

# Alder pollen season in selected cities of Poland in 2020

Małgorzata Malkiewicz<sup>1</sup>, Krystyna Piotrowska-Weryszko<sup>2</sup>, Małgorzata Puc<sup>3</sup>, Anna Rapiejko<sup>4, 5</sup>, Dariusz Jurkiewicz<sup>6</sup>, Grzegorz Siergiejko<sup>7</sup>, Katarzyna Dąbrowska-Zapart<sup>8</sup>, Ewa Kalinowska<sup>9</sup>, Agnieszka Lipiec<sup>10</sup>

<sup>1</sup> Laboratory of Paleobotany, Department of Stratigraphical Geology, Institute of Geological Sciences, University of Wrocław, Poland

<sup>2</sup> Department of Botany and Plant Physiology, University of Life Sciences in Lublin, Poland

<sup>3</sup> Institute of Marine & Environmental Sciences, University of Szczecin, Poland

<sup>4</sup> Allergen Research Center, Warsaw, Poland

<sup>5</sup> Medical University of Warsaw, Poland

<sup>6</sup> Department of Otolaryngology with Division of Cranio-Maxillo-Facial Surgery in Military Institute of Medicine, Warsaw, Poland

<sup>7</sup> Pediatrics, Gastroenterology and Allergology Department, University Children Hospital, Medical University of Białystok, Poland

<sup>8</sup> Faculty of Natural Sciences, Institute of Earth Sciences, University of Silesia in Katowice, Poland

<sup>9</sup> Allergen Research Center, Warsaw, Poland

<sup>10</sup> Department of Prevention of Environmental Hazards and Allergology, Medical University of Warsaw, Poland

## Abstract:

This paper presents the course of alder pollination season in Poland in 2020. The measurements were performed in Bydgoszcz, Białystok, Lublin, Olsztyn, Opole, Piotrków Trybunalski, Sosnowiec, Szczecin, Warsaw, Wrocław and Zielona Góra. Volumetric method with the use of Volumetric Spore Trap (Burkard, Lanzoni) was implemented. Pollen season was defined as the period in which 95% of the annual total catch occurred. The alder pollen season in 2020 started about 10–30 days earlier compared to 2017–2019. The pollen season started first in Szczecin, Opole and Zielona Góra (in the second half of January). In the other cities alder pollen season started in first half of February. The highest daily pollen count was recorded in Lublin (1211 P/m<sup>3</sup>). In other cities the maximum concentrations ranged from 160 P/m<sup>3</sup> in Sosnowiec to 465 P/m<sup>3</sup> in Piotrków Trybunalski. The highest alder pollen concentrations were detected in the first decade of March (March 1<sup>st</sup>–3<sup>rd</sup>). Only in Zielona Góra, Wrocław, Opole and Sosnowiec the maximum concentration was recorded in the third decade of February. The annual pollen sum of *Alnus* in 2020 was even 5–10 times lower than in years 2019.

**Key words:** allergens, pollen count, alder (*Alnus*), 2020

**A**lder, birch and hazel are important sources of allergenic pollen in the temperate climatic zone of the Northern Hemisphere [1, 5]. Also sensitization rates to trees belonging to the family *Betulaceae* (hazel, alder, birch) are high in Central/Western Europe, and Poland especially showing high sensitiza-

tion rates for alder (22.8%) [2]. The threshold value for clinical symptoms for *Alnus* pollen grains for the majority of patients is visible during exposure to the concentration of 45 pollen grains in 1 m<sup>3</sup> of air. Symptoms were noted in all sensitized patients at the concentration of 85 grains/m<sup>3</sup> of air [3, 4].

**Aim**

The aim of the study was to compare the alder pollen concentration in the air of in selected cities in Poland: Bydgoszcz, Białystok, Lublin, Olsztyn, Opole, Piotrkow Trybunalski, Sosnowiec, Szczecin, Warsaw, Wrocław and Zielona Gora in 2020.

**Material and method**

In 2020, the measurements of the pollen concentration in the study sites were performed with the volumetric method using Burkard and Lanzoni pollen samplers. Microscopic observations were performed on preparations obtained in a 7-day cycle with assessment of 24-hour periods. The length of the alder pollen seasons was determined with the 95% method. Pollen concentrations were expressed as the number of pollen grains in 1 m<sup>3</sup> of air per day (P/m<sup>3</sup>). The course of the pollen seasons in each city is shown in the graphs (fig. 1–6).

