

Poplar Pollen-Related Allergy in Ankara, Turkey: How Important for Patients Living in a City with High Pollen Load?

Gülfem Çelik, M.D.,* Dilşad Mungan, M.D.,* Münevver Pınar, Ph.D.,# and Zeynep Mısırlıgil, M.D.* (Turkey)

ABSTRACT

The impact of high pollen load of particular plants on sensitized subjects is a topic of interest. We aimed to detect the clinical importance of poplar allergy in subjects with seasonal allergy living in Ankara, capital city of Turkey, having a high poplar pollen load. The subjects with seasonal allergy and demonstrating allergy to Populus alba in skin-prick tests (SPTs) (n = 20) underwent a specific nasal provocation test with P. alba allergen extract and were requested to fill in symptom-medication reports. During the same period, P. alba and Gramineae pollen counts were assessed in the city. Pollination for P. alba in Ankara for the year 2001 started in the 2nd week of March and terminated in the 1st week of May; 96.5% of subjects also had grass pollen sensitivities. By history, 85% of the subjects described mild symptoms in March and April, the expected pollinosis season for P. alba. Symptom and medication scores were higher in May and June than in March and April ($p < 0.05$). Allergy to P. alba pollen in patients with seasonal allergy causes mild symptoms where the dominant clinical presentation was demonstrated to be due to their additional

Gramineae (grass) pollen allergy. (Allergy and Asthma Proc 26:113–119, 2005)

Seasonal allergic rhinitis (SAR) affects 1.3 to 6.4% of the population in Turkey.^{1,2} In accordance with other European countries, *Gramineae* pollen allergy seems to be the most important cause of SAR in our country, although different plant species exist in varying regions.^{3–6} However, subjects living in regions with an overabundance of tree pollen were reported to have a high incidence of positive reactions to tree pollen as an important cause of SAR.⁷ Our recent trial supported high tree pollen sensitization in subjects with SAR living in Ankara.⁸

The influence of high pollen load derived from particular plants on clinical symptoms in sensitized subjects living in that area is a current topic of interest. During the early years of the republic of Turkey, there existed an increase in plantations in Ankara, the capital city of Turkey, owing to its arid climate. As a result of this, now, many plant species, particularly trees, exist in the town. Poplar, being one of these, has a widespread distribution in parks, gardens, and along the streets of Ankara city; the main *Populus* species is *Populus alba*.⁹ Previous aerobiology trials showed that the atmospheric *P. alba* pollen count was 10 to 15% of the total tree pollen count for a year that causes a high pollen load for the city.^{10,11} However, there is no information about the clinical effect of poplar pollen load on subjects with seasonal allergy in our region. In this prospective study, we aimed to assess the clinical importance of *Populus alba* allergy in subjects with seasonal allergy living in Ankara.

*From the *Ankara University School of Medicine, Cebeci Hospital, Department of Chest Diseases, Division of Allergy; and #Ankara University Faculty of Science, Department of Biology, Küçükesat/Ankara, Turkey*

*Address correspondence and reprint requests to Gülfem Çelik, M.D., Esat caddesi 37/20, 06660 Küçükesat/Ankara, Turkey
Copyright © 2005, OceanSide Publications, Inc., U.S.A.*

MATERIALS AND METHODS

Study Group

The study was conducted in our tertiary care clinic located in Ankara, the capital city of Turkey. The subjects were selected among patients living in Ankara who were examined in our outpatient clinic between March 2000 and July 2000 with intermittent or persistent symptoms of seasonal allergic rhinitis (SAR), and in whom *Populus alba* pollen allergy was demonstrated by skin-prick tests ($n = 30$). They were recalled in January and February 2001. The subjects who gave written informed consent constituted the eligible study population ($n = 20$).

After inclusion in the study group, patients underwent a specific nasal provocation test with *P. alba* allergen extract. Following the nasal provocation test, all subjects were requested to fill in a symptom-medication form on a daily basis and return it at the end of June. During the same period, atmospheric *P. alba*, total tree, and *Gramineae* pollen counts were assessed.

