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DIVERSITY OF INTERNAL FIELD MYCOFLORA OF SORGHUM VULGARE

Shaila Sakhala, Associate Professor

Department of Botany, Nanasaheb Y.N.Chavan Arts,Science and commerce College, Chalisgaon,Dist-Jalgaon, (M.S.) India

Abstract-

Nine samples of sorghum were collected directly from fields either as ear-head (4-5/ field) from standing crop or as grains (about 500 gm) from threshing floors from villages of Jalgaon District, Maharashtra. Moisture content was determined by wet weight basis. Data on germination performances were collected from blotter test method and recorded as normal seedlings, abnormal seedlings and ungerminated seeds. Screening of mycoflora was studied by seed dissection method to record the mycoflora from pericarp, endosperm and embryo were dissected and incubated following blotter method. After 7 days fungi appearing on the seed were observed under streobinocular microscope. Comparing the three parts of seed, endosperm was found maximum number of fungi.

Keywords- *Sorghum vulgare, moisture content, embryo, pericarp, endosperm, mycoflora, deterioration.*

I. INTRODUCTION

Sorghum is popularly known as "Jowar" in India. The crop in the country stands at the third place in context of importance after wheat and rice. The grain had been used for consumption of both humans and livestock and also different genes of the plant serve many other important uses. The nutritional value of sorghum is same as of that of corn and that is why it is gaining importance as livestock feed. Sorghum is also used for ethanol production, producing grain alcohol, starch production, production of adhesives and paper other than being used as food and feed.

Sorghum is one of the important cereals and. a dietary stable food in Khandesh region of Maharashtra (India). Its cultivation extends throughout the drier and warmer parts of India. Verma and Khan (1965) made study of external and internal fungi associated with different varieties of sorghum grain. Mycoflora of sorghum has been studied time to time by many workers. Mathur and Sehgal (1964), Siddiqui and Khan (1973), Ravindra and Indira (1979). Commercially, discolored sorghum seeds caused by fungi are of poor quality (Castor and Frederiksberg, 1980; Gopinath and Shetty, 1987), reducing their acceptability and thus, the market value of the produce. Grain mold causes crop loss by reducing seed size and weight, the food value and keeping quality of grains (Gopinath, 1984: Bandyopadhyay, 1986), Girish and Baig (2011),Panchal and Dhale (2011).

MATERIALS AND METHODS

A.Determination of moisture Content-

Immediately after bringing to the laboratory 10 gm grains from each sample was kept in oven at 105^0 C for 16 hours. On completion of time oven were switched off and as the grains cooled to room temperature, they were weighed again and the difference between two weights was designated as moisture content on wet weight basis. (Table-1)

B. **Determination of germination Percentage**

Data on germination performances were collected from blotter test method. From each sorghum samples, two plating were done and in each 100 grains were plated in 4 Petri plates. Then these Petri plates were transferred to a rack fitted with two cool white fluorescent light 41 cm. above the Petri plates. Illumination was alternated for 12 h light and 12 darkness for 8 days at $20^0 \pm 40^0$ C temperatures. On completion of 8 days of incubation period plates were examined under Stereo binocular microscope for germination. Data on germination were recorded as normal seedlings, abnormal seedlings and ungerminated seeds (Table-1)

C. **Screening of mycoflora by seed dissection method**

To record the mycoflora from pericarp, endosperm and embryo, grains were dissected and incubated.For this purpose seeds were first soaked in water for 2-3 hour and then dissected carefully to separate out pericarp and embryo. Remaining portion of grain was endosperm also called half grain (endosperm). These three different parts i. e embryo, pericarp and half grain were plated in Petri dishes containing 4 layers of blotter ordinary filter paper with 7 ml of sterile water, and incubated under conditions similar to blotter method. After 7 days fungi appearing on the grain parts were observed in stereobinocular microscope. Identification of fungi was done while viewing fungal colony under stereo binocular microscope on the basis of characters outlined by Lambat (1982, and Neergaard (1977). For further confirmation of identification cotton blue lectophenol slides were prepared following Ellis (1971), and Booth (1977), and Subramanian (1971).

II. RESULTS AND DISCUSSION

It is clear from results (Table 1) that the grain of none of the varieties were found to be free from mycoflora. This shows that irrespective of the environmental conditions and varieties the fungi developed the contact with seed either very superficial, semi deep or completely inside the seed. All the samples tested were associated with at least one known pathogen. These results are in agreement with those of Kamal and Mughal (1968) and Khan et al. (1974), who reported the presence of *Alternaria, Helminthosporium, Fusarium, Curvularia, Cladosporium, Aspergillus*, and *Penecillium* species in sorghum seeds. The results also collaborate those of Khan and Bhutta (1994) and Bhutta and Hussain (1999), who reported the occurrence of *Drechslera sorokiniana* and *Fusarium moniliforme* as major pathogens of sorghum seed. Other reports by Singh (1983) also showed that *Aspergillus, Drechslera, Penicillium* and *Fusarium* spp., were common associates of stored sorghum seeds. The common occurrence of other pathogens like *Alternaria, Curularia, Fusarium, Aspergillus, and Penicilium* has been widely reported (Martin et al., 1984). The consequence of such infestation is not only limited to yield losses, but also accounts for the build-up of mycotoxins in infected grains. The findings of this study are therefore, important as they highlight the need for effective measures aimed at reducing seed-borne infection of sorghum seeds cause deterioration. Halgekar and Giri (2015),Pande et. al. recovered higher percentage of the pathogen from both the embryo and endosperm region in rice. Sachan and Agrawal (1995) reported higher frequency in seed coat followed by endosperm and embryo. The results presented in foregoing indicate that pre-harvest rain on mature crop resulted in mouldy activity causing severe damage to seed health both externally and internally. Results observed on different parts of the grain are tabulated in Table-2. Dominant fungi recorded from each grain parts were:

