IMPACT OF VARIOUS FUNGICIDES AGAINST THE ERGOT DISEASE OF SORGHUM CAUSED *BY CLAVICEPS* SP. UNDER SOUTH GUJARAT CONDITION OF GUJARAT

G.R. Bhanderi[1], Prashant B. Sandipan*[2], N.V. Patel [3] and D.K. Davda[4]

[1 & 2] Main Cotton Research Station (MCRS), Navsari Agricultural University (NAU), Surat 395 007 (Gujarat), India
[3 & 4] Sorghum Research Station, Navsari Agricultural University (NAU), Surat – 395 007 (Gujarat), India
Email: prashantsandipan@gmail.com

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Abstract: Sorghum (*Sorghum bicolor* L.) is one of the main staples for the world's poorest and most food-insecure people commonly known as Jowar. It grows well in both summer and winter, and is thus both a *rabi* and *kharif* crop. The disease reduces yield through poor seed set and causes harvesting difficulties due to sticky honeydew on seed heads and also grain quality distress heavily due to the presence of the fungal bodies. An experiment was conducted at Sorghum Research Station, NAU, Surat (Gujarat) to find out the most effective fungicide for the control of ergot disease in sorghum. From the result analysis, the ergot incidence was found significantly lower in the treatment of Hexaconazole 5% SC @ 0.005% (18.30 % & 16.85 %) respectively in both the years.

Keywords: Sorghum, Ergot, *Claviceps* sp., *Sorghum bicolor*, Fungicides, Treatment

INTRODUCTION

Claviceps sp. is an important disease of sorghum crop causes the ergot disease. Three species causing the disease have been reported, *Claviceps sorghi* in India, *C. sorghicola* in Japan, and *C. africana* in all ergot-positive countries. Sorghum is one of the main staples for the world's poorest and most food-insecure people. Sorghum is the third largest crop to be grown in India after wheat and rice. (*Claviceps africana* Frederickson, Mantle and de Milliano) is an important disease of sorghum (*Sorghum bicolor* (L.) Moench) on all continents (Bandyopadhyay *etal*., 1998) and *C. sorghicola* (Tsukiboshi *etal*., 1999). More commonly known as jowar in the Indian sub-continent, it grows well in both summer and winter, and is thus both a *rabi* and *kharif* crop. 75% of the cultivated area is devoted to the production of sorghum. Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh are some of the regions where sorghum is grown on a massive scale.

The fungus is best known by its imperfect stage, *Sphacelia sorghi* McRae, but the perfect stage, *Claviceps sorghi*, has been described by (Kulkarni *et al*., 1976). The disease reduces yield through poor seed set and causes harvesting difficulties due to sticky honeydew on seed heads. Grain quality can be reduced through lower nutritional value and due to the presence of fungal bodies called sclerotes (ergots). Sorghum grain contaminated with sclerotes can cause toxicity when fed to livestock, particularly sows, dairy cattle and beef cattle in feedlots. Infection occurs during flowering, when spores of the fungus land on the feathery stigmas of flowers in sorghum heads (Molefe, 1975). About 7 days after infection, sticky honeydew oozes out of the flowers and drips onto leaves and the ground. When the weather is wet and/or humid, the honeydew turns white due to the production of the infective spores just above the surface of the honeydew. Ultimately (near grain maturation), the fungal mass develops into a hard fungal body - the sclerote. Ergot can occur at any time during the growing season if suitable weather conditions occur. In experiments, a constant temperature of 20°C and relative humidity close to 100% favours maximum infection (Anahosur and Patil, 1982, McLaren and Wehner 1990). Outbreaks in main heads during summer are associated with at least two days of rainy weather, with daily maximum temperatures below 28°C. There is a trend for increasing ergot severity as the temperatures drop towards the end of the growing season In this experiment, the dual purpose sorghum varieties were more preferred, which are high yielding, good grain and fodder quality. Since last two-three years, the ergot incidence was severe particularly at Surat location. Therefore, it became necessary to study the efficacy of some newer fungicides for the control of ergot disease in sorghum. So that, the necessary measures could be taken up before ergot causes severe loss/damage to the sorghum crop.

*Corresponding Author

MATERIAL AND METHOD

Experimental details

Year of Commencement & Place	*Kharif* 2014, Main Sorghum Research Station, Surat
Experimental Details	
a. Crop & variety	Sorghum GJ 38
b. Treatments	08
c. Design	RBD
d. Replication	3
e. Plot Size	Gross : 2.7 x 4.0 m Net: 1.8 x 3.7 m
f. Spacing	45 x 15 cm
Methodology	20 earhead from each of the plots were randomly selected and each of the earhead was critically examined for presence of ergot disease and intensity. The earhead were sprayed twice, first spray was done 15 days after penicle emergence and second spray was done at 15 days after first spray.

The test entries are to be scored based on the basis of severity following 1 to 9 rating scale given here under. Readings recorded on per cent disease intensity and per cent disease control.

Disease score

Score	Description
1	No grain mold
2	1-5 % grains molded in a panicle
3	6-10 % grains molded in a panicle
4	11-20 % grains molded in a panicle
5	21-30 % grains molded in a panicle
6	31-40 % grains molded in a panicle
7	41-50 % grains molded in a panicle
8	51-75 % grains molded in a panicle
9	>75 % grains molded in a panicle

Ergot

Calculate the mean severity percentage over 10 panicles for each entry. Record data on 50% flowering time (Days) and germination (%) in threshed grains by using following formula.