**Results and discussion**

The onset of alder flowering period highly depends on atmospheric conditions, especially on cu-

mulative air temperature. Depending on weather conditions, the duration of the alder pollen season can vary by 30–50 days in individual years.

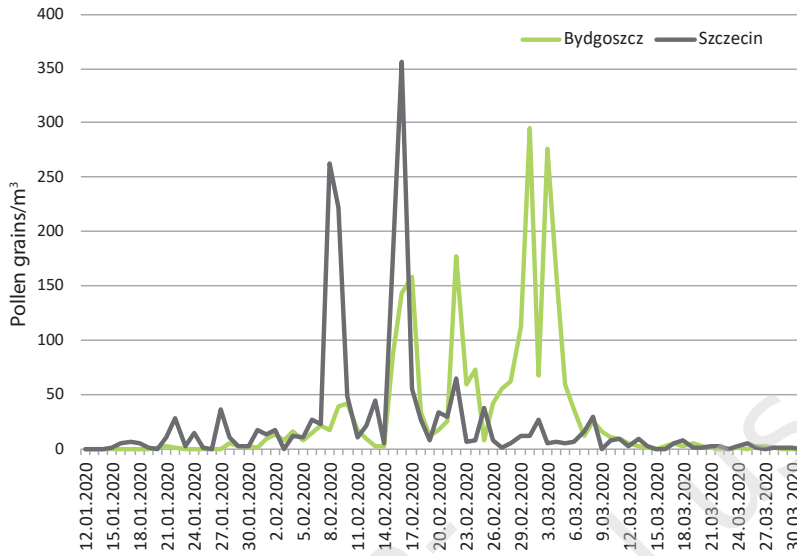
In 2020, the first grains of alder pollen were recorded in Lublin and Opole in the first decade of January. The alder pollen season (determined using the 95% method), in three cities started in the second half of January and in the other cities in February (tab. 1). The earliest the alder pollen season started in Szczecin, Opole and Zielona Gora – January 22<sup>nd</sup>, 27<sup>th</sup> and 28<sup>th</sup>. In Bydgoszcz and in Olsztyn – February 2<sup>nd</sup> and 4<sup>th</sup>, and in Sosnowiec, Warsaw and Wrocław – February 9<sup>th</sup> and 10<sup>th</sup>. The latest onset of the alder pollen season was recorded in Lublin and Białystok – February 17<sup>th</sup>. In the comparison to previous years (2017, 2019) in 2020 alder pollen season started 10–20 days earlier [6–8]. Although in 2018 alder pollen season started even later – at the beginning of March [9].

The highest alder pollen concentrations were detected in the first decade of March (March 1<sup>st</sup>–3<sup>rd</sup>) in a majority of the analysed cities. Although in Zielona Gora, Wrocław, Opole and Sosnowiec the maximum concentration occurred on February 22<sup>nd</sup> and 23<sup>rd</sup>. Only in Szczecin the highest alder pollen concentra-

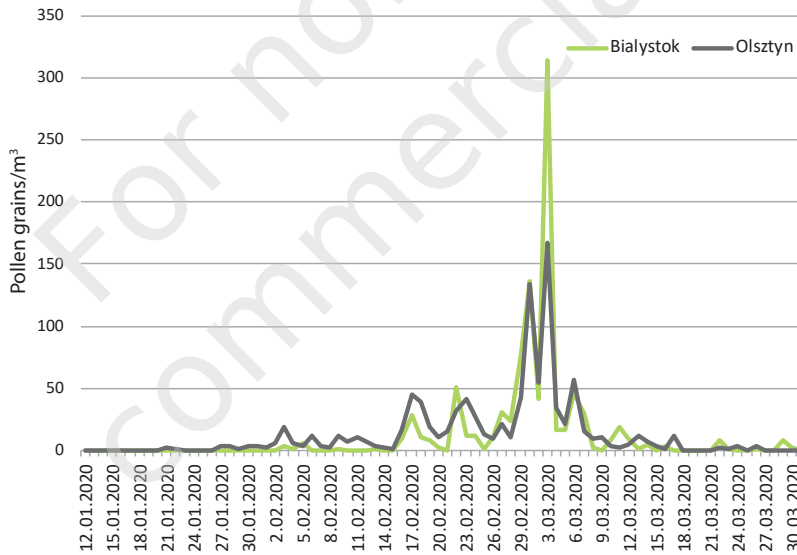
**Table 1.** Characteristics of *Alnus* pollen season in 2020.

