

N Prasad Memorial Lecture Award - 2014

Molecular Detection of Fungal Pathogens, Activation of Defense Responses and Management Approaches for Crop Diseases



B N Chakraborty

B N Chakraborty

Immuno-Phytopathology Laboratory, Department of Botany, University of North Bengal, Siliguri – 734 013, West Bengal, India, E-mail: bncnbu@gmail.com

Abstract

Disease diagnosis is an art as well as a science. Early disease detection and prevention are imperative to minimize the disease induced damage in crops. Recent trends in detection of plant pathogens include the development of more rapid diagnostics techniques which combine the ability of high specificity for the target organism with detection in very low amounts and at very early stages of infection. The initial infection process involving cell surface recognition events between plants and pathogens is essential for successful establishment of pathogens. In order to colonize host tissue and reproduce, a successful parasite must have accumulated the genetic information to eliminate, overcome, avoid or escape all of the host defences encountered. On the other hand, defense gene expression is to be a great extent regulated through the production of metabolites which act as signals. Activation of inducible defense responses is likely to be based upon recognition of pathogen associated molecular patterns, which bind to plant receptors. Recent progress in our understanding of beneficial microorganisms and their role on improvement of plant health status and disease management has developed formulations of biocontrol microorganisms. However, in order to improve their commercial use, it is extremely important to emphasize and concentrate on quality control, delivery system and studying the role of environmental factors for providing real benefit to the farmers.

Key words: Biocontrol, biopesticides, defense enzymes, immunotechniques, molecular markers

Citation: Chakraborty BN. 2016. Molecular detection of fungal pathogens, activation of defense responses and management approaches for crop diseases. *J Mycol Pl Pathol* 46(1): 1 – 20.

P R Verma Ph D student award-2015 Winner

Development of Immunological Formats for Detection of *Bipolaris sorokiniana* in Wheat Leaf and Strategies for Induction of Resistance against Spot Blotch Disease using Bioinoculants



AP Chakraborty

AP Chakraborty, U Chakraborty and BN Chakraborty

Immuno-Phytopathology Laboratory, Department of Botany, University of North Bengal, Siliguri 734013
Email: arkapratimchakraborty@gmail.com

Abstract

Spot blotch of wheat caused by *Bipolaris sorokiniana* is one of the most important diseases of wheat. In the present study, thirty-five isolates of *B. sorokiniana* were collected from naturally infected wheat leaves. Among these, one isolate (BS29) after of completion of Koch's postulate was further identified by 18 S rDNA sequencing and also immunologically characterized. Serological formats using purified IgG of *B. sorokiniana* were developed for screening of resistance of 115 wheat germplasm against the pathogen following PTA-ELISA, Dot immunobinding assay. Simultaneously disease reactions were also evaluated in one month old field grown wheat plants and compared with serological data. Among the tested genotypes, CWL-6726 (MUNAL1) was found to be resistant, whereas, CWL (1-15), CWL22, CWL56, CWL57, CWL (63-69), CWL95, CWL96 were moderately resistant and CWL(16-21), CWL(23-43), CWL(44-50), CWL(51-55), CWL(58-62), CWL(70-89), CWL(90-92), CWL(97-100) were moderately susceptible. Conidial germination was comparatively high in wheat leaves of susceptible genotypes. Detection of *B. sorokiniana* in spot blotch infected wheat leaves was done by immuno-electron microscopy using PAb of pathogen. One of the highly susceptible genotype (CWL 6702) was further selected for induction of resistance using bioinoculants against *B. sorokiniana*. Talc based formulation of *Bacillus methylophilus* (NAIMCC-B 01492), a potent PGPR was applied both as seed treatment and foliar application, while wheat bran based formulation of *Trichoderma asperellum* (NAIMCC-F-01963) and mass multiplied *Glomus mosseae* were used as soil application. Combination of all three formulations were found to be most effective in disease reduction. Time course accumulation of chitinase (CHT), β -1,3 glucanase (GLU) and phenyl alanine ammonia lyase (PAL) increased markedly in treated plants in comparison to healthy control following 12, 24, 48, 72 and 96 h of challenge inoculation with *B. sorokiniana*. SDS PAGE analysis of soluble proteins and native PAGE of peroxidase revealed increased band intensity in pathogen inoculated as well as bioinoculants treated and pathogen inoculated plants. Accumulation of p-coumaroylagmatine (phytoalexin) in treated and inoculated plants were analysed by HPLC. Immunolocalization of chitinase in bioinoculant treated and pathogen inoculated leaf tissue was further confirmed by transmission electron microscopy using PAb of chitinase and gold labelled conjugates.

