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Pathogenicity of *Nomuraea rileyi* Against Larval Instars of *Spodoptera litura* (Fabricius) Reared on Different Host Crops

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ABSTRACT

The pathogenicity tests of *Nomuraea rileyi* against II, III and IV instar larvae of *Spodoptera litura* (Fabricius) reared on three different host crops *viz.,* castor, groundnut and tomato were carried out. *N. rileyi* infected larvae died by exhibiting the characteristic symptoms like slightly raised head and anterior portion of body and firmly adhering the posterior portion to the substrate *i.e.* food material with prolegs. After infection and death with *N. rileyi* the larval body was observed to be covered with white mycelial mat and later entire body became olive green due to sporulation. With respect to individual instars, as the concentration of *N. rileyi* decreased, the larval mortality showed positive correlation. The larval mortality was also in negative association with age of the larvae. Relatively higher mortality were obtained when treated, larvae were fed with castor leaves than groundnut and tomato and cent per cent death was recorded in II instar at higher concentrations.

Key words : Host Crops, Larval Mortality,*Nomuraea rileyi*, Pathogenicity, *Spodoptera litura*

The tobacco cut worm, *Spodoptera litrua* (Fabricius) is a polyphagous pest which reported to infest more than 100 cultivated plants and causes severe damage to castor, groundnut, tomato, sorghum, maize, banana, citrus, cabbage, cauliflower *etc.* The use of chemical insecticides steadily increased from 2.2 g/ha a.i in 1950 to the current level of 605 g/ha (David, 1995). Their continuous and injudious use has resulted in several implications such as development of insecticidal resistance in key pest species (Kranthi *et al.,* 1997), pesticide residue in food chain (Handa, 1995), degradation in quality of ecosystem and human health with eroded profits (Pratap, 2003). Hence, management of insect pests including *Spodoptera litura* by employing eco-friendly methods was felt necessary such as microbes, parasitoids, predators etc. *Nomuraea rileyi* (Farlow) Samson which is a deuteromycete fungus infecting polyphagous noctuid pests namely *S. litura, Helicoverpa armigera, Trichoplusia ni, Plusia* sp. *etc.* is one of the important microbes.

MATERIAL AND METHODS

Sterilized glass jars of 15 cm diameter and plastic troughs of 30 cm diameter were used for rearing of *S. litura* larvae. Egg masses of *S. litura* were collected from untreated castor plants from Dryland Farm, S.V. Agricultural College, Tirupati. After hatching, the larvae were reared on three host leaves *i.e.,* castor, groundnut and tomato. From II, III and IV instars, 20 uniform sized larvae were taken into petriplates individually. Then with the help of hand atomizer different concentrations of *N. rileyi i.e.,* 1×10^8 to 1×10^2 spores ml^{-1} were sprayed on larvae. After 5 minutes the treated larvae were transferred into the rearing jar containing host material *i.e.,* castor, groundnut and tomato. Like this three replications were maintained for each treatment. An untreated control treatment was also maintained. The observations on symptoms in larvae after infection with *N. rileyi* and the larval mortalities at 24 hr interval were recorded.

RESULTS AND DISCUSSION

Nomuraea rileyi treated larvae have become sluggish and consumed less food, the larvae died with raised head and anterior portion of the body and firmly adhering the posterior portion to the substrate. After few hours of the death the larvae became stiff, later covered with whitish mycelium and then turned to light green colour due to sporulation within one week under optimum temperature and humidity conditions. These observations are in accordance with the Landa and Siranova (1988) reported that the infection of the host is initiated by invasion of hyphae growing through natural orifices. *N. rileyi* symptoms are apparent with in 24-48 hrs after the contact of conidia with insect and sporulation occurs with in 72 hours and maximum sporulation may occur with in 5-7 days. Pornpoj *et al.* (2005) examined the mode of infection of *N. rileyi* in *S. litura* larvae, germ tubes penetrated through the cuticle surface within 48 hrs. Hyphal bodies converted to mycelia with in 5-6 days after inoculation, which turned green in 1-2 days later with spore production.

