

Chemical Control of Sugary Disease of Sorghum (*Claviceps africana*)

PINTO,
N.F.J. de
199

N.F.J. de Almeida Pinto, A. da Silva Ferreira, and C.R. Casela

Abstract

Sugary disease, caused by Claviceps africana, represents a major threat to hybrid seed production in Brazil. Since the disease was observed in 1995, a collaborative research program involving private and public sector has been developed for control of the disease. This paper reports results of recent trials developed in the EMBRAPA Maize and Sorghum Research Center Experiment Station, in the evaluation of fungicides and doses for the control of sugary disease in seed production fields.

Sugary disease of sorghum, caused by *Claviceps africana*, has been considered a major threat to hybrid seed production in Brazil. The disease was observed in Brazil in 1995 and by mid 1996, Brazilian scientists, through a collaborative research program involving public and private sector, identified two active ingredients that were highly effective in the control of the disease.

Very few reports are found in the literature regarding the control of *C. africana* by fungicides. No fungicidal activity towards sugary disease was reported for the residual action of benomyl, bitertanol, carbendazim plus flusilazole, procymidone, propiconazole, tebuconazole, and triadimenol. On the other hand, Dithane M-45, Difolatan, Cuman, Carbendazim plus Tridemorph, Carbendazim plus Thiram, and Thyophanate methyl proved to be effective in reducing disease severity and

significantly increased seed production. In vitro studies indicated that Benomyl, Captan, Ziram, Thiram, Vitavax, and Miltox inhibited growth and sporulation of *Sphacelia sorghi*. In this paper we present some of the recent results of fungicide trials performed at the Embrapa Experiment Station to evaluate the impact of fungicides in the control of sugary disease.

Fungicide trials were divided into three experiments. In the first trial fungicide treatments consisted of four sprays, at three-day intervals using a backpack sprayer, starting at the beginning of anthesis. In all treatments sorghum panicles were sprayed so that they were completely covered by the fungicide. Disease evaluations were based on the percentage of infected panicle according to a 1 to 5 scale, where 1 = no disease and 5 = above 50% of disease. Tebuconazole was very effective in controlling sugary disease (Table 1). Some toxicity to sorghum seeds was observed as a result of application of Triadimenol, despite its high efficiency in the control of the disease (Table 2).

N.F.J. de Almeida Pinto, A. da Silva Ferreira, and C.R. Casela,
CNPMS/EMBRAPA, C.P. 151, Sete Lagoas, MG, Brazil

Table 1. Effect of fungicides in the control of sugary disease (*Claviceps africana*) in a seed production field of the cultivar BR304, Embrapa Corn and Sorghum Research Center, Lagoas, MG, Brazil, 1997.

Treatment	Dose (ml a.i. ha ⁻¹)	DP ^a (%)	DP ^b (%)	DP ^c (%)	DS ^d (%)	DS ^e (%)	DS ^f (%)	NE1 ^g	NE2 ^h	NE3 ⁱ
Propiconazole	75.0	0.0	4.4	77.3	0.0	1.0	3.2	1	2	2
Propiconazole	125.0	0.0	0.0	24.6	0.0	0.0	1.2	1	1	2
Propiconazole	50.0+	0.0	7.5	82.9	0.0	1.0	3.2	1	2	2
Difenoconazole	50.0									
Propiconazole	75.0+	0.0	12.6	73.3	0.0	2.0	4.0	1	2	2
Difenoconazole	75.0									
Tebuconazole	60.0	0.0	2.3	41.1	0.0	0.5	1.2	1	1	2
Testemunha	-	58.9	100.0	100.0	3.0	37.5	65.0	2	4	5

^a=diseased panicles three days after last spraying; ^b=diseased panicle 14 days after last spraying; ^c=diseased panicle final rating;

^d=disease severity three days after last spraying; ^e=disease severity 14 days after last spraying; ^f=disease severity final rating;

^g=disease grade three days after last spraying; ^h=disease grade 14 days after last spraying; ⁱ=disease grade final rating.

Table 2. Effect of fungicides in the control of sugary disease (*Claviceps africana*) in a seed production field of the cultivar BR304, Embrapa Corn and Sorghum Research Center, Lagoas, MG, Brazil, 1996.

Treatment	Dose (g or ml a.i. ha ⁻¹)	DP1 ^a (%)	DP2 ^b (%)	DS1 ^c (%)	DS2 ^d (%)	NE1 ^e	NE2 ^f
Tebuconazole	375	19.8	38.4	2.6	5.0	2	2
Benomyl	750	49.2	86.3	5.0	15.0	2	3
Mancozeb	2400	79.4	100.0	20.7	50.0	3	4
Triadimenol	250	0.0	0.0	0.0	0.0	1	1
Fentin hydroxide	500			Phytotoxic to panicles and leaves			
Metalaxyl + Mancozeb	960+216	91.4	100.0	21.3	66.7	3	5
Tiofanato	700	88.9	100.0	21.7	50.0	3	4
Metilico							
Testemunha	-	87.2	100.0	58.3	93.3	5	5
Tebuconazole	375	57.4	90.1	12.3	15.0	3	3
Tebuconazole	375	30.9	42.5	4.0	5.3	2	2

^a=diseased panicles three days after last spraying; ^b=diseased panicle 14 days after last spraying; ^c=disease severity three days after last spraying; ^d=disease severity 14 days after last spraying; ^e=disease grade three days after last spraying; ^f=disease grade 14 days after last spraying.

