

Airborne pollen grains of Gemlik (Bursa)

Gemlik'in (Bursa) atmosferik polenleri*

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ABSTRACT

Objective: Pollen calendars, which exposes by determining airborne pollen, help the allergologists and the people that sensitive to allergenic pollen. The goal of this study to identify the airborne pollen grains to establish the pollen calendar of Gemlik (Bursa) in the year 2008.

Materials and Methods: Airborne pollen grains in Gemlik (Bursa) were collected between 1st January and 31st December 2008 by using Durham sampler. Weekly pollen grains per cm² were calculated.

Results: During the period 6957 pollen grains/cm² belonging to 43 taxa (excluding unidentified pollen grains) were recorded. Eleven plant taxa take a place, which encountered up to 1% of the total and it can be reported that pollen season durations and total percentages for the dominating pollen grains in Gemlik were; 5-32nd week for *Pinus* spp. (22.14%), 19-37th week for *Olea europaea* L. (18.19%), 9-43rd week for Gramineae (10.62%), 12-24th week for *Platanus* spp. (10.58%), 4-27th week for Cupressaceae/Taxaceae (10.19%), 13-23rd week for *Fagus* spp. (6.09%), 9-21st week for *Quercus* spp. (5.33%), 5-19th week for *Fraxinus* spp. (2.41%), 4-23rd week for *Betula* spp. (1.81%), 27-44th week for *Xanthium* spp. (1.53%) and 14-22nd week for *Juglans* spp.

ÖZET

Giriş: Atmosferik polenlerin belirlenmesi sonucu ortaya çıkarılan polen takvimleri allerjistlere ve polenlere karşı duyarlı olan kişilere yardımcı olmaktadır. Bu çalışmada Gemlik (Bursa) ilçesinin atmosferik polenleri belirlenerek 2008 yılına ait polen takviminin ortaya çıkarılması hedeflenmiştir.

Gereç ve Yöntem: Gemlik (Bursa) atmosferindeki polenler 1 Ocak 2008-31 Aralık 2008 tarihleri arasında Durham cihazı kullanılarak toplanmış, haftalık olarak cm² başına düşen polen sayısı hesaplanmıştır.

Bulgular: Çalışma periyodu boyunca 43 taksona ait (tanımlanamayan polenler hariç) olan, cm² başına toplam 6957 polen kaydedilmiştir. Toplam polen sayısının %1'inden fazla olan dominant 11 takson çiçeklenme dönemleri ve toplam yüzdeleriyle birlikte; *Pinus* spp. için 5-32. haftalar (%22.14), *Olea europaea* L. için 19-37. haftalar (%18.19), Gramineae için 9-43. haftalar (%10.62), *Platanus* spp. için 12-24. haftalar (%10.58), Cupressaceae/Taxaceae için 4-27. haftalar (%10.19), *Fagus* spp. için 13-23. haftalar (%6.09), *Quercus* spp. için 9-21. haftalar (%5.33), *Fraxinus* spp. için 5-19. haftalar (%2.41), *Betula* spp. için 4-23. haftalar (%1.81), *Xanthium* spp. için 27-44. haftalar (%1.53) ve *Juglans* spp. için

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lans spp. (1.35%). 40.46% of total pollen grains were recorded during the month of april with a prevalence of arboreal pollen grains.

Conclusion: This preliminary study performed to determine pollen calendar for Gemlik region (Bursa) may be useful for allergologists to establish an exact diagnosis of the people that has pollen allergy.

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Key words: Pollen, pollen calendar, Gemlik, Bursa.

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INTRODUCTION

There is a body of evidence which suggests that the frequency of atopic diseases, particularly those induced by pollen allergens (rhinoconjunctivitis and/or bronchial asthma) is increasing and atopic diseases have become more common in recent years^[1]. The allergenic content of the atmosphere varies according to climate, geography and vegetation^[2]. Therefore regularly performed atmospherical pollen counting may help the allergologists to identify allergens and to establish the cause of patients' symptoms^[3]. As a result of pollen counting pollen calendars have been prepared in many cities in Turkey and in many countries in the world^[4-10].

The aim of this study to determine the beginning, course and end of the pollen season and to establish the pollen calendar of Gemlik (Bursa).

