DOI:10.33451/florafauna.v24i2pp239-244
FLORA AND FAUNA ISSN 2456 - 9364 (Online)
2018 Vol. 24 No. 2 PP 239-244 ISSN 0971 - 6920 (Print)

SEASONAL VARIATIONS IN THE AEROMYCOFLORA OF MENTHA ARVENSIS

***N. B. SINGH AND K.L. TIWARI[1]**

* Department of Botany
Govt. Nagarjuna P.G. College of Science,
RAIPUR (C.G.) INDIA-492010
[1]School of Studies in Biotechnology
Pt. Ravishankar Shukla University,
RAIPUR (C.G.) INDIA-492010

Received : 18.10.2018; ***Accepted*** : 01.12.2018

ABSTRACT

The survey of aeromycoflora over *Mentha arvensis* L. plants was carried out at Raipur. During investigation period, a total of 52 fungal species were recorded. Maximum 35 species recorded during winter season and minimum 19 species during summer season. The seasonal variations showed climatic factors influence the occurrence of aeromycoflora. *Syncephalastrum racemosum, Alternaria alternate, Aspergillus niger, Cladosporium cladosporoides, Curvularia lunata,* and *Fusarium oxysporum* were recorded in all the three seasons of the year. *Emericella nidulans* and *Aspergillus japonicus* were recorded during summer and rainy season. *Mucor hiemalis f. silvaticus, Rhizopus oryzae, Curvularia clavata, Fusarium equiseti* and *Penicillium frequentans* during rainy and winter season. Mycelia sterilia (White-ii) was recorded during summer and winter season only. Maximum number of fungal species *i.e.* 35 was recorded during winter season because of the favourable temperature (29.1ºC) and relative humidity (62.1%). Minimum numbers of fungal species *i.e.*19 were recorded during summer season due to unfavourable temperature (38.4ºC) and relative humidity (46.1%).

Figures : 02 References : 11 Table : 01
KEY WORDS : Aeromycoflora, Atmosphere, Fungi, Mycelia sterilia.

Introduction

Raipur is the capital of newly formed Chhattisgarh state. It is geographically located approximately in the central part of India at 21Ú-14' North latitude and 81Ú-37' in East latitude, situated at a height of 298.60 meters above mean sea level. Raipur has a year round tropical climate characterized by warm days and cooler nights. The climate of the Raipur city is pleasant, except in the later part of summer (April to mid June). The whole year is divided into three climatic seasons, the summer season from March to June, the rainy season from July to October and the winter season from November to February. The microorganisms survive in the air for varying period of time. It is controlled by a complex set of circumstances and conditions such as speed of air current, humidity, sunlight, temperature and the ability of microorganisms to survive in a new physical environment. As long as microorganisms remain in the air they are of little importance. When they come to rest they may develop and become beneficial or harmful. These microorganisms cause different kinds of allergic disorders in human beings and animals. The present paper provides a critical account of the airborne fungal spores found over *Mentha arvensis* L. plants.

Material and Methods

The survey of aeromycoflora over *Mentha arvensis* L. plants was carried out by gravity petriplate method from March 2004 to February 2005. 5 petriplates containing PDA media were used. The petriplates were exposed over cultivated *Mentha arvensis* L. plants for 5 minutes at a regular interval of 15 days and then these petriplates were brought into the laboratory and placed at 25 ± 1ºC for incubation. After appropriate incubation period, numbers of colonies were counted, identified with the help of available literature and identifying authority of India.

Result and Discussion

The survey of the aeromycoflora revealed total 52 fungal species over *Mentha arvensis* L. plants. Seasonal changes affect the distribution of aeromycoflora of

ACKNOWLEDGEMENTS : The authors are thankful to Principal, Government Nagarjuna Post Graduate College of Science, Raipur (C.G.) India-492010 for encouragement and providing necessary facilities.

