The Bioscan 9(1): 433-435, 2014 (Supplement on Plant Pathology)
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

MANAGEMENT OF SCLEROTIUM WILT OF *JATROPHA CURCAS*

YASHODA R. HEGDE*, TIPPESHI L. CHAVHAN AND RAJALAXMI S. KESHGOND
Department of Plant Pathology,
University of Agricultural Sciences, Dharwad - 580 005, Karnataka, INDIA
e-mail: uasyashoda@rediffmail.com

KEYWORDS
Fungicides
Jatropha curcas
Management
Sclerotium wilt

Received on :
20.12.2013

Accepted on :
24.02.2014

***Corresponding author**

ABSTRACT

Fungicides were evaluated under *in vitro* conditions against *Sclerotium rolfsii* causing wilt of *Jatropha curcas* and the efficient ones were then evaluated under *in vivo* conditions. All the tested fungicides could give cent per cent inhibition of mycelial growth of *Sclerotium rolfsii* except carbendazim that gave 57.44 per cent mycelial growth inhibition. Systemic fungicides like hexaconazole (0.1%), propiconazole (0.1%) or combiproducts like carboxin 37.5% + thiram 37.5% (0.1%) and carbendazim + mancozeb (0.2%) were the best with no wilt incidence. Both hexaconazole (0.1%) and carboxin + thiram (0.1%) were found to increase per cent seed germination (75%) and plant height(17.28 and 16.23 cm respectively). Carbendazim could give the highest seed germination (91.66%) and recorded 25.00 per cent wilt incidence under *in vivo*. Mancozeb was found to be least efficient in managing Sclerotium wilt under *in vivo* with 33.00 per cent wilt incidence.

INTRODUCTION

Physic nut (*Jatropha curcas* L.) globally known as Jatropha belongs to the family Euphorbiaceae. It is a large shrub or small tropical tree widely distributed in arid and semiarid areas. It is a multipurpose crop of significant economic importance as a biofuel and parts of the shrub are used in traditional medicine and as raw material for pharmaceutical and cosmetic industries (Paramathma *et al*., 2006). Sclerotium wilt incited by *Sclerotium rolfsii* is a potential biotic limiting factor for cultivation of *Jatropha curcas*. It is known to affect the plant at all growth stages, causes seed and seedling rot and finally wilting of seedlings, first reported by Hegde *et al*. (2009). *Sclerotium rolfsii* Sacc. Is a soil borne fungal pathogen with a wide host range causing root/ collar rot and wilt diseases. It perpetuates through sclerotia which are considered to be extremely hardy and relatively resistant survival structures (Singh *et al*., 2003), principle means of dispersal (Okabe *et al*., 2000; Gururaj, 2012; Rasu *et al.,* 2013).

Management of Sclerotium wilt is difficult since it is soil-borne in nature, has a wide host range and survives for longer periods through the sclerotial bodies. The present paper deals with the evaluation of fungicides to manage Sclerotium wilt of Jatropha both under *in vitro* and *in vivo* condition.

MATERIALS AND METHODS

In vitro evaluation of fungicides against *Sclerotium rolfsii*

Different systemic, contact and combi-product fungicides were evaluated against *Sclerotium rolfsii* by employing poisoned food technique (Nene and Thapliyal, 1982) at three concentrations. The calculated quantity of fungicide was added to potato dextrose agar (PDA), mixed thoroughly and poured into sterilized Petriplates and allowed to solidify. After solidification, each plate was inoculated with a 5 mm diameter disc obtained from an actively growing margin of *S. rolfsii* colony on PDA. There were 3 replications for each treatment. The Petri dishes were incubated at 27 + 1ºC in BOD incubator. The observations on colony diameter were recorded when control plate was completely covered with the test fungus. Per cent inhibition of mycelial growth of test fungus was calculated by using the formula given by Vincent (1947) and the results are presented in Table 1, 2 and 3.

