** in International conference on Advances in Agricultural and Biodiversity Conservation for Sustainable Development (ABCD-2017) on October 27-28, 2017 at C.C.S University, Meerut, Uttar Pradesh, India.
2. **Miss Supriya Dixit**, Research Assistant, (UP-CST Project), awarded **Best oral presentation 2017** for the paper entitled “Homology modeling, quality assessment and validation of lytic enzymes of *Trichoderma harzianum*” in National seminar on Nutritional Security and Environmental Protection: Present scenario and Future prospects November 10-11, 2017 at Vigyan Parishad Auditorium, Allahabad.

## BIO CONTROL LAB ORGANIZATION/ STAFF POSITION

S. no.	Name	Post	Personal Information
1.	Dr. U. K. Tripathi	Head	Mobile:8299345852, 9454032208 Email : tripathiuk_1960@rediffmail.com
2.	Dr. Ved Ratan	Officer In- charge	Mobile:9696033923, 9839567727 Email :vedratancsau@gmail.com
3.	Mr. Yatindra Kr. Srivastava	Lab Assistant	Mobile: 9792799367 Email: yat81srivastava@gmail.com
4.	Dr. Neetu Trivedi	Young Professional I	Mobile: 8799680053 Email: trivedinitu@yahoo.co.in
5.	Smt. Sumitra	Lab Attendant	Mobile: 7897411942
6.	Mr. Sushil Kumar	Mali	Mobile: 9695540787

## RESOURCE GENERATION

❖ <b>Trichoderma based biopesticide Sale</b>	01 Kg	Rs. 127/
❖ <b>Biopesticide sample Testing</b> (Approved by Uttar Pradesh government)	Government Sample	Rs. 500/-
	Private Sample	Rs. 2500/-
❖ <b>Training Programmes</b>		
<b>Module I-</b> Detection and diagnosis of plant pathogens	(01 month)	Rs. 8000/-
<b>Module II-</b> Phenotypic Characterization	02 months)	Rs. 15000/-
<b>Module III-</b> Biochemical aspects of plant samples	(03 month)	Rs. 15000/-
<b>Module IV-</b> Biological control of pathogens	(03 months)	Rs. 15000/-
<b>Module V-</b> Trichoderma production and its uses	(06 days)	Rs. 1000/-



\* **Module (V) Six days Training programme entitled “Trichoderma production and its uses”** was started from January 2020. Two trainings have been conducted during 13-18 Jan 2020 and 3-8 Feb 2020.



## REVENUE GENERATED

S. no.	Financial Year	Revenue generated by different sources (Rs.)			Total (Rs.)
		Sample Testing Revenue (Rs.)	Biopesticide Sale (Rs.)	Training (Rs.)	
1.	2019-20	57,000.00	79,629.00	47,000.00	1,83,629.00
2.	2018-19	45,000.00	51,308.00	30,000.00	1,26,308.00
	Total	1,02,000.00	1,30,937	77,000	309,937.00

- ❖ All Revenue generated from different activities perform by bio control lab is deposited in Bio Control Lab Revolving Fund.

### On Going and Completed Schemes/Projects

- Rastriya Krishi Vikas Yojna (RKVY- Raftaar), Uttar Pradesh sponsored project entitled “Strengthening of Bio-Control Lab for mass production of *Trichoderma* based fungicide” start in financial year 2019-2020. (Running).
- Uttar Pradesh Council of Science and Technology, Lucknow sponsored project entitled “*In-silico* approaches in improvising novel strain of *Trichoderma* spp.” successfully run in this lab during financial year 2016-2019. (Completed).
- Department of Science & Technology, New Delhi sponsored Women Scientist B project entitled “Development of novel bio-formulations with increased shelf life for the management of soil borne pathogens” run in this lab during financial year 2015- 2018. (Completed).
- Indian Council of Science and Technology (ICAR), New Delhi sponsored project entitled “Exploration and Exploitation of *Trichoderma* as antagonist against soil borne pathogens” was successfully run in this lab during 2011-2016.(Completed).