Skin-Prick Tests

Skin-prick tests (SPTs) were performed by using a common panel including *Dermatophagoides pteronyssinus*, *D. farinae*, grass, tree [birch (*Betula alba*), alder (*Alnus glutinosa*), oak (*Quercus robur*), nut (*Corylus avellana*), maple (*Acer pseudoplatanus*), beech (*Fagus sylvatica*), elder (*Sambucus nigra*), hornbeam (*Carpinus betulus*), willow (*Salix caprea*), olive (*Olea europa*), elm (*Ulmus campestris*)], and weed pollens, cat, dog, mold mixture, and cockroach allergen extracts (Stallergenes, France). Sensitivity to poplar pollen was assessed by two different *P. alba* allergen extracts (ALK, Denmark and Stallergenes, France). Positive and negative controls were histamine (10 mg/mL) and phenolated glycerol saline, respectively. Skin testing was performed by puncture method and a mean wheal diameter of 3 millimeters or greater than that obtained with control solution was considered as positive.

Pollen Counts

Airborne *P. alba*, total tree, and *Gramineae* pollen grains were counted in the Ankara atmosphere from March to July in 2001. The Burkard (Burkard manufacturing Rickmansworth, Herts, UK) 7-day recording volumetric spore trap was used for sampling. The pollen was sucked at an airflow rate of 10 L/min onto tapes that were coated with a thin film of Vaseline-paraffin wax in toluene. The tape was then mounted in glycerin jelly. The 12 transverse stripes were counted on each slide, at a magnification of 400 $\times$. Counts were made at 2-hour intervals and total daily counts were converted to number of pollen grains per cubic meter of air. Pollens were counted daily by the Palynological laboratory in the Department of Biology of Ankara University.

Clinical Assessment of Poplar Allergy

History of Symptoms. A detailed history regarding the nasal and asthmatic symptoms between March and April, poplar tree pollinosis time for Ankara, was taken for each patient.

Specific Nasal Provocation Tests. In January and February 2001 subjects with poplar pollen allergy in SPTs and with no symptoms at the time of evaluation underwent nasal-specific provocation tests with *P. alba* allergen extract (ALK, Denmark). Before testing, initial nasal flows and resistances performed by anterior rhinomanometry were recorded. At the beginning of the procedure, 0.2 mL of diluent (negative control) is applied equally (0.1 mL) to both internal nares via a spray. To avoid aspiration to the larynx, the patient was requested to take a deep breath and hold it during the atomization period. Ten minutes later, nasal flows, nasal airway resistance, and presence of symptoms were recorded.

A positive reaction was defined as an allergen concentration eliciting no fewer than two of three of the following criteria: a minimum of 0.5 mL nasal secretion, a minimum of five sneezes, and a decrease of 20% or more in nasal peak flow. In the presence of a positive reaction, the provocation test was stopped. If no reaction was observed during the first 10 minutes, the next step of the procedure was performed: 0.2 mL of 100 SQ, 1,000 SQ, 10,000 SQ, and 100,000 SQ of *P. alba* allergen extracts were consecutively applied (1000 SQ = 25 ng major allergen per milliliter). The observation period between each concentration was 10 minutes and if no reaction occurred, nasal provocation tests were continued with a 10-fold stronger concentration. When 100,000 SQ/mL was reached and no positive reaction occurred, the provocation test was regarded as negative.

Symptom-Medication Scores. A symptom-medication score method was used to determine whether symptoms were associated with *P. alba* pollen counts. The subjects were requested to record their symptom and medication scores from March to July, the expected *P. alba* (March and April) and *Gramineae* pollinosis period (May and June) for Ankara.

Symptoms for rhinitis and asthma were scored as follows: "0," no symptoms; "1," mild symptoms not disturbing daily activities of the subjects and not requiring medication; "2," moderate symptoms moderately disturbing daily activities and requiring medication; and "3," severe symptoms that disturb patients' daily activities and require intensive medication for palliation.

