



KrishiKosh (कृषिकोश)

(/) An Institutional Repository of Indian National Agricultural Research System



(/)

[Advanced Search \(/advanced-search\)](#)

[Krishikosh \(/\)](#) / [Indian Agricultural Research Institute, New Delhi \(/handle/1/20\)](#) / [Theses \(/handle/1/30364\)](#)

Please use this identifier to cite or link to this item: <http://krishikosh.egranth.ac.in/handle/1/5810009824>

Authors: [BHEEMARAYA \(/browse?type=author&value=BHEEMARAYA\)](#)

Advisor: [Robin Gogoi \(/browse?type=author&value=Robin+Gogoi\)](#)

Title: NANO-HEXACONAZOLE INDUCED RESPONSES IN *Rhizoctonia solani* f. sp. *sasakii* CAUSING BANDED LEAF AND SHEATH BLIGHT IN MAIZE

Publisher: Division of Plant Pathology Indian Agricultural Research Institute New Delhi

Language: en

Type: Thesis

Agrotags: null

Keywords: NANO-HEXACONAZOLE, INDUCED RESPONSES, *Rhizoctonia solani* f. sp., *sasakii*, BANDED LEAF, SHEATH BLIGHT, MAIZE

Abstract: Banded leaf and sheath blight (BLSB) caused by *Rhizoctonia solani* f. sp. *sasakii* is one of the most important fungal diseases of maize. Chemical control, more specifically use of fungicides is the most efficient means to manage this disease. A study was conducted to know the effect of two formulations of hexaconazole viz., commercial and newly synthesized nano-hexaconazole molecule on phenotype, phytotoxin and ergosterol biosynthesis of *R. solani* f. sp. *sasakii*. A total of 58 isolates belonging to maize, rice, moong and pigeon pea collected from different parts of the country were subjected to pathogenicity analysis. All the isolates could cause infection on the susceptible maize cultivar Vivek QPM-9, irrespective of their hosts of origin. The time taken for *R. solani* isolates to express symptoms on maize crop varied from 1.0 to 3.4 days. The per cent disease index (PDI) ranged from 56.0 to 90.0. The virulence index varied from 16.5 to 90.0. The length of infected area recorded in different *R. solani* isolates ranged between 50.2 cm to 85.6 cm. The relative length of infected area produced by different isolates varied from 26.7 to 45.5 as per cent. Among all isolates, two isolates, M25 and M16 of *R. solani* f. sp. *sasakii* were superior in above mentioned parameters. The phylogenetic relationship of twenty two selected isolates of *R. solani* based on ITS sequences also revealed differences of M25 and M16 from other isolates, and hence was selected for further studies. The effect of nano-hexaconazole on phenotypic characters of *R. solani* f. sp. *sasakii* M25 and M16 isolates revealed higher radial growth inhibition, delayed sclerotia formation, reduced number and weight of sclerotia, decreased infectivity of nano-hexaconazole exposed fungi on host when compared with commercial hexaconazole. However, it did not exhibit a clear role in colony colour, colony appearance, sclerotial colour, sclerotial aggregation and sclerotia formation pattern of the test isolates. Nano-hexaconazole and commercial-hexaconazole caused prominent morphological changes on hyphae, which were rough and wrinkled, globular structures of different sizes, complete collapse of hyphae, and tearing off of hyphal walls. The fungi cultured in nano-hexaconazole amended Richards growth medium yielded least quantity of phytotoxin. In vitro bioassay of phytotoxin collected from nano-hexaconazole amended growth medium produced reduced necrotic lesion on the leaves of susceptible maize cultivar. Tissue necrosis due to phytotoxin was also observed on different host species viz., barley, wheat, rice, tomato, onion, field bean, citrus and pomegranate apart from maize. Infrared (IR) spectrum of phytotoxin resulted in possible presence of lactone, ketone and benzene groups in the crude phytotoxin. The HPLC study revealed less phytotoxin in the pathogen exposed to nano-hexaconazole than in commercial-hexaconazole. Biosynthesis of ergosterol was also less in nano-hexaconazole treated *R. solani* f. sp. *sasakii*.

