RESEARCH ARTICLE

Diversity of fungal spores over Jowar Crop

Gadekar SS

Department of Botany, Nowrosjee Wadia college, Pune, Maharashtra, India, 411001.

Address for correspondence Email: gadekar59@gmail.com

Manuscript details:

Received: 21 February, 2014
Revised: 06 March, 2014
Revised received: 06 May, 2014
Accepted :05 June, 2014
Published :30 June 2014

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Citation this article as:
Gadekar SS (2014) Diversity of fungal spores over Jowar Crop, *Int. J. of Life Sciences*, 2(2): 155-159.

ABSTRACT

To study fungal diversity over Jowar crop, aerobiological investigations were carried out for four consecutive seasons. Tilak volumetric air sampler was used to estimate fungal diversity both qualitative and quantitatively with respect to meteorological parameters. Tilak air sampler runs on an electric supply and provides a continuous sampling for eight days. The spore analysis and identification was based on morphological characters, visual identification by comparison with reference slides, prepared from fungal collection in and around the crop fields by exposing culture plates. The meteorological parameters were recorded throughout the period of investigation. They exhibited great deal of variation during different seasons i.e. Rabi and Kharif.

In the census 63 fungal spore types have been identified up to generic level, other types included hyphal fragments, pollen, protozoan cyst, insect parts etc. Analysis of fungal diversity after air sampling revealed 63 spore types including 34 from Deuteromycotina, 18 from Ascomycotina, 4 from Basidiomycotina, 2 from Zygomycotina. Percentage contribution of these fungal spore groups to the total airspora revealed that Deuteromycotina (60%) as a dominant group followed by Ascomycotina (19%), Basidiomycotina (16%), other types (2.5%) and Zygomycotina (1.5%).

Key words: Jowar crop, Fungal spores, meteorological parameters.

INTRODUCTION

Diversity in the aeromicroflora includes fungal spores, pollen grains, protozoan, insect parts, trichomes etc. The pollen grains and fungal spores are of immense importance in inciting the health disorders in human beings and plants.

The fungal spores present in the atmosphere are responsible to cause various diseases over many important crops including Jowar leading to severe crop loss, which affect the economy of farmers.

According to Jacobs (1951) aerobiology includes the dispersion of insect population, fungal spores, pollen, bacteria, viruses in fact all microbial

life forms belonging to both plants and animal group that are borne high up and transported partly or wholly in the atmosphere.

Cunningham (1873), for the first time, investigated micro-organisms in air over presidency jail at Kolkata in India. Mehta's (1940) work is noteworthy who had tackled the problems of rust of wheat and barley with aeroscope experiment at Agra.

These studies over microenvironment of the Jowar crop revealed 58 fungal spore types and five other types. Zygomycotina was represented by *Cunninghamella* and *Rhizopus* while Ascomycotina was represented by 18 different ascospores. Basidiomycotina was represented by four spore types while Deuteromycotina was represented by highest number of spore types. Other types included hyphal fragments, insect parts, pollen, protozoan cyst and unidentified spore types. Deuteromycotina dominated the aerospora exhibiting 60.19% contribution to the total airspora may be due to accessory method of asexual reproduction and formation of exogenous spores leading high fecundity. It is followed by Basidiomycotina (16%), Ascomycotina (19%), other types 2.5% and Zygomycotina 1.5%.

Some of the fungal spore types were pathogenic to the Jowar crop. The spores of *Cladosporium*, *Curvularia, Alternaria,* Smut, Rust, *Helminthosporium, Cercospora* and *Nigrospora* were reported to be the dominant types in the aerospora over Jowar crop at Pune.

This study was carried out for two consecutive years i.e. two Rabi and two Kharif seasons (2009 to 2011). The findings revealed seasonal variation in the percentage contribution during four seasons to the total aerospora. Rust spores, smut spores and spores of *Claviceps, Helminthosporium,* Ascochyta and *Curvularia* were found to be pathogenic types causing diseases to the Jowar crop.

The various ascospores were found to be released and encountered in the atmosphere over Jowar crop after the rainfall during the kharif seasons.

MATERIALS AND METHODS

Material is the atmospheric bio components over the environment of Jowar crop field at Pune, Maharashtra. Air sampling was carried out using continuous volumetric Tilak air sampler for four consecutive seasons comprising two rabi and two kharif seasons.

