Hazel pollen in the air of northern Poland in 2017

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Abstract: The aim of the study was to compare the pollen season of hazel in the cities of northern Poland: Bialystok, Bydgoszcz, Drawsko Pomorskie, Olsztyn, Szczecin and Warsaw in 2017. Measurements were performed by the volumetric method (Hirst type pollen sampler). Seasonal Pollen Index (SPI) was estimated as the sum of daily average pollen concentrations in the given season.

Pollen season was defined as the period in which 98% of the annual total catch occurred. The pollen season of hazel started first in Bialystok, on the 6th February, and the lasted till the beginning of April. In other cities the season lasted till the end of March. The differences of pollen seasons duration ware not considerables. The highest, record airborne concentration of 221 pollen grains/m^3 was noted Szczecin on the 27th February. The maximum values of seasonal pollen count occurred between of 28th February and 5th March in all cities.

Key words: allergens, pollen count, hazel (*Corylus*), 2017

The alterations in the chemical composition of pollen, induced by urbanization and air pollutants, may intensify the allergenic potential and may cause the increase in the incidence of allergies in people. Mutations in nucleic acids are accompanied by a number of molecular changes leading to the formation of allergenic proteins. It seems that the type of habitat, where the pollen grew, affects the individual differentiation. Indeed, it was found that in the site exhibiting low pollution, the hazel pollen contains a lower amount of proteins than to the ones from a site with high anthropopression [1]. The hazel pollen analysed in this paper also comes from areas with high anthropopression and urbanization. Clinical symptoms of allergