J Indian bot Soc Vol 77 (1998) 23-25

BIOACTIVITY OF *NOMURAEA RILEYI* AGAINST *SPILOSOMA OBLIQUA*: EFFECT OF DOSAGE, TEMPERATURE AND RELATIVE HUMIDITTY.

STEPHEN O. MATHEW, R.C. RAJAK AND S.S. SANDHU
Department of Biological Sciences, R.D. University, Jabalpur-482 001 (M.P)
(Accepted March, 1998)

Nomuraea rileyi caused 90% mortality in second instar larvae of *Spilosoma obliqua* at $8.97x10^7$ conidia/ml with LT_{50} as 144 hrs. LD_{50} value was calculated to be 8627677 conidia/ml. The pathogen was infective between 20°-28°C temperature, optimum being 28±1°C. 100% R H favoured maximum mortality of 92% with progressive decline at lower humidities.

Key Words: *Nomuraea rileyi, Spilosoma obliqua*, bioactivity, dosage, temperature, relative humidity.

Spilosoma obliqua (Walker) (Lepidoptera: Arctiidae) is a cosmopolitan and polyphagous pest damaging different cereals, fibres, pulses, oilseeds, vegetables and ornamental plants in various parts of India. The entomopathogenic fungus *Nomuraea rileyi* (Farlow) Samson has a world wide distribution and has been isolated from a variety of lepidopterous hosts. It is also known to be the causative agent of epizootics of several serious caterpillar pests of soybeans (Ignoffo *et al.*, 1975). The occurrence of *N. rileyi* in India under natural conditions has been reported from *Helicoverpa armigera* (Gopalkrishnan and Narayanan, 1988), *Spodoptera litura* (Rao and Phadke, 1977), *Acontia graelsii* (Gopalkrishnan and Narayanan, 1988a), *Spilosoma obliqua* (Singh and Gangrade, 1975), *Hypocala rostrata, Agrotis ipsilon Mocis undata, Diachrysia orichalcea, Lamprosema indicata* and *Amsacta moorei* (Agarwal and Rajak, 1985; Rajak *et al.*, 1991). Although *N. rileyi* has received considerable attention as a possible biocontrol agent against a number of noctuid pests, its potenntial as a mycoinsecticide against other lepidopteran pests is yet to be evaluated. The purpose of the present study was to determine the effect of different dose levels, temperature and relative humidity on the susceptibility of *S. obliqua* larvae to *N. rileyi*.

MATERIALS AND METHODS

The population of S. obliqua was raised from moths collected from field with the help of light trap (SM 85-Survey trap Vaishampayan, 1985). Rearing of larvae was done as per the method described by Ignoffo *et al.*, 1975. Conidia for bioassay of the fungus *N. rileyi* were harvested from 21 day old cultures and their viability was determined prior to application as suggested by Gillespie (1986). The bioassay was done as per the method described by Sandhu *et al.*, 1993. The dose mortality response was evaluated by taking five different concentrations of conidia ranging from $6.0x10^6$ to $8.87x10^7$ conida/ml and directly spraying 5 ml of the conidial suspension on the IInd instar larvae of S. *obliqua* using an atomizer. The LC_{50} values were calculated after converting percent mortality into probits by probit regression analysis (Finney, 1971). The effect of temperature on bioactivity of *N. rileyi* was evaluated by spraying 5 ml of conidial suspension ($8.87x10^7$ conidia/ml) on to IInd instar larvae of *S. obliqua* and incubated at four different temperatures 10°, 20°, 28° and 37°C. Mortality was recorded daily and corrected by Abott's formula (Abott, 1925). The effect of relative humidity (RH) on bioactivity of *N. rileyi* was evaluated by spraying 5 ml of conidial suspension ($8.87x10^7$ conidia/ml) on to IInd instar larvae of *S. obliqua* and incubating them at six different relative humidities in polypot humidity chambers constructed as suggested by Doberski (1981). The saturated salt solutions were prepared as per the method of Wexler and Hasegawa, 1954.

