International Multidisciplinary Research Journal 2011, 1(9): 16-20
ISSN: 2231-6302
Available Online: http://irjs.info/

INTERNATIONAL MULTIDISCIPLINARY RESEARCH JOURNAL

Ecological study of fungi in pond ecosystem

*Deo Sajal Saju and Tiwari, K.L.

K.D. R.C.S.T., Atari, Raipur (C.G.), 492099, India

Abstract

The distribution of fungal species in the pond water is determined by the various types of environmental factors. During present study Petriplate method containing potato dextrose agar (PDA) media had been adopted for survey of pond water fungi from one year March 2007 to February 2008. Total 91 fungal species (362 colonies) belonging to 45 fungal genera were isolated from Dumaratarai pond. During the present study *Aspergillus terreus* shows maximum percentage frequency (58.3%) which was followed by *A. niger and A. sydowi* with 50% frequency. Similarly maximum percentage contribution (87.01%) was encountered for group Anamorphic fungi, which were followed by group Zygomycotina (3.05%), Ascomycotina (8.01%) and minimum percentage contribution (1.94%) was encountered for group Mycelia sterilia. *Aspergillus* sp. was the leading genus with 28.73% contribution. *Cladosporium* sp. came behind and was represented by 15.46% contribution of gross total count, which was followed by *Penicillium* sp. with 8.29%, and *Fusarium* sp. with 5.24% contribution. The broadest spectrum of species were produced by *Aspergillus* (17species), *Penicillium* (11 species) Fusarium (04 species), *Phoma* (05 species) and *Cladosporium* (03).

Keywords: Percentage frequency, Percentage contribution, Anamorphic, Zygomycotina

INTRODUCTION

The ecosystem is the basic functional unit of organisms and their environment interacting with each other and with their own components (Sushmitha, 2007). Environment acts as a natural check on population because the environment is dynamic and it keeps on changing from time to time. Environmental factors (temperature, rainfall, moisture etc.) determine the distribution of each species and have two limits- the maximum and the minimum limits within which a species survives and show its characteristic growth potentiality. They are called limit of tolerance. At the optimum maximum growth and vigour of a species is exhibited. Physiological stress and loss of vigour begin to appear towards the limits of tolerance and the individuals of one species are unable to compete with the better adapted individuals of other species and consequently they become infrequent. Although fungi are cosmopolitans in nature and have been recovered from all most all natural habitats, they are highly sensitive to environmental fluctuation (Manoharachary, 2005). All the fungal species present in an area constitute the fungal community of that area. Community study is an important aspect of ecology and for this purpose we collect (assemble) quantitative data to understand the composition of the fungal community.

Raipur is the capital town of Chhattisgarh state. Atmospheric temperature remains moderate throughout the year. Summer season (March to June) is extremely hot and dry and in this season temperature of the city was ranging between 29^{0}C-45^{0}C (±2^{0}C), winter season (November to February) is hot and humid and temperature was ranging between 08^{0}C-27^{0}C (±2^{0}C). Raipur city receives about 1300 mm of rain, mostly in rainy season from late June to early October. Dumaratarai Talab located in the suburbs in the south of Raipur city is selected for the present study.

Received: June 19, 2011; Revised August 21, 2011; Accepted August 21, 2011.

*Corresponding Author

Deo Sajal Saju
K.D. R.C.S.T., Atari, Raipur (C.G.), 492099, India

Email: sajalsaju@gmail.com

MATERIALS AND METHOD

The water sample was collected twice a month for one year (March 2007 to February 2008) at fortnightly intervals with the help of pre sterilized screw capped bottles and Petriplate method containing potato dextrose agar (PDA) media had been adopted for survey of pond water fungi.

Contribution and frequency of an individual in the formation of community in an ecosystem depends upon their distribution patterns. In the community, the individual of all the species are not evenly distributed. The distribution patterns of individuals of different species indicate their reproductive capacity as well as their adaptation ability to the environment.

Percentage contribution of fungi

Contribution indicates the share of a particular fungal species (as %) in the formation of a community by their number.

Percentage contribution (%) is calculated as: Total no. of colonies of individual genus / total no. of colonies of all species ×100 (Prasad and Bilgrami, 1969).

Percentage frequency of fungi

Frequency refers to the degree of dispersion of individual species (as %) in a particular area at a particular period of time.

Percentage frequency (%) is calculated as: number of observation in which a genus is present/ total number of observation examined ×100 (Letcher and Powell, 2001; Yanna *et al*., 2001).