Site	Pollen season period by the 95% method	Maximum pollen count (P/m <sup>3</sup> ) (date)	Annual pollen sum	Days number above threshold 45 P/m <sup>3</sup>	Days number above threshold 85 P/m <sup>3</sup>
Szczecin	22.01–12.03	356 16.02	1871	8	4
Bydgoszcz	4.02–9.03	295 1.03	2310	14	8
Olsztyn	2.02–15.03	167 3.03	1017	5	2
Białystok	17.02–14.03	314 3.03	958	5	2
Zielona Gora	28.01–7.03	376 22.02	2884	18	12
Warsaw	9.02–14.03	342 3.03	2756	16	10
Piotrkow Trybunalski	11.02–14.03	465 3.03	3244	18	12
Lublin	17.02–16.03	1211 3.03	5096	23	16
Wrocław	9.02–16.03	263 22.02	1826	10	4
Opole	27.01–9.03	290 22.02	3037	19	10
Sosnowiec	10.02–19.03	160 23.02	1920	13	11

**Figure 1.** Alder pollen count in Szczecin and Bydgoszcz in 2020.



**Figure 2.** Alder pollen count in Białystok and Olsztyn in 2020.



**Figure 3.** Alder pollen count in Piotrków Trybunalski and Warsaw in 2020.

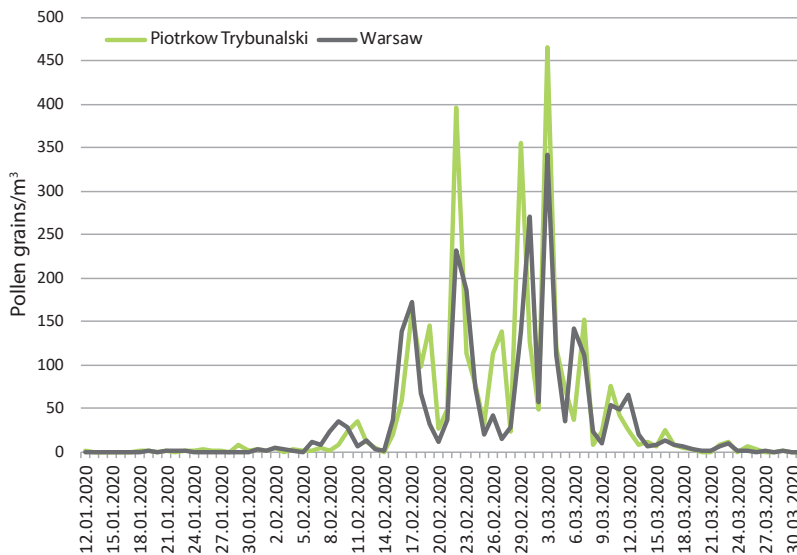


Figure 4. Alder pollen count in Zielona Gora and Wroclaw in 2020.

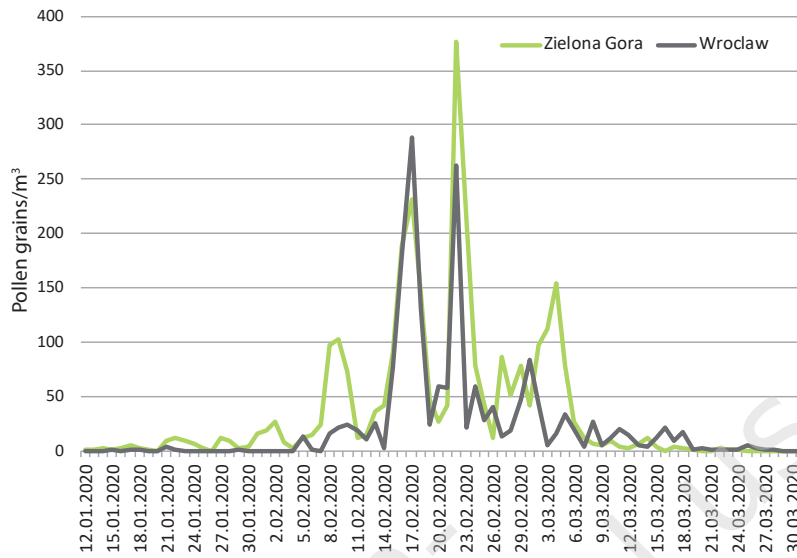


Figure 5. Alder pollen count in Sosnowiec and Opole in 2020.