Visual rating has been the most common means of quantifying grain mold. Visual appraisal involves a complex of factors and can estimate severity (degree of colonization of a uniform sample indicated by signs or discoloration), incidence (proportion of grain affected), or damage (reduction in grain size), depending upon the method of assessment. Large numbers of samples have been screened using visual appraisal method since it is the quickest and easiest method (Bandyopadhyay and Mughogho 1988). Visual assessment of grain mold severity has been standardized using a common scale of well-defined units such as percentage of grain surface affected (Forbes 1986; Bandyopadhyay and Mughogho 1988).

RESULT AND DISCUSSION

Interpretation and Conclusion

In this experiment, new fungicides were evaluated against the recommended fungicides and untreated was considered as control. The lowest ergot incidence (14.07%) was recorded in the treatment of Carbendazim (50% WP) @ 0.05% and it was at par with all the treatments except Ziram 78% WP @ 0.2% and control. Highest diseases incidence (36.48%) was observed in control (Absolute). As far as the yield concerned, the highest grain was recorded in the treatment of Carbendazim 50% WP @ 0.05% which was 28.65 q/ha (Table: 1 & Graph: 1).

In Zimbabwe, benomyl at 0.2% ai. reduced ergot significantly in A-lines if they were sprayed once at heading and this control schedule was economically feasible (Frederickson, 1993).

Mclaren, 2003 found that triadimenol and triadimefon were the most effective chemicals while, Propiconazole and Tebuconazole, which are recommended in Australia, Brazil and USA for ergot control were less effective for the control of sorghum ergot. Sorghum ergot surveys were conducted from October 1999 to February 2000 to determine the incidence and severity of the disease in major sorghum-growing Indian states (Navi *et al*., 2002 a,b).

Graph 1. Indicates the per cent disease control of ergot disease of sorghum

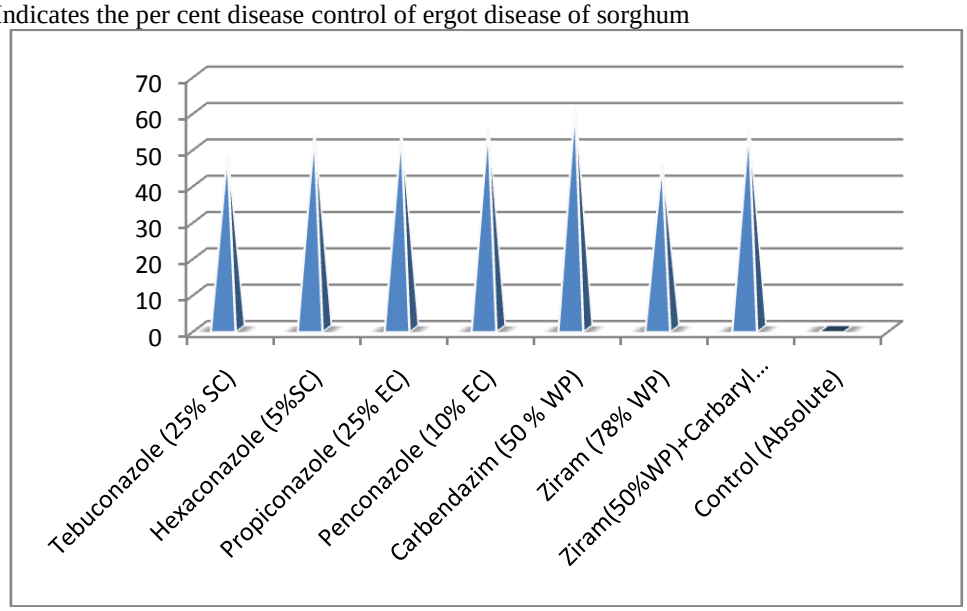

Table 1. Impact of various fungicides for the control of ergot disease of sorghum.

Sr. No.	Treatments	Conc.	Year 2014	
			Per cent Disease Intensity (PDI) (%)	Diseases control per cent (%)
T1	Tebuconazole (25% SC)	0.025%	25.61 (18.89)	48.22
T2	Hexaconazole (5%SC)	0.005%	24.07 (16.85)	53.81
T3	Propiconazole (25% EC)	0.025%	24.19 (16.85)	53.81
T4	Penconazole (10% EC)	0.01%	23.64 (16.11)	55.84
T5	**Carbendazim (50 % WP)**	**0.05%**	**21.99 (14.07)**	**61.42**
T6	Ziram (78% WP)	0.2%	26.42 (19.81)	45.69
T7	Ziram(50%WP)+Carbaryl (28%WP)	0.1%	23.79 (16.30)	55.33
T8	Control (Absolute)	00	37.02 (36.48)	0
S.Em±			**1.36**	-
CD @ 5 %			**4.12**	-
S.Em±			-	-
CD @ 5 %			-	-
CV %				-

* Figure in parenthesis is original values while those outside are arc sign transformed value.

CONCLUSION

For effective and economic management of sorghum ergot, two sprays of Carbendazim (50% WP) @ 0.05% at an interval of 15 days commencing from 15 days after emergence of the earhead.

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