Studies on Environmental Fungal Flora of Wheat Cultivated Area

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Abstract:

Inhaled fungal spores surviving in the air are implicated to cause allergy and asthma. Aeromycological survey of wheat cultivated area under irrigation at different locations for two month period in rabi season revealed that majority fungal spores of diverse group adhere to film of nutrient medium were confined viable and forms colonies of different colours in variable frequency. Out of the total population of 1710 fungal colonies fall under 20 genera and 39 species, 57.3% colonies were appeared in the month of November by petri plate exposure method. Ascomycota contributed higher fungal colonies over others. An ascomycetous genus, *Aspergillus* was recorded dominant, exhibiting higher count of species and contributed 33.6% of the total colony count followed by *Fusarium* (11.2%) and *Alternaria* (10.2%). *Curvularia, Penicillium, Helminthosporium* and *Rhizopus* were reported equally dominant. Least concentration of spore has been recorded for *Cunninghamela, Nigrospora, Phomopsis, Pithomyces* and Sterile *white mycelia* whereas pathogenic fungal genera including *Pythium, Cladosporium, Trichothecium* were reported to appear in moderate concentration. It may be concluded that distribution of diverse group of viable fungal spores in variable concentration in response to climate of high humidity and low temperature over wheat field may cause allergic disorders to farmers.

Keywords: *Fungal spores, asthma, allergy, airspora, environment, mycelia,*

Introduction:

Environmental microfungal spores are most prominent allergen bioparticulates than pollen grains, insect debris, house dust, mites, animal dander, chemicals, and foods, implicated to cause allergic symptoms and respiratory disorders. Asthma is a significant global public health issue. In irrigated areas, the severity of these disorders in the farmers' population has been lined to airborne level of fungal spores. The distribution of these microbes in the environment varies from place to place attributed to variation in climate, season, geographical location, vegetation flora combination (El-Gali and Abdullrahman, 2014). Airborne fungal spores originally created from plant, animal and soil sources get airborne during day time particularly in the afternoon, carried to a long distance, suddenly deposits on epidermal region of plant parts and may cause diseases to diverse group of healthy plants (Agrios, 2005; Gl-Gali, 2014). They are implicated in damage of food commodities, spoilage of stored grains, fruits, food stuff, in deterioration of organic material and their high concentration of mycotoxins may cause health hazards (Nafis and Sharma, 2012).

The farming practices like irrigation of land for cropping in *Rubi season* help to enhance a level of atmospheric humidity to greater extent together with plant transpiration o as well as respiration by crop plants increase CO_2 concentration that stimulate fungal sporulation suggesting that levels of the airspora correlate with humidity and temperature (Agrios, 2005). Environmental microfungal spores inhaled by farmers may land on sensitized lining of a nose, the conjunctiva of eye, and mucous membranes of airway or they get inhaled into the depth of lungs and

their allergy causes incessant sneezing, itchy eyes and severe seasonal asthma (Chelak and Sharma, 2012;). Usually these spores cause no trouble to most of the human population but they can be harmful by provoking allergic responses or infections and cause disorders, bronchial asthma, allergic rhinitis, migraine, urticaria, eczema, atopic dermatitis etc. in some segments of human population (Ianovici and Tudorica, 2009). Several investigations have been made on aeromycoflora on various parts of the globe due to their relationship with plants, animals and human disorders (Ghosh et a., 2011; Nafis and Sharma, 2012; Bhajbhuje, 2013; Kayarkar and Bhajbhuje, 2014). Literature survey revealed that allergy asthma is a common disease amongst the farmers in cold winter season, there is a great need for undertaking, aerobiological studies of these fields, it seemed to be worthwhile to report a more comprehensive and systematics of aeromycoflora over wheat field under irrigation in Rubi season.

Material and Methods:

Sampling site:

An area under cultivation of wheat (*Triticum aestivum* L) with irrigation facilities has been selected as sampling site located in Hingna taluka Dist. Nagpur. The selected site lies on the Deccan plateau at an altitude of 310.5 meters above the sea level. The Rabi season of winter lasts from *November to January*, during which temp can drop below 10^0C.

