Mini Review

Variability and Management of *Fusarium fujikuroi* causing Foot Rot and Bakanae Disease of Rice

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**Abstract**

Foot rot and bakanae disease of rice caused by *Fusarium fujikuroi* (*F. moniliforme* Sheld.) (*Gibberella fujikuroi* Wineland) occurs in almost all the rice growing areas of the world and causes substantial yield losses. In this article, the information available on variation in sensitivity of *F. fujikuroi* strains to different fungitoxicants; morphological, physiological and pathogenic variability; heterothallism, genetics, sexuality and heterokaryosis, and disease management through host resistance, cultural practices, use of botanicals, biocontrol agents and fungitoxicants has been reviewed, and future lines of research indicated.

**Key words:** Foot rot and Bakanae, *Fusarium fujikuroi*, management, *Oryza sativa*, variability

**Citation:** Kumar Pankaj, Singh Ram and Sunder S. 2014. Variability and management of *Fusarium fujikuroi* causing foot rot and bakanae disease of rice. *J Mycol Pl Pathol* 44(3): 227-236.
Efficacy of Secondary Metabolites Produced by *Bacillus subtilis* EPCO16 against Tomato Wilt Pathogen *Fusarium oxysporum* f.sp. *lycopersici*

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Abstract

Endophytic bacterial isolate *Bacillus subtilis* EPCO16 which inhibited the mycelial growth (46.0%) of tomato vascular wilt pathogen *Fusarium oxysporum* f.sp. *lycopersici* was selected for assessing its secondary metabolites. Polymerase chain reaction was carried out to screen isolate EPCO16 for genes involved in biosynthesis of antibiotics. Amplicons of the expected sizes were detected for *ItoC*, *ItoD*, *BmyA*, *BacD*, *BacAB*, and *FenD* involved in the biosynthesis of Iturin, Bacillomycin, Bacilysin and Fengycin, respectively. The identity of these genes was confirmed by DNA sequence analysis of the amplicons. Iturin and surfactin were detected in culture filtrates from isolate EPCO16 by thin layer chromatography. Gas chromatography coupled with mass spectroscopy analysis revealed the presence of anti-fungal volatile compounds from isolate EPCO16. Seed treatment, seedling dip and soil application of *B. subtilis* EPCO16 in liquid formulation upon challenge inoculated with *F. oxysporum* f.sp. *lycopersici* resulted in lower disease incidence (68.4% reduction) with increased plant growth and fruit yield of tomato relative to the control.

Key words: *Bacillus subtilis*, biological control, *F. oxysporum* f.sp. *lycopersici*, lipopeptides


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Efficacy and Defence Response of a Bioformulation against Leaf Folder Insect and Sheath Blight Disease of Rice*

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Abstract

Efficacy of a bioformulation consisting of Pseudomonas fluorescens strains, Pf-1 and AH-1 (Agathir hills) and an entomopathogenic fungus Beauveria bassiana was tested against leaf folder insect (Cnaphalocrocis medinalis Guenee) and rice sheath blight disease (Rhizoctonia solani Kuhn) under glasshouse and field conditions. The treatment reduced the incidence of leaf folder and sheath blight disease in rice likely due to induced resistance. To understand the mechanism of induction of pest and disease resistance a protein profiling strategy was performed in leaf folder infested rice plants inoculated with/without the bioformulation. Inoculation with bioformulation had significant effect on the expression of proteins viz., ribulose-bisphosphate carboxylase, large chain precursor of rice chloroplast, putative ATP dependent CIP protease proteolytic sub unit, peroxidase component PR-2 or 4, and putative glutathione S-transferase. The results indicated potential involvement of these key genes due to bioagents-mediated plant resistance against the target insect pest and the pathogen.

Key words: Beauveria bassiana, leaf folder, P. fluorescens, rice, Rhizoctonia solani, sheath blight


*Presented at the 35th ISMPP Annual Conference at Dr PDKV Akola, MS, 8-10 Jan 2014.
Micronutrient and *Trichoderma harzianum* Enriched Organic Manure for the Management of White Mold of French Bean caused by *Sclerotinia sclerotiorum*

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**Abstract**

White mold of French bean caused by *Sclerotinia sclerotiorum* (Lib.) de Bary is a major constraint in the profitable cultivation of French bean. Antagonist like *Trichoderma harzianum* Rifai has been widely explored as an eco-friendly option for controlling soil borne pathogens of plants. To enhance the efficiency of *T. harzianum*, the effect of Zn (0.5% and 0.25%) was tested. Zn @ 0.5% showed higher growth of *T. harzianum* which was also inhibitory to *S. sclerotiorum*. In a field experiment, soil application (w/w) of vermicompost enriched *T. harzianum* and Zn @ 10qha⁻¹ was found effective in reducing the white mold by 66.7% and increased dry weight, length of roots (8.63 cm) and shoots (9.75 cm) and pod yield (62.50 q ha⁻¹) as compared to control.

