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Epizootiology of *Nomuraea rileyi* (Farlow) Samson in Field Populations of *Helicoverpa (=Heliothis) armigera* (Hubner) in relation to three Host Plants

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ABSTRACT

Epizootiological studies of *Nomuraea rileyi* in field population of *Helicoverpa (=Heliothis) armigera* occurring on tomato, field beans and vegetable pigeonpea, grown under uniform field conditions, showed higher rates of fungal infection in *H. armigera* found on vegetable pigeonpea (37%) than on field beans (28.2%) and tomato (20.5%). Further, *H. armigera* larvae collected from these host plants and reared on the respective host plants under laboratory conditions also revealed the same trend.

KEY WORDS : *Nomuraea rileyi, Helicoverpa armigera,* Epizootiology

The entomopathogenic fungus *Nomuraea rileyi* (Farlow) Samson is an important natural control agent of many Lepidoptera throughout the world (Fuxa, 1984) and is frequently observed in soybean ecosystems as a natural epizootic of at least six major caterpillar pests (Puttler *et al.* 1976). In India, though the occurrence of *N. rileyi* under natural condition has been reported from *Helicoverpa (= Heliothis) armigera* on tomato (Gopalakrishnan and Narayanan, 1988), the occurrence of this fungus in an epizootic form has not been reported on any crop pest so far. This paper deals with the preliminary observation made on the epizootic occurrence of *N. rileyi* on *H. armigera* on the control plots of vegetable pigeonpea, field bean and tomato respectively, while conducting simultaneous field trials against *H. armigera* with its NPV at Indian Institute of Horticultural Research Farm, Hessaraghatta, Bangalore.

MATERIALS AND METHODS

In 100 m^2 plots of vegetable pigeonpea (ICPL-211), field bean (Hebbal avare) and tomato (Pusa ruby) raised simultaneously during the month of August 1987, observations on the epizootics of *N. rileyi* on *H. armigera* were made from the month of September'87 to January'88 at an interval of seven days. Larval counts were taken in ten plants at random in all the plots. The symptoms described by Kish and Allen (1976) were followed for taking observations on larval mortality due to fungal infection. Percentage of larval mortality due to infection was calculated out of the total number of larvae counted on ten plants at random in each plot and the average percentage mortality were calculated by pooling the counts of all the five control plots for each crop.

About twentyfive grown up caterpillars were collected at random from each of the plot in all the crop trials, in the month of December, and reared in the laboratory on the respective host plants in plastic containers, individually. Simultaneously, the meteorological data were collected regularly during the crop period from the I.I.H.R. weather observatory.

RESULTS AND DISCUSSION

The population of *H. armigera* was very high in the control plots of vegetable pigeonpea (28.2/plot), moderate in field bean (24.8/plot) and comparatively less in tomato (18.6/plot). Epizootic of *N. rileyi* was noticed on all the three crop ecosystem during the months of November and-December 1987. The percentage mortalities due to fungal infection during November on vegetable pigeonpea, field bean and tomato were 25.0, 18.1 and 13.3, and those of December were 55.0, 40.9 and 26.30 respectively. The total percentage mortality recorded during the months of November and December was 37.0, 28.2 and 20.50 respectively. The grown up caterpillars collected from the field and kept under laboratory condition during the month of December recorded 40.0, 24.0 and 16.0% mortality on vegetable pigeonpea, field bean and tomato, respectively (Table 1).

