

## PRESENCE AND DISTRIBUTION OF SORGHUM SMUTS IN SINDH

A.A. HAKRO, M. ASLAM, A.H. JAFFRY AND A.K. KHANZADA

*Crop Diseases Research Institute, Pakistan Agricultural Research Council, Karachi, Pakistan*

(Received December 23, 1989; revised October 6, 1990)

Grain and long smut were the most prevalent diseases of the sorghum in Sindh, Pakistan. The level of infection by grain and long smut varied from 13% to 51% and from 12% to 54% respectively. The only places where long smut was not found were Mirpurkhas and Sanghar. Thirteen sorghum varieties were screened against grain smut by seed inoculation with spores. Most of the varieties were found resistant to the disease.

**Key words:** *Sorghum vulgare*, *Sphacelotheca sorghi*, *Tolyposporium ehrenbergii*.

### Introduction

Sorghum (*Sorghum vulgare* Pers.) is an important cereal crop throughout the world. It is grown in tropics and subtropics, particularly in India, Pakistan, some countries of Africa and some parts of Europe. Davies [1] reported that 55% of the world production of sorghum is grown in semi-arid tropical countries. In Pakistan, the crop is mainly grown for grain and fodder. The grain is used for human consumption as well as for feeding cattle. The average yield of the crop in Pakistan is 484 kg/hectare [2] which is much lower than that in India and other countries. The crop is subjected to losses due to various diseases and pests.

Sattar *et al.* [3] reported grain smut caused by *Sphacelotheca sorghi* Link. Long smut caused by *Tolyposporium ehrenbergii* Khun, and Cramer [4] reported that grain smut of sorghum caused heavy losses in the grain yield of Pakistan. According to Kamal *et al.* [5], grain smut was more prevalent (30-50%) than long smut (5-7%).

In Sindh, new improved varieties are generally not available. Consequently, the farmers resort to planting old, tall and susceptible varieties. Therefore, the sorghum crop was surveyed to assess the situation regarding diseases affecting the crop. In addition some improved varieties/lines were screened under artificial conditions at the Crop Diseases Research Institute, Karachi. The results of these studies are presented in this paper.

### Materials and Methods

All sorghum growing areas in Sindh were surveyed during the 1987-88 and 1988-89 crop seasons. Observations were recorded on the incidence and intensity of the diseases prevalent in farmers fields. Infected and healthy heads were counted in each square meter at three random locations.

The spores of grain and long smut collected from the field were dried over silicagel at room temperature ( $25 \pm 3^\circ$ ) for 72 hr. After drying they were stored in sealed glass tubes at  $4^\circ$  in a refrigerator. Viability was checked before use in tests and was found to be 60%. The inoculum was mixed with the seed

of the each variety and shaken thoroughly so that the seeds were uniformly coated with spores. The inoculated seed was planted in the field in plot measuring 2 x 2 metres. Each variety was planted in six rows of each plot. Rows were spaced 40 cm apart, with 10 cm between the plants in the row. The trial was laid out in a randomized complete block design (RCBD) with three replications. The number of healthy as well as diseased heads in each treatment plot were recorded. The percent infection on each variety was calculated from these data. Varieties were then classified according to the scale used by Rodenhiser *et al.* [6] as resistant (0-10% infection) intermediate (11-40% infection) and susceptible (40-100% infection).

### Results and Discussion

During the survey of the sorghum crop in Sindh, it was observed that the grain and long smuts were the most prevalent diseases in the province. Grain smut was found at levels varying from 13.0% to 51.0%. Data on the infection level at individual sites is presented in Table 1. These observations indicates that both incidence and level of infection by grain smut in the province is quite high and may increase further if adequate measures to control it are not adopted.

TABLE 1. INFECTION BY GRAIN SMUT AT VARIOUS LOCALITIES IN SINDH.

S. No.	Locality	Grain smut percent infection
1.	Mirpurkhas	25
2.	Sanghar	25
3.	Matyari	31
4.	Bhitshah	48
5.	Halla	31
6.	Saeedabad	32
7.	Sakrand	13
8.	Nawabshah	22
9.	Kazi Ahmed	30
10.	Moro	38
11.	Dadu	34

(Table 1, continued)

(Table 1, continued)

12.	Nosheroferoze	29
13.	Mehrabpur	39
14.	Ranipur	30
15.	Kotdeji	49
16.	Khairpur	29
17.	Rohri	41
18.	Hassan Wahan	49
19.	Pano aqil	51
20.	Ghotki	49

Long smut of sorghum was found to be second most frequent disease in the province. The level of infection ranged from 12.0 to 54.0%, based on head counts (Table 2). The only places where the disease was not found were Mirpurkhas and Sanghar. This might be due to the unfavourable weather conditions for the establishment of the pathogen and/or absence of inoculum. Hafiz [7] reported the disease in varying intensities from Multan and Muzaffargarh and also from the central parts of Sindh.

Results of test of significance (Z-test)\* of the grain smut percentage at twenty different localities.

