

Alder pollen season in selected cities of Poland in 2019

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Abstract:

This paper presents the course of alder pollination season in Poland in 2019. The measurements were performed in Bydgoszcz, Cracow, 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 2019 started about 20 days earlier compared to 2018. The pollen season started first in Szczecin. The highest daily pollen count was recorded in Wrocław on February 26th (4266 P/m³).

Key words: allergens, pollen count, alder (*Alnus*), 2019

Alder is an early flowering tree. The onset of alder flowering period highly depends on atmospheric conditions, especially on cumulative air temperature.

Alder pollen, next to hazel and birch pollen, is a very common cause of pollinosis in Central and Northern Europe [1]. It is present in the air already at the turn of winter and spring, and one alder inflorescence can produce up to 3 680 000 pollen grains [2].

The onset and peak of the alder pollen season show a significant variability. Depending on weather conditions, the duration of the alder pollen season can vary by 30–50 days in individual years.

The threshold concentration of alder pollen in Poland is 45 grains/m³ of air [2, 3]. With the concentration of 85 grains/m³ of air, all individuals allergic to alder pollen suffer from pollinosis.

Aim

The aim of the study was to compare the alder pollen concentration in the air of in selected cities in Poland: Bydgoszcz, Cracow, Lublin, Olsztyn, Opole, Piotrkow Trybunalski, Sosnowiec, Szczecin, Warsaw, Wroclaw and Zielona Gora in 2019.

Material and method

In 2019, 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 m³ of air per day (P/m³). The course of the pollen seasons in each city is shown in the graphs (fig. 1–6).

Results and discussion

In 2019, the first grains of alder pollen were recorded in Szczecin in the first half of January, and in Sosnowiec at the end of January. However, the period of consistent pollination, determined using the 95% method, started in the second half of February (tab. 1), similarly to 2017 and 20 days earlier in comparison to 2018 [4, 5]. The dates of the alder pollen season onset in the analysed cities in Poland in 2019 were very similar. The earliest the alder pollen season started in Szczecin – February 16th, and Opole, Wroclaw and Zielona Gora – February 19th (tab. 1). In Bydgoszcz and in Lublin – February 20th, and in Sosnowiec, Warsaw, Piotrkow Trybunalski and Cracow – February 21st (tab. 1). The latest onset of the alder pollen season was recorded in Olsztyn – February 28th.

The highest alder pollen concentrations were detected in the third decade of February (26th–28th February) in a majority of the analysed cities. Only in Szczecin the highest alder pollen concentration

Table 1. Characteristics of alder pollen season in 2019.

Site	Pollen season period by the 95% method	Maximum pollen count (P/m ³) (date)	Annual pollen sum	Length of the pollen season (day)	Days number above threshold 45 P/m ³	Days number above threshold 85 P/m ³	Days number above threshold 1200 P/m ³
Szczecin	16.02–7.03	2003 18.02	15 357	20	24	20	6
Bydgoszcz	20.02–14.03	1867 28.02	11 162	23	20	17	2
Olsztyn	28.02–24.03	1975 1.03	7820	25	19	14	2
Zielona Gora	19.02–9.03	2879 27.02	18 597	19	22	21	5
Warsaw	21.02–13.03	2387 28.02	10 349	21	20	16	2
Piotrkow Trybunalski	21.02–11.03	2672 28.02	11 522	19	19	18	2
Lublin	20.02–15.04	2091 28.02	11 209	55	27	19	3
Wroclaw	19.02–14.03	4266 26.02	18 467	24	24	22	5
Opole	19.02–8.03	2657 26.02	18 622	18	21	19	7
Sosnowiec	21.02–10.03	1914 26.02	6783	18	16	13	1
Cracow	21.02–9.03	1481 28.02	7445	17	17	15	2

Figure 1. Alder pollen count in Szczecin and Bydgoszcz in 2019.