TABLE-1 : Showing Seasonal Variations in Aeromycoflora of *Mentha arvensis* L. (March 2004 to February 2005)

S.N.	Name of fungal species	Summer Season				Rainy Season				Winter Season			
		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
1	*Mucor hiemalis f. silvaticus*	-	-	-	-	+	+	+	-	-	+	+	-
2	*Rhizopus oryzae*	+	-	-	-	-	+	-	-	-	+	+	-
3	*Syncephalastrum racemosum*	-	-	-	-	+	-	-	+	-	-	-	-
	ASCOMYCOTINA												
4	*Emericella nidulans*	+	-	+	-	-	-	-	-	-	-	-	-
5	*Khuskia oryzae*	-	-	-	-	-	-	-	+	+	-	-	-
6	*Lewia infectoria*	-	-	-	+	+	+	-	-	+	+	-	-
	ANAMORPHIC FUNGI												
7	*Acremonium strictum*	-	-	-		-	-	-	-	+	-	+	-
8	*Acremonium* sp.	-	-	-		-	-	-	-	+	-	-	-
9	*Alternaria alternata*	+	-	-	+	+	+	-	-	+	+	-	+
10	*Alternartia chlamydospora*	-	-	-	-	-	-	-	-	+	-	+	-
11	*Alternaria humicola*	-	-	-	-	-	-	-	-	-	-	+	-
12	*Alternaria radicina*	-	-	-	-	-	-	-	-	+	-	-	+
13	*Alternaria triticina*	-	+	-	-	-	-	-	-	-	-	+	-
14	*Alternaria* sp.	-	-	-	+	+	+	+	+	-	-	-	-
15	*Arthririnium sphaerospermum*	-	-	-	-	-	+	-	-	-	-	-	-
16	*Aspergillus carneus*	-	-	-	-	-	-	-	-	-	-	-	+
17	*Aspergillus flavus*	-	-	-	-	-	-	+	+	+	+	+	-
18	*Aspergillus flavus* var. *columnaris*	-	-	+	-	-	-	-	-	-	-	-	-
19	*Aspergillus fumigatus*	+	+	+	+	+	-	-	-	-	-	+	+
20	*Aspergillus japonicus*	+	+	+	+	+	+	+	+	-	-	-	-
21	*Aspergillus niger*	+	-	-	+	+	+	+	+	+	+	+	+
22	*Aspergillus ochraceous*	-	-	-	-	-	+	+	+	-	-	-	-
23	*Aspergillus parasiticus*	-	-	-	-	-	-	+	-	-	-	-	-
24	*Aspergillus speluneus*	-	-	-	-	+	+	+	+	-	+	+	-
25	*Aspergillus sydowi*	-	-	-	-	-	-	-	-	+	+	-	-

26	*Aspergillus terreus*	-	-	-	-	+	+	-	-	-	-	-	-
27	*Cladosporium cladosporoides*	+	-	-	-	-	-	+	+	+	+	+	+
28	*Curvularia clavata*	-	-	-	-	-	-	+	+	+	+	+	+
29	*Curvularia lunata*	+	-	-	-	+	+	+	+	+	+	+	+
30	*Curvularia ovoidea*	-	-	-	-	-	-	-	-	-	-	+	+
31	*Chaetomella raphigera*	-	+	-	-	-	-	-	-	-	-	-	-
32	*Drechslera australiensis*	-	-	-	-	+	+	-	-	-	-	-	-
33	*Drechslera biseptata*	-	-	-	-	-	-	-	-	+	+	+	-
34	*Drechslera halodis*	-	-	-	-	-	-	-	-	-	-	-	+
35	*Fusarium equiseti*	-	-	-	-	-	+	-	+	-	+	-	+
36	*Fusarium oxysporum*	-	+	-	-	+	+	-	+	+	+	+	+
37	*Myrothecium cinctum*	-	-	-	-	-	-	-	-	+	+	+	-
38	*Paecilomyces humicola*	+	-	-	+	-	-	-	-	-	-	-	-
39	*Penicillium citrinum*	-	-	-	+	-	-	-	-	-	-	-	-
40	*Penicillium frequentans*	-	-	-	-	+	+	-	+	+	+	+	+
41	*Penicillium funiculosum*	-	-	-	-	-	-	-	-	-	+	-	-
42	*Phoma fickeli*	-	-	-	-	-	-	-	-	-	-	+	-
43	*Phoma fimeti*	-	+	-	-	-	-	-	-	-	-	-	-
44	*Phoma herbarum*	-	-	-	-	-	-	-	-	-	-	+	-
45	*Trichoderma psuedo koningii*	-	-	-	+	-	-	-	-	-	-	-	-
46	*Trichurus spiralis*	-	-	-	-	-	-	-	-	-	-	-	+
	MYCELIA STERILIA												
47	Mycelia sterilia(White-i)	-	-	-	-	-	-	-	-	-	+	-	-
48	Mycelia sterilia *(W*hite-ii)	+	+	-	-	-	-	-	-	-	+	+	+
49	Mycelia sterilia *(W*hite-iii , Reverse black)	-	-	-	-	-	-	-	-	-	+	-	-
50	Mycelia sterilia (Black)	-	-	-	-	-	+	+	-	-	-	-	-
51	Mycelia sterilia (Grey)	-	-	-	-	-	-	-	-	-	-	+	-
52	Mycelia sterilia (Pinkish white, reverse black)	-	-	-	-	+	-	-	-	-	-	-	-
Total no of species			**10**	**7**	**4**	**9**	**15**	**17**	**12**	**14**	**17**	**20**	**22 15**

