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Efficacy of Fungicides against *Corynespora cassiicola* (Berk. and Curt.) Wei causing Target Leaf Spot of Soybean

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A B S T R A C T

The present *in vitro* study was carried out at the Department of Plant Pathology, University of Agricultural Sciences, Dharwad, Karnataka, India during August 2018 to evaluate the efficacy of different fungicides against *Corynespora cassiicola* (Berk. and Curt.) Wei causing target leaf spot of soybean. The efficacy of non-systemic (1500, 2000 and 2500 ppm) and systemic fungicides (250, 500 and 1000 ppm) were assayed under *in vitro* by following poisoned food technique. Among the non-systemic fungicides tested, maximum inhibition of mycelial growth was recorded from chlorothalonil (42.96 %). Whereas, least mycelial inhibition was observed in mancozeb (20.00 %). Among the five systemic fungicides tested, carbendazim and thiophanate methyl recorded complete (100 %) inhibition of mycelial growth and were significantly superior to all other fungicides used. Least mycelial inhibition was observed in hexaconazole (13.89 %).

Introduction

Soybean (*Glycine max* (L.) Merrill) is one of the important oilseed and pulse crops of India belongs to family "Leguminaceae". It is also known as wonder crop, miracle crop because of its high protein (40 %) and oil (20 %) content which is the primary source of the world's supply of protein and vegetable oil. Major soybean producing countries are USA, Brazil, Argentina, China and India. In India the crop covers an area of 10.80 million hectare with a production of 12.10 million tonnes and a productivity of 1120 kg/ha. Madhya Pradesh state, which has the lion's share in soybean production, is often referred as "Soybean state", followed by Maharashtra, Rajasthan and Karnataka and Telangana (Anon., 2018).

Now a days, some of the minor diseases like target leaf spot are gaining importance in

soybean growing areas of Karnataka. The disease target leaf spot of soybean was first reported during 1945 in USA (Olive *et al*., 1945). Now it has been found in most of the important soybean growing states. The disease has also been reported in Cambodia, Canada, China, Japan and Nicaragua (Sinclair, 1982). In India, it was reported from Palampur during 1999-2000 and from Jabalpur during 2002-03. In Chhattisgarh it has been reported during 2002 from Raipur (Patel, 2005).

The disease affects all the above ground plant parts like leaves, stem and pods. On leaves spots are rounded to irregular and dark brown in colour and size varies from small specks to big mature spots. These spots are surrounded by a dull green or yellowish green halo. At later stages the leaves become yellow and drop prematurely. On stem and petiole the spots are dark brown and spindle shaped. On pods the spots are mostly circular with slightly depressed having light brown centre and dark brown margin.

Evaluation of fungicides under *in vitro* condition provides useful information related to the effectiveness of the fungicides against the test pathogen and this information is very much helpful for planning which fungicides are to be used under field condition. Use of fungicides for the management of disease in the absence of resistant genotypes is an old practice and it is one of the best options when there is outbreak of disease. These fungicides need to be used judiciously based on their need, dose and type of disease to be managed.

Materials and Methods

In vitro evaluation of fungicides by poisoned food technique

The efficacy of non-systemic fungicides (1500, 2000 and 2500 ppm) and systemic fungicides (250, 500 and 1000 ppm) were assayed under *in vitro* condition by following poisoned food technique (Sharvelle, 1961). Required quantity of the individual fungicide was added separately into molten and cooled potato dextrose agar so as to get the desired concentration of fungicides. Later 20 ml of the poisoned medium was poured into sterile Petri plates. Five mm mycelial disc taken from the periphery of seven days old fungal culture was placed in the centre of each plate. Control was maintained without adding any fungicide to the medium. Required number of replications were maintained for each treatment. Then such plates were incubated at 28 ± 1^{0}C till the control plate is fully covered by the growth of the mycelium and radial growth of colony was measured. The efficacy of a fungicide was expressed as per cent inhibition of mycelial growth over control and it was calculated by using the formula given by Vincent (1947).

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

Where,

I = Inhibition of mycelial growth (%)

C = Radial growth of mycelium in control (cm).

T = Radial growth of mycelium in treatment (cm).

List of fungicides used for *in vitro* evaluation

The following non-systemic fungicides were used for the evaluation at 1500, 2000 and 2500 ppm.

Sl. No.	Common name	Trade name
1	Mancozeb 75 % WP	Dithane M-45
2	Propineb 70 % WP	Antracol
3	Copper oxychloride 50 % WP	Blitox
4	Chlorothalonil 75 % WP	Kavach

The following systemic fungicides were used for the evaluation at 250, 500 and 1000 ppm.

Sl. No.	Common name	Trade name
1	Carbendazim 50 % WP	Bavistin
2	Difenconazole 25 % EC	Score
3	Thiophanate methyl 70 % WP	Roko
4	Hexaconazole 5 % EC	Contaf
5	Propiconazole 25 % EC	Tilt

Results and Discussion

Efficacy of four non-systemic and five systemic fungicides were evaluated at three different concentrations under *in-vitro* against *C. cassiicola* by following poisoned food technique as explained in material and methods. The results obtained from the study are depicted in Table1, 2 and Plate 1, 2.

