

Host range of *Paramyrothecium roridum* isolated from jute

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ABSTRACT

A foliar pathogen causing leaf spots on jute was collected from Prakasam district. The fungal pathogen that was identified as *Paramyrothecium roridum* by using its morphological characteristics. The host range of most virulent *Paramyrothecium roridum* isolate was evaluated by using nine plant species belonging to five families. The fungus was able to produce disease symptoms on six plants species (jute, soybean, blackgram, cotton, *Panicum javanicum* and *Amaranthus* spp.). The results indicated jute as the primary host.

Key Words: *Host range, Paramyrothecium, Jute and Pathogenicity test*

Jute (*Corchorus capsularis* L. and *Corchorus olitorius* L.), also known as “Golden fiber” (Fakhar *et al.*, 2021) is the second most important bast fiber crop next to cotton. It is a dicotyledonous plant, mostly self-pollinated (Fryxell, 1957) but sometimes with natural outcrossing (Basak and Paria, 1975; Mir *et al.*, 2009) it belongs to the Tiliaceae family. It is widely cultivated in India, Bangladesh, Nepal, China, Indonesia, Thailand, Myanmar and in South American countries (Mahapatra *et al.*, 1998).

Fungal foliar pathogens not only affect the yield and health of crop but are also responsible for deteriorating the quality of fibre as well as seeds (Kashem *et al.*, 2018). *Myrothecium roridum* Tode has been considered as important as a plant pathogen, affecting more than 200 plant species of distinct botanical families (Tulloch, 1972; Domsch *et al.*, 1980; Ahrazem *et al.*, 2000; Murakami and Shirata, 2005). As a soilborne fungus with a broad susceptible host range, control of *M. roridum* is difficult (Bruton, 1996). Furthermore, depending on the host-pathogen interaction, *M. roridum* is seedborne and efficiently transmitted through seeds (Ellis, 1971; Mendes *et al.*, 1998). Thus, there was a need to identify the last range of this pathogen and an attempt was made in the study.

MATERIAL AND METHODS

Paramyrothecium isolate from jute was used for the experimentation and was collected from the

department of Plant Pathology, Agricultural College, Bapatla, for experimentation. The test plants (9) were raised in earthen pots filled with sterilized soil under greenhouse conditions (Table 1). The experiment was conducted by using a CRD, with 3 replications of each treatment, and control and were maintained without pathogen inoculation.

Paramyrothecium isolate was multiplied on PDA plates. The conidial suspension was prepared from a seven days old culture where a millilitre of sterilized double-distilled water was added to PDA plates containing the culture of the test fungus, and to remove the conidia, the culture was gently rubbed with a sterile needle and the spore suspension was collected in a sterilized test tube containing 9 ml of sterilized double-distilled water. The suspension was adjusted to 1×10^6 conidia per millilitre of water using haemocytometer.

The conidial suspension of *Paramyrothecium* isolate was inoculated on 45 days old seedlings of tested plants by spraying the conidial suspension of 1×10^6 concentration with a hand sprayer during evening hours. The inoculated plants were incubated at 25 to 28°C under 100% humidity for 24 hours by covering seedlings with a perforated polythene bag for penetration of conidia and disease development. The un-inoculated plants served as controls. Observations on incubation period and per cent disease index were recorded at regular intervals. Disease severity was recorded on the standard 0–4 scale (Table 2) and PDI was calculated to compare the effect of *Paramyrothecium* pathogen on different hosts.

Table 1. List of plants used for host range studies

Sl. No.	Type of plants	Host Plant		Family
		Common name	Scientific name	
1	Crops	Jute	<i>Corchorus capsularis</i>	Malvaceae
2		Rice	<i>Oryza sativa</i>	Poaceae
3		Maize	<i>Zea mays</i>	Poaceae
4		Soybean	<i>Glycine max</i>	Fabaceae
5		Black gram	<i>Vigna mungo</i>	Fabaceae
6		Groundnut	<i>Arachis hypogaea</i>	Fabaceae
7		Cotton	<i>Gossypium hirsutum</i>	Malvaceae
8	Weeds	Panicum	<i>Panicum javanicum</i>	Poaceae
9		Amaranthus	<i>Amaranthus</i> spp.	Amaranthaceae

$$PDI = \frac{\text{Sum of individual disease ratings}}{\text{No. of observations assessed} \times \text{Maximum disease rating}} \times 100$$

