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**Mamta**

Department of Plant Pathology,  
College of Agriculture, G. B.  
Pant University of Agriculture  
and Technology, Pantnagar-  
263145, U S Nagar,  
Uttarakhand, India

**Y Singh**

Department of Plant Pathology,  
College of Agriculture, G. B.  
Pant University of Agriculture  
and Technology, Pantnagar-  
263145, U S Nagar,  
Uttarakhand, India

## Evaluation of efficacy of chemicals against zonate leaf spot of sorghum

**Mamta and Y Singh**

**Abstract**

Zonate leaf spot caused by *Gloeocercospora sorghi* Bain & Edgerton is one of the most destructive diseases of sorghum in India and Uttarakhand is considered as a hot spot for this disease. The present investigation was carried out to test the efficacy of eight chemicals viz, Mancozeb, Carbendazim, Blitox-50, Roko, Sure, Tilt, Ridomil and Kavach were evaluated at different concentrations (50, 100 and 250ppm) against *G. sorghi* for their antifungal activity *in-vitro* condition. At minimum concentration i.e. 50ppm, Mancozeb gave maximum mycelial growth inhibition (100%) of the test fungus followed by Carbendazim (97.13%), Ridomil (97.02%), Tilt (95.80%), Kavach (94.65%) and Sure (94.13%). At 100 and 250ppm, Mancozeb, Carbendazim and Ridomil showed complete inhibition of test fungus. The findings suggest that Mancozeb and Carbendazim can suppress the pathogen.

**Keywords:** Zonate leaf spot, Chemicals, *Gloeocercospora sorghi*, Poisoned food technique

**Introduction**

Sorghum (*Sorghum bicolor* (L.) Moench), is a major feed, food and fodder crop throughout the world. It is the fifth most important cereal crop in the world after maize (*Zea mays* L.), wheat (*Triticum vulgare* L.), rice (*Oryza sativa* L.), and barley (*Hordeum vulgare* L.). It is cultivated widely throughout the arid, semi arid tropics and temperate regions within the latitude of 45°-N to 45°-S. Its peculiar quality of withstanding drought makes it a potential alternative in dryland and rainfed conditions in semi-arid tropics (SAT) (Ross and Webster 1970) [8]. In Northern Western India, it meets the major fodder requirement of *kharif* and summer seasons. It is a staple food in parts of Africa and Asia and a major feed crop in the United States, Mexico, Australia and South Africa. Sorghum is attacked by a wide range of pathogens because of the diversity of its use and range of environments in which it is cultivated. Zonate leaf spot caused by *Gloeocercospora sorghi* Bain & Edgerton is one of the most destructive diseases of Sorghum crop in India, and Uttarakhand is considered as a hot spot for this disease. The disease was first reported from Louisiana State, USA by was described in detail by Bain and Edgerton (1943) [3]. Being cultivated in a variety of environments, sorghum is constantly challenged by rays of plant pathogens, especially the foliar pathogens. Numerous diseases have been reported in sorghum such as charcoal rot, stalk rot, rough leaf spot, downy mildew, red rust and anthracnose (Tarr 1962) [9]. The foliar diseases of fungal origin prevalent in India are rust, downy mildew, anthracnose, zonate leaf spot, leaf blight, grey leaf spot, sooty stripe and tar spot (Sharma *et al.* 1978). Losses in sorghum due to foliar diseases ranged from 32 to 60% (Chesser 1959) [4]. The overall estimated losses due to foliar diseases except sorghum downy mildew were around 30 % (Anahosur 1986) [2]. Zonate leaf spot cause damage upto 85% of photosynthetic area under humid and cloudy weather conditions (Agnihotri and Pandey 1977) [1]. To nourish the mushrooming human population and shrinking fertile land area has posed profound pressure upon growers to produce more and more food. For producing more, on a required rate, growers have to solely depend on agrochemicals for their consistent and expected result. Therefore, present investigation was carried to test the efficacy of fungicides against the *Gloeocercospora sorghi* under field conditions.

**Materials and Methods****Efficacy of fungicides on growth of *G. sorghi* *in vitro***

Effect of eight fungicides at different concentrations on radial growth of test fungus was evaluated by poisoned food technique (Nene and Thapliyal, 2000) [6] on oat meal agar medium (OMA). Hundred ml stock solutions (1000µg/ml) of each fungicide was prepared in sterilized

