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NS Chavda

Department of Plant Pathology,
Junagadh Agricultural
University, Junagadh, Gujarat,
India

KK Kanzaria

Department of Plant Pathology,
Junagadh Agricultural
University, Junagadh, Gujarat,
India

Field evaluation of fungicides against *Colletotrichum sorghi* (Cesati.) Wilson causing anthracnose of sorghum

NS Chavda and KK Kanzaria

Abstract

The efficacy of different seven fungicides were tested under field condition against *Colletotrichum sorghi* (Cesati.)Wilson causing anthracnose of sorghum. All the fungicides tested were significantly reduced disease as compared to the control. The minimum per cent disease intensity (PDI) (25.55) was recorded in the treatment of carbendazim 50% WP at 0.025% and was found significantly superior over rest of the treatments. The results indicated that benomyl 50% WP at 0.025% recorded 44.07 PDI but it was remained at par with propiconazole 25% EC at 0.025% (47.40 PDI) in reducing anthracnose disease. While, picoxystrobin 22.52% SC at 0.025% followed by chlorothalonil 75% WP at 0.20% were found less effective and remained statistically at par. The control treatment recorded 97.04 PDI. The maximum per cent disease reduction over control (73.67%) was recorded in carbendazim treated plots followed by benomyl 54.58%. The highest dry fodder yield of sorghum 8014 kg ha⁻¹ was obtained in carbendazim treated plots and was remained statistically at par with benomyl with 7773 kg ha⁻¹ of dry fodder yield.

Keywords: Sorghum, anthracnose, *C. sorghi*, fungicides, per cent disease intensity

Introduction

Sorghum [*Sorghum bicolor* (L.) Moench] is one of the leading cereal crop grown for food and fodder purpose. The crop is prone to be affect by several fungal diseases. The important diseases reported are Cercospora leaf spot (*Cercospora sorghi*), Anthracnose-foliar, head, root and stalk rot (*Colletotrichum graminicola*) and leaf blight (*Drechslera turcicum*). Among them anthracnose of sorghum caused by *Colletotrichum sorghi* has become serious problem in Saurashtra region of Gujarat state during last few years. Looking to its regular occurrence in mild to severe form in kharif season and importance of this disease as it deteriorate the quality of fodder in Saurashtra region, an experiment was conducted to find out the most effective fungicide in reducing the disease intensity under field condition.

Material and Methods**Evaluation of Fungicides**

Field evaluation of different seven fungicides were tested against anthracnose of sorghum at Research Farm, Department of Plant Pathology, JAU, Junagadh in randomized block design with three repetitions. Sorghum variety 'Gundari' was sown at the rate of 15 kg seeds per hectare at onset of monsoon. Seeds was drilled evenly at 45 x 10 cm spacing in each plot of the size 5.00 x 2.70 m² manually and the rows were covered by light planking. General cultural practices were followed as per recommendation.

Required concentration of fungicidal solution for foliar spray of each fungicide was prepared on the basis of active ingredient available in the formulation. Required quantity of respective fungicide was added to measured quantity of water so as to get desired concentration. The spraying of fungicides was carried out at initial appearance of disease and thereafter sprayed at 15 days interval. Control was maintained by without spraying of any fungicide. The details of fungicidal treatments used are given in Table 1.

Correspondence**NS Chavda**

Department of Plant Pathology,
Junagadh Agricultural
University, Junagadh, Gujarat,
India

Table 1: Fungicides used for management of anthracnose of sorghum under field condition.

S. No	Fungicides	Concentration (a. i.)	Quantity/ 10 lit. of water
1.	Benomyl 50% WP	0.025	5 g
2.	Carbendazim 50% WP	0.025	5 g
3.	Chlorothalonil 75% WP	0.20	27 g
4.	Mancozeb 75% WP	0.20	27 g
5.	Picoxystrobin 22.52% SC	0.025	11 ml
6.	Propiconazole 25% EC	0.025	10 ml
7.	Thiophanate methyl 70% WP	0.070	10 g
8.	Control	-	-

Disease Assessment

Observations on disease intensity was recorded from ten tagged plants randomly selected from each treatment after seven days of last spray using 1-9 scale (Sharma, 1983) as mentioned in Table 2. Each plant was evaluated for its disease reaction by scoring the disease intensity on top, middle and lower five leaves.