Tilak air sampler (1970) was kept at a constant height of 1.5m above the ground level, sampling the air at the rate of 5l /min which deposits the air spora over the cellophane tape, fixed over the drum by impingement process. Cellophane tape loaded air spora have been replaced weekly. It is cut into 16 equal parts and mounted over the clean glass slides in melted glycerine jelly. Slides have been scanned under 45X x10X combination of binocular research microscope for qualitative and quantitative estimation of airspora. Data of meteorogical parameters have been daily recorded for its relevance on spore incidence.

RESULTS AND DISCUSSION

These observations of ascospores group during RI& RII revealed interesting findings. Ten ascospores have been recorded during first Rabi while fifteen ascospores types have been recorded during second Rabi Findings varied under different sets of environmental parameters with rainfall (37mm), Relative humidity (41%) and temp (20^{o}c). *Leptosphaeria* (3.43%) to the total airspora over Jowar crop field.

During Rabi II, sets of environmental parameters with Rain fall (40mm), relative humidity (50%) and temperature 15^{0}c. The fungal genus, *Didymosphaeria* (3.52%) was found to be dominant followed by *Claviceps* (2.74%) to the total aerospora.

Findings of present study revealed that during KI and KII, the ascospore groups have been found to be significant. Total count of ascospores recorded during both the consecutive Kharif seasons exhibited 18 types each. During Kharif I, total rainfall was recorded to be 384mm. *Leptospharia* was recorded dominant (4.55%) among 18 ascospores followed by *Dydimospharia* (3.72%) to the total aerospora. All other ascospores have been recorded to be insignificant. Kharif II revealed *Leptoshpaeria* to be dominant (5.16%) followed by *Didymospharia* (4.27%) while others have been recorded insignificantly when total rainfall was 611mm at average RH-75% and average temperature range between 25-30^{o}C.

Leptosphaeria have been recorded to be dominant during R-I, K-I and K-II when *Didymospharia* ranked second, while during R-II *Didymospharia* have been

encountered as dominant while *Leptospharia* was second dominant. During R-II along with 2nd dominant the *Claviceps* (2.74%), *Leptosphaeria* (2.35%) and *Chaetomium* (2.20%) were found to be significant. Thus environmental parameters play significant role in release and diversity of ascospores (Table I). Jogdand (1984) reported greatest concentration of ascospores over others during rainy season while investigating aerospora on Jowar crop.

Table 1: Per cent contribution of dominant ascospores during four consecutive seasons over the environment of Jowar crop.

Sr. No.	Spore type	Nov		Dec		Jan		Feb	
		I	II	I	II	I	II	I	II
1	*Claviceps*	0	0	0	0	0	0	0	7.58
2	*Leptosphaeria*	0	0	6	0	7.25	0	5.95	0
3	*Didymospharia*	0	5.51	0	0	0	0	0	0

Table 2. Percent contribution of dominant ascospores during RI &RII over Jowar field to the total airspora .

Spore types	R-I	R-II	k-I	K-II
Leptosphaeria	6.07	2.35	4.55	5.16
Didymospharia	3.43	3.52	3.72	4.27
Claviceps	0	2.74	0.79	1.06
Chaetomium	1.54	2.2	1.9	2.04
Rainfall	37	40	384	611
Relative Humidity	41	50	82	75
Temperature	20	15	25-30	25-30

Table 3. Monthly average percentage contribution of dominant ascospores during KI and KII to the total aerospora.

Sr. No.	Spore type	July		Aug		Sept		Oct	
		I	II	I	II	I	II	I	II
1	*Hysterium*	0	0	0	83.17	0	0	0	0
2	*Lophiostoma*	0	0	6	76.44	7.25	0	0	0
3	*Claviceps*	0	0	0	0	0	0	69.67	0
4	*Rosellina*	0	0	0	67.94	0	0	0	0
5	*Melanospora*	0	0	0	0	0	59.84	0	0
6	*Pleospora*	0	0	0	58.8	0	0	0	0
7	Rainfall	-	-	-	263	-	200	107	-
8	Relative Humidity	-	-	-	85	-	90	90	-
9	Temperature	-	-	-	25	-	25	25	-