**Correspondence****Mamta**

Department of Plant Pathology,  
College of Agriculture, G. B.  
Pant University of Agriculture  
and Technology, Pantnagar-  
263145, U S Nagar,  
Uttarakhand, India

distilled water in 500 ml Erlenmeyer flask. Required amount of stock solution was poured into 150 ml Erlenmeyer flask containing 100 ml of sterilized melted OMA so as to get final concentration of 0.5 µg/ml, 1.0 µg/ml, 1.5 µg/ml, 2.0 µg/ml, 25µg/ml, 50 µg/ml, 100 µg/ml and 200 µg/ml. For calculation of amount of stock solution to be added to OMA to get above concentrations, the formula  $C_1V_2=C_2V_1$  was used, where  $C_1$  and  $C_2$  are concentration of stock solution (µg/ml), respectively, and  $V_1$  is the volume (ml) of stock solution to be added to the measured volume ( $V_2$ ) of OMA. OMA containing different concentration, each petriplate was centrally inoculated with 5 mm mycelia discs cut from the 48 hours old culture of test fungus. Unamended OMA plates served as check. Three replications were maintained for each treatment. Plates were incubated at 28±10C and colony diameter was measured when the check plates were fully covered with mycelial growth of test fungus. Per cent inhibition of the mycelium growth was calculated by using following formula:

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

where,

I = Per cent inhibition

C = Radial growth in check in mm

T = Radial growth in treated plates in mm

## Results and Discussion

Eight fungicides viz, Mancozeb, Carbendazim, Blitox, Roko, Sure, Tilt, Ridomil and Kavach were evaluated at different concentrations against *G. sorghi* for their antifungal activity. All the fungicides were found effective and significantly differed from check in mycelial growth inhibition of fungus. The per cent increase in inhibition was directly proportional to increase in concentration of each fungicide. Data pertaining to per cent inhibition of radial growth is presented in Table 1, Fig 1 and Plate 1.

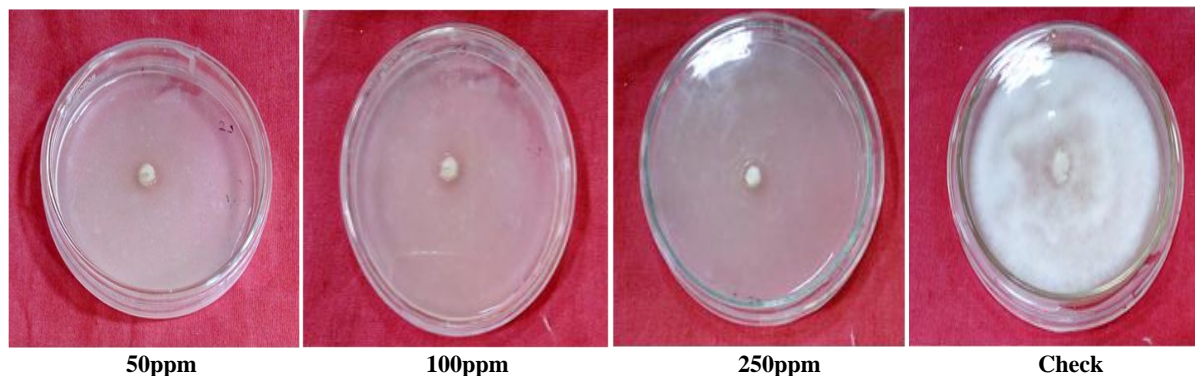
The data showed that at minimum concentration i.e. 50ppm, Mancozeb gave maximum mycelial growth inhibition (100%) of the test fungus followed by Carbendazim (97.13%), Ridomil (97.02%), Tilt (95.80%), Kavach (94.65%) and Sure (94.13%). At 100 and 250ppm, Mancozeb, Carbendazim and Ridomil showed complete inhibition of test fungus. It can be concluded that Mancozeb, Carbendazim and Ridomil were found to be more effective against *G. sorghi*. Kharayat and Singh (2012) [5] evaluated the effect of fungicides at different concentrations under lab conditions. The growth inhibition of the test pathogen was 100 % with Carbendazim, Saaf, Curzate, Quintal, Captan and Tilt at 25, 50, 100 and 200ppm concentration laboratory conditions. Carbendazim, Curzate and Quintal also inhibited growth completely at low concentrations (0.5, 1.0, 1.5 and 2.0ppm). Purohit *et al.*, (2014) [7] Observed that Saaf, Quintal and Bavastin gave 100 per cent inhibition of mycelial growth of *G. sorghi* at all concentrations *in-vitro*.