In the second trial, plots were sprayed in a three-spray program at 5-day intervals. The highest doses of Tebuconazole were the most effective in controlling sugary disease, resulting in increased seed weight and percentage of germination, and a reduced number of

diseased spikelets and number of sclerotia per 100g of seed (Table 3). The third trial included a 7-day interval spraying program for the highest dose of the combination Propiconazole + Difeconazole. The fungicides Propiconazole, Propiconazole +

Table 3. Effect of fungicides in the control of sugary disease (*Claviceps africana*) in a seed production field of the cultivar BR304, Embrapa Corn and Sorghum Research Center, Lagoas, MG, Brazil, 1997.

Treatment	Dose (kg or l a.i. ha ⁻¹)	Disease spikelets (%)	Seed weight (g 1000 ⁻¹)	Germination (%)	Vigor (%)	Seed weight panicle ⁻¹ (g)	No. sclerotia per 100 g of seed
Tebuconazole	0.2500	4.33	32.15 a	76.67 a	64.33 abc	11.29 a	2.7
Tebuconazole	0.1250	8.00	30.31 a	78.33 a	63.00 abc	10.55 a	4.3
Tebuconazole	0.0625	12.00	26.63 b	73.00 ab	62.67 abc	8.23 ab	17.7
Propiconazole	0.2500	4.00	26.87 b	76.67 a	67.33 ab	8.13 ab	3.3
Propiconazole	0.1250	10.60	25.87 b	73.67 ab	69.67 a	10.57 a	8.0
Propiconazole	0.0625	12.30	25.62 b	70.00 bc	59.67 abc	9.55 a	28.0
Triadimenol	0.2500	0.63	25.46 b	68.33 bc	54.33 c	10.84 a	0.3
Triadimenol	0.1250	0.30	26.94 b	69.67 bc	58.67 bc	8.78 a	0.0
Triadimenol	0.0625	1.00	26.59 b	65.67 c	56.67 bc	9.97 a	0.7
Testemunha	-	57.00	19.37 c	68.33 bc	60.00 abc	5.48 b	54.0

l=average values followed by the same letter are indicative of no significant differences at 5% probability (Tukey).

Difeconazole, and Tebuconazole were effective in controlling the disease (Table 1).

In all the trials, plots artificially or naturally inoculated before fungicide spraying, fungicides did not give complete control of disease, indicating the non-curative effect of the fungicides. Residual fungicide activity was not enough to protect the crop throughout the flowering period.

References

- Anahosur, K.H. 1979. Chemical control of ergot of sorghum. *Indian Phytopathology*, 32:487-489.
- Anahosur, K.H. and Patil, H.S. 1982. Effect of date of sowing on the incidence of ergot of sorghum. *Indian Phytopathology* 35:507-509.
- Cagas, B. 1992. Seed yield and diseases in Kentucky after fungicide application. *Journal Applied Seed Production*, 10:11-14.
- Khadke, V.D., More, B.B., and Konde, B.K. 1979. In vitro evaluation of some fungicides and antibiotics for the control of *Sphacelia sorghi* an incitant of sugary disease of sorghum. *Pesticides*, 22:15-60.
- Lakshmanan, P., and Mohan, S. 1988. Studies on the effect of various fungicides on *Sphacelia sorghi*. *Pesticides*, 22:27.
- McLaren, N. W. 1994. Efficacy of systemic fungicides and timing of preventative sprays in the control of sugary disease of grain sorghum (*Sorghum bicolor*). *South African Journal of Plant and Soil*, 11:30-33.
- Mielke, H. 1993. Investigations on the control of ergot. *Nachrichtenblatt Deutschen Pflanzenschutzdienstes*, 45:5-6.
- Pinto, N.F.J.A., Ferreira, A.S., and Casela, C.R. 1997. Ergot (*Claviceps africana*) ou doença açucarada do sorgo. Sete Lagoas, MG: EMBRAPA-CNPMS, page 24 in EMBRAPA-CNPMS. Circular Técnica, 23.
- Schultz, T.R., Johnston, W.J., Golob, C.T., and Maguire, J.D. 1993. Control of ergot in Kentucky bluegrass seed production using fungicides. *Plant Disease*, 77:685-687.
- Zgorkiwic, A. 1987. Chemical control of ergot (*Claviceps purpurea* Tul.) on meadow grass (*Poa pratensis* L.). *Prace Naukowe Instytutu Ochrony Roslin*, 29:179-195.