J. Biol. Control, 18(1): 87-90, 2004

Research Note

Report of entomopathogenic fungi on adults of lepidopteran pests in rice

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ABSTRACT: **Fungal infection on moths of lepidopteran pests of rice plant has been witnessed in certain parts of Tamil Nadu. Three entomopathogenic fungi *viz.*, *Mucor hiemalis*, *Fusarium moniliformae* and *Scopulariopsis* sp. have been isolated from the yellow rice borer, leaffolder cutworm and yellow hairy caterpillar moths of rice ecosystem. All the fungi are found pathogenic. In laboratory evaluation spore suspensions of moth infecting fungi each at concentration of $1x10^7$ spores/ml revealed their virulence against yellow rice borer, leaf folder and cutworm with 60, 61.60 and 52.6 per cent mortality.**

KEYWORDS: Cadaver, entomophathogenic fungi

Lepidopterans like yellow rice borer, *Sciropophaga incertulas* (Walker) and leaffolder, *Cnaphalocrocis medinalis* (Guenée) are major limiting factors in rice production as they attack rice plant at both vegetative and reproductive stages causing significant reduction in the yield by 48.8-56.9 per cent. (Murugesan and Chelliah, 1983).

Larvae of the lepidopteran pests are the most destructive stages of rice plants. If the adult moths, which are the introducers of these infesting larval stages, tackled with any means, the yield losses can be prevented to a great extent. Earlier workers have reported infection of adult stages of rice pests like brown planthopper, and other leafhoppers by fungal pathogens (Narayanasamy, 1994). However, such reports are few and scattered.

In this background, surveys were conducted to isolate and identify virulent entomopathogenic fungi, if any, infecting moths of key pests of rice like yellow rice borer, leaffolder, etc. and to ascertain pathogenicity of fungal pathogens Koch's postulate was proved.

Surveys were undertaken in rice fields of Cuddalore, Nagapattinam, Pudukkottai districts and Pondicherry union territory to collect naturally occurring fungal cadavers of adult moths of rice pests. Collections were made during *samba* season (Oct.–Feb., 2000 and 2001). At each site of the survey, 50 hills were examined for the mycosed moths. The cadavers noticed were collected in sterile glass vials, separately. Pathogens of the cadavers were isolated on PDA medium following standard mycological techniques (CMI, 1983).

Fungal infected cadavers were subjected to identification, besides raising culture slants. Spore suspension of each pathogen was prepared by using 75-100ml of sterile distilled water containing Tween-80 solution. The spore concentration of $1x10^7$ spores with more than 85 per cent of germination was taken for spraying (Gillespie, 1986).

Spore suspension of the fungi was sprayed using glass atomizer over insects confined with Mylar film cages enclosing rice plants of CR-1009 variety, which is susceptible to the yellow rice borer. Cotton wool dipped in 50 per cent honey solution was kept as diet for adults. Three replications were maintained. Per cent mycosis of the test moths was recorded two days after treatment. The cadavers were used for re-isolating the pathogen in pure culture for confirming the pathogenicity of fungi.

The potted rice plants confined with ten moths of yellow rice borer in each cage were subjected to 5 concentrations and replicated 4 times. The treatments comprised of $1x10^7$, $6.2x10^6$, $5.7x10^6$, $4.5x10^6$ spores ml^{-1} and a control. Per cent mycosis was recorded similar to pathogenicity test.

Totally three fungi were isolated from pests of rice. Yellow rice stem borer was infected by two fungi, namely, *Mucor hiemalis* and *Fusarium moniliformae* and cutworm by *Scopulariopsis* sp. (Table 1). *Mucor hiemalis* was recorded on yellow rice borer, leaf folder and yellow hairy caterpillar.

Table 1. Survey and collection of fungal cadavers of moth pests from Tamil Nadu and Pondicherry

Place of collection	Fungal infection (%)					
	Yellow rice borer		Leaffolder	Yellow hairy caterpillar	Cutworm	Fungal occurrence(%)
	M.hiemalis	*F.moniliformae*	*M.hiemalis*	*M.hiemalis*	*Scoplariopsis* sp.	
Annamalainagar	42.81	38.82	35.40	37.20	32.254	55.04
Bhuvanagiri	33.69	-	-	-	-	26.95
Kavarapattu	-	-	-	-	-	-
Keerapalayam	39.00	23.74	29.85	-	30.30	47.68
Manalur	40.50	34.10	34.48	-	-	45.27
Mariappa nagar	38.00	-	-	-	-	17.98
Orathur	-	-	-	-	-	-
Sivapuri	-	33.80	-	-	-	18.32
Vallampadugai	-	-	-	-	-	-
Vandurayanpattu	-	-	-	-	-	-
Vaitheeswaran koil	34.04	-	-	-	-	34.04
Kudumianmalai	21.55	21.30	-	-	-	33.96
Vamban	-	-	-	-	-	17.92
Pondicherry	29.68	-	-	-	-	19.40
Karaikkal	27.77	-	-	-	-	20.00

In majority of places, yellow rice borer was recorded with *Mucor hiemalis* with overall casualities of moths ranging between 21.55 and 42.81 per cent. The entomophathogenic fungus on cadavers was identified by whitish, tightly packed filamentous hyphal bodies, which engulfed the entire body of the moths leaving the wings.

