RESEARCH ARTICLE

AEROBIOLOGICAL INVESTIGATIONS OVER JOWAR CROP FIELD AT RAHURI

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ABSTRACT

Aerobiological investigations have been carried out at Rahuri for four consecutive seasons over Jowar crop. Tilak volumetric air sampler was used to estimate different aerobiocomponents both qualitatively and quantitatively with respect to meteorological parameters. Analysis of airspora after air sampling revealed 63 spore types including 34 from Deuteromycotina, 18 from Ascomycotina, 4 from Basidiomycotina, 2 from Phycomycotina and 5 other types. Percentage contribution of these spore groups to the total airspora revealed that, Deuteromycotina (60.37%) as a dominant group followed by Ascomycotina (18.96%), Basidiomycotina (16.63%), other types (2.54%) and Phycomycotina (1.5%). Average percentage contribution of each spore type to the total airspora of four consecutive seasons reavealed that *Cladosporium* (15.44%) as a dominant type followed by *Curvularia* (7.65%), *Alternaria* (7.32%), Smut spores (6.49%), *Cercospora* (4.94%), *Helminthosporium* (4.13%) etc. Pathogenic spore types like Rust, Smut, *Alternaria, Curvularia* and *Helminthosporium* have been observed in sufficiently higher concentrations followed by respective disease incidence. Seasonal variations and diurnal periodicity studies revealed typical rhythm and pattern of spore incidence.

Keywords : Aerobiocomponents, Air sampling, diseases, Meteorology.

INTRODUCTION

The fungal spores present in the atmosphere have been found to be responsible for the causation of various diseases over many important crop plants. Severe diseases result into maximum loses of these crops in terms of quality as well quantity of the crop yield affecting economy of the farmers.

Jowar is the major staple food and fodder crop in Maharashtra and other states of India. It is affected by various airborne diseases. Hence, this topic has been selected for the crop protection.Louis Pasteur (1861) in his germ theory of diseases demonstrated that the air was a carrier of many common germs. Ehrenberg (1872) first published information on the microorganisms collected from the atmospheric dust. These aerobiological investigations carried out in Maharashtra through the school of Aerobiology by Prof. Tilak, who was honoured as father of Indian Aerobiology at Magadh University, Bodha Gaya.

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MATERIAL AND METHODS

Material is the atmospheric biocomponents over the environment of Jowar crop field at Rahuri dist. Ahmednagar. 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 deposites the airspora over the cellophane tape, fixed over the drum by impingment process. Cellophane tape loaded airspora 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 45x10x 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 & DISCUSSION:

Monthwise percentage contribution of each spore group to total airspora for the first and Rabi seasons revealed *Deuteromycotina* as dominant (66 and 69%)

in all the months. (fig. 1a and 1b). While concentration of deuteromycotina is as follows:
1st Rabi (N-66, D-66, J-63 and F-50),
2nd Rabi (N-66, D-66, J-69 and F-53)
Fig 1a and 1b.

1st Kharif (N-63, D-64, J-58 and F-58), 2nd Kharif (N-57,D-57, J-54 and F-59) fig 2a and 2b.

Monthwise percentage contribution of each spore group to the total airspora for the first and second Kharifs revealed incidence of high airspora in all the groups may be due to high rainfall, high relative humidity and moderate temperature, as prevalent meteororological factors as compared to Rabi seasons. However first Kharif season revealed higher percentage contribution during September (P4, A21, B15 and D58) and during second Kharif it was recorded unevenly i.e., P in July (1.95), A in August (26.96), B in October (17.79) and D in October (58.75), which may be due to more rainfall in the respective months (fig. 2a and 2b).

Variation in percentage contribution of different spore types during two Kharif and two Rabi seasons revealed *Cladosporium* (20%, 19%, 11% and 11%) as dominant spore type during all the four seasons. And it was more during both the Rabi seasons (20% and 19%) as compared to both Kharif seasons. (11 and 11%) (Table 1). It may be due to variation in the environmental parameters during Kharif and Rabi seasons respectively.

Alternaria, Curvularia, Basidiospores and *Cladosporium* revealed highest monthwise percentage contribution during August as compared to the other months of the second Kharif season (fig.3). Dirunal periodicity curves of *Curvularia* and *Alternaria* revealed peak points at 14-16 hours representing day spora group (fig 4a & 4b). Month-wise variation in some of the prominent spore types have been recorded during two Rabi seasons and two Kharif seasons.