RESULTS AND DISCUSSION

Larval mortality was rapid with higher conidial concentrations. LT_{50} at $6.0x10^6$ conidia/ml was 216 hrs decreasing to 144 hrs when con centration was increased to $8.87x10^7$ conidia/ml (Table 1). The percent mortality ranged from 50.0 to 90.0 in all the five concentrations tested. Chi square value tabulated at

Received January, 1998

Table 1. Dose mortality response of second instar larvae of *S. obliqua* to *N. rileyi*.

S.No.	Inoculum concentration (Conidia/ml)	Corrected percent Mortality[a]	Emperical probit	LT_{50} (in hours)
1.	$6.00x10^6$	50.00	5.0	216
2.	$1.34x10^7$	52.94	5.0753	192
3.	$2.75x10^7$	62.50	5.3319	180
4.	$4.45x10^7$	83.33	5.9542	168
5.	$8.87x10^7$	90.00	6.2816	144

a= Calculated as per Abott's formula.

Table 2. Effect of temperature on cohorts of control and *N. rileyi* treated second instar larvae of *S. obliqua*.

Relative humidity=95%±5%

Temperature (In °C)	Control		*N. rileyi* treated[a]	
	(N)[b] Mortality	Total% Mortality	(N)[b]	Total% Mortality
10	10	50	50	00
20	10	05	50	89.47
28	10	00	50	90.00
37	10	30	50	28.57

a-Dose-$8.87x10^7$ conidia/ml.
b-No. of larvae used.

5% level of significance was 4.3279 which suggested that there is an indication of homogenity in the data. The regression equation was found to be Y=1.1148 x - 2.7265. Data on dose mortality response of the test larvae to the conidial suspension of *N. rileyi* indicate a good fit of the observed and expected responses based on chi square LD_{50} value was found to be ca. 8627677 conidia/ml. (Table 4). Similar observations seem to be typical for fungus insect interactions according to earlier workers (Boucias *et al.*, 1984; Sandhu *et al.*, 1993).

The ambient temperature had a direct influence on the bioactivity of *N. rileyi* (Table 2). The fungus was most effective at 20° and 28°C with a maximum larval mortality of 89.47% and 90% respectively. At 37°C the unfavourable temperature limited mortalities to 28.57%. Our data on the high rate of infection at 20° and 28°C corroborates Getzin's report. The temperature range is significantly important if *N.rileyi* is to be used against *S. obliqua* as the temperature in soybean agroecosystem persists between 20° to 32°C in Central India.

Table 3. Effect of relative humidity on cohorts of control and *N. rileyi* treated larvae of *S. obliqua*.

Temperature = 28±1°C

RH (In %)	Control		*N.rileyi* treated[a]	
	(N)[b]	Total% Mortality	(N)[b]	Total% Mortality
0	10	20	50	25.00
33	10	10	50	37.50
53	10	10	50	50.00
75	10	05	50	63.15
85	10	00	50	80.00
100	10	00	50	92.00

a-Dose-$8.87x10^7$ conidia/ml.
b-No. of larvae used.

Table 4. Probit Analysis of dose mortality responses of second instar larvae of *S. obliqua* to *N. rileyi*.

1	Chi square	- 4.3279
2.	Regression equation	- Y= 1.1148x -2.7265
3.	LD_{50}	- 8627677 conidia/ml.
4.	Upper limit (UL)	- $1.40x10^7$ conidia/ml.
5.	Lower limit (LL)	- $5.29x10^6$ conidia/ml.

Results with relative humidities showed maximum mortality of 92% at 100% RH. Significat mortalites of 80% and 63.15% also occurred at 85% and 75% RH respectively (Table 3). There was a progressive decline in larval mortalities at lower RH levels. The results corresponded with the observations of earlier workers (Doberski, 1981). Observations presented herein indicate that the present isolate of *Nomuraea rileyi* was quite effective againnst young larvae of *S. obliqua* and offers great potential for its use in the management of *S. obliqua*. Taking into account these facts, attempts are being made at this institute to develop *N. rileyi* as a mycoinsecticide for the management of insect pests of soybean.

The authors are thankful to UGC New Delhi for financial assistance.

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