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ORIGINAL PAPER/*PRACA ORYGINALNA*

# Importance of aerobiological monitoring to determine artemisia and ambrosia hypersensitivity

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## ABSTRACT

**Introduction:** Allergic sensitization to aeroallergen (atmospheric pollen and fungal spores) is the most common seasonal allergy trigger. The main reason for that study is unexpected skin prick test results obtained in our dermatology department. For that reason, we would like to check whether the consequences depend on cross-reactivity or aeroallergen invasion.

**Aim:** The purpose of the present study is to determine the pollen types, including the amount and concentration of the native and invasive pollen in the Çanakkale Region during the spring and summer periods. The main reason for that study is unexpected skin prick test results obtained in our dermatology department. For that reason, we would like to check whether the consequences depend on cross-reactivity or aeroallergen invasion.

**Material and methods:** The pollen monitoring station was placed in the Çanakkale Central Public Park. The sampling was performed by a Durham trap based on the gravimetric method. The slide was replaced with a new one every week and evaluated by 10× ocular and 40× apochromatic lenses.

**Results:** The primary pollen producers were the following arboreal plants: *Pinus* sp. (65.0%), *Quercus* sp. (9.37%), *Platanus* sp. (4.29%), *Moraceae* (3.87%), *Oleaceae* (2.71%). The pollen distribution of herbaceous plants and bushes were determined as *Poaceae* (4.34%), *Chenopodiaceae* (1.99%), *Plantago* sp. (1.97%) and *Xanthium* sp. (1.35%). In addition to our current knowledge, Ambrosia pollens' first record was found with a ratio of 0.22% in the Çanakkale atmosphere. These invasive plants have most probably entered the atmosphere with long-distance transport.

**Conclusions:** Aerobiological monitoring is essential to determine allergen variety and concentrations to find a cure against pollinosis. The health professionals should apply a skin prick test against a significant allergen, i.e. Ambrosia pollens even if there is no previous report in the region. The authors also advised clinicians to be aware of pollen invasion to ensure that patients do not have false-negative results.

## KEY WORDS

allergy, Alien plant, *Ambrosia pollinosis, Ailanthus altissima*, pollen.

## ADDRESS FOR CORRESPONDENCE

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## INTRODUCTION

Allergic diseases have become a pandemic health problem. The prevalence of asthma, allergic rhinitis, and atopic dermatitis have increased all over the world. It is estimated that half a billion people suffer from allergic diseases, according to the 2016 statement of the European Academy of Allergy and Clinical Immunology (EAACI) [1]. One hundred fifty million people in Europe suffer from chronic allergic diseases, and the ratio is predicted to reach fifty percent of the entire population by 2025 [1]. Allergic diseases are quite prevalent also in Turkey, and the prevalence varies between 8.5% and 18%, depending on the environmental and climate differences [2].

Sensitization to an aeroallergen (atmospheric pollen and fungal spores) is the most common seasonal allergy trigger. Pollen triggers urticaria [3], rhinitis, conjunctivitis, and allergic respiratory diseases [4]. The prevalence and severity of pollen allergy are closely related to pollen types, the biology of the plants, and the area's climate [4, 5]. The standard diagnostic techniques consist of determination of the IgE level in blood and applying skin prick testing [6]. Also, pollen sensitivity causes cross-reactivity against plant origin's food [7–10].

Depending on the factors that affect pollen concentrations and pollens' distribution, the symptoms manifest at different times. Thus, measuring pollen concentration and monitoring yearly fluctuations of allergic pollen exchange is crucial for controlling allergic symptoms.

The Çanakkale Province is located within the boundaries of the Marmara Region with eastern longitude of 25° 40'-27° 30' and northern latitude of 39°27'–40° 45' respectively. The city is the gateways between the Mediterranean and the Black Sea and links Asia and Europe; its climate has features of transitional climate due to the city's location. The pollen distribution changes depending on the city's climatic properties. Together with this, the other species' invasion power on land also relates to the climate properties of cities. The unique climate properties of the town differ from other geographical parts of Turkey.

The main reason for the study is that our hospital's dermatology department has many positive results for pollens that are not native in Çanakkale. Even if there is no similarity of the record between the skin prick test and the city's climate, the increasing number of allergic reactions caused us to evaluate the reason for this positivity. Does the prick test give false positives, or does the pollen distribution change depend on the climate change? In that paper, we would like to evaluate the main reason for increasing pollen allergy results. Does it depend on false-positive signals, or shift in pollen distribution of the atmosphere depends on non-native species' airflow?