All the fungicides evaluated were significantly superior over the control with respect to per cent mycelial inhibition. Systemic fungicides performed better than non-systemic fungicides. Among the non-systemic fungicides tested at three different concentration (1500, 2000 and 2500 ppm), maximum inhibition of mycelial growth was recorded in treatment involving chlorothalonil (42.96 %) which was significantly superior over rest of the fungicides, followed by Copper oxychloride (35.92 %) and propineb (25.93 %). Whereas, least mycelial inhibition was observed in mancozeb (20.00 %).

Among the systemic fungicides, complete (100 %) inhibition of mycelial growth was recorded at all the three concentrations of carbendazim and thiophanate methyl which were significantly superior over rest of the fungicides used, followed by propiconazole (94.44 %) difenconazole (70.09 %). Least mycelial inhibition was observed in hexaconazole (13.89 %).

Table.1 *In vitro* evaluation of non-systemic fungicides against *Corynespora cassiicola*

Sl. No.	Fungicides	Trade name	Inhibition of mycelial growth (%)			
			Concentrations (ppm)			Mean
			1500	2000	2500	
1	Chlorothalonil 75 % WP	Kavach	40.00 (39.23)*	42.22 (40.52)	46.67 (43.09)	**42.96 (40.94)**
2	Copper oxychloride 50 % WP	Blitox	28.89 (32.50)	37.78 (37.92)	41.11 (39.88)	**35.92 (36.76)**
3	Propineb 70 % WP	Antracol	15.56 (23.18)	25.56 (30.35)	36.67 (37.26)	**25.93 (30.26)**
4	Mancozeb 75 % WP	Dithane M-45	6.67 (14.94)	16.67 (24.08)	36.67 (37.26)	**20.00 (25.43)**
	Mean		**22.78 (27.46)**	**30.55 (33.21)**	**40.28 (39.37)**	**31.20 (33.34)**
	Source				**S. Em. ±**	**CD @ 1 %**
	Fungicide (F)				0.36	1.41
	Concentration (C)				0.32	1.22
	Fungicide × Concentration (F×C)				0.64	2.44

* Angular transformed value

Table.2 *In vitro* evaluation of systemic fungicides against *Corynespora cassiicola*

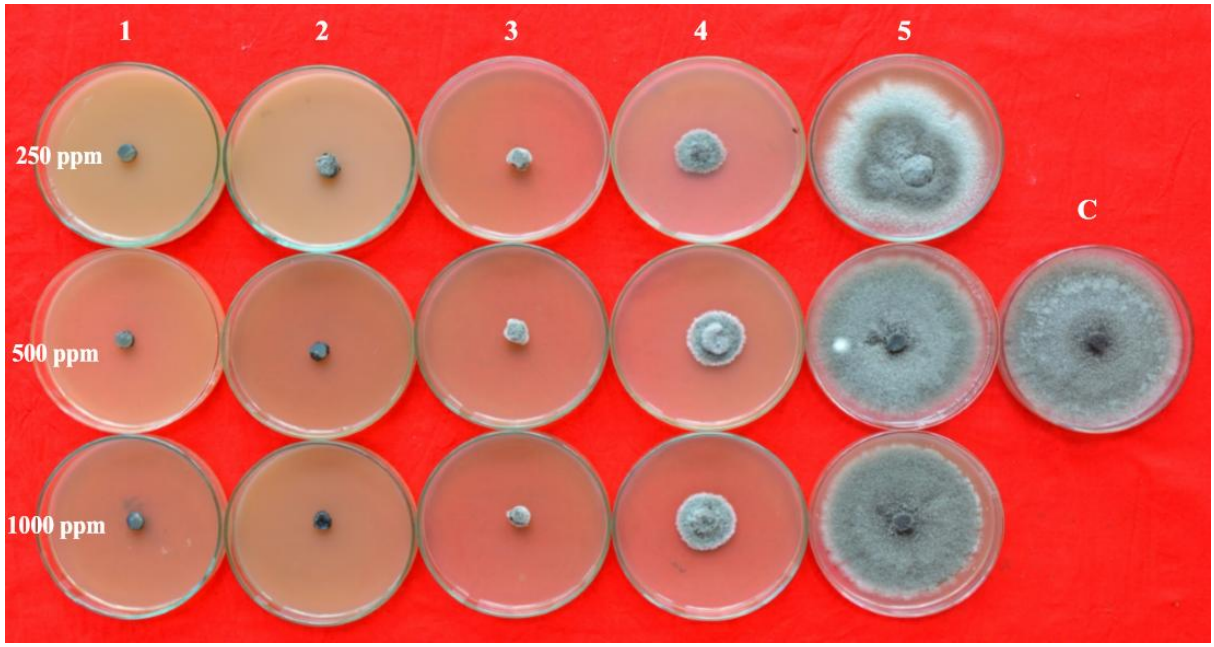
Sl. No.	Fungicides	Trade name	Inhibition of mycelial growth (%)			
			Concentration (ppm)			Mean
			250	500	1000	
1	Carbendazim 50 % WP	Bavistin	100.00 (90.00)*	100.00 (90.00)	100.00 (90.00)	**100.00 (90.00)**
2	Thiophanate methyl 70 % WP	Roko	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	**100.00 (90.00)**
3	Propiconazole 25 % EC	Tilt	94.44 (76.43)	94.44 (76.53)	94.44 (76.46)	**94.44 (76.47)**
4	Difenconazole 25 % EC	Score	65.83 (54.23)	70.83 (57.31)	73.61 (59.10)	**70.09 (56.88)**
5	Hexaconazole 5 % EC	Contaf	8.61 (16.84)	11.39 (19.70)	21.67 (27.65)	**13.89 (21.39)**
Mean			**73.77 (65.50)**	**75.33 (66.70)**	**77.94 (68.64)**	**75.66 (67.01)**
Sources					**S. Em. ±**	**CD @ 1 %**
Fungicide (F)					0.46	1.75
Concentration (C)					0.35	1.35
Fungicide × Concentration (F×C)					0.80	3.04