**Table 1:** Efficacy of different concentration of fungicides on radial growth of *G.sorghi*

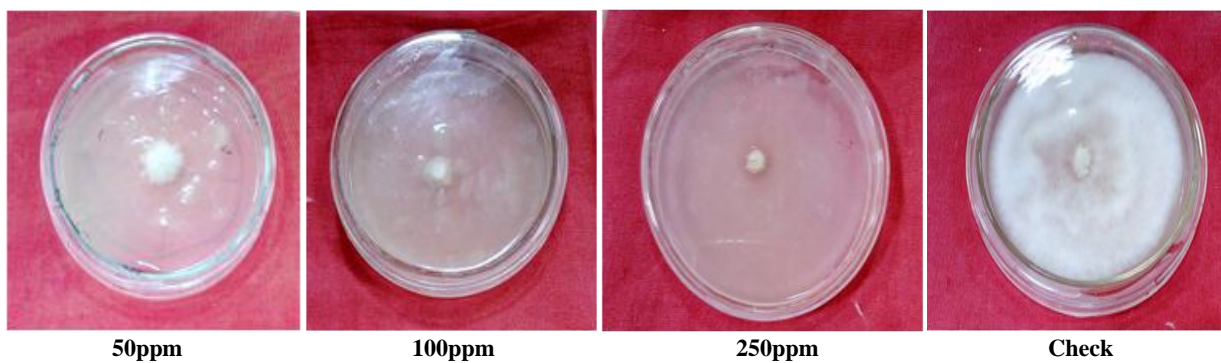
Fungicides	Radial growth of fungus (mm)			Growth inhibition (%)		
	50ppm	100ppm	250ppm	50ppm	100ppm	250ppm
Mancozeb	00	00	00	100	100	100
Carbendazim	2.58	00	00	97.13	100	100
Blitox	70.37	58.68	49.51	21.81	34.80	44.98
Roko	62.47	50.21	31.58	30.58	44.21	65.43
Sure	5.28	4.88	3.11	94.13	94.57	96.54
Tilt	3.78	3.29	1.28	95.80	96.34	98.57
Ridomil	2.68	00	00	97.02	100	100
Kavach	4.81	3.78	2.61	94.65	95.80	97.10
Check	90.00	90.00	90.00	00	00	00
CD at 5%	Dose(A)=0.31	Treatment(B)=0.54	A×B= 0.93			
CV= 2.45						