Table 1: Variation in percentage contribution of different spore types during 2 Kharif and 2 Rabi seasons.

Sr. No.	Dates	Total No. of spores obtained	Dominant spore type	Lowest spore type
1	1st Rabi (1st Nov to 20th Feb)	46	1. *Cladosporium* (19.59%)(21644)	1.*Trichoconis* 0.01%)(14)
			2. Smut spores (12.52%)(13832)	
2	2nd Rabi (6th Nov to 25th Feb)	54	1. *Cladosporium* (18.79%)(30660)	1.*Apiorhynchostoma* (0.02%)(28)
			2. *Curvularia* (8.67%)(14154)	
3	1st Kharif (10th July to 20th Oct)	63	1. *Cladosporium* (10.59%) (32984)	1. *Diplodia* (0.14%) (308)
			2. *Curvularia* (7.26%) (15680)	
4	2nd Kharif (1st July to 10th Oct)	63	1. *Cladosporium* (10.59%)(23492)	1. *Corynespora* (0.16%)
			2. *Alternaria* (6.48%) (14350)	

Table 2: Seasonal variations of average percentage contribution of each class to the total airspora.

CLASS	R1	R2	K1	K2
Phycomycotina	0.55	0.76	2.3	1.5
Ascomycotina	13.72	14.61	19.7	25
Basidiomycotina	22.54	19.75	15.34	15
Deuteromycotina	63	65	62.15	58

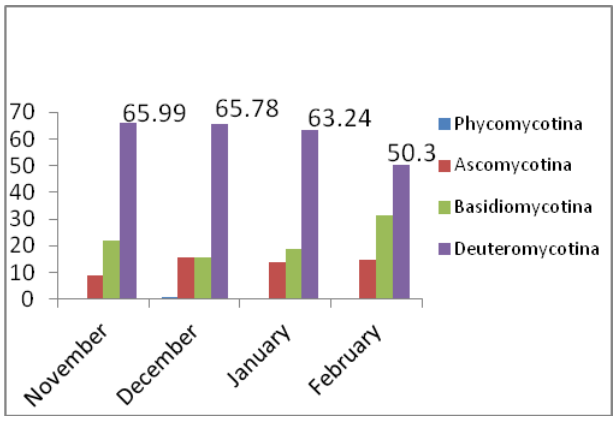

Fig. 1a. Monthwise Average percent age contribution of each spore group to the total airspora for the 1st Rabi season.

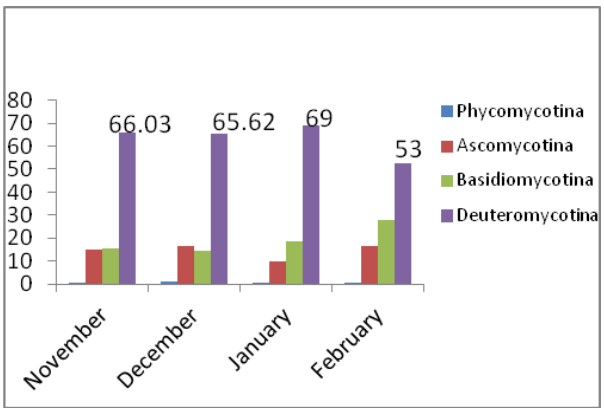

Fig. 1b. Monthwise Average percent age contribution of each spore group to the total airspora for the 2nd Rabi season.

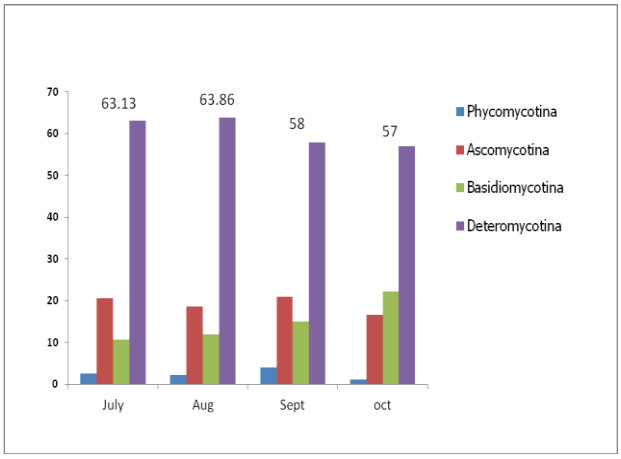

Fig 2a. Monthwise average percentage contribution of each spore group to the total airspora for the 1st Kharif season