Table 2. Descriptive scale for assessing disease severity (Sheo Raj, 1988)

Scale	Per cent of leaf area covered
0	No infection
1	A few spots of less than 2 mm size, leaf area covering less than 5%
2	Spots of 3 mm size, covering 6-20% of leaf area
3	Spots of 3-5 mm size, irregular in shape coalesce and covering 21-40% of leaf area.
4	Spots covering more than 40% of leaf area

RESULTS AND DISCUSSION

Incubation period and symptomatology:

Incubation period of two days for *Paramyrothecium* was observed in *Panicum javanicum* while it was three days for jute, soybean, blackgram, cotton and *Amaranthus* spp. However, rice, maize and groundnut did not support for pathogen establishment and development.

On leaves: Inoculated leaves were initially observed with minute water-soaked circular spots that spread gradually as round to irregular lesions, which later turned into irregular spots with greyish centre and dark brown margin (plate.1).

On stem: The infected seedlings showed brown necrotic lesion on tender stem and petioles (Plate.1). Similar symptoms were reported by Singh and Narain (2008) who observed symptoms on the leaves and sometimes on petioles and tender branches as minute,

dark purple spots or streaks, which gradually increased in size on different hosts which included blackgram and cotton.

Per cent disease index: After three DAI highest PDI of 7.41% was observed in jute followed by 6.94% in cotton and *Panicum javanicum*. A drastic increase in symptoms from three DAI (2.78%) to eight DAI was seen in blackgram (8.80%) and soybean (8.33%).

Per cent disease index (PDI) increased gradually among all the hosts. After 18 days of inoculation highest PDI of 30.56% was seen in jute followed by blackgram and cotton (11.57%) and similar result was observed at 23 and 28 DAI. At 33 DAI the highest PDI of 37.50% was seen in jute followed by cotton (15.28%), blackgram (14.81%) and soybean (14.35%) which recorded higher PDI than *Panicum javanicum* (14.35%) and

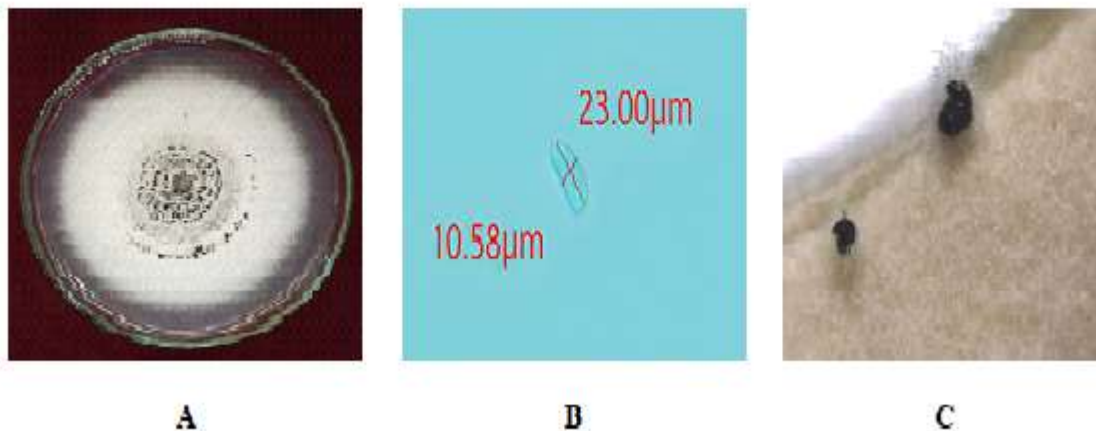


Plate.1 A: culture plate of *Paramyrothecium roridum* B: conidia and C: sporodochium

