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RESEARCH PAPER

Influence of pesticides on the entomogenous fungus *Nomuraea rileyi* (Farlow) Samson

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Abstract : A laboratory study was carried out to determine the compatibility of *Nomuraea rileyi* (Farlow) Samson with different pesticides including 15 insecticides and 15 fungicides during 2009 – 10 at the Junagadh Agricultural University, Campus, Junagadh. The results showed that azadirachtin 0.0075 per cent, spinosad 0.009 per cent, fenvalerate 0.01 per cent, endosulfan 0.07 per cent, cypermethrin 0.009 per cent, profenophos 0.05 per cent and acephate 0.15 per cent were the most compatible with *N. rileyi*. In case of fungicides, sulphur 0.2 per cent proved its superiest compatibility with *N. rileyi*, followed by zineb 0.2 per cent, copper oxychloride 0.2 per cent and propiconazole 0.025 per cent.

Key Words : Compatibility study, *Nomuraea rileyi* (Farlow) Samson, Pesticides

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INTRODUCTION

Due to the indiscriminate use of chemical pesticides has also caused the environment pollution. Hence, entomologists and environmentalists felt to develop viable alternate strategies which could be integrated into a workable system called integrated pest management. Among such eco-friendly approaches, entomopathogenic fungi form one of the most important components which are being employed to control noxious insect pests of many crops. Among several entomopathogenic fungi, *Nomuraea rileyi* (Farlow) Samson is an important natural mortality factor of many Lepidopteran pests on variety of crop ecosystem. Looking to the importance of *N. rileyi* as microbial control agent, it is highly necessity to evaluate the compatibility of *Nomuraea rileyi* (Farlow) Samson with different pesticides. Despite of recent advances in insect pathology, the study of mycosis caused by entomopathogenic fungi has held a modest position, though it played a commendable role in the early development of this field of biocontrol. Research efforts were mostly directed towards the study of bacteria and viruses which were supposed to have greater potential for the microbial control of crop pests.

Growing dissatisfaction with chemical toxicants due to reduction in efficacy, threat to environment and human health as well as the increase in cost of their development and use of mycopathogens in integrated management of insect pests have been demonstrated successfully in agricultural crops. Employing biological control principles for pest management will provide productive, efficient, ecologically stable and economically available solutions to pest problems.

MATERIAL AND METHODS

The food poison technique described by Dhingra and Sinclair (1986) was adopted to know the effect of pesticides on growth of entomogenous fungus, *N. rileyi*. The petsticides were weighed considering the recommended dose (Table 1).

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Then they were mixed under aseptic condition with 100 ml Sabaroud Maltose Agar Yeast extract (SMAY) medium given by Bell *et al.* (1982) (Media was composed of maltose- 40 g, neopeptone-10 g, agar- 15 g, yeast extract-10 g in 1000 ml distilled water). Flasks were shaken well to disperse the insecticides uniformly and 20 millilitre mixtures were poured in Petri plates (1.5 cm height x 9.0 cm in diameter) under aseptic condition. Five millimeter discs (bits) of fungal growth were cut with the help of sterilized cork borer from vigorously growing culture on SMAY medium. These discs (bits) were used to inoculate the Petri plates having poisoned medium with the insecticides and repeated thrice. Radial growth of the entomogenous fungus was recorded when full growth obtained with control (8^{th} day of inoculation). The per cent inhibition in radial growth over control was calculated as per the following equation given by Bliss (1934), and statistical analysis was done after angular transformation.

$$I = \frac{C - T}{T} \times 100$$

where, I = per cent inhibition, C = colony diameter of control plate, T = colony diameter of treated plate.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Compatibility with insecticides :

Almost all the insecticides used in test were found inhibitory more or less for the growth of *N. rileyi* (Table 1). Perusal of data on radial growth indicated that azadirachtin 0.0075 per cent recorded highest radial growth (86.33 mm) and it was at par with spinosad 0.05 per cent as it gave 83.67 mm radial growth. The treatments of fenvalerate 0.01 per cent, endosulfan 0.07 per cent, cypermethrin 0.009 per cent, profenophos 0.05 per cent and acephate 0.15 per cent remained next in order which registered 80.67, 75.33, 74.00, 73.67 and 71.00 mm radial growth, respectively. Triazophos 0.06 per cent and methomyl 0.1 per cent showed significantly lowest radial growth which recorded 28.00 and 28.67 mm radial growth. The remaining insecticides had lower fungal growth (40.67 to 66.33 mm).