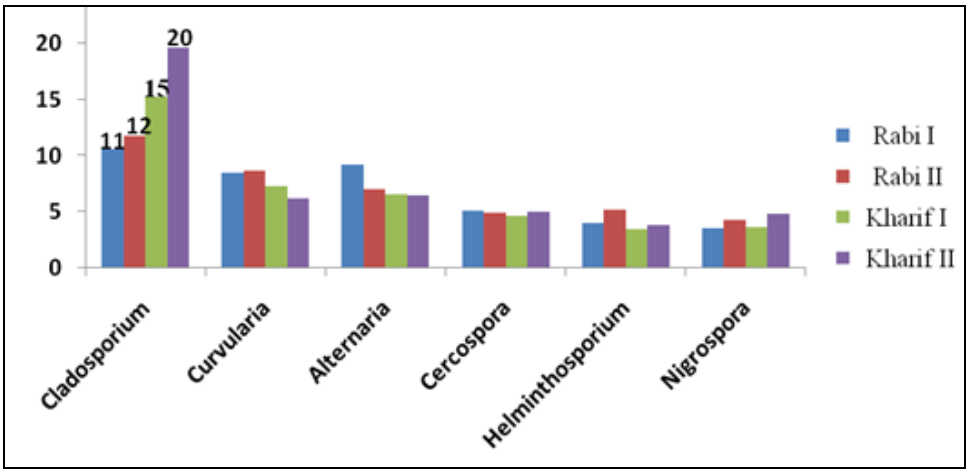

Fig. 1: Comparison between per cent contribution of some dominant spore types of Deuteromycotina for two consecutive seasons over Jowar crop.

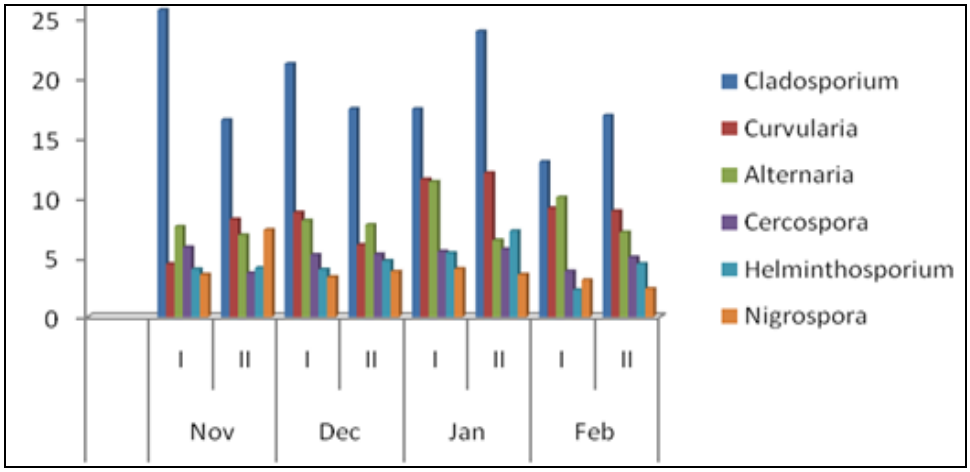

Fig. 2: Month wise per cent contribution of dominant spore types of Deuteromycotina during Rabi-I and II season over Jowar crop.

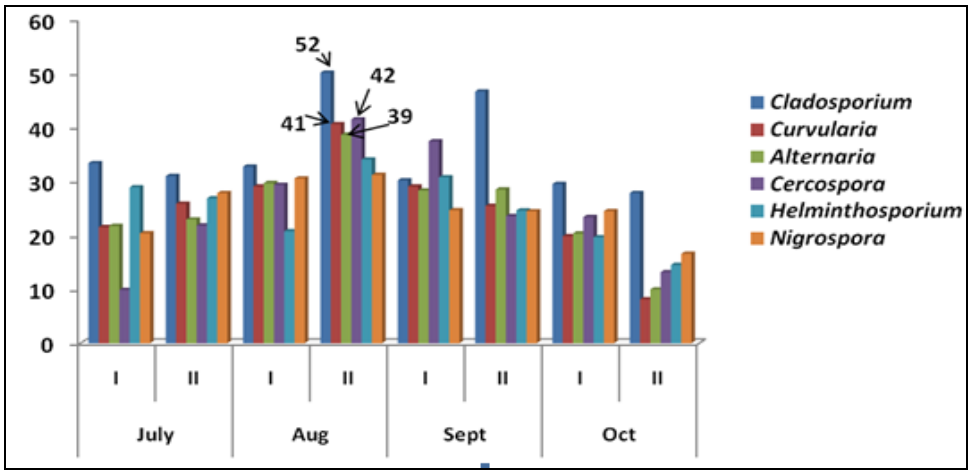

Fig. 3: Month wise per cent contribution of dominant spore types of Deuteromycotina during Kharif-I and II season over Jowar crop.

Month wise average per cent contribution of ascospores during two consecutive Rabi seasons and Kharif seasons revealed comparatively more biodiversity of ascospores during KI and KII as compare to RI and RII.