RESULT

During the period of present investigation overall total 91 fungal species (362 colonies) belonging to 45 fungal genera are isolated from Dumaratarai pond. Results indicating that, maximum percentage contribution (87.01%) is encountered for group Anamorphic fungi, which are followed by group Zygomycotina

(3.05%), Ascomycotina (8.01%) and minimum percentage contribution (1.94%) is encountered for group Mycelia sterilia.

The maximum numbers of species are belongs to *Aspergillus* (17 species) and they are the leading genus in term of contribution also with 28.73% contribution. *Penicillium* genera are represented by 11 species but have only 8.29% contribution of gross total count. However *Cladosporium* represented by only 03 species, have second highest contribution (15.46%) of gross total count. *Cladosporium* genera are present only in the month of July and august of rainy season and in the winter season. *Phoma* genera were represented by 05 species, *Fusarium* genera by 04 species and have 5.80% and 5.24% contribution respectively.

Individually maximum percentage contribution is shown by *Cladosporium sphaerospermum* with 8.01% and has only 41.7% frequency. Second highest contribution is shown by *Aspergillus fumigatus* with 6.91% but has only 33.3% frequency. This is followed by *Cladosporium cladosporoides* with 5.52% contribution and 33.3% frequency. Most frequent species is *Aspergillus terreus* (58.30%) but show only 2.21% contributions. Second highest most frequent species are *Neoarachnotheca keratinophila, Aspergillus niger, A. sydowi* with 50% frequency and has 4.7%, 3.31%, 4.14% contribution to total count respectively.

Table-1: Showing the fungi present in Dumaratarai Talab ponds water

No	*NAME OF FUNGI*	SUMMER					RAINY					WINTER					G. Tot.	% frequency	% Contribution
		Mar	*Aprl*	*May*	*June*	Tot.	*July*	*Aug*	*Sep*	*Oct.*	Tot.	*Nov*	*Dec*	*Jan*	*Feb*	Tot.			
A	*Zygomycotina*																		
1	*Absidia corymbifera*	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	8.33	0.28
2	*Absidia* sp.	0	0	0	0	0	0	0	0	1	1	0	1	0	1	2	3	25	0.83
3	*Mucor racemosus*	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2	8.33	0.55
4	*Rhizopus nigricans*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	8.33	0.28
5	*R. oryzae*	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	8.33	0.28
6	*Syncephalastrum racemosum*	0	0	0	1	1	0	0	0	1	1	0	0	0	1	1	3	25	0.83
Total number of colonies		0	0	1	1	2	0	2	1	2	5	0	1	1	2	4	11		
Total number of species		0	0	1	1	2	0	1	1	2	4	0	1	1	2	3	6		
Total number of genera		0	0	1	1	2	0	1	1	2	3	0	1	1	2	3	4		
B	Ascomycotina																		
1	*Chaetomium* sp. I	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	2	16.7	0.55
2	*Emericella nidulans*	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	3	8.33	0.83
3	*Neoarachnotheca keratinophila*	1	0	3	6	10	0	2	4	1	7	0	0	0	0	0	17	50	4.7
4	*Neosartoria fischeri*	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1	2	8.33	0.55
5	*Thielavia appendiculata*	0	0	0	0	0	0	0	0	0	0	1	3	0	0	4	4	16.7	1.1
6	*Wolkia decolorans*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	8.33	0.28
Total number of colonies		2	0	4	9	15	0	2	4	1	7	2	4	0	1	7	29		
Total number of species		2	0	2	2	4	0	1	1	1	1	2	2	0	1	4	6		
Total number of genera		2	0	2	2	4	0	1	1	1	1	2	2	0	1	4	6		
C	Anamorphic																		
1	*Acremonium persicinum*	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	8.33	0.28
2	*A. recefi*	0	0	0	0	0	2	0	0	0	2	0	3	0	0	3	5	16.7	1.38
3	*A. stictum*	0	0	0	1	1	0	0	0	0	0	1	2	0	0	3	4	25	1.1
4	*A. terricola*	0	0	0	0	0	1	0	1	0	2	0	1	0	0	1	3	25	0.83
5	*Aspergillus candidus*	0	0	0	0	0	0	0	0	5	5	1	1	0	0	2	7	25	1.93
6	*A. carneus*	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	2	16.7	0.55
7	*A. flavus*	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2	8.33	0.55
8	*A. fumigatus*	9	7	0	8	24	0	0	0	0	0	0	0	0	1	1	25	33.3	6.91
9	*A. Japonicus*	0	0	0	0	0	0	0	4	0	4	0	0	0	0	0	4	8.33	1.1
10	*A. luchuensis*	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	8.33	0.28
11	*A. niger*	0	1	0	4	5	3	1	0	0	4	0	0	1	2	3	12	50	3.31