EMBRYO- *Phoma, Cladosporium, Fusarium moniliforme, Alternaria alternata and Curvularia lunata.*
PERICARP- *NIgrospora* sp., *A. alternata, Phoma* sp, *Cladosporium, Curvularia lunata, A.flavus, Fusarium semitectum, F. moniliforme, Drechslera longirostrata, D. rostrata and Colletotrichum graminicola.*
ENDOSPERM- *Phoma, Cladosporium, F. moniliforme , Alternaria alternata Curvularia lunata, Aspergillus flavus, Penicillium* sp., *A.niger, Epicoccum* sp., *Drechslera halodes, Fusarium semitectum, Nigrospora* sp. *chaetomium* sp. *Cephalothecium* sp., *Colletotrichum graminicola, Memnoniella* sp., *Drechslera longirostrata and Periconia* sp.

Comparing the three parts of grain endosperm was found to harbor maximum number of fungi in sample 9 all the three parts gave same number of fungi. Number of fungi in embryo were next in number in sample 1, 2, 4, 5 while in sample 3, 6 and 8, number in pericarp was closer to that of embryo. In sample 7 fungi appearing from pericarp and embryo were more than that of endosperm. *Phoma* (*Phoma sorghina*) responsible for leaf spot disease of sorghum appeared from endosperm or embryo of all samples except sample No.1. In certain sample its number was maximum e. g. sample 2, 3, 6, 8 and 9. *Alternaria alternata Curvularia lunata* and *F. moniliforme* were dominant forms in endosperm in larger proportion of samples. *Colletotrichum (C..graminicola*) another leaf spot pathogen was isolated only from sample no.9. Drechslera sp. were detected only from grains of sample 6, 7, 8, and 9. On the other hand *Epicoccum, Nigrospora* and *Chaetomium* were detected only in sample 1 and 5. *Cephalothecium, D.halodes, Periconia* and *Penicillium* were recorded from the endosperm of only one sample. The presence of pathogenic fungi in various geographical areas indicates a clear need for field surveys for these and other pathogens. There is need to increase public awareness on aspects related to seed health and to develop suitable management practice for improving the quality of the seed. Testing seed health of major crops should be introduced in the national seed quality control.

Table – 1 Grain moisture, deterioration and germination percentage of nine sorghum samples

Sample No.	Date of collection	Grain moisture	Grain deterioration	Percent germination *		
				Normal seedlings	Abnormal seedlings	Ungerminated seedlings
1	01/11/2018	30.00	7.00	83	17	0
2	01/11/2018	29.00	05.75	75	25	0
3	05/11/2018	28.00	15.50	48	52	0
4	05/11/2018	26.00	03.50	14	79	07
5	08/11/2018	17.70	04.50	27	43	30
6	17/11/2018	20.30	09.72	15	72	13
7	17/11/2018	29.20	25.00	01	61	38
8	17/11/2018	14.90	03.50	26	51	03
9	29/11/2018	13.90	51.20	00	65	35

* Data based upon observation recorded in blotter method.

Sr No	Fungi	Sample No-1			Sample No. -2			Sample No. 3			Sample No. 4			Sample No. 5			Sample No. 6			Sample No. 7			Sample No.8			Sample No. 9		
		Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo	Pericarp	Endosperm	Embryo
1	*Alternaria alternata*	1	15	-	1	6	7	4	6	-	1	2	1	17	12	2	25	3	11	17	14	7	16	7	2	19	11	0
2	*Aspergillus flavus*	-	1	-	-	1	1	1	8	8	-	1	-	-	5	4	2	1	-	-	-	-	-	-	-	-	-	-
3	*A.niger*	-	3	-	-	3	-	-	5	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	*Cephalothecium sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
5	*Chaetomium sp.*	-	-	-	-	2	-	-	-	-	1	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	1
6	*Cladosporium sp.*	-	-	4	9	7	5	-	-	4	1	2	4	-	1	-	-	-	-	-	-	-	1	16	4	4	4	2
7	*Colletotrichum graminicola*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	1	1	-	-	-	-	-	2	3	8
8	*Curvularia lunata*	-	8	-	9	4	4	2	5	-	-	1	1	19	9	-	-	-	-	13	11	7	4	9	1	13	4	13
9	*Drechslera halodes*	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	4	-	-	-	-	-	-	-	-	-
10	*Drechslera longirostrata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3	-	-	1	-	1	-	-	-	-	-
11	*Drechslera rostrata*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	3	-	1	-	2	2	2
12	*Epicoccum sp.*	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1	20	9	3	-	-	-	-	-	-	-	-
13	*Fusarium moniliforme*	-	6	-	-	12	-	2	-	1	-	20	-	1	1	1	-	2	1	3	-	17	7	7	2	2	18	1
14	*Fusarium semitectum*	-	2	-	-	-	-	2	2	-	-	-	-	-	-	-	-	4	-	2	-	3	-	-	-	-	-	-
15	*Memnoniella sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	1	-	-	-	-	-	-
16	*Nigrospora sp.*	1	-	-	4	5	2	3	8	2	-	1	-	-	-	-	1	-	-	-	-	-	2	2	-	-	-	-
17	*Penicillium sp.*	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	*Periconia sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	1	-	-	-	-
19	*Phoma sp.*	-	-	-	14	16	12	3	-	17		-	4	1	3	4	5	6		8	8	12	3	10	6	19	-	13
20	Total No	2	9	2	5	9	6	4	6	7	6	7	4	4	8	5	9	9	7	7	4	7	7	8	5	7	7	7

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