

AIRBORNE FUNGAL SPORES OF NORTH-WEST ANATOLIA**GULSAH SAATCIOĞLU^{*}, AYCAN TOSUNOĞLU¹, HULUSI MALYER¹
AND ADEM BİCAKCI¹***Battalgazi Vocational School, Inonu University, Malatya, Turkey**Key words:* Allergy, Fungal spore, North-west, Anatolia, Airborne**Abstract**

Fungal spores of north-west Anatolia, Gemlik captured using Durham samplers were investigated. Accordingly 29.916 fungal spores per cm² area were counted and 32 taxa were determined in a year. The dominating taxa were; *Cladosporium* (27.97%), Basidiomycetes (24.90%), *Aspergillus/Penicillium* (21.75%), Ustilaginales (10.03%) and *Alternaria* (3.95%).

Fungi occur as saprophytes or parasites on a variety of substrata. Airborne fungal spores are originally created from plant, animal, water and soil sources but some authors reported that spores originate mostly from vegetation (Klarić and Pepeljnjak 2006, Topbaş *et al.* 2006, Abu-Dieyeh *et al.* 2010). Consequently, fungal spore variety and concentration in the air depend on topographic and climatic local conditions (Henríquez *et al.* 2001). As spores often have a small size they can stay in the air for long period and be transported over a large distance (Eduard 2009). For these characteristics of fungal spores several aeromycological research have been carried out worldwide in many countries for many years (Saad 1958, D'Amato *et al.* 1984, Johansen 1991, Henríquez *et al.* 2001, Hedeyati *et al.* 2005) including also Turkish cities (Özkaragöz 1969, Sakiyan and Inceoğlu 2003, Çolakoğlu 2003).

Durham gravimetric trap was used for sampling fungal spores and the sampler was placed on terrace of a building which is 15 m high at the centre of the study region, Gemlik. The slides placed in the sampler were changed weekly. Before exposure, the slides were covered with glycerine jelly mixed with basic fuchsin (Charpin *et al.* 1974) and identification was made by light microscopy. The fungal spores that could not be identified were shown as unidentified types. The numbers of fungal spores found in the cover-glass area were converted to spore counts. The total number of fungal spores was expressed per cm² of microscope cover glass.

In the atmosphere of north-west Anatolia, 29916 fungal spores per cm² from 32 taxa and unidentified fungal spores were investigated in 2008 (Table 1). According to the results, the fungal spore taxa, each comprise more than 1% of the total spore content in 2008, were accepted dominant, and listed as *Cladosporium* (27.97%), Basidiomycetes (24.90%), *Aspergillus/Penicillium* (21.75%), Ustilaginales (10.03%) and *Alternaria* (3.95%) (Table 1). The dominant taxa constituted 88.60% of the total fungal spore count. During investigation maximum amount of fungal spores was recorded in June (19.74%) and minimum in December (3.41%).

The detailed data about the dominant taxa can be seen as below:

***Cladosporium*:** This taxon was found to have produced most frequently fungal spore with 27.92% in the atmosphere (Table 1). These fungal spores were collected during every month in the air of the study region. *Cladosporium* spores started to increase in May and the highest value was noted in June with 2510 per cm², then decreased by the end of 2008.

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Basidiomycetes: The fungal spores, belonged to this family, because of the similarity each other of closed genera, were given in Basidiomycetes family in this paper. This fungal spores were constituted 24.90% of the total number in a year (Table 1). Basidiomycetes spores existed throughout the investigating year. The quantity of spores had three peaks in 2008; in March, June and September however, in our opinion, these peaks were originated by the different genus and/or species spores' distribution of this family. The highest value of fungal spores belonged to this taxon was noted in June (1226 spores/cm²).

Table 1. Fungal spore taxa, found in the atmosphere of north-west Anatolia, Gemlik in the year 2008.

