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Airborne pollen content of Kuşadası

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Abstract: Atmospheric pollen grains of Kuşadası were captured using Durham samplers and investigated in 2005. The total number of pollen grains and the pollen grains/cm^2 were calculated from slides that were changed weekly. During the study period a total of 12,980 pollen grains/cm^2 belonging to 44 identified taxa and unidentified pollen grains were recorded at 2 stations. At the first station (S1), 7346 pollen grains were counted per cm^2, while only 5634 pollen grains were counted at the second station (S2). The majority of the investigated pollen grains were from *Olea europaea* L. (34.46%), Cupressaceae/Taxaceae (30.04%), *Pinus* spp. (19.71%), *Platanus* spp. (4.41%), Poaceae (3.70%), and *Morus* spp. (1.22%). In addition, 41.22% of the annual pollen index was captured in May. According to our results, seasonal pollen durations for the predominant pollen grains in Kuşadası were as follows: nearly the whole year for Cupressaceae/Taxaceae, *Pinus* spp., and Poaceae; March–September (between the 17th and 35th weeks) for *Olea europaea*; March–May (between the 11th and 21st weeks) for *Platanus* spp.; and March–April (between the 11th and 17th weeks) for *Morus* spp.

Key words: Pollen, pollen calendar, Kuşadası, Turkey

1. Introduction

Bioaerosols may cause a range of health issues in humans and animals, depending on their composition and concentrations in the air. Such effects include mucus membrane irritation, chronic bronchitis, allergic rhinitis and asthma, extrinsic allergic alveolitis (hypersensitivity pneumonitis), inhalation fever, humidifier fever or organic dust toxic syndrome, and immunological response impairment (Lacey & Dutkiewicz, 1994). Airborne pollen grains, which are produced in particular by anemogame plant species, are significant organic bioaerosols. For this reason, sensitive individuals show symptoms caused by pollinosis during the pollen season. Determination of the type and proportions of pollen grains is useful for patients who complain of pollen allergies. Due to the health impact of pollen grains, pollen calendars have been prepared worldwide for many years (Peternel et al., 2003; Gioulekas et al., 2004; Weryszko-Chmielewska & Piotrowska, 2004; Rizzi-Longo et al., 2007; Vergamini et al., 2007; Rodríguez-de la Cruz et al., 2010); they have also been prepared for a number of Turkish cities (Inceoglu et al., 1994; İnce, 1994; Bicakci & Akyalcin, 2000c; Bicakci et al., 2000a, 2000b, 2002; Guvensen & Ozturk, 2002, 2003; Kaya & Aras, 2004; Celik et al., 2005; Bicakci, 2006; Bilisik et al., 2008a, 2008b; Altunoglu et al., 2008; Tosunoglu, 2009; Erkan et al., 2011; Kızılpınar & Doğan, 2012).

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The research reported in this paper aims to record the beginning, duration, and end of the pollen season and establish a preliminary pollen calendar for Kuşadası.

2. Materials and methods

Kuşadası is a resort town situated in the province of Aydın (37°52.2′N, 27°15.0′E) on the Aegean coast of Turkey at an altitude of 15 m. Kuşadası is near the ancient city of Ephesus and other popular tourist destinations such as Miletos, Didim, Pamukkale, and the island of Samos.

The study area exhibits a typical Mediterranean climate, and Mediterranean maquis elements are dominant in the region, including *Arbutus andrachne* L., *Asparagus acutifolius* L., *Ceratonia siliqua* L., *Cistus creticus* L., *C. salviifolius* L., *Daphne gnidioides* Jaub. et Spach, *Erica manipuliflora* Salisb., *Laurus nobilis* L., *Myrtus communis* L., *Nerium oleander* L., *Olea europaea* L. var. *sylvestris* (Miller) Lehr., *Phlomis bourgaei* Boiss., *Phillyrea latifolia* L., *Pistacia lentiscus* L., *P. terebinthus* L., *Platanus orientalis* L., *Quercus aucheri* Jaub. et Spach, *Q. coccifera* L., *Sarcopoterium spinosum* (L.) Spach, *Satureja thymbra* L., *Spartium junceum* L., *Styrax officinalis* L., *Thymbra spicata* L., and *Vitex agnus-castus* L. The mountain slopes are covered with *Pinus brutia* Ten. forests, and *Cupressus sempervirens* L. populations

are also sometimes present. In addition, *Olea europaea* L., *Gossypium hirsutum* L., *Nicotiana tabacum* L., *Ficus carica* L., and mulberry species are commonly cultivated plants in the study area.

