

# Populus pollen in the air of selected Polish cities in 2018

Małgorzata Malkiewicz<sup>1</sup>, Agnieszka Lipiec<sup>2</sup>, Małgorzata Puc<sup>3</sup>, Krystyna Piotrowska-Weryszko<sup>4</sup>, Beata Żuraw<sup>4</sup>, Katarzyna Dąbrowska-Zapart<sup>5</sup>, Kazimiera Chłopek<sup>5</sup>, Dariusz Jurkiewicz<sup>6</sup>, Kornel Szczygielski<sup>6</sup>, Agnieszka Kwaśnik-Balińska<sup>6</sup>, Monika Ziemianin<sup>7</sup>, Artur Górecki<sup>8</sup>, Agnieszka Świdnicka-Siergiejko<sup>9</sup>, Alina Stacewicz<sup>3</sup>, Adam Rapiejko<sup>10,11</sup>, Grzegorz Siergiejko<sup>12</sup>, Ewa M. Świebocka<sup>12</sup>, Ewa Kalinowska<sup>10</sup>, Piotr Rapiejko<sup>6</sup>

<sup>1</sup> Department of Palaeobotany, Institute of Geological Sciences, University of Wrocław, Poland

<sup>2</sup> Department of Prevention of Environmental Hazards and Allergology, Medical University of Warsaw, Poland

<sup>3</sup> Department of Botany and Nature Conservation, Faculty of Biology, University of Szczecin, Poland

<sup>4</sup> Department of Botany, University of Life Sciences in Lublin, Poland

<sup>5</sup> Department of Paleontology and Stratigraphy, Faculty of Earth Sciences, University of Silesia, Poland

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

<sup>7</sup> Department of Clinical and Environmental Allergology, Jagiellonian University, Medical College, Cracow, Poland

<sup>8</sup> Institute of Botany, Jagiellonian University, Cracow, Poland

<sup>9</sup> Department of Gastroenterology and Internal Medicine, Medical University of Białystok, Poland

<sup>10</sup> Allergen Research Center, Warsaw, Poland

<sup>11</sup> Oxford Archaeology Ltd., Oxford, England

<sup>12</sup> Pediatrics, Gastroenterology and Allergology Department, University Children Hospital, Medical University of Białystok, Poland

**Abstract:** This paper presents the course of poplar pollen season in selected Polish cities in 2018. The measurements were performed in Szczecin, Bydgoszcz, Olsztyn, Białystok, Zielona Góra, Warsaw, Piotrków Trybunalski, Lublin, Wrocław, Opole, Sosnowiec and Cracow. 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. Pollen season of poplar in 2018 started more than 30 days later in comparison to 2014. The pollen season started first in Cracow (March 20<sup>th</sup>). The highest daily pollen count was recorded in Wrocław on April 11<sup>th</sup> (1104 P/m<sup>3</sup>).

**Key words:** aeroallergens, pollen count, poplar (*Populus*), 2018

**P**oplar (*Populus sp.*) is a tree, in which the blooming period occurs at the end of March and April [1]. Pollen which is produced by male flowers reaches high concentration in the air [2–4]. In the highest moment of pollen season the maximum concentration can reach up to 2100 P/m<sup>3</sup>, although near to blooming male trees the concentration of the pollen can reach even 270 000 P/m<sup>3</sup> [1, 5]. Poplar pollen is not very significant in allergology, because oversensitivity to its allergens is rather small [6]. However, there is few scientific works pointing at clinical meaning of poplar allergens [7–9].

## Aim

The aim of the study was to compare the poplar pollen concentration in the air in selected Polish cities: Szczecin, Bydgoszcz, Olsztyn, Białystok, Zielona Góra, Warsaw, Piotrków Trybunalski, Lublin, Wrocław, Opole, Sosnowiec and Cracow in 2018.

## Material and method

In 2018, 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 poplar 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).

**The results**

The pollen season of poplar in 2018 determined with the 95% method began in the third decade of March in most of analyzed cities: Bydgoszcz, Olsztyn, Zielona Gora, Warsaw, Piotrkow Trybunalski, Lublin, Opole and Sosnowiec (tab. 1). The pollen season started first in Cracow – March 20<sup>th</sup>. In Wroclaw, Szczecin and Bialystok the pollen season started unusually late – not until the beginning of April. In comparison to 2014 the beginning of poplar pollen season was belated almost a month [10]. The length of pollen seasons fluctuated between 14 days in Wroclaw to 29 days in Olsztyn (tab. 1).