Spore sampling and identification:

The samples of different locations were collected in winter Rabi season of winter at one week interval for two month (Nov-Dec). The aeromycoflora was counted employing culture plate exposure technique reported earlier (Chelak and Sharma, 2012). Potato Dextrose Agar nutrient medium composed of peeled potato (400gm^{-1}), dextrose (20gm^{-1}) and agar (20gm^{-1}) in a liter of distilled water was prepared and slightly cooled autoclaved medium transferred aseptically to sterile Petri dishes. The medium was allowed to jellify, thereafter, the junctures of Petri plates were sealed with cello-tape. Petri dishes containing PDA nutrient medium were exposed in triplicate for 5-7 minutes over wheat cultivated field in weekly visit, in afternoon between 11.00 to 11.30 p.m., placed at 6meter height. An exposure time of 5-7 minutes provided to be very suitable, as it gave adequate colony counts. The exposed petri plates were sealed again with cellophane-tape, to avoid chances of any contamination. These petri plates containing fungal propagules were brought to laboratory and incubated at 25 to 28^{0}C in B.O.D. incubator for 3 to 5 days depending upon growth of colonies. The developed colonies were counted, isolated and identified after sub-culturing on tube slants containing Czapek's medium. Literature, Micro- & macro morphology and reverse surface coloration of colonies on Czapek's medium were used for species identification and finally authenticated by authority. The broken hyphae or chlamydospores were recorded as hyphal fragments.

Result and Discussion:

Environmental mycoflora is known to cause damage to diverse group of healthy plants reducing yield potential and their high concentration of mycotoxins may cause health hazards (Bhajbhuje, 2013; El-Gali, 2014). The prevalence of airspora over the wheat cultivated field under irrigation *Rabi season* is receiving the increasingly attention with the framework of potential health hazards to both vegetation flora and fauna including human beings. Great concern has been expressed about potential health hazards to a segment of farmers' remained engaged in farming in the field with special focus on allergenic or toxigenic microfungal flora and their association with air quality. The present study aims to record diverse group of viable propagules of fungal organisms over wheat cultivated area under irrigation following culture plate exposure method during *Rabi season* of winter.

Aeromycological analysis revealed prevalence of a population of altogether 1710 fungal colonies categorize under 20 genera and 39 species over wheat cultivated area under irrigation in rubi season (Table 1). Ascomycotina dominated with 42.9% fungal spora exhibiting highest concentration followed by Deuteromycota contributing 40.1%. Moderate concentration was recorded with Zygomycota while sterile mycelia represented 5.2% of the total colony count. Oomycota had least count. Fungal spores from Basidiomycota did not appear on agar plating (Table I). In Oomycota, total 39 fungal colonies were recorded representing 2 genera and 2 species. Both the isolates, *Phytophthora infestans* and *Pythium aphanidermatum* were detected in equal concentration. Total 733 fungal colonies of Ascomycota were recorded representing 4 genera and 13 species. *Aspergilli* contributed with higher (33.6%) concentration followed by *Penicilli* (7.0%) while *Chaetomium glabosum* and *Phomopsis* had least colony count. Deuteromycota had 685 fungal colonies representing 9 genera and 18 species of diverse nature. The dominant isolates in this group included *Fusarium* (11.2%), *Alternaria* (10.2%), Curvularia (6.37%) and Helminthosporium (6.0%) while remainings were detected in the frequency ranged between 0.64- 2.28%. Among other types sterile hyphae with few chlamydospores contributed 5.2% of total colonies (Table II).