In recent years the population of Kuşadası, which is one of Turkey's popular tourism destinations, has increased, and this population growth is resulting in a rapid expansion of the city area. The growth also threatens the Dilek Peninsula National Park, which claims to have the best protected maquis cover in all of Europe (Deniz and Şirin, 2010).

In this study, pollen sampling was performed from January to December of 2005. Durham samplers were placed 4 km apart: 1 in the town centre [37°51′14″N, 27°15′43″E (S1)] and 1 in northern Kuşadası [37°52′46″N, 27°16′8″E (S2)] for gravimetric studies. The locations of these 2 stations were shown on a map created by Google Earth program (Figure 1). The S1 station was at a height of 15 m above the ground and S2 was at ground level. The city centre of Kuşadası contains little vegetation because the natural flora of the area is rapidly changing due to urbanisation and degradation, which parallels the population growth. The S2 station was in the northern part of the city, which is closer to undamaged and natural lands and olive groves (Figure 1).

Slides placed in the traps were changed weekly. Before exposure, the slides were covered with glycerine jelly mixed with basic fuchsine (Charpin et al., 1974), and they were examined weekly. The grains were identified and counted by light microscopy, with identification at species, genus, or family level. The pollen grains that could not be identified were considered unidentified types. The pollen grain numbers were expressed per cm^2 of the microscope cover glass.

Pollen grains of identified taxa in the Kuşadası atmosphere are shown on a calendar, which was prepared using the average pollen count and constructed in 3 steps for weekly total pollen numbers (<10 pollen grains/cm^2, low; 10–49 pollen grains/cm^2, moderate; and ≥50 pollen grains/cm^2, high) (Figure 2).

3. Results and discussion

In the study period, 7346 pollen grains/cm^2 and 41 pollen taxa were recorded from the slides in the S1 sampler (Table 1). The amount of pollen began to increase in January and reached its peak in May with 3133 pollen grains/cm^2 (Figure 3). Pollen grains of *Olea europaea* (33.23%), Cupressaceae/Taxaceae (28.44%), *Pinus* spp. (22.13%), Poaceae (4.36%), and *Platanus* spp. (3.84%) were the predominant types recorded at this station (Table 1).

In total, 5634 pollen grains/cm^2 belonging to 38 taxa were counted from the S2 slides. Pollen amounts began to increase in January, and the highest value was recorded in May with 2218 pollen grains/cm^2 (Figure 3). According to the S2 pollen data, *Olea europaea* (36.07%), Cupressaceae/Taxaceae (32.13%), *Pinus* spp. (16.56%), *Platanus* spp. (5.17%), Poaceae (2.84%), and *Morus* spp. (1.62%) were the most abundant types of pollen in the atmosphere (Table 1).

In the study of the Kuşadası atmosphere, a total of 12,980 pollen grains/cm^2 from 44 taxa were identified at both stations. Monthly means of total pollen grains recorded in the atmosphere are shown in Figure 3. During the study period the maximum number of pollen grains, 41.22%