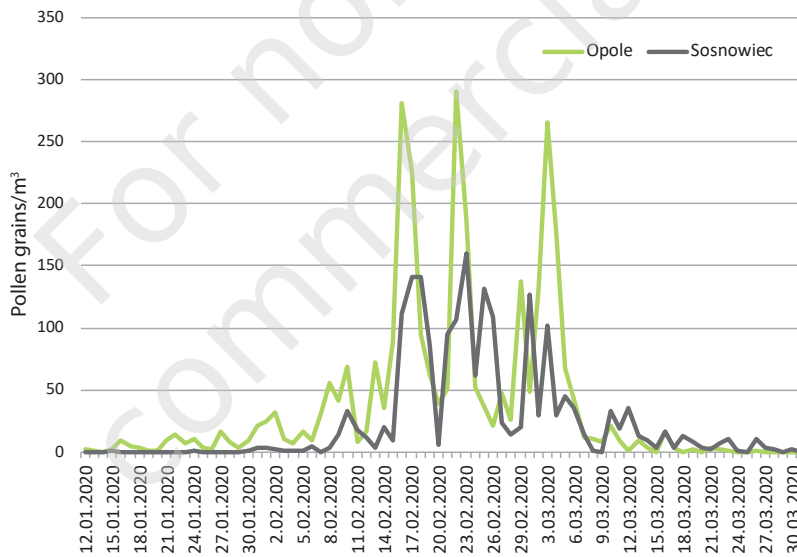
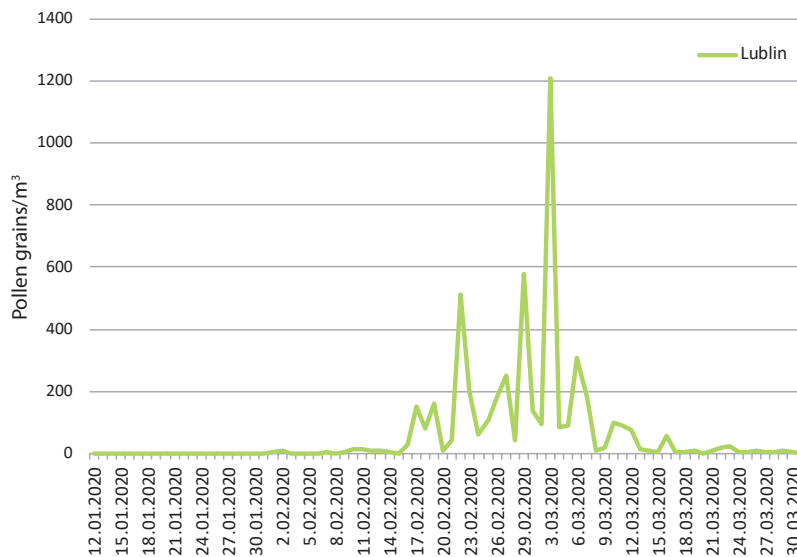


Figure 6. Alder pollen count in Lublin in 2020.



tion occurred almost 16 days earlier (February 16<sup>th</sup>). The highest daily pollen count was recorded in Lublin – 1211 P/m<sup>3</sup> (fig. 6). In other cities the maximum concentrations ranged from 263 P/m<sup>3</sup> in Wrocław to 465 P/m<sup>3</sup> in Piotrków Trybunalski (fig. 3, 4). The lowest daily alder pollen concentration were noted in Sosnowiec – 160 P/m<sup>3</sup> and Olsztyn – 167 P/m<sup>3</sup> (fig. 2, 5). The highest alder pollen concentrations were few times higher than in 2019 [6].

The highest annual pollen sum of alder pollen grains were recorded in Lublin – 5096 pollen grains. They were similarly high in Opole and Piotrków Trybunalski. In other cities annual pollen sum of alder pollen grains ranged between 1017 in Olsztyn to 2884 in Zielona Góra. Only in Białystok the annual pollen sum of alder pollen grains hasn't exceed 1000 (tab. 1). The annual pollen sum of *Alnus* in 2020 was even 5–10 times lower than in years 2019 [6].

The comparison with alder pollen seasons in previous years revealed that in 2020 alder pollen concentrations in all cities were much lower than in 2019 [6]. The highest risk of pollen allergy expressed in days with pollen levels exceeding the threshold value at which first symptoms of allergy develop (45 P/m<sup>3</sup>) was shown for Lublin (23 days) and for Opole, Piotrków Trybunalski and Zielona Góra (18, 19 days). In the other analysed cities, the risk of allergies related to the pollen levels exceeding the threshold value persisted from 5 to 16 days. Pollen concentration causing severe clinical symptoms (above 85 P/m<sup>3</sup>) was detected in Lublin (16 days) and in Piotrków Trybunalski and Zielona Góra (12 days). Only one day with the concentration above 1200 P/m<sup>3</sup> was recorded in Lublin.

