Analysis of Corylus pollen season in selected cities of Poland in 2025

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Abstract:
Corylus produces allergenic pollen grains that appear in the air in early spring and are among the first sources of seasonal aeroallergens in Poland. The aim of this study was to analyse and compare the *Corylus* pollen seasons in selected cities of Poland in 2025. Aerobiological monitoring was conducted in Bialystok, Olsztyn, Opole, Szczecin and Warsaw using volumetric Burkard or Lanzoni pollen samplers. Daily pollen concentrations were expressed as the number of pollen grains in 1 m^3 of air. Seasonal characteristics were determined using the Seasonal Pollen Index (SPI), peak value and peak date. In addition, the number of days with pollen concentrations exceeding clinically relevant threshold values of 35 and 80 grains/m^3 was calculated. The hazel pollen season in 2025 began between late February and early March and showed clear regional differences in intensity. The highest annual pollen sum and the greatest number of threshold exceedance days were recorded in Opole, while the lowest values were observed in Bialystok. The results indicate a moderate to high risk of allergic symptoms in sensitised individuals, particularly in central and south-western Poland.

Key words: aeroallergens, pollen concentration, risk of allergy, hazel, 2025

The hazel (*Corylus avellana* L.) is among the earliest-flowering trees in Poland, and its blooming is regarded as a phenological indicator of early spring [1]. Hazel flowers before leaf development, usually at the turn of February and March, and produces large quantities of pollen grains that are easily dispersed by wind. Due to its anemophilous pollination strategy, *Corylus* pollen frequently reaches concentrations capable of inducing allergic symptoms in sensitised individuals.

Hazel pollen allergy symptoms often precede sensitisation symptoms to other tree pollens, such as alder and birch, and therefore play an important role in the early seasonal allergy burden [2]. Numerous aerobiological studies conducted in Poland have demonstrated considerable interannual and regional variability in the timing, duration and intensity of *Corylus* pollen seasons [3–5]. These differences are primarily influenced by meteorological conditions during winter and early spring, particularly air temperature, as well as by regional differences in vegetation structure and land use.

Continuous monitoring of hazel pollen concentrations is essential for updating pollen calendars, assessing allergenic risk and improving the effectiveness of allergy prophylaxis. The present study continues

Alergoprofil 2025, Vol. 21, Nr 3, 19-23
DOI: 10.24292/01.AP.213401025

Received: 1.09.2025
Accepted: 15.09.2025
Published: 30.09.2025

long-term aerobiological observations and provides detailed data on the *Corylus* pollen season in Poland in 2025.

Aim

The aim of the study was to analyse the course and intensity of the *Corylus* pollen season in selected cities of Poland in 2025, with particular emphasis on seasonal dynamics, peak pollen concentrations and the assessment of allergenic risk based on clinically relevant threshold pollen values.

Material and methods

Aerobiological investigations of airborne *Corylus* pollen concentrations were conducted in five Polish cities: Bialystok, Olsztyn, Opole, Szczecin and Warsaw. Measurements were performed continuously using volumetric Burkard or Lanzoni pollen samplers installed at standard heights above ground level. Daily pollen concentrations were determined using standard microscopic counting procedures and expressed as the number of pollen grains per cubic meter of air (grains/m³).

Seasonal characteristics of the hazel pollen season were described using the Seasonal Pollen Index (SPI), defined as the annual sum of daily mean pollen concentrations, as well as the maximum daily pollen concentration (peak value) and the date of its occurrence. The duration of the pollen season and its dynamics were analysed based on daily concentration curves.

On the basis of clinical and aerobiological literature data, the number of days with pollen concentrations equal to or exceeding the threshold values of 35 and 80 grains/m³ was calculated for each city. These threshold values correspond to the onset of allergic symptoms in subjects sensitised to hazel pollen and to symptoms occurring in the majority of allergic patients, respectively [6].

Results

In 2025, the *Corylus* pollen season in the analysed cities of Poland showed pronounced regional differences in both intensity and temporal pattern (tab. 1). The highest annual pollen sum (SPI) was recorded in Opole (1719), indicating the greatest seasonal exposure. SPI values were considerably lower in Warsaw (776) and Szczecin (544), while the lowest annual pollen sum was observed in Bialystok (347).

The maximum daily pollen concentrations varied substantially across cities, ranging from 47 grains/m³ in Szczecin to 98 grains/m³ in Opole. High peak values were also recorded in Warsaw (83 grains/m³) and Bialystok (78 grains/m³). The peak pollen concentrations occurred between 25 February and 10 March 2025, with the earliest peak observed in Opole and the latest in Bialystok.

Analysis of daily pollen concentration curves revealed predominantly unimodal pollen seasons, with a clearly defined maximum occurring shortly after the onset of the season (fig. 1–5). Cities located in central and south-western Poland were characterised by earlier and more intensive pollen seasons than those situated in the north-eastern part of the country.

Threshold analysis demonstrated substantial differences in allergenic risk between the cities. In Opole, pollen concentrations equal to or exceeding 35 grains/m³ were recorded on 19 days, while the higher threshold of 80 grains/m³ was exceeded on 5 days. In Warsaw, these thresholds were exceeded on 5 days and 1 day, respectively. In contrast, no days with pollen concentrations ≥80 grains/m³ were recorded in Bialystok, Olsztyn or Szczecin.

Discussion

The results obtained for 2025 confirm the considerable spatial variability of *Corylus* pollen seasons in Poland reported in earlier studies [3–5]. The highest seasonal pollen load observed in Opole is consistent with the tendency for more intense hazel pollen seasons in central and south-western regions of the country, where climatic conditions favour early flowering and abundant pollen production.

The timing of peak pollen concentrations in late February and early March corresponds well with phenological observations of hazel flowering and

Table 1. *Characteristics of the Corylus pollen season in selected cities of Poland in 2025.*

City	Seasonal Pollen Index	Peak value (grains/m³)	Peak date	Days ≥35 grains/m³	Days ≥80 grains/m³
Bialystok	347	78	10.03.2025	3	0
Olsztyn	455	56	05.03.2025	2	0
Opole	1719	98	25.02.2025	19	5
Szczecin	544	47	03.03.2025	4	0
Warsaw	776	83	08.03.2025	5	1