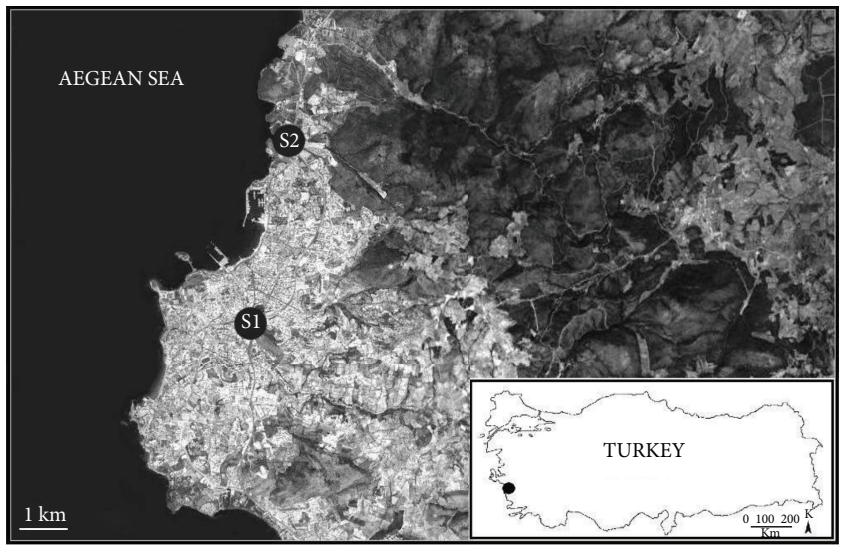
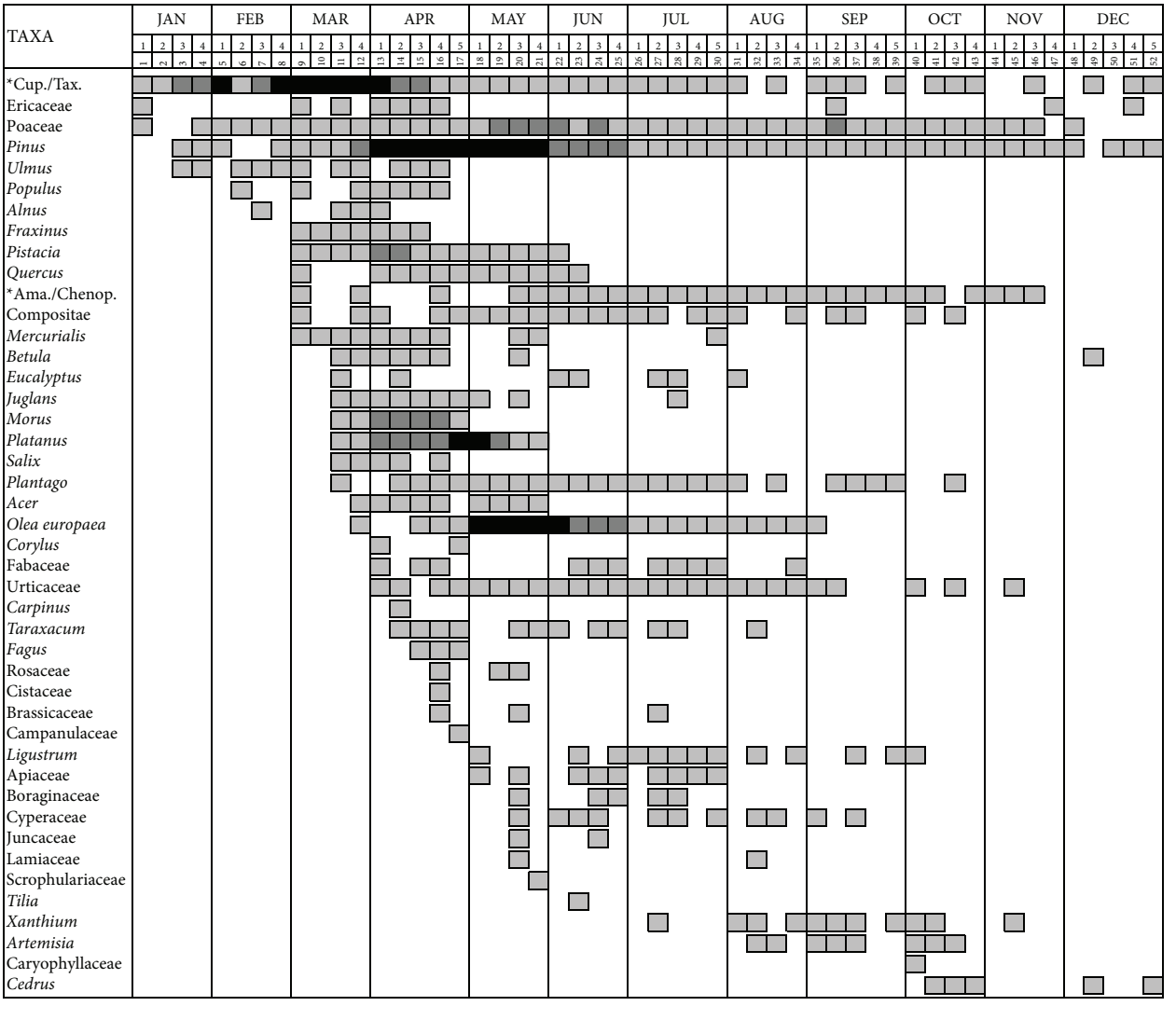