Medication scores were filled in for each drug consumed over the last 24 hours. One point was given for each drug consumption and the total medication score was scored as the sum of points given for each drug. Total weekly symptom and medication scores were used in the analysis of the

TABLE I	
Demographic and Disease Features of the Study Group (n = 20)	
Age (Mean $\pm$ SE, yr)	30.4 $\pm$ 1.9
M/F, n (%)	16/4 (80/20%)
Disease duration (Mean $\pm$ SE, yr)	7.4 $\pm$ 1.5
Diagnosis, n (%)	
Allergic rhinitis	15 (75%)
Allergic rhinitis and asthma	5 (25%)
SPT results n (%)	
Monosensitization	0 (0%)
Multisensitization	20 (100%)
Tree pollen	18 (90%)
Grass pollen	19 (95%)
Weed pollen	8 (42.1%)
House dust mites	3 (15.3%)
Mold	1 (5.3%)
Cat dander	5 (26.3%)
Dog dander	3 (15.8%)
Cockroach	0 (0%)

data. The patients were instructed to use medications in accordance with the International Guidelines.¹²

Statistical Analysis

Nominal values were expressed as n (%) with intergroup differences determined by chi-square test. Age and disease duration values were given as mean $\pm$ SEM. Total weekly symptom and medication scores were given in median values and within-group comparisons were made by Wilcoxon signed-ranks test. All directional p-values were two-tailed and significance was assigned to values lower

than 0.05. Statistical analysis was performed by Statistical Package for Social Sciences (SPSS) v.10.0 for Windows.

RESULTS

Study Group

Among 30 subjects with documented poplar allergy, 20 agreed to participate in the study by giving informed consent. The characteristics of the latter group were found to be comparable with whole group. Demographic and disease features of the study group subjects are given in Table I. Individual tree pollen sensitivities in SPTs were birch (*B. alba*) in 15%, alder (*A. glutinosa*) in 35%, oak (*Q. robur*) in 20%, nut (*C. avellana*) in 35%, maple (*A. pseudoplatanus*) in 60%, beech (*F. sylvatica*) in 70%, elder (*S. nigra*) in 35%, hornbeam (*C. betulus*) in 35%, willow (*S. caprea*) in 35%, olive (*O. europa*) in 50%, and elm (*U. compestris*) in 25% of the patients.

Pollen Counts

Atmospheric pollen counts in Ankara between March and June 2001 are presented in Fig. 1. Pollination for *P. alba* in Ankara for the year 2001 started in the 2nd week of March and terminated in the 1st week of May (Fig. 1). After the 2nd week of March, there was an increase in *P. alba* pollen counts reaching a peak value in the 4th week of March (487 grain/m³/week, 49.6 grain/m³/day) followed by a decline in April and cessation at the end of the 1st week of May. Total *P. alba* pollen counts in March, April, and May were 769 grain/m³, 201 grain/m³, and 36 grain/m³, respectively. The *P. alba* pollen count comprised 13.7% of total tree pollen count in March and April.

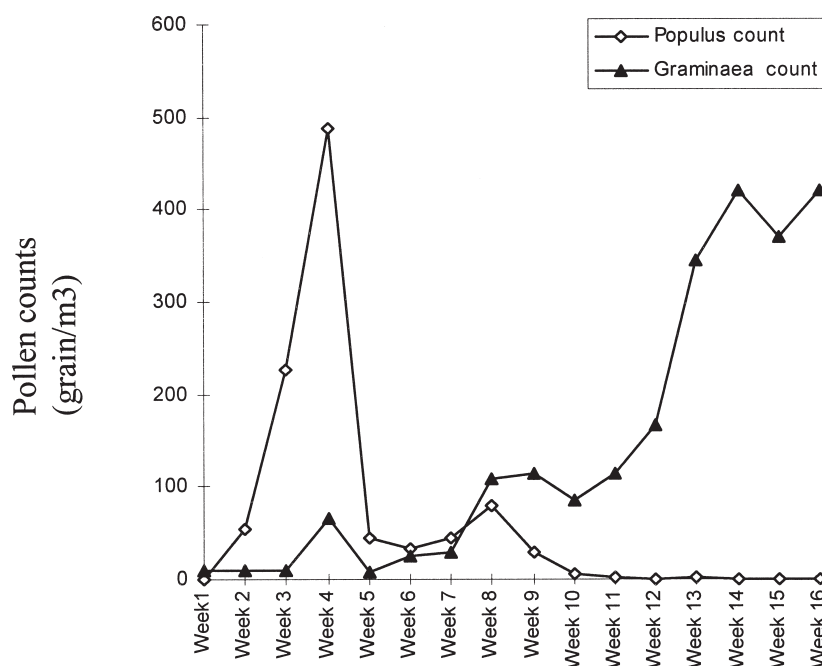


Figure 1. Populus alba and Gramineae pollen counts in Ankara for the year 2001.

