

Original Research Article

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Efficacy of Fungicides on Grain Mold of Sorghum

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ABSTRACT

Grain mold is economically important disease of sorghum. For Management of sorghum grain mold various chemicals were screened for efficacy and management of grain mold under field conditions. Four different fungicides viz., Hexaconazole, carbendazim, thiram+mancozeb, propiconazole and two control treatments i.e. one water spray and one absolute control were evaluated for control of sorghum grain mold. Among all treatments three spray of propiconazole 25% EC at 0.025% was the best treatment with highest grain yield and straw yield at both locations viz., Navsari and Waghai followed by hexaconazole 5% SC at 0.05%, propiconazole treatment recorded grain yield (1364.20 kg/ha.) and stover yield of (4694.44 kg/ha.) while hexaconazole treatment recorded grain yield (1319.44 kg/ha) and straw yield of (3765.43 kg/ha) in pooled mean of both locations. In determination of percent disease incidence (PDI%) spray of propiconazole 25% EC at 1ml/litre recorded lowest disease incidence in pooled (3.00 %) followed by hexaconazole 5% SC at 0.05% (3.15%).

Keywords

Sorghum, grain mold, disease incidence, fungicides, yield, disease intensity

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Introduction

Grain mold disease of sorghum caused due to different micro-organisms. It is a serious disease in sorghum cultivation areas throughout the world. The grain mold disease affects the grains within the ear heads and reduces sorghum yield and quality. The grain mold disease is classified as a major disease among all the sorghum growing areas of world

and India depending upon the environmental conditions during growing season. Grain mold of sorghum is classified as major biotic constraint in the cultivation, marketing and utilization of sorghum grains. The disease is particularly important in cultivars and varieties that mature during the humid, tropical and subtropical climates. Usually the term “grain mold” in scientific literature is used to describe the diseased or abnormal

appearance or colour of the sorghum grains infected due to one or more than one pathogenic fungus. In sorghum, the “Grain Mold complex” is complex of more than 40 genera of fungi that are competent of infecting and colonizing in sorghum grain at all levels of maturity (Little *et al.*, 2012). Various types of losses caused by grain mold include reduction in grain yield, deterioration of seed and grain quality, reduction of remuneration in form of money and reduced marketability of the produce. Damage due to grain mold has been associated with losses in seed mass, grain density, seed germination, storage quality, food and feed processing quality, and market value. The disease sometimes induces premature sprouting of grain in the panicle. Loss of final produce is more because of discoloration of grain and due to yield loss. The yield loss occurs mostly due to reduction in seed size and weight of grain. Some of the mold fungi are producers of potent mycotoxin that are harmful to human and animal health and productivity.

In *Kharif* season in humid region, the grain mold complex is affecting the productivity and quality causing 30–100% loss in yield depending on cultivar, time of flowering and surrounding environment conditions during crop maturity to harvesting period (Singh and Bandyopadhyay, 2000). In a survey of economic losses carried out based on all India disease survey data between the years 2001–2010 It was estimated that the economic losses due to grain mold in case of moderate incidence was Rs. 1452 kg/ha and for severe incidence it was Rs.2323 kg/ha. The figure for economic losses due to grain mold of sorghum in Gujarat state was Rs.1301 kg/ha. for moderate incidence and Rs.2082 kg/ha. for severe incidence. The total economic losses due to the grain mold disease was Rs. 3150.6 million for moderate incidence and Rs. 5040.7 million in case of severe incidence. (Das and Patil,2015).

Materials and Methods

Experiments were conducted at farm of N. M. College of Agriculture, Navsari Agricultural University, Navsari and Rajendrapur Farm of Krishi Vigyan Kendra, Waghai (District: Dangs) at Navsari Agricultural University, Navsari during *kharif* 2016-17. Navsari Agricultural University, Navsari, where the present investigations were carried out situated on co-ordinates 20.9248⁰N, 72.9079⁰E and situated 13 kilometers away from the seashore of Dandi and has altitude of 9 meters from mean sea level.

Whereas, Waghai is located in the Dangs district on coordinates 20.7737⁰N, 73.4976⁰E and under heavy rainfall zone of south Gujarat where average rainfall is 2500 mm/year. And has an elevation of 147 meters from mean sea level. The details of procedures adopted in experimentation are described as follows:

Management of sorghum grain mold through fungicides

Six treatments were applied in the experiment the treatments included four fungicides and two control treatment including one for the water spray and one absolute control *i.e.*, no treatment. Treatment details of fungicides used to control the grain mold of sorghum *viz.*, Hexaconazole 5% SC, carbendazim 50 % WP, Thiram + mancozeb 75% WP (0.2%+0.3 %), propiconazole 25EC, water spray and absolute control (no spray).

Three spray of fungicides and Water spray was carried out after initiation of flowering in sorghum crop. The spray was carried out at interval of 15 days. Experiment was carried out with six treatments and four replications and sowing was done at recommended spacing of 45 cm x 15 cm. The net plot size was 3.60m x4.50 m. Sowing and fertilizer application was done as per recommended time and dose.

