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Research Note

Virulence of *Nomuraea rileyi* in certain dry formulations against third instar larvae of *Spodoptera litura* (Fab.)

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ABSTRACT: The virulence of dry formulations of *Nomuraea rileyi* for different storage conditions was tested against third instar larvae of *Spodoptera litura* (Fab.). Talc formulations retained the virulence of *N. rileyi* for relatively longer period (45 per cent mortality after 3 months storage, 30 per cent after 4 months) than other formulations.

KEY WORDS: *Nomuaea rileyi, Spodoptera litura,* dry formulations, storage

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The studies on developing and evaluating the formulation of *Nomuraea rileyi* in terms of virulence were conducted at the Department of Entomology, S.V. Agricultural College Tirupati. The *N. rileyi* culture available in the Department (locally collected) was retrieved and mass multiplied on Saboraud's maltose agar medium fortified with one percent yeast extract (SMAY). After attainment of sufficient quantity of *N. rileyi* culture, spores on agar media were harvested for usage.

For preparation of dry formulations of *N. rileyi* the inert materials *viz*., talc powder, wheat flour, corn flour, broken rice flour and vermiculite, were selected. Commercially available talc powder, wheat flour and corn flour were used while broken rice was powdered and used for preparing formulations. Vermiculite was collected from a tank in Rompicherla mandal. The clumps of vermiculite were broken and made into powder. Hundred ml of distilled water was added to 100 gm of each carrier, and the mixtures were autoclaved for 20 minutes under 15 psi pressure at 121° C. Then the mixtures were placed in an oven at 120° C for three hours on each day for seven days until completely dry. After the carriers were completely dried, they were cooled and mixed each with 2 g of harvested *N. rileyi* spores under aseptic conditions in laminar air flow chamber along with 2-3 drops of Tween 20 as a wetting agent. The prepared formulations of *N. rileyi* were transferred to sterilized polythene bags separately, tightly packed and incubated at 20° C.

Virulence of *N. rileyi* in the prepared and stored dry formulations was evaluated against freshly moulted third instar *S. litura* larvae. Spore suspensions of 1 x 10^7 spores ml^{-1} of the five formulations were prepared and sprayed on the castor leaves with hand atomizer. The third instar treated *S. litura* larvae were made to crawl on the treated castor leaf and feed. From next day onwards, fresh castor leaves were supplied and mortalities were recorded from the next day onwards, till the larvae were dead due to infection of *N. rileyi* or gone to pupation. For each treatment, ten larvae were used and each treatment was replicated three times. An untreated control was also maintained. The cumulative mean larval mortalities obtained in different treatments were expressed as percentages and subjected to statistical analysis.

The results showed that talc maintains the virulence of *N. rileyi* for relatively longer period (45.00 per cent mortality after 3 months storage, 30.00 per cent after 4 months) than other formulations (Table 2). The same was evident with viability tests also. Second and third positions in holding the *N. rileyi* in pathogenic condition were occupied by corn flour (32.50 per cent after 3 months) and rice flour (25.00 per cent after 3 months) respectively (Table 1). The wheat flour formulation maintained 47.50 per cent larval mortality during the first month treatment but it decreased drastically with storage period and the virulence was retained up to three months of storage. The vermiculite

proved inferior in retaining the virulence of *N. rileyi* spores. This was true in the case of conidial viability studies also.

In the present study, the decreasing trend in virulence with time may be due to the reduced germination capacity of conidia.. Sharma *et al*. (1999) prepared talc based formulations of *Metarhizium anisopliae* and *Beauveria bassiana* by mixing in proportion 1:2 to 1:5 with talc to achieve 4.6 x10^8 conidia per gram. High virulence of these formulations against *Holotrichia consanguinea* was recorded.

Mallikarjuna *et al*. (2010) tested wettable powder formulations of *Nomuraea rileyi*, *viz*., bentonite + glucose (7: 1), talc + glucose (7: 1), bentonite + sucrose (7: 1) and talc + sucrose (7: 1) and recorded 87.00, 74.00, 72.00 and 75.00 per cent mortality of *S. litura* and 79.0, 70.0, 66.0 and 88.0 per cent of *Helicoverpa armigera* (Hubner), respectively. Nagaraja (2005) evaluated *N. rileyi* formulations *viz*., oil formulation (sunflower oil + Tween-80 (0.02%), wettable powder (talc) and crude formulation at 2 x 10^8 conidia per ml concentration against third instar larvae of *S. litura*. At the end of 10th day, the cumulative mortality was 95.00 per cent in oil formulation followed by wettable powder (83.10) and crude formulation (77.00). Ramegowda (2005) prepared eight WP formulations of *N. rileyi*. Among them, crude WP had registered lowest LC_{50} value of 80.09 × 10^3