25	0																			
31	0.67	0.67																		
48	2.5	2.5	1.78																	
31	0.67	0.67	0.00	1.78																
32	0.78	0.78	0.10	1.68	0.10															
13	1.5	1.5	2.27	4.26	2.27	2.40														
22	0.36	0.36	1.03	3.56	1.03	1.14	1.2													
30	0.56	0.56	0.10	1.91	0.10	0.21	2.17	0.93												
38	1.42	1.42	0.74	1.03	0.74	0.63	3.0	1.79	0.82											
34	1.00	1.00	0.32	1.41	0.32	0.21	2.62	1.36	0.43	0.42										
29	0.45	0.45	0.21	2.04	0.21	0.32	2.05	0.81	0.11	0.96	0.54									
39	1.53	1.53	0.10	0.92	0.10	0.74	3.20	1.91	0.92	0.10	0.52	1.07								
30	0.56	0.56	2.27	1.91	0.27	0.21	2.17	0.93	0.00	0.86	0.43	0.11	0.96							
49	2.60	2.60	2.14	0.10	2.14	2.00	4.3	3.00	2.5	1.13	0.15	2.12	1.03	2.5						
29	0.45	0.45	0.21	2.04	0.21	0.32	2.05	0.81	0.11	0.96	0.54	0.00	1.07	0.11	2.12					
41	4.6	4.6	1.05	0.71	1.05	0.96	3.41	2.11	1.17	0.30	0.72	1.27	0.20	1.17	0.81	1.27				
49	2.6	2.6	2.14	0.10	2.14	2.00	4.3	3.00	2.5	1.13	0.15	2.12	1.03	2.5	0.00	2.12	0.81			
51	2.82	2.82	2.10	0.30	2.10	2.00	4.6	3.20	2.23	1.34	1.74	2.34	1.23	2.23	0.20	2.34	1.00	0.20		
49	2.60	2.60	2.14	0.10	2.14	2.00	4.3	3.00	2.5	1.13	0.15	2.12	1.03	2.5	0.00	2.12	0.81	0.00	0	
	25	25	31	48	31	32	13	22	30	38	34	29	39	30	49	29	41	49	51	

Grain smut percentage

(\*z-value greater than 1.96 are significant at p = 0.05)

TABLE 2. INFECTION BY LONG SMUT OF SORGHUM AT VARIOUS LOCALITIES IN SINDH.

S.No.	Locality	Long smut percent infection
1.	Mirpurkhas	00
2.	Sanghar	00
3.	Matyari	36
4.	Bhitshah	54
5.	Halla	26
6.	Saeedabad	23
7.	Sakrand	22
8.	Nawabshah	26
9.	Kazi Ahmed	21
10.	Moro	23
11.	Dadu	32
12.	Nosheroferoze	32
13.	Mehrabpur	31
14.	Ranipur	13
15.	Kotdeji	30
16.	Khairpur	12
17.	Rohri	41
18.	Hassan Wahan	41
19.	Pano aqil	52
20.	Ghotki	32

TABLE 3. INFECTION BY GRAIN SMUT ON SORGHUM VARIETIES

S. No.	Variety	Grain smut percentage infection	Reaction
1.	Bhagdar	4.0	R
2.	BR-123	5.7	R
3.	BR-319	20.0	I
4.	DS-73	4.9	R
5.	Giza	7.7	R
6.	IC-1039	16.8	I
7.	MR-839	2.0	R
8.	PAK-SS-II	4.8	R
9.	Potohar 2	2.0	R
10.	Potohar 3	2.0	R
11.	PU-7	11.0	I
12.	1744	10.7	I
13.	Redjanpur	65.6	S

R = Resistance, I = Intermediate, S = Susceptible

The level of infection by grain smut on different sorghum varieties in the screening nursery is presented in Table 3. Out of a total of 13 varieties tested 8 were found resistant, 4 intermediate and 1 susceptible. Work needs to be carried out on determining the genetic basis of resistance in sorghum to both these smut diseases.

Results of test of significance (Z-test)\* of the long smut percentage at twenty different localities.

0	0																			
36	0	0																		
54	0	0	1.85																	
26	0	0	1.09	3.25																
23	0	0	1.44	3.48	0.35															
22	0	0	1.37	3.55	0.47	0.12														
26	0	0	1.09	3.25	0.00	0.35	0.47													
21	0	0	1.70	3.04	0.60	0.24	0.12	0.60												
23	0	0	1.44	3.48	0.35	0.00	0.12	0.35	0.24											
32	0	0	0.42	2.31	0.67	1.02	1.11	0.67	1.27	1.02										
32	0	0	0.42	2.31	0.67	1.02	1.11	0.67	1.27	1.02	0.00									
31	0	0	0.53	2.42	0.56	0.90	1.03	0.56	1.16	0.90	0.10	0.10								
13	0	0	2.83	5.00	1.71	1.33	1.21	1.71	1.09	1.33	2.40	2.40	2.27							
30	0	0	0.64	2.55	0.45	0.80	0.93	0.45	1.05	0.80	0.23	0.23	0.10	2.17						
12	0	0	3.00	5.18	1.91	1.48	1.36	1.91	1.25	1.48	2.56	2.56	2.43	0.15	2.33					
41	0	0	0.51	1.32	1.63	1.97	2.11	1.63	2.24	1.97	0.94	0.94	1.05	3.41	1.17	3.67				
41	0	0	0.51	1.32	1.63	1.97	2.11	1.63	2.24	1.97	0.94	0.94	1.05	3.41	1.17	3.67	0.00			
52	0	0	1.64	0.20	2.82	3.18	3.33	2.82	3.48	3.18	2.43	2.43	2.21	4.75	2.34	5.06	1.12	1.12		
32	0	0	2.42	2.31	0.67	1.02	1.11	0.67	1.27	1.02	0.00	0.00	0.10	2.40	0.21	2.63	0.95	0.95	2.10	
0	0	0	36	54	26	23	22	26	21	23	32	32	31	13	30	12	41	41	52	

(\*z-value greater than 1.96 are significant at  $p = 0.05$ )

**Acknowledgement.** We thank Dr. Aly Khan for advice with statistical analysis.

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