Figure 1. Geographical localisation of Kuşadası and pollen monitoring stations (S1 = station 1, S2 = station 2).



Abbreviations: * Cup./Tax. = Cupressaceae/Taxaceae, Ama./Chenop. = Amaranthaceae/Chenopodiaceae.

Figure 2. Pollen calendar of Kuşadası.

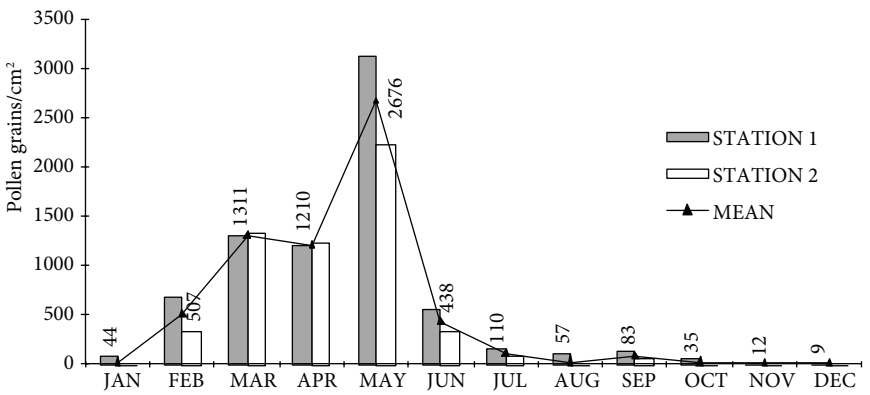


Figure 3. Total monthly variation and mean value of deposited pollen grains of 2 stations in Kuşadası in 2005.

Table 1. Pollen taxa found in the atmosphere of Kuşadası and annual totals of weekly pollen counts.