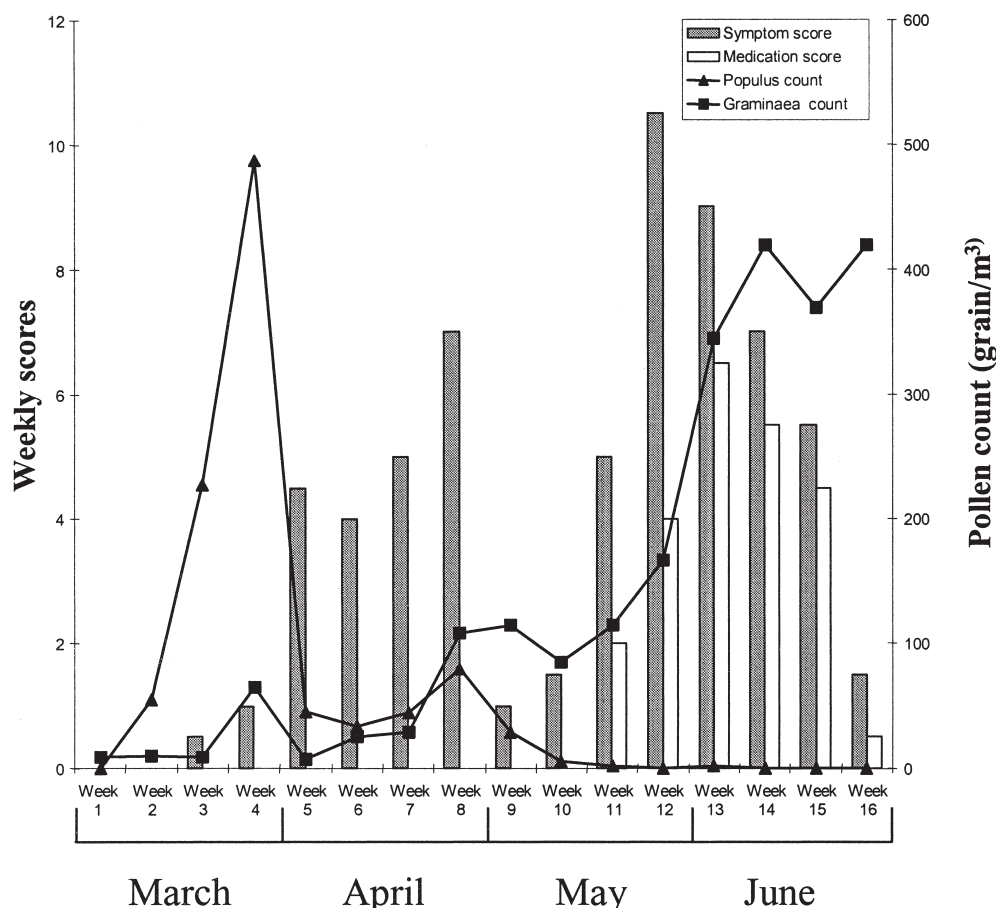


Figure 2. Weekly total medication and symptom scores in patients with poplar allergy in comparison with weekly *Populus alba* and Gramineae pollen counts. Mean and median values are used for pollen counts and symptom-medication scores, respectively.

As far as the *Gramineae* pollen count is concerned, despite very low levels in March, an increase was observed after the last week of April reaching to a peak value in June (Fig. 2). *Gramineae* pollen counts were 103 grain/m³, 169 grain/m³, 475 grain/m³, and 1554 grain/m³ in March, April, May and June, respectively.

Clinical Assessment of Poplar Allergy

History of Symptoms. Seventeen of 20 subjects (85%) described mild nasal symptoms in March and April, the expected pollinosis time for *P. alba* for Ankara. All 20 subjects described moderate to severe symptoms in May and June.

Specific Nasal Provocation Tests. Nasal provocation tests with *P. alba* pollen extract yielded positive responses in 11 of 20 subjects (55%). Provocative concentrations were 1,000 SQ ($n = 5$), 10,000 SQ ($n = 1$), and 100,000 SQ ($n = 5$), respectively.