The results recorded on growth inhibition of *N. rileyi* (Table 1) indicated that azadirachtin 0.0075 per cent showed significantly lowest growth inhibition (3.87 %). It was at par with spinosad 0.05 per cent which recorded growth inhibition of 6.98 per cent. The treatments of fenvalerate 0.01 per cent, endosulfan 0.07 per cent, cypermethrin 0.009 per cent, profenophos 0.05 per cent and acephate 0.15 per cent were found next in order which recorded 10.35, 16.04, 17.57, 18.13 and 21.01 per cent growth inhibition, respectively. Triazophos 0.06 per cent and methomy l 0.1 per cent showed significantly highest radial growth inhibition, which recorded 68.90 and 68.22 per cent growth inhibition. The treatments of

Table 1 : Effect of different fungicides and insecticides on the radial growth of *N. rileyi*

Sr. No.	Fungicides	Radial growth (mm) after seven days of inoculation	Growth inhibition (%) after seven days of inoculation	Insecticides	Radial growth (mm) after seven days of inoculation	Growth inhibition (%) after seven days of inoculation
1.	Benomyl 0.05%	0.00	90.00(100.00)	Acephate 0.15%	71.00	27.28(21.01)
2.	Captan 0.2%	43.00	46.28(52.23)	Azadirachtin 0.0075%	86.33	11.35(3.87)
3.	Carbendazim 0.05%	0.00	90.00(100.00)	Carbaryl 0.2%	43.67	45.85(51.48)
4.	Chlorothalonil 0.2%	50.00	41.81(44.44)	Chlorpyriphos 0.05%	56.33	37.69(37.38)
5.	Copper oxychloride 0.2%	73.33	25.44(18.45)	Cypermethrin 0.009%	74.00	24.78(17.57)
6.	Dinocap 0.48%	64.33	32.27(28.50)	Endosulfan 0.07%	75.33	23.61(16.04)
7.	Fosetyl Al 0.16%	63.33	32.97(29.62)	Fenvalerate 0.01%	80.67	18.76(10.35)
8.	Hexaconazole 0.005%	48.33	42.87(46.29)	Imidacloprid 0.005%	66.33	30.76(26.15)
9.	Mancozeb 0.2%	0.00	90.00(100.00)	Indoxacarb 0.0075%	48.67	42.66(45.92)
10.	Propiconazole 0.025%	71.33	27.07(20.71)	Methomyl 0.1%	28.67	55.69(68.22)
11.	Ridomil- MZ 0.2%	58.00	36.58(35.52)	Monocrotophos 0.04%	66.33	30.83(26.27)
12.	Sulphur 0.2%	88.67	6.89(1.44)	Profenofos 0.05%	73.67	25.20(18.13)
13.	Thiophanet methyl 0.07%	53.00	39.87(41.10)	Quinalphos 0.05%	60.00	35.24(33.30)
14.	Tridemorph 0.04%	49.33	42.23(45.17)	Spinosad 0.009%	83.67	15.31(6.98)
15.	Zineb 0.2%	77.67	21.70(13.67)	Triazophos 0.06%	28.00	56.11(68.90)
16.	Untreated control	90.00	90.00(100.00)	Untreated control	90.00	27.28(21.01)
S.Em.±		1.2373	0.87		1.88	1.48
C.D. (P=0.05)		3.5731	2.52		5.44	4.28
C.V.%		4.11	3.63		5.05	8.54

*Angular transformation. Figures in parentheses are original

monocrotophos 0.04 per cent, imidacloprid 0.005 per cent, quinalphos 0.05 per cent, chlorpyriphos 0.05 per cent and indoxacarb 0.0075 per cent showed moderately growth inhibition of *N. rileyi* as they inhibited less than 50 per cent radial growth. The remaining treatment carbaryl 0.2 per cent had more than 50 per cent growth inhibition.

