J.Biol.Control, 7 (2), 109-111, 1993

Studies on the Natural Infection of the Entomogenous Fungus, *Beauveria velata* Sams. & Evans on Some Pests of Low Land Rice Ecosystem

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In Arunachal Pradesh, rice is the principal food crop, being grown in an area of 1,16, 500 ha (Anon, 1988). The crop is cultivated during Kharif season in diverse ecological conditions ranging from jhum land/up land/ rain fed conditions and low land having irrigated fields. Insect pests (Table 1) contribute substantially to low yields. Information pertaining to natural enemies of rice pests in this region has been reported earlier (Padmanaban *et al.,* 1990; Padmanaban and Chaudhary, 1991). First occurrence of *Beauveria velata* Sams. and Evans. infecting larvae of Arctiidae was reported by Samson and Evans (1982). Subsequently it was reported infecting the lepidopteran rice pests (Padmanaban *et al.,* 1990) (CMI Herb No. 331750 and 331751). In this communication, incidence of *B. velata* in relation to some lepidopteran rice pests is presented along with abiotic factors.

Seasonal incidence of the fungus in relation to lepidopteran rice pests was recorded at the ICAR Research Farm, Basar, (660 a.m.s.l.) during 1987 to 1989 under up land and low land conditions having local variety 'Kimin' and HPU 636 respectively. Samples were taken from 20 plots each of 5 sq.m and five hills were selected randomly from each plot. The incidence of insect pests was noticed from 10-15 days after sowing/transplanting. From each site, healthy and diseased insects were counted. Only those larvae showing fungus growth were considered infected. The infected pupae were hard and brittle. They were brought to laboratory and pest-wise percentage of infection was calculated.

Lepidopteran insect pests recorded in the rice crop under upland and lowland rice ecosystem is indicated in Table 1. Difference in the pest and pest status has been observed

Table 1. Lepidopteran insect pests of Rice, their pest status and entomopathogen infection

Insect Pest		Pest Status	Ecological Niche	Entomopathogen Infection
Yellow stemborer:	*Tryporyza incertulus* Wlk. (Pyralidae)	Major	Upland & Lowland	-
Striped stemborer:	*Chilo suppressalis* Wlk. (Pyralidae)	Major	„	-
Pink borer:	*Sesamia inferens* Wlk.	Minor	„	-
Leaf folder:	*Cnaphalocrocis medinalis* Gue. (Pyraustidae)	Major	„	+
Horned caterpillar:	*Melanites ismene* Cram. (Satyridae)	Minor	Lowland	+
Rice skipper:	*Pelopidas mathias* F. (Hespiriidae)	Minor	„	+
Rice caseworm:	*Nymphula depunctalis* Gue. (Pyraustidae)	Minor	„	-

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among the rice ecosystems. Pest attack and pest incidence was higher in the lowland ecosystem than the upland.

The entomopathogen infection was noticed consecutively for the three years only in the low land rice ecosystem on 2nd, 15th and 27th October in 1987, 88 and 89 respectively. The pathogen out break was recorded 90-98 days after transplanting, when the crop was in tillering/booting stage. Pests recorded in the rice ecosystem, their status and the pathogen infection are indicated in Table (1)

Infection percentage/mortality calculated for the different pests during different years indicated maximum infection of the rice horned caterpillar during 1987 and 1988 to the extent of 52.63, 70.78 per cent respectively, where as 62.87 per cent infection was noticed in rice skipper during 1989 (Fig. 1). Statistical analysis revealed the difference in mortality during different years, than between the species ($p=0.05$). From the 1989 data of pathogenicity, correlation was worked out to find out the linear relationship between insect density and the percentage of mortality and there was a very low correlation ($r=0.371$; $n=20$).

Weather data recorded during initial entomopathogenic infection indicated (Table 2) a minimum and maximum temperature of 13.4 - 20.38; 24.9 - 26.0°C respectively, whereas the cumulative and progressive rainfall ranged from 1921.52 (135 days) to 2397.18 (143 days) and 37.2 to 154.0 mm respectively and the relative humidity was 72.0 to 78.5%.

