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In vitro inhibition of *Beauveria bassiana* (Bals.) Vuill. growth by different commonly used insecticides in rice

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ABSTRACT: *In vitro* inhibition of 13 different insecticides and one botanical on *Beauveria bassiana* growth was tested. Two doses of chemical insecticides, one at recommended dose (RD) and another at half of recommended dose (½ RD) and for botanicals three doses, first one at recommended and one at ½ and another at ¼ of the recommended dose were tested. 100 per cent of mycelial growth was observed when the entomopathogen was grown in presence of monocrotophos (0.31%) and dichlorvos (0.12%). Cypermethrin, deltamethrin, alphamethrin and phosphamidon at recommended dose showed growth inhibition of < 50 per cent. Half of the recommended dose of deltamethrin was found having lowest inhibition (14.06 %).

KEY WORDS: *Beauveria bassiana, Dicladispa armigera*, inhibitory effect, insecticides, rice hispa

INTRODUCTION

Integrated management of insect pests is an important way in reducing the severe impact of chemical pesticides on ecosystem. Biocontrol agents have been studied inadequately as component of integrated pest management system. *Beauveria bassiana* (Bals.) Vuill., a potential biocontrol agent occurred naturally and it readily attacks a large number of insect pests. It is an effective biocontrol agent of rice hispa (*Dicladispa armigera* Oliver) (Coleoptera: Chrysomelidae) in Assam, India (Hazarika and Puzari, 1990; Puzari and Hazarika, 1991, 1992). Insecticides may have antagonistic or synergistic effect on the potentiality of *B. bassiana*, and may disrupt natural epizootics. Under such epizootic condition it is expected to enhance effectiveness through joint action of pathogen and compatible insecticides, which would reduce not only the cost of protection and but also reduce the contamination of the environment. It was also shown that sub-lethal dose of a insecticide would make the insect physiologically weak up to a desired degree which made it much more susceptible to the attack of the entomopathogens (Fedorinehik, 1974). Earlier Puzari and Hazarika

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(1991), observed that conidia of *B. bassiana* at a concentration of 10^7/ml, when mixed with Sandovit, Triton-AE, Teepol-80 and Hamam toilet soap (all at 0.025%) caused 81, 74, 81, 96 and 92 per cent mortality to the adult hispa, respectively. Growth inhibition of entomopathogenic fungi is a useful criterion for initial testing of its compatibility. Contradictory results in the literature and variation among fungal isolates of the same species in relation to the same insecticides suggest that it is important to evaluate compatibility of the potential strains / isolates of fungi with more common agrochemicals. The present study aims at to know the influence of some selected insecticides on the growth of *B. bassiana* (isolate rice hispa) *in vitro*.

MATERIALS AND METHOD

The present experiment was conducted in the Mycology Research Section, Department of Plant Pathology, Assam Agricultural University, Jorhat, Assam, India during the period of 2002-2003.

Isolate of *Beauveria bassiana*

Beauveria bassiana was isolated in pure culture on Potato Dextrose Agar (PDA) medium from infected adults of rice hispa, collected from rice hispa endemic area of Sibsagar district, Assam, India (Puzari & Hazarika, 1994).

Insecticides and botanicals

Commercial formulations of thirteen common insecticides used against insect pests of rice in Assam *viz*. endosulfan (Thiodan 35 EC), dimethoate (Rogor 100EC), monocrotophos (Nuvacron 36 SL), malathion (Assamol 50EC), chloropyriphos (Dursban 20 EC), carbofuran (Furadon 3G), dichlorvos (Nuvan 100 EC), quinalphos (Ekalux 25 EC), triazophos (Hostathion 40 EC), cypermethrin (Kripcord 10 EC), deltamethin (Decis 28 EC), alphamethrin (Farsa 10EC), phosphamidon (Dimecron 85 EC) and one botanical *viz*. Neemerin (7EC) were selected. These were tested for their growth inhibition of *B. bassiana* by poison food technique on PDA medium with five replications. For chemical insecticides two doses were tested one at recommended dose (RD) and another at half of the recommended dose (½ RD) and for Neemerin three doses one at recommended and one at ½ and another at ¼ of the recommended dose were tested.

Each 100 ml portion of the medium was dispensed in to a 250 ml Erlenmeyer conical flask and autoclaved at 121° C for 30 minutes. It was then cooled to about 45°C; stock solutions of the pesticides prepared in sterilized distilled water were incorporated into each flask to provide different level of doses.

