

Biodiversity of entomopathogenic fungi on coastal rice in Puducherry

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ABSTRACT

Survey was conducted in six communes of Karaikal district, U. T. of Puducherry, India viz., Nedungadu, Thirunallar, Kottucherry, T. R. Pattinam, Neravy and Karaikal. Survey on natural occurrence of entomopathogenic fungi indicated that mycosis was more pronounced in rice crop followed by pulse (black gram). Sixteen species of fungal pathogens were isolated from insect cadavers collected from different communes. The identified pathogenic fungi were *Aspergillus flavus* Link, *Aspergillus niger* van Tieghum, *Aspergillus oryzae*, *Aspergillus parasiticus* Speare, *Beauveria bassiana* (Bals.) Vuill., *Beauveria bronginiartii* Tenella, *Fusarium moniliforme* Sheld, *Fusarium moniliforme* Var *Subglutinans* *Fusarium oxysporum* Schlecht, *Fusarium pallidoroseum* (Cooke) Sacc. *Fusarium solani*, *Mucor cymosus*, *Paecilomyces varioti* Bain, *Penicillium citrinum*, Sacc., *Rhizopus stolonifer* and *Verticillium psalliotae* Treschow based on cultural and morphological characters.

Key words: Puducherry, coastal rice, entomopathogenic fungi, isolation, identification

Entomopathogenic fungi are known to be the earliest identified organisms since they play a significant role in causing fungal diseases in insects under natural conditions. In rice ecosystem epizootics of mycosis was well pronounced (Narayanasamy, 1993). Hence surveys were undertaken to identify the naturally occurring entomopathogenic fungi (EPF) on rice in the coastal agroecosystem of Karaikal.

Cadavers were collected from the standing crops during September 2006 to February 2007 and September 2007 to February 2008 in six communes of Karaikal district to survey for the presence of entomogenous fungi. In rice 50 hills and for rice fallow pulses 50 plants were randomly observed for the presence of mycosed insects. The cadavers were collected separately in sterile glass vials and brought to laboratory for further study.

The insect cadavers were surface sterilized with 0.5 per cent sodium hypochlorite in 75 per cent alcohol and rinsed in three changes of sterile water for 1-2 min. Washed specimen was cut into pieces and placed on Sabouraud's Dextrose Agar (SDA) with yeast extract medium. The fungal colonies appeared were observed. Tip of the mycelial growth was transferred aseptically into the SDA slants. The cultures were purified and maintained in SDA slants (Dayakar and Kanaujia, 2001).

The EPF were isolated, purified and maintained in SDA media in slants. On the basis of the morphological and cultural characters, the fungi isolated from the insects were identified based on the morphological characters and further confirmed by National Centre of Fungal Taxonomy, New Delhi.

Of the sixteen native fungi thus isolated and identified six fungi were found to be highly pathogenic. *B. bassiana* was pathogenic to rice coccinellid beetle *Micraspides discolor* (fab) and black gram spotted pod borer. *F. moniliforme* was pathogenic to green leaf hopper in rice. *F. pallidoroseum* was highly virulent against rice leaf folder and *V. psalliotae* was effective against brown plant hopper and skipper in rice.

Mycosis of *B. bassiana* on rice leaf folder was earlier reported by Rao (1975). Ambethgar (1996) reported multiple outbreaks of *B. bassiana* on leaf folder in lowland rice from Karaikal region of Puducherry.

Among the natural enemies in rice, occurrence of *B. bassiana* has been well documented in coccinellids. In black gram *B. bassiana* infection was noticed in all the communes because of its short stature, dense canopy, microclimate and presence of high larval population. This is reported for the first time in India.

Table 1. Identification of entomopathogenic fungi isolated during September 2006 to February 2008

