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Two fungal diseases of chilli and bell pepper in West Bengal

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Foot rot of chilli and bell pepper (caused by *Phytophthora capsici* Leonian) is prevalent in West Bengal. *P. capsici* from chilli and bell pepper infected brinjal, guava, cucumber, pointed gourd, tomato fruits, betel vine and black pepper leaves in laboratory condition. *P. capsici* could be successfully isolated in Oat meal agar medium amended with vancomycin (200 ppm), pimaricin (10 ppm), carbendazim (25 ppm). When a agar disc with mycelial growth of *P. capsici* was put in water in half submerged condition, it produced good mycelial growth, abundant sporangia and the sporangia thus formed germinated in water. Putting colonized agar disc at different concentrations of fungicides and recording the extent of mycelial growth, sporangia formation and sporangial germination in aqueous condition, sensitivity of *P. capsici* was successfully tested. Copper oxychloride, copper hydroxide, mancozeb, ziram, thiram, combination product of mancozeb + metalaxyl, copper oxychloride + metalaxyl. cymoxanil + mancozeb inhibited this fungus to a large extent.

Twig blight caused by *Choanephora cucurbitarum* (Berk & Ravenel) Thaxt also causes extensive damage of chilli and bell pepper. Initially the pathogen infected actively growing young branches. Water soaked lesion was formed at a point of an individual branch above which the ultimate branches were produced. The lesion encircled the branch causing death of young branch above the lesion. Prominent hairy growth of *C. cucurbitarum* on the infected tissue was found in the morning hours. The disease gradually spreaded to more and more branches, even to the stem causing severe crop damage under warm and humid condition. Spraying of copper oxychloride checked the disease.

Key words: Chilli, bell pepper, *Phytophthora capsici*, *Choanephora cucurbitarum*, Thaxt, Foot rot, Twig blight

INTRODUCTION

Chilli is an important cash and spice crop in West Bengal; which is cultivated almost in every district of the state. The crop is grown for both green and dry chilli. In recent years, bell pepper is cultivated in some areas of the state. Both the crops are affected by number of diseases (Khatua and Maiti. 1982). Recently these crops are found to be infected by two fungal diseases, foot rot and twig blight. A little is known about these problems in this sate. Present investigation has been initiated with recording the symptoms of the diseases followed by selection of suitable medium for isolation and development of easy technology for bioassay of fungicides against foot rot pathogen. In addition, an attempt has been taken to know the host range of the foot rot pathogen and for management of twig blight through spraying fungicides under field condition.

MATERIALS AND METHODS

Preparation of selective medium

Oat meal medium was used as basal medium (Jana *et al.*, 2005). Vancomycin, pimaricin, carbendazim were taken in a 25 ml sterilized conical flask and l m l absolute alcohol was added to it. The flask was kept as such for 24 h to allow alcohol to evaporate. Then 20 ml of sterile water was added to the flask and shaken. The solution was kept in refrigerator for future use (up to 30 days). Now the solution was mixed with the molten, sterilized oat meal agar medium (Oat meal 17 g, Agar-agar 20 g, water 1 liter) prepared earlier @ 4 ml/200 ml medium before use.

Pathogenicity test

Pathogenicity test was conducted by putting small agar disc containing active mycelial growth of the individual fungus over injured surface of fruit followed by covering the surface with moist cotton. Injury was done by a sterilized needle up to a depth of 0.5 mm covering an area of 1 cm^2. The inoculated fruit was placed inside a polythene bag containing moist cotton wool, blown with air and the mouth tied with a rubber band. These polythene bags were then incubated at 28 ± 1°C in a BOD incubator. Observation on extent of rotting was taken at 24 h interval up to seven days.

Bioassay of fungicide

Phytophthora capsici was grown in oat meal agar medium and after 10 days growth circular discs of 5 mm diameter were cut with the help of sterilized cork borer. Three such discs were put in a Petriplatc. Fungicide suspension was then poured in this plate in such way that the agar disc became partially submerged in fungicide suspension. Now the plate was covered with its lid and incubated at room temperature or in BOD at 25-28°C. For each concentration of a particular fungicide four such plates were prepared and incubated for three days. Suitable control was maintained with water. After incubation, the plates were observed under microscope to note the extent of mycelial growth, sporangia formation and sporangial germination in fungicidal suspension and water. Presence of empty sporangia represented sporangial germination. Eleven fungicides were selected for bioassay and five concentrations for an individual fungicide for the study (Table2).