**Key words:** French bean, organic amendment, *S. sclerotiorum*, *T. harzianum*, vermicompost, Zinc

**Citation:** Hoque Hifjul and Das BC. 2014. Micronutrient and *Trichoderma harzianum* enriched organic manure for the management of white mold of French bean caused by *Sclerotinia sclerotiorum*. *J Mycol Pl Pathol* 44(2): 161-165.
Research Article

Bioefficacy of *Muntingia calabura* Botanical Formulation against *Alternaria solani* causing Early Blight in Tomato

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Abstract

Efficacy of a botanical formulation from a medicinal plant, *Muntingia calabura* was evaluated against *Alternaria Solani* that causes early blight of tomato. The formulation was prepared from the purified antimicrobial metabolite (stigmasterol) isolated from the methanol extract of *M. calabura* root. Different concentrations of Muntingin 5EC were tested on seed infection, germination and seedling vigour of tomato and it was found that Muntingin 5EC (2%) increased the tomato seed germination and seedling vigour and reduced the seed infection by *A. solani* to a significant extent. The formulation was found to possess good emulsion stability and retained its antimicrobial activity (shelf life) for 120 d. Application of Muntingin 5EC increased the activity of enzymes such as peroxidase (PO), polyphenol oxidase (PPO), phenylalanine ammonia lyase (PAL) and phenol content of tomato. Muntingin 5EC (2%) was effective in controlling early blight of tomato under pot culture conditions.

Key words: *Alternaria solani*, botanical formulation, early blight, Muntingin 5EC, tomato

Spent Mushroom Substrates for Management of Bacterial Wilt and Yield Enhancement in Ginger

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Abstract

A study was conducted under pot culture to assess the influence of spent mushroom substrate (SMS) mulching of paddy straw, saw dust and neopeat from Pleurotus florida and P. sajor-caju on growth parameters, yield and bacterial wilt (Ralstonia solanacearum) incidence in ginger (Zingiber officinale). The influence of SMS was compared with recommended inorganic fertilization along with control. The paddy straw SMS of P. sajor-caju was significantly superior to all other treatments and the bacterial wilt was not observed in this treatment, compared to 100% wilt incidence in control. The highest number of tillers, leaves per tiller, height of tillers and rhizome yield were also recorded in paddy straw SMS of P. sajor-caju. The other SMS treatments were also effective compared to control.

Key words: Bacterial wilt, ginger, growth parameters, Pleurotus florida, Pleurotus sajor-caju, Ralstonia solanacearum, spent mushroom substrate, yield

Prevention of Fusarium Wilt of Chickpea by *Rhizobium* sp.

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**Abstract**

Mycelial growth of chickpea wilt pathogen *Fusarium oxysporum* f. sp. *ciceris* was inhibited by the native *Rhizobium* isolates of Anand, Gujarat. Three *Rhizobium* cultures (R12, R16, and R19) and one standard culture from chickpea (IC76) were evaluated in pot culture to find out the most effective isolate for controlling wilt in chickpea. Among these the isolate R-16 was found most promising, followed by R12, IC76 and R19, showing 50-60 % wilting index in pots. Molecular characterization of these isolates showed the presence of *nif*H gene and capacity to fix nitrogen. The 16S rDNA sequencing identified isolate R-12 as *R. subbarioni* (NCBI Accn no: NR108508.1), R-16 as *R. pusense* (NCBI Accn no: JX266311.1) and R-19 as *R. dajeojense* (NCBI Accn no: NR042851.1).

