IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
ISSN-0973-1547 Volume 17 | Issue 2 | July, 2022 | 163-166
DOI: 10.15740/HAS/IJPS/17.2/163-166
Visit us - www.researchjournal.co.in

RESEARCH ARTICLE

In vitro evaluations of fungicides against *Sclerotium rolfsii* Sacc. Causing collar rot of chickpea

■ N. Sangeeta, H. Virupaksha Prabhu and Gurupad Balol

SUMMARY

Collar rot of chickpea is caused by *Sclerotium rolfsii*. *In vitro* evaluation of fungicides for the management of collar rot was carried using contact, systemic and combi fungicides. Among contact fungicides tested Mancozeb showed cent per cent inhibition at 0.20 %. Among systemic fungicides tested Hexaconazole (0.05 %) and Propiconazole (0.15 %) showed cent per cent inhibition. Among the combi fungicides evaluated Carbendazim 12 % + Mancozeb 63 % (0.15 %) and Hexaconazole 4 % WP + Zineb 68 %, Carboxin 37.5 % + Thiram 37.5 %, Tricyclazole18 % + Mancozeb 62 % WP, Captan70 % + Hexaconazole 5 % WP at 0.05 per cent concentration showed cent per cent inhibition. Among allthe fungicides tested combi products were found to be effective (Hexaconazole 4 % + Zineb 68 % at 0.05 %) in inhibiting the pathogen.

Key Words : Chickpea, *Sclerotium rolfsii*, *Chemicals* collar rot, Management

How to cite this article : Sangeeta, N.,Virupaksha Prabhu, H. and Balol, Gurupad (2022). *In vitro* evaluations of fungicides against *Sclerotium rolfsii* Sacc. Causing collar rot of chickpea. *Internat. J. Plant Sci.*, **17** (2): 163-166, **DOI: 10.15740/HAS/IJPS/17.2/163-166,**

Article chronicle : Received : 08.04.2022; **Revised :** 24.04.2022; **Accepted :** 26.05.2022

Sclerotium rolfsii Sacc. is a devastating soil-borne fungus which infects more than 500 plant species in tropical and subtropical countries of the world (Aycock, 1966 and Punja, 1985). It infects all stages of plants like seeds, seedlings and mature plants in the field. Disease appear in legumes, cereals, fresh vegetables and tuber rhizomes (Dasgupta and Mandal, 1989).

The chickpea is the *Rabi* season crop grown under residual soil moisture, the prevailing uncertain climatic condition leads to various plant diseases resulted in economic loss of agricultural productivity due to climate change. Plant disease outbreaks are increasing and threatening food security of the world under changing climatic scenario. Global yield losses due to crop pests and diseases on crops are large. Important diseases such as Turcicum leaf blight in maize (Hooda *et al*., 2017), *Fusarium wilt* and dry root rot in chickpea (Talekar *et*

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
N. Sangeeta, Department of Plant Pathology, College of Agriculture, Dharwad University of Agricultural Sciences, **Dharwad (Karnataka) India**
Email : sangeetamnevani@gmail.com

Address of the Co-authors:
H. Virupaksha Prabhu, Department of Plant Pathology, College of Agriculture, Dharwad University of Agricultural Sciences, **Dharwad (Karnataka) India**

Gurupad Balol, AICRP on MULLaRP, University of Agricultural Sciences, **Dharwad (Karnataka) India**

al., 2017 and 2021), phyllody in chickpea (Balol *et al.,* 2021) and chickpea rust (Basamma *et al.,* 2021), leaf spots in groundnut, Phytopthora blight and wilt in pigeonpea, necrosis disease in sunflower (Sundaresha *et al.,* 2012) and bud blight caused by groundnut bud necrosis virus (Balol and Patil, 2014) *etc.* are contributing for the yield loss. Out broken pest fall armyworm in maize (Tippannavar *et al.,* 2019) also threatening food security. When there is high soil moisture and temperature at early stage influence the activity of *Sclerotium rolfsii* leads to heavy yield loss. Prabhu (2003) conducted *in vitro* evaluation of different systemic and non-systemic fungicides against collar rot of soybean caused by *Sclerotium rolfsii* and reported cent per cent mycelial inhibition in case of Carboxin, Carbendazim (63 %) + Mancozeb (12 %) and Propiconazole. Thiram was found most effective and Zineb showed least effectiveness. Keeping the above view the present work was taken upto evaluate some systemic, contact and combi (combination) fungicides against the pathogen *S. rolfsii* under *in vitro*.

MATERIAL AND METHODS

Isolation of the pathogen:

Affected chickpea plants showing the typical symptoms of collar rot disease were collected from the farmers' field during survey and were subjected to isolation of the fungus through standard isolation technique. Affected tissue bits were surface sterilized with 1:1000 mercuric chloride solutions for one minute and then aseptically transferred to Petri plates having potato dextrose agar medium. These plates were then incubated at 27± 1 ^{0}C for 4-5 days. The fungal growth, which arose through the infected tissues were aseptically transferred to the PDA slants.