RESULTS AND DISCUSSION

Symptoms: Foot rot

Foot rot disease was recorded mainly in chilli crop grown for production of green chilli during September to November in both the direct seeded and transplanted crop. Wilting of the plant was the first noticeable symptom. Rotting of bark was seen at basal part of the stem. Such rotting was seen below the soil level where earthing up was followed along the row or slightly above the soil level. In some infected plants, rotting of stem continued up to the branches. Encircling the stem or branch resulted death of plant parts above the point of infection.

In bell pepper Foot rot disease was recorded in early growth stage of the crop in September to November. Rotting of stem appeared at basal part of the stem of young plants and the plants died.

Medium for isolation of the Foot rot causing pathogen

Initially isolation of the eausal pathogen in PDA was not successful. Later attempt was taken to develop a selective medium. It was developed through incorporation of Vancomycin (200 mg), Pimaricin (10 mg) and Carbendazim (25 mg) per liter of Oat meal agar medium. There were earlier reports of selective media for isolation of *Phytophthora* (Ocana and Tsao, 1966; Tsao and Ocana 1969; Ploetz and Parrado, 1987; Tsao and Menyonga, 1966). All these media contained Pimaricin and Vancomycin in general. One medium contained PCNB, and another one medium contained PCNB, Ampicillin, Rifampicin and Hemexazole in addition to Vancomycin and Pimaricin. It was difficult to obtain these chemicals for the present study. Attempts were made to find out a suitable alternative. Finally a selective medium was developed through modification of the medium originally proposed by Tsao and Ocana (1969). Human drugs, as available in the market, were used as source of Vancomycin and Pimaricin. Carbendazim was used in place of PCNB, since the later is not available here. In this modified medium isolation of *P. capsici* became easy and *P. capsici* could be obtained in pure form.

The Foot rot causing pathogen

The causal pathogen was successfully isolated in

the selective medium. The causal fungus also grew well on oat meal agar medium. Only few sporangia were formed on these media. Abundant sporangia were formed when a small agar disc with mycelial growth of the fungus was put in water in half submerged condition and the sporangia germinated in water.

Hyphae were aseptate and course. Sporangiophores were narrow and branched. Sporangia were broadly ovoid or elongated, papillate and caducous, 35-64 to 22-37 μm in size. Its length breadth ratio was 1.5:1. Chlamydospores were present. The pathogen was identified as *Phytophthora capsici* Leonian (Stamps *et al.*, 1990)

Host range of Phytophthora capsici

On artificial inoculation in laboratory, *Phytophthora capsici* isolated from chilli and bell pepper infected chilli, bell pepper, brinjal, tomato, pointed gourd, cucumber and guava fruits, betelvine and black pepper leaves (Table 1). *Phytophthora* spp. are known to cause rot type disease in many plants in West Bengal (Jana *et al.*, 2005), *P. capsici* was not detected in natural condition in these plants (cucumber, pointed gourd, tomato, brinjal, sesamum, betelvine and black pepper).

Bioassay of fungicides against Phytophthora capsici

Of the fungicides tested carbendazim did not inhibit mycelial growth, sporangia formation of *Phytophthora capsici* and their germination. Other ten fungicides showed inhibitory effect against *Phytophthora capsici* (Table 2). Combination product of copper oxychloride and metalaxyl appeared as best as the performing fungicide followed by thiram, copper oxychloride, copper hydroxide and

Table 1: Host range of *Phytophthora capsici*

Isolated from	Inoculated on								
	Fruit							Leaves	
	Chilli	Bell pepper	Brinjal	Tomato	Pointed gourd	Cucumber	Guava	Betelvine	Black pepper
Chilli	+++	+++	+++	++	++	++	++	++	++
Bell peeper	+++	+++	+++	+++	++	++	++	++	++

+ : Extent of rotting

Table 2: Effect of fungicides on *Phytophthora capsici* in aqueous environment.

