

Investigation of Biocomponents Over Jowar Crop Field at Jamkhed

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ABSTRACT: In the present study aerobiological investigation was carried out over Jowar crop field using continuous volumetric Tilak Air Sampler during four consecutive seasons two kharif (2009 and 2011) and two rabi seasons (2008 – 2009, 2009 -2010) at Jamkhed. Jowar (*Sorghum vulgare pers*) is a major crop and used as staple food and fodder in India and it is affected by different airborne diseases. During these study different airborne components such as fungal spores, pollen grains, insect parts etc. have been recorded. Among them the common fungal spores were *Cladosporium*, *Alternaria*, *Curvularia*, *Cercospora*, *Helminthosporium*, Rust spores, *Albugo*, *Smut spore*, *Fusariella*, *Pyricularia*, *Bispora*, *Colletotricum*, *Claviceps* etc. was observed and were responsible for causing number of diseases over Jowar crop field. The total 80 fungal spore types and 8 other types were found. Analysis of airspora revealed class wise variation in the order of dominance. The group *Deuteromycotina* dominated the airspora having highest concentration (63.22% and 50.98%) in rabi and kharif Session respectively. followed by *Basidiomycotina* (20.00% and 11.00%), *Ascomycotina* (7.30% and 14.76%), Other types (7.69% and 10.71%), *Zygomycotina* (0.56% and 11.54%), *Myxomycotina* (0.56% and 1.00%), *Myceliasterilia* 0.65% in rabi seasons only. This data may be useful in formulating basis for disease forecasting when studied in relevance to meteorological parameters.

Key words: Jowar field, Air sampler, Biocomponents, and meteorology.

INTRODUCTION

Air sampling was carried out by installing “Air sampler” in the Jowar crop field for four seasons such as, two rabi seasons and two kharif season at Taluka Jamkhed, District Ahmednagar, Maharashtra. Jamkhed is located on the boundary of Beed, Osmanabad and Solapur district. Jamkhed is well known Tahasil of Ahmednagar district having an area of 772.3 sq. km area. Jamkhed city alone having a population of 1,24,363 (Census 2011). It is located at 75° 45' in east longitude and 18° 25' North latitude. The average rainfall of this area is 150.8-311.4 mm.

For the kharif seasons hybrid Mahyco-Bhagyalakshmi 296 and for rabi seasons the local variety Bedri was selected. Area under cultivation used for experimental purpose was over five acre and seed rate was 10-15 kg/acre. Jowar (*Sorghum vulgare pers*) is a major crop and used as staple food and fodder in India and it is affected by different airborne diseases. Jowar is a major crop in Ahmednagar District; hence Jowar crop was selected for the present investigation. The kharif Jowar crop was surrounded by bajara, cotton, maize and sunflower etc.

The investigation was carried out for four seasons, 1st rabi season was started from 15th October 2008 to 28th February 2009 and 2nd rabi season started from 10th October 2009 to 25th February 2010. The 1st kharif season starts from 15th June 2009 to 26th October 2009. The second kharif

season started from 15th June 2011 to 18th October 2011.

The present study was undertaken for air monitoring over Jowar crop fields. It includes qualitative and quantitative analysis of airspora at Jamkhed. This investigation was related to different growth stages of Jowar, disease incidence at the different stages and in relevance with meteorological parameters. Catching of airspora was done by air sampling with the help of volumetric continuous Tilak air samplers. The catching of the air components was done throughout the night and day continuously for four consecutive seasons over the Jowar crop field.

In the present study, Jowar crop was affected by various pathogens which were irregular in distribution of different vegetation cover and various environmental parameters. The various diseases such as leaf spots caused by *Alternaria*, *Helminthosporium*, *Curvularia*, *Cladosporium*, *Ascochyta*, etc Rust diseases caused by *Puccinia*, Smut caused by *Sphacelotheca*, Ergot caused by *Claviceps*, Red rot caused by *Colletotricum*, and various insect pests to which Jowar is affected from time to time.

Many scientists studied diseases of Jowar crop Shrama and Sinha (1971), Gaikwad (1974), Pande (1976), Bhalke (1981), Wankhade (1983), Patil (1985), Jogdand (1987), Kavishwar (1991), Bandyopadhyay, *et. al.*, (1991), Mali (2002), Rajasab, *et. al.*, (2004), Tilak and Gadekar (2005),

Gadekar (2014), Karne (2015) and Patil, et al., (2015).

MATERIALS AND METHODS

In the present study, volumetric Tilak Air sampler was installed in the field to trap the spores for four Jowar crop seasons such as, two rabi seasons and two kharif season. Air sampler was placed in the middle of the Jowar field at a height of 1.5 meter above the ground level on the field with orifice facing towards west. The slides were prepared and scanned according to the methods suggested by Tilak (1987) "Air Monitoring". Identification was done with the help of authentic literature, photographs, reference slide, etc. Daily meteorological data has been recorded time to time.

