Research Paper :

In vitro management of *Macrophomina phaseolina* by chemicals

P.V. KHALIKAR, V.M. GHOLVE AND A.K. ADSUL

International Journal of Plant Protection, Vol. 4 No. 1 (April, 2011) : 201-203

See end of the article for authors' affiliations

Correspondence to :
V.M. GHOLVE
Department of Plant Pathology, College of Agriculture, Marathwada Agricultural University, PARBHANI (M.S.) INDIA
Email : vikramgholve@rediffmail.com

SUMMARY

Chemical control is one of the measures to manage the disease and avoid the losses. The evaluation study was therefore conducted *in vitro*. Seven fungicides were tested against the pathogen *i.e. Macrophomina phaseolina in vitro*. The highest inhibition (100%) of *M. phaseolina* was observed due to carbendazim (500 ppm), chlorothalonil (500 ppm), hexaconazol (500 ppm) and captan (2500 ppm) followed by mancozeb (2500 ppm) (94.39 %) and benomyl (1000 ppm) 93.4 % and rest of the treatments significantly inhibited colony growth over control. The significantly highest inhibition (100%) of scleortial production was recorded due to carbendazim (500 ppm), chlorothalonil (800 ppm), hexaconazol (500 ppm) and captan (2500 ppm) followed by mancozeb (2500 ppm) 96.59 % and benomyl (1000) 96.59%.

Khalikar, P.V., Gholve, V.M. and Adsul, A.K. (2011). *In vitro* management of *Macrophomina phaseolina* by chemicals. *Internat. J. Pl. Protec.*, **4**(1): 201-203.

Key words : *Macrophomina phaseolina,* Poisoned food technique, Inhibition zone

***Received :* December, 2010**
***Accepted :* March, 2011**

Oilseed crops have been the backbone of agricultural economy of India from time immemorial. Safflower (*Carthamus tinctorius* L.) is one of the important oilseed crops of the world valued for its highly nutritious edible oil. Safflower plant is much branched herbaceous annual plant. The safflower crop is grown in India in *Rabi* or winter season *i.e.* from October / November to March/April on all types of soil including sandy soil but crop is best suited to deep, well drained fertile soil with high water holding capacity and neutral pH.

It is primarily grown as mixed or sole crop under rainfed conditions but in some area it is grown under irrigation. The important safflower growing countries are: India, Mexico, USA, Argentina, Canada, China, Spain, Italy, Turkey, Iraq, Iran, Egypt, Ethiopia and Sudan. In India, it is mainly grown in Maharashtra, Karnataka, and part of Andhra Pradesh, Madhya Pradesh, Orissa and Bihar. In Maharashtra, it is mainly grown in Solapur, Pune, Ahmednagar, Latur, Osmanabad, Parbhani, Hingoli and Jalna districts.

Economically India occupies first position in hectarage followed by USA. Maharashtra ranks first in area and production accounting as 67% and 63%, respectively, in India (Anonymous, 2006). In India diseases play an important role in safflower cultivation and responsible to cause 25-60 % yield losses every year.

Some of the important diseases of safflower occurring in India are root rot [*Macrophomina Pheseolina* Tassi. (Goid.)], leaf spot/blight (*Alternaria carthami*),wilt (*Fusarium oxysporum* f. sp. *carthami*), powdery mildew (*Erysiphe cichoracearum* DC), anthracnose (*Colletotrichum capsici*), leaf blight/spot (*Pseudomonas syringae* Van Hall), mosaic (Cucumber mosaic virus) and necrosis (Tobacco streak virus)

Amongst these diseases the root rot caused by *Macrophomina pheseolina* Tassi (Goid) is a serious and commonly occurring as soil born disease. The fungus produces stem splitting symptoms on plant.

MATERIALS AND METHODS

The disease samples were collected from All India Coordinated Research Project on Safflower, Marathwada Agricultural

University, Parbhani during the month of the November 2009. Affected plants showing typical symptoms genotypes were selected for isolation of pathogen.