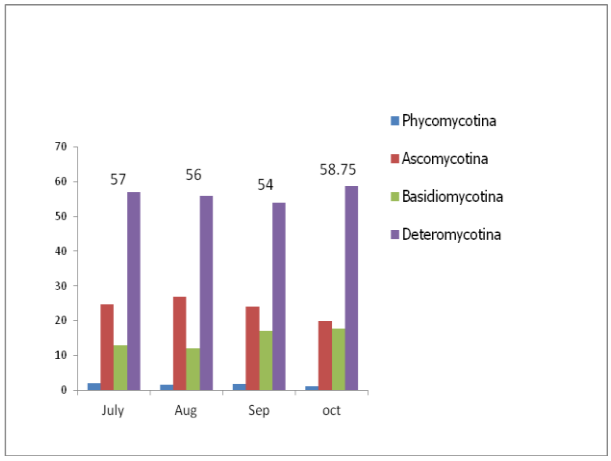

Fig2b. Monthwise average percentage contribution of each spore group to the total airspora for the 2nd Kharif season

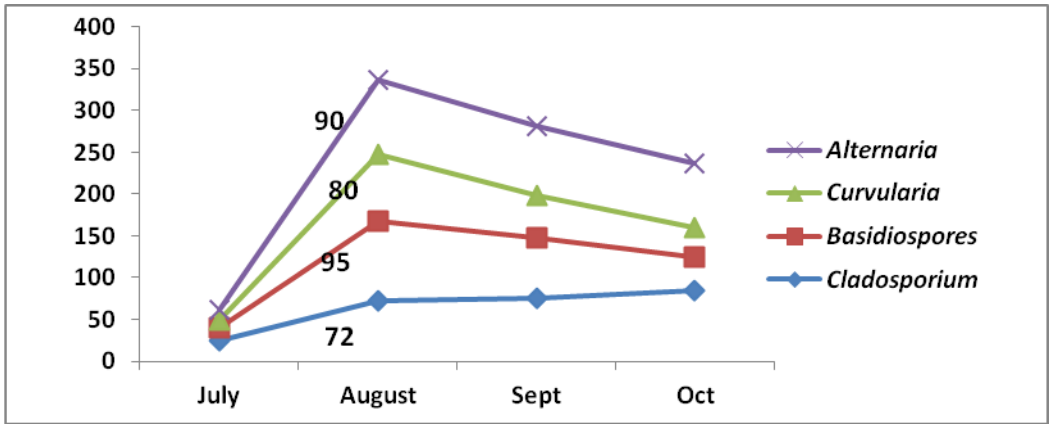

Fig.3. Relevance of metrological parameters with the spore load during second kharif. Meterological Relevance to Some Dominant Spore

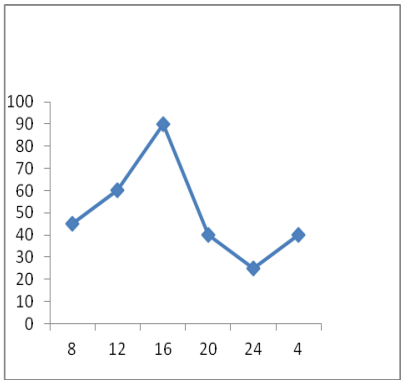

Fig. 4a. Dirunal periodicity curv of Alternaria

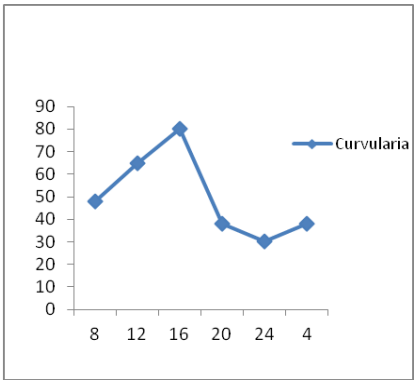

Fig. 4b. Dirunal periodicity curve of *Curvularia*

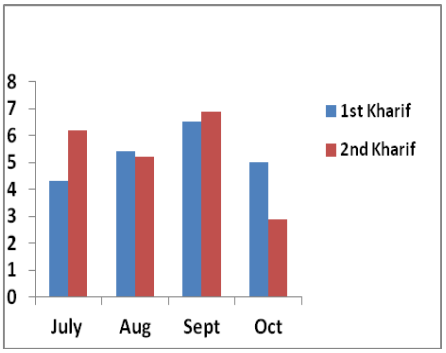

Fig. 5a. Monthwise average percentage contribution of Rust to the total airspora (1st & 2nd Kharif)