Description: t-9128

Subject: Plant Pathology

Theme: Banded leaf and sheath blight (BLSB) caused by *Rhizoctonia solani* f. sp. *sasakii* is one of the most important fungal diseases of maize. Chemical control, more specifically use of fungicides is the most efficient means to manage this disease. A study was conducted to know the effect of two formulations of hexaconazole viz., commercial and newly synthesized nano-hexaconazole molecule on phenotype, phytotoxin and ergosterol biosynthesis of *R. solani* f. sp. *sasakii*. A total of 58 isolates belonging to maize, rice, moong and pigeon pea collected from different parts of the country were subjected to pathogenicity analysis. All the isolates could cause infection on the susceptible maize cultivar Vivek QPM-9, irrespective of their hosts of origin. The time taken for *R. solani* isolates to express symptoms on maize crop varied from 1.0 to 3.4 days. The per cent disease index (PDI) ranged from 56.0 to 90.0. The virulence index varied from 16.5 to 90.0. The length of infected area recorded in different *R. solani* isolates ranged between 50.2 cm to 85.6 cm. The relative length of infected area produced by different isolates varied from 26.7 to 45.5 as per cent. Among all isolates, two isolates, M25 and M16 of *R. solani* f. sp. *sasakii* were superior in above mentioned parameters. The phylogenetic relationship of twenty two selected isolates of *R. solani* based on ITS sequences also revealed differences of M25 and M16 from other isolates, and hence was selected for further studies. The effect of nano-hexaconazole on phenotypic characters of *R. solani* f. sp. *sasakii* M25 and M16 isolates revealed higher radial growth inhibition, delayed sclerotia formation, reduced number and weight of sclerotia, decreased infectivity of nano-hexaconazole exposed fungi on host when compared with commercial hexaconazole. However, it did not exhibit a clear role in colony colour, colony appearance, sclerotial colour, sclerotial aggregation and sclerotia formation pattern of the test isolates. Nano-hexaconazole and commercial-hexaconazole caused prominent morphological changes on hyphae, which were rough and wrinkled, globular structures of different sizes, complete collapse of hyphae, and tearing off of hyphal walls. The fungi cultured in nano-hexaconazole amended Richards growth medium yielded least quantity of phytotoxin. In vitro bioassay of phytotoxin collected from nano-hexaconazole amended growth medium produced reduced necrotic lesion on the leaves of susceptible maize cultivar. Tissue necrosis due to phytotoxin was also observed on different host species viz., barley, wheat, rice, tomato, onion, field bean, citrus and pomegranate apart from maize. Infrared (IR) spectrum of phytotoxin resulted in possible presence of lactone, ketone and benzene groups in the crude phytotoxin. The HPLC study revealed less phytotoxin in the pathogen exposed to nano-hexaconazole than in commercial-hexaconazole. Biosynthesis of ergosterol was also less in nano-hexaconazole treated *R. solani* f. sp. *sasakii*.

These Type: Ph.D

Issue Date: 2014

Appears in Theses (/handle/1/30364)

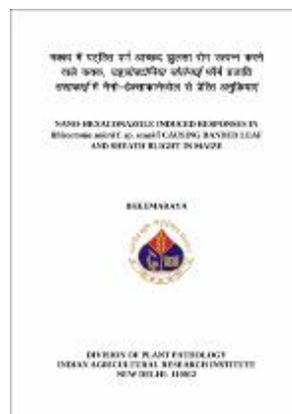
Collections:

Files in This Item:

File	Description	Size	Format
------	-------------	------	--------

Bheemaraya 10031.pdf

6.48 MB Adobe PDF



[View/Open \(/displaybitstream?handle=1/5810009824\)](#)

[Show full item record \(/handle/1/5810009824?mode=full\)](#)

[Statistics \(/handle/1/5810009824/statistics\)](#)

Items in DSpace are protected by copyright, with all rights reserved, unless otherwise indicated.