corresponding area. Out of 52 fungal species, maximum fungal species *i.e.* 35 were recorded from aeromycoflora during winter season, moderate 25 species during rainy season and minimum number of fungal species *i.e.* 19 were recorded during summer season. The winter aeromycoflora was dominated by *Aspergillus niger, Cladosporium cladosporoides*, *Curvularia clavata, C. lunata*, and *Penicillium frequentans* as they were reported during all the months of the winter season. On the contrary *i.e. Khuskia oryzae*, *Acremonium* sp., *Alternaria humicola, A. triticina, Aspergillus carneus, Drechslera halodis*, *Penicillium funiculosum*. *Phoma fickeli*, *P. herbarum*, *Trichurus spiralis* and Mycelia sterilia grey were exclusively restricted in the winter season. High incidence of *Cladosporium, Aspergillus* and other dominant types in the air was due to their high degree of saprophytic and fruitlessness ability with passive spore liberations[3].

During the rainy season, a total of 25 fungal species were recorded. Out of total fungal species, 03 species of the group Zygomycotina, 02 species of the group Ascomycotina, 18 species of the group of Anamorphic fungi and 02 species of the group Mycelia sterilia were recorded. *Alternaria* sp., *Aspergillus japonicus, A. niger, A. speluneus,* and *Curvularia lunata* were reported during all the months of the rainy season. On the contrary, *Mucor hiemalis* f. *silvaticus*, *Syncephalastrum racemosum, Lewia infectoria, Alternaria alternata, Aspergillus flavus, A. ochraceous, A. terreus, Cladosporium cladosporoides*, *Curvularia clavata, Drechslera australiensis, Fusarium equiseti, F. oxysporum, Penicillium frequentans* and Mycelia sterilia black were reported in more than one months but not present in all the months of rainy season. Certain fungal species were exclusively restricted in a particular month of rainy season. *Aspergillus fumigatus* and Mycelia sterilia (pinkish white) were recorded only in the month of July, *Arthririnium sphaerospermum and Rhizopus oryzae* only in the month of August, *Khuskia oryzae* only in the month of October and *Aspergillus parasiticus* were recorded only in the month of September.