Symptom-Medication Scores. Symptoms between March and May were present in 75% of subjects. Median total weekly symptom and medication scores in comparison

with pollen counts are presented in Fig. 2. Total weekly symptom scores in May and June were higher than in March ($p < 0.05$). Total weekly medication scores in May and June were higher than in March and April ($p < 0.05$). There were no differences in the number of patients developing symptoms (83% versus 71%, $p > 0.05$) and in mean symptom scores during the poplar tree pollination period between nasal provocation positive and negative patients.

DISCUSSION

Among tree pollens, poplar tree pollen is known to be moderately allergenic and symptoms following exposure to pollen are reported to be very rare in Europe.^{13,14} In this study, we demonstrated that the clinical presentation of allergy to *P. alba* was mild in sensitized subjects with SAR living in Ankara, a city that has a high poplar tree pollen load. In a study evaluating the airborne pollen concentration in Ankara between 1990 and 1993 by İnceoğlu *et al.*, *P. alba* pollen comprised 15% of the total tree pollen count for three consecutive years.¹⁰ Similar results were also achieved in the following year.¹¹ This value seems to be higher than other countries as well as different acclimatized

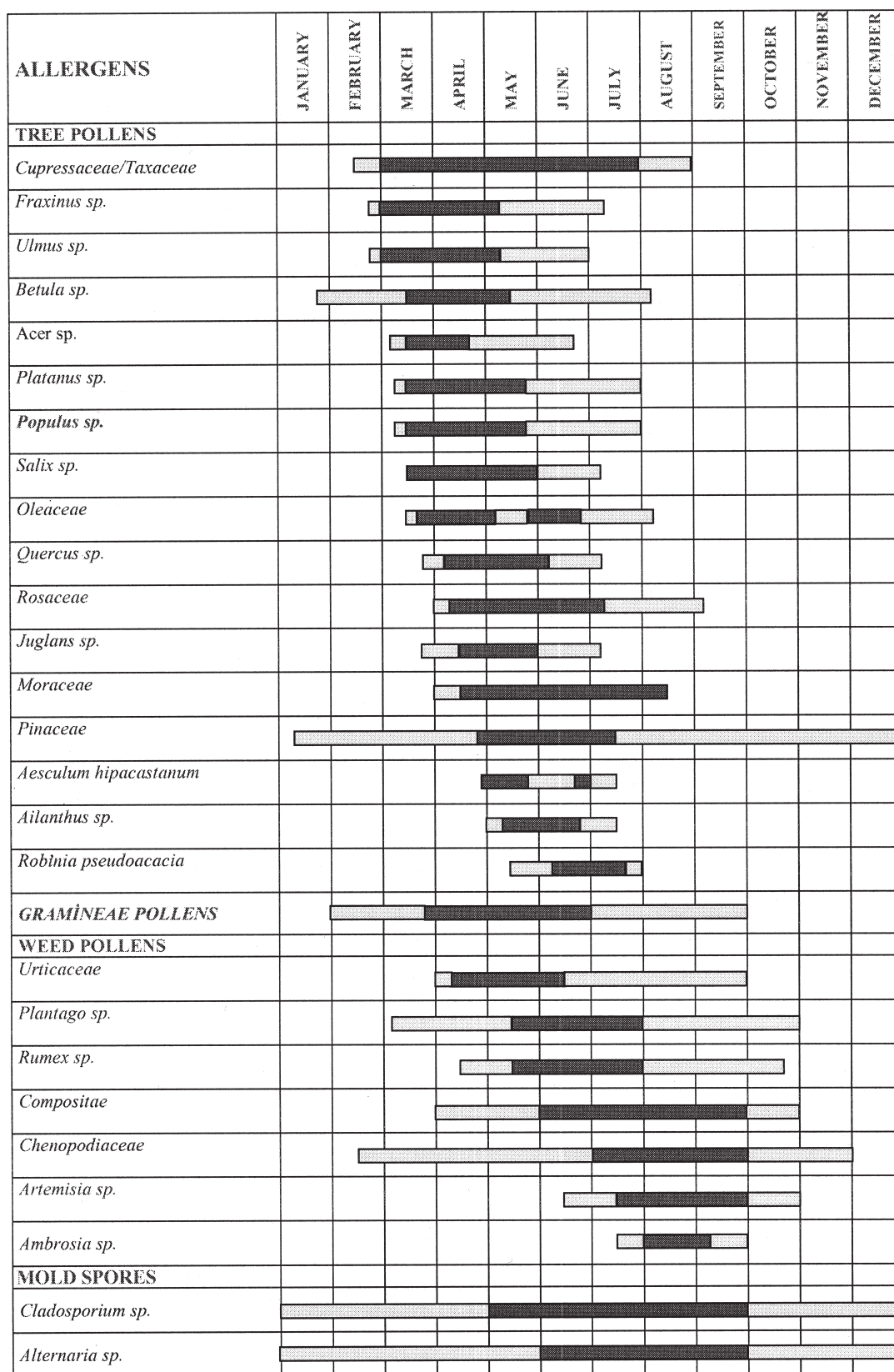


Figure 3. Ten-year cumulative pollen counts for Ankara. Solid bar, high pollen counts (higher than 50 grain/m³); shaded bar, low pollen counts (lower than 50 grain/m³).

regions of our country.^{15–19} Allergenicity of poplar pollen was reported to be moderate and sensitization varied according to the predominating plant species in the region.^{20–22}

Previous trials conducted in Ankara demonstrated that the primary pollination time for *P. alba* was between March and the first week of May despite some influences from weather conditions such as rain and wind (Fig. 3). This was also true for the year 2001. As far as the presence of symptoms is concerned, among 20 patients allergic to *P. alba* pollen the majority (85%) described symptoms in the season for *P. alba* pollen in Ankara. In a detailed history, these symptoms were mild and all but three patients reported to our outpatient clinic at the end of April, which is out of season for *P. alba* pollination.

Regarding the symptom-medication scores, patients with poplar allergy exhibited a bimodal symptom distribution. The first peak occurred in April, in which 76.9% of the subjects with *P. alba* pollen allergy had mild symptoms requiring no medication. In patients with a positive nasal specific provocation test, these symptoms could be attributed in part to poplar pollen allergy.