Key words: *Bipolaris sorokiniana*, bioinoculants, induction of resistance, spot blotch.

Citation: Chakraborty AP, Chakraborty U and Chakraborty BN. 2016. Development of immunological formats for detection of *Bipolaris sorokiniana* in wheat leaf and strategies for induction of resistance against spot blotch disease using bioinoculants. *J Mycol Pl Pathol* 46(1): 21-37.

Research Article

Appraisal of Shoulder Browning Disease of Mango (*Mangifera indica* L.) Caused by Fungus Complex in Subtropical Region of India

PK Shukla, Tarun Adak, AK Misra and Achal Singh

Division of Crop Protection, Central Institute for Sub-tropical Horticulture, Rehmankhera, PO Kakori, Lucknow – 226 101, Uttar Pradesh, India, Email: pksmush@gmail.com

Abstract

Shoulder browning disease of mango (*Mangifera indica* L.) caused by fungus complex has emerged as a severe threat to mango production in Uttar Pradesh and Uttarakhand states of India during the last decade. This disease affects the epicarp of mango fruits, major portion of which become dark brown to black and fruits lose their aesthetic value. Keeping this in view, incidence and severity of the disease were appraised for three consecutive years (2011-13) in mango orchards of 14 different districts of Uttar Pradesh and Uttarakhand. In general, the first incidence was recorded at 25th SMW (Standard meteorological week) in different mango orchards across locations coinciding after rainfall events. The severity was observed to vary between 2.2 in 25th SMW to 100 per cent till 32nd SMW. Wide variations were also recorded among the mango orchards across the seasons regarding the incidences and development of the disease. Positive and significant correlation of the disease incidence and development was observed with number of rainy days ($r = 0.95$), amount of rainfall ($r = 0.93$) and relative humidity (0.49) over the fruit growing seasons.

Key words: *Alternaria alternata*, *Capnodium mangiferae*, *Colletotrichum gloeosporioides*, mango, rainfall

Citation: Shukla PK, Adak T, Misra AK and Singh A. 2016. Appraisal of shoulder browning disease of Mango (*Mangifera indica* L.) caused by fungus complex in subtropical region of India. *J Mycol Pl Pathol*. 46 (1): 38-46.

Research Article

Impact of Weather Parameters on the Progression of White Rust, *Alternaria* blight and Powdery Mildew of Indian Mustard

Manmohan and Naresh Mehta

*Department of Plant Pathology, CCS, Haryana Agricultural University, Hisar-125004 Haryana, India;
Email: mmbaghel@gmail.com*

Abstract

Severity of white rust, *Alternaria* leaf blight and powdery mildew diseases is an important constraint in the production of Indian mustard. An experiment was conducted during *rabi* season of 2010-2011 at CCS, Haryana Agricultural University, Hisar to investigate the role of weather conditions like, humidity, temperature and rainfall in relation to sowing time and spacing on these diseases. Weather variable found to be greatly influenced the disease progression under field conditions. Temperature (max) and relative humidity (morning) contributes maximum in disease progression in all three diseases. Maximum growth of pustules, spots and specks size (mm) of white rust, *Alternaria* blight and powdery mildew respectively found in 1st date of sowing with narrow spacing (30x15 cm) in variety Varuna and RH-9801, which decreased with delay in dates of sowing. The maximum R^2 value in white rust and *Alternaria* blight was recorded in fourth dates of sowing in both the varieties but in powdery mildew maximum R^2 was found in third dates of sowing in variety Varuna. The equations developed based on data will be suitable for disease prediction in mustard growing area.