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

Where,

I: Percent inhibition

C: Radial growth in control

T: Radial growth in treatment

The efficient fungicides were then evaluated under *in vivo* conditions. Giant culture of *S. rolfsii* prepared on corn meal sand medium was inoculated to the pots at 4 per cent concentration (Hegde *et al*., 2010). Jatropha seeds were sown in these wilt sick pots and after 30 days of sowing, drenching of different fungicides at mentioned concentrations was done.

RESULTS AND DISCUSSION

In vitro studies revealed that systemic fungicides like hexaconazole, propiconazole and difenconazole showed complete inhibition of mycelial growth at all concentrations tested (Table1). Contact fungicides like mancozeb, chlorothalonil, captan and zineb inhibited the mycelial growth completely at the concentration of 0.1% (Table2). All the

Table 1: *In vitro* evaluation of systemic fungicides against *Sclerotium rolfsii* infecting *Jatropha curcas*

	Per cent inhibition of mycelial growth Concentration (%)			
Systemic Fungicides	0.025	0.05	0.1	Mean
Carbendazim	55.90	57.38	59.96	57.74
Propiconazole	100.00	100.00	100.00	100.00
Hexaconazole	100.00	100.00	100.00	100.00
Difenconazole	100.00	100.00	100.00	100.00

Table 2: *In vitro* evaluation of contact fungicides against *Sclerotium rolfsii* infecting *Jatropha curcas*

	Per cent inhibition of mycelial growth Concentration (%)			
Contact Fungicide	0.1	0.2	0.3	Mean
Mancozeb	100.00	100.00	100.00	100.00
Zineb	100.00	100.00	100.00	100.00
Chlorothalonil	100.00	100.00	100.00	100.00
Captan	100.00	100.00	100.00	100.00

Table 3: *In vitro* evaluation of combi products against *Sclerotium rolfsii* infecting *Jatropha curcas*

	Per cent inhibition of mycelial growth Concentration (%)			
Combi products	0.05	0.1	0.2	Mean
Carboxin 37.5% + thiram 37.5%	100.00	100.00	100.00	100.00
Carbendazim 12% + mancozeb 63%	100.00	100.00	100.00	100.00
Zineb 64% + Hexaconazole 4%	100.00	100.00	100.00	100.00
Tricyclazole 18% + Mancozeb 62%	100.00	100.00	100.00	100.00

Table 4: Effects of fungicides on per cent germination, height and wilt incidence in *Jatropha curcas*

Fungicides	Concentration (%)	Seed germination (%)	Plant height (cm)	Per cent Sclerotium wilt
Untreated control	-	33.33	12.80	41.67(6.46)*
Hexaconazole	0.1	75.00	17.28	0.00(1.00)
Carboxin + thiram	0.1	66.66	14.38	0.00 (1.00)
Carbendazim	0.1	91.66	13.28	25.00(4.41)
Mancozeb	0.2	75.00	10.83	33.33(5.78)
Propiconazole	0.1	58.33	14.00	0.00(1.00)
Carbendazim + mancozeb	0.2	75.00	16.23	0.00(1.00)
S.Em±		6.80	1.12	0.74
CD at 5%		20.97	3.43	2.29

*- Figures in parentheses are $\sqrt{x+1}$ transformed values

combiproducts like carboxin 37.5% +thiram 37.5% and carbendazim 12% + mancozeb 63% completely inhibited *S. rolfsii* (Table 3). Bindu Madhavi and Bhattiprolu (2011) reported that difenconazole, hexaconazole and propicoazole were efficient in inhibiting the mycelial growth of *S. rolfsii* causing chilli dry root rot under *in vitro* conditions. Efficacy of propiconazole (0.10%) and hexaconazole (0.1%) under *in vitro* against *S. rolfsii* has also been reported by Vinod (2006).