## AIM

Thus, we aim to examine the pollen types, count, and concentrations derived from biological species and invasive alien species during spring and summer periods with the highest allergenic pollen concentrations in the season in Çanakkale, Turkey.

## MATERIAL AND METHODS

The pollen monitoring station was constructed in the Çanakkale Central Public Park, located in the city centre, and a monitoring study was conducted in April 2019-August 2019 (Figure 1). The aerobiological sampling was performed with a Durham gravimetric sampler, 15 m above the ground. Samples were prepared according to the Wodehouse method in Guidelines of the European Aerobiology Society Working Group [11]. Slides were renewed weekly, and pollen monitoring was performed by microscope. The identification and quantification of pollens were analysed with a Zeiss Primo Star Light Microscope. The pollen percentages were evaluated. The statistical analyses were performed with SPSS 18.

## RESULTS

The total quantity of pollen was documented as 4513 grains/cm$^2$ between April and August 2019 at the atmosphere of Çanakkale. In the sampling period, the predominating pollen was from the Pinaceae (65.07%) families (Figure 2).

The primary pollen producers were the following arboreal plants: *Pinus* sp. (65.0%), *Quercus* sp. (9.37%), *Platanus* sp. (4.29%), *Moraceae* (3.87%), *Oleaceae* (2.71%). The highest arboreal pollens were Pinus and mostly determined in the 2$^{nd}$ week of April, and the total amount of pollen grains were reached maximum levels in April (Figure 1). The pollen distribution of herbaceous plants and bushes was determined as *Poaceae* (4.34%), *Chenopodiaceae* (1.99%), *Plantago* sp. (1.97%) and *Xanthium* sp. (1.35%). In addition to native species, the pollen of two invasive species with highly allergic structures: *Ambrosia artemisiifolia* and *Ailanthus altissima*, were found in the Çanakkale atmosphere ratio of 0.22% and 0.13%, respectively (Figure 3). Although Ailanthus altissima is located in the Çanakkale flora, an invasive species, it's surprising to determine Ambrosia artemisiifolia pollen in glass slides. Ambrosia artemisiifolia never reported in Çanakkale land, but invasive plants' pollens have entered our atmosphere with long-distance transport. It's the first record of the Ambrosia artemisiifolia pollen in the Çanakkale atmosphere. Also, there was a significant


FIGURE 1. The location map of the study area

inverse correlation between the amount of two invasive pollen distribution and the seasons. The highest amount of Ambrosia sp.'s pollen was found in August. In contrast, *Ailanthus* sp. pollen reached its highest level in spring while the lowest level was determined in summer time (Figure 1).

## DISCUSSION

In this study, pollen grains of the invasive plants of local flora brought by airflow were identified and calculated. The aeroallergens in Çanakkale were found as *Pinaceae, Quercus* sp., *Poaceae* sp., *Platanus* sp., *Moraceae* sp., *Oleaceae* sp., *Chenopodiaceae* sp., *Plantago* sp., *Xanthium* sp. and *Artemisia* sp. The pollen grain type and concentrations of pollen are similar to close city pollen calendars.

*Ailanthus altissima* pollen is a potentially high allergen that causes respiratory disorders [1, 12]. Our data showed that Ailanthus altissima was located in the Çanakkale flora, and pollens occurred in the atmosphere. Also, *Ambrosia artemisiifolia* pollen was found in the Çanakkale atmosphere for the first time. *Ambrosia artemisiifolia* is an invasive plant that has a high adaptation ability to many climate and soil conditions. The two different climatic distribution of the ragweed is shown in the Black Sea and Thrace Region. The power of inva-

