Ann. Appl. Biol. 112(Suppl.) 26-27.

FUNGITOXIC EFFECT OF ENDOSULFAN AND QUINALPHOS ON PHYTOPHTHORA PALMIVORA, THE FOOT ROT PATHOGEN OF BLACK PEPPER

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Keywords : Fungitoxicity, Phytophthora palmivora MF4, Piper nigrum L., foot rot, Longitarsus nigripennis, endosulfan, quinalphos.

Introduction

The fungus, Phytophthora palmivora MF4 (morphological form 4) causing 'foot rot' disease and the flea beetle, Longitarsus nigripennis infesting berries and tender leaves cause severe losses in black pepper (Piper nigrum L) They cause maximum damage during South-west monsoon period (June -September). Since spraying of pepper plantations with fungicides and insecticides is undertaken simultaneously, we attempted studies on the compatibility of systemic fungicides such as metalaxyl and Aliette with the insecticides, endosulfan and quinalphos which are commonly used to control the berry damage by flea beetle. The fungitoxicity of the insecticides revealed during the course of these studies are reported here.

Materials and Methods

The effect of insecticides on the radial growth of P. palmivora in carrot agar and corn meal agar media was studied adapting poison-bait technique. Technicalgrade samples of endosulfan (94.88%; Hoechst India Ltd.,) and quinalphos (94.4%; Sandoz (India) Ltd.) were first dissolved in acetone and later incorporated into media in required quantities to get the final concentrations ranging from 1 to 150 ug/ml . For every concentrations three replicate plates of 9 cm dia, each containing about 15 ml of the amended medium were used. Plates containing medium unamended with insecticides but containing acetone equivalent in quantities to the insecticide amended media were maintained as controls. The plates were inoculated with 2 mm culture discs of P. palmivora and incubated for 72 h at 25 $\pm$ 1°C. Colony diameters were recorded and inhibition percentages were calculated. Regression analysis was carried out taking log concentrations and the probit values of inhibition percentages to work out ED-50 values (Table 1).

The effect on sporangiogenesis was studied at 10, 50, 100 and 150 ug/ml concentrations. From the margins of colonies grown at these concentrations on carrot agar, 0.5 mm discs @ three from each of three colonies per concentration were transferred to corresponding concentrations of insecticides kept in three petriplates of 5 cm dia, each containing 5 ml of the solution/suspension. The insecticide solutions/suspensions were prepared by first dissolving them in acetone and then diluting with sterile distilled water. Culture discs kept in sterile distilled water containing same quantities of acetone as in insecticide solutions served as control. After 72 h of incubation under fluorescent light, the sporangia in each of four microscopic fields per disc were counted at a magnification of 10x x 40x. Inhibition percentages were calculated (Table 1).

To test the in vivo effect of the insecticides, six-month old pepper cuttings of cultivar Karimunda having at least six fully opened leaves were used. A set of four plants were sprayed with about 80 ml of insecticide at 500 ug/ml concentration prepared using commercial samples. Another set of plants sprayed similarly with distilled water was kept as control.

After the leaves were dry the plants were inoculated by spraying with 8 ml/plant of zoospore suspension containing approximately 15 x 10^4 zoospores/ml. Both for insecticides application and inoculation, glass automiser was used. After inoculation the plants were incubated in a humid chamber at 25-28°C. After 72 h the number diameters of the lesions were recorded (Table 2).

Table 1. Effect of endosulfan and quinalphos on growth and sporulation of Phytophthora palmivora

Treatment	ED 50(ug/ml)		Sporangial inhibition(%)			
	Corn meal agar	Carrot agar	10 ug/ml	50 ug/ml	100 ug/ml	150 ug/ml
Endosulfan	56.1	52.8	26.2	81.5	88.5	89.5
Quinalphos	58.4	276.7	8.6	6.4	Not tested	92.45

Table 2. Effect of endosulfan and quinalphos on Phytophthora palmivora infection in black pepper.

Treatment	No.of lesions (Total for 4 plants)	Mean lesion diameter (in cm)
Untreated control	13	1.2
Endosulfan	1	1.3
Quinalphos	3	0.2

Results and discussion

According to earlier reports quinalphos did not affect the fungal populations in rice and groundnut fields (3, 2) whereas the available reports differ with regard to the effect of endosulfan on soil fungi(4,1). Our results have shown that both these insecticides were toxic to P. palmivora in vitro and in vivo (Table 1 and 2). This character can be exploited in the integrated disease and pest management of black pepper.

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