Taxa	STATION 1		STATION 2		STATION 1–2		
	Total	%	Total	%	Total	Average	%
Olea europaea	**2441**	**33.23**	**2032**	**36.07**	**4473**	**2237**	**34.46**
Cupressaceae/Taxaceae	**2089**	**28.44**	**1810**	**32.13**	**3899**	**1950**	**30.04**
Pinus	**1626**	**22.13**	**933**	**16.56**	**2559**	**1280**	**19.71**
Platanus	**282**	**3.84**	**291**	**5.17**	**573**	**287**	**4.41**
Poaceae	**320**	**4.36**	**160**	**2.84**	**480**	**240**	**3.70**
Morus	67	0.91	**91**	**1.62**	**158**	**79**	**1.22**
Pistacia	59	0.80	40	0.71	99	50	0.76
Amaranthaceae/Chenopodiaceae	66	0.90	29	0.51	95	48	0.73
Urticaceae	69	0.94	24	0.43	93	47	0.72
Plantago	34	0.46	28	0.50	62	31	0.48
Quercus	25	0.34	19	0.34	44	22	0.34
Ligustrum	39	0.53	3	0.05	42	21	0.32
Fraxinus	14	0.19	21	0.37	35	18	0.27
Xanthium	16	0.22	15	0.27	31	16	0.24
Asteraceae	20	0.27	7	0.12	27	14	0.21
Boraginaceae	22	0.30	3	0.05	25	13	0.19
Salix	19	0.26	-	-	19	10	0.15
Mercurialis	9	0.12	8	0.14	17	9	0.13
Acer	-	-	16	0.28	16	8	0.12
Cyperaceae	12	0.16	1	0.02	13	7	0.10
Juglans	8	0.11	5	0.09	13	7	0.10
Fabaceae	7	0.10	6	0.11	13	7	0.10
Taraxacum	9	0.12	5	0.09	14	7	0.11
Ulmus	7	0.10	6	0.11	13	7	0.10
Artemisia	9	0.12	3	0.05	12	6	0.09
Betula	7	0.10	4	0.07	11	6	0.08
Ericaceae	7	0.10	5	0.09	12	6	0.09
Apiaceae	6	0.08	6	0.11	12	6	0.09
Fagus	5	0.07	4	0.07	9	5	0.07
Eucalyptus	7	0.10	1	0.02	8	4	0.06
Populus	3	0.04	5	0.09	8	4	0.06
Rosaceae	-	-	7	0.12	7	4	0.05
Alnus	2	0.03	4	0.07	6	3	0.05
Cedrus	2	0.03	3	0.05	5	3	0.04
Brassicaceae	2	0.03	1	0.02	3	2	0.02
Juncaceae	2	0.03	1	0.02	3	2	0.02
Campanulaceae	0	0.00	1	0.02	1	1	0.01
Carpinus	1	0.01	-	-	1	1	0.01
Caryophyllaceae	-	-	1	0.02	1	1	0.01
Corylus	2	0.03	-	-	2	1	0.02
Cistaceae	1	0.01	-	-	1	1	0.01
Lamiaceae	1	0.01	1	0.02	2	1	0.02
Scrophulariaceae	1	0.01	-	-	1	1	0.01
Tilia	1	0.01	-	-	1	1	0.01
Unidentified	27	0.37	34	0.60	61	31	0.47
TOTAL	7346	100.00	5634	100.00	12,980	6490	100.00

of the total pollen recorded for the year, was recorded in May (Table 2). In our study there was an increase in the number of pollen grains from January through May (Figure 2). Most of the anemophilous woody species have a spring flowering season (Lattore, 1997), and we conclude that the increase was a result of the reproductive cycle of the arboreal plant taxa (Figure 2), including Cupressaceae/Taxaceae, Ericaceae, *Pinus* spp., *Pistacia* spp., *Morus* spp., and *Platanus* spp., which produce high numbers of pollen grains and similar results in other cities (Lattore, 1997; Ballero & Maxia, 2003; Güvensen & Öztürk, 2003; Gioulekas et al., 2004; Celenk et al., 2009). The main pollen producers of Kuşadası were *Olea europaea* (34.46%), Cupressaceae/Taxaceae (30.04%), *Pinus* spp. (19.71%), *Platanus* spp. (4.41%), Poaceae (3.70%), and *Morus* spp. (1.22%); these species accounted for 93.51% of the annual pollen index (API) (Tables 1 and 2).

According to the data, over the course of the year some amount of pollen was collected during every month. In January we recorded 0.67% of the annual pollen index, with the majority of the pollen comprising Cupressaceae/Taxaceae type pollen grains. In February the percentage of the total count was 7.81%, and as in January the pollen derived from Cupressaceae/Taxaceae (7.71%). In March the percentage of the annual pollen index was 20.20%, and Cupressaceae/Taxaceae pollen reached its highest level at 18.98%. During March *Pinus* spp. pollen grains also began to increase in the atmosphere around Kuşadası. The main pollen producers in April were *Pinus* spp. (10.93%), *Platanus* spp. (2.37%), Cupressaceae/Taxaceae (2.07%), and *Morus* spp. (1.16%). There was a decrease in the number of pollen grains from March through April (18.65%). The highest amount of pollen was recorded in May (41.22%) with *Olea europaea* (30.41%), *Pinus* spp. (6.39%), *Platanus* spp. (1.91%), and Poaceae (1.26%) pollen grains as the primary contributors. There was a large decrease in the number of pollen grains after May. The pollen count was 6.75% of the total in June, and the main types of pollen grains were *Olea europaea* (3.79%) and *Pinus* spp. (1.35%). After June we recorded very low pollen concentrations in the Kuşadası atmosphere (Figure 3).