Table 3. Effect of *Paramyrothecium* isolate on different hosts

Crop	Incubation period (days)	Per cent Disease Index (PDI%)						
		3 DAI	8 DAI	13 DAI	18 DAI	23 DAI	28 DAI	33 DAI
Jute	3	7.41 (2.90) ^a	16.20 (4.15) ^a	30.56 (5.62) ^a	30.56 (5.62) ^a	32.87 (5.82) ^a	34.26 (5.94) ^a	37.50 (6.20) ^a
Rice	0	0.00 (1.00) ^d	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^d
Maize	0	0.00 (1.00) ^d	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^d
Soybean	3	2.78 (1.94) ^c	8.33 (3.06) ^{bc}	9.26 (3.20) ^{cd}	10.65 (3.41) ^{bc}	11.57 (3.55) ^b	12.96 (3.74) ^{bc}	14.35 (3.92) ^b
Blackgram	3	2.78 (1.94) ^c	8.80 (3.13) ^{bc}	10.19 (3.34) ^{bc}	11.57 (3.55) ^b	12.04 (3.61) ^b	13.43 (3.80) ^b	14.81 (3.98) ^b
Groundnut	0	0.00 (1.00) ^d	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^c	0.00 (1.00) ^d	0.00 (1.00) ^d
Cotton	3	6.94 (2.82) ^a	9.72 (3.27) ^b	11.11 (3.48) ^b	11.57 (3.55) ^b	12.04 (3.61) ^b	12.96 (3.74) ^{bc}	15.28 (4.03) ^b
Panicum	2	6.94 (2.82) ^a	8.33 (3.06) ^{bc}	9.26 (3.20) ^{cd}	9.72 (3.27) ^c	11.57 (3.55) ^b	12.50 (3.67) ^{bc}	14.35 (3.92) ^b
Amaranthus	3	5.56 (2.56) ^b	7.87 (2.98) ^c	8.80 (3.13) ^d	9.26 (3.20) ^c	11.57 (3.55) ^b	12.04 (3.61) ^c	12.50 (3.67) ^c
SEm±	0.06	0.07	0.06	0.05	0.07	0.05	0.04	0.05
C.D. (P ≤ 0.05)	0.18	0.22	0.18	0.16	0.19	0.15	0.13	0.16
CV (%)	2.15	6.31	4.23	3.35	3.99	2.92	2.47	2.94

*Figures in parenthesis are square root transformed values

Mean of two replications

#Figures with similar alphabets doesn't differ significant.

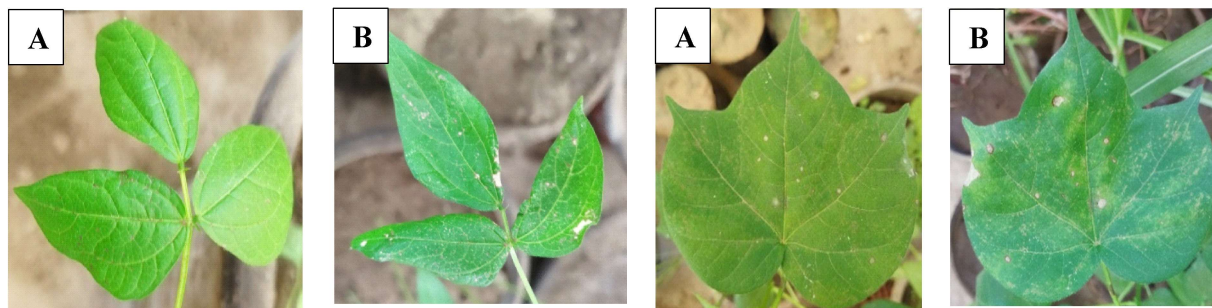
Amaranthus spp. (12.50%). Rice, maize and groundnut did not serve as host for *Paramyrothecium* (Table 3).

The occurrence of maximum PDI (37.50%) on jute at 33 DAI confirmed it as the primary host, while the other infected hosts like soybean, blackgram, cotton and weed species like *Panicum javanicum* and *Amaranthus* spp. as collateral hosts. Rice, maize and groundnut were termed to be non-host crops (Table 3).

The results were in accordance with the earlier reports given by Singh and Narain (2008) and

