

Pathogenicity of three entomogenous fungi against insect pests of sugarcane*

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ABSTRACT : Pathogenicity of three entomogenous fungi, *Beauveria bassiana*, *Fusarium oxysporum* and *Metarhizium anisopliae* var. *anisopliae* were conducted against eleven different insect pests of sugarcane in the laboratory. Of these, *B. bassiana* was found most pathogenic to larvae of *Chilo auricilius*, *Chilo infuscatellus* and *Sesamia inferens*; nymphs and adults of *Cavelerius sweeti*, adults of *Phytoscaphus* sp. and *Astychus lateralis*, and grubs of *Holotrichia consanguinea*. *Metarhizium anisopliae* was found pathogenic to larvae of *C. auricilius*, *C. infuscatellus* and *S. inferens*; adults of *Phytoscaphus* sp. and *A. lateralis*, and adults and nymphs of *Pyrilla perpusilla*. *Fusarium oxysporum* was found effective against larvae of *C. auricilius*, *C. infuscatellus* and *S. inferens*; and adults and nymphs of *P. perpusilla*.

KEY WORDS : *Beauveria bassiana*, *Fusarium oxysporum*, *Metarhizium anisopliae*, pathogenicity, sugarcane insect pests

Entomogenous fungi have been used successfully as microbial control agents of sugarcane pests in Taiwan (Wang Leu, 1974) and in Brazil (Risco, 1978; Almeida and Alves, 1982). To explore the possibility of utilising some of these fungi for the management of insect pests of

sugarcane in Uttar Pradesh, survey for entomogenous fungi of insect pests of sugarcane were conducted during 1978 - 1985 which resulted in isolating several entomogenous fungi (Varma and Tandan, 1995). The results of the same are being presented in the paper.

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MATERIALS AND METHODS

The fungi utilised for pathogenicity study were collected from sugarcane ecosystem. *Beauveria bassiana* (Balsamo) Vuillemin was isolated from dead adults of *Phytoscaphus* sp., *Fusarium oxysporum* Schlecht from dead larvae of *Chilo auricilius* Dudgeon collected from sugarcane field in Majhola in Pilibhit district (Uttar Pradesh) and *Metarhizium anisopliae* var. *anisopliae* (Metschinkoff) Sorokin from dead adults of *Pyrilla perpusilla* from Sehore (Madhya Pradesh). The fungi were cultured and maintained on potato dextrose agar (PDA) according to standard procedures (Poinar and Thomas, 1978; Schaerffenberg, 1964; Wittig, 1963; Zacharuk and Tinline, 1968). All pathogenicity tests were conducted with 30 days old culture of fungi kept at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ in BOD incubator. Ten insects of each species were allowed to crawl on a sporulating culture of the candidate fungus for twenty minutes. The petri dishes were shaken periodically for even scattering and deposition of the spores on bodies of test insects.

All inoculated stages were transferred to their preferred portions of sugarcane provided in glass jars or chimneys with tops covered with muslin cloth or petri dishes.

Humidity was maintained by a sheet of filter paper placed at the bottom of the containers, kept moist with sterile distilled water (SDW). The sterile sand into which the plant portions were planted was also

kept moist with SDW. In simultaneously run controls, ten identical stages not exposed to the fungi were used. All the tests were replicated five times. The treated and untreated control insects for the entire experimental period were kept in BOD incubator maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

After minimum disturbance during the first two or three days, the test insects were examined regularly at an interval of 24 h. Cumulative mortality at seven days interval was recorded. The corrected per cent mortality was calculated with the help of Abbott's formula (1925). The pathogenic fungi were reisolated from inoculated test insect to confirm the pathogenicity.

RESULTS AND DISCUSSION

Beauveria bassiana was found to be pathogenic to seven species of sugarcane pests. It caused 100 per cent mortality to first instar *C. auricilius* larvae within 4-5 days (Table 1). Mortality of fifth instar larvae of *C. auricilius* as also of *C. infuscatellus* and *S. inferens* ranged from 65-90 per cent within seven days. It killed 99 per cent and 90 per cent of adults and nymphs of *C. sweeti*, respectively within 7 days.