Table.1 Effect of fungicides on per cent disease incidence of sorghum grain mold

Sr.no.	Treatment	Concentration (%)	Percent disease incidence (%)year 2016		
			Waghai	Navsari	Pooled
1	Hexaconazole 5 SC	0.05	2.88(1.96)	3.43(2.10)	3.15(7.49)
2	Carbendazim 50 WP	0.05	4.15(2.26)	3.75(2.17)	3.95(9.47)
3	Thiram + Mancozeb 75 WP	0.2 + 0.3	4.98(2.44)	4.23(2.28)	4.60(11.06)
4	Propiconazole 25 EC	0.025	3.43(2.10)	2.58(1.88)	3.00(7.24)
5	Control (Water spray)	-	5.33(2.51)	4.25(2.29)	4.79(11.53)
6	Control (absolute)	--	6.48(2.73)	5.48(2.54)	5.98(14.36)
	S.Em. ±		0.20	0.22	0.30
	C.D. at 5 (%)		0.59	0.67	1.10
	C.V. (%)		8.67	11.30	7.44

*Square root transformation

Table.2 Effect of fungicides treatment on grain yield and straw yield of sorghum

Sr.no.	Treatment	Concentration (%)	Waghai grain yield(kg/ha)	Waghai straw yield(kg/ha)	Navsari grain yield(kg/ha)	Navsari straw yield(kg/ha)	Pooled grain yield(kg/ha)	Pooled straw yield
1	Hexaconazole 5 SC	0.05	1200.00	3765.40	1370.00	3765.40	1319.44	3765.43
2	Carbendazim 50 WP	0.05	1116.00	3398.10	1324.00	4845.60	1182.87	4121.91
3	Thiram + Mancozeb 75 WP	0.2 + 0.3	1012.00	4123.40	1250.00	5925.90	1168.21	5024.69
4	Propiconazole 25 EC	0.025	1268.00	4666.66	1578.00	4722.20	1364.20	4694.44
5	Control (Water spray)	-	1015.00	3969.10	722.00	2604.90	868.83	3287.04
6	Control absolute	--	945.00	3555.50	688.00	2478.30	800.93	3016.98
	S.Em ±		0.23	043	0.16	0.46	0.23	1.04
	C.D. at 5 (%)		0.69	1.30	0.49	1.40	0.82	3.78
	C.V. (%)		25.75	13.60	17.23	14.12	16.63	10.40

Spray was done at weekly interval after the initiation of disease. The sorghum variety GJ-42 which is a mid-late variety was used for the experimental trial. Four replications of six treatments were carried out in Randomized block design the plot size was 3.60x4.50 metre. The outcome was studied in terms of disease incidence and yield. The PDI was calculated using the following formula.

PDI

Sum of all numerical ratings

= -----x 100 higher rating

Total number of plants observed

Effect of fungicides spray on grain and straw yield of sorghum

All the fungicides were sprayed three times at the interval of 15 days. Among all the fungicides used to control sorghum grain mold three sprays of propiconazole 25 EC (0.025%) at fifteen days interval was the best treatment for control of sorghum grain mold disease incidence and grain and straw yield as shown in Table 2 followed by hexaconazole 5 SC (0.05%) all other treatments were lagging behind in control of sorghum grain mold followed by carbendazim 50 per cent W.P., combination of thiram (0.2%) + mancozeb (0.3%). The results are in confirmation of Audilaxmi *et al.*, (2007) who carried out an experiment during rainy seasons of the years 2000 and 2001 to study the effect of spray treatment of a fungicide they found out that propiconazole (0.025%). The result is also in confirmation of Shaik *et al.*, (2019) who conducted two set of experiments simultaneously using naturally and artificially Fusarium challenged induced infected sorghum panicles. The treatment of three sprays of propiconazole 0.025% was the best treatment in terms of grain yield and straw yield at 1364.20 kg/ha and 4694.44 kg/ha

respectively in pooled at both the locations followed by treatment of hexaconazole with grain yield and straw yield of 1319.44 kg/ha and 3765.33 kg/ha Carbendazim treatment recorded 1182.87 kg/ha grain yield and 4121.91 kg/ha straw yield. Treatment of Thiram+mancozeb recorded 1168.21 kg/ha grain yield and 5024.69 kg/ha straw yield followed by controlled water treatment which recorded 868.83 kg/ha grain yield and 3287.04 kg/ha straw yield and absolute control treatment recorded 800.93 kg/ha and grain yield and 3016.98 kg/ha straw yield.

Effect of fungicides spray on disease incidence of sorghum grain mold

The lowest infection scores of 3.0 was recorded with three spray of propiconazole at 0.025% spraying at fifteen days followed by 3.15 per cent disease incidence in hexaconazole spray. Carbendazim Thiram+mancozeb, Water spray and absolute control treatments recorded disease incidence in increasing order respectively. Control treatment of Water spray augmented the disease and highest disease incidence was observed in Control treatment with no spray.

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