12	*A. niveus*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
13	*A. ochraceus*	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	8.33	0.28
14	*A. oryzae*	0	0	0	2	2	0	1	0	0	1	0	0	0	0	0	3	16.7	0.83
15	*A. speluneus*	0	0	0	2	2	1	0	0	0	1	0	2	0	0	2	5	25	1.38
16	*A. sydowi*	0	0	0	0	0	1	0	2	1	4	2	7	2	0	11	15	50	4.14
17	*A. terreus*	0	1	0	1	2	0	1	0	1	2	1	2	1	0	4	8	58.3	2.21
18	*A. versicolor*	0	0	0	0	0	0	10	0	1	11	4	0	0	0	4	15	25	4.14
19	*Aspergillus* sp. I	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	8.33	0.28
20	*Aspergillus* sp. II	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
21	*Aspergillus* sp. III	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	8.33	0.28
22	*Aureobasidium pullulans*	0	0	0	0	0	1	0	0	0	1	1	0	0	0	1	2	16.7	0.55
23	*Candida* sp.I	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	8.33	0.55
24	*Candida* sp.II	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3	8.33	0.83
25	*Chaetophoma quercilifolia*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	8.33	0.28
26	*Chalaropsis thielavioides*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
27	*Chrysosporium tropicum*	0	2	0	1	3	0	0	0	0	0	1	0	0	0	1	4	25	1.1
28	*Cladosporium cladosporoides*	0	0	0	0	0	0	0	0	3	3	11	3	3	0	17	20	33.3	5.52
29	*C. herbarum*	0	0	0	0	0	0	0	0	0	0	0	6	1	0	7	7	16.7	1.93
30	*C. sphaerospermum*	0	0	0	0	0	0	1	0	0	1	5	12	1	10	28	29	41.7	8.01
31	*Colletotrichum gloeosporioides*	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2	8.33	0.55
32	*Corynespora* sp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
33	*Cylindrocarpon* sp.	0	0	0	0	0	0	0	0	0	0	0	3	1	0	4	4	16.7	1.1
34	*Endobotryella oblonga*	0	0	0	0	0	0	1	0	0	1	0	10	0	0	10	11	16.7	3.04
35	*Fusarium moniliforme*	0	0	0	0	0	1	1	3	0	5	0	0	0	0	0	5	25	1.38
36	*F. oxysporum*	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2	8.33	0.55
37	*F. solani*	0	0	0	0	0	2	2	0	0	4	2	4	0	0	6	10	33.3	2.76
38	*Fusarium* sp. I	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2	8.33	0.55
39	*Geotrichum* sp.	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3	8.33	0.83
40	*Gliocladium* sp.	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2	8.33	0.55
41	*Graphium* sp.	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
42	*Helicocephalum sareophilium*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
43	*Helicoma* sp.	0	0	0	0	0	0	0	3	0	3	1	0	0	0	1	4	16.7	1.1
44	*Macrophomina phaseolina*	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	2	16.7	0.55
45	*Memnoniella echinata*	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	8.33	0.28
46	*Moniliella* sp.	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	8.33	0.28
47	*Myridontium kerotinophilum*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
48	*Nigrospora oxyzae*	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	8.33	0.28
49	*N. sphaerica*	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2	16.7	0.55
50	*Penicillium digitatum*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	8.33	0.28
51	*P. frequentans*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
52	*P. multicolor*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
53	*P. notatum*	0	0	1	2	3	0	0	0	0	0	0	0	0	1	1	4	25	1.1
54	*P. oxalicum*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
55	*P. purpurascens*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	8.33	0.28
56	*P. purpurogenum*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28