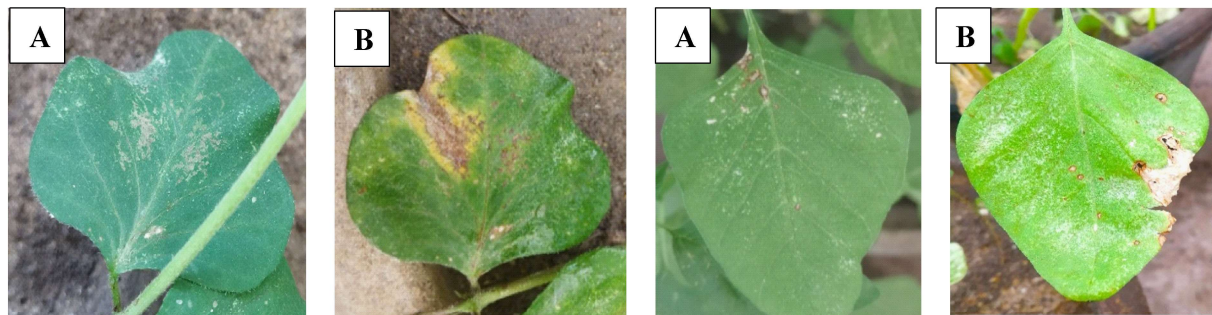
Quezado *et al.* (2010) who reported cotton and blackgram as host to *Myrothecium* spp. Nguyen *et al.* (1973), Talukdar and Dantre (2014) reported that soybean as an alternative host for the pathogen. Several weed species like *Amaranthus* spp. and *Panicum* spp. (Yang and Jong (1995), water hyacinth Piyaboon *et al.* (2016) were identified as collateral hosts for the pathogen. Srivastava and Khan (1997) reported a disease index of 94.4% on soybean plants inoculated 25 days after sowing.

In present investigation rice, maize and groundnut was found to be non-host crops. This is in



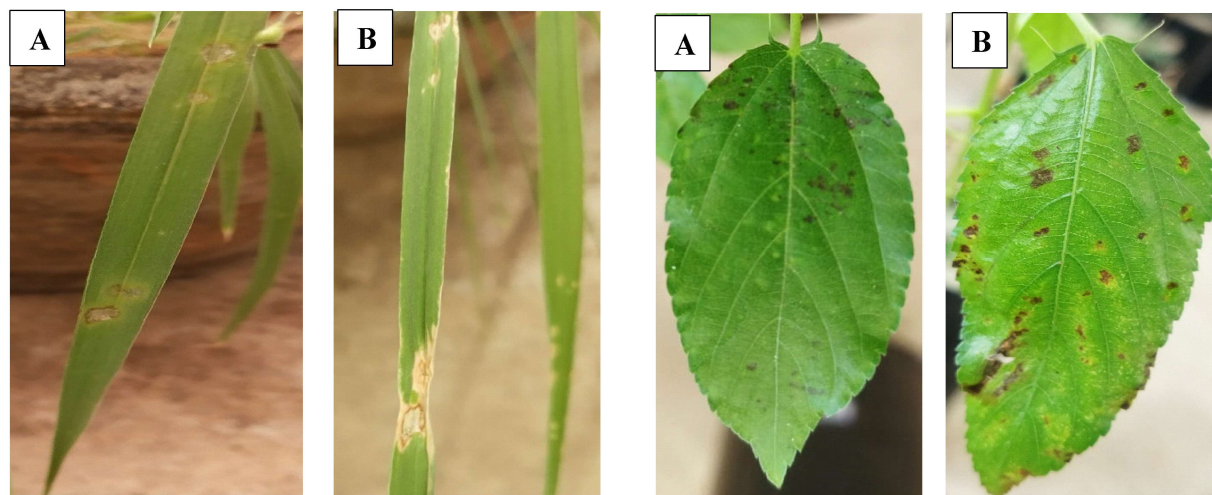
Blackgram

Cotton



Soybean

***Amaranthus* spp.**

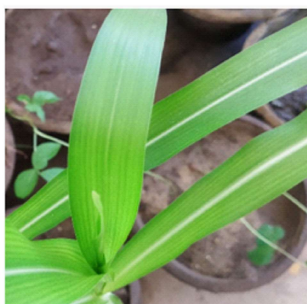


Panicum javanicum

Jute



Rice



Maize



Groundnut

Plate. 2. Response of different hosts to *Paramyrothecium roridum* inoculation

accordance with Singh and Narain (2008) and Piyaboon *et al.* (2016) who reported that *Paramyothecium* spp. does not cause disease on rice, maize and groundnut. This is in contrary to Nguyen *et al.* (1973) who reported that rice is a host to *M. verrucaria*.

CONCLUSION

The present study indicates that *Paramyothecium roridum* from jute has caused disease on jute, soybean, blackgram, cotton, Amaranthus spp. and Panicum javanicum but symptoms were not produced on rice, maize (cereals) and groundnut.

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