Key words: *Alternaria* blight, Indian mustard, powdery mildew, white rust, weather parameters

Citation: Manmohan and Mehta Naresh. 2016. Impact of weather parameters on the progression of white rust, *Alternaria* blight and powdery mildew of Indian mustard. *J Mycol Pl Pathol* 46 (1) : 47-56

Research Article

Estimation of Yield Losses in Safed Musli (*Chlorophytum borivilium* Santapau & Fernandez) caused by Root Rot (*Rhizoctonia solani*)

Pokhar Rawal and Tarun Pal Singh

AICRP-Medicinal, Aromatic Plants and Betelvine, Department of Plant Pathology, Rajasthan College of Agriculture, MPUA&T, Udaipur-313 001, Rajasthan, India, Email. dr.p.rawal@gmail.com

Abstract

Intensive survey was carried out in safed musli growing villages of Udaipur, Chittorgarh and Pratapgarh districts of Southern Rajasthan to record root rot (*Rhizoctonia solani*) disease severity and losses caused during different sowing time intervals at farmer's fields. Lower root rot severity 8.69 and 11.59 per cent, respectively and minimum yield 8.63 and 11.42 per cent, respectively were recorded in timely sowing dates i.e. 16-20th and 21-25th June; while the moderate root rot severity (29.0 and 18.70%, respectively) and yield losses (28.75 and 18.53%, respectively) were recorded when the crop was sown a little early and late on the date of 11-15th and 26-30th June. However, the higher root rot severity (36.40, 38.82, and 45.93%, respectively) and maximum yield losses (36.31, 38.75, and 45.86%, respectively) were recorded when the crop was sown late and very late on the dates of 1-5th, 6-10th and 11-15th July.

Key words: *Chlorophytum borivilium*, estimation of yield losses, *Rhizoctonia solani*, root rot

Citation: Rawal P and Singh TP. 2016. Estimation of yield losses in safed musli (*Chlorophytum borivilium* Santapau & Fernandez) caused by root rot (*Rhizoctonia solani*). J Mycol Pl Pathol 46 (1) : 57-60.

Research Article

Simultaneous Laccase Production, Protein Enrichment and Detoxification of Gossypol in Cotton Seed Meal by Selected Lignolytic Fungi

Swapnil Kale,¹ Amit Deshmukh¹ and Vinay Deshmukh²

¹Nagarjun Medicinal Plants Garden, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola-444 104, India, ²Department of Plant Pathology, Dr Panjabrao Deshmukh Krishi Vidyapeeth, Akola-444 104, India. E-mail: agd4in@yahoo.com

Abstract

Cotton seed meal is widely used as feed for ruminant animal, but presence of gossypol makes it unsuitable for non-ruminants. So detoxification of CSM by removal of free gossypol is necessary for being used as feed. In present paper, CSM was used as substrate for laccase and manganese peroxidase production under solid state and submerged fermentation condition using some lignolytic fungi. Fermented substrate was evaluated for free gossypol and protein enrichment. Study indicated that fungal treatment could significantly reduce free gossypol levels with further enrichment of protein in CSM. Fungal species *Daedaleopsis flavidia* DK17 was found to be most efficient in detoxification (72.69%) & laccase production (421.59 U ml⁻¹), while highest protein enrichment (57.04 % over control) was observed in case of *Lenzites* sp. DK14 under solid state fermentation condition.

Keywords: Cotton seed meal, *Daedaleopsis flavidia* DK1, gossypol, laccase, *Lenzites* sp. DK14

Citation: Kale S, Deshmukh A and Deshmukh V. 2016. Simultaneous laccase production, protein enrichment and detoxification of gossypol in cotton seed meal by selected lignolytic fungi. *J Mycol Pl Pathol*. 46 (1): 61-69.

