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RESEARCH ARTICLE

Documentation and management of anthracnose - A new nursery disease of *Garcinia indica Choice* in Karnataka

■ M.S. LOKESH[1]*, V. SURYANARAYANA[2], S.V. PATIL[3], S.B.GURUMURTHY[3], M.G. PALAKSHAPPA[4] AND G.O. MANJUNATH[2]

[1*]AICRP on Spices, Horticulture Research Station (U.H.S.) Sirsi, UTTARA KANNADA (KARNATAKA) INDIA
[2]Department of Plant Pathology, College of Forestry (UAS-D.) Sirsi, UTTARA KANNADA (KARNATAKA) INDIA
[3]Department of Agronomy, College of Horticulture, Sirsi, UTTARA KANNADA (KARNATAKA) INDIA
Email: sangappavpatil@gmail.com
[4]AICRP on Sesame and Niger, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
Email pal_uasd@gmail.com

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*Corresponding author :
lokeshsirsi@ rediffmail.com

ABSTRACT

An anthracnose disease in nursery of *Garcinia indica* was observed in Uttara Kannada of Central Ghats of Karnataka. Sympto matology and etiology of disease resulted into the observations of *Colletotrichum glocosporioides* Penz. Pathogenicity of the fungus was established. Seven fungicides were evaluated *in vitro* for their efficicaey. The fungus constitutes the new record from Karnataka on *Garcinia indica* choice cousing anthracnose in nursery.

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INTRODUCTION

Kokum (*Garcinia indica* Choice), a medicinally important spice crop, indigenous to the Western Ghats is commonly cultivated in home gardens and in areacanut based system. It is popularly used as traditional home remedy in case of flatulence, heat strokes and infections (Kirtikar and Basu, 1984). It has high medicinally valued hydroxyl citric acid (HCA) helpful in treating obesity and acidity as HCA has high antioxidant property (Peter, 2001; Wildman, 2001). So, in recent past, there is high industrial demand to extract HCA from the fruit rind (Jena *et al*., 2002). In the eve of commercial venture through extensive nursery networks, stress affecting seedlings growth and vitality cannot be ignored. Recently, next to insect pest menace, diseases are gaining momentum in damaging seedlings especially foliar diseases. Though, no reports are available in Karnataka, however in India, there is only one record from Maharashtra on the occurrence of leaf spot caused by *Colletotrichum glocosporioides* Penz. and its *in vitro* management (Jadhav *et al*., 2008). In the preliminary survey made in the forest nurseries and medicinal plants nursery raised in Sirsi, Karnataka showed anthracnose disease on foliage. As it was not under records in Karnataka and by looking to increasing seedlings demand, it was considered to work in detail about the disease.

MATERIALS AND METHODS

Investigations on disease incidence, etiology, symptoms and lab assays with different fungicides were carried out at Horticulture Research Station, Sirsi, Uttara Kannada district during 2010.

Disease documentation:

Survey for documenting disease in *Garcinia indica* was done in a nursery maintained at Horticulture Research Station, Sirsi. Disease incidence was recorded by using the formula nd/N X100 (where, nd = number of seedlings affected , N= total number of seedlings observed). The characteristic symptom of disease on foliage was recorded in the affected young seedlings.

Characterization of the pathogens :

Characterization of the pathogen was done to develop a management strategy. The affected plant samples collected from the field were subjected to tissue isolation on Potato dextrose agar medium. The culture media was prepared by the standard procedures.

Tissue isolation and pure culture maintenance :

The infected sample bits with healthy tissue margin of 3-5 mm were cut and such bits were surface sterilized by rinsing with 0.1 per cent mercuric chloride for 30 seconds. Such, surface sterilized bits were subjected to 4 serial washes with sterilized distilled water followed by transferring them onto PDA using sterilized forceps. Then, the inoculated plates were incubated at 26-28^{0}C. Pure culturing was done by lifting and transferring actively growing mycelium from two days old culture using sterilized inoculation loop onto fresh PDA slants under aseptic conditions.

Pathogenicity tests :

To ascertain the cause of the disease, pathogenicity test was done by proving Koch's postulates.

Identification :

Microscopic observations of pure culture was done and the observations on mycelium, asexual structures and sexual structures were made. Standard literature were referred for characterization of pathogen (Alexopulous *et al.,* 1995).

***In vitro* efficacy of fungicides:**

The experiment was laid out with seven different treatments, each with two concentrations (1000 ppm and 2000 ppm) and replicated thrice in each of the concentrations. The experimental design employed was factorial completely randomized design (CRD). The fungicides used were, Carbendazim 50 per cent W.P, Mancozeb 75 per cent WP, Hexaconazole 5 per cent EC, (Carbendazim 50% WP + Mancozeb 75% WP), Cuprous oxide, Propiconazole 25 per cent EC and Wettable sulphur 80 per cent WP. A check was maintained without poisoning the medium with fungicide. The poisoned food technique described by Nene and Thapliyal (1993) was employed in carrying out the experiment.