***In vitro* evaluation of fungicides against *S. rolfsii* :**

The efficacy of five systemic fungicides (Carbendazim 50 %WP, Difenconazole 25 % EC, Propiconazole 25% EC, Hexaconazole 5% EC, Thiophanate Methyl 70% WP); four non-systemic fungicides (Mancozeb 75%WP, Captan 50% WP, Copper oxychloride and Chlorothalonil) and five combo fungicides (Carbendazim 12% + Mancozeb 63%, Hexaconazole 4 % WP + Zineb 68 %, Carboxin 37.5% + Thiram 37.5%, Tricyclazole 18 % + Mancozeb 62 % WP and Captan70 % + Hexaconazole 5 % WP) was evaluated *in vitro* at different concentrations (contact fungicides at 0.15,0.2,0.25 % and systemic and combi fungicides at 0.05, 0.1,0.15 % concentration) against the growth of *Sclerotium rolfsii* on potato dextrose agar (PDA) medium using poisoned food technique (Nene and Thapliyal, 1982). Five replications were maintained for each treatment. Potato dextrose agar medium without any of the fungicide served as control. The plates were incubated at 27± 1^{0}C for recording radial growth of the target fungus *in vitro*.

The mean colony diameter in each treatment was recorded after reaching the full growth in the control plate. It was measured by taking diameter of the colony in two directions. The per cent inhibition of the growth over control was calculated by using the formula given by Vincent (1947).

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

where,

I = Per cent inhibition of mycelium

C = Growth of mycelium in control

T = Growth of mycelium in treatment.

RESULTS AND DISCUSSION

The fungicides were evaluated under *in vitro* condition. Fungicides such as contact, systemic and combi products were tested. Among the contact fungicides, Mancozeb (0.20 %) showed 100 per cent inhibition whereas copper oxychloride was showed least inhibition (5.04 %). Among the systemic fungicides evaluated, hexaconazole showed 100 per cent inhibition at all concentrations (0.05 %, 0.10 %, 0.15 %), followed by propiconazole at 0.15 % concentration. In five combi products tested, cent per cent inhibition observed in case of Carbendazim + Mancozeb (Saaf 63 %) at 0.15 % concentration and in all other fungicides evaluated. The result confirm with the established findings of earlier workers *viz.,* Prabhu (2003), Manu *et al.* (2012) reported that hexaconazole, Hexaconazole and propiconazole were found to be most effective on the growth of *S. rolfsii* at lower concentrations. All the five combo fungicides were found to be highly inhibitory on the growth of *S. rolfsii* and it is in accordance with the works of many workers.

This finding showed that the combi products found most effective in managing the pathogen and preventing the resistance development. Contact fungicides interfere with much fungal physiological activity whereas; systemic fungicides interfere with some functional activity of the fungus, which is easily overcome by the pathogen's

resistant reaction.Therefore, the combination of both contact and systemic fungicides provides better long-term plant disease management.

Efficacies of fungicides were tested under pot trials. The fungicides found best under *in vitro* study were tested. These fungicides were drenched and tested. The

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

Fungicides	Trade name	Inhibition of mycelial growth (%) Concentration (%) 0.05	0.10	0.15	Mean
Hexaconazole 5% EC	Contaf	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Propiconazole 25% EC	Tilt	94.17 (76.03)	98.94 (84.09)	100.00 (90.00)	97.70 (83.37)
Difenconazole 25% EC	Score	88.06 (69.79)	89.72 (71.30)	90.69 (72.23)	89.49 (71.11)
Carbendazim 50 % WP	Bavistin	11.81 (20.10) *	19.72 (26.36)	24.58 (29.72)	18.70 (25.40)
Thiophanate methyl 70 % WP	Topsin M	25.89 (30.59)	33.19 (35.18)	39.44 (38.90)	32.84 (34.89)
Mean		63.99 (57.30)	68.31 (61.39)	70.94 (64.17)	67.75 (60.95)
		S.E. +		C. D. (P=0.01)	
Fungicides (F)		0.52		1.98	
Concentrations (C)		0.41		1.54	
F x C		0.91		3.44	

* Arcsine transformed values

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

Fungicides	Trade name	Inhibition of mycelial growth (%) Concentration (%) 0.15	0.20	0.25	Mean
Mancozeb	Dithane M-45	87.80 (69.56) *	100.00 (90.00)	100.00 (90.00)	95.93 (83.19)
Captan	Captaf	41.23 (39.95)	53.60 (47.06)	56.10 (48.50)	50.31 (45.17)
Copper oxychloride	Blitox - 50	1.42 (6.84)	3.02 (10.01)	10.69 (19.08)	5.04 (11.98)
Chlorothalonil	Kavach	26.60 (31.05)	28.51 (32.28)	32.87 (34.98)	29.33 (32.77)
Mean		39.26 (36.85)	46.28 (44.84)	49.91 (48.14)	45.15 (43.28)
	S. E. +			C. D . (P=0.01)	
Fungicides (F)	0.37			1.41	
Concentrations (C)	0.32			1.22	
F x C	0.65			2.44	