An ascomycetous genus, *Aspergillus* contributed one-third of the total colony count followed by *Fusarium Alternaria, Penicillium, Rhizopus, Curvularia, Helminthosporium* and *sterile black mycelia* with chlamydospores. *Alternaria and Fusarium were recorded equally dominant* while *Penicillium, Rhizopus, Curvularia, Helminthosporium* were detected subdominant. Fungal spora of well-known storage fungal genera, *Aspergillus amstelodomi*, *A. niger* and *A. flavus were* seemed to be prevalent in high concentration followed by *Alternaria triticina*, *Curvularia lunata*, *Helminthosporium spiciferum, Fusarium oxysporum, F. solani* and *Sterile black mycelia.* Other members represented 0.64 – 3.27 of the total colony (Table I). *Rhizopus* of Zygomycota, *Aspergilli* & *Penicilli* of Ascomycota; *Alternaria, Curvularia, Fusarium, Helminthosporium* of Deuteromycota contributed as major components; represented a group of taxa of cosmopolitan fungal organisms that can exploit virtually any organic substrate (Jyoti and Malik, 2013). Minor components included 13 airborne genera which are less frequent and sporadic

type. Other stable components recorded were *Cunninghamela elegans*, *Diplodia sp.*, *Pythium aphanidermatum*, and sterile mycelia. *Aspergillus sulphureus, Phomopsis sp. Fusarium culmorum, Nigrospora sp., Pithomyces sp., Trichothecium roseum* were rare in samples, prevailed only 2-6 times during sampling.

The culture plate exposure method was confined to be more precise in isolation of aeromycoflora over wheat cultivated field under irrigation is attributed to certain advantages including (i) Fungal spores with similar appearance can be identified to their generic level (ii) Fungal species of too small size with sufficient individual characteristics to use as means of identification (*Yeast*, *Phoma* etc.) (iii) Viable fungal hyphae can also be identified on the slides (iv) Material on the sides cannot be blow away with strong wind (Nafis and Sharma, 2012; Kayarkar and Bhajbhuje, 2014).

Fungal organisms grow profusely, with different shades as compared to other diverse group of microbes. *Aspergillus* was dominated over wheat cultivated field and exhibiting higher count of species and contributed 33.6% colonies of the total (Fig.1 & 2) hence *Aspegillosis* is reported a common disorder among the farmers. It is in agreement with earlier findings of Sharma et al (2011) who have reported significant concentration level of *Aspergillus niger, A. fumigatus, A. flavus, A. candidus* in the aeromycoflora. These results are confirmed with earlier findings (Bhajbhuje, 2013). The most common degrading products in the field include cellulosic rich dead remains of plants, cow dungs that form an ideal nutrient rich substrate for development of fungal organisms as bio-deteriogens. The cellulosic products provide sugar rich substrate for many fungal species. Microbial deterioration of cellulose fibers is very well established facts in crop cultivation area (Anderson et al 2012). *Aspergilli* and *Penicilli* are abundantly reported on these nutrient rich substrates, involved in degradation (Sharma et. al., 2011). Ramamurthy et al., (2011) reported 32% *Penicillium* and 28% *Aspergillus* on cellulosic material. These substrates may act as rich source of carbon and nitrogen for microfungal organisms.

Liberation of spores of *Aspergilli* and *Penicilli* were favored by high air humidity and while those of *Alternaria Cladosporium* and *Helminthosporium*, were liberated mechanically by the action of wind. Spore dispersal of Ascomycota is therefore favored by high relative humidity and low temperature while slightly increasing temperature with low humidity supports spore dispersal of Deuteromycota. The occurrence of such conditions at different times in different geographical regions may help to explain differences in the observed periodicities (Sharma, 2010).

Aspergillus niger has potential to produce *ochratoxin-A. Aspergillus flavus* secretes aflatoxin and other toxic compounds including *strigmatocystin, cyclopiazonic acid, kojic acid, ß-nitropropionic acid, aspertoxin, aflatrem, gliotoxin* and *aspergillic acid. Penicillium*s was reported as a common opportunistic pathogen, secretes penicillic acid, causing systemic penicilliosis (EFSA, 2011). Members of *Helminthosporium* have been reported to produce *Helminthisporin*, four different HC toxins; *Curvularia lunata* produces 2-methyl-(5-hydroxy methyl) furan-2 carboxylate. *Fusarium* secretes a diverse range of mycotoxins includes

trichothecenes (*T-2 toxin, HT-2 toxin, deoxy-nivalenol & nivalenol), zearalenone* and *fumonisins* that have been suspected of causing toxicity in human. *Fusarium solani* and *F. moniliformae* were reported to cause *keratitis* and also associated with wound and infections of the eyes and fingernails (EFSA, 2011). Several species of *Alternaria* are reported to secrete *Altersolarol-A* and *alternaric acid dibenzopyron, tetranic acid, altertoxin-I & II, alternariol, alternariol monomethyl ether, tentoxin, tenuazonic acid, altertoxins, stemphyltoxin III* (Brakhage and Schroeckh, 2011).