Research Article**Efficacy of Systemic Acquired Resistance Activators Against Alternaria Blight of Fennel****Suresh Meena and RP Ghasolia**

Department of Plant Pathology, SKN College of Agriculture, Sri Karan Narendra Agriculture University, Jobner- 303 329, Jaipur, Rajasthan Email: skumarpathology@gmail.com

Abstract

Alternaria blight of fennel, caused by *Alternaria alternata* (Fr.) Keissler is an important disease which is known to causes heavy yield loss in Rajasthan as well as in India. Among systemic acquired resistance (SAR) activators, salicylic acid, β -amino butyric acid, isonicotinic acid and azoxystrobin were evaluated *in vitro* and *in vivo*. Salicylic acid at 100 ppm was proved to be the most effective in inhibiting mycelial growth and increasing seed yield by reducing disease intensity in field.

Key words: Alternaria blight, *Alternaria alternata*, fennel, SAR activators

Citation: Meena S and Ghasolia RP. 2016. Efficacy of systemic acquired resistance activators against Alternaria blight of fennel. *J Mycol Pl Pathol* 46(1): 70–76.

Research Article

Effect of Weather Parameters on Progression of Fruit Rot Disease of Chilli Caused by *Colletotrichum capsici* in West Bengal

Md Sarfraz Alam, Vikas Kumar Ravat and Amitava Basu

Department of Plant Pathology, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia-741252, West Bengal,
Email : basuamitava1961@hotmail.com

Abstract

The present investigation focuses on the field study of fruit rot diseases on chilli, variety Bullet during cropping season of 2013, 2014 and 2015 in the farmer's field. The disease appeared during mid August on chilli crop under field condition in consecutive three cropping seasons. The data shows a progressive increase in PDI of fruit rot which was recorded upto 14 weeks in each year from the date of sowing. Overall, the mean temperature ranged from, 25.8 C to 32.17 C, relative humidity varied between 78.6 per cent to 93.2 per cent during the disease progress of 2013, 2014 and 2015. Infection rate during 2013 reached maximum at 5th week. Finally the infection rate significantly decreased due to prevalence of unfavorable weather factors. In case of 2014, initially the infection rate during 2nd and 3rd week increased and thereafter, the infection rate reached at maximum during 4th week and gradually declined during 5th week. Year wise multiple regression equation was done for the disease prediction based on the data recorded during three cropping seasons with PDI. The three weather parameters i.e temperature, relative humidity and cumulative rainfall were contributing in *Colletotrichum* fruit rot disease prediction. Thus, the present finding may help the chilli growers by alerting them in advance for prophylactic spray of fungicides to manage the *Colletotrichum* fruit rot and enhance the production.

Key words: Chilli, *Colletotrichum capsici*, disease severity, fruit rot, West Bengal, Weather Parameters

Citation: Alam S, Ravat VK and Basu A. 2015. Effect of weather parameters on progression of fruit rot disease of chilli caused by *Colletotrichum capsici* in West Bengal. *J Mycol Pl Pathol* 46(1): 77-83.

Short Communication**Bioefficacy of Some Fungal Biocontrol Agents Against *Meloidogyne incognita* Infecting Tomato****Anusha BG and Shripad Kulkarni**

Institute of Organic Farming, College of Agriculture, University of Agricultural Sciences, Dharwad – 580 005, Karnataka, India. E-mail : shripadkulkarni@rocketmail.com

Key words : Fungal bio control agent, *Paecilomyces*, *Meloidogyne incognita*

Citation : Anusha BG and Kulkarni S. 2016. Bioefficacy of some fungal biocontrol agents against *Meloidogyne incognita* infecting tomato. *J Mycol Pl Pathol* 46(1): 84-88.

Short Communication

First Report of Hazelnut (*Corylus avellana* L.) Blight and Anthracnose caused by *Alternaria* species and *Piggotia coryli* in India

Durga Prashad, IM Sharma, RS Chandel and Pankaj Gupta

Regional Horticultural Research & Training Station and Krishi Vigyan Kendra, Sharbo, Kinnaur, Himachal Pradesh, India. Email: dpbhandari47@gmail.com

Key words: Anthracnose, *Alternaria* spp, Hazelnut *Piggotia coryli*

Citation: Prashad Durga, Sharma IM, Chandel RS and Gupta Pankaj 2016. First Report of Hazelnut (*Corylus avellana* L.) Blight and anthracnose caused by *Alternaria* species and *Piggotia coryli* in India. *J Mycol Pl Pathol* 46(1): 89-92.