Maximum daily concentration of *Populus* pollen in analyzed cities in 2018 were diversified. The highest concentration per 24 hours – 1104 P/m<sup>3</sup> occurred in Wroclaw. The lowest in Cracow – 32 P/m<sup>3</sup>. In the rest of the cities, maximal seasonal poplar pollen concentration reached from 65 to 470 P/m<sup>3</sup> (fig. 1–6). The highest concentration of poplar pollen was between April 10<sup>th</sup> and 14<sup>th</sup> in most of the cities. Earlier

– between April 5<sup>th</sup> and 9<sup>th</sup> only in Cracow and Lublin (tab. 1). The number of days with very high concentration of pollen grains (above 100 P/m<sup>3</sup>) amounted to 9 in Zielona Gora and 6 – in Wroclaw and Opole (tab. 1).

The highest annual count of poplar pollen grains in 2018 was recorded in Wroclaw (4796 pollen grains) and Zielona Gora (3010 pollen grains). The lowest – in Cracow (266 pollen grains). In remaining cities the SPI ranged between 438 pollen grains in Bialystok and 1790 pollen grains in Opole. In 2009 in the majority of analyzed cities the maximal concentration count of pollen and the annual amount were higher than in 2018, but in 2014 lower than in 2018 [10].

The danger caused by poplar pollen allergens in 2018 was increased in Zielona Gora, Opole and Wroclaw. In those cities, the number of days with the pollen concentration above 50 P/m<sup>3</sup> was the highest (tab. 1). In Zielona Gora 12 days, in Opole – 11, and in Wroclaw 10.

**Conclusions**

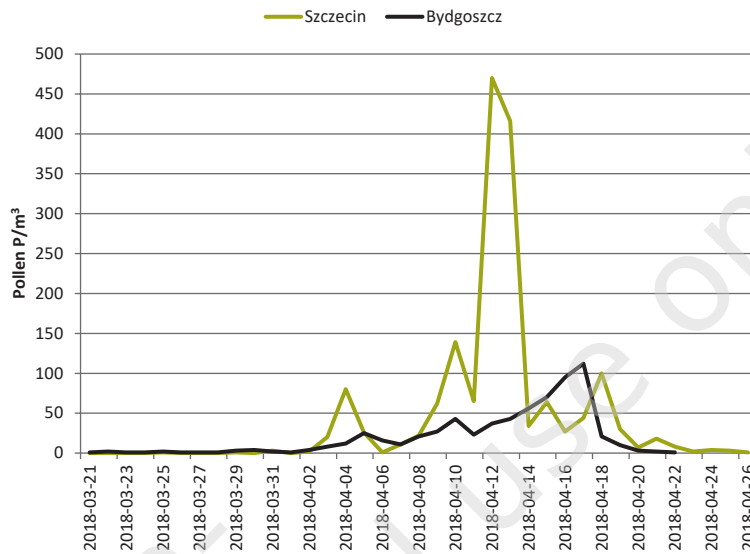
The poplar pollen seasons in 2018 in analyzed cities began sooner comparing to 2009 [3], but more than a month later comparing to 2014 [10].

The start of poplar pollen season in 2018 occurred in the third decade of March. The maximum concentrations of poplar pollen in majority of the cities were noted between April 10<sup>th</sup>–14<sup>th</sup>, only in Cracow and Lublin in the beginning of April.

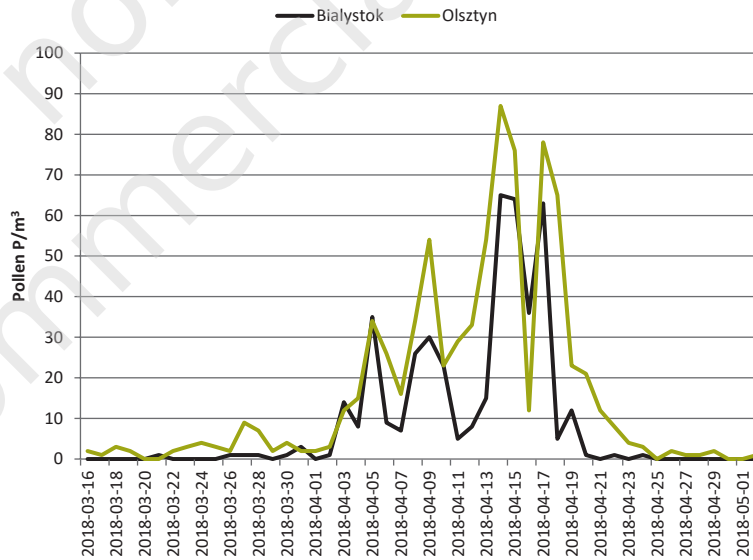
**Table 1.** Characteristics of *Populus* pollen season in 2018.