RESULT AND DISCUSSION

In the present investigation, aerospora catches consist of 88 biocomponents, out of which 80 fungal spore types and 8 other types consisting algal filaments, hyphal fragments, pollen, insect parts along with mites, protozoan cysts, epidermal hairs and various other bio particles were trapped on the cello tape fixed on the drum of the volumetric Tilak Air Sampler. Along with these various dust particles were also seen in abundance. The unidentified spores were grouped under the heterogeneous group known as unidentified types.

The highest number of bio component i.e. 45 belonged to *Deuteromycotina*, 23 to *Ascomycotina*, 5 to *Basidiomycotina* and 4 to *Zygomycotina*, 8 to other types, 2 to *Myxomycotina* and 1 in *Mycelia sterilia*, have been recorded during four consecutive seasons over Jowar crop field.

The total concentration of spore was maximum during two kharif seasons (33,12,442 spore/m³) and less during two rabi seasons (11,67,138 spore/m³).

The group *Deuteromycotina* dominated the airspora having highest concentration (63.22% and 50.98%) in rabi and kharif Session respectively. followed by *Basidiomycotina* (20.00% and 11.00%), *Ascomycotina* (7.30% and 14.76%), Other types (7.69% and 10.71%), *Zygomycotina* (0.56% and 11.54%), *Myxomycotina* (0.56% and 1.00%), *Myceliasterilia* 0.65% in rabi seasons only, showed in Table No. 1 and 2 and Graph No. 1 and 2.

During the period of investigation the dominant biocomponents recorded were arranged

in the order of dominance such as *Cladosporium* spore type contributed in highest number (6.17% K and 15.60 %R), followed by Rust spores (4.23%K and 7.09%R), *Alternaria* (4.19% K and 6.87% R), Smut (1.92%K and 8.92%R), *Curvularia* (4.19%K and 4.69%R), *Basidiospores* (3.7%K and 3.66%R), *Nigrospora* (3.10% K and 4.69%R), *Pseudotorula* (3.57% and 3.14%), and *Helminthosporium* (2.5%K and 4.33%R), hyphal fragments (2.67%K and 3.06%R), Algal fragment (2.67%K and 0.50%R), *Rhizopus* and *Sclerospora*, *Cunninghamella* showed a definite seasonal pattern in the occurrence.

During the both kharif seasons the Ergot of cobs was highly observed caused due to *Claviceps sorghi*, while in both rabi seasons Rust and Smut was highly noticed caused due to the pathogen *Puccinia purpurea* and *Sphacelotheca*. These diseases were caused due to the environmental factors, response of Jowar crop to the fungal pathogens, plentiful substratum on which the pathogen can survive around and middle of the Jowar crop field, previous crop field were suitable for the pathogens. These pathogens can produce the ascospore during the heavy rainfall, moderate temperature and high humidity period. This findings correlates with a Janaki Bai and Subba Reddy (1980), Patil (1985), Jogdand (1987), Pande (1976), Tilak and Bhalke (1978) and many more.

CONCLUSION

It is concluded that during both kharif seasons the biocomponents airspora has been found to be in highest percentage contribution due to the favorable environmental conditions like high relative humidity, moderate temperature and heavy rainfall, while quite less during both rabi seasons due to warm conditions with high temperature, less humidity and scanty rainfall.

The Ergot of cobs caused by *Claviceps sorghi*, during kharif, while Rust and Smut caused due to pathogen *Puccinia purpurea* and *Sphacelotheca* in both rabi seasons due to the favorable environmental factors, aggressive nature of pathogen and susceptibility of the Jowar crop.

Thus meteorological parameters have been found to play important role in the incidence of biocomponents airspora and due to heavy rainfall wet airspora have been found in maximum number as compare to dry airspora during rabi seasons.

Table – 1

Total Airspora and percentage contribution of each spore group over hybrid Jowar (*Sorghum*) var.- Mahyco-Bhagylaxmi-296, during 1st and 2nd Kharif seasons.

(1st season-15th June 2009 to 26 October 2009 and 2nd season-15th June 2011 to 18th October 2011)

Spore Group	Total Airspora Total spores/m ³ of air		Percentage Contribution		Mean
	Seasons I	Season II	Seasons I	Season II	%
<i>Myxomycotina</i>	1167	1218	1.01	1.00	1.00
<i>Zygomycotina</i>	15451	11716	13.46	9.62	11.54
<i>Ascomycotina</i>	14156	20947	12.33	17.20	14.76
<i>Basidiomycotina</i>	11130	14957	9.693	12.28	11.00
<i>Deuteromycotina</i>	59914	60640	52.18	49.79	50.98
Other Types	13010	12297	11.33	10.09	10.71
Total	114828	121775	100	100	99.99