MATERIALS and METHODS

Study Area

Gemlik is situated on the west part of Bursa, which is one of the biggest cities in Turkey with its high population, takes place on the coast of Marmara Sea. Study area is restricted by mid-high Katırlı Mountains from the south and Samanlı Mountains from the north. The west and east extensions of these mountains make this world known international port a closed gulf.

14-22. haftalar (%1.35) olarak belirlenmiştir. Toplam polen sayısının %40.46'lık kısmı odunsu polenlerin yoğun olduğu nisan ayı boyunca kaydedilmiştir.

Sonuç: Gemlik (Bursa) ilçesinin polen takvimini belirlemek amacıyla yapılan bu ön çalışma allerjiler için polen allerjisine sahip kişiler üzerinde doğru tanı yapabilmeye faydalı olabilir.

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Anahtar kelimeler: Polen, polen takvimi, Gemlik, Bursa.

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Phytogeographically, Gemlik is including to the Mediterranean region and Mediterranean elements (23.1%) are especially dominated near the coastal areas. At higher and inner parts of the study area Euro-Sibirian (13.1%), Euxin (2%) and Iran-Turanian (1.3%) elements take a place instead of Mediterranean elements^[11,12]. Looking up to floral composition, dominant species can be frequently seen like; *Castanea sativa* Mill., *Fagus orientalis* Lipsky, *Quercus cerris* L., *Q. petraea* (Mattuschka) Liebl. subsp. *iberica* (Stevon ex Bieb) Krassiln, *Carpinus betulus* L., *Acer campestre* L., *Pinus nigra* Arn., *P. brutia* Ten., *P. pinea* L., *Arbutus unedo* L., *Phillyrea latifolia* L., *Erica arborea* L., *Cistus creticus* L., *C. salvifolius* L., *Olea europaea*. The main families that contribute to Flora with more taxa are Asteraceae, Fabaceae, Gramineae and Lamiaceae and the genus are *Trifolium*, *Vicia*, *Ranunculus*, *Verbascum* and *Geranium*^[11-13].

Sampling and Identification of Pollen

In this study, Durham Sampler was used for sampling pollen grains and sampler has placed to 15 m at the center of Gemlik. The slides, that were placed in the Sampler changed weekly. Before exposure, the slides were covered with glycerin jelly mixed with basic fuchsin and identification made by microscopy^[14]. The pollen grains that couldn't identified, were shown as unidentified types. The total number of pollen grains were expressed per cm² of microscope cover glass.

RESULTS

In the atmosphere of Gemlik 6957 pollen grains per cm² from 43 taxa and unidentified pollen grains were investigated between 1st January-31st December 2008 period (Table 1). During the study period, maximum quantity of pollen grains were recorded in april with 3277 pollen grains/cm² (47.10%) (Table 2). The predominant pollen types (up to 1%) of Gemlik were *Pinus* spp. (22.14%), *Olea europaea* (18.19%), Gramineae (10.62%), *Platanus* spp. (10.58%), Cupressaceae/Taxaceae (10.19%), *Fagus* spp. (6.09%), *Quercus* spp. (5.33%), *Fraxinus* spp. (2.41%), *Betula* spp. (1.81%), *Xanthium* spp. (1.53%), *Juglans* spp. (1.35%) (Figure 1, Table 1 and 2).

In our study the amount of pollen grains increased from january to april. This is probably the result of being in the pollination season of arboreal plant taxa which produce great number of pollen grains. The quantity of pollen grains reached the highest level in april in the atmosphere of Gemlik. From july to november pollen grains of nonarboreal plants were higher than pollen grains of arboreal plants. 1st, 2nd, 3rd, 50th and 52nd weeks of the study there was not any pollen grains found in Gemlik atmosphere.

Pollination seasons, intensities, and variations of the pollen grains which belong to identified taxa can be seen in the calendar which was prepared using the total pollen count per cm² (Figure 2). Eleven different taxa each comprise more than 1% of the total pollen count.

***Pinus* spp.:** This genus has seen as most frequent pollen in the atmosphere and pollen season started in the first week of february and ended in the 2nd week of august. The highest values were notted in the 3rd week of april (7.49%). Pollen grains of this genus constituted of 22.14% (Table 1, 2).