* Angular transformed value

Plate.1 *In vitro* evaluation of non-systemic fungicides against *Corynespora cassiicola*

1) Chlorothalonil 2) Copper oxychloride 3) Propineb 4) Mancozeb C) Control

Plate.2 *In vitro* evaluation of systemic fungicides against *Corynespora cassiicola*



1) Carbendazim 2) Thiophanate methyl 3) Propiconazole 4) Difenconazole
5) Hexaconazole C) Control

The results are in confirmative with Jones and Jones (1985), tested four different fungicide for the management of *C. cassiicola* under *in vitro* condition and reported that chlorothalonil was found most effective. Manju *et al.* (2019), complete mycelial growth inhibition was observed in carbendazim and (carbendazim 12 % + mancozeb 63 %).

The results are contradictory with respect to fungicide hexaconazole and its combi form (hexaconazole 4 % + zineb 68 %) which were found least effective among the tested fungicides. Kurre (2016) reported that hexaconazole along with propiconazole, tebuconazole, fluxapyroxad inhibited complete mycelial growth. It might be due to the presence variation in races of the pathogen prevailing in the particular area.

Triazole fungicides such as propiconazole, difenconazole and tebuconazole are effective because they interfere with the biosynthesis of fungal sterols and act as ergosterol biosynthesis inhibitors. In most of the plant pathogenic fungi ergosterol is an important component of cell wall structure and its absence leads to damage to the cell wall and death of the fungal cell. The results are in agreement with Nene and Thapliyal (1973) who reported effectiveness of triazoles because they are known to inhibit the biosynthesis pathway in fungi.

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References

Anonymous, 2018. Director's report and summary table of experiments of soybean. ICAR - IISR, Indore, pp. 2-3.

Jones, J. P. and Jones, J. B. 1985. Target spot

of tomato, epidemiology and control. Proc. Florida state Hort Soc., 97(2) : 216-218.

Kurre, A. K. 2016. Studies on variability and management of target leaf spot of soybean caused by *Corynespora cassiicola* (Berk. and Curt.) Wei. *M. Sc.* (*Agri.*) *Thesis*, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisagarh (India).

Manju, M. J., Mushrif, S., Santhosh, H. M., Patil, R. S., Shankarappa, T. H., Benagi, V. I. and Idicula, S. P. 2019. Evaluation of different fungi toxicants against *Corynespora cassiicola* causing Corynespora leaf fall disease of rubber [*Hevea brasiliensis* (Muell.) Arg.]. *Int. J. Curr. Microbiol. App. Sci*., 8(2) : 1640-1647.

Nene, Y. L. and Thapliyal, P. N. 1973. Fungicides in plant disease control. Oxford and IBH publishing Co. Pvt. Ltd., New Delhi., p. 325.

Olive, L. S., Bain, D. C. and Lefebvre, C. L. 1945. A leaf spot of cowpea and soybean caused by an undescribed species of *Helminthosporium*. *Phytopathology*, 35: 822-831.

Patel, M. P. 2005. Studies on *Corynespora cassiicola* (Bark. and Curt.) Wei causing target spot of soybean (*Glycine max* (L.) Merrill). *M. Sc.* (*Agri.*) *Thesis*, Indira Gandhi Agric. Univ. Raipur, Chhattisagarh (India).

Sharvelle, E. G. 1961. The nature and use of modern fungicides. Burges Publication Co., Minnesota, USA, p. 308.

Sinclair, J. B. 1982. Compendium of soybean diseases. *Phytopathology*, 4: 27-28.

Vincent, J. M. 1947. Distribution of fungal hyphae in presence of certain inhibitors. *Nature*, 96: 596.

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