Deuteromycota fungus *Alternaria triticina* a serious leaf blight pathogen of what was detected in significant concentration. The pathogen is known to cause leaf blight, damping off of seedlings, producing brown to black leaf spots lead to a reduction of leaf count, adversely affect anabolism, premature defoliation and reported reduction in annual average yield to the extent of 20-30% (Mamgain et al., 2013). *Alternaria solani* is a major constituent of fungal bio-aerosol (Chelak and Sharma, 2012). *Cladosporium* is most correlated with meteorological parameters. This may be attributed dry conidia in chains easily carried through air. Therefore dispersion of *Cladosporium* spores is more influenced by meteorological parameters than *Alternaria* spores (Ianovici, 2008).

The distinction between dry-air spores and wet-weather air spores is well known. Dry-air spores included *Cladosporium, Alternaria, Helminthosporium, Trichothecium* and *Curvularia*. Members of dry-airspora are found in greatest abundance in the atmosphere characterized by low humidity, generally during warmer afternoon hours (Ianovici and Tudorica, 2009). With regard to spore species, viability can differ considerably; spores of Deuteromycota remained viable after a certain period. High concentrations and long lasting presence of allergenic fungal spores in the air may cause and intensify clinical symptoms in people suffering from sensitivity and extend the period of presence of allergens in the atmosphere (Ianovici, 2008).

Fungal spores are appeared frequent throughout post-rubi season particularly in month of Nov.–Dec. The peak period of fungal spore concentrations was confined in second week of December. Moreover this period is marked by optimum climatic condition with temperature ranges between 22^{0}C to 25^{0}C and relative humidity to the extent of 85% to 89% that favors for dissemination of fungal spores in the environment over wheat field. Marginal reduction in fungal spore concentration in forth week, and again sudden increase in third week was recorded. It is in agreement with earlier findings of Uddin (2004) who reported greater concentration of aeromycoflora over rice field in Rubi season in the state of West Bengal, India. It seems possible due to fluctuating temperatures and relative humidity which stimulate or inhabit fungal growth. The fungi failed to sporulate were categorized under "*sterile forms*" and were found regularly throughout a period of investigation. It is interesting to note that post-monsoon season correlate closely with a period of highest atmosphere ascomycetous and deuteromycetous mould prevalence over wheat cultivated field under irrigation.

Table. 1- Environmental fungal flora of wheat cultivated field under irrigation in rubi season.