* Arcsine transformed values

Table 3: *In vitro* evaluation of combi fungicides against *Sclerotium rolfsii*

Fungicides	Trade name	Inhibition of mycelial growth (%) Concentration (%) 0.05	0.10	0.15	Mean
Carbendazim 12% + Mancozeb 63%	Saaf	32.08 (34.50) *	97.95 (81.77)	100.00 (90.00)	76.68 (68.76)
Hexaconazole 4% WP + Zineb 68%	Avtar	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Carboxin 37.5% + Thiram 37.5%	Vitavax power	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Tricyclazole18% + Mancozeb 62% WP	Merger	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Captan70% + Hexaconazole 5% WP	Taquat	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Mean		86.42 (78.90)	99.59 (88.35)	100 (90.00)	95.33 (85.75)
		S.E. +		C. D.(P=0.01)	
Fungicides (F)		0.48		1.80	
Concentrations (C)		0.37		1.40	
F x C		0.82		3.12	

result revealed that these fungicides were effective in inhibiting the pathogen. Avtar and Vitavax power showed 20 per cent of disease incidence, and other fungicides showed significant result in managing the disease. The similar study was done by Sangeetha (2011) in soybean collar rot.

Conclusion:

In the present investigation, five systemic fungicides; four non- systemic and five combo fungicides were evaluated for their potential of inhibition to the growth of the pathogen (*S. rolfsii*) *in vitro*. This was done with poisoned food techniques. The two fungicides *viz.,* Hexaconazole and Propiconazole among the systemic fungicides, were found to be highly effective at all the concentrations used. Least inhibition was observed with Carbendazim and Thiophanate methyl.

REFERENCES

Aycock, R. (1966). Stem rot and other diseases caused by *Sclerotium rolfsii.N. C. Agri. Exp. Stn. Tech. Bull*., pp. 174-200.

Balol, G. and Patil, M.S. (2014). Biological characterization and detection of groundnut bud necrosis virus (GBNV) in different parts of tomato. *J. Pure & Appl. Microbiol.*, **8** (1) : 749-752.

Balol, G., Channakeshava, C. and Patil, M.S. (2021). Molecular characterization of Candidatus phytoplasma aurantifolia isolates infecting chickpea (Cicer arietinum) in Dharwad, Karnataka. *Legume Research-An International J.*, **44**(7) : 854-858.

Basamma Kumbar, Gurupad Balol, Lokesh B.K, Shivaleela, Kukanur and Hanamant Nayak, (2021). Field evaluation of different fungicides against *Uromyces ciceris-arietini* causing rust in chickpea in northern Karnataka. *J. Pharmacognosy & Phytochemistry,* **10** (1): 896-900.

Dasgupta, M.K. and Mandal, N.C. (1989). *Post-harvest pathology of perishables.* New Delhi: Oxford and IBH Publisher, pp. 623.

Hooda, K.S., Khokhar, M.K. and Shekhar, M. (2017). Turcicum leaf blight—sustainable management of a re-emerging maize disease. *J. Plant Dis. Prot.,* **124** :101–113.

Manu, T. G., Nagaraja, A., Chetan, S., Janawad, Venayaka, H. (2012). Efficacy of fungicides and biocontrol agents *Sclerotium rolfsii* causing root disease of finger millet under *in vitro* conditions. *Global J. Biology, Agricultural & Health Science*, **1**(2): 46-50.

Nene, Y.L. and Thaplial, P. N. (1982). *Fungicides in plant disease control*. Oxford and IBH Publishing House, New Delhi, pp.163.

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

Punja, Z.K. (1985). The biology, ecology and control of *Sclerotium rolfsii*. *Annu. Rev. Phytopathol*., **23**: 97-127.

Sangeetha, T. V. (2011). Studies on root rot/ wilt of soybean. M. Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, Karnataka (India), pp. 104.

Sundaresha, S., Sreevathsa, R., Balol, G.B., Keshavareddy, G., Rangaswamy, K.T. and Udayakumar, M. (2012). A simple, novel and high efficiency sap inoculation method to screen for tobacco streak virus. *Physiology & Molecular Biology of Plants*, **18**(4): 365-369.

Talekar, S.C., Lohithaswa, H.C. and Viswanatha, K.P. (2017). Identification of resistant sources and DNA markers linked to genomic region conferring dry root rot resistance in chickpea (*Cicer arietinum* L.). *Plant Breed*., **136** : 161-166.

Talekar, S.C., Lohithaswa, H.C. and Viswanatha, K.P. (2021). Screening for host plant resistance to Rhizoctonia bataticola in chickpea in controlled conditions. *Legume Res.,* **44**(1) : 101-108.

Tippannavar, P.S., Talekar, S.C., Mallapur, C.P., Kachapur, R.M., Salakinkop, S.R. and Harlapur, S.I. (2019). An outbreak of fall armyworm in Indian subcontinent: A new invasive pest on maize. *Maydica,* **64** (M4): 1-10.

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