The portion of the roots affected by root rot disease were cut into 5 mm small pieces. These pieces were then surface sterilized in 0.1 per cent mercuric chloride solution ($HgCl_2$) followed by three changes in sterile water. Then these pieces were planted on sterilized Potato dextrose agar (PDA) in Petri dishes. The Petri dishes were incubated at 28 $\pm$ 2^0C temperature in inverted position. After 3 days, subculturing was done on Potato dextrose agar slants by transferring the young mycelial bit with the help of sterile inoculating needle. The culture tubes were kept at 28 $\pm$ 2^0C temperature throughout the course of studies.Subculturing was done at regular intervals of 15 days, using Potato dextrose agar slants.

Potato dextrose agar medium was used as a basal medium for the fungicidal study by Poisoned food technique**.** Potato dextrose agar medium was prepared in the 250 ml conical flask. 100 ml medium was taken in each flask. The medium then was sterilized at 15 lbs vapour pressure for 15 minutes. Required quantity of test fungicides were calculated and added in the sterilized medium separately. Flasks containing poisoned medium were shaken well to have even and uniform distribution of the fungicides.

About 20 ml of poisoned PDA was poured in each of the sterilized Petri plates and allowed to solidify. The plates were inoculated by pure culture of *Macrophomina phaseolina*. For this purpose, 5 mm disc of one week old culture was cut with a sterilized cork borer. The disc was lifted and transferred aseptically in the centre of Petri plates containing the medium with test fungicides. Three plates were maintained for each treatment. The control plates without fungicides were also inoculated and kept for incubation.

Treated plates were incubated at 28+2^0C temperature. The observations on colony diameter were recorded after 5 days. The inhibition zone was calculated by using the following formula:

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

where,

PI = Per cent inhibition

C = Growth in control plates

T = Growth in plates treated with fungicides.

The data were statistically analysed in C.R.D.

Experimental details:

Experimental design	:	CRD
Replications	:	Four
Number of treatments	:	8
Treatment details		
		Conc. (ppm)
C_1- Carbendazim		500
C_2- Mancozeb		2500
C_3- Propiconazole		500
C_4- Chlorothalonil		500
C_5- Hexaconazol		500
C_6- Benomyl		1000
C_7- Captan		2500
C_0- Control		0

RESULTS AND DISCUSSION

The results presented in Table 1 revealed that all the fungicides were significantly effective in reducing the radial mycelial growth of *M. phaseolina* over control. Significantly lower mycelial growth was obtained in carbendazim (500 ppm), chlorothalonil (500 ppm), hexaconazol (500 ppm) and captan (2500 ppm) over all the treatments. Mancozeb (2500 ppm) and benomyl (1000 ppm) treatments were at par with each other. Propiconazole (500 ppm), benomyl (1000 ppm) and mancozeb (2500 ppm) were found to be least effective in reducing the growth. Maximum inhibition of *M. phaseolina* was observed due to carbendazim (100 %), chlorothalonil (100%), Hexaconazole (100%) and captan (100%).

Table 1 : Efficacy of fungicides against *M. phaseolina in vitro*

Treatments	Five days after inoculation		
	Conc. (ppm)	Mean diameter (mm)	% inhibition over control
C_1- Carbendazim	500	0.00	100
C_2- Mancozeb	2500	5.05	94.39
C_3- Propiconazole	500	20.13	77.64
C_4- Chlorothalonil	500	0.00	100
C_5- Hexaconazol	500	0.00	100
C_6- Benomyl	1000	5.94	93.4
C_7- Captan	2500	0.00	100
C_0- Control	0	90.00	0.00
S.E. $\pm$		0.713	
C.D. (P=0.05)		2.09	

Sclerotial production:

The results presented in Table 2 reveal that all the

Table 2 : *In vitro* effect of fungicides on sclerotial production and inhibition of *M. phaseolina*