Olea europaea: The pollen season started in the 2nd week of may and ended in the 2nd week of september. The highest values were notted in

Table 1. Pollen taxa found in the atmosphere of Gemlik and total of weekly pollen counts

Taxa	Total	%
<i>Pinus</i> spp.	1540	22.14
<i>Olea europaea</i>	1265	18.19
<i>Platanus</i> spp.	736	10.58
Cupressaceae/Taxaceae	709	10.19
<i>Fagus</i> spp.	424	6.09
<i>Quercus</i> spp.	371	5.33
<i>Fraxinus</i> spp.	168	2.41
<i>Betula</i> spp.	126	1.81
<i>Juglans</i> spp.	94	1.35
<i>Morus</i> spp.	65	0.93
<i>Alnus</i> spp.	45	0.65
<i>Acer</i> spp.	34	0.48
<i>Carpinus</i> spp.	30	0.43
Rosaceae	20	0.29
Ericaceae	20	0.28
<i>Tilia</i> spp.	16	0.24
<i>Salix</i> spp.	14	0.21
<i>Populus</i> spp.	14	0.20
<i>Cedrus</i> spp.	11	0.15
<i>Ulmus</i> spp.	9	0.13
<i>Ligustrum</i> spp.	5	0.08
<i>Aesculus</i> spp.	5	0.07
<i>Pistacia</i> spp.	5	0.07
Cistaceae	4	0.05
<i>Ostrya</i> spp.	3	0.04
Arboreal total	5732	82.39
Gramineae	739	10.62
<i>Xanthium</i> spp.	106	1.53
<i>Plantago</i> spp.	59	0.84
Amaranthaceae/Chenopodiaceae	53	0.76
<i>Rumex</i> spp.	47	0.68
<i>Artemisia</i> spp.	38	0.54
<i>Mercurialis</i> spp.	26	0.37
Urticaceae	24	0.35
Boraginaceae	21	0.30
<i>Humulus lupulus</i> L.	20	0.29
Legüminosae	16	0.22
<i>Taraxacum</i> spp.	11	0.16
Compositae	10	0.14
Cruciferae	9	0.13
Cyperaceae	6	0.09
Labiatae	4	0.05
Scrophulariaceae	3	0.04
Umbelliferae	3	0.04
Non-Arboreal total	1193	17.15
Unidentified	32	0.46
Total	6957	100.00

Table 2. Plant taxa that encountered more than 1% of the total pollen content and their yearly composition of percentage in Gemlik

Taxa/Months	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
<i>Pinus</i> spp.		0.07	0.05	14.24	6.65	0.95	0.15	0.03					22.14
<i>Olea europaea</i>				16.84	16.84	1.23	0.09	0.01	0.01				18.19
Gramineae		0.04	0.48	3.42	3.55	1.41	0.84	0.57	0.19	0.11			10.62
<i>Platanus</i> spp.			0.18	8.48	1.72	0.19							10.58
Cupressaceae/Taxaceae	0.01	1.86	3.31	4.36	0.59	0.03	0.01						10.19
<i>Fagus</i> spp.			0.06	5.93	0.08	0.01							6.09
<i>Quercus</i> spp.		0.01	0.13	5.04	0.15								5.33
<i>Fraxinus</i> spp.		0.94	0.31	1.09	0.06								2.41
<i>Betula</i> spp.	0.01	0.85	0.31	0.55	0.08	0.01							1.81
<i>Xanthium</i> spp.				1.30	0.05		0.06	0.91	0.52	0.04			1.53
<i>Juglans</i> spp.				0.09	0.08	0.06	0.05	0.05	0.03	0.01			1.35
Unidentified		0.93	1.28	2.69	1.29	0.94	0.89	0.94	0.40	0.30	0.07	0.03	9.77
Others													
Total	0.03	4.71	6.11	47.10	31.07	4.79	2.04	2.47	1.12	0.45	0.07	0.03	100.00

the 4th week of may (10.51%). Pollen grains of this species constituted 18.19% (Table 1,2).

Gramineae: The pollen season started in the 5th week of february and ended in the 4th week of october. Gramineae pollen reached the highest values in the 3rd week of april (1.31%). Pollen grains of this family constituted 10.62% (Table 1,2).