A second peak in symptom and medication use occurred in the second half of May and in June, during which patients had higher symptom and medication scores in comparison with March and April ($p < 0.05$). This increase was parallel to the increase in *Gramineae* pollen counts, to which the majority of the subjects also were allergic. As there is no *P. alba* pollen in the atmosphere of Ankara city in these months, these findings suggested that the main symptoms of these subjects belonged to their grass pollen co-sensitivity, which is the primary reason for SAR in Turkey, in agreement with other countries.^{2–6,13,14}

According to the results of the current study, the diagnostic value of nasal provocation testing was low based on symptoms during the *P. alba* pollination period. For a possible explanation, allergenic properties of the allergen extract used or different standardization procedures might have influenced the results. Alternatively, patients with negative nasal provocation to *P. alba* pollen extract might not exhibit a clinical manifestation at all, and their co-sensitivities to other tree pollens such as oak, maple, and olive, having pollination between March and April, could be responsible for the symptoms during this period.

Another problem with the poplar tree is the spreading of its seed. Every year, at the end of May or at the beginning of June, seeds of the poplar tree spread all around Ankara, creating a cotton-like storm. It is of note that, during this period, most of the pollen-allergic patients, especially grass pollen-allergic subjects, describe an increase in complaints and have a tendency to think that these seeds are responsible for their augmented symptoms. Even this association may cause social pressure to cut down these trees. In fact, the seeds spread from the female poplar tree to achieve fertilization and do not contain pollen and, in turn, have no

allergenic properties. The main problem with these seeds is limited to their nonspecific irritant effect and obstructive and flammable properties, depending on the particle size and concentration.¹⁴ In this study we have demonstrated that the seeds of the poplar tree were present at the end of May and there was no *P. alba* pollen in the atmosphere during the seed spread. These data also provide scientific evidence for the prevention of poplar tree slaughter in our city!

In conclusion, despite high *Populus alba* pollen counts, allergy to *P. alba* caused mild symptoms in subjects with SAR living in Ankara. Dominant symptoms and medication use of these patients was demonstrated to be due to their additional *Gramineae* pollen allergy. It is advisable that allergens from plants dominating a specific region should be in the battery of SPTs. However, the clinical importance of these allergens must be carefully evaluated for future advice regarding planting of trees and patient care.