Pollination seasons, intensities, and variation in the pollen grains of identified taxa are shown on the calendar, which was prepared using the average pollen count (Figure 2). Of special interest are 6 plant taxa, which individually account for more than 1% of the annual pollen index (Table 2).

Olea europaea was the most abundant type of pollen in the study area, with a total abundance of 34.46% (Table 1). Pollen grains of this taxa started to accumulate on the slides in the last week of March (12th week), reached a maximum between the 18th and 22nd weeks, and ended in the first week of September (35th week) (Figure 2). The total pollen counts were 2441 grains/cm^2 at S1 and 2032 grains/cm^2 at S2 (Table 1). Olive trees are represented in the Mediterranean region by a single species, *Olea europaea* L., in both wild and cultivated form. In Turkey *Pinus* spp. are generally reported to be the dominant pollen producer (Bicakci et al., 2002, 2003; Bilisik et al., 2008). In this study the high number of *Olea europaea* pollen grains was not surprising due to the floral structure of the study area. However, this result is unfavourable for human health in the study region because *O. europaea* pollen tends to be more allergenic than pine pollen. Olive pollen, which has provoked numerous cases of pollinosis among the population, has prompted a number of studies throughout

Table 2. Plant taxa in Kuşadası comprising more than 1% of the total pollen content and their yearly percentage of composition as a mean value.

Taxa	MONTHS												%
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Olea europaea	-	-	0.01	0.03	30.41	3.79	0.15	0.06	0.02	-	-	-	**34.46**
Cupressaceae/Taxaceae	0.62	7.71	18.98	2.07	0.30	0.15	0.05	0.02	0.03	0.02	0.01	0.07	**30.04**
Pinus	0.02	0.02	0.28	10.93	6.39	1.35	0.29	0.12	0.14	0.06	0.08	0.03	**19.71**
Platanus	-	-	0.13	2.37	1.91	-	-	-	-	-	-	-	**4.41**
Poaceae	0.02	0.04	0.08	0.31	1.26	0.64	0.45	0.26	0.45	0.15	0.04	0.01	**3.70**
Morus	-	-	0.05	1.16	-	-	-	-	-	-	-	-	**1.22**
Others	0.02	0.04	0.63	1.68	0.85	0.77	0.71	0.41	0.59	0.25	0.05	0.03	**5.99**
Unidentified	-	-	0.05	0.10	0.10	0.05	0.03	0.02	0.06	0.06	0.01	-	**0.47**
TOTAL	**0.67**	**7.81**	**20.20**	**18.65**	**41.22**	**6.75**	**1.69**	**0.89**	**1.28**	**0.54**	**0.18**	**0.14**	**100.00**

the Mediterranean in recent years (Bousquet et al., 1985; D'Amato & Lobefalo, 1989; D'Amato & Liccardi, 1994; Geller-Bernstein et al., 1996; Liccardi et al., 1996; Quiralte et al., 2002; Mesa et al., 2003).

Cupressaceae/Taxaceae pollen grains were observed in the slides throughout the entire year, although only intermittently in the late summer and autumn. However, the presence of different species with successive flowering times may mean that pollen grains of this type are detected in the atmosphere for longer periods (Hidalgo et al., 1999). Pollen grains of this taxa accounted for 30.04% of the total pollen count (Table 2), and they were observed in high amounts in the Kuşadası atmosphere during the 5th and the 8th–13th weeks (Figure 2). Total numbers of Cupressaceae/Taxaceae pollen grains per cm^2 were 2089 at S1 and 1810 pollen grains/cm^2 at S2 (Table 1). Looking to aeropalynological studies in Turkey, Cupressaceae/Taxaceae pollen grains were detected at levels ranging between 0.93% and 54.03% in the annual pollen indexes (Bıçakçı et al., 2010). In addition, different authors have cited this taxonomic group as an important allergen in the Mediterranean (Cimignoli et al., 1992; D'Amato & Liccardi, 1994; Nardi et al., 1996; Diaz de la Guardia, 2006).