Platanus spp.: The pollen season started in the 3rd week of march and ended in the 2nd week of june. The highest values notted in the 2nd week of april (6.11%). Pollen grains of this genus constituted 10.58% (Table 1,2).

Cupressaceae/Taxaceae: The pollen season was between of the 4th week of january and the 1st week of july. These taxa reached the highest values in the 3rd week of april (1.93%). Pollen grains of these families constituted 10.19% (Table 1,2).

Fagus spp.: The pollen season started 4th week of march and ended first week of june. This genus reached the maximum pollen level in 2nd week of april (3.67%). Pollen grains of this taxon constituted 6.09% (Table 1,2) of the total.

Quercus spp.: The pollen season started in the 5th week of february and ended in the 4th week of may. The highest values were notted in the 3rd week of april (2.93%). Pollen grains of this genus consituted 5.33% (Table 1,2).

Fraxinus spp.: The pollen season started in the first week of february and ended in the 2nd week of may. The highest values were notted in the 5th week of february (0.81%). Pollen grains of this genus constituted 2.41% (Table 1,2).

Betula spp.: The pollen season was between of the last week of january and the first week of june. The highest values were notted in the 5th week of february (0.48%). Pollen grains of this genus constituted 1.81% (Table 1,2).

Xanthium spp.: The pollen season started in the first week of july and ended in the 5th week of october. The highest values were notted in the last week of august (0.50%). Pollen grains of this genus constituted 1.53% (Table 1,2).

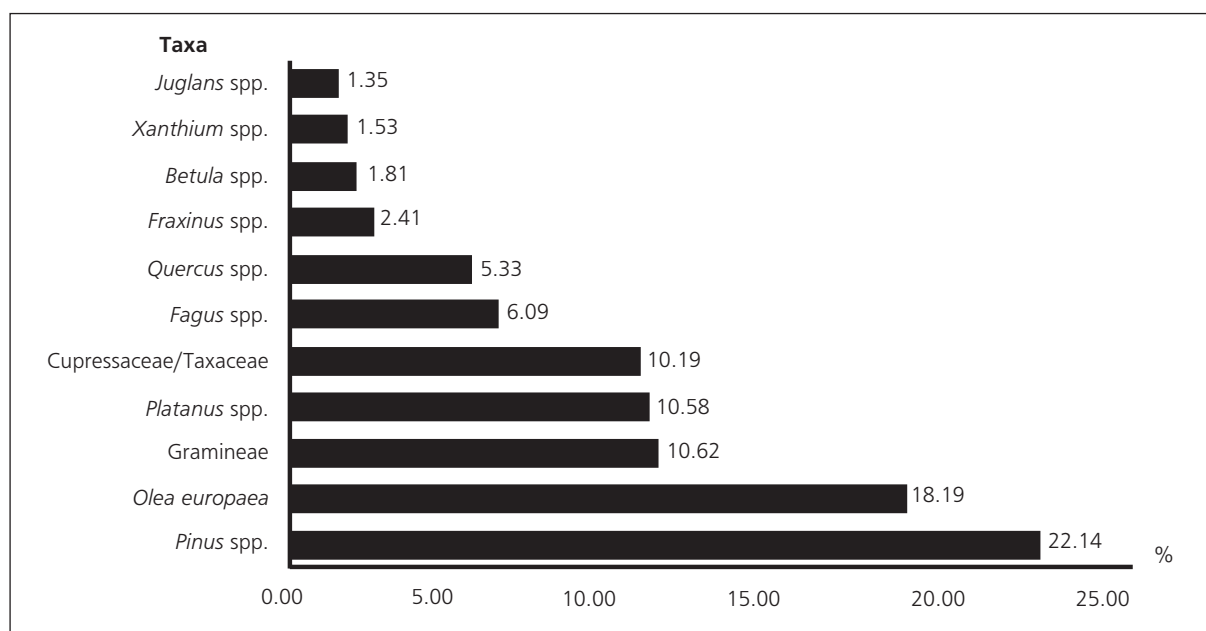


Figure 1. Predominant pollen taxa of Gemlik.

Juglans spp.: The pollen season started in the first week of april and ended in the last week of may. This taxon reached the highest values in the 2nd week of april (0.65%). Pollen grains of this genus constituted 1.35% (Table 1,2).