Table 1. Mortality of III instar *Spodoptera litura* with dry formulations of *Nomuraea rileyi*

Formulation	Mean per cent larval mortality (DAS- Days after Storage)				
	30 DAS	60 DAS	90 DAS	120 DAS	150 DAS
Talc	57.50 (49.33)	47.50 (43.56)	45.00 (42.12)	30.00 (33.21)	17.50 (24.53)
Wheat Flour	47.50 (43.56)	35.00 (36.22)	10.00 (18.43)	0.00 (0.00)	0.00 (0.00)
Corn Flour	67.50 (55.28)	52.50 (46.44)	32.50 (34.72)	15.00 (22.50)	5.00 (9.22)
Broken Rice Flour	62.50 (52.27)	47.50b (43.56)	25.00 (29.89)	12.50 (20.47)	0.00 (0.00)
Vermiculite	37.50 (37.73)	27.50 (31.55)	10.00 (15.86)	0.00 (0.00)	0.00 (0.00)
Untreated control	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
General Mean	45.42 (39.69)	35.00 (33.55)	20.42 (23.50)	9.58 (12.70)	3.75 (5.63)
S.E	1.91	2.00	3.67	1.79	3.29
C.D.*P*= (0.05)	4.01	4.21	7.70	3.77	6.91

• The values are means of three replications.
• Figures in the paranthesis are angular transformed values.

Table 2. Effect of stored formulations of *Nomuraea rileyi* on the biological parameters of *Spodoptera litura*

Formulations	30 Days After Storage		60 Days After Storage		90 Days After Storage		120 Days After Storage	
	Pupal mortality	Malformed adults	Pupal mortality	Malformed adults	Pupal mortality	Malformed adults	Pupal mortality	Malformed adults
Talc	25.10 (26.45)	25.10 (26.45)	30.00 (32.90)	15.00 (19.92)	15.00 (19.92)	0.00 (0.00)	10.71 (16.65)	0.00 (0.00)
Wheat flour	17.50 (24.53)	0.00 (0.00)	12.50 (18.07)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Corn flour	49.99 (45.00)	0.00 (0.00)	18.75 (22.50)	12.50 (15.00)	14.28 (22.20)	0.00 (0.00)	6.25 (10.35)	0.00 (0.00)
Broken rice flour	37.50 (37.50)	0.00 (0.00)	30.00 (32.90)	0.00 (0.00)	9.38 (15.53)	0.00 (0.00)	0.0000 (0.00)	0.00 (0.00)
Vermiculite	20.83 (26.88)	16.66 (24.09)	7.14 (11.10)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)

Untreated control	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
General Mean	25.14 (26.73)	6.94 (8.42)	16.40 (19.58)	4.58 (5.82)	6.44 (9.61)	0.00 (0.00)	2.83 (4.50)	0.00 (0.00)
S.Ed	6.83	5.09	7.31	6.30	4.86	0.00	4.71	0.00
C.D.*P*= 0.05	14.35	10.69	15.36	13.24	10.21	NS	9.89	NS

Figures in the paranthesis are angular transformed values

conidia per ml (82 per cent mortality) followed by talc based WP and rice flour against *S. litura* larvae.

REFERENCES

Mallikarjuna DR, Patil RK, Sujay YH, Ramegowda GK. 2010. Development and evaluation of wettable powder and oil based formulations of *Nomuraea rileyi* (Farlow) Samson against *Helicoverpa armigera* (Hübner) and *Spodoptera litura* (Fabricius) *J Biol Control* **24 (3)**: 930-941.

Nagaraja SD. 2005. Effect of formulations of *Nomuraea rileyi* (Farlow) Samson and spray equipments in the management of tobacco caterpillar in groundnut and pod borer in chickpea ecosystem. *M.Sc. (Agri.) Thesis*, University of Agricultural Sciences, Dharwad.

Ramegowda GK. 2005. Aerobiology, epizootiology and utilization of *Nomuraea rileyi* (Farlow) Samson. Ph. D. Thesis, University of Agricultural Sciences, Dharwad.

Sharma S, Gupta RBL, Yadav CPS. 1999. Mass multiplication and formulation of entomopathogenic fungi and their efficacy against white grub. *J Mycol Pl Pathol*. **29(3)** : 299 – 305.