

Ash pollen count in the air of selected Polish cities in 2017

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Abstract: The aim of the study was to compare the pollen season of ash in Białystok, Bydgoszcz, Cracow, Drawsko Pomorskie, Lublin, Olsztyn, Sosnowiec, Szczecin, Warsaw, Wrocław and Zielona Góra in 2017 year. Measurements of pollen concentration were performed by the use of volumetric method (Burkard or Lanzoni pollen sampler). The pollen season of ash started in all measurement sites in the last week of March and first week of April. The peak values of seasonal pollen count occurred between 31st March and 10th April in all cities. The highest concentration of 772 pollen grains \times m⁻³ was noted in Cracow, and the lowest of 45 pollen grains \times m⁻³ in Białystok. The risk of pollen allergy because of the presence in the air the high concentrations of ash pollen grains was the biggest in Cracow (10 days) and in Zielona Góra (9 days). The highest annual sum (SPI, Seasonal Pollen Index) of ash pollen grains was recorded in Cracow (1928), and it was over 9 times higher than in Białystok (218).

Key words: allergens, pollen count, Ash (*Fraxinus*), 2017

Ash tree (*Fraxinus excelsior*) is the main representative of the *Oleaceae* family in temperate zones [1–3]. Diagnosis of ash pollen allergy is made difficult due to an overlapping pollination period with *Betulaceae* and some cross-reactivity with minor allergens from *Betulaceae* [1]. It is not clear whether ash pollen is a primary cause of sensitization

or whether it is implicated through cross-sensitization to other pollens [4]. *Fraxinus* is a major allergen for ash pollen-sensitized individuals in northern and central Europe [2, 3]. Ash pollen should be considered a relevant factor and distinct entity in spring pollinosis. In all, only 20% of positive skin tests to ash appear to result from cross-sensitization to pollen panallergens

[4]. Ash pollen allergy was not routinely investigated and its clinical relevance may well have been underestimated, particularly since ash and birch tree pollination times are largely the same [5].

Aim

The aim of the study was to compare the pollen season of ash in Białystok, Bydgoszcz, Cracow, Drawsko Pomorskie, Lublin, Olsztyn, Sosnowiec, Szczecin, Warsaw, Wrocław and Zielona Góra in 2017.

Material and method

Measurements of airborne alder pollen were carried out in Białystok, Bydgoszcz, Cracow, Drawsko Pomorskie, Lublin, Olsztyn, Sosnowiec, Szczecin, Warsaw, Wrocław and Zielona Góra in the year 2017. Measurements were performed by the volumetric method (Burkard and Lanzoni as the Hirst type pollen sampler).

The total pollen count over this period was expressed by the symbol SPI (Seasonal Pollen Index).

On the basis of literature data, the number of days with concentrations of the pollen of the *Fraxinus* genus exceeding the threshold values at which the consecutive allergy symptoms develop were determined (tab. 1) [2].

Results

In 2017, the ash pollen season started between 29th March (Cracow and Zielona Góra) and 6th April (Białystok) and lasted until the end of April. The peak values of seasonal pollen count occurred between 31st March and 10th April in all cities. The highest concentration of 772 pollen grains \times m⁻³ was noted in Cracow, 263 pollen grains \times m⁻³ was noted in Szczecin, 243 pollen grains \times m⁻³ was noted in Zielona Góra, and the lowest of 45 pollen grains \times m⁻³ in Białystok and 56 pollen grains \times m⁻³ in Olsztyn. The highest ash pollen allergen hazard occurred (above 45 g/m³) in Cracow (10 days) and Zielona Góra (9 days). Pollen concentration causing severe clinical symptoms (above 85 g/m³) was noted in Wrocław (7 days) and in Cracow (5 days).

Table 1. Characteristics of ash pollen season in 2017.

| Features of pollen season | Białystok | Bydgoszcz | Cracow | Drawsko Pomorskie | Lublin | Olsztyn | Sosnowiec | Szczecin | Warsaw | Wrocław | Zielona Góra |
|-------------------------------------|---------------|--------------|---------------|-------------------|---------------|---------------|--------------|---------------|---------------|-----------------|---------------|
| Seasonal Pollen Index – SPI (total) | 218 | 493 | 1928 | 605 | 1173 | 326 | 575 | 1067 | 853 | 862 | 1313 |
| Peak value and peak date | 45 (10 IV) | 76 (7 IV) | 772 (2 IV) | 167 (3 IV) | 208 (3 IV) | 56 (10 IV) | 73 (2 IV) | 263 (1 IV) | 157 (5 IV) | 134 (31 III) | 243 (2 IV) |
| Days \geq 45 g/m ³ | 1 | 3 | 10 | 4 | 6 | 2 | 3 | 9 | 6 | 7 | 9 |
| Days \geq 85 g/m ³ | 0 | 0 | 5 | 1 | 4 | 0 | 0 | 5 | 1 | 7 | 4 |

Figure 1. Ash pollen count in Białystok in 2017.