During the summer season, a total of 19 fungal species were recorded. Of the total, 01 species from group Zygomycotina, 02 species from group Ascomycotina, 15 species from group of Anamorphic fungi and 01 species from group Mycelia sterilia were recorded. On the contrary certain fungal species were exclusively restricted to a particular month of summer season. *Rhizopus oryzae,* and *Cladosporium cladosporoides* were restricted to month of March. *Alternaria triticina Chaetomella raphigera, Fusarium oxysporum* and *Phoma fimeti* were restricted to month of April. *Aspergillus flavus* var. *columnaris* were restricted to month of May. *Lewia*

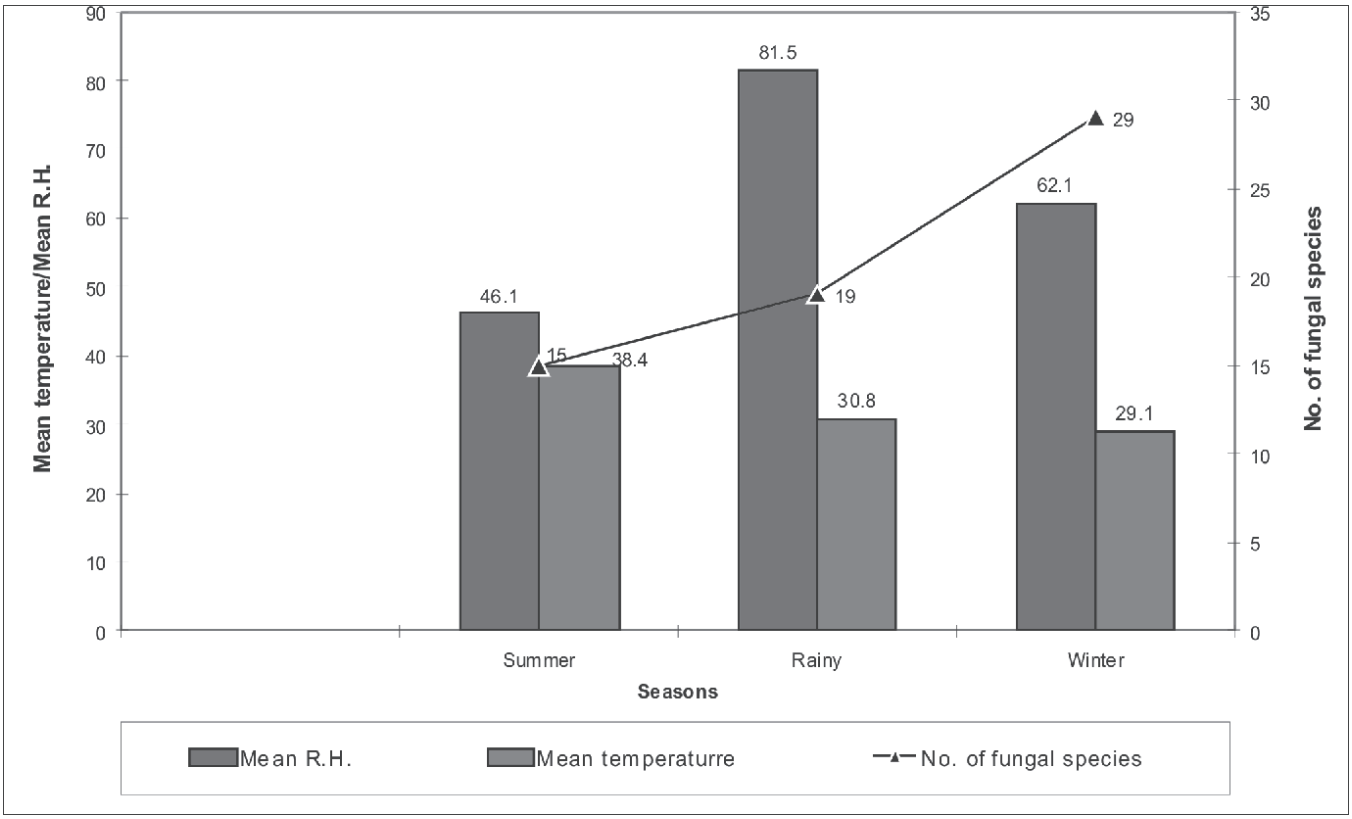

Fig.1 : Seasonal variation in the number of fungal species of aeromycoflora in relation to mean temperature and mean R.H.

infectoria, *Alternaria* sp., *Penicillium citrinum,* and *Trichoderma psuedo-koningii* were restricted to month of June. The biggest tall of group Anamorphic Fungi, as a whole, dominated the entire aeromycoflora. *Cladosporium* has been always a dominant fungus every where in the world. The spores abundantly get trapped through out the year except April to July.

Seasonal variations in the concentration of fungal species take place due to changes in the meteorological parameters like temperature, relative humidity and rainfall. The seasonal variations of aeromycoflora with reference to the variation in the climatic parameters like temperature and relative humidity were considered. Maximum number of fungal species *i.e.*35 were recorded during winter season because of the favourable temperature (29.1ºC) and relative humidity (62.1%). Moderate number of fungal species *i.e.*25 were recorded during rainy season because of the slightly unfavourable temperature (30.8ºC) and relative humidity (80.1%). Minimum numbers of fungal species *i.e.,* 19 were recorded during summer season due to unfavourable temperature (38.4ºC) and relative humidity (46.1%). Monthly variation studies revealed that, the maximum 22 fungal species were recorded during January month (maximum 27.5ºC and R.H. 65%) and minimum 04 fungal species were recorded in the month of May (maximum 41.1ºC and R.H. 35%).

It appeared from the survey that temperature and relative humidity affect the fungal load in the atmosphere. Hot and dry climate during summer (mean maximum temp. 38.4ºC and mean R.H. 46.1%) decreased the fungal load in the atmosphere while optimum climatic conditions (mean maximum temp. 29.1ºC and mean R.H. 62.1%) favoured the fungal load in the atmosphere. Thus dry conditions adversely affect the atmospheric fungal load. The high temperature and low R.H. check the spore discharge of some fungi. The low fungal load during hot months of summer has also been reported[3,4]. The maximum fungal count in the atmosphere was during winter, moderate during rainy season and minimum during summer season was also reported from Aurangabad[7,8], around Gaya[6], from Raipur[10], from Nagpur[2], from Raipur[9], over Southern ocean and Schirmacher Oasis, East Antarctica during IX and XI Indian Antarctic Expedition[1], from coastal environment in Chennai, India[11] and over sunflower field in Udgir[5].

Conclusion

In view of foregoing discussion it is concluded that the fungal population was not homogenous throughout the year and show seasonal variations. The detailed study of aeromycoflora of *Mentha arvensis* L. reveals that, the fungal population varied monthly and seasonally. Meteorological parameters like temperature, relative