During RI monthly variation in diversity of ascospores revealed November (10), December (10), January (10)and February (9) types while in RII N-14, D-11, J-12 and F-12 which showed comparatively more diversity of ascospores in the second Rabi as compared to first season. *Claviceps* was reported dominant during February of R-II (7.58%), followed by *Leptosphaeria* (7.25%) in January of R-I, at average temperature 20°c and 15°c respectively (Table-II).

Monthly average percent contribution of dominant ascospores during KI and KII to the total aerospora revealed *Hysterium* (83.17%) of Kharif II found to be dominant followed by *Lophiostoma* (76.44) in the same month in same seasons. When there was 263mm rainfall, 85% RH and temperature 25°C, which formed congenial environment of the release and higher percentage contribution of the ascospores proving detrimental growth of environment on the ascospores load (Table III).

In relation to present studies Meshram and Deotale (2013) also dealt with the source of primary inoculum of disease incidence in relation to climatic factors and host nature. Bhati and Gaur (1979) studied different types of fungal spores including rust and smut spores etc.

Comparative observations of dominant Deuteromycotina spores during four consecutive seasons over Jowar crop field revealed highest percentage contribution of *Cladosporium* (10.59 & 11.79) during RI & RII when there was scanty rainfall (RI 37mm & RII 46mm). Less relative humidity (RI-41, RII-50%) at temp RI 20°C and RII 15°C, while during KI

and KII due to high rainfall (KI 384 and KII 611mm) with high relative humidity (KI-82 and KII-75%) and moderate temperature 25^{o}c, there was significant increase in the dominant spore types of *Cladosporium* (KI-15.26 and KII-19.59%) as compared to Rabi (GraphI). Tilak and Babu (1982) studied aerobiology of Bajra crop and revealed that the cause of leaf spot disease in Jowar was in relation to meteorological parameters.

Month wise percentage contribution of dominant Deuteromycotina spores during RI and RII over Jowar crop revealed *Cladosporium* is the most dominant spore types during all the months of RI and RII as compared to other spore types.

Ri-N-25.67 D-21.17, J-13.39 and F-12.98; RII- N-16.47 D-17.40, J-23.86 and F-16.84 (Fig.2) Month wise percentage contribution of dominant Deuteromycotina spore types during KI and KII revealed direct correlation to the highest rainfall 263mm, higher RH(90%), and moderate temp (25^{0}C). Shinde (2013) reported greatest per cent contribution of airspora during Kharif (71.49%). During August KII variation observed in per cent contribution aeromycospora such as *Cladosporium*50.12%, *Cercospora* 41.48%, *Curvularia* 40.59% and *Alternaria* 38.63%. Thus it is confirmed that the environment play determinate role in existence of aerospora during August (Fig. 3).

CONCLUSION

Diversity in aeromicrobiota was studied during two Rabi and two Kharif seasons. Rabi I and Rabi II exhibited less diversity over Kharif I and Kharif II. Rabi seasons had less concentrations and diversity of fungal spores than Kharif, attributed to less rainfall and other unfavourable conditions for the growth of fungi.

During Kharif II, rainfall was high (more than 200mm), relative humidity around 85% and temperature was moderate. These conditions were favourable for the growth of fungi and hence percentage count and diversity was very high. Group Deuteromycotina revealed to be dominant and the spore type *Cladosporium* was dominant among the all the spores for the all the seasons. Ascospores revealed less concentration on the rainy days but becomes dominant after rain.

REFERENCES

Bhati HS, Gaur RD (1979) Studies on Aerobiology: Atmospheric fungal spores. *New Phytologist*, 82: 519-527

Cunningham DD (1873) Microscopic examination of air. Govt. Printer, Culcutta.58.

Jacob WC (1951) Aerobiology in composition of meteorological Society, Batson, 1103-1111.

Jogdand (1998) Aerospora at Aurangabad , *Ph. D Thesis,* 1988, 204-238.

Mehta KC (1940) Further studies on cereal rusts in India. Sci. Monogr. Coun. Agric. Res.India18:1-368.

Meshram BM, Deotale Shilpa (2013) Aerobiology epidemiology and chemical control of Bean Rust. *Int. J. of Life Sci*., A (1): 84-87.

Shinde M (2013) An overview of aerobiology over groundnut crop at Patan(m.s.). *Int.J.of Life Sci*., A (1) :40-46.

Tilak ST (1982) Aerobiology of Pyricularia leaf spot diseases of Bajra in relation of weather condition. *Pollen Research Journal,* 19-22.

Tilak ST (1970) A new air sampler, Experimentia, 26:443.