Preparation of fungicidal solution and assay :

Stock solutions of 5000 ppm for all the above given fungicides were prepared based on the active ingredient. The amount of commercial product to be used= (Required dose/ Active ingredient) X 100. For preparing 1000 ppm, of 45 ml (taking into consideration that 15 ml of media per Petri plate), concentrated fungicide media, 9 ml of the stock solution was poured in to 36 ml of sterilized PDA. Similarly for preparing 45 ml of 2000 ppm concentration, 18 ml of the stock solution was poured into 27 ml of sterilized PDA.

Assay for fungicidal solutions :

Poisoned medium of 15 ml in each of the concentration under respective treatment was poured under aseptic condition. Actively growing mycelial discs of 7mm from 7 days old culture maintained on PDA were cut using sterilized cork borer. Using sterilized inoculation loop individual discs were lifted and inoculated to poisoned PDA. Such plates were incubated at 27-28^{0}C.The observations on radial growth of mycelia in different treatments including check were assessed. It was measured at daily interval till the growth of fungus in the check reached periphery of Petriplate. The per cent mycelial growth inhibition over control was calculated by using the formula, I= (C-T/C) X100 (I= per cent inhibition, C= Growth in control, T= Growth in treatment) as developed by Vincent (1974).

RESULTS AND DISCUSSION

The findings of the present study well as relevant discussions have been presented under following heads:

Disease incidence and symptoms :

In survey the leaf spot disease in *G. indica* has ranged from 15-22 per cent. The characteristic symptoms were the appearance of minute brown spots on the foliage. Gradually, they developed into irregular to ovate shaped spots with brown centre having dark brown margins with a distinct yellow hallow. Shot hole appearance was also observed in the later stages.

Characterization of pathogen :

The pathogen was identified as *Colletotricum glocosporioides* Penz. based on visual observations of colony characters and microscopic observations of mycelia and reproductive structures. Further, pathogenicity tests with the above pathogen through Koch postulates proved positive.

***In vitro* evaluations of fungicides against *Colletotricum gleosporioides* :**

It is evident from Table 1, that significant differences existed among all treatments at both the concentrations (1000 ppm and 2000 ppm) with respect to mycelial growth inhibition and indicated a positive correlation between growth inhibition

Table 1: *In vitro* efficacy of fungicides against *Colletotrichum gloeosporioides* causing anthracnose of *Garcinia indica*

Treatments	Mean colony diameter (mm)		Mycelial growth inhibition over control (%)		Mean mycelial inhibition (%)
	Concentration		Concentration		
	1000	2000	1000	2000	
T_1- Carbendazim 50% WP	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
T_2- Mancozeb 75% WP	27.84	18.57	20.72 (27.06)	56.03 (48.45)	38.37 (38.23)
T_3- Hexaconazole 5 % EC	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
T_4-(Carbendazim 50% WP+Mancozeb75% WP)	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
T_5- Cuprous oxide	57.10	45.56	55.89 (48.33)	68.73 (55.98)	62.31 (52.18)
T_6- Propiconazole 25% EC	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
T_7- Wettable sulphur 80% WP	59.00	47.35	10.87 (19.19)	23.65 (29.06)	17.26 (24.50)
T_8- Control	90.00	90.00	0.00 (0.00)*	0.00 (0.00)	0.00 (0.00)
Mean treatment effect	29.24	25.18			
			S.E.±	C.D. at 1%	
Concentration			0.43	1.65	
Treatment			0.87	2.89	
Concentration x Treatment			1.23	3.79	

* Figures in the parenthesis indicate arcsine transformed values

and concentration of fungicides. Cent per cent mycelial growth inhibition was recorded at both the concentrations of 1000 ppm and 2000 ppm in four treatments *viz.,* Carbendazim 50 per cent WP, Carbendazim 50 per cent WP + Mancozeb 75 per cent WP, Propiconazole 25 per cent EC and Hexaconazole 5 per cent EC over the control. The least (10.87 % and 23.65% at 1000 and 2000 ppm, respectively) was recorded in Wettable sulphur 80 per cent WP. Second least mean mycelial growth inhibition was recorded in Wettable sulphur 80 per cent WP. Though, many insect pest damages have been reported in *Garcinia indica*, there is no record of Anthracnose disease in Karnataka on it. However, there is one record of leaf spot on *Garcinia indica* from Maharashtra for the first time in India (Jadhav *et al*., 2008). They worked out in detail about its management under *in vitro* conditions. The observations of the present findings are in confirmatory with the recordings of Jadhav *et al*. (2008). Their study revealed 100 per cent mycelial growth inhibition by Mancozeb + Carbendazim (0.25%), Propiconazole (0.1%), Carbendazim (0.1%), Tricyclazole (0.15%) among nine fungicides tested. The entire generated information from the present investigations forms a first of its kind in Karnataka state of India.

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