In vivo results depicted in Table 4 and Plate 1 indicated that all fungicides, *viz*. hexaconazole (0.1%), carboxin + thiram (0.1%), carbendazim (0.1%), mancozeb (0.2%), propiconazole (0.1%) and carbendazim + mancozeb (0.2%) reduced the Sclerotium wilt incidence significantly compared to the untreated control. Hexaconazole (0.1%), carboxin + thiram (0.1%), propiconazole (0.1%) and carbendazim + mancozeb (0.2%) completely controlled wilt incidence. Kulkarni *et al.* (1986) reported that vivatax (carboxin) at a concentration of 50 ppm was effective in complete inhibition of *S. rolfsii* infecting wheat under *in vitro* conditions. Charde *et al.* (2002) reported that soil treatment with propiconazole and hexaconazole effectively reduced stem rot of groundnut caused by *S. rolfsii*. Virupaksha Prabhu and Hiremath (2003) reported that hexaconazole, propiconazole and mancozeb completely inhibited *S. rolfsii* in cotton when applied as soil drench. Hegde *et al.* (2010) reported that hexaconazole (0.1%), carboxin + thiram (0.1%) and carbendazim 12% + mancozeb 63% (0.2%) completely controlled wilt of stevia caused by *S. rolfsii* under *in vivo* conditions. Bindu Madhavi and Bhattiprolu (2011) reported that hexaconazole and propiconazole completely inhibited the growth of *S. rolfsii* causing chilli dry root rot in pot culture. Manu *et al.* (2012) reported that carboxin + thiram completely inhibited the mycelial growth of *S. rolfsii* under *in vitro*. Mondal and Khatua (2013) evaluated efficacy of carboxin + thiram against *S. rolfsii* causing foot rot of *Amorphophallus campanulatus* and found that sclerotial germination was completely inhibited.

Carbendazim @ 0.1 per cent was not that efficient in managing wilt but increased the seed germination (91.66%) followed by hexaconazole (75%), whereas untreated control recorded only 33.33 per cent seed germination. Plant height was maximum in hexaconazole (17.28 cm) which was on par with carbendazim+ mancozeb, carboxin+thiram and

T_1 - Control
T_2 - Hexaconazole
T_3 - Carboxin + thiram
T_4 - Carbendazim
T_5 - Mancozeb
T_6 - Propiconazole
T_7 - Carbendazim + Mancozeb

Seed germination in sick pot

T_1 - Control
T_2 - Hexaconazole
T_3 - Carboxin + thiram
T_4 - Carbendazim
T_5 - Mancozeb
T_6 – Propiconazole
T_7 – Carbendazim + Mancozeb

Seedling wilts

1 - Control
2 - Hexaconazole
3 - Carboxin + thiram
4 - Carbendazim + Mancozeb
5 - Propiconazole

Effective treatments

Plate 1: Effect of fungicides against Sclerotium wilt of *Jatropha curcas*

propiconazole. Similar results were obtained by Mane *et al.* (2011) who observed increased seed germination in sorghum treated with carbendazim @ 2.5g/kg seed. Tomar and Shastry (2006) reported increased seed germination in cotton besides reducing incidence of Myrothecium leaf blight by carbendazim.

Results clearly indicate that soil drenching with hexaconazole (0.1%) or carboxin + thiram (0.1%) managed the Sclerotium wilt of Jatropha effectively with increased seed germination and plant growth.

ACKNOWLEDGEMENT

We are grateful to National Oil seeds and Vegetables Oils Development board (NOVOD), Gurgaon, Haryana, for providing financial assistance during investigation.

REFERENCES

Bindu Madhavi, G. and Bhattiprolu, S. L. 2011. Integrated disease management of dry root rot of chilli incited by *Sclerotium rolfsii* (Sacc.). *Int. J. Pl. Ani and Environ. Sci.* **1(2):** 31-37.

Charde, J. D., Waghale, C. S. and Dhote, V. L. 2002. Management of stem rot of groundnut caused by *Sclerotium rolfsii*. *Plant Dis. Res.* **11**: 220-221.