**Key words:** ACC deaminase, chitinase, HCN, siderophore, organic acid, *nif*H, *Rhizobium*

**Citation:** Mistry SJ, Vyas RV, Bhatt SB and Shelath HN. 2014. Prevention of *Fusarium* wilt of Chickpea by *Rhizobium* sp. *J Mycol Pl Pathol* 44(2): 176-180.
Evaluation of Varieties for Resistance to and Fungicides for the management of Foliar Blight of Wheat

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Abstract

Foliar blight of wheat caused by Helminthosporium sativum (syn. Bipolaris sorokiniana) has become a serious and widespread disease in India. Attempts were made to find varietal resistance and fungicide management for the disease. Of the 11 commonly grown wheat varieties evaluated for resistance to foliar blight under natural epiphytotic, Birsa gehun 3 showed the least disease severity (12.2 %), resistant reaction and grain yield of 31.9 q ha⁻¹. Four varieties i.e., BG 2, HD 2923, HDR 77 and HD 2865) were moderately resistant to foliar blight. Of six fungicides evaluated, two sprays of hexaconazole @ 0.1 % recorded the lowest mean disease severity of 6.6%, compared to 31.6% in control and the highest mean grain yield (26.2 qha⁻¹) which was 39.6% more over the control. This was followed by two sprays of propiconazole (0.1%) which recorded mean disease severity of 9.3%, mean grain yield of 24.7 q ha⁻¹ and 30.6% more yield over control.

Key words: Foliar blight, fungicides, grain yield, Helminthosporium sativum, management, resistance, wheat

Molecular Detection and DNA Sequence Phylogeny of *Colletotrichum* spp. Causing Leaf Spot Disease of Turmeric

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**Abstract**

*Colletotrichum* spp. the causal agent of the turmeric leaf spot cause severe destruction and yield losses. Accurate species identification is critical to understand the epidemiology and develop effective control of disease. For molecular detection ITS-rDNA of 16 isolates of *Colletotrichum* spp. were amplified at 590 bp and sequenced. Among these, 13 isolates were identified as *C. capsici*, which revealed 97-100% DNA sequence homology with *C. capsici* and 3 isolates detected as *C. gloeosporioides* depicted 99-100% sequence homology with *C. gloeosporioides* in the NCBI database. DNA sequence based phylogenetic analysis elucidated the molecular variability and genetic distance between the species of *Colletotrichum*. Phylogenetic analysis revealed the average rDNA sequences homology between species that varied from 55 to 99%. DNA sequence based methodologies precisely detected and distinguished the presence of two pathogenic species *C. capsici* and *C. gloeosporioides* which were causal agents of turmeric leaf spot.

**Key words:** *Colletotrichum*, detection, ITS-rDNA, leaf spot, phylogeny, turmeric

Genetic Variation amongst the Isolates of *Fusarium oxysporum* f. sp. *ciceri* Causing Chickpea Wilt

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**Abstract**

Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* (Padwick) results into heavy losses in India. Twenty four isolates of the pathogen from chickpea wilt affected areas were collected from different districts of Maharashtra state and studied for genetic diversity using the random amplified polymorphic DNA (RAPD). A total of 651 polymorphic fragments were amplified using four random primers. Genetic similarity matrix based on Nei and Li's coefficient found to be in the range of 46.46% to 92.51%. These coefficients were used to construct a dendrogram using the UPGMA algorithm. The isolates were grouped into two main clusters, comprising one and 23 isolates, with a genetic relatedness of 52%. Within the clusters, *F. oxysporum* f. sp. *ciceri* isolates are not necessarily related either by geographic origin or by the chickpea cultivar from which they were isolated. The RAPD can be useful in genetic differentiation of population. The correlation between the pigmentation and type of virulence had no statistical significance with RAPD clustering pattern.

**Keywords:** Chickpea, *Fusarium oxysporum* f. sp. *ciceri*, genomic diversity, RAPD, virulence

**Citation:** Khilare VC, Ahmed Rafi and Khedkar GD. 2014. Genetic variation amongst the isolates of *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt. *J Mycol Pl Pathol* 44(2): 191-197.
Influence of Weather Parameters and Different Host Plant Nutrition Sources on Development of Early Blight of Tomato Predicted Using Logistic and Gompertz Models

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Abstract

Field experiments were conducted during 2008-09 and 2009-10 to study the influence of different weather factors on the development of early blight in tomato caused by Alternaria solani under different host plant nutrition sources (both organics, inorganics and their amalgamation) and also to compare between the two transformation models viz., Logit and Gompertz through which the disease progress curve moves over time. Different prediction equations were developed for each treatment separately through step wise multiple regression analysis which showed that different meteorological factors having different influence on disease severity and these were done after Logistic and Gompertz transformation of the realized observed value of the disease severity (expressed as AUDPC). Alteration in nutrition sources showed differences in disease severity. All the treatment combinations reduced the disease severity significantly. Minimum disease severity (AUDPC = 97.12 and 102.09) was found in only fertilizer treated plots (N150: P 60: K 60 and N180: P 90: K 90) individually in the two respective years. Maximum disease severity (AUDPC= 112.15 and 114.37) was noticed in the soil amended with N : P : K along with 3.2 ton ha^{-1} FYM. Linearization of AUDPC following the two models (Logistic and Gompertz) showed that Gompertz fit better than Logit for the prediction of early blight disease severity and this was confirmed by the low standard error estimate. The co-efficient of determination value (R^2) showed that variation in disease severity can be explained up to 82 % (maximum) in logistic as well as 93% (maximum) in Gompertz with combined effect of the weather variables included in this study.