REFERENCES

1. Kalyoncu AF, Çöplü L, Selçuk ZT, et al. Survey of the allergic status of patients with bronchial asthma in Turkey: A multicenter study. *Allergy* 50:451–455, 1995.
2. Kalyoncu AF, Karakoca Y, Demir AU, et al. Prevalence of asthma and allergic diseases in Turkish university students in Ankara. *Allergol Immunopathol (Madr)* 24:152–157, 1996.
3. D'Amato G, Spieksma FTM, Liccardi G, et al. Pollen-related allergy in Europe. *Allergy* 53:567–578, 1998.
4. Wissenbach M, Holm J, van Neerven RJJ, and Ipsen H. Grass pollen allergens. *Clin Exp Allergy* 28:784–787, 1998.
5. Kalyoncu AF. Perennial and seasonal rhinitis in Ankara, Turkey. *Allergy* 52:1040–1041, 1997.
6. Çelik G, Mungan D, Bavbek S, et al. The prevalence of allergic diseases and atopy in Ankara, Turkey: A two-step population-based epidemiological study. *J Asthma* 36:281–290, 1999.
7. Frank Wu LY, Steidle GM, Meador MA, et al. Effect of tree and grass pollens and fungal spores on spring allergic rhinitis. *Ann Allergy Asthma Immunol* 83:137–143, 1999.
8. Çelik G, Mungan D, Abadoğlu O, et al. Direct cost assessments in subjects with seasonal allergic rhinitis living in Ankara, Turkey. *Allergy Asthma Proc* 25:107–113, 2004.
9. Pehlivan S. Atlas of Allergenic Pollens of Turkey [Türkiye'nin alerjen pollenleri atlası]. Ünal Basımevi. Ankara, 1995 (In Turkish).
10. İnceoğlu O, Pınar NM, Şakıyan N, et al. Airborne pollen concentration in Ankara, Turkey 1990–1993. *Grana* 33:158–161, 1994.
11. Pınar M, Şakıyan N, İnceoğlu Ö, et al. A one year aeropalynological study at Ankara, Turkey. *Aerobiologica* 15:307–310, 1999.
12. Consensus statement on the treatment of allergic rhinitis. European Academy of Allergology and Clinical Immunology. *Allergy* 55:116–134, 2000.
13. Brooks DG, and Bush RK. Allergens and other factors important in atopic diseases. In Patterson's Allergic Diseases, 6th ed. Grammer LC, and Greenberger PA (Eds). Philadelphia: Lippincott Williams & Wilkins, 81–130, 1997.
14. Solomon WR, and Jelks ML. Airborne allergens. In Allergy, 2nd ed. Kaplan AP (Ed). Philadelphia: WB Saunders, 344–384, 1997.
15. Anderson JH. A survey of allergenic airborne pollen and spores in the Fairbanks area, Alaska. *Ann Allergy* 52:26–31, 1984.

16. Negrini AC, and Aroba D. Allergenic pollens and pollinosis in Italy: recent advances. *Allergy* 47:371–379, 1992.
17. Bıçakçı A, Canitez Y, Akkaya A, et al. Atmospheric pollen concentrations in Bursa and some other parts of Turkey [Bursa ve Türkiye'nin diğer bazı bölgelerindeki atmosferik polen konsantrasyonları]. *Allerji ve Astım* 2:150–155, 2000 (In Turkish).
18. Kadosa E, Bittera I, and Juhasz M. Aeropollinologic and allergologic studies for the clarification of "poplar tree hay fever." *Orv Hetil* 134:2081–2083, 1993.
19. Jung K, Schlenvoigt G, and Jager L. Allergologic-immunochemical study of tree and bush pollen. II. Study of sensitization spectrum of patients with seasonal rhinitis in the spring. *Allergol Immunol (Leipz)* 33:215–221, 1987.
20. Lewis WH, and Imber WE. Allergy epidemiology in the St. Louis, Missouri, area. III. Trees. *Ann Allergy* 35:113–119, 1975.
21. Galant S, Berger W, Gillman S, et al. Prevalence of sensitization to aeroallergens in California patients with respiratory allergy. *Ann Allergy Asthma Immunol* 81:203–210, 1998.
22. Subiza J, Jerez M, Jimenez JA, et al. Allergenic pollens and pollinosis in Madrid. *J Allergy Clin Immunol* 96:15–23, 1995. □

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.