Pinus spp. pollen season was long and included nearly the entire year, similar to the Cupressaceae/Taxaceae pollen. The pollen count was 1626 pollen grains/cm^2 at S1 and 933 pollen grains/cm^2 at S2 (Table 1) and reached its highest level between the 13th and 21st weeks (Figure 2); pine pollen grains comprised 19.71% of the total count (Table 2). In comparison with other studies, pine was mostly recorded as a main pollen producer in the neighbouring cities of Kuşadası, including Burdur (28.13%) (Bicakci et al., 2000a), Uşak (29.67%) (Bicakci et al., 2004), İzmir (57%–57.3%) (Guvensen and Öztürk, 2003), Fethiye (42.46%), and Didim (45.58%) (Bilisik et al., 2008b, 2008c). A high abundance of pine pollen is not as problematic for sensitive individuals because the allergenic effect of pine pollen grains is low (Levétin & Buck, 1980; Harris & German, 1985; Fang et al., 2001; Marcos et al., 2001).

The duration of the pollen season for *Platanus* spp. was 11 weeks, beginning in the third week of March (9th week), peaking between the 17th and 18th weeks, and ending during the last week of May (21st week) (Figure 2). Plane trees were a significant producer of pollen grains, accounting for 4.41% of all pollen with observed levels of 282 pollen grains/cm^2 at S1 and 291 pollen grains/cm^2 at S2 (Table 1). Some authors have considered *Platanus* pollen to be moderately allergenic (Lewis, 1983). In contrast, recent studies (Subiza et al., 1994; Varela et al., 1997) concluded that *Platanus* spp. pollen is a significant cause of pollinosis. Plane tree pollen has been cited in numerous European cities as an important spring allergen (Bousquet et al., 1984; Subiza et al., 1995; Jato et al., 2001; Sánchez-Reyes et al., 2009).

Family Poaceae pollen grains were the only major non-arboreal type observed in the atmosphere of Kuşadası. A relatively long pollen season for grass pollen is seen in Figure 2, but the quantity was not recorded in high levels (>50 pollen grains/cm^2) during any particular week. Poaceae were reported as the most common pollen grains among non-arboreal plants in studies conducted in Santiago, Chile (7.6%) (Villegas and Nolla, 2001), Brisbane (71.6%) (Green et al., 2002), İzmir (7.7%–6%) (Güvensen and Öztürk, 2003), Sakarya (18.95%) (Bicakci, 2006), and Didim (6.33%) (Bilisik et al., 2008c). These plants comprised 3.70% of the total pollen in the study area; 320 pollen grains/cm^2 were counted at S1 and 160 pollen grains/cm^2 were observed at S2 (Table 1). Pollen from the grass family has been considered one of the most important aeroallergens in the world (D'Amato & Lobefalo, 1989; D'Amato & Liccardi, 1994; Mesa et al., 2003; Puc & Puc, 2004; Abreu et al., 2008).

The relatively short pollen season of *Morus* spp. began in the third week of March (11th week), peaked between the 13th and 16th weeks, and ended in the last week of April (17th week) (Figure 2). Mulberry pollen grains comprised 1.22% of all pollen (Table 2); 67 pollen grains/cm^2 were counted at S1, and 91 pollen grains/cm^2 were counted at S2 (Table 1). Mulberry is one of the dominant tree pollens in the atmosphere of the study area, mostly due to its cultivation in orchards. Additionally, mulberry pollen has been described as an important allergen (Chapman & Williams, 1984).