# Visitors (International/ National)

Year	2019	2018	2017	2016	2015
No. of visitors	05	11	24	10	17

## International Visitors

- **Shree H. A. S. Weersinghee**, Sugarcane Research Institute, Uda Walawe, Sri Lanka.
- **Shree K. A. F. Karunsena**, Chairman, Sugarcane Research Institute, Uda Walawe, Sri Lanka.
- **Dr. A. P. Keerthipale**, Director / Chief Executive Officer, Sugarcane Research Institute, Sri Lanka

## National Visitors

- **Shree Ranvendra Pratap Singh**, State Agriculture minister, U. P. Government.
- **Dr. A. K. Singh**, Corporate General Manager, NABARD, Lucknow
- **Dr. M. P. Thakur**, DI/ Controller of Examination, IGKV, Raipur.
- **Dr. D. K. Srivastava**, Director, Uttar Pradesh Council of Science and Technology, Lucknow.
- **Dr. P. L. Gautam**, Ex DDG (Crop Science ICAR) & Vice Chancellor GBPUAT, Pantnagar
- **Dr. Arvind Kuamr**, DDG(Education), ICAR ,New Delhi
- **Dr. Rajendra Yadav**, DG ,UPCAR, Lucknow
- **Dr. S. L. Goswami**, Vice-chancellor of Banda Agriculture University, Banda.
- **Dr. Ashok Kumar**, Vice-chancellor of CSJM University, Kanpur
- **Dr. L. S. Yadav**, Assistant Director (Plant Protection), Lucknow
- **Dr. S. N. Sushil**, Indian Institute of Sugarcane Research, Lucknow.
- **Dr. S. S. Sharma**, Professor& Head, Plant Pathology, MPUAT, Udaipur.
- **Dr. S.A. Faruqki**, Rtd. Director, ICFRI, Jhansi.
- **Prof. D.R.C Bakhetia**, Ex-head of entomology, Punjab Agriculture University.

# Road Map

of Bio Control Lab, Department of Plant Pathology  
C. S. Azad University of Agriculture & Technology, Kanpur

## Short term programme (1–3 years)

- Strengthening of Training facilities for establishment of modern equipments.
- Strengthening of production facilities for mass production of bioagents.
- Repairing of instruments (Kelplus Analyzer, Deep Freezer, BOD incubator, & spectrophotometer).
- Development of Bio Control lab into a knowledge hub for entrepreneurs interested in setting up bio-pesticide units and take up promotional activity for establishment of bio-control production units.
- Development human resource at various levels (farmers, students and scientists) in biologically disease management and production technology of important bio-agents.

## Midterm programme (1–5 years)

- Establishment of advance analytical instruments technology for up gradation of Bio Control lab.
- Conduct training programme related to bio control lab and established instruments for farmer, students and enterprenuerers.
- Development of specific marker for proper identification of the potential isolates.
- Deposition of effective isolates of *Trichoderma* in national and international repository for future use.
- Development of crop specific biocontrol technology, its validation and dissemination at grass root level.
- Increased the shelf life and bio-efficacy of selective bioagents like: *Trichoderma* and other bioagents against important seed and soil borne diseases.
- Development of cost effective technology for mass production of bioagents and protocol and their standardizations.

## Long term programme (more than 5 years)

- Identify potential bioagents, workout their effectiveness and develop novel strains for the management of seed and soil borne diseases
- Establishment of bankability of mass multiplication of bioagents in the laboratory and subsequent release to farmers for biological control of pests and diseases.
- Development of cheap and cost effective technology for agro-waste management through bio control agent and change the compost in valuable bio nutrient or bio compost.



# SWOT Analysis of Bio Control Lab, Department of Plant Pathology

**A SWOT analysis Identifying core strengths, weakness, opportunities and threats of Bio Control Lab lead to fact- based analysis, fresh perspectives and new ideas.**

## **Strength**

- Ecofriendly research and development base.
- Advance and well equipped lab.
- Availability of bioinformatics tools and techniques.
- Suitable spp. of bioagents for ecofriendly management of soil and seed borne disease.
- Suitable for sustainable organic farming.
- Well trained technical staff for lab technology.
- Bankability of national and international recognized bioagents.

## **Weakness**

- Insufficient human resource.
- Lacking of some important instruments.
- Lacking of proper linkage among the scientists, extension workers and farmers.
- Insufficient linkage with research organization and related industries.
- Lacking of required infrastructure for mass production of Bioagents.
- Lacking of required infrastructure for training activities.
- Crisis of financial assistance for repairing and consumables items.

## **Opportunities**

- Diversified physical factors like: temp. and pH tolerance resistance bioagents for different agro climatic zones of Uttar Pradesh.
- Development of ecofriendly management of seed and soil borne pathogen using bio control agents.
- Organizing the training programme for mass production technology of bioagents for students, government officers, farmers, and enterprenurers.
- Organizing the training programme of Bioinformatics tools and techniques for students.
- Prepare good quality bioagents formulations on the basis of demand of KVKs, Farmers and other agencies.
- Development of ecofriendly agro-waste management Technology and value added bio-nutrient.
- Development of more effective and cost effective bioagents production technology.

## **Threats**

- Insufficient awareness for application of Bio control agents against seed and soil borne disease management.
- Insufficient awareness of organic farming.
- Lacking of human resources.
- Local governing system.

# Glimpses