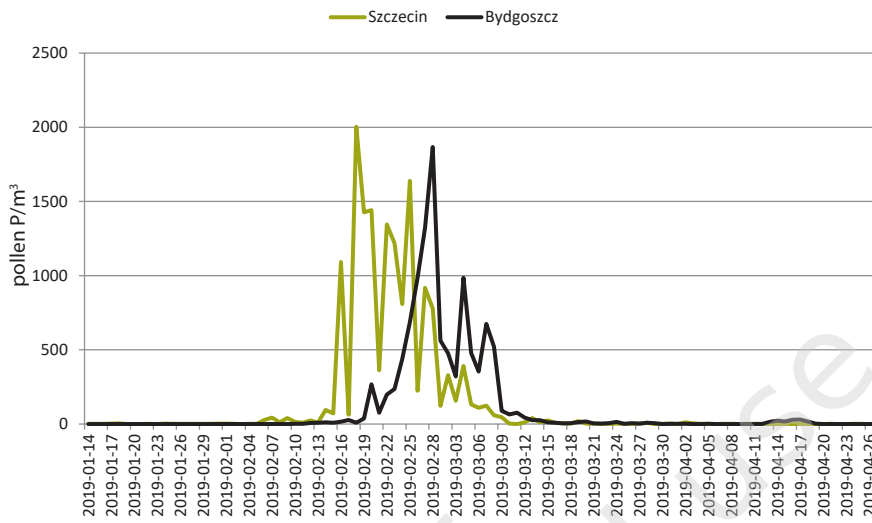


Figure 2. Alder pollen count in Zielona Gora and Olsztyn in 2019.

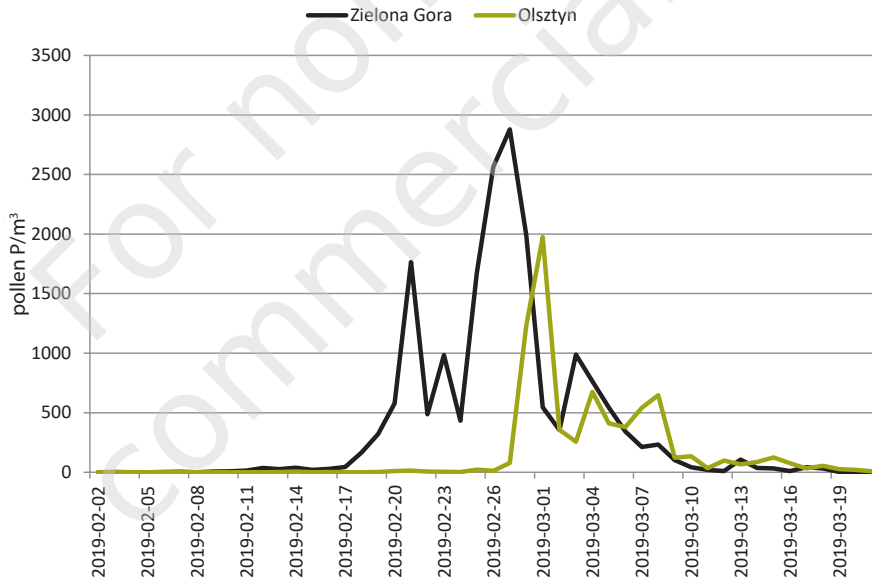


Figure 3. Alder pollen count in Piotrkow Trybunalski and Warsaw in 2019.

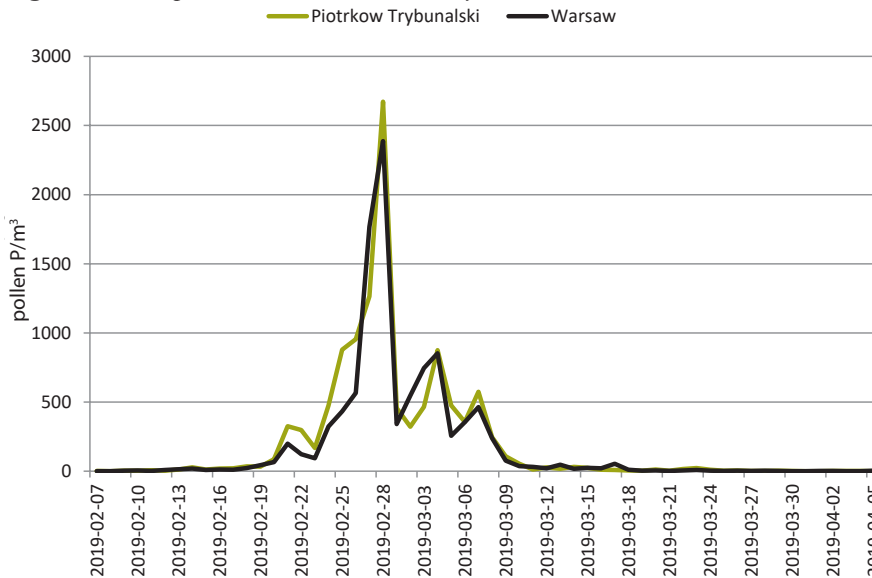


Figure 4. Alder pollen count in Lublin and Cracow in 2019.