Sl. No.	Pathogens identified	Species	Stage of cadaver	Location
1.	<i>Aspergillus flavus</i> Link	<i>Nephotettix virescens</i> (Dist.)	Adult	Kottucherry
		<i>Scotinophara lurida</i> Burmeister	Adult	Nedungadu, Thirunallar
		<i>Cnaphalocrocis medinalis</i> (Guenee)	Larva	Thirunallar, Karaikal, T.R. Pattinam, Neravy
		<i>Pelopidas mathias</i> (Fab.)	Larva	Nedungadu, T.R. Pattinam
		<i>Micraspis discolor</i> (Fab.)	Adult	Nedungadu
2.	<i>Aspergillus niger</i> Van Tieghem	<i>Scotinophara lurida</i> Burmeister	Adult	Nedungadu, Karaikal, Neravy, T.R. Pattinam
3.	<i>Aspergillus oryzae</i>	<i>Melanitis leda ismene</i> (Drury.)	Larva	Karaikal
4.	<i>Aspergillus parasiticus</i> Speare	<i>Nephotettix virescens</i> (Dist.)	Adult	Nedungadu, T.R. Pattinam
		<i>Pelopidas mathias</i> (Fab.)	Larva	Neravy
		<i>Psalis pennatula</i> (Fab.)	Larva	Thirunallar, Kottucherry
5.	<i>Beauveria bassiana</i> (Bals.) Vuill.	<i>Micraspis discolor</i> (Fab.)	Adult	Nedungadu, Karaikal, Neravy, T.R. Pattinam, Thirunallar, Kottucherry
		<i>Maruca testulalis</i> (Geyer)	Larva	Thirunallar, Nedungadu, Karaikal, Neravy
6.	<i>Beauveria brongniartii</i> Tenella	<i>Leptocorisa acuta</i> (Thunb)	Adult	Nedungadu,
7.	<i>Fusarium moniliforme</i> var. <i>subglutinans</i> Wollenw and Reink	<i>Nilaparvata lugens</i> (Stal.)	Adult	Nedungadu, Karaikal, Neravy
8.	<i>Fusarium moniliforme</i> (Sheld)	<i>Nephotettix virescens</i> (Dist.)	Adult	Nedungadu, Thirunallar, Karaikal
		<i>Leptocorisa acuta</i> (Thunb)	Adult	Thirunallar
		<i>Psalis pennatula</i> (Fab.)	Adult	Nedungadu, Karaikal
9.	<i>Fusarium oxysporum</i> Schlect	<i>Psalis pennatula</i> (Fab.)	Adult	Nedungadu, Thirunallar
10.	<i>Fusarium pallidoroseum</i> (Cooke) Sacc.	<i>Leptocorisa acuta</i> (Thunb)	Adult	Nedungadu
		<i>Cnaphalocrocis medinalis</i> (Guenee)	Larva	Nedungadu, Neravy, T.R.Pattinam, Thirunallar, Kottucherry, Karaikal
		<i>Pelopidas mathias</i> (Fab.)	Larva	Karaikal
		<i>Psalis pennatula</i> (Fab.)	Adult	Thirunallar
		<i>Micraspis discolor</i> (Fab.)	Adult	Nedungadu
		<i>Maruca testulalis</i> (Geyer)	Larva	Thirunallar
11.	<i>Fusarium solani</i>	<i>Nephotettix virescens</i> (Dist.)	Adult	Nedungadu, Karaikal
12.	<i>Mucor cymosus</i>	<i>Psalis pennatula</i> (Fab.)	Larva	Nedungadu, Neravy, T.R. Pattinam
13.	<i>Paecilomyces varioti</i> Bainier-Bull	<i>Maruca testulalis</i> (Geyer)	Larva	Thirunallar
14.	<i>Penicillium citrinum</i>	<i>Pelopidas mathias</i> (Fab.)	Larva	Karaikal
		<i>Ophionea</i> sp	Adult	Nedungadu, Karaikal, Kottucherry
		<i>Maruca testulalis</i> (Geyer)	Larva	Thirunallar, Nedungadu, Neravy
15.	<i>Rhizopus stolonifer</i>	<i>Nephotettix virescens</i> (Dist.)	Adult	Nedungadu, Kottucherry
16.	<i>Verticillium psalliotae</i> Treschow	<i>Nilaparvata lugens</i> (Stal.)	Adult	Nedungadu, Thirunallar, Kottucherry, Karaikal, Neravy
		<i>Pelopidas mathias</i> (Fab.)	Larva	Thirunallar, Nedungadu. Karaikal, Neravy, Kottucherry

The *F. moniliforme* isolated from the cadavers of the rice green leaf hopper was also found to be highly pathogenic. The maximum incidence of *F. moniliforme* was abundant during January and February of 2006-08 due to the favourable temperature and the microclimate prevalent in the Karaikal region. *F. moniliforme* was reported to be highly pathogenic to yellow stem borer *Scirpophaga incertulas* walker in rice (Yasodha and Narayanasamy, 2004).

Natural mycosis of *F. pallidoroseum* was noticed in rice leaf folder. This findings are in confirmity with Manisegarane and Letchoumanane (1996) who reported epizootics of *F. pallidoroseum* on rice leaf folder in Karaikal region, Kerala were found to be highly pathogenic to pulse aphid *A. craccivora* (Faizal and Mathai, 1996). Leaf folder larvae were infected predominantly with a fungus, *F. Pallidoroseum* in all the places of collection. The wide spread occurrence

of *F. Pallidroseum* on rice leaf folder was observed in all the communes clearly revealed the adaptability and potential of the fungus under field conditions.

V. psalliotae was predominant in Karaikal district and it was pathogenic to BPH and skipper in rice. Occurrence of *Verticillium* spp. on aphids was earlier reported by Hall and Burges (1979). Zare and Games (2003) reported that *Lecanicillium psalliotae* was mainly associated with a cacao cicadellid. A study conducted in Iran showed that *L. psalliotae* was very effective against the ticks *Boophilus* spp. (Kheirabadi *et al.*, 2007). Recently, Goettel *et al.* (2008) reported that development of *Lecanicillium* hybrids through protoplast fusion resulted in broad host range of insects and found to be effective against nematodes, whiteflies and aphids. It is evident from the study, that *V. psalliotae* was effective both to sucking pests and also lepidopteran caterpillar. The results confirmed that epizootics of fungal cadaver was pronounced well in rice crop. Forty species of entomopathogenic fungi were recorded in India alone (Narayanasamy, 2001).

Most of the fungi are well adapted and successful in ecosystems having high humidity and relatively constant temperature because of which, Gillespie and Jinenz (1990) stressed the importance of these agents for the rice pest management. *V. psalliotae* on BPH and rice skipper is reported for the first time in India.

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