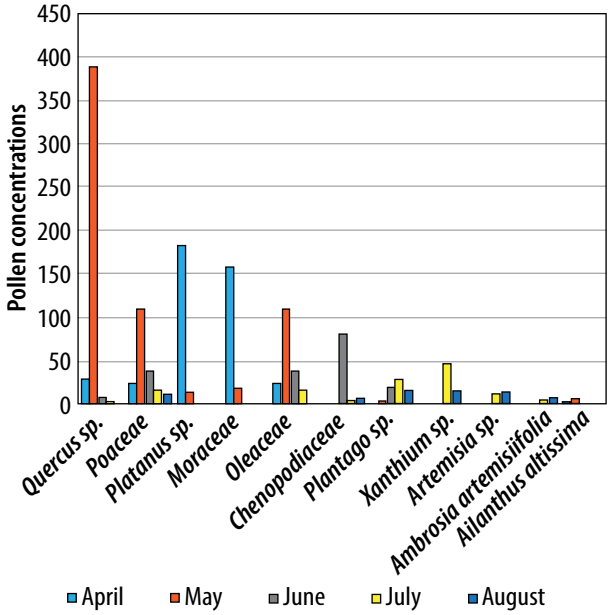


FIGURE 2. Pollen concentrations of the main taxa (pollen grains/cm$^2$) in slides by month

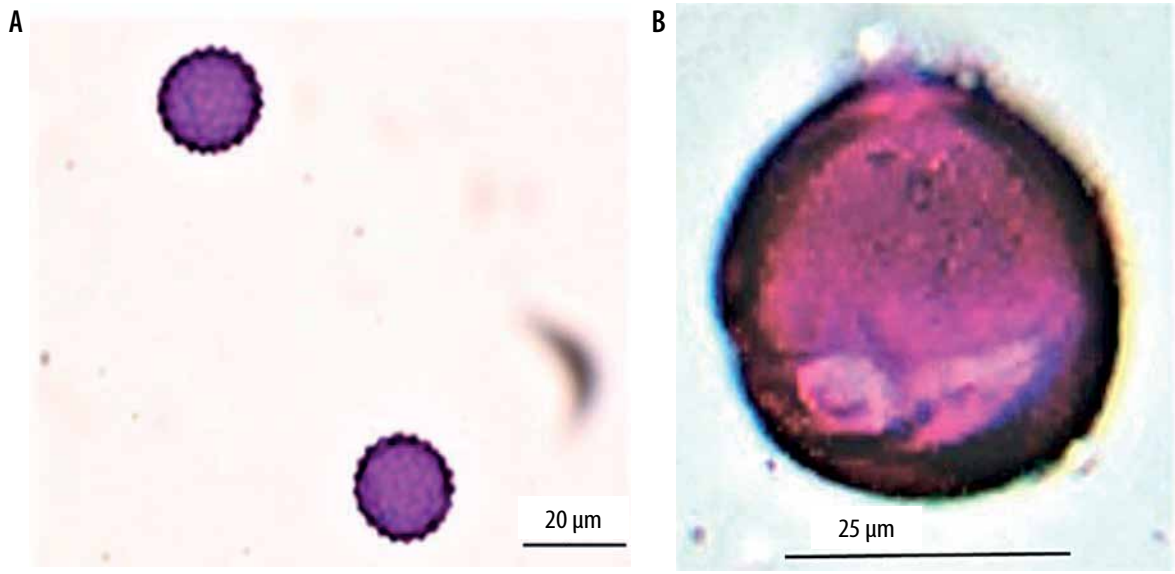


**FIGURE 3.** Microscopic representation of grains identified in Çanakkale Central: **A** – *Ambrosia artemisiifolia* (100× magnification), **B** – *Ailanthus altissima* (400× magnification). Microscopy by Mine AKKAYA

sion in a different climate is achieved by different seed germination niche and seedling emergence requirements [13]. Previously, the ragweed (*Ambrosia* spp.) pollen grains were found in Istanbul and Bursa but not in Kırlareli or Balıkesir [13–15]. The European Commission Cooperation in Science and Technology (COST) Action FA1203 group has prepared a map of the distribution of Ambrosia artemisiifolia in Europe based on the data collected during ten years (2004–2013). According to that COST study, Ambrosia artemisiifolia was shown only in İstanbul and Bursa [16]. Our study's surprising result is the first record of Ambrosia artemisiifolia pollen in the Çanakkale atmosphere.

## CONCLUSIONS

The present findings suggest that health professionals must be aware of Ambrosia artemisiifolia allergy risk in the August–September period even if there are no recorded atmospheric data in their region. In summary, our study has shown the pollen amount and varieties in the Çanakkale region and highlighted two important invasive pollen in the Çanakkale atmosphere. We want to conclude that the results may be useful to predict the beginning of the seasonal pollen allergies and assess the invasive species' impact as triggers of allergic problems. Because allergic diseases arise from many different parameters, comprehensive epidemiological studies examining the correlation of allergic diseases, and the season and allergen exchange should be conducted.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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