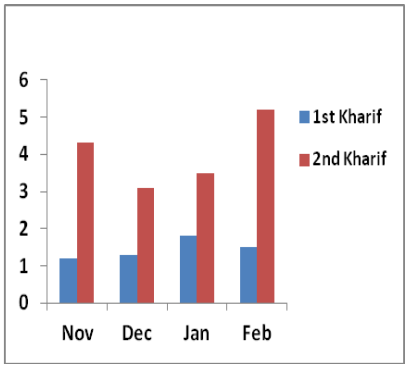

Fig. 5b. Monthwise average percentage contribution of Rust to the total airspora (1st & 2nd Rabi)

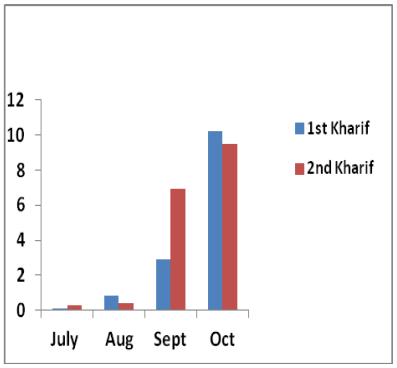

Fig. 6a. Monthwise average percentage contribution of smut to the total airspora (1st & 2nd Kharif)

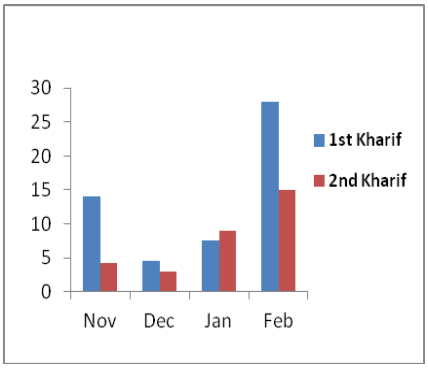

Fig. 6b. Monthwise average percentage contribution of smut to the total airspora (1st & 2nd Rabi)

Prominent Pathogenic spore types like rust and smuts revealed specific pattern of month-wise distribution during four consecutive seasons i.e. R1, R2, K1 and K2. Rust spores revealed highest average percentage contribution during September of both the kharif seasons (K1and K2) as compared to other months while during first and second rabi seasons (R1 and R2) average percentage contribution was higher during second rabi as compared to first rabi and was highest during second rabi. (fig.5a and 5b)

Smut spores revealed rhythmic variations and particular pattern of monthwise distribution during four consecutive seasons. It was found highest during both the kharif seasons in the month of October as compared to other months of both the kharifs. It was comparatively lower in both the rabi seasons in all the months. Within the rabi seasons it was found highest during the first rabi season in the month of February as compared to all the months of both the rabi seasons. However, average percentage contribution of smut spores was scanty during July and August of both the kharif seasons, it slightly increased in the September of both the kharif seasons and highest during October of both the kharif seasons.

When the crop was at emergence and grain formation stage similar was the case during both the rabi seasons executing higher percentage contribution during February after the emergence stage of the crop (fig 6a and 6b).

Seasonal variation of average percentage contribution of each class to the total air spora during four consecutive seasons (R1, R2, K1 and K2) revealed interesting rhythm Deuteromycotina revealed highest percentage contribution in all the four seasons. Phycomycotina and Ascomycotina revealed progressive increase from R1, R2, K1 and K2. While Basidiomycotina and Deuteromycotina revealed

progressive decrease in average percentage contribution from R1, K1 and K2. While R2 revealed highest percentage contribution to all four consecutive seasons. (Table 2)

CONCLUSION:

Aerobiological investigations over jowar crop field at Rahuri during four consecutive seasons revealed interesting findings in general and pathogenic aerospora and exhibited rhythmic monthly and seasonal variations in relevance to meteorological parameters and growth stages of jowar crop. These studies and extensive data for a long period will help significantly in formulation of useful and appropriate model for disease forecasting system for the protection of jowar crop from airborne diseases in our country.

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