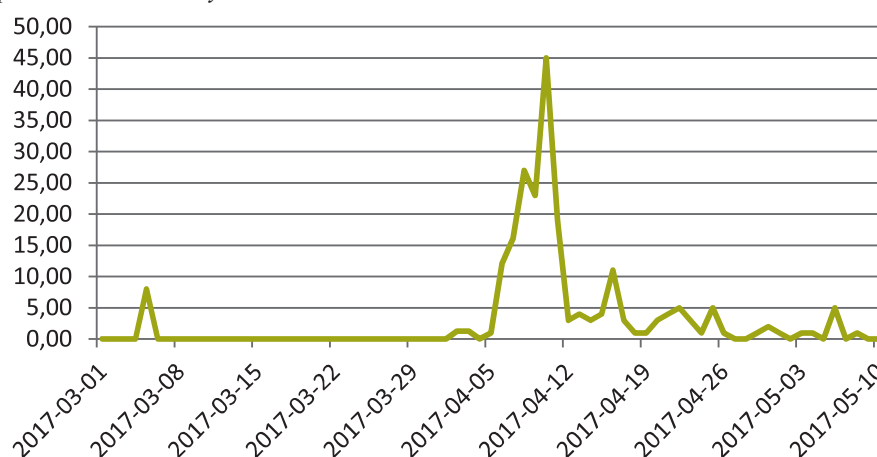


Figure 2. Ash pollen count in Bydgoszcz in 2017.

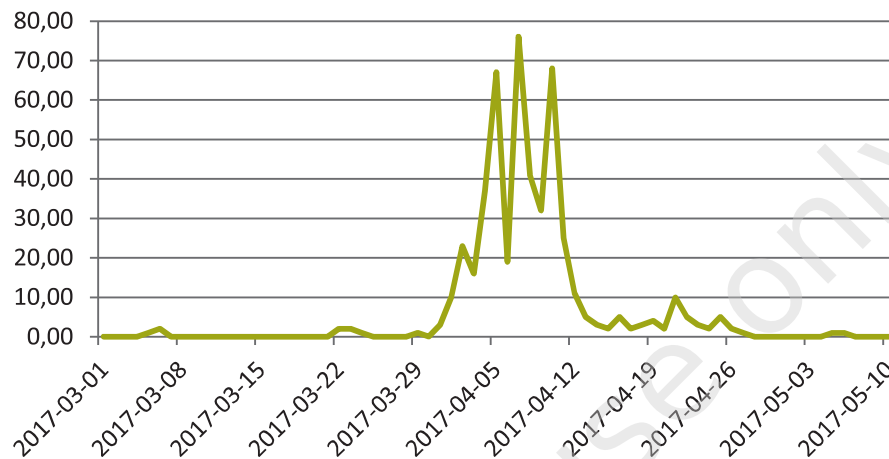


Figure 3. Ash pollen count in Cracow in 2017.

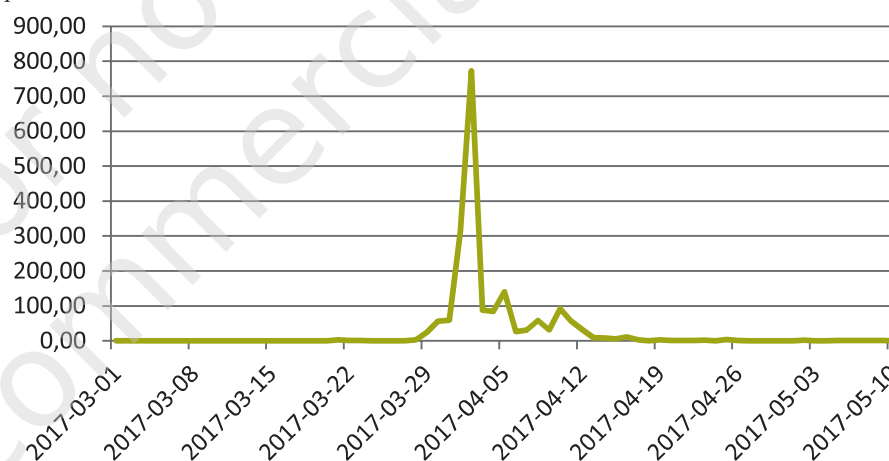


Figure 4. Ash pollen count in Drawsko Pomorskie in 2017.