Figure 1. *Hazel pollen concentration in Bialystok in 2025.*

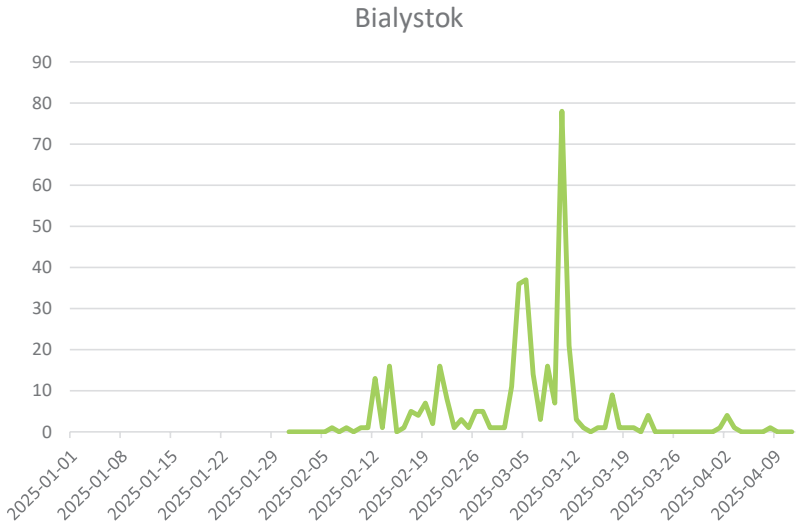

Figure 2. *Hazel pollen concentration in Olsztyn in 2025.*

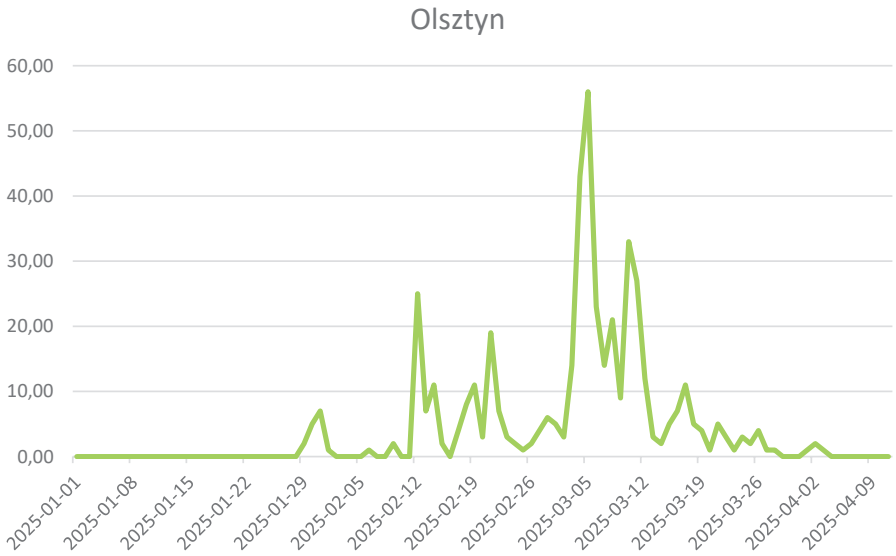

Figure 3. *Hazel pollen concentration in Opole in 2025.*

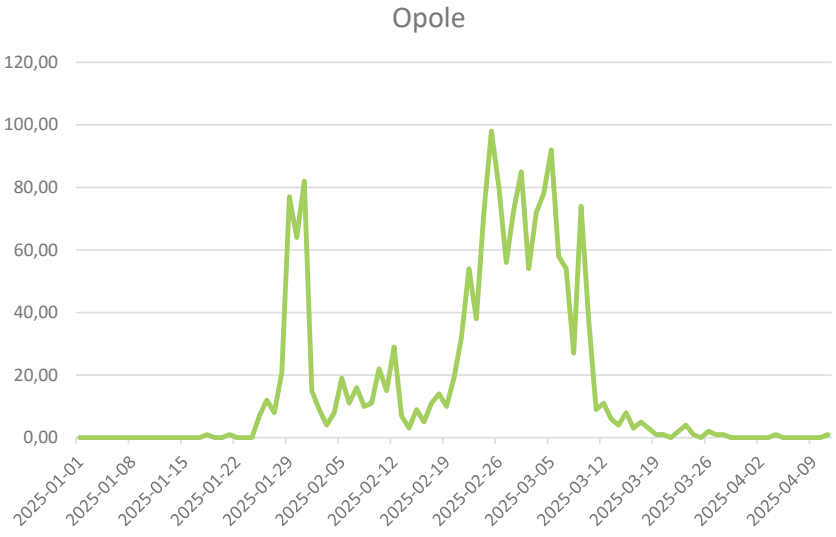

Figure 4. *Hazel pollen concentration in Szczecin in 2025.*

Figure 5. *Hazel pollen concentration in Warsaw in 2025.*

with long-term aerobiological data from Poland. The absence of days with very high pollen concentrations (≥80 grains/m³) in north-eastern Poland suggests a lower risk of severe allergic symptoms in this region.

The observed differences in pollen season dynamics underline the importance of regional pollen monitoring and support the need for locally adapted pollen forecasts. Continuous aerobiological observations remain essential for effective allergy prevention and for assessing potential changes in pollen seasons driven by ongoing climate change.

Conclusions

1. The *Corylus* pollen season in Poland in 2025 showed marked regional differences in intensity.
2. The highest hazel pollen exposure and the greatest number of threshold exceedance days were recorded in Opole.
3. Peak hazel pollen concentrations occurred mainly between late February and early March.
4. Continuous aerobiological monitoring remains essential for effective allergy prophylaxis.

References

1. *Sokołowska J. Przewodnik fenologiczny. Wydawnictwa Komunikacji i Łączności, Warszawa 1980.*
2. *Erhard SM, Bellach J, Yürek S et al. Primary and pollen-associated hazelnut allergy in school-aged children in Germany: A birth cohort study. Allergol Int. 2021; 70(4): 463-470. http://doi.org/10.1016/j.alit.2021.05.006.*

3. *Weryszko-Chmielewska E, Puc M, Rapiejko P. Comparative analysis of pollen counts of Corylus, Alnus and Betula in Szczecin, Warsaw and Lublin (2000-2001). Ann Agric Environ Med. 2001; 8(2): 235-40.*
4. *Piotrowska-Weryszko K, Weryszko-Chmielewska E, Dąbrowska-Zapart K et al. Analysis of Corylus pollen season in Poland in 2021. Alergoprofil. 2021; 17(2): 54-9.*
5. *Tomczyk S, Werner M, Malkiewicz M et al. Influence of meteorological conditions and climate on pollen season of the early-flowering woody taxa in Poland, Central Europe. Int J Biometeorol. 2025; 69(10): 2781-93. http://doi.org/10.1007/s00484-025-02995-4.*
6. *Rapiejko P, Stankiewicz W, Szczygielski K et al. Threshold pollen count necessary to evoke allergic symptoms. Otolaryngol Pol. 2007; 61(4): 591-4. http://doi.org/10.1016/s0030-6657(07)70491-2.*

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Author's contributions: JR 55%, other Authors: 15% each.
Conflict of interests: The authors declare that they have no competing interests.
Ethics: The contents presented in this paper are compatible with the rules the Declaration of Helsinki, EU directives and standardized requirements for medical journals.
Financial support: Research in Bialystok, Olsztyn, Opole and Warsaw funded by Allergen Research Center Ltd.

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