Sporadic incidence of the fungus was also noticed during the month of September and October, and actual epizootic occurred during the months of November and December. The outbreak of the fungus was noticed on November, 9 and it

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TABLE 1 **Epizootic of *Nomuraea rileyi* on *Helicoverpa armigera* on three different crops**

Period	% Fungal infection					
	Veg. Pigeonpea		Field bean		Tomato	
	Field	Lab	Field	Lab	Field	Lab
9-24, Nov. '87	25.0	-	18.1	-	13.3	-
4-29, Dec. '87	55.0	40.9	40.9	24.0	26.3	16.0
Nov.9-Dec.29, '87	37.0	-	28.2	-	20.5	-

continued up to November, 24. There was a break of ten days and again it continued from December 4 to December 29. Thereafter the percentage mortality was greatly reduced and sporadic incidence was again noticed in the month of January 1988 only on Vegetable pigeonpea. Thus, *Nomuraea* infection appeared in the month of September and proceeded to increase gradually as the season progressed. The reason for the slow development of infection may be due to the low number of larvae present on the crops early in the season. This is in close agreement with the observations made by Ignoffo *et al.* (1975) in Soybean ecosystem.

The differences in the fungal infection rates in the different crops is probably related to the suitability of the host plants for the development of the insect. Host plants on which growth and survival of *H. armigera* were optimum probably produced larvae more susceptible to *N. rileyi*. The preferred host plants of *H. armigera* were in the descending order of pigeonpea, field bean and tomato (Jayaraj, 1981). The low incidence of *H. armigera* in tomato, and in turn its lower susceptibility to *N. rileyi* as observed in our preliminary observation may be due to the steroidal glycoalkaloid, tomatine, produced by tomato plants (Roddick, 1974). However, further studies are needed to confirm this. Host plant species modifying the susceptibility of insects to various fungal, (Hare and Andreadis, 1983) and viral pathogens (Rabindra & Jayaraj, 1986; Richter *et al.* 1987)have been reported earlier.

Further, the differences in the disease intensity on different crops may be attributed to the differences in the canopy of the crop and the density of the pest population, on a particular crop. In vegetable pigeonpea the canopy was close and dense, but it was not the case with field bean and tomato. In tomato the canopy was open, the leaves hairy and leaf curling was common, whereas, in field bean it is somewhat close. Vegetable pigeonpea attracted more pest population compared to field bean. Similarly, field bean attracted more population than tomato. Burleigh (1975), observed significant difference in *Nomuraea* infection of *Heliothis* larvae collected from two cotton varieties. The infection was lowest (18%) in the okra leaf cotton variety (open canopy) and highest (23%) in Delta pine cotton variety (close canopy). It may be that high humidity and high pest population prevailed on vegetable pigeonpea which influenced the rate of infection by the fungus.

The average minimum and maximum temperature recorded during September to October was 20.1-20.4°C and 28.2 -29.1°C, respectively and the average relative humidity recorded during the period for morning and evening hours was 80-84% and 60-72%, respectively. During November to December, the average minimum and maximum temperature recorded was 17.2-18.3 and 25.7-27.5 C, respectively. The average relative humidity during the period was 80-81% for morning h and 62% for evening h. The optimum temperature for invasion and infection of neonatal *Trichoplusia ni* larvae sprayed with 10^7 conidia/ml was 25°C (Getzin, 1961) RH 90% (Kish and Allen, 1978).

Though the temperature and humidity recorded during September to October were almost the same as those of November to December, epizootic did not occur during September to October probably due to the incessant rainfall and at times there was heavy down pour which might have prevented the occurrence of epizootics. The average rainfall recorded during the month of September to October was 102.7-157.8 mm and that of November to December was 35.1 to 53.6 mm. It has been demonstrated by Kish and Allen (1978) that the density of air borne conidia was significantly less after rain; high levels of conidia are correlated with periods of passage of warm, dry front which resulted in a count of 150,000 conidia/slide for a 2 h period (1200-1400 h).

The epizootic peak of each season is largely determined by the load of active inoculum, density of the hosts, canopy of the host plants, ideal environmental conditions and extent of dispersal of conidia early in the season (Ignoffo et al.,1977). Considering the above facts attempts are being made at this Institute to probe further into the role of host plants in the relationship between herbivores and entomopathogens in initiating epizootics and to utilise this fungus as a microbial insecticide to control some of the caterpillar pests of horticultural crops.

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