Treatments	Five days after inoculation		
	Conc. (ppm)	Mean diameter (mm)	% inhibition over control
C_1- Carbendazim	500	0.00	100
C_2- Mancozeb	2500	4.75	96.59
C_3- Propiconazole	500	7.75	94.43
C_4- Chlorothalonil	500	0.00	100
C_5- Hexaconazol	500	0.00	100
C_6- Benomyl	1000	4.75	96.59
C_7- Captan	2500	0.00	100
C_0- Control	0	139.00	0.00
S.E. $\pm$		1.05	
C.D. (P=0.05)		3.08	

fungicides tested, significantly inhibited sclerotial production over untreated control (0.00). Significantly lower sclerotial production was observed in carbendazim (500 ppm), chlorothalonil (500 ppm), hexaconazol (500 ppm) and captan (2500 ppm) treatments and were at par with each other. Benomyl (1000 ppm) and mancozeb (2500 ppm) treatments were found at par with each other. However, fungicides carbendazim (500 ppm), chlorothalonil (500 ppm), hexaconazol (500 ppm) and captan (1000 ppm) recorded 100 per cent inhibition of average sclerotial production. This was followed by the fungicides mancozeb (96.59 %), benomyl (96.59 %) and propiconazole (94.43 %).

Results obtained in respect of the efficacy of fungicides effectively inhibiting colony growth and scleortial production of *M. phaseolina* are in conformity with those reported earlier in safflower, groundnut, black gram, cowpea (Jhooty and Bains, 1972; Kapoor and Chohan, 1974; Goel and Mehrotra, 1981; Giri and Peshney, 1983; Hooda and Grover, 1983; Martin *et al*., 1984; Gautam and Narain, 1996; Devi and Singh, 1997; Sheela and Packiaraj, 1999; Lambhate *et al*., 2002).

Authors' affiliations:
P.V. KAHLIKAR AND A.K. ADSUL, Department of Plant Pathology, College of Agriculture, Marathwada Agricultural University, PARBHANI (M.S.) INDIA

REFERENCES

Anonymous, (2006). Safflower. Annual Progress Report of DOR, **3**:101-107.

Devi, T.P. and Singh, R.H. (1997). Screening of fungicides against seedling mortality of blackgram caused by *Macrophomina phaseolina*. *Indian J. Plant Prot.*, **25**(2): 123-127.

Gautam, V.S. and Narain, Udit (1996). Efficacy of some fungitoxicants against *Macrophomina phaseolina* casuing blight of cowpea. *Ann. Plant Protec Sci.,* **4**(1): 85-94.

Giri, G.K. and Peshney N.L. (1983). Efficacy of some fungicides *in vitro* against fungi causing leaf spot in mungbean. *J. Soil & Crops,* **3**(2): 112-114.

Goel, S.K. and Mehrotra, R.S. (1981). Chemical control of root rot of gram caused by *Rhizoctonia bataticola. Acta Botanica Indica*., **9**(2): 228-232.

Hooda, I. and Grover, R.K. (1983). Comparative antifungal activity of fungitoxicants against *Rhizoctonia bataticola* causing seedling rot and foliage blight of mungbea. *Indian J. Pl. Path*., **1**(1): 75-82.

Jhooty, J.S. and Bains, S.S. (1972). Evaluation of different systemic and non systemic fungicides against greengram leaf spot incidence. *Karnataka J. Agric. Sci.*, **5**(3): 241-243.

Kapoor, S.P. and Chohan, J.S. (1974). Evaluation of fungicides for the control of fruit rot of papaya caused by *Macrophomina phaseolina. Indian Phytopath*, **27**: 251.

Lambhate, S.J., Chaudhari, G.K., Mehtre, S.S. and Zanjare, S.R. (2002). *In vitro* evaluation of chemicals against root rot of cotton caused by *Macrophomina phaseolina. J. Maharashtra Agric. Univ.,* **27**(1):99-100.

Martin, S. Bruce, Lean, Lucas, T. and Canbell, C. Lee (1984). Comparative sensitivity of *Rhizoctonia solani* and *Rhizoctonia* like fungi to selected fungicides *in vitro*. *Phytopathology*, **74**(4): 778-781.

Sheela, J. and Packiaraj, D. (1999). Biological controls of root rot of groundnut. *Madras Agric. J*., **86**(10-12):599-601.

****