Site	Pollen season period by the 95% method	Maximum pollen count (P/m <sup>3</sup> ) (date)	Seasonal Pollen Index SPI (total)	Length of the pollen season (day)	Days number above threshold 50 P/m <sup>3</sup>	Days number above threshold 100 P/m <sup>3</sup>
Szczecin	4.04–20.04	470 (12.04)	1662	17	8	4
Bydgoszcz	30.03–19.04	112 (17.04)	660	21	4	1
Olsztyn	25.03–22.04	87 (14.04)	777	29	6	0
Bialystok	3.04–19.04	65 (14.04)	438	17	3	0
Zielona Gora	29.03–19.04	425 (12.04)	3010	22	12	9
Warsaw	30.03–19.04	156 (13.04)	951	21	6	3
Piotrkow Trybunalski	27.03–20.04	232 (12.04)	1218	25	8	4
Lublin	30.03–15.04	296 (9.04)	749	17	3	2
Wroclaw	1.04–14.04	1104 (11.04)	4796	14	10	6
Opole	26.03–18.04	266 (10.04)	1790	24	11	6
Sosnowiec	28.03–23.04	323 (10.04)	1177	27	6	3
Cracow	20.03–13.04	32 (5.04)	266	16	0	0

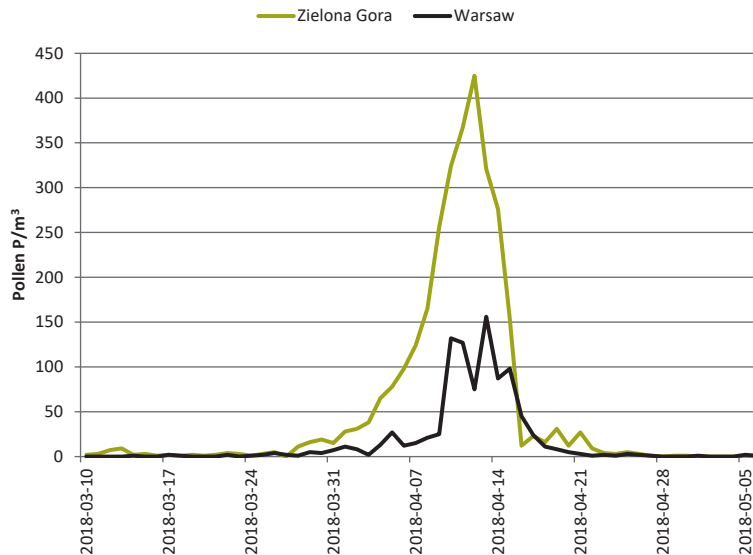
**Figure 1.** Poplar pollen count in Szczecin and Bydgoszcz in 2018.



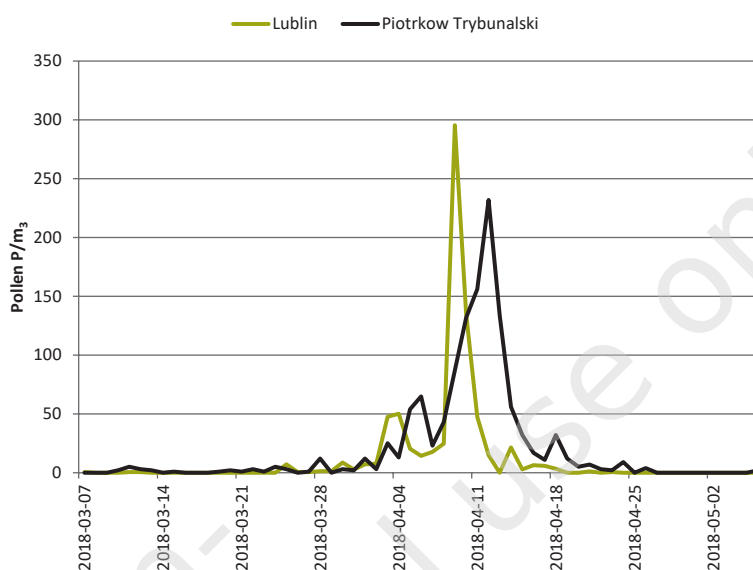
**Figure 2.** Poplar pollen count in Olsztyn and Białystok in 2018.



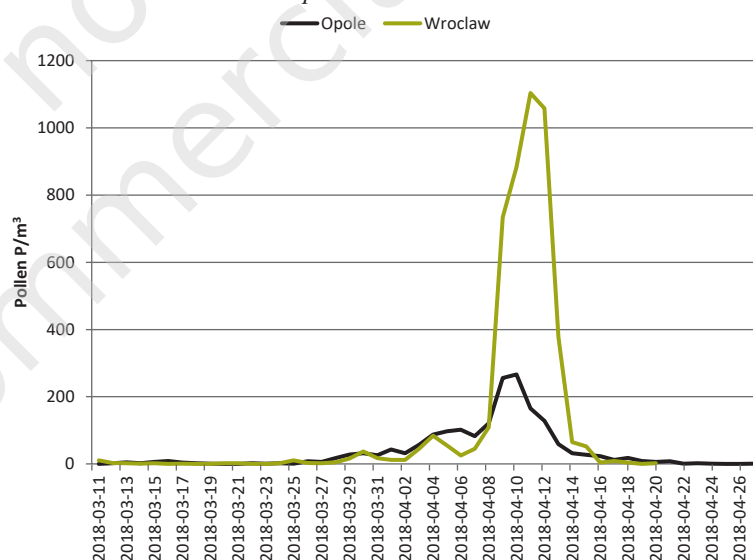
**Figure 3.** Poplar pollen count in Zielona Góra and Warsaw in 2018.