Difference in the pest and pest status has been observed among the rice ecosystems. This is substantiated by the work of Litsinger *et al.* (1988) that the upland rice is often isolated spatially and temporally compared to lowland systems. These factors significantly affect the quality and quantity of insect and natural enemy fauna. The percentage of infection of *B.velata* was higher (52.63 - 70.8%) in low land rice pests like the rice skipper, the horned caterpillar and lesser in the leaf folder, which is a common pest of both ecosystems. The post monsoon period, appears to be more conclusive for the entomopathogen. Studies by Wilding (1981) indicated that moisture and relative humidity are conducive for spore germination, fungal development and spread.

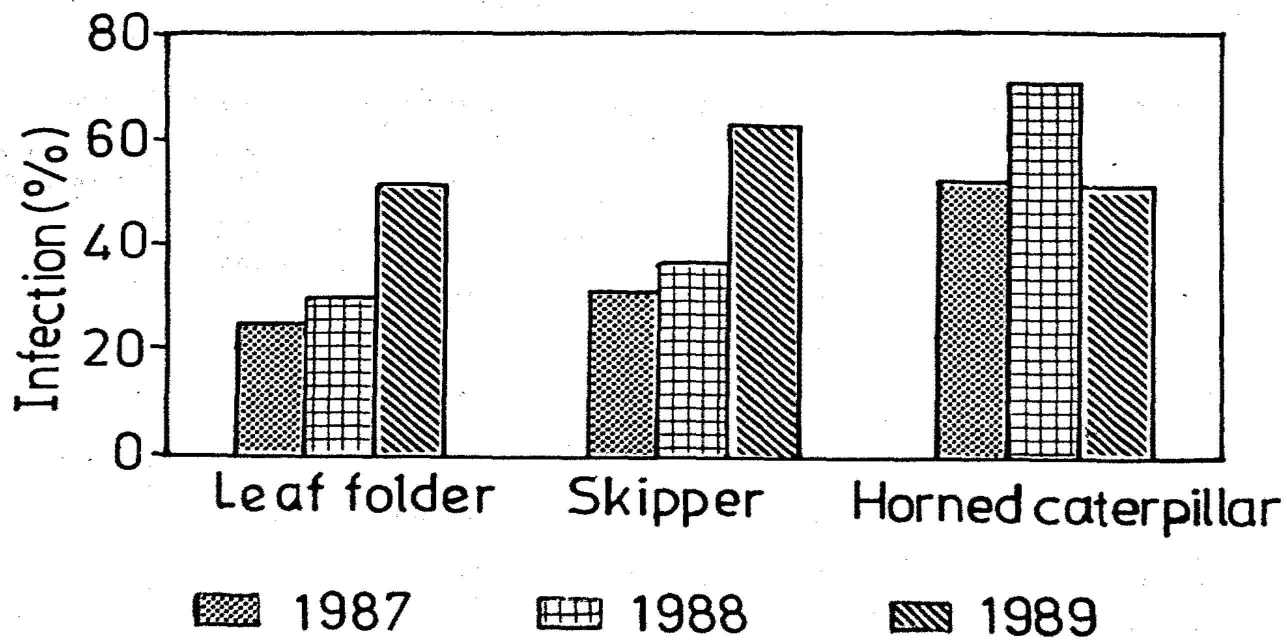

Fig.1 Natural occurrence of *B. velata* on some Lepidopteran rice pests during 1987 to 1989

Table 2. Range of abiotic factors during the initial out break of *B. velata*

Year	Date of Initial out break	Temp (°C) Max	Min	RH (%)	Rainfall (mm) Prog.	Cumu.	Rainy Days Prog.	Cumu.
1987	2nd Oct (40th Std. Week)	26.0	17.2	78.5	154.0	2397.2	20	143
1988	15th Oct (42nd Std. Week)	25.0	20.3	72.8	44.6	2081.9	2	141
1989	27th Oct (43rd Std. Week)	24.9	13.4	72.0	37.2	1921.5	2	135

Wet air has been shown to be necessary for many entomogenous fungus to discharge their conidia and for them to germinate. In view of the high infectivity of the fungus, possibility of exploring this pathogen for biological control is suggested.

ACKNOWLEDGEMENT

Thanks are due to the Director, IIM, London, for determination of the pathogen.

KEY WORDS: *Beauveria velata,* rice pests, *Cnaphalocrocis medinalis, Melanites ismene, Pelopidas mathias*

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