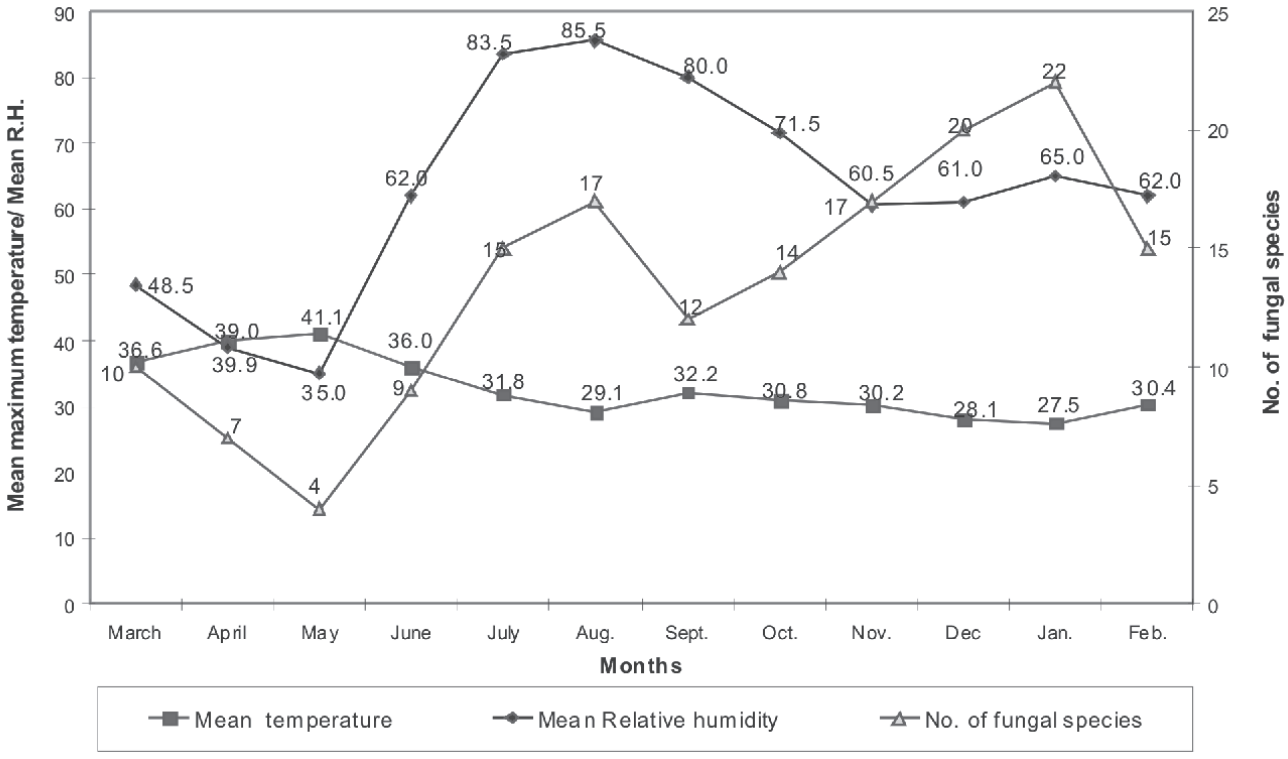

Fig. 2 : Monthly variation in the number of fungal species of aeromycoflora in relation to mean relative humidity

humidity and rainfall were responsible for the fluctuation in the fungal population. Above findings serve as a convenient basis for further aerobiological studies in other economically important medicinal and agricultural plants.

References

1. Bera SK, Khandelwal A. Incidence of aerobioparticles over Southern ocean and Schirmacher oasis, East Antarctica during IX and XI Indian Antarctic Expedition: A comparative analysis. *5th Nat., Conf. Indian Acad. of Allergy.* 2002; 68.
2. Giri SK, Saoji AA. Air borne mycoflora from local food storage places at Nagpur. *Abst. Nat. Conf. Aerobial. Poona.* 1996; 14.
3. Gregory PH. "The microbiology of the atmosphere". 2nd Ed. Leonard Hill, London. 1973; 377.
4. Jadhav SK. Studies of aeromycoflora over rice field at Balodabazar, Raipur. Ph.D. Thesis, Pt. Ravishankar Shukla University, Raipur. 1996.
5. Pande BN, Banswadkar. Atmospheric concentration of pathogenic spores over sunflower field in Udgir (Kharif season). *Abstr. Nat. Conf. Emer. Pollu.* Marathwada University, Aurangabad. 2004; 7.
6. Singh SS, Mishra KB. Aerofungi of a rural area around Gaya. *Ind., J. Aerobiol.* 1988; **1** (2) : 81-84.
7. Tilak ST, Bhalke SP. Aeromycology at Aurangabad- II: Ascospores. *Biovigyanam.* 1976-a; **5** : 175-177
8. Tilak ST, Bhalke SP. Aeromycology at Aurangabad-II: Deuteromycetes. *Indian J. Bot* .1976-b; **1** : 113--115.
9. Tiwari KL, Jadhav SK. Studies of aeromycoflora over rice field I at Baloda Bazar, Raipur (M.P.). *Abst. 9th Nat. Conf. Arobiol.* Hyderabad. 1997; 103.
10. Tiwari KL, Pandey P, Sahu SK. Aeromycoflora over *Abelmoschus esculentum-var.* Pusakrati. *Ind. Bot. Repotr.* 1995; **14** (1+2) : 10-12.
11. Udaya Prakash NK, Sampat Kumar B, Saravanan T, Bhuvaneswari S, Vittal BPR. Atmospheric mycoflora of a coastal environment in Chennai, India. *12th Nat. Conf. Aerobiol. Santiniketan.* 2003; 12.