57	*P. rubrum*	0	0	0	0	0	0	0	0	0	0	2	2	0	0	4	4	16.7	1.1
58	*Penicillium* sp. I	0	0	0	0	0	0	1	0	4	5	0	6	0	1	7	12	33.3	3.31
59	*Penicillium* sp. II	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	2	16.7	0.55
60	*Penicillium* sp. III	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	2	8.33	0.55
61	*Phoma eupyrena*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	8.33	0.28
62	*P. eupyrena*	0	0	0	0	0	0	2	1	1	4	0	0	0	0	0	4	25	1.1
63	*P. medicaganis*	0	0	0	0	0	4	0	2	0	6	0	2	0	2	4	10	33.3	2.76
64	*P. sorghina*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
65	*Phoma* sp.	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	5	8.33	1.38
66	*Phomopsi* sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	16.7	0.55
67	*Sclerococcum sphaerale*	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2	16.7	0.55
68	*Scopulariopsis cinereus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	8.33	0.28
69	*Scytalidium* sp.	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	2	16.7	0.55
70	*Trichoderma atroviride*	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	8.33	0.28
71	*T. viride*	0	0	1	0	1	0	1	4	1	6	0	0	0	0	0	7	33.3	1.93
72	*Trichoderma* sp.	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	2	8.33	0.55
73	*Trichothecium roseum*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
74	Unknown - I	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	8.33	0.28
75	*Verticillium lamellicola*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	8.33	0.28
76	Yeast	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	2	16.7	0.55
Total number of colonies		11	13	3	24	51	20	31	28	27	106	43	83	12	20	158	315		
Total number of species		2	6	3	11	16	13	19	13	15	44	19	29	9	9	46	76		
Total number of genera		2	3	3	4	8	9	13	7	9	21	14	14	5	6	23	34		
D	Mycelia sterilia																		
1	Mycelia sterilia (white)	0	0	0	0	0	2	1	0	0	3	2	0	0	0	2	5	25	1.38
2	Mycelia sterilia (white puffy)	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	8.33	0.28
3	Mycelia sterilia (Brown)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	8.33	0.28
Total number of colonies		1	0	0	0	1	2	1	0	0	3	2	1	0	0	3	7		
Total number of species		1	0	0	0	1	1	1	0	0	1	1	1	0	0	2	3		
Total number of genera		1	0	0	0	1	1	1	0	0	1	1	1	0	0	1	1		
GRAND TOTAL	Number of colonies	14	13	8	34	69	22	36	33	30	121	47	89	13	23	172	362		
	Number of species	5	6	6	14	23	14	22	15	18	50	22	33	10	12	55	91		
	Number of genera	5	3	6	7	15	10	16	9	12	26	17	18	6	9	31	45		

DISCUSSION

The distribution of fungal species in an ecosystem is governed by environmental factor. Temperature is an important factor that governs survival, growth and reproduction of the fungi. Usually temperature is negatively and moisture positively related to fungal contribution and frequency (Sharon *et al.* 2002).

During present study *Aspergillus, Penicillium, Cladosporium, Fusarium* and *Phoma* are the main genera present in water samples. Nasar and Munchi (1980) also reported that the fungal population in freshwater pond of Bhagalpur (India), is mainly composed of the *Aspergillus, Penicillium, Fusarium,Cladosporium, Epicoccum* and *Mucor*. The result of Grover (2007) is also accordance to my result. They also found that *Aspergillus fumigatus, A. niger, Cladosporium cladosporioides, C. sphaerospermum* and *Penicillium chrysogenum* usually contributed maximum to the CFU values in the polluted as well as in unpolluted habitats. Barron (1968) stated that *Aspergillus* is biologically one of the most successful of all fungi and is expected to occur on all sorts of organic debris. They have very low moisture requirements and some of them are xerophilic (dry tolerant). As a result, they can colonize in substrate where only minimal or intermittent moisture is available and can successfully compete with other fungi for their low moisture requirement. According to Gregory (1961) the high incidence of *Aspergillus* and *Cladosporium* is due to their high degree of saprophytic and fruitlessness ability with passive spore liberation.

During the present study it is found that all three species of *Cladosporium*, *Phoma* genera which is represented by 05 species and *Fusarium* by 04 species are absent in the summer season.

Penicillium species show the lowest contribution (04 colonies represented by only two species) in summer season and highest (16 colonies) in the winter season. All these species like cooler temperatures. *Cladosporium* show an optimum growth only between 18-28^{0}C (Domsch *et al.* 1980). Out of 21 colonies of *Phoma* species 19 present in six month that is July to December and 02 in January. Thomidis showed that the rate of development of *Phoma glomerata* in vitro was reduced as temperatures increased from 25°C to 30°C, decreased from 25°C to 15°C, and was totally inhibited at 35 and 10°C (Thomidis et *al.*, 2011). The studies conducted by Imran *et al.* to find out the role of different temperature levels on growth *Fusarium oxysporum* f.sp. *ciceri* revealed that maximum mycelial growth was observed at a temperature of 30^{0}C (329.29 mg) followed by 25^{0}C (306.66 mg). The least growth was occurred at 15^{0}C (175.13 mg). Temperatures below 25^{0}C and above 30^{0}C reduced the growth of *Fusarium* species drastically (Imran *et al.* 2011). Philip found that *Penicillium* isolated mainly from unharvested corn grew on agar from 8-35°C, optimally at 30-35°C, and could germinate and sporulate at RH of 86% and above (Philip *et al.* 1970).