Gururaj, S. 2012. Tebuconazole: a new triazole fungicide molecule for the management of stem rot of groundnut caused by *Sclerotium rolfsii*. *The Bioscan.* **7(4):** 601-603.

Hegde, Y. R., Tippeshi, C. and Patil, S. J. 2009. *Jatropha curcas - A new host for Sclerotium rolfsii. J. Pl. Dis. Sci.* **4(2):** *230.*

Hegde, Y. R., Chavhan, T. L., Chavan, S. S., Rao, M. S. L. and Rasalkar, R. 2010. Evaluation of fungicides against *Sclerotium rolfsii* causing wilt of *Stevia rebaudiana*. *J. Pl. Dis. Sci*. **5(2):** 254-256.

Kulkarni, S., Chattannavar, S. N. and Hegde, R. K. 1986. Laboratory evaluation of fungicides against foot rot of wheat caused by *Sclerotium rolfsii* Sacc. *Pesticides.* **9:** 27-31.

Mane, P. V., Rathod, L. R., Honna, G. B., Patil, V. C. and Muley, S. M. 2011. Effect of fungicidal seed treatment on seed mycoflora and seed germination during storage of sorghum. *Biosci. Disc*. **2(2):** 214-216.

Manu, T. G., Nagaraja, A., Janawad, C. S. and Vinayaka, H. 2012. Efficacy of fungicides and biocontrol agents against *Sclerotium rolfsii* causing foot rot disease of finger millet, under *in vitro* conditions. *G.J. B.A.H.S.* **1(2):** 46-50.

Mondal, B. and Khatua, D. C. 2013. Evaluation of Plaster of Paris and some fungicides for management of Foot rot of *Amorphophallus campanulatus* Blume caused by *Sclerotium rolfsii* Sacc. *Int. J. Agri. Environ. and Biotech.* **6(4):** 585-589.

Nene, Y. L. and Thapliyal, P. N. 1982. Fungicides in plant disease control. *Oxford and IBH pub. Co. Pvt. Ltd.* New Delhi, pp. 212-349.

Okabe, I., Morikawa, C. and Matsumoto, N. 2000. Variation in southern blight fungi detected by ITS-RFLP analysis. *http// :ss.Jirkas.Affrc.go.Jp/engpage/jarq/34-2/okabe/34-2(3).*

Paramathma, M., Venkatachalam, P., Sampathrajan, A., Vairavan, K., Jude Sudhagar, R., Parthiban, K. T., Subramanian, P. and Kulanthaisamy, P. 2006. Cultivation of Jatropha and biodiesel production. Sri Sakthi Promotional Litho Process. p. 40.

Rasu, T., Nakkeeran, S., Raguchander, T. and Ramasamy, S. 2013. Morphological and genomic variability among *Sclerotium rolfsii* populations. *The Bioscan*. **8(4):** 1425-1430.

Singh, A., Mehta, S., Singh, H. B. and Nautiyal, C. S. 2003. Biocontrol of collar rot disease of betelvine (*Piper betle* L.) caused by *Sclerotium rolfsii* by using rhizosphere-competent *Pseudomonas fluorescens* NBRI-N6 and *P. fluorescens* NBRI-N. *Curr. Microbiol*. **47(2):** 153-158.

Tomar, D. S. and Shastry, P. P. 2006. Efficacy of fungicides against recovery of *Myrothecium roridum* in cotton seed. *Internat. J. Agric. Sci.* **2(2):** 408-410.

Vincent, J. M. 1947. Distortion of fungal hyphae in the presence of certain inhibitors. *Nature.* **159:** 850.

Vinod, D. 2006. Studies on root rot of chilli caused by *Sclerotium rolfsii* sacc. Thesis University of Agricultural Sciences, Dharwad. p. 55.

Virupaksha Prabhu, H. and Hiremath, P. C. 2003. Bioefficacy of fungicides against collar rot of cotton caused by *Sclerotium rolfsii* Sacc. *Karnataka J. Agric. Sci.* **16(4):** 576-579.