S.N	Environmental microfungal organism	Number of fungal colonies										Total colonies	Per cent frequency	
		November					December						Species	Genera
		1-wk	**2-wk**	**3-wk**	**4-wk**	**Total**	**1-wk**	**2-wk**	**3-wk**	**4-wk**	**Total**			
A	**Oomycota**	**5** (0.29)	**1** (0.06)	**4** (0.23)	**6** (0.35)	**16** (0.94)	**7** (0.41)	**8** (0.47)	**5** (0.29)	**3** (0.18)	**23** (1.35)	**39**	2.28	2.28
1	*Phytophthora infestans* de Bary	3 (0.18)	1 (0.06)	1 (0.06)	4 (0.23)	9 (0.58)	4 (0.23)	4 (0.23)	2 (0.12)	1 (0.06)	11 (0.64)	20	1.16	1.16
2	*Pythium aphanidermatum* (Edson) Fitzp..	2 (0.12)	-	3 (0.18)	2 (0.12)	7 (0.41)	3 (0.18)	4 (0.23)	3 (0.18)	2 (0.12)	12 (0.70)	19	1.11	1.11
B.	**Zygomycota**	**21** (1.23)	**20** (1.17)	**18** (1.05)	**4** (0.23)	**63** (3.68)	**23** (1.35)	**27** (1.58)	**25** (1.46)	**26** (1.52)	**101** (5.91)	**164**	9.59	9.59
3	*Cunninghamella elegans* Lendner	2 (0.12)	1 (0.06)	-	1 (0.06)	4 (0.23)	2 (0.12)	1 (0.06)	2 (0.12)	3 (0.18)	8 (0.47)	12	0.70	0.70
4	*Mucor pusillus* Lindt	6 (0.35)	4 (0.23)	5 (0.29)	-	15 (0.88)	6 (0.35)	8 (0.47)	5 (0.29)	3 (0.18)	22 (1.29)	37	2.16	2.16
5	*Rhizopus stolonifer* Eh. Ex.Rr.)Lind.	8 (0.47)	7 (0.41)	11 (0.64)	-	26 (1.52)	8 (0.47)	10 (0.58)	9 (0.53)	12 (0.70)	39 (2.28)	65	3.80	6.72
6	*Rhizopus nigricans Demelius*	5 (0.29)	8 (0.47)	2 (0.12)	3 (0.18)	18 (1.05)	7 (0.41)	8 (0.47)	9 (0.53)	8 (0.47)	32 (1.87)	50	2.92	
C.	**Ascomycota**	**75** (4.39)	**89** (5.20)	**71** (4.15)	**98** (5.73)	**333** (19.5)	**96** (5.61)	**120** (7.02)	**95** (5.56)	**89** (5.20)	**400** (23.4)	**733**	42.9	42.9
7	*Aspergillus amstelodomi (Mang) Thom & Church*	7 (0.41)	12 (0.70)	8 (0.47)	5 (0.29)	32 (1.87)	10 (0.58)	12 (0.70)	10 (0.58)	9 (0.53)	41 (2.40)	73	4.27	33.6
8	*Aspergillus candidus*	10 (0.58)	12 (0.70)	12 (0.70)	10 (0.58)	44 (2.57)	12 (0.70)	14 (0.82)	11 (0.64)	12 (0.70)	49 (2.87)	93	5.44	
9	*A. flavus* Link.	14 (0.82)	19 (1.11)	16 (0.94)	22 (1.27)	71 (4.15)	14 (0.82)	24 (1.40)	19 (1.11)	16 (0.94)	73 (4.27)	144	8.42	
10	*A. nidulans* (Eidam) Winter	3 (0.18)	2 (0.12)	-	4 (0.23)	9 (0.53)	1 (0.06)	3 (0.18)	3 (0.18)	4 (0.23)	11 (0.64)	20	1.17	
11	*A. niger* Van Tieghen	24 (1.40)	19 (1.11)	17 (0.99)	28 (1.64)	88 (5.15)	26 (1.52)	29 (1.70)	23 (1.35)	21 (1.23)	99 (5.79)	187	10.9	
12	*A. sulphureus* (Fres.)Thom & Church	1 (0.06)	3 (0.18)	-	-	4 (0.23)	3 (0.18)	3 (0.18)	-	2 (0.12)	8 (0.47)	12	0.70	
13	*A. terreus* Thom.	3 (0.18)	-	2 (0.12)	4 (0.23)	9 (0.53)	5 (0.29)	3 (0.18)	4 (0.23)	3 (0.18)	15 (0.88)	24	1.40	
14	*Aspergillus versicolor* (Vuill.) Tiraboschi	3 (0.18)	-	2 (0.12)	3 (0.18)	8 (0.47)	3 (0.18)	5 (0.29)	4 (0.23)	2 (0.12)	14 (0.82)	22	1.29	
15	*Chaetomium glabosum Kunze & Schm*	-	2 (0.12)	1 (0.06)	4 (0.23)	7 (0.41)	5 (0.29)	4 (0.23)	3 (0.18)	4 (0.23)	16 (0.94)	23	1.35	1.35
16	*Penicillium citrinum* (C & S) Pitt.	6 (0.35)	7	4 (0.23)	6 (0.35)	23 (1.35)	7 (0.41)	9 (0.53)	7 (0.41)	4 (0.23)	27 (1.58)	50	2.92	7.01
17	*Penicillium pallidum* (Cruick & Shank) Pitt.	-	2 (0.12)	1 (0.06)	3 (0.18)	6 (0.35)	3 (0.18)	3 (0.18)	2 (0.12)	-	8 (0.47)	14	0.82	

