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Evaluation chemicals against cercospora leaf spot of okra

■ SHRAWAN KUMAR, M.R. DABBAS* AND PRITI TIWARI

Vegetable Section, C.S. Azad University of Agriculture and Technology, Kalyanpur, KANPUR (U.P.) INDIA

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*Corresponding author:
Email: drmrdabbas@gmail.com

ABSTRACT

Okra (*Abelmoschus esculentus* L. Moench) earlier designated as *Hibiscus esculentus* (L.) is one of the most important vegetable crops extensively cultivated in *Kharif* and *Zaid* seasons in India. Present investigation was carried out during 2011 to 2013. The radial growth of the fungus in various treatments was measured and the average of diameter of the colony was noted. However, among the 13 fungicides, only three fungicides *viz*., *Tebuconazole, Propiconazole* and *Bavistin* 100 per cent radial growth of the fungus and proved to be the most effective as they have inhibited the fungus growth. In field conditions maximum seed germination (98.33%), minimum disease incidence (0.17%) and maximum fruit yield 145.16 q/ha was recorded in treatment three foliar of the *Tebuconazole* (0.1%).

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INTRODUCTION

India is the vegetable basket of the world. Vegetable play an important role in fitting into the traditional cropping system to make it more remunerative. Growing of vegetable is fitted for small and marginal farmers because their families can earn more profit from limited holding by intensive cultivation of vegetable crop. Vegetable growing is one of the most important commercial aspects of Indian farming system. Vegetable provide proteins, carbohydrates, minerals and vitamins which along with some cereals and other food constitute the essential part of a balanced diet. The recommended vegetable consumption is 300 g/capita/day and the current availability is only 145 g/capita/day in the developing countries of the world. One individual person should consume about 115g of green leafy vegetable, 115g other vegetable and 70g root and tuber vegetable daily for balanced diet (Gupta, 2012). Okra is one of the most important vegetable crops extensively cultivated in *Kharif* and *Zaid* seasons in India (Shivpuri *et al.*, 2004). It belongs to the family Malvaceae. It is known by many local names in different parts of the world. It is called "lady's finger" in England, "Gumbo" in United States and "Bhindi" in India (Chauhan, 1972). Okra is known to be originated from West Africa (Joshi *et al.*, 1974). Major okra growing states in India are Uttar Pradesh, Odisha, Bihar and West Bengal. It is an annual vegetable crop grown from seed in tropical and sub tropical parts of the world. It is rich in vitamins, calcium, potassium and other mineral nutrients.

Total area of vegetable in the world is 1115.931 thousand ha with fruit production 8710.210 thousand mt and productivity of the crop is 7.8 mt/ha (NHB, 2013). The area under okra cultivation in India is 530.8 thousand ha, with production 6350.3 thousand mt and productivity 12.0 mt/ha (NHB, 2013). In Uttar Pradesh total area under okra crop is about 12.44 thousand ha with production 159.30 thousand mt and productivity 12.8 mt /ha (NHB, 2013).

Okra is found to suffer from a number of diseases caused by fungi, bacteria, viruses, mycoplasmas or phytoplasmas and nematodes. The most important diseases of okra are Damping Off (Pythium sp., *Rhizoctonia* sp.), Fusarium Wilt (*Fusarium oxysporum* f. sp. vasinfectum), Powdery Mildew (*Erysiphe cichoracearum*), Yellow Vein Mosaic Virus (YVMV) and Cercospora Leaf Spot (*Cercospora abelmoschi* and *Cercospora malayensis*). Among the fungal diseases Cercospora leaf spots of okra (*Cercospora abelmoschi*) is one of the most important in all states wherever okra is grown. The past survey work conducted at Kanpur locality and Vegetable Research Farm, Kalyanpur, Kanpur revealed that main constraint to low production and productivity of okra in the region was due to infection of leaf spots of okra.

MATERIAL AND METHODS

Present investigation was carried out during 2011 to 2013. Laboratory experiment was carried out at the Department of Plant Pathology, C.S.A. University of Agriculture and Technology, Kanpur. *Cercospora abelmoschi* affected samples were collected during the year 2011-12 from different okra growing areas of Uttar Pradesh. Isolates of different isolations obtained from affected plants was tested in the same order to establish the pathogenic nature of fungi.

Chemical control of the disease:

In the investigation, different fungicides were listed for the control of *Cercospora abelmoschi*. However, prior to undertaking these studies the efficacy of fungicides belonging to different group were first as curtailed test against the pathogen and those were found effective used in further experiment in field for control of the disease. The methods adopted in these studies were as follows :

Laboratory bioassay of different chemicals:

The relative efficacy of fourteen different fungicides was tested against pathogen in the laboratory. Poison food technique developed by Schmitz (1930) was followed for screening the fungicides. The requisite of the fungicides were incorporation in 2 per cent sterilized potato-dextrose-agar medium containing flask of 150 ml and shaken well to make it homogenous. This fungicides impregnated medium was then poured in 90 mm sterilized Petri-dishes with three replications for each treatment and solidifies these dishes, than 5 mm. circular discs of inoculums from 10 days old culture was placed in the centre of each peril-plate in such a way that fungus may come in direct contact with the medium. The medium without any fungicides and inoculated similarly served as control. The Petri-dishes were incubated at 28 $\pm 1^0$C up to full growth in control. The efficacy of various fungicides was assessed by measuring the radial growth of the fungal colony in mm. The fungicides which were found effective in laboratory evaluation were further tried in the field.