Taxa	Total	%	Taxa	Total	%
<i>Cladosporium</i>	8369	27.97	<i>Drechslera/Bipolaris</i>	52	0.17
<i>Basidiomycetes</i>	7450	24.90	<i>Didymella</i>	49	0.16
<i>Aspergillus / Penicillium</i>	6506	21.75	<i>Ganoderma</i>	42	0.14
Ustilaginales	3000	10.03	<i>Fusarium</i>	41	0.14
<i>Alternaria</i>	1182	3.95	<i>Tetracoccosporium</i>	41	0.14
<i>Agrocybe</i>	278	0.93	<i>Botrytis</i>	37	0.12
<i>Exosporium</i>	224	0.75	<i>Coprinus</i>	36	0.12
<i>Epicoccum</i>	167	0.56	<i>Torula</i>	31	0.10
<i>Stemphyllum</i>	127	0.42	<i>Xylaria</i>	31	0.10
<i>Uloclodium</i>	122	0.41	Pucciniales	26	0.09
<i>Melanomma</i>	106	0.35	<i>Venturia</i>	24	0.08
<i>Leptosphaeria</i>	96	0.32	<i>Chaetomium</i>	15	0.05
<i>Pleospora</i>	96	0.32	<i>Pithomyces</i>	11	0.04
<i>Nigrospora</i>	71	0.24	<i>Curvularia</i>	6	0.02
<i>Perenospora</i>	71	0.24	<i>Melanospora</i>	6	0.02
Ascomycetes (septat)	62	0.21	Hypha fragments	570	1.90
<i>Paecilomyces</i>	62	0.21	Unidentified	911	3.04
			Total	29.916	100.00

Aspergillus/Penicillium: The fungal spores of these two genera were more or less similar, so they were dealt together. These taxa consisted of 21.75% of the total spore amount (Table 1). They were observed in 2008 in the atmosphere of north-west Anatolia, Gemlik. In the study period, the taxa reached the maximum value in August (1252 spore/cm²).

Ustilaginales: In this study, because of the hardness in determining, the genera of Ustilaginales were discussed together. The fungal spores of this taxon constituted 10.03% of the total spore count of the year (Table 1). In the study period, despite of the less quantity increasing in September, reached the maximum value in May with 1307 spores /cm².

Alternaria: *Alternaria* spores, represented 3.95% of the total fungal spores. *Alternaria* spores reached the maximum value (346 spores/cm²) in July.

Number of fungal spores and taxa which they belong to, varies according to regions. This information is supported by former studies around the world. *Cladosporium*, Basidiomycetes, *Alternaria* and *Fusarium* in Sardinia (Palmas and Cosentino 1990); *Cladosporium*, *Didymosphaeria*, *Curvularia*, *Drechslera* and *Pithomyces* in Singapore (Lim *et al.* 1998); *Cladosporium* and *Penicillium* in Spain the campus of Anchieta (La-Serna *et al.* 2002); Basidiomycetes, *Cladosporium*, *Periconia*, *Nigrospora* and *Aspergilli* group, ascospores in Bengal (Chakraborty *et al.* 2003) were determined as dominant fungal spores.

Multiple fungal spores may be observed at any time of the year, but in temperate climates, spore numbers peak during summer and fall, decrease with cooler temperatures (Horner *et al.* 1995). Similarly, in this study the number of fungal spores reached the maximum value in summer and fall, but by the decrease in temperatures, the number of fungal spores become less (Fig. 1). The number of fungal spores reached the maximum value in June and decreased to a minimum levels in December in north-west Anatolia.

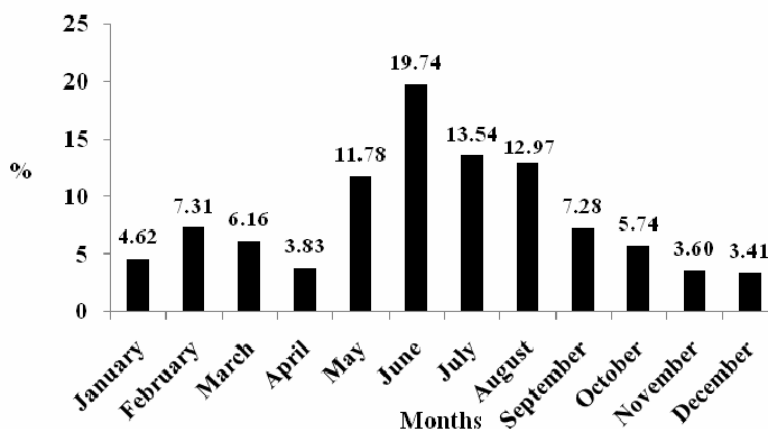


Fig. 1. Monthly variation in the percentage of fungal spores in the atmosphere of North-West Anatolia.

In conclusion, fungal spores of 32 taxa and the period of their presence in the atmosphere were identified in the year of 2008 in north-west Anatolia.

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