18	*Penicillium digitatum* (Pers. Ex. Fr.) Sacc.	4 (0.23)	8 (0.47)	8 (0.47)	6 (0.35)	26 (1.52)	7 (0.41)	9 (0.53)	6 (0.35)	8 (0.47)	30 (1.75)	56	3.27	
19	*Phomopsis sp.*	-	3 (0.18)	-	3 (0.18)	6 (0.35)	-	2 (0.12)	3 (0.18)	4 (0.23)	9 (0.53)	15	0.88	0.88
D.	**Basidiomycota**	-	-	-	-		-	-	-	-		-		
E.	**Deuteromycota**	**56** (3.27)	**100** (5.85)	**62** (3.63)	**64** (3.74)	**282** (16.5)	**80** (4.68)	**145** (4.48)	**96** (5.61)	**82** (4.80)	**403** (23.6)	**685**	40.1	40.1
20	*Alternaria alternata* (Fr.) Keissler	5 (0.29)	4 (0.23)	3 (0.18)	4 (0.23)	16 (0.94)	5 (0.29)	8 (0.47)	7 (0.41)	6 (0.35)	26 (1.52)	42	2.45	
21	*Alternaria solani (E & M) Jones & Grout*	2 (0.12)	6 (0.35)	4 (0.23)	4 (0.23)	16 (0.94)	6 (0.35)	8 (0.47)	6 (0.35)	3 (0.18)	23 (1.35)	39	2.28	
22	*Alternaria porri* (Ells) Cif.	2 (0.12)	2 (0.12)	3 (0.18)	-	7 (0.41)	2 (0.12)	7 (0.41)	2 (0.12)	2 (0.12)	13 (0.76)	20	1.17	10.23
23	*Alternaria triticina* Prasada & Prabhua	8 (0.47)	12 (0.70)	7 (0.41)	6 (0.35)	33 (1.93)	10 (0.58)	15 (0.88)	7 (0.41)	9 (0.53)	41 (2.40)	74	4.33	
24	*Cladosporium fulvum* Cooke.	-	5 (0.29)	4 (0.23)	2 (0.12)	11 (0.64)	3 (0.18)	8 (0.47)	3 (0.18)	2 (0.12)	16 (0.94)	27	1.58	1.58
25	*Curvularia lunata* (Wakker) Boedijn	6 (0.35)	8 (0.47)	7 (0.41)	6 (0.35)	27 (1.58)	8 (0.47)	14 (0.82)	10 (0.58)	11 (0.64)	43 (2.51)	70	4.09	
26	*Curvularia intermedia* (Tracy & Barle) Boedjin	2 (0.12)	6 (0.35)	4 (0.23)	4 (0.23)	16 (0.94)	6 (0.35)	8 (0.47)	6 (0.35)	3 (0.18)	23 (1.35)	39	2.28	6.37
27	*Diplodia sp*	4 (0.23)	7 (0.41)	-	7 (0.41)	18 (1.05)	5 (0.29)	8 (0.47)	5 (0.29)	3 (0.18)	21 (1.23)	39	2.28	2.28