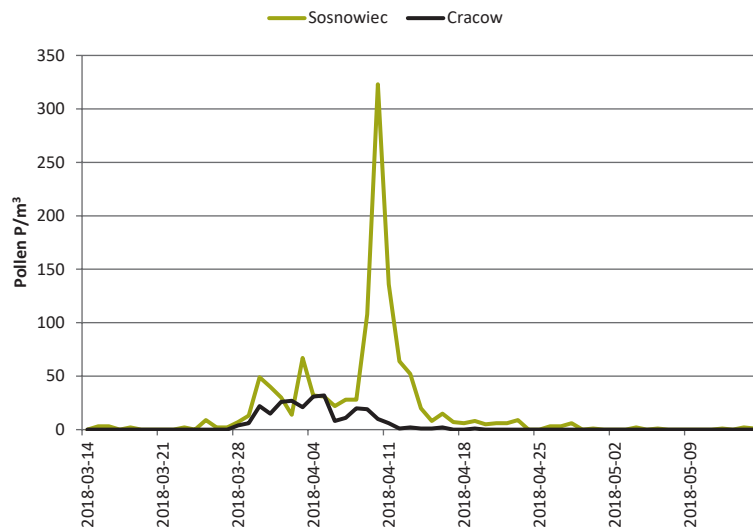
**Figure 4.** Poplar pollen count in Piotrkow Trybunalski and Lublin in 2018.



**Figure 5.** Poplar pollen count in Wroclaw and Opole in 2018.



**Figure 6.** Poplar pollen count in Sosnowiec and Cracow in 2018.



The highest concentration of poplar pollen were registered in Wrocław (1104 P/m<sup>3</sup>), the lowest – in Cracow (32 P/m<sup>3</sup>).

## References

1. Rapijko P. *Alergeny pyłku roślin*. Medical Education, Warszawa 2008.
2. Lipiec A, Myszkowska D, Puc M et al. Analiza stężenia pyłku topoli w wybranych miastach Polski w 2008 roku. *Alergoprofil* 2008, 4(3): 53-56.
3. Rapijko P, Lipiec A, Puc M et al. Pylek topoli w powietrzu wybranych miast Polski w 2009 r. *Alergoprofil* 2009, 5(2): 65-68.
4. Weryszko-Chmielewska E (red). *Pylek roślin w aeroplanktonie różnych regionów Polski*. Wyd. Katedra i Zakład Farmakognozji Wydziału Farmaceutycznego Akademii Medycznej im. Prof. F. Skubiszewskiego, Lublin 2006: 49-58.
5. Rapijko P. *Alergeny pyłku topoli*. *Alergoprofil* 2008, 4(2): 30-32.
6. Rapijko P, Lipiec A, Emeryk A et al. Annual total amount of pollen and the frequency of positive skin prick test results to pollen allergens. *Polish J. Environ. Stud.* 2006, 15(2a): 653-660.
7. Lin RY, Clauss AE, Bennet ES. Hypersensitivity to common tree pollen in New York City patients. *Allergy Asthma Proc* 2002, 23(4): 253-258.
8. Dales RE, Cakmak S, Judek S et al. Tree pollen and hospitalization for asthma in urban Canada. *Int Arch Allergy Immunol* 2008, 146(3): 241-247.
9. Celik G, Mungan D, Pinar M, Misirligil Z. Poplar pollen-related allergy in Ankara, Turkey: how important for patients living in a city with high pollen load? *Allergy Asthma Proc* 2005, 26(2): 113-119.
10. Chłopek K, Malkiewicz M, Weryszko-Chmielewska E et al. Pylek topoli w powietrzu wybranych miast Polski w 2014 r. *Alergoprofil* 2014, 10(3): 31-35.

Authors' contributions: Malkiewicz M: 60%; and other Authors: 2,2% each.

Conflict of interests: The authors declare that they have no competing interests.

Financial support: Research in Białystok, Bydgoszcz, Olsztyn, Opole, Zielona Góra, Piotrków Trybunalski and Warsaw funded by Allergen Research Center Ltd. (Ośrodek Badania Alergenów Środowiskowych Sp. z o.o.).

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

Corresponding author:

**Małgorzata Malkiewicz**

Laboratory of Paleobotany,

Institute of Geological Sciences,

University of Wrocław

50-205 Wrocław, ul. Cybulskiego 34

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