The leaffolder and cutworm moths were found infected by *Mucor hiemalis* and *Scopulariopsis* sp., respectively with overall casualities ranging from 23.74 to 38.82 per cent for leaf folder and 30.30 to 32.25 per cent for cutworm. This is in consonance with Narayanasamy (1994) who reported leaffolder, caseworm, yellow rice borer and cutworm moths infected by *Cladosporium* sp.

Pathogenecity test revealed that *F. moniliformae* isolated from Annamalainagar caused maximum mortality of 61.6 per cent which was more than maximum mortality caused by *M. hiemalis* against both yellow rice borer and leaffolder. This finding is supported by Varma and Tandon (1996) who reported that *Fusarium oxysporium* to be infective against *Chilo auricilius*, *Sesamia inferens* and *Chilo infuscatellus*. Again, the Annamalainagar isolate of *Scopulariopsis* sp. caused maximum mortality of 52.6 per cent against cutworm moths (Table 2).

Laboratory evaluation showed that *M. hiemalis* and *F. moniliformae* at a concentration of 1×10^7 conidia /ml caused highest mortality of 50.00

Table 2. Pathogenicity of selected strains of *M. hiemalis* against yellow rice borer and leaffolder moths

Isolate (Location)	Corrected mortality (%)			
	M. hiemalis		*F. moniliformae*	*Scopulariopsis* sp
	Yellow rice borer moths	Leaffolder moths	Yellow rice borer moths	Cutworm moths
Annamalainagar (Cuddalore District)	59.18[a] (50.28)	58.11[a] (50.83)	61.60[a] (51.70)	52.60[a](46.49)
Keerapalayam (Cuddalore District)	42.60[b] (40.74)	41.15[c] (39.90)	45,12[b] (42.19)	42.13[b] (40.47)
Manalur (Cuddalore District)	43.01[b] (40.98)	45.01[b] (42.13)	-	-
Vaitheeswarankoil (Nagapattinam District)	32.42[c] (34.70)	36.75[d] (37.31)	-	-
Kudumianmalai (Pudukkottai District)	-	-	28.25[c] (32.10)	-
Control	15.81[d] (23.43)	16.21[e](23.74)	11.75[d] (20.04)	13.12[c] (21.23)
CD (P=0.05)	2.28	2.41	2.445	1.26
SEM±	0.80	1.08	1.14	0.58

Each value is the mean of three replications.

Figures in parentheses are arcsine-transformed values

In a column mean followed by a common letter are not significantly different (P=0.05) by DMRT

and 55.00 per cent followed by 6.2×10^6 ml^{-1} conidia with 47.50 and 50.00 per cent mortality (Table 3). Least mortality was observed with the concentration 4.5×10^6 conidia. From this data it is inferred that entomopathogenic fungi appear to be appropriate tools to combat adult moths pests of the rice plant.

Table 3. Laboratory evaluation of certain entomopathogenic fungi against yellow rice borer moths

Concentration (Spores / ml)	Corrected mortality (%)	
	M. hiemalis	*F. moniliformae*
1×10^7	50.00[a] (45.00)	55.00[a] (47.86)
6.2×10^6	47.50[b] (43.56)	50.00[b] (45.00)
5.7×10^6	42.50[c] (40.68)	45.00[c] (4.13)
4.5×10^6	32.50[d] (34.75)	35.00[d] (36.27)
Control	5.00[e] (12.92)	5.00[e] (12.92)
CD (P=0.05)	2.10	2.31
SEM±	0.85	0.97

Each value is the mean of four replications.

Figures in parentheses are arcsine-transformed values.

In a column mean followed by a common letter are not significantly different (P=0.05) by DMRT.

ACKNOWLEDGEMENTS

We thank authorities of Annamalai University for providing necessary facilities and permission for the study. Our sincere thanks are due to Dr. Richard A. Humber, Insect Mycologist, United States Department of Agriculture, Agricultural Research Service, Ithaca, New York for his help in identification of the fungi.

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