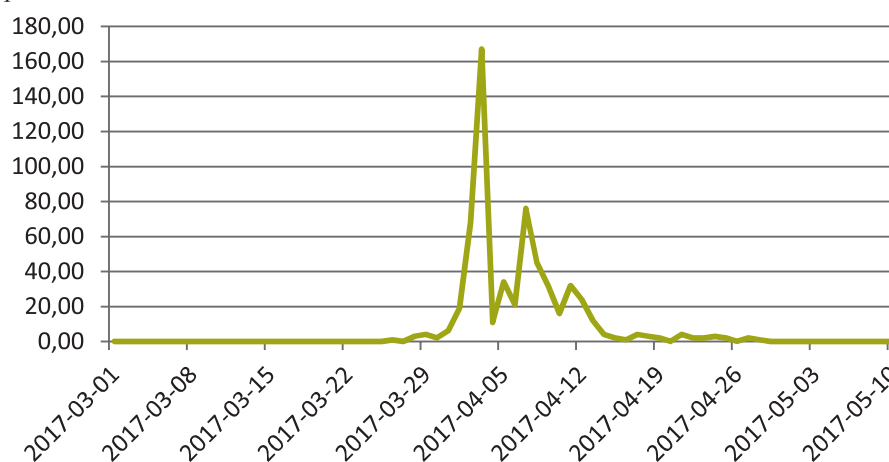


Figure 5. Ash pollen count in Lublin in 2017.

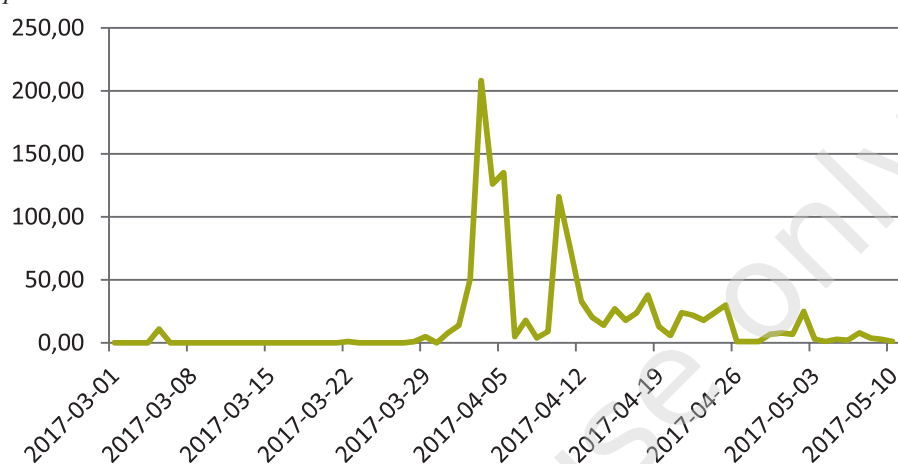


Figure 6. Ash pollen count in Olsztyn in 2017.

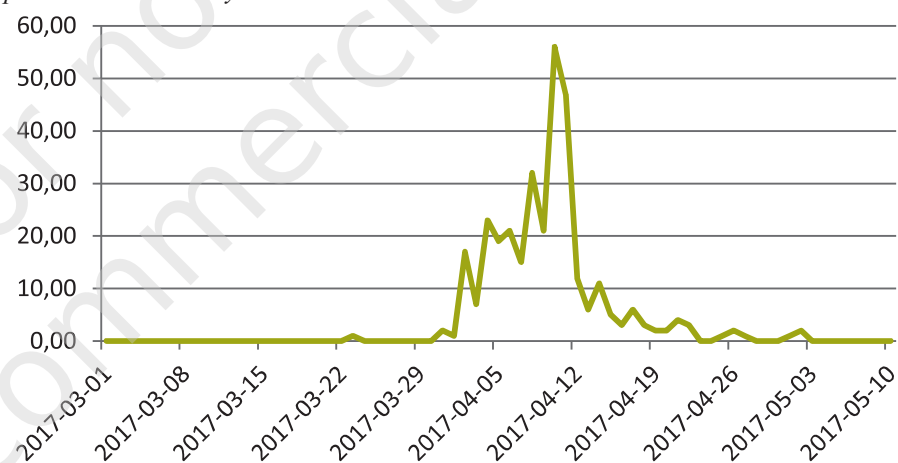


Figure 7. Ash pollen count in Sosnowiec in 2017.