Fungicides	Standard dose of spraying (g/l) or (ml/l)	Extent of mycelial growth at concentration-g/l or ml/1			At concentration-g/l or ml/l	
		No growth	Poor or deformed growth	Normal growth	Inhibition of sporangia formation	Inhibition of sporangial germination
Copper oxychloride 50%WP	4.0	1.0-0.5	0.25-0.125	0.0625	0.0625	0.0625
Copper hydroxide 77%WP	2.5	1.0	0.5-0.125	0.0625	0.0625	0.0625
Ziram 27% SC	3.4	1.0	0.5-0.125	0.0625	0.0625	0.0625
Zineb 75%WP	2.0	1.0	0.5-0.25	0.125	0.125	0.125
Mancozeb75%WP	2.0	–	0.125-1.0	0.0625	0.125	0.125
Thiram 75%DS	2/0	0.5	0.125-025	0.0625	0.0625	0.0625
Carbendazim 50%WP	1.0	–	–	1.0	–	–
Metalaxyl 35%WS	1.0	1.0	0.5	0.25	0.5	0.5
Mancozeb (64%)+ Metalaxyl (8%)WP	2.5	1.0	0.25-0.125	0.0625	0.125	0.125
Copper oxychlorider (50%) +Metalaxyl (6%)WP	2.5	0.25	0.125	0.0625	0.0625	0.0625
Cymoxanil (8%) Mancozeb (64%)WP	2.0	1.0	0.5-0.25	0.0625	0.125	0.125

ziram. All these fungicides inhibited sporangia formation and their germination at a concentration of 0.0625 g/1. Mancozeb plus metalaxyl formulation inhibited mycelial growth at a concentration of 0.5 g/1 but sporangia formation and sporangial germination were inhibited at a concentration of 0.125 g/1. Saha *et al.* (2004) obtained more or less similar results in respect to *Phytophthora melonis* (Guharoy *et al.*, 2006). Following this procedure effect of any chemical can be tested against *Phytophthora capsici* easily. This simple method is useful to study the effect of fungicide on mycelial growth, sporangia formation and their germination of *Phytophthora melonis*

Symptoms Twig blight

The disease was recorded in West Bengal by Khatua and Maiti in 1982. That time the disease affected the crop in September-November. The disease was considered as minor disease. Presently this disease appeared to be common in occurrence. Usually the disease affected the plant at active growing stage. Water soaked lesion appeared at a point of an individual branch above which the ultimate branches were produced. The lesion encircled the branch causing death of young branch above the lesion. Prominent hairy growth of the pathogen was seen on the infected tissue in the morning hours. In warm and humid weather, the disease spreaded rapidly causing severe damage ol the crop. In this stage lesion could be seen on the stem. In 2007, twig blight was seen in middle of January. The intensity of the disease has been increased to a large extent after the first record of the disease in 1982. Direct fruit infection ware rare. In bell peeper the symptoms were similar. The causal pathogen is identified as *Choanephora cucurbitarum* (Berk & Ravenel) Thaxt (Khatua and Maiti, 1982).

Tablew 3 : Efficacy of fungicides in controlling twig blight of chilli

Fungicides	Dose (g or ml/l)	Number of infected twig per plot
Copper oxychloride 50%WP	4.0	6.25
Ziram 27%SC	3.0	10.25
Copper oxychloride (50%)+ metalaxyl (6%)WP	4.0	4.0
Mancozeb (64%)+ metalaxyl (8%)WP	3.0	15.5
Carbendazim 50%WP	1.0	47.75
Control		45.75
CD at 5%		4.88

Fungicidal control of Twig blight of chilli

A field trial was conducted at farmer's field to evaluate the efficacy of five selected fungicides against twig blight of chill. The trial was conducted in November. Fungicides were sprayed after the appearance of the disease in the field and the infected twig were removed from the field before first spraying. Individual plot size was 15 feet x 4 feet and there were four replication for each treatment. The fungicides were sprayed twice at ten days interval and number of infected twig was counted fifteen days after second spray. It appears from the result that copper oxychloride + metalaxyl formulation gave excellent control (Table 3). Copper oxychloride and ziram also gave good protection followed by mancozeb + metalaxyl formulation. Carbendazim was ineffective.

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