DISCUSSION

In our study, the predominant pollen types of Gemlik were presented as *Pinus* spp., *Olea europaea*, Gramineae, *Platanus* spp., Cupressaceae/Taxaceae, *Fagus* spp., *Quercus* spp., *Fraxinus* spp., *Betula* spp., *Xanthium* spp., *Juglans* spp. (Figure 1, Table 1,2). According to other studies in the Mediterranean area; Cupressaceae/Taxaceae, Fagaceae, Oleaceae, Graminae, Urticaceae, Corylaceae, Pinaceae and Compositae in Italy Rome Tor Vergata; Cupressaceae, Gramineae, Hamamelidaceae, Pinaceae, Urticaceae, *Quercus* spp., *Acer* spp., Myrtaceae, Caryophyllaceae, Oleaceae, Betulaceae and *Plantago* spp. in Porto-Portugal were dominating^[15,16]. In Turkey; *Pinus* spp., Cupressaceae/Taxaceae, Gramineae, *Platanus* spp., *Quercus* spp., *Olea* spp., *Salix* spp., Urticaceae, Moraceae, *Plantago* spp., Chenopodiaceae/Amaranthaceae, *Ailanthus* spp., *Juglans* spp., *Carpinus* spp. and Rosaceae were dominant

in Balikesir; *Platanus* spp., Cupressaceae/Taxaceae, Poaceae, *Pinus* spp., *Alnus* spp., *Castanea* spp., *Quercus* spp., Asteraceae, *Olea* spp., *Acer* spp., *Plantago* spp., *Corylus* spp. *Fagus* spp. and *Artemisia* spp. were dominant in Yalova^[17,18].

Our dominant pollen taxa show similarity with other studies. Pine pollen is also dominant in Kutahya (35.82%), in Usak (29.67%), in Kayseri (32.3%), in Savastepe-Balikesir (58.20%)^[19-22]. The genus *Olea* L. is represented in the Mediterranean region and cultivated primarily for oil and study area is famous with olive orchards and oil products^[23]. That's probably the reason of dominated olive pollen in our study. *Olea europaea* pollen is also found dominant in the center of Bursa (7.8%), in Thessaloniki-Greece (9.1%), in Estepona-Spain (17.84%) and in Didim-Aydin (9.19%)^[24-27]. Pollen grains of Gramineae family can be seen in the atmosphere in the whole year except a few months; because family members have different phenological periods^[28]. Gramineae pollen reported as a dominated pollen type also from different cites like; Almeria-Spain (8.84%) and Braga-Portugal (31.71%)^[29,30]. *Platanus* spp. pollen is reported

