Alder pollen season in northern Poland in 2017

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Abstract: Tree pollens are responsible for type I allergies during the flowering season in late winter and early spring. Pollen grains from e.g. alder constitute the important allergen sources in this respect in the northern hemisphere. The aim of the study was to investigate the concentration of alder (*Alnus* spp.) in Szczecin, Drawsko Pomorskie, Bydgoszcz, Olsztyn, Warsaw and Bialystok in 2017. In northern Poland, the genus *Alnus* Mill. is represented by only 2 species, *A. glutinosa* (L.) Gaertner and *A. incana* (L.) Moench. Measurements were performed by the volumetric method (Burkard and Lanzoni pollen samplers). Pollen season was defined as the period in which 98% of the annual total catch occurred. Seasonal Pollen Index (SPI) was estimated as the annual sum of daily average pollen concentrations. The pollen season of alder started first in Szczecin, on the 21st February and also in Bialystok and Drawsko Pomorskie on the 22nd February (only one day later). This pollen season lasted till the 3rd April in Bialystok. The differences of pollen seasons duration ware not considerables. The highest, record airborne concentration of 1215 pollen grains/m^3 was noted in Szczecin on the 4th March and in Warsaw, Drawsko Pomorskie, Bydgoszcz and Olsztyn on the 5th of March. The peak values of seasonal pollen count occurred between 4th and 22nd March in all cities.

Key words: allergens, pollen count, alder (*Alnus*), 2017

Alnus pollen is an early component of the annual atmospheric aerosol of the north-west regions of Poland, which causes the first occurrence of allergic symptoms. Clinical symptoms of allergic disease are connected with the high concentration of aeroallergen [1].

Alder (*Alnus* Mill.) belongs to the order *Fagales* Engl. and the family *Betulaceae* Gray [2]. This tree with birch and hazel are important sources of allergenic pollen in the temperate climatic zone of the Northern Hemisphere. The major pollen allergens from members of the family *Betulaceae* are structurally and immunochemically similar. Therefore, alder, birch and hazel allergens have a high degree of cross-reactivity [3]. Approximately 15% of the European population suffers from allergies, and Poland is one of the countries with the highest allergy incidence rates, up to 45%. It mostly affects children and young people. Sensitisation rates to trees belonging to the family *Betulaceae* are high in Central/Western Europe, with Poland showing high sensitisation rates for alder (22.8%) [4].

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^3 of air. Symptoms were noted in all sensitized patients at the concentration of 85 grains/m^3 of air [5].

Aim

The aim of the study was to analyze the alder pollen seasons in the air of Szczecin, Drawsko Pomorskie, Bydgoszcz, Olsztyn, Warsaw and Bialystok in 2017.

Material and method

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

The pollen season was defined using the 98% method; the day on which the cumulative pollen count during the period 1st January–30th June reached the value of ≥ 1% was determined to be the start date of the pollen season, and the end of the season was the day when the cumulative pollen count was ≥ 99% [6]. 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 *Alnus* genus pollen concentrations exceeding the threshold values at which the consecutive allergy symptoms develop were determined (tab. 1) [5].

Results and discussion

Winter-flowering trees such as the alder (*Alnus glutinosa* [L.] Gaertner) can survive periods of adverse climatic conditions, entering a period of dormancy in the early fall. The end of dormancy and the start of the pollen season require a period of low temperatures followed by another of warm temperatures. These requirements were studied in Spain. Chilling accumulation took place from late October to late December or early January. The best result was obtained with a threshold temperature of 6.5°C and an average of 848 chilling hours. Heat requirements were calculated at maximum temperature, an average 143 growth degree days were needed, with a threshold temperature of 0°C [7]. These observations also refer to data from Poland.

If common alder and grey alder grown in the same habitat, *A. incana* flowers several days to 3 weeks prior to *A. glutinosa* [8]. In 2017, the alder pollen season started between 21st and 26th February and lasted until the beginning of April. For example in 2015 the alder pollen season in most of Poland's area started 9–10th March. Also in 2015 the maximum daily concentration was observed between 8th and 13th March [9]. Similarly in 2017 in most cities of central and northern Poland the dates of maximum concentrations were noted between 4th and 22nd March (tab. 1; fig. 1–3).

The highest daily pollen count was noted in 2017 in Szczecin (1215 g/m^3) (tab. 1) and the highest annual sum of alder pollen grains (SPI) was observed in Warsaw, only 6273 and it was about 2 times lower than in Piotrkow Trybunalski in 2016 [10].

The highest alder pollen allergen hazard occurred (above 45 g/m^3) in Olsztyn and Warsaw (25–26 days). Pollen concentration causing severe clinical symptoms (above 85 g/m^3) was noted also in Warsaw and in Bydgoszcz 18–21 days). The comparison of alder pollen seasons in previous years revealed that in 2017 alder pollen concentrations in all cities compared in this paper were much lower than in 2016 [9]. In comparison to data from 2001–2005 [11] in northern

Table 1. *Characteristics of alder pollen season in 2017.*

Features of pollen season	Szczecin	Drawsko Pomorskie	Bydgoszcz	Olsztyn	Warsaw	Bialystok
Duration of pollen season (number of days)	21 II–28 III (36)	22 II–31 III (38)	25 II–29 III (33)	26 II–31 III (34)	23 II–28 III (34)	22 II–3 IV (40)
Seasonal Pollen Index – SPI (total)	5759	5023	4188	4125	6273	2994
Peak value and peak date	1215 (4 III)	986 (5 II)	698 (5 III)	432 (5 III)	1121 (5 III)	619 (22 III)
Days ≥ 45 g/m^3 [5]*	22	23	24	26	25	18
Days ≥ 85 g/m^3 [5]**	13	13	18	17	21	10