Each flask was shaken well and poured into sterilized Petri-dishes (90 mm). Medium without insecticide served as a control. Each plate was inoculated with a 5mm inoculum disc cut out with the help of sterile cork borer from 10 days old culture of *B. bassiana* and transferred to center of Petri-dishes containing the desired media. The inoculated dishes were incubated at 25 ± 1° C. Observation on radial growth of colony (mm) of *B. bassiana* in the Petri-plates treated with different insecticides at different doses were recorded on 16th day of incubation. Per cent growth inhibition over control was calculated. Five replicates were maintained for each treatment including one set of control separately for recommended and half of the recommended dose and interpreted at 5 per cent level of significance.

RESULTS AND DISCUSSION

Commercially used insecticides of all the tested chemicals and botanical lowered the mycelial growth of *B. bassiana* in PDA medium significantly. There is complete inhibition of mycelial growth (100.00%) with monocrotophos (0.31%) and dichlorvos 100 EC (0.12%) (Table1). This complete inhibition of mycelial growth at the recommended dose of monocrotophos is in contradictory with Vilas Boas and Alves (1989) who reported with no inhibition of viability with the insecticides. This may be due strainal variation. Cypermethrin followed by deltamethrin, alphamethrin and phosphamidon at field recommended dose could be tolerated well and showed growth inhibition of < 50 per cent. Half of the recommended dose of deltamethrin was found best in compatibility with lowest per cent inhibition of 14.06. This was

Table1. *In vitro* compatibility of *B. bassiana* with insecticides

Treatment (%)	Dose (%)	Radial Growth of *B. bassiana* (mm)*	Per cent growth inhibition over control
Control	-	89.60	-
Endosulfan	0.350	25.40	71.65
	0.175	72.80	18.75
Dimethoate	0.370	22.90	74.44
	0.185	43.90	51.00
Monocrotophos	0.310	0.00	100.00
	0.160	47.90	56.54
Malathion	0.250	24.60	75.54
	0.125	65.70	42.24
Choloropyriphos	0.050	24.80	72.32
	0.025	64.00	28.57
Carbofuran	0.070	41.00	54.24
	0.035	55.40	38.17
Diclorvos	0.120	0.00	100.00
	0.060	35.60	60.27
Quinalphos	0.050	38.00	57.59
	0.025	58.70	34.49
Triazophos	0.050	26.83	70.05
	0.025	36.67	59.07
Cypermethrin	0.006	54.00	39.73
	0.003	66.80	25.45
Deltamethrin	0.002	48.00	46.43
	0.001	77.00	14.06
Alphamethrin	0.008	46.80	47.77
	0.004	70.30	21.54
Phosphamidon	0.005	44.50	50.33
	0.025	62.50	30.25
Neemerin	3.000	36.80	58.93
	1.500	38.00	57.59
	1.000	50.40	43.75
CD (p=0.05)		4.68	

followed by endosulfan exhibiting 18.75 per cent inhibition at the half of the recommended dose (0.175%). Half of the recommended concentration of alphamethrin (0.004%), cypertmethrin (0.003%) and chloropyriphos (0.125%) were however, tolerated well showing 21.54, 25.45 and 28.57 per cent of growth inhibition, respectively. Malathion at recommended concentration (0.25%) showed 75.54 per cent inhibition of the mycelial growth of *B. bassiana*. The inhibitory effect of 28.57 per cent at half of the recommended dose of chloropyriphos may be helpful on development of rice hispa (*Dicladispa armigera* in endemic areas. Ribba *et al.* (1983) advocated this half of the recommended dose of chloropyriphos in combination with *B. bassiana* to *Ostriana nubilalis*.

This inhibitory effect on radial growth of *B. bassiana* was also reported by Anderson and Roberts (1983). They also reported that the formulations obtained in either wettable or in flowable forms cause no inhibition of fungal growth but often increases colony numbers, whereas emulsifiable concentrate formulations shows inhibition of *B. bassiana* germination. Significant and consistent inhibition of *B. bassiana* by different insecticides was reported earlier (Fargues, 1972; Fargues and Vey, 1974).

Study on growth inhibition of Neemerin at recommended dose (3%), another at half and one of the recommended doses showed growth inhibition of 58.93, 57.59 and 43.75 per cent, respectively (Table 1). Gupta *et al.* (1999) reported compatibility of certain neem formulation *viz.*, Achook, Field Marshal, Margocide, and Nimbicidine in 10,000, 1000 and 100 ppm to *B. bassiana*, but in our present study we have found inhibitory action of Neemerin (7 EC) at 3, 1.5 and 1 per cent. This may be due to the chemical nature of azadirachtin and other active ingredients present in the formulation.

The present studies open an area of using entomopathogen together with compatible insecticides as multiple mortality factors against target pests and also help in delay and expression of resistance to new insecticides.

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