28	*Fusarium moniliformae* Sheldom	3 (0.18)	5 (0.29)	4 (0.23)	3 (0.18)	15 (0.88)	6 (0.35)	9 (0.53)	5 (0.29)	4 (0.23)	24 (1.40)	39	2.28	
29	*Fusarium oxysporum* Schlecht	5 (0.29)	10 (0.58)	8 (0.47)	8 (0.47)	31 (1.82)	8 (0.47)	12 (0.70)	8 (0.47)	8 (0.47)	36 (2.11)	67	3.92	
30	*Fusarium solani* (Mert.) APP. & Wollenw	7 (0.41)	8 (0.47)	6 (0.35)	6 (0.35)	27	7 (0.41)	9 (0.53)	8 (0.47)	6 (0.35)	30	57	3.33	11.16
31	*Fusarium semitectum* Berk & Rav.	-	3 (0.18)	2 (0.12)	1 (0.06)	6 (0.35)	2 (0.12)	5 (0.29)	3 (0.18)	1 (0.06)	11 (0.64)	17	0.99	
32	*Fusarium culmorum*	-	2 (0.12)	1 (0.06)	-	3 (0.18)	-	4 (0.23)	3 (0.18)	1 (0.06)	8 (0.47)	11	0.64	
33	*Helminthosporium* spiciferum (Bain.) Nicol	8 (0.47)	12 (0.70)	8 (0.47)	9 (0.53)	37 (2.16)	10 (0.58)	12 (0.70)	11 (0.64)	11 (0.64)	44 (2.57)	81	4.74	6.03
34	*Helminthosporium tetramera* G & A	2 (0.12)	3 (0.18)	-	1 (0.06)	6 (0.35)	-	6 (0.35)	5 (0.29)	5 (0.29)	16 (0.94)	22	1.29	
35	*Nigrospora sp.*	-	2 (0.12)	-	1 (0.06)	3 (0.18)	2 (0.12)	4 (0.23)	-	2 (0.12)	8 (0.47)	11	0.64	0.64
36	*Pithomyces sp*	-	2 (0.12)	1 (0.06)	-	3 (0.18)	-	4 (0.23)	3 (0.18)	2 (0.12)	9 (0.53)	12	0.70	0.70
37	*Trichothecium roseum* Link	2 (0.12)	3 (0.18)	-	2 (0.12)	7 (0.41)	-	4 (0.23)	4 (0.23)	3 (0.18)	11 (0.64)	18	1.05	1.05
	Other types	**9** (0.53)	**9** (0.53)	**10** (0.58)	**9** (0.53)	**37** (2.16)	**14** (0.82)	**12** (0.70)	**12** (0.70)	**14** (0.82)	**52** (3.04)	**89**	5.20	5.20
38	*Sterile black mycelia*	9 (0.53)	7 (0.41)	9 (0.53)	9 (0.53)	34 (1.99)	9 (0.53)	8 (0.47)	10 (0.58)	12 (0.70)	39 (2.28)	73	4.27	4.27
39	*Sterile white mycelia*	-	2 (0.12)	1 (0.06)	-	3 (0.18)	5 (0.29)	4 (0.23)	2 (0.12)	2 (0.12)	13 (0.76)	16	0.93	0.93