In our mean data, 6 plant taxa take precedence, each individually accounting for more than 1% of the annual pollen index. All 6 were prominent at S2, although there were only 5 prominent taxa at S1. Although S1 is located in the city centre and S2 located more close to natural areas and olive groves (Figure 1), we recorded more pollen grains, and interestingly, more olive pollen at S1 than at S2. In addition, there is a large graveyard in the city centre that contains a dense cypress grove; however, S2 was richer in total number of Cupressaceae/Taxaceae pollen grains than S1. *Acer* spp., Rosaceae, and Caryophyllaceae pollen grains were not recorded at S1 although they were observed at S2. In addition, *Salix* spp., *Carpinus* spp., *Corylus* spp., Cistaceae, Scrophulariaceae, and *Tilia* spp. pollen grains were recorded at S2 but not at S1. Regarding locations of the stations and the data obtained from them, we could not find a relationship between localisation and adjacency of floral elements in Kuşadası. This was probably the result of area geography, as the wind effect was most likely cut off by the fields at the northern station (S2). Moreover, the height of the samplers might affect the number and variability of pollen grains. The data obtained from the 2

stations and the percentage results of the 2 stations seems to indicate relatively small differences between them.

According to studies conducted around the world, *Betula* spp., *Corylus* spp., *Ambrosia* spp., and Urticaceae were predominant pollen producers in Zagreb, Croatia (Peternel et al., 2002); Cupressaceae, Pinaceae, Urticaceae, Anacardiaceae, Oleaceae, and Polygonaceae were predominant in Cagliari, Italy (Ballero and Maxia, 2003); Cupressaceae, Gramineae, Hamamelidaceae, Pinaceae, Urticaceae, *Quercus* spp., *Acer* spp., Myrtaceae., Caryophyllaceae, Oleaceae, Betulaceae, and *Plantago* spp. were predominant in the Porto region of Portugal (Abreu et al., 2003); Cupressaceae, *Quercus* spp., Urticaceae, Oleaceae, Pinaceae, Poaceae, Platanaceae, *Corylus* spp., Chenopodiaceae, and *Populus* spp. were predominant in Thessaloniki, Greece (Gioulekas et al., 2004); and *Betula* spp., Pinaceae, *Alnus* spp., Poaceae, and *Urtica* spp. were predominant in Lublin, Poland (Weryszko-Chmielewska and Piotrowska, 2004).

In Turkey, the most abundant pollen is generally pine. The most abundant accompanying pollen grains are generally cypress, olive, oak, plane, grass, and mulberry, for example, *Pinus* spp., *Olea* spp., *Platanus* spp., Gramineae, Cupressaceae/Taxaceae, *Quercus* spp., *Acer* spp., *Morus* spp., *Xanthium* spp., *Castanea* spp., Chenopodiaceae/Amaranthaceae, *Corylus* spp., *Artemisia* spp., *Urtica* spp., and *Fraxinus* spp. were predominant in Bursa (Bicakci et al., 2003); *Pinus* spp., *Quercus* spp., Cupressaceae/Taxaceae, *Salix* spp., *Platanus* spp., *Populus* spp., *Carpinus* spp., *Fagus* spp., Moraceae, *Corylus* spp., *Fraxinus* spp., Gramineae, Chenopodiaceae/Amaranthaceae, *Xanthium* spp., and Urticaceae were abundant in Sakarya (Bicakci, 2006); and *Pinus* spp., Cupressaceae/Taxaceae, *Olea* spp., *Platanus* spp., Gramineae, *Pistacia* spp., *Morus* spp., *Quercus* spp., *Abies* spp., and *Plantago* spp. were the dominant pollen species observed in Didim (Bilisik et al., 2008c). In general, the predominant pollen composition of Turkey can be associated with the country's overall flora and climate, and many of the findings are similar to those in neighbouring Mediterranean countries, especially for coastal areas.

In conclusion, pollen grains of 44 taxa were observed in deposited samples in Kuşadası in 2005, and 6 taxa formed 93.51% of the total sample population. The most impressive result of this paper is the high percentages of *Olea europaea* pollen (34.43%). The preliminary pollen calendar for this region presented here may be useful for visitors to this well-known tourism centre and for allergologists as an aid in establishing exact diagnoses.

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