Table Efficacy of *Nomuraea rileyi* against II, III and IV instar larvae of *Spodoptera litura reared* on three different host leaves in laboratory

Concentration of *N.rileyi* (Spores ml^{-1})	II instar Per cent larval mortality				III instar Per cent larval mortality				IV instar Per cent larval mortality			
	Castor	Groundnut	Tomato	Mean	Castor	Groundnut	Tomato	Mean	Castor	Groundnut	Tomato	Mean
1x 10^8	100.00	91.66	83.33	91.66	83.33	75.00	70.00	76.11	46.66	41.67	33.33	40.55
1x 10^7	100.00	85.00	71.66	85.55	71.67	58.33	55.00	61.66	38.33	26.67	25.00	31.11
1x 10^6	91.66	71.67	61.67	75.00	61.66	48.33	40.00	50.00	28.33	25.00	16.67	22.77
1x 10^5	85.00	61.66	46.66	64.44	50.00	38.33	28.33	38.89	16.67	15.00	10.00	12.77
1x 10^4	76.67	46.66	33.33	52.22	35.00	25.00	16.67	25.55	10.00	5.00	0.00	5.00
1x 10^3	68.33	35.00	21.67	41.66	25.00	18.33	8.33	17.22	0.00	0.00	0.00	0.00
1x 10^2	58.33	21.66	13.33	31.11	16.66	6.67	1.66	8.33	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
Mean	72.50	51.66	41.45	55.20	42.91	33.75	27.50	34.72	17.50	13.96	10.62	14.03

	II instar		III instar		IV instar	
	SEm±	CD(P=5%)	SEm±	CD(P=5%)	SEm±	CD(P=5%)
Concentration	0.41	1.16	0.57	1.16	0.31	0.89
Food material	0.67	1.89	0.93	2.63	0.51	1.44
Concentration and food material	1.15	3.28	1.60	4.56	0.88	2.49

When II instar larvae treated with *N. rileyi*

The highest mean larval mortality of 72.50 per cent was recorded when *N. rileyi* treated larvae fed with castor leaves and lowest mortality of 41.45 per cent was observed with tomato. Among the concentrations, the highest mean larval mortality of 91.66 per cent was recorded with highest concentration (1 x 10^8 spores ml^{-1}) with the lowest of 31.11 per cent at the least concentration *i.e.,* 1 x 10^2 spores ml^{-1}. More than 70.00 per cent death of caterpillars was obtained with all the three host materials at two higher concentrations *i.e.,* 10^7 and 10^8. The mean per cent larval mortalities of 100.0, 91.66 and 83.3 were recorded when II instar larvae treated with 1 x 10^8 spores ml^{-1} concentration. Lezama *et al.* (1993) reported cent per cent mortality of first, second, third and fifth instars of *S. frugiperda* at 1 x 10^8 spores ml^{-1}.

Vimaladevi (1994) obtained cumulative mortality 88-97 per cent in III instar *S. litura* fed castor with *N. rileyi* at 2 x 10^{11} spores ml^{-1}. Ramanujam *et al.* (2003) reported 76.66 per cent mortality in III instar of *S. litura* larvae with *N. rileyi* in laboratory. Manjula *et al.* (2004) observed 80 per cent mortality in III instar larvae of *S. litura* with the spore suspensions (1 x 10^9 to 1 x 10^1 spores ml^{-1}) of *N. rileyi*.

Most of the concentrations are significantly differed from one another in showing larval mortalities. Likewise the mean larval mortalities with the different food materials also differed significantly.

When III instar *S. litura* treated with *N. rileyi*

A mean larval mortality of 42.91 per cent was recorded when treated larvae were fed with castor leaves compared to the mortalities with groundnut (33.75%) and tomato (27.50%). Among the concentrations, the mean per cent larval mortality was highest (76.11%) with the highest concentration 1 x 10^8 spores ml^{-1} and lowest with the lowest concentration i.e.,1x10^2 spores ml^{-1}. Among all the treatments, the highest larval mortality of 83.33 per cent was observed at the highest concentration (1x 10^8 spores ml^{-1}) with castor and the lowest mortality of 1.66 per cent with lowest concentration of *N. rileyi* (1 x 10^2 spores ml^{-1}) in tomato. All the concentrations and three crops gave significantly different results.

When IV instar *S. litura* treated with *N. rileyi*

When IV instar treated larvae were fed with castor, groundnut and tomato leaves 17.50, 13.96 and 10.62 per cent mean larval morality were obtained, respectively. The mean per cent larval

mortality with 1 x 10^8 spores ml^{-1} was 40.55 per cent and the concentration 1 x 10^4 spores ml^{-1} recorded the lowest mean per cent larval mortality (5.00%). No larval mortalities were recorded with 1 x 10^3 and 1 x 10^2 spores ml^{-1} concentrations.

The higher concentrations also resulted by giving less than 50 per cent death of caterpillars.

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