Keywords: AUDPC, early blight of tomato, Logistic and Gompertz models, host nutrition, prediction equation, weather parameters

Citation: Saha P and Das S 2014. Influence of weather parameters and different host plant nutrition sources on development of early blight of tomato predicted using Logistic and Gompertz models. J Mycol Pl Pathol 44(2): 198-204.
Influence of Sowing Dates on Incidence and Severity of Post Flowering Stalk Rot of Maize caused by *Fusarium verticillioides*

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Abstract

Field experiments were conducted during kharif 2012 and 2013 at Rajasthan College of Agriculture, MPUAT, Udaipur (Rajasthan) to evaluate the effect of date of sowing on the development of post flowering stalk rot (PFSR) due to *Fusarium verticillioides*. Of the 12 dates of sowing from 5th May to 25th August, maximum mean disease severity (88.2%) and minimum grain yield (1158 g/10 plants) and fodder yield (1363g/10 plants), were recorded when the crop was planted on 5th July 2012 and 2013 followed by 25th June 2012 and 2013, 5th May 2012 and 2013. The disease severity in maize crop planted in May and August was significantly less on the other dates in June and July. Results of average disease rating and inoculum density of *F. verticillioides* studies indicated that the plants were susceptible to PFSR infection irrespective of sowing dates however, higher disease severity (6.6 to 8.4) with heavy inoculum (14.3 to 14.7 cfu × 10⁷/g soil) was recorded when the crop was sown between 5th June to 15th July. The crop sown after 25th July had lower disease intensity and inoculum density from 5.8 to 4.2 and 11.5 to 8.4 cfu ×10⁷/g soil, respectively than that planted before as the critical stage of susceptibility matched with tasselling. The observations on meteorological conditions in relation to PFSR development revealed that minimum temperature (24.4-25.8 C), maximum temperature (33.3-35.8 C), RH (44.5-54.5%) and rainfall (4.0-6.0 mm) were most favorable for the development of PFSR.

Key words: Disease severity, *Fusarium verticillioides*, maize, PFSR, sowing dates

New Report

Hitherto Unreported Post Harvest Diseases of Kiwifruit (*Actinidia deliciosa*) from Himachal Pradesh

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**Key words:** *Actinidia deliciosa, Alternaria alternata, Botrytis cinerea, Cladosporium herbarum, Penicillium digitatum, Kiwifruits*

**Citation:** Sharma IM, Prashad D and Sharma S. 2014. Hitherto unreported post harvest diseases of kiwifruit (*Actinidia deliciosa*) from Himachal Pradesh. *J Mycol Pl Pathol* 44(2): 209-211.
New Report

_Piper longum_ – A New Host of Two Fungal Pathogens

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Key words: Botryodiplodia theobromae, Colletotrichum gloeosporoides, Piper longum

Short Communication

Molecular Characterization of *Mungbean Yellow Mosaic Virus* Infecting Mungbean in South Gujarat

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Key words: Begomovirus, DNA-A, MYMV, PCR, ORF, YMD

Short Communication

Antifungal Metabolites of *Trichoderma aureoviride*

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**Key words:** Antifungal metabolites, biocontrol, *Fusarium solani*, ginger rhizome, *Trichoderma aureoviride*

**Citation:** Sharma A and Mathur PN. 2014. Antifungal metabolites of *Trichoderma aureoviride*. *J Mycol Pl Pathol* 44(2): 219–222.
**Short Communication**

Comparison of Integrated Disease Management Module with Chemicals on Disease and Yield Attributes in Elephant Foot Yam

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Key words: *Amorphophallus paeoniifolius*, biodynamic formulation, chemicals, collar rot, Phytophthora blight

Short Communication

Management of Gummy Stem Blight of Bottle Gourd by Bioagents

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Key words: Bioagents, bottle gourd, gummy stem blight, management