	Total colonies	**166**	**219**	**165**	**181**	**731**	**220**	**312**	**233**	**214**	**979**	**1710**	99.9	99.9
	Per cent frequency	9.7	12.8	9.6	10.6	42.7	12.9	18.2	13.6	12.5	57.3	100.0		
Values in parenthesis are in percent contribution over total colonies recorded														

Table. 2-Distribution of fungal air spora flora over wheat cultivated field under irrigation in rubi season.

S.N	Fungal group	Period of survey				Total colonies	Per cent contribution
		November		December			
		Colony count	Percent contribution	Colony count	Percent contribution		
1.	Oomycota	16	0.94	23	1.35	39	2.28
2.	Zygomycota	63	3.68	101	5.91	164	9.59
3.	Ascomycota	333	19.47	400	23.74	733	42.9
4.	Basidiomycota	-	-	-	-	-	-
5.	Deuteromycota	282	16.49	403	23.56	685	40.1
6.	Sterile mycelia	37	2.16	52	3.04	89	5.20
Total colonies		**731**	**42.7**	**979**	**57.25**	**1710**	

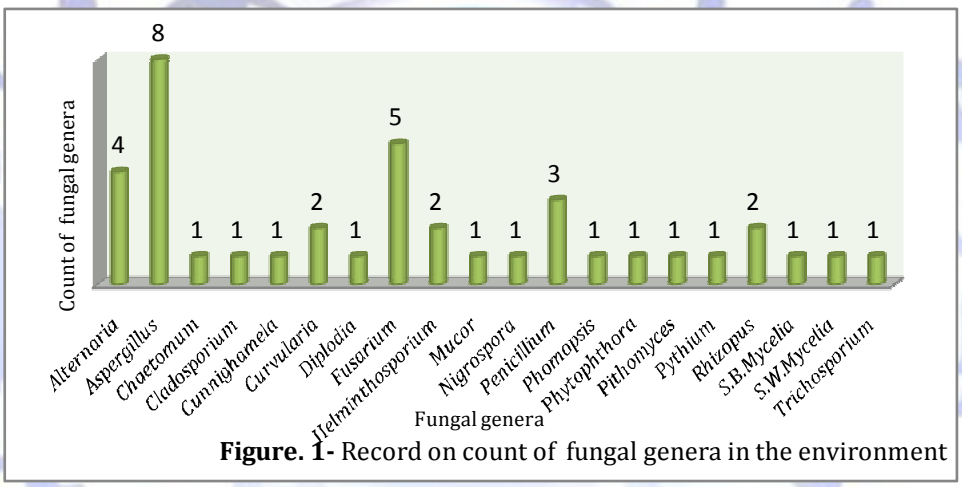

Figure. 1- Record on count of fungal genera in the environment

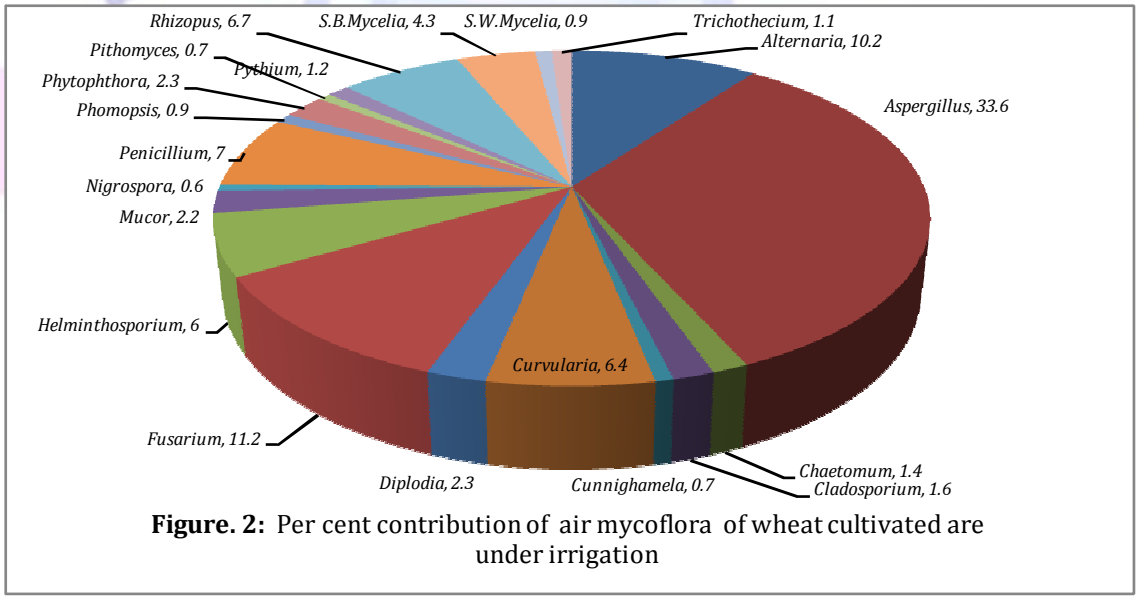

Figure. 2: Per cent contribution of air mycoflora of wheat cultivated are under irrigation

Conclusion:

Environmental fungal organisms are responsible for spread of diseases in response to transport of their viable propagules even to a small distance in favourable season. The results of present survey revealed occurrence of high concentration of diverse group of fungal flora in variable frequencies in response to favourable climate of high humidity and low temperature over wheat field area in *Rubi season*. Some of these environmental microfungal propagules are responsible for a variety of respiratory diseases in humans, plants and animals. Prevalence of higher concentration of viable fungal spores over wheat field may cause allergic disorders to a segment of farmers involved in farming. Monitoring of environmental mycoflora can be helpful in prevention of *Aspegillosis* and other fungal allergic disorders.

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