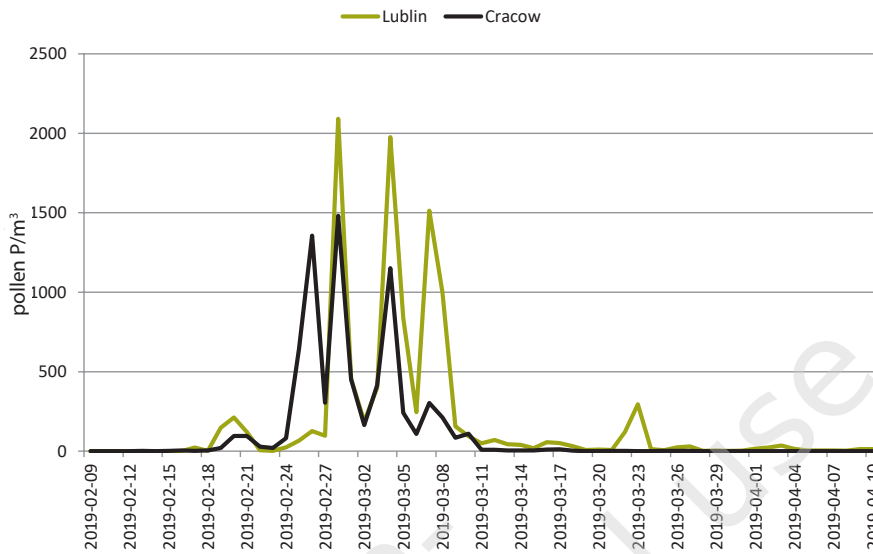


Figure 5. Alder pollen count in Sosnowiec and Opole in 2019.

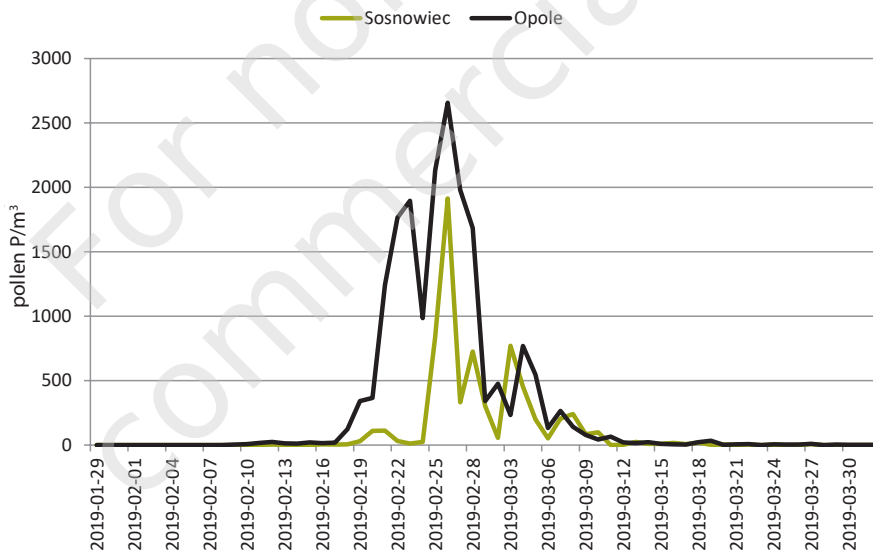
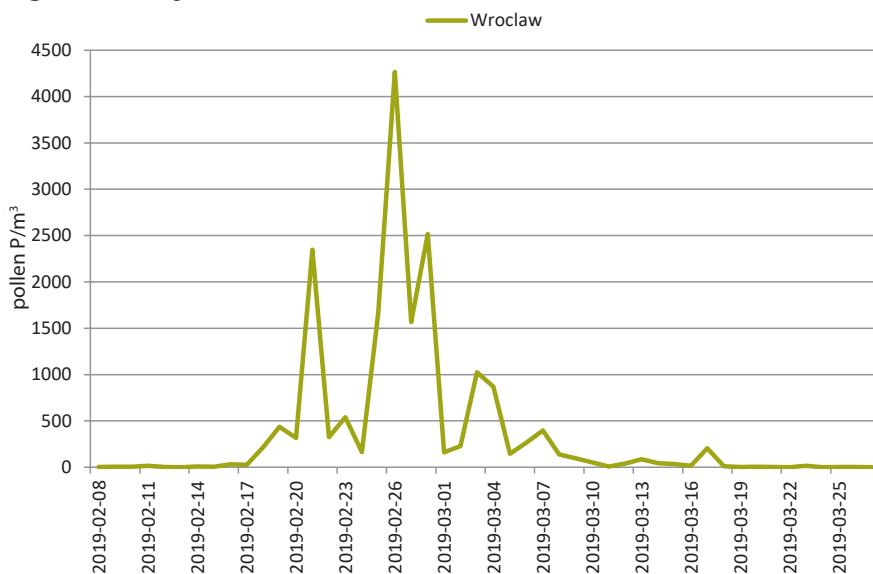