Table – 2

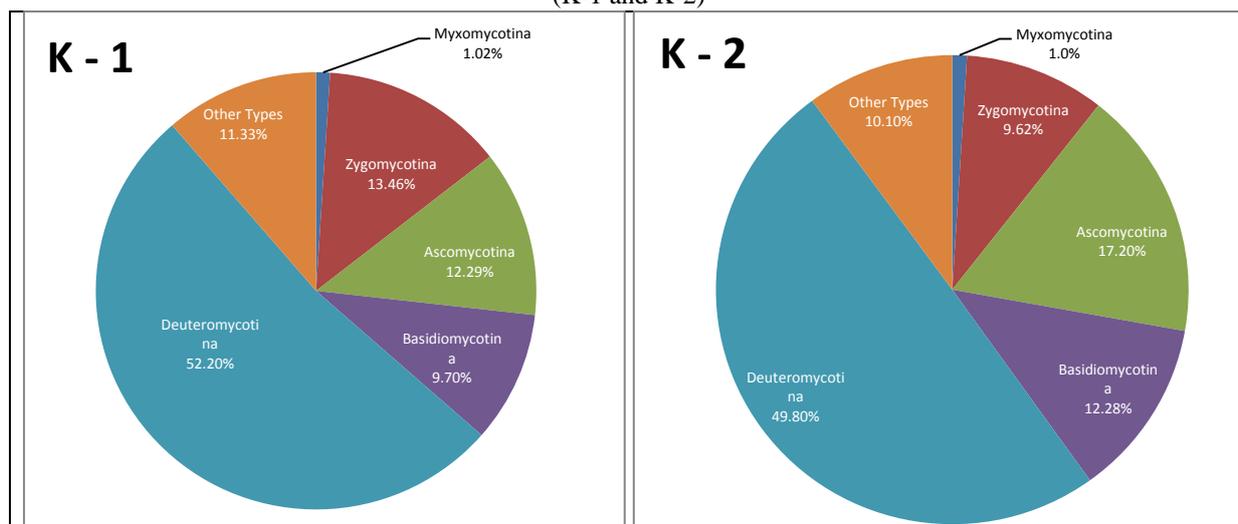
Total Airspora and percentage contribution of each spore group over Jowar (*Sorghum*) local var. Bedri, during 1st and 2nd Rabi seasons.

(From 15th Oct 2008 to 28th Feb 2009 and 10th Oct 2009 to 25th Feb 2010)

Spore Group	Total Airspora Total spores/m ³ of air		Percentage Contribution		Mean
	Seasons I	Season II	Seasons I	Season II	%
<i>Myxomycotina</i>	311	143	0.80	0.32	0.56
<i>Zygomycotina</i>	155	327	0.40	0.73	0.56
<i>Ascomycotina</i>	1829	4422	4.72	9.87	7.30
<i>Basidiomycotina</i>	7628	9078	19.71	20.3	20.00
<i>Deuteromycotina</i>	25050	27638	64.75	61.7	63.22
<i>Mycelia Sterilia</i>	237	308	0.61	0.69	0.65
Other Types	3474	2873	8.98	6.41	7.69
Total	38684	44789	100	100	99.98

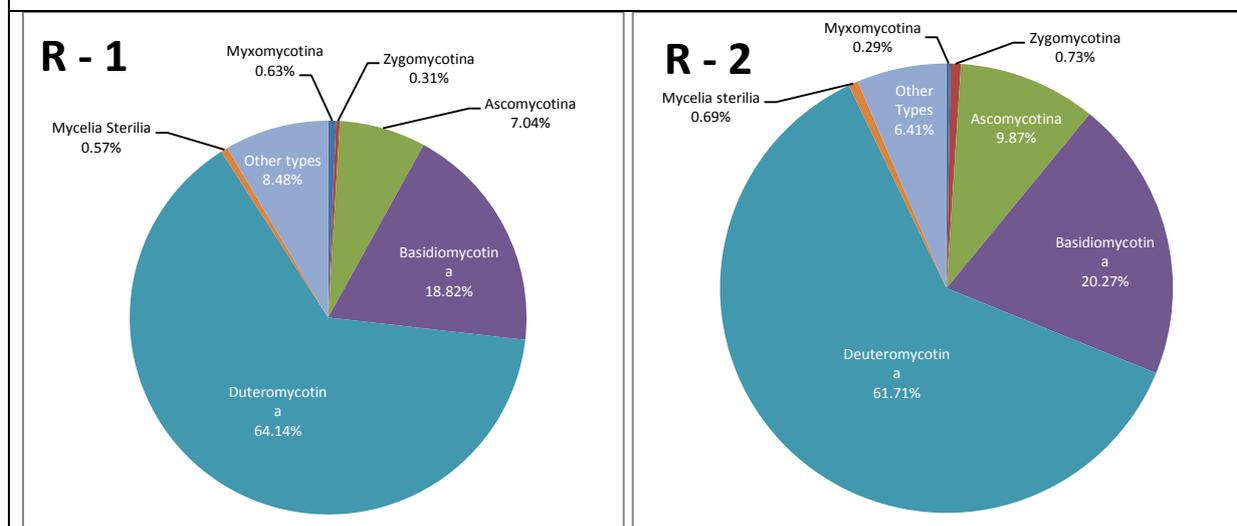
Graph No: 1

Graph showing the variation in percentage contribution of each spore group in two consecutive Kharif seasons (K-1 and K-2)



Graph No: 2

Graph showing the variation in percentage contribution of each spore group in two consecutive Rabi seasons (R-1 2008- 2009 and R-22009-2010)



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