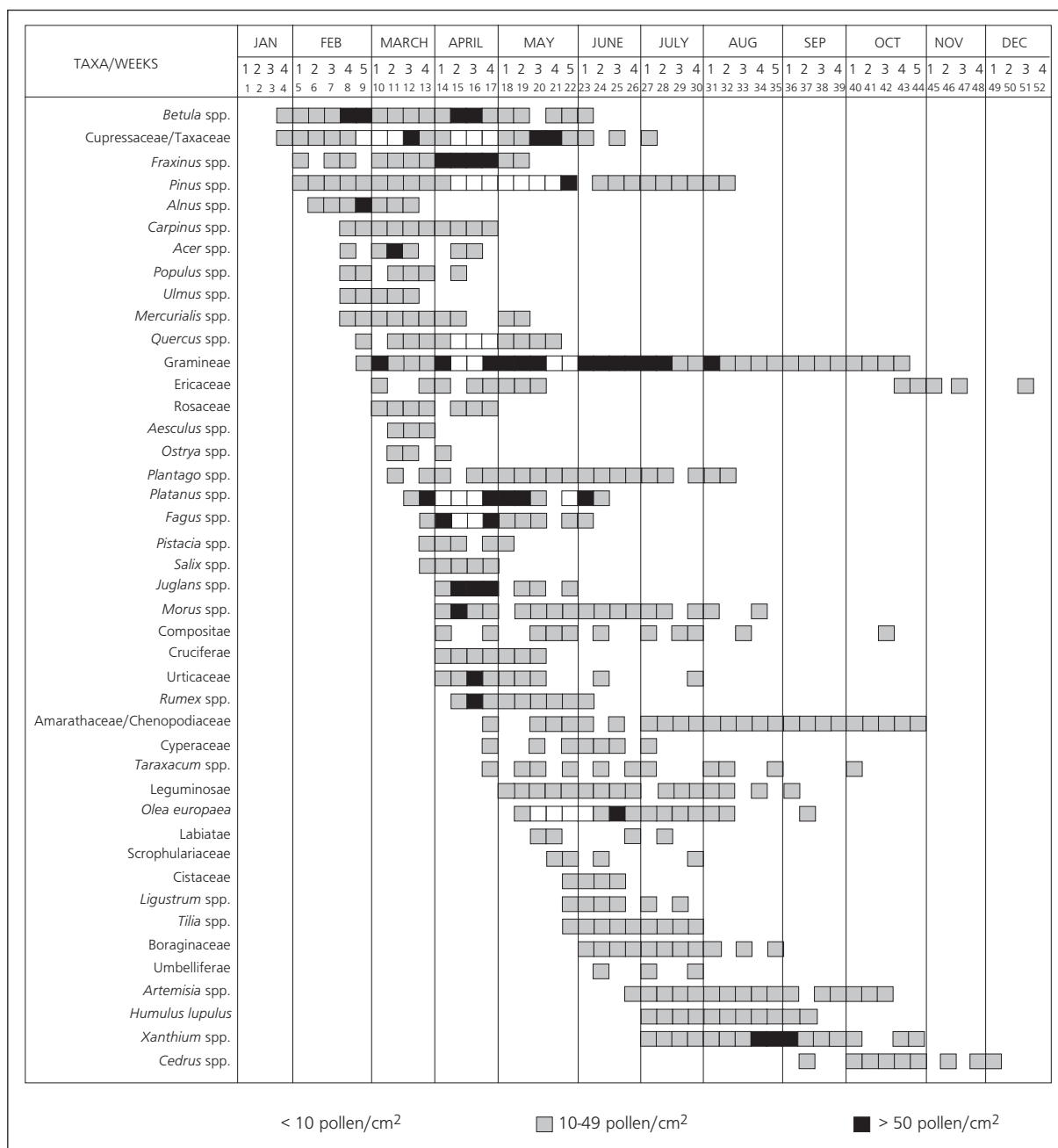


Figure 2. Pollen calendar of Gemlik.

as dominant in Balıkesir (7.30%) and Yalova (29.08%)^[17,18]. Another dominated arboreal plant taxa Cupressaceae/Taxaceae pollen are reported as dominant also in the center of Bursa (9.0%) and Fethiye Mugla (25.11%)^[24,31]. *Fagus* spp. pollen grains are found dominant in the

center of Bursa (2.9%) and Bilecik (2.08%)^[24,32]. Another dominant taxon of our study *Quercus* spp. pollen is also found as dominant in Yalova (3.07%) and Cordoba-Spain (59.81%)^[18,33]. *Fraxinus* spp. pollen are reported as dominant in Buenos Aires-Argentina

(56.39%) and in Toronto-Canada (3.88%)^[34,35]. Another dominated arboreal plant taxon *Betula* spp. pollen are dominant in Brussels-Belgium (19.2%) and in Patagonia-Argentina (17.1%)^[36,37]. *Xanthium* spp. pollen are also reported from the center of Bursa (1.80%) and Sakarya (1.96%)^[38,39]. *Juglans* spp. pollen is found dominant in Bitlis (9.57%) and in Edirne (2.93%)^[40,41].

It advances that the *Pinus* spp. pollen's allergenic effects do not presents much risks^[42,43]. Also grass pollen is a major cause of pollinosis in many parts of the world and grass-induced pollinosis is the most common pollen allergy in Mediterranean area^[44,45]. Some important allergenic pollen of plant taxa such as *Olea* spp., *Platanus* spp., *Quercus* spp., *Xanthium* spp., Cupressaceae/Taxaceae and *Fraxinus* spp. were also found in high concentrations in Gemlik^[1,42,46-48].

In conclusion, pollen grains of 43 taxa were identified between 1st January-31st December 2008 in the atmosphere of Gemlik of which 90.23% of the total pollen spectrum. In the region, investigated pollen grains reached their maximum level in april. A preliminary pollen calendar for the region presented in this paper may be useful for allergologists to establish an exact diagnosis.

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