Effect of fungicides in field trial:

Seed treatment and foliar spray of eleven fungicides *viz., Tebuconazole* (0.1%), *Propiconazole* (0.1%), *Hexaconazole* (0.2%), *Matco* (0.2%), *Propanil* (0.1%), *Copper oxychloride* (0.3%), *Taqat* (0.2%), *Roko* (0.2%), *Bavistin* (0.1%), *Mancozeb* (0.2%), and *Vitavax* (0.2%) applied for two times at 10 days interval from the initiation of the disease. Disease intensity was recorded on the basis of percentage of infected leaf area after 10 days of last spraying. Then statistically analyzed. The percentage of the disease over control was calculated as follows :

$$\text{Per cent disease control} = \frac{\text{Disease intensity in control - Disease intensity in treatment}}{\text{Disease intensity in control}} \times 100$$

The yield (q/ha green pods) of okra also recorded in plot and then statistically analyzed.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

Bio-assay of chemicals against the pathogen (*in vitro*):

The radial growth of the fungus in various

Table 1 : Effects of various fungicides on the radial growth of the pathogen (*in-vitro*)

Sr. No.	Fungicides	Doses in per cent	Average diameter of fungal colony (mm.)	Per cent inhibition over control
1.	*Tebuconazole*	0.1	00	100
2.	*Propiconazole*	0.1	00	100
3.	*Bavistin*	0.2	00	100
4.	*Hexaconazole*	0.1	1.50	96.29
5.	*Taqat*	0.2	2.50	93.82
6.	*Copper oxychloride*	0.3	8.00	80.24
7.	*Mancozeb*	0.2	12.00	70.37
8.	*Roko*	0.2	20.00	50.61
9.	*Matco*	0.2	28.50	29.63
10.	*Propanil*	0.1	30.30	25.18
11.	*Vitavax*	0.2	32.50	19.75
12.	*Captan*	0.2	33.40	17.53
13.	*Captafal*	0.2	35.20	13.08
14.	Control		40.50	-
	C.D. (P=0.05)		1.73	
	CV		7.22	

Table 2 : Effect of fungicides on seed germination, disease incidence and yield

Sr. No.	Fungicide	Doses (%)	Seed germination (%)				Disease incidence (%)				Yield q/ha (Green Pods)			
			2011	2012	2013	Mean	2011	2012	2013	Mean	2011	2012	2013	Mean
1.	*Tebuconazole*	0.1	98.50 (84.31)	98.50 (83.23)	98.00 (82.31)	98.33	0.00 (0.00)	0.50 (3.99)	0.00 (0.00)	0.17	145.23	143.57	146.67	145.16
2.	*Propiconazole*	0.1	98.00 (82.31)	97.50 (81.50)	98.00 (82.31)	97.83	0.00 (0.00)	1.00 (5.71)	0.00 (0.00)	0.33	133.48	135.37	137.47	135.44
3.	*Bavistin*	0.2	97.00 (80.21)	95.00 (77.22)	96.50 (79.35)	96.17	2.60 (8.99)	1.50 (7.02)	1.00 (5.61)	1.70	128.83	130.87	132.47	130.72
4.	*Hexaconazole*	0.1	97.00 (80.21)	96.00 (78.68)	95.50 (77.83)	96.17	7.80 (16.16)	6.00 (14.14)	5.80 (13.85)	6.53	126.78	128.77	130.37	128.64
5.	*Copper oxychloride*	0.3	95.00 (77.14)	94.50 (76.55)	93.50 (75.26)	94.33	8.50 (16.90)	9.20 (17.63)	10.20 (18.50)	9.30	127.23	127.77	127.17	127.39
6.	*Taqat*	0.2	96.50 (79.35)	95.00 (77.22)	94.50 (76.48)	95.33	11.00 (19.33)	11.80 (20.07)	12.30 (20.50)	11.70	95.43	96.17	94.77	95.46
7.	*Mancozeb*	0.2	90.75 (72.30)	91.50 (73.19)	88.50 (70.17)	90.25	16.60 (24.00)	15.90 (23.48)	15.20 (22.92)	15.90	86.48	88.48	91.67	88.88
8.	*Roko*	0.2	86.66 (98.57)	85.50 (67.66)	87.00 (68.92)	86.39	17.90 (24.99)	18.50 (25.44)	17.90 (25.00)	18.10	89.30	91.53	91.57	90.80
9.	*Matco*	0.2	85.50 (67.60)	85.50 (67.66)	84.00 (66.45)	85.00	20.50 (26.89)	22.50 (28.29)	21.40 (27.52)	21.47	84.20	81.13	84.77	83.37
10.	*Propanil*	0.1	85.40 (67.52)	83.50 (66.06)	85.50 (67.66)	84.80	25.90 (30.56)	24.80 (29.84)	24.20 (29.44)	24.97	77.10	78.13	79.87	78.37
11.	*Vitavax*	0.2	83.33 (65.89)	84.00 (66.45)	85.50 (67.66)	84.28	28.20 (32.05)	27.00 (31.28)	27.20 (31.41)	27.47	69.40	70.43	71.07	70.30
12.	Control (Distil water)		80.00 (63.42)	77.50 (67.69)	78.80 (62.59)	78.77	32.50 (34.73)	33.50 (35.34)	33.80 (35.52)	33.27	64.00	64.43	63.97	64.13
	C.D. (P=0.05)		4.01	4.87	3.77		1.26	1.92	0.96		9.66	10.72	10.53	
	CV		3.17	3.91	3.02		3.79	5.58	2.93		5.54	6.10	5.92	