## Conclusions

1. In 2020, the alder pollen season began in the second half of January and first half of February.
2. The maximum concentrations of alder pollen were recorded on second half of February and first days of March.
3. The highest concentrations for alder pollen were noted in Lublin, whereas the lowest concentrations were recorded for Sosnowiec.
4. The annual pollen sums in 2020 were much lower than those in the previous year.
5. The greatest number of days with concentrations exceeding the threshold value was noted in Lublin, Opole, Piotrków Trybunalski and Zielona Góra.

## References

1. Rodríguez-Rajo FJ, Dopazo A, Jato V. Environmental factors affecting the start of pollen season and concentrations of airborne *Alnus* pollen in two localities of Galicia (NW Spain). *Ann Agric Environ Med*. 2004; 11(1): 35-44.
2. Heinzerling LM, Burbach GJ, Edenhartner G et al. GA(2)LEN skin test study I: GA(2)LEN harmonization of skin prick testing: Novel sensitization patterns for inhalant allergens in Europe. *Allergy*. 2009; 64(10): 1498-506.
3. Rapijko P, Lipiec A, Wojdas A et al. Threshold pollen concentration necessary to evoke allergic symptoms. *Int Rev Allergol Clin*. 2004; 10(3): 91-4.
4. Rapijko P. *Alergeny pyłku roślin*. Medical Education, Warszawa 2008.
5. González-Parrado Z, Fuertes-Rodríguez CR, Vega-Maray AM et al. Chilling and heat requirements for the prediction of the beginning of the pollen season of *Alnus glutinosa* (L.) Gaertner in Ponferrada (León, Spain). *Aerobiologia*. 2006; 22(1): 47-53.
6. Malkiewicz M, Puc M, Stacewicz A et al. Alder pollen season in selected cities of Poland in 2019. *Alergoprofil*. 2019; 15(1): 22-6.
7. Piotrowska-Weryszko K, Rapijko P, Weryszko-Chmielewska E et al. *Alnus* pollen season in selected cities of Poland in 2017. *Alergoprofil*. 2017; 13(2): 81-4.
8. Puc M, Lipiec A, Kotrych D et al. Alder pollen season in northern Poland in 2017. *Alergoprofil*. 2017; 13(2): 77-80.
9. Rapijko P, Puc M, Malkiewicz M et al. *Alnus* pollen season in Poland in 2018. *Alergoprofil*. 2018; 14(1): 27-31.

## ORCID

M. Malkiewicz – ID – <http://orcid.org/0000-0001-6768-7968>  
 K. Piotrowska-Weryszko – ID – <http://orcid.org/0000-0003-3827-3218>  
 M. Puc – ID – <http://orcid.org/0000-0001-6734-9352>  
 A. Rapijko – ID – <http://orcid.org/0000-0002-8906-2405>  
 D. Jurkiewicz – ID – <http://orcid.org/0000-0003-3729-2679>  
 G. Siergiejko – ID – <http://orcid.org/0000-0003-4084-8332>  
 K. Dąbrowska-Zapart – ID – <http://orcid.org/0000-0002-8976-7739>  
 E. Kalinowska – ID – <http://orcid.org/0000-0003-4821-6882>  
 A. Lipiec – ID – <http://orcid.org/0000-0003-3037-2326>

Author's contributions: Malkiewicz M.: 60%, and other authors: 5% 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 Białystok, Bydgoszcz, Olsztyn, Opole, Warsaw, Zielona Góra and Piotrków Trybunalski funded by Allergen Research Center Ltd. (Ośrodek Badania Alergenów Środowiskowych Sp. z o.o.).

Copyright: © Medical Education sp. z o.o. This is an Open Access article distributed under the terms of the Attribution-NonCommercial 4.0 International (CC BY-NC 4.0). License (<https://creativecommons.org/licenses/by-nc/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material, provided the original work is properly cited and states its license.

*Corresponding author:*

**Małgorzata Malkiewicz, PhD**

Laboratory of Paleobotany,

Department of Stratigraphical Geology,

Institute of Geological Sciences,

University of Wrocław

50-205 Wrocław, Cybulskiego 34

e-mail: malgorzata.malkiewicz@uwr.edu.pl

For non-commercial use only