The fungus produced mortality in adults of two defoliators, *Phytoscaphus* sp. and *A. lateralis* to an extent of 75 - 80 per cent. The fungus killed 66 per cent of fourth instar grubs of *H. consanguinea* in 7 days, with first mortality occurring on 4th day.

Fusarium oxysporum was found to be pathogenic to only four species of insect pests of sugarcane. It caused 100 per cent mortality of first instar larvae of *C. auricilius*. Mortality of mature larvae of *C. auricilius* and *S. inferens* was 50 per cent and of *C. infuscatellus* was 30 per cent. The fungus caused mortality of *P. perpusilla* nymphs and adults to an extent of 15 per cent and 10 per cent, respectively (Table 1).

Metarhizium anisopliae was found to be pathogenic to six species of sugarcane pests. As evident from Table 1, the green muscardine fungus produced 40 per cent mortality of first instar larvae of *C. auricilius*. Mortality of mature larvae of *S. inferens*, *C. auricilius* and *C. infuscatellus* was 20 per cent, 25 per cent and 30 per cent, respectively. Adults of *Astychus lateralis* and *Phytoscaphus* sp. were killed by this fungus to the extent of

Table 1. Susceptibility of some major pests of sugarcane to *Beauveria bassiana*, *Fusarium oxysporum* and *Metarhizium anisopliae*

Insect/stage	Maximum mortality (%) and time taken (days) for		
	<i>B. bassiana</i>	<i>F. oxysporum</i>	<i>M. anisopliae</i>
<i>C. auricilius</i>			
1st instar	100 (4-5)	100 (7)	40 (7)
5th instar	90 (7)	50 (7)	25 (7)
<i>C. infuscatellus</i>			
5th instar	65 (7)	30 (7)	30 (7)
<i>S. inferens</i>			
5th instar	70 (7)	50 (7)	20 (7)
<i>A. lateralis</i>			
Adult	80 (7)	-	10 (7)
<i>Phytoscaphus</i> sp.			
Adult	75 (7)	-	20 (7)
<i>H. consanguinea</i>			
Grub	66 (7)	-	-
<i>C. sweeti</i>			
Adult	99 (7)	-	-
Nymph	90 (7)	-	-
<i>P. perpusilla</i>			
Adult	-	15 (7)	80 (7)
Nymph	-	10 (7)	90 (7)

10 per cent and 20 per cent, respectively. The fungus also killed 80 per cent of *P. perpusilla* adults in 7 days, while nymphal mortality was 90 per cent.

The three entomopathogenic fungi, *B. bassiana*, *F. oxysporum* and *M. anisopliae* evaluated for their pathogenicity to sugarcane pests proved non-pathogenic to three species of sucking pests viz., *M. indosacchari*, *S. sacchari* and *P. saccharifolii*. *Pyrilla perpusilla* proved susceptible to *F. oxysporum* but surprisingly not to *B. bassiana*. It was also highly susceptible to *M. anisopliae*. *Cavelerius sweeti* and *H. consanguinea* were found susceptible only to *B. bassiana*. *Holotrichia consanguinea* beetles from sugarcane have been reported to be infected by *M. anisopliae* in Bihar (Rao and Vijayalakshmi, 1959). *Astychus lateralis* and *Phytoscaphus* sp. were found susceptible to *B. bassiana* and *M. anisopliae*, with the former being more virulent.

Jagtap (1958) reported that a heavy spore suspension of *M. anisopliae* killed 92 - 98 per cent of adults and 90 - 95 per cent of nymphs of *P. perpusilla* while identically treated eggs hatched normally. Oblisami *et al.* (1969) evaluated *M. anisopliae* isolated from *P. perpusilla* using a heavy spore concentration and recorded 62 per cent adult mortality.

From the present studies *B. bassiana* emerges as the most promising microbial control agent followed by *M. anisopliae* and *F. oxysporum*.

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