Per cent disease intensity (PDI) in each treatment was worked out using the formula given by Wheeler (1969) [5].

$$PDI = \frac{\text{Sum of total rating}}{\text{Total plants observed} \times \text{Maximum disease rating (9)}} \times 100$$

Table 2: Disease assessment

Score	Description
1	No symptoms or presence of chlorotic flakes
2	1-5 % leaf area covered with lesion
3	6-10 % leaf area covered with lesion
4	11-20 % leaf area covered with lesion
5	21-30% leaf area covered with lesion
6	31-40 % leaf area covered with lesion
7	41-50 % leaf area covered with lesion
8	51-75 % leaf area covered with lesion
9	More than 75 % leaf area covered with lesion

The percentage disease control and the percentage deviation in dry fodder yield were calculated with the help of following formula (Mathur *et al.*, 1971).

$$\text{Disease control (\%)} = \frac{\text{P. D. I. in check} - \text{P. D. I. in treatment}}{\text{P. D. I. in check}} \times 100$$

$$\text{Yield increase (\%)} = \frac{\text{Yield in treatment} - \text{Yield in check}}{\text{Yield in check}} \times 100$$

The dry fodder yield of sorghum in tons ha⁻¹ was computed from fodder yield of each net plot as under.

$$\text{Fodder yield (tons/ha)} = \frac{\text{Fodder yield/plot (tons)} \times 10,000 \text{ (sq. m.)}}{\text{Net plot size (sq. m.)}} \times 100$$

Results and Discussion

Perusal of data presented in Table 3 and depicted in Fig. 1 revealed that all the fungicides tested in field condition were significantly capable to reduce disease as compared to the control. The minimum per cent disease intensity (PDI) was recorded in carbendazim 50% WP sprayed treatment at 0.025% concentration with 25.55 PDI and remained significantly superior over rest of the treatments. The next best fungicide found was benomyl 50% WP sprayed at

0.025% concentration which recorded 44.07 PDI but it was remained statistically at par with propiconazole 25% EC at 0.025% concentration with 47.40 PDI in reducing anthracnose disease under field condition. However, other fungicides *viz.* thiophanate methyl 70% WP at 0.070% and mancozeb 75% WP at 0.20% concentrations found moderately effective and noticed 55.18 and 56.67 PDI, respectively and remain at par. The least and equally effective fungicides in reducing the anthracnose disease of sorghum was picoxystrobin 22.52% SC at 0.025% and chlorothalonil 75% WP at 0.20% concentrations with 88.89 and 89.26 PDI, respectively. The control treatment recorded highest 97.04 PDI. The maximum per cent disease reduction (73.67%) over control was recorded in carbendazim 50% WP treated plots followed by benomyl 50% WP, propiconazole at 25% EC, thiophanate methyl 70% WP and mancozeb 75% WP with 54.58, 51.15, 43.13 and 41.60 per cent, respectively. While, picoxystrobin 22.52% SC (8.40) followed by chlorothalonil 75% WP (8.01) exhibited the lowest per cent disease reduction over control.

The sorghum dry fodder yield was recorded higher in all the treatments as compared to control. The maximum dry fodder yield of sorghum 8014 kg ha⁻¹ was obtained in carbendazim 50% WP treated plots and was statistically at par with benomyl 50% WP (7773 kg ha⁻¹) followed by propiconazole 25% EC (6949 kg ha⁻¹), thiophanate methyl 70% WP (6440 kg ha⁻¹) and mancozeb 75% WP (5690 kg ha⁻¹). The maximum per cent yield increase was recorded in carbendazim 50% WP (86.91%) treated plots followed by benomyl 50% WP, propiconazole 25% EC, thiophanate methyl 70% WP and mancozeb 75% WP with 81.31, 62.09, 50.19 and 32.70 per cent, respectively. Whereas, picoxystrobin 22.52% SC (16.40) and chlorothalonil 75% WP (7.55) exhibited minimum per cent dry fodder yield increased over control.