** first symptoms of allergy*
*** symptoms present in all examined patients.*

Figure 1. *Alder pollen count in Szczecin and Olsztyn in 2017.*

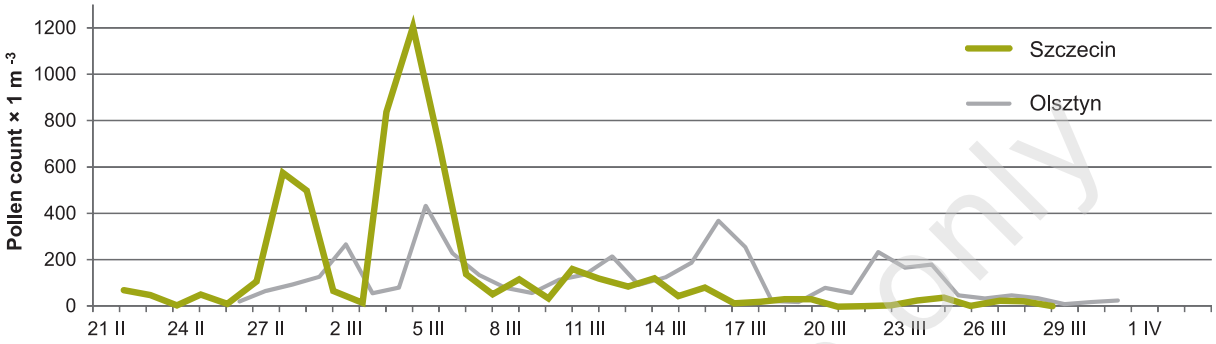


Figure 2. *Alder pollen count in Drawsko Pomorskie and Bydgoszcz in 2017.*

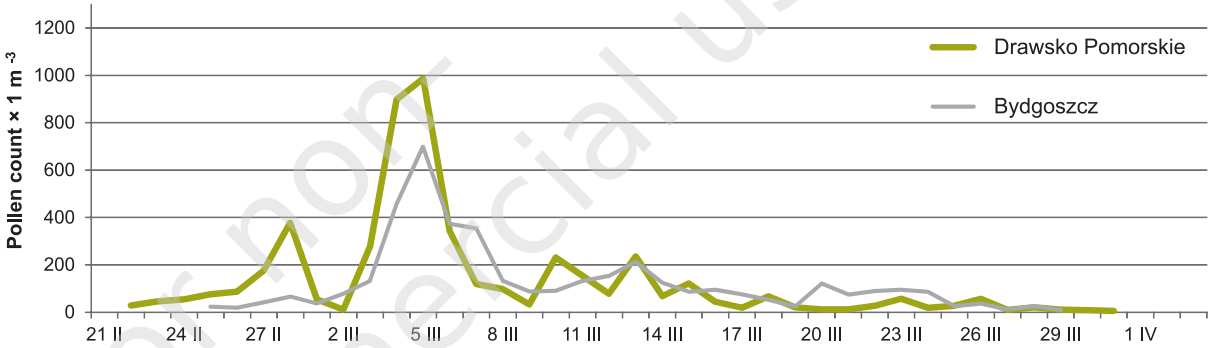
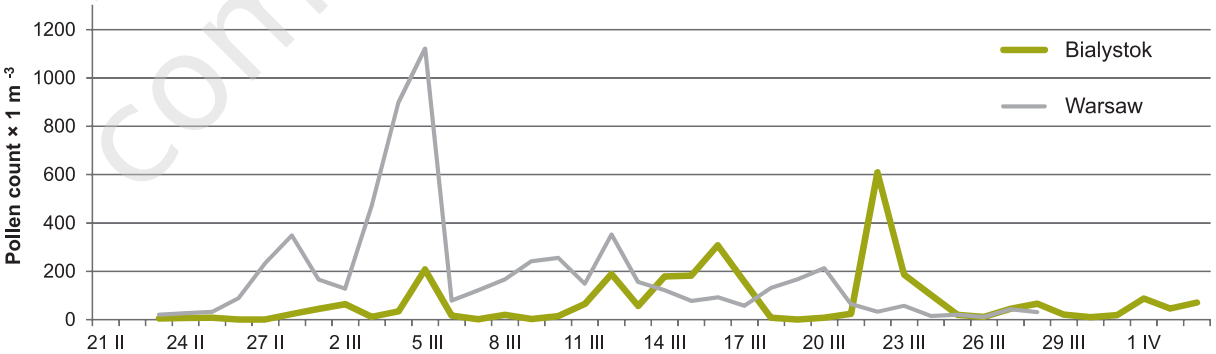


Figure 3. *Alder pollen count in Warsaw and Bialystok in 2017.*



Poland, in 2017 pollen concentration of alder was one of the lowest in all analysed cities.

Conclusions

Alder pollen season in most cities was more than 50 days long and was characterized by low total annual pollen (only to 6273 g/m^3).

The start of *Alnus* pollen season in 2017 occurred in the end of February; in Szczecin on the 21st February and also in Bialystok and Drawsko Pomorskie only 1 day later. Alder pollen season lasted to the beginning of April.

The highest alder pollen allergen hazard occurred in 2017 in Olsztyn and Warsaw. The period with pollen counts exceeding the threshold value (≥ 45 g/m^3) lasted as long as 26 and 25 days. The lowest risk of allergy symptoms to alder pollen was observed in Bialystok 18 days of exceeded threshold count.

The end of dormancy and the start of the pollen season require a period of low temperatures followed by another of warm temperatures.

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

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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.

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