Figure 6. Alder pollen count in Wroclaw in 2019.



occurred almost 10 days earlier (February 18th), although in Olsztyn it occurred on March 1st, which is the latest date. The highest daily pollen count was recorded in Wrocław – 4266 P/m³ (fig. 6). In other cities the maximum concentrations ranged from 1867 P/m³ in Bydgoszcz to 2879 P/m³ in Zielona Góra (fig. 1, 2). The lowest daily alder pollen concentration were noted in Cracow – 1481 P/m³ (fig. 4). The highest alder pollen concentrations were few times higher than in 2018 [5].

The highest annual pollen sum of alder pollen gains were recorded in Opole – 18 622 pollen grains. They were similarly high in Wrocław and Zielona Góra. In other cities annual pollen sum of alder pollen gains ranged between 10 349 in Warsaw to 15 357 in Szczecin (tab. 1). Only in Olsztyn, Sosnowiec and Cracow the annual pollen sum of alder pollen grains hasn't exceed 8000 (tab. 1). The annual pollen sum of *Alnus* in 2019 was even 3–5 times higher than in years 2017–2018 [4, 5].

The comparison with alder pollen seasons in previous years revealed that in 2019 alder pollen concentrations in all cities were much higher than in 2017–2018 years [4, 5]. 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/m³) was shown for Lublin (27 days) and for Wrocław and Szczecin (24 days). In the other analyzed cities, the risk of allergies related to the pollen levels exceeding the threshold value persisted from 16 to 22 days. Pollen concentration causing severe clinical symptoms (above 85 P/m³) [2, 3] was detected in Wrocław (22 days) and Zielona Góra (21 days). In all of the analysed cities there were days with the concentration above 1200 P/m³ which caused diponea in people allergic to alder pollen.

Conclusions

1. In 2019, the alder pollen season in all the analyzed cities began in the second half of February.
2. The maximum concentrations of alder pollen in majority of the cities were recorded on a similar date (February 26th–28th).

3. The highest concentrations for alder pollen were noted in Wrocław, whereas the lowest concentrations were recorded for Sosnowiec.
4. The annual pollen sums in 2019 were higher than those in the previous year.
5. The greatest number of days with concentrations exceeding the threshold value was noted in Lublin, Wrocław and Szczecin.

References

1. Wihl JA, Ipsen B, Nuchel PB et al. Immunotherapy with partially purified and standardized tree pollen extracts. *Allergy* 1998, 43: 363-369.
2. Rapiejko P. *Alergeny pyłku roślin. Medical Education, Warszawa 2008.*
3. Rapiejko P, Lipiec A, Wojdas A et al. Threshold pollen concentration necessary to evoke allergic symptoms. *Int Rev Allergol Clin* 2004, 10(3): 91-94.
4. Piotrowska-Weryszko K, Rapiejko P, Weryszko-Chmielewska E et al. *Alnus pollen season in selected cities of Poland in 2017. Alergoprofil* 2017, 13(2): 81-84.
5. Rapiejko P, Puc M, Malkiewicz M et al. *Alnus pollen season in Poland in 2018. Alergoprofil* 2018, 14(1): 27-31.

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