These result revealed that significantly higher yield and maximum disease control were obtained in carbendazim. The result recorded are in close agreement with those obtained by Gwary and Asala (2006). They reported that spraying of either of the systemic foliar fungicides such as, benomyl, mancozeb and carbendazim three times in the season reduced both the incidence and severity of symptoms. Treating carbendazim was found to be more effective than the other three treatments in reducing the progress of the disease symptoms. While, Rekha (2013) [3] found maximum yield (53.94 q/ha) in iprodione + carbenbazim treated plot followed by carbendazim (47.00 q/ha) and chlorothalonil (48.56 q/ha) from which chlorothalonil showing contrary results with the present findings. Which may be due to some external factors effects on the effectiveness of fungicides to manage the disease under field condition.

Table 3: Effect of different fungicides on anthracnose intensity and fodder yield of sorghum

S. No	Fungicides	Per cent disease intensity	Disease Reduction over control	Dry Fodder Yield (kg/ha)	Yield increased over control
1.	Benomyl 50% WP	41.59 (44.07)*	54.58	7773	81.31
2.	Carbendazim 50% WP	30.35 (25.55)	73.67	8014	86.91
3.	Chlorothalonil 75% WP	71.35 (89.26)	8.01	4611	7.55
4.	Mancozeb 75% WP	48.83 (56.67)	41.60	5690	32.70
5.	Picoxystrobin 22.52% SC	70.54 (88.89)	8.40	4991	16.40
6.	Propiconazole 25% EC	43.50 (47.40)	51.15	6949	62.09
7.	Thiophanate methyl 70% WP	47.97 (55.18)	43.13	6440	50.19
8.	Control	80.42 (97.04)	-	4287	-
	S.Em.±	0.93	-	500.55	-
	C.D. at 5 %	2.84	-	1518	-
	C.V. %	3.00	-	14.23	-

Data were arcsine transformed before analysis.

*Numerals in parentheses are re-transformed value.

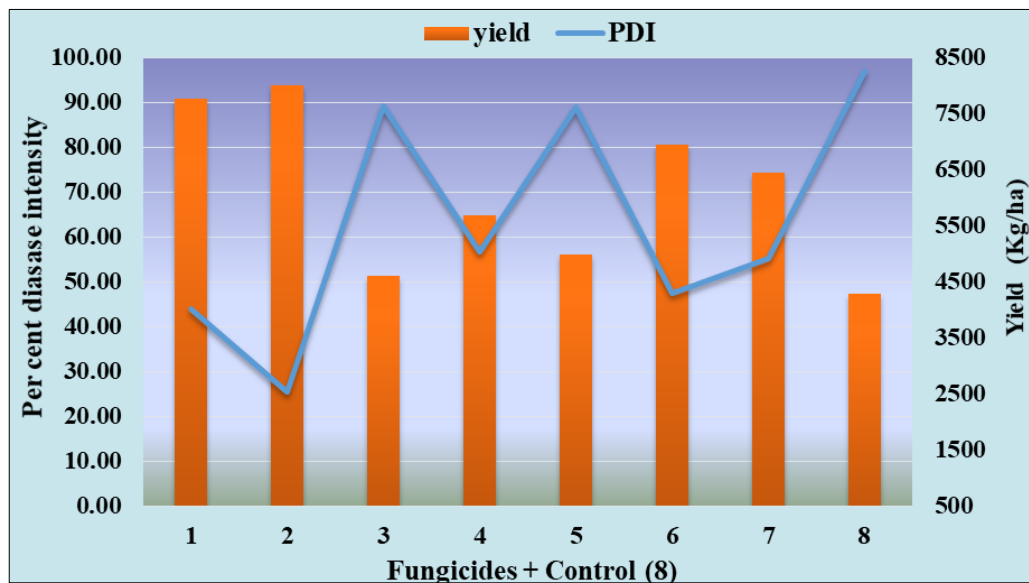


Fig 1: Field evaluation of fungicides against anthracnose of sorghum

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