Some fungal species present only in summer season they are *Rhizopus oryzae, Emericella nidulans, Aspergillus ochraceus,* some in rainy season *Absidia corymbifera, Mucor racemosus, Acremonium persicinum, Aspergillus flavus, A. Japonicus, A. luchuensis, Colletotrichum gloeosporioides, Fusarium moniliforme, F. oxysporum, Memnoniella echinata, Penicillium frequentans, P. oxalicum, Phoma eupyrena, Trichoderma atroviride* and some in winter season *Rhizopus nigricans, Thielavia appendiculata, A. niveus, Chaetophoma quercilifolia, Cladosporium herbarum, Myridontium kerotinophilum, Penicillium digitatum, P. multicolor, P. purpurogenum, P. rubrum, Phoma eupyrena, P. sorghina, Sclerococcum sphaerale, Scopulariopsis cinereus, Trichothecium roseum, Verticillium lamellicola. Aspergillus fumigatus* present only in March, April and June month of summer season and in February but show better contribution to total count (25 colonies). *A. fumigatus* show optimum growth between a temperature range of about 12-52^{0}C (David 1994).

According to Harriet Burge the heat effects the chemical reaction within the fungal cell. Temperatures in a range allow the most efficient progression of the chemical reactions necessary for optimum growth. As temperatures progress above the optimum temperature, the chemical reactions occur less efficiently, and growth slows. Eventually, when the temperature can reach a point where growth stops, and cell components begin to be actually damaged by the heat (Harriet Burge, 2006).

REFERENCES

Sushmitha Baskar and Baskar R., 2007. Environmental Studies for Undergraduate Courses. Unicorn Books, pp88.

Manoharachary C., Sridhar K., Reena Singh, Alok Adholeya, Suryanarayanan T. S., Seema Rawat and Johri B. N., 2005. Fungal biodiversity: Distribution, conservation and prospecting of fungi from India. *Current Science,* 89, 1, 10.

Prasad, S.S. and Bilgrami. R.S., 1969. Investigations on disease of litchi - I Phyllosphere mycoflora of *Litchi chinensis* in relation to fruit rot. *Indian Phytopathology*, 22:507-510.

Letcher, P.M. and Powell, M.J., 2001. Distribution of zoosporic fungi in forest soils of the Blue Ridge and Appalachian Mountains of Virginia. *Mycologia,* 93:1029-1041.

Yanna, Ho W.H., Hyde, K.D. and Goh, T.K., 2001. Occurrence of fungi on tissues of *Livistona chinensis*. *Fungal Diversity*, 6: 167-180.

Sharon M. Talley, Phyllis D. Coley and Thomas A. Kursar, 2002. The effects of weather on fungal abundance and richness among 25 communities in the Intermountain West. *BMC Ecology* 2002, 2:7.

Nasar, S.A.K., Munshi, J.D., 1980. Studies on the seasonal variations in the fungal population of a freshwater pond of Bhagolpur,India. Imnologica (Berlin), 12:137-139.

Grover, R., Sharma, K.P., Kumar, P., Kumar, S., 2007. Response of fungal community in the unpolluted and polluted (textile and distillery wastes) habitats. *J Environ Sci Eng.* 49(2):93-8.

Barron, G.L., 1968 The genera of Hyphomycetes from soil. *Williams and Wilkins Co*, Baltimore.

Gregory, P.H., 1961. The microbiology of the atmosphere. LeonardHill (Books) Ltd. *Inter science Publishers INC*, New York: p.233.

Domsch, K.H., Gams, W., Anderson, T.H., 1980. Compendium of soil fungi, Academic Press, London.

David H. Griffin, 1994. Fungal physiology, second edition, Willey Liss Inc., 605 Third Avenue, New York, NY 10158-0012 Page 198.

Thomidis, Thomas; Michailides, Themis; Exadaktylou, Efstathia; 2011. *Phoma glomerata* (Corda) Wollenw. & Hochapfel a new threat causing cankers on shoots of peach trees in Greece. European Journal of Plant Pathology, 131, 2, 171-178.

Imran Khan, H. S., Saifulla M., Mahesh, S. B. & Pallavi, M.S., 2011, Effect of Different Media and Environmental conditions on the growth of *Fusarium oxysporum* f. sp. *ciceri* Causing Fusarium Wilt of Chichpea, International Journal of Science and Nature, 2(2):402-404.

Philip B. Mislivec, John Tuite, 1970. Temperature and Relative Humidity Requirements of Species of Penicillium Isolated from Yellow Dent Corn Kernels, Mycologia, 62,1, 75-88.

Harriet Burge, 2006. How Does Heat Affect Fungi?, The Environmental Reporter, Volume 4, Issue 3.