The present results indicated that azadirachtin and spinosad proved to be poorest inhibitors of *N. rileyi* growth, followed by fenvalerate and endosulfan. Cypermethrin, profenophos, acephate, monocrotophos, imidacloprid and quinalphos were found moderately inhibitors. While, triazophos, methomyl and carbaryl, were found to be strong inhibitors for *N. rileyi* growth. Devi and Prasad (1996) found that the seed kernel extracts from *Azadirachta indica* compitable with the fungus *Nomuraea rileyi*. Gopalakrishnan and Mohan (2000) found that the insecticides, monocrotophos, quinalphos, carbaryl, endosulfan and fenvalerate were safe at low concentrations. Kulkarni and Lingappa (2001) and Devi *et al.* (2002) reported that the neem based insecticide exhibited the lowest growth inhibition of *N. rileyi*. The results obtained in present investigation are in close agreement with the results of earlier workers.

Compatibility with insecticides :

Data on radial growth of *N. rileyi* presented in Table 1 showed that highest growth was obtained in sulphur 0.2 per cent, which recorded 88.67mm redial growth and it was at par with control (90.00 mm). The fungicides, zineb 0.2 per cent, copper oxychloride 0.2 per cent and propiconazole 0.25 per cent were found to be next order to growth of *N. rileyi* as they exhibited 77.67, 73.33 and 71.33, mm radial growth, respectively. The fungicides, dinocap 0.48 per cent, fosetyl AL 0.16 per cent, ridomil- MZ 0.2 per cent, thiophanate methyl 0.07 per cent and chlorothalonil 0.2 per cent were found to permit the moderate growth of *N. rileyi* as they exhibited 64.33, 63.33, 58.00, 53.00 and 50.00 mm radial growth, respectively. The fungicides, hexaconazole 0.005 per cent (48.33 mm), tridemorph 0.04 per cent (49.33 mm) and captan 0.2 per cent (43.00 mm) were found with less than 50 per cent radial growth. The fungicides, benomyl 0.05 per cent, carbendazim 0.05 per cent and mancozeb 0.2 per cent resulted no growth of the *N. rileyi*.

The percentage inhibition of radial growth (Table 1) indicated that sulphur 0.2 per cent showed significantly lowest growth inhibition (1.44 %) of *N. rileyi*. The fungicides, zineb 0.2 per cent, copper oxychloride 0.2 per cent, propiconazole 0.25 per cent, dinocap 0.48 per cent and fosetyl AL 0.16 per cent were found to be next in order to lowest growth inhibition of *N. rileyi* as they exhibited 13.67, 18.45, 20.71, 28.50 and 29.62 per cent growth inhibition, respectively. Captan 0.2 per cent, chlorothalonil 0.2 per cent, hexaconazole 0.005 per cent, ridomil- MZ 0.2 per cent and tridemorph 0.04 per cent recorded less than 50 per cent growth inhibition and found moderately compatible with *N. rileyi*. The fungicides, benomyl 0.05 per cent, carbendazim 0.05 per cent and mancozeb 0.2 per cent were found to give complete inhibition of *N. rileyi*.

Gardner *et al.* (1979) found that benomyl and maneb completely inhibited *N. rileyi* growth at all concentrations. Terribile and Monteiro-de-Barros (1991) reported that benomyl did not compatible with the fungus, *N. rileyi.* Devi *et al.* (2002) reported that mancozeb and carbendazim completely inhibited *N. rileyi* at recommended rate. Gopalakrishnan and Mohan (2000) found that captan and sulfur allowed conidial germination at low (0.1%) and normal (0.2%) concentrations. The results obtained in present investigation are in close agreement with the results of earlier workers.

From the above results it can be concluded that the insectidicides azadirachtin, spinosad, fenvalerate, endosulfan and cypermethrin were most compatible with entomogenous fungus, *N. rileyi* while in case of fungicides, sulphur 0.2 per cent was found the most compatible with *N. rileyi*, followed by zineb 0.2 per cent, copper oxychloride 0.2 per cent, propiconazole 0.25 per cent, dinocap 0.48 per cent and fosetyl AL 0.16 per cent.

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