**Plate 1.**

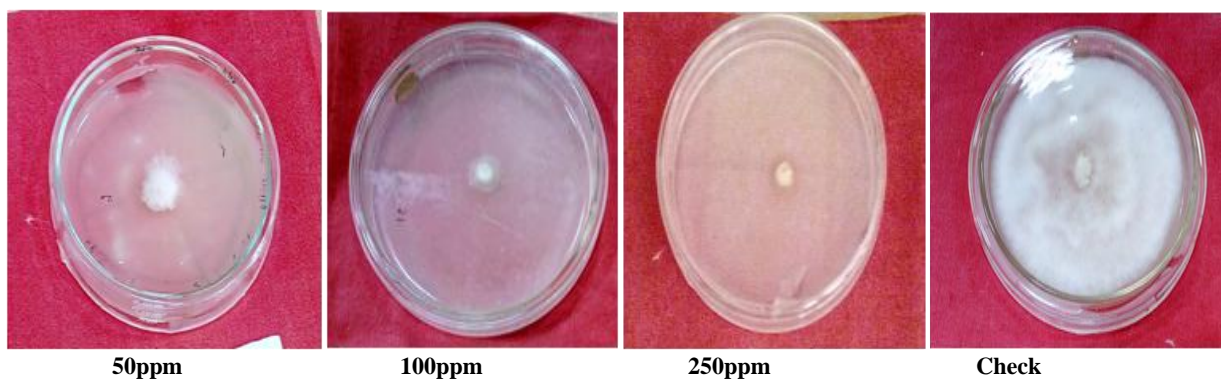
### Mancozeb



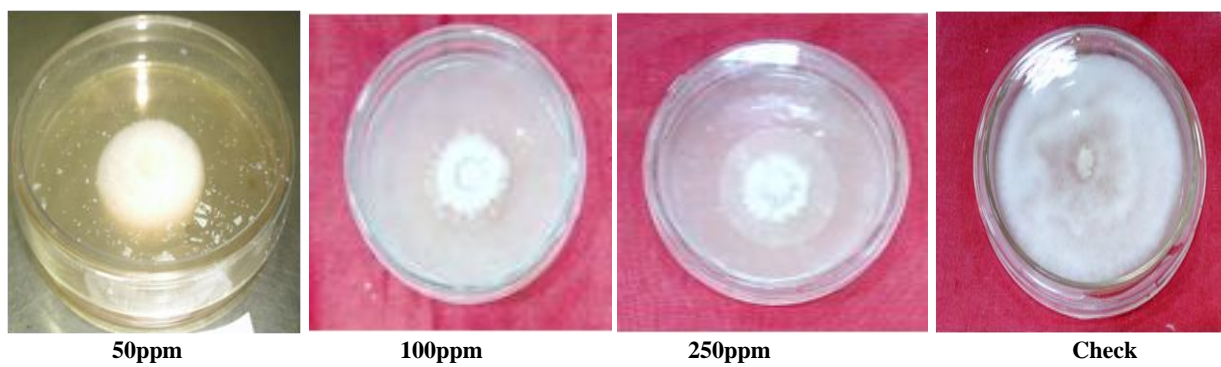
### Carbendazim



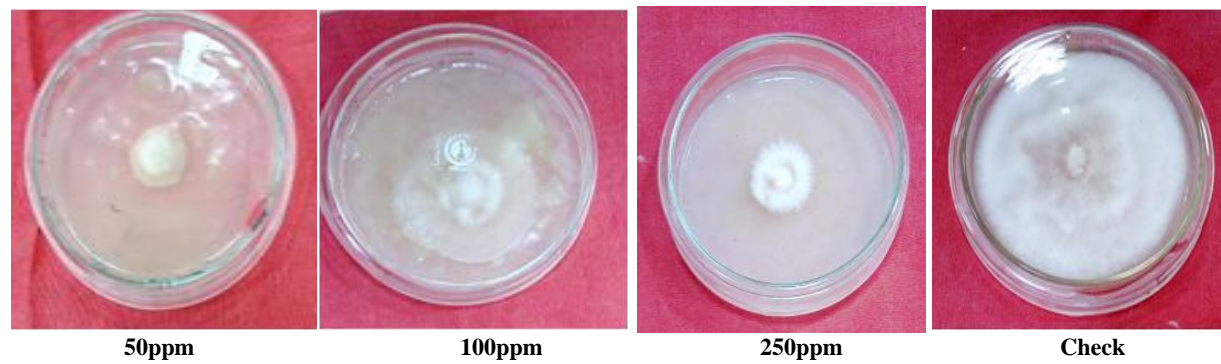
### Tilt



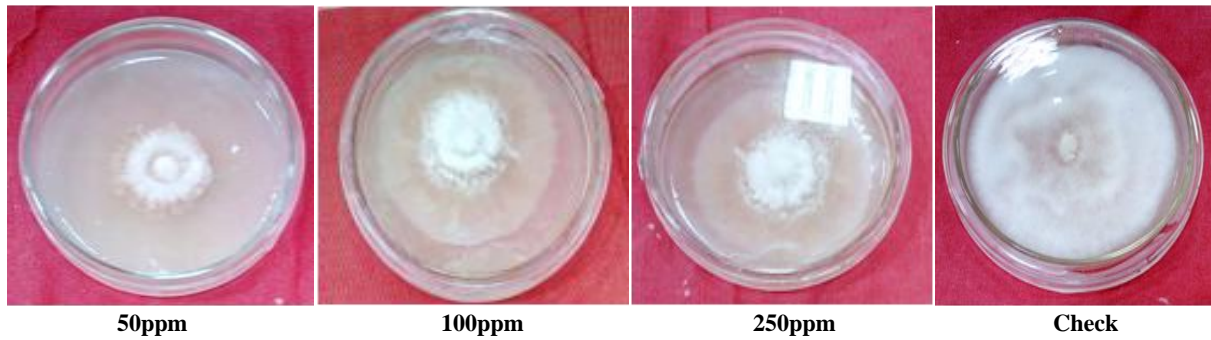
### Ridomil



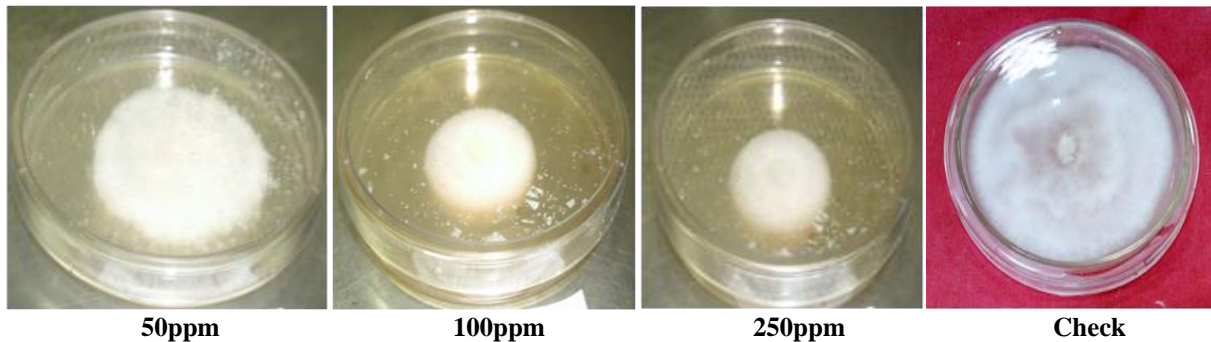
### Kavach



## Sure



## Roko



## Blitox-50



Fig 1: Effect of fungicides at different concentration on radial growth of *G. sorghi*

### Conclusion

Results of the present study indicated that for the management of this disease besides many cultural practices, chemicals are also used. It can thus be concluded that Mancozeb and Carbendazim are effective against *G. sorghi in-vitro* condition.

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