(Figure in parenthesis shows angular value)

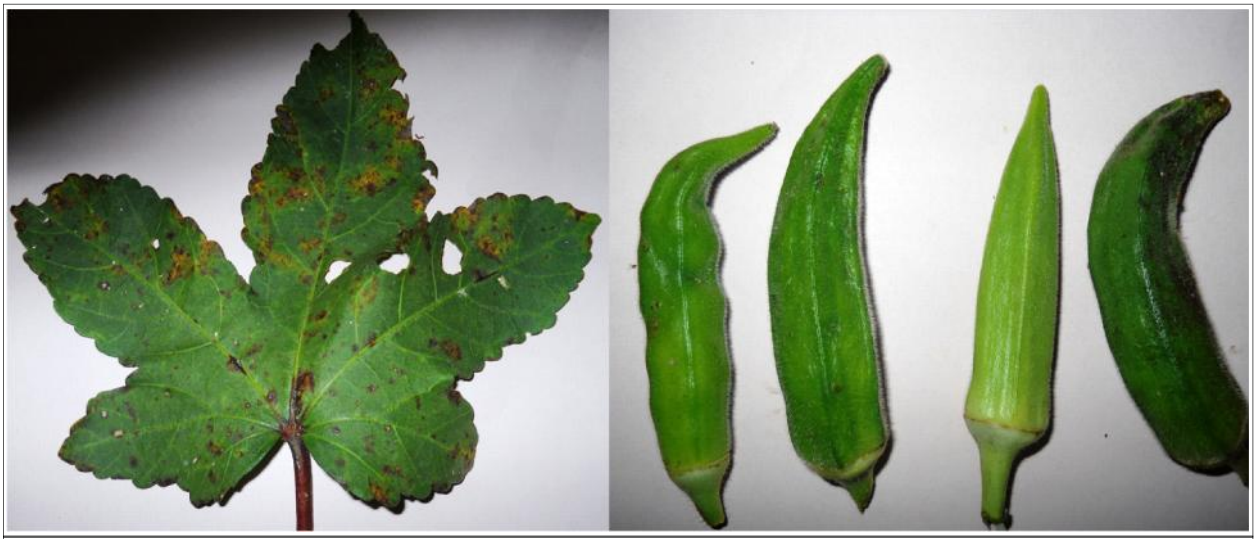

Plate 1 : Symptoms of cercospora leaf spot of okra

treatments was measured and the average diameter three replication of the colony was calculated and results were presented in Table 1. However, among the thirteen fungicides, only three fungicides *viz.*, *Tebuconazole* (0.1%), *Propiconazole* (0.1%) and *Bavistin* (0.2%), were checked the 100 per cent radial growth of the fungus proved to be the most effective. Whereas, *Hexaconazole* checked (96.29%), *Taqat* checked (93.82%), *Copper oxychloride* checked (80.24%) and *Mancozeb* checked (70.37%) mycelial growth of the pathogen. Matco checked (29.63%) and was found least effective against Cercospora abelmoschi. The present finding is supported by Beura *et al.* (2007) and Arain *et al.* (2012).

Evaluation of seed treatment and foliar spray with fungicides in field conditions:

The experiment was carried out in sick field at Vegetable Research Farm, Kalyanpur of C.S.A. University of Agriculture and Technology, Kanpur during *Kharif* seasons (2011 to 2013). The trial comprised of twelve most effective fungicides *viz.*, *Tebuconazole, Propiconazole, Bavistin, Hexaconazole, Taqat, Copper oxychloride, Mancozeb, Roko, Matco, Propanil, Vitavax* and control for seed treatment and three foliar sprays. The average seed germination, disease intensity and yield recorded were summarized in Table 2 showed that all the treatment tested was significantly effective increasing seed germination and reducing Cercospora leaf spot percentage over control. The maximum seed germination (98.33%), minimum disease incidence (0.17%) and maximum fruit yield 145.16 q/ha was recorded in three foliar sprays of Tebuconazole (0.1%), next best effective fungicides were *Propiconazole* (0.1%) and *Bavistin* (0.2%) which were statistically at par in case of seed germination disease intensity and green pod yield. Similar results have also been reported by Ansari *et al.* (1992); Srivastava *et al.* (1992); Beura *et al.* (2007) and Arain *et al.* (2012).

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