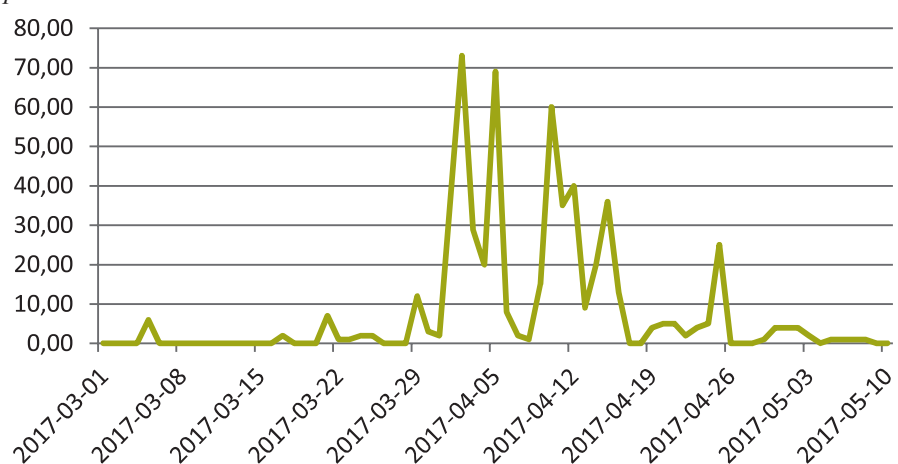


Figure 8. Ash pollen count in Szczecin in 2017.

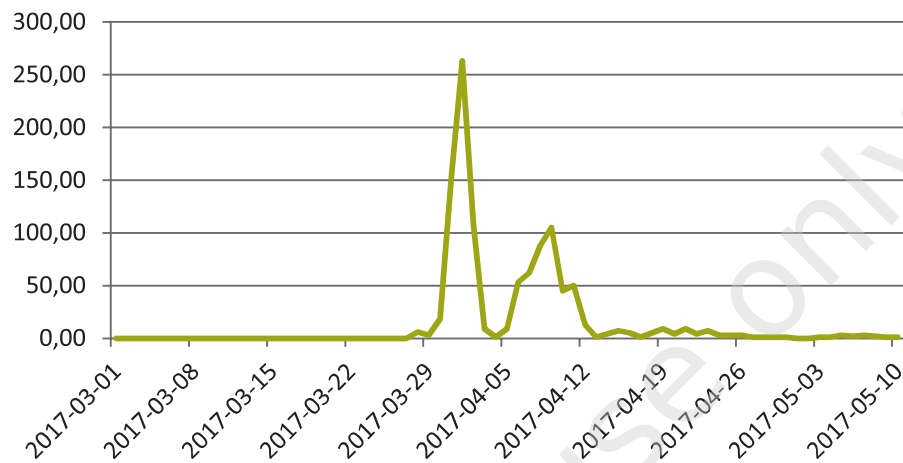


Figure 9. Ash pollen count in Warsaw in 2017.

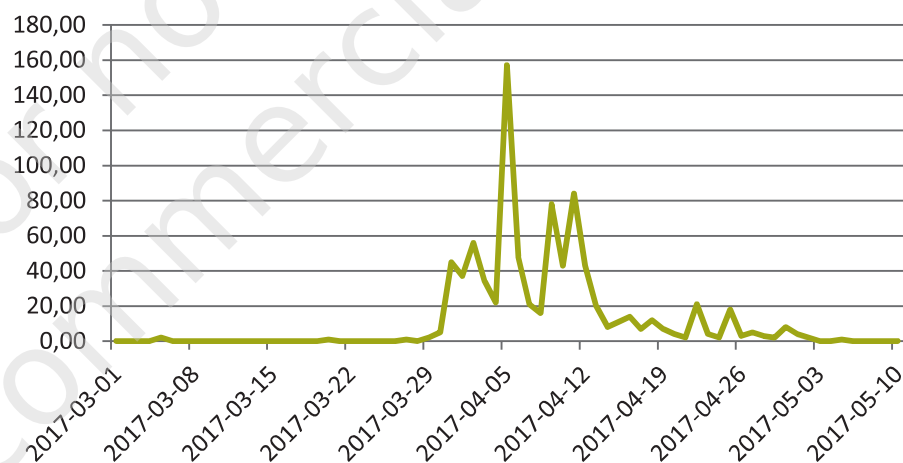


Figure 10. Ash pollen count in Wrocław in 2017.

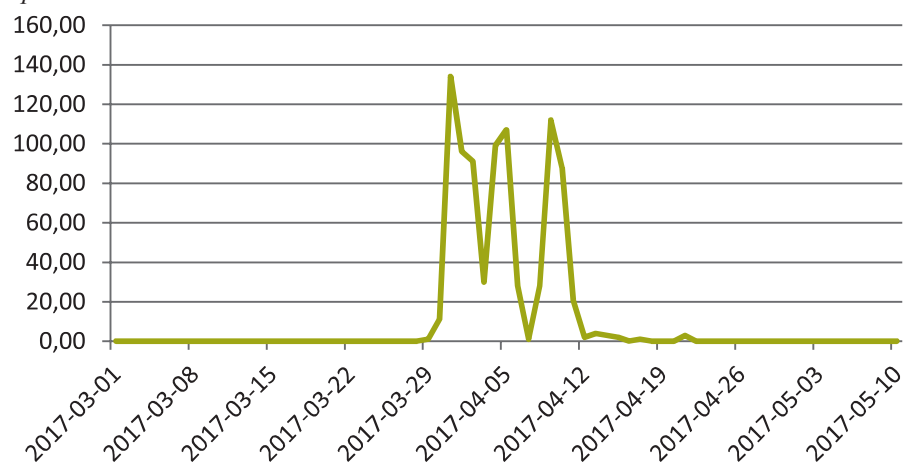
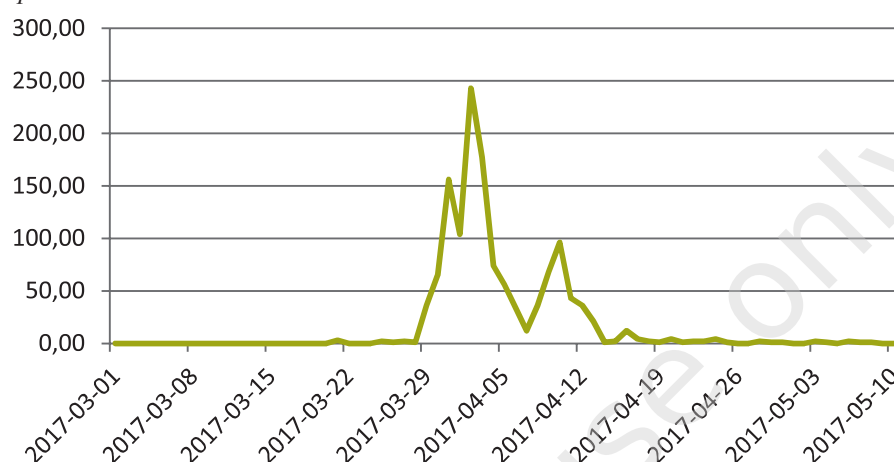


Figure 11. Ash pollen count in Zielona Gora in 2017.



Conclusions

The pollen season of ash started in all measurement sites in the last week of March and first week of April.

The peak values of seasonal pollen count occurred between 31st March and 10th April in all cities.

The highest concentration of 772 pollen grains \times m⁻³ was noted in Cracow, and the lowest of 45 pollen grains \times m⁻³ in Białystok.

The updating of pollen calendars and accurate pollen announcements are important for efficient prophylaxis and immunotherapy of pollen allergies.

- Hemmer W, Focke M, Wantke F et al. Ash (*Fraxinus excelsior*) – pollen allergy in central Europe: specific role of pollen panallergens and the major allergen of ash pollen, *Fra e 1*. *Allergy* 2000, 55(10): 923-930.
- Imhof K, Probst E, Seifert B et al. Ash pollen allergy: reliable detection of sensitization on the basis of IgE to *Ole e 1*. *Allergo J Int* 2014, 23(3): 78-83.

Authors' contributions:

Szczygielski K: 40%; Puc M: 10%; Lipiec A: 10%; and other Authors: 3% each.

Conflict of interests:

The authors declare that they have no competing interests.

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Ethics:

The contents presented in this paper are compatible with the rules the Declaration of Helsinki, EU directives and standardized requirements for medical journals.

References:

- Hrabina M, Purohit A, Oster JP et al. Standardization of an ash (*Fraxinus excelsior*) pollen allergen extract. *Int Arch Allergy Immunol* 2007, 142(1): 11-8.
- Rapiejko P. *Alergeny pyłku roślin*. Medical Education, Warszawa 2012.
- Barderas R, Purohit A, Rodríguez R et al. Isolation of the main allergen *Fra e 1* from ash (*Fraxinus excelsior*) pollen: comparison of the natural and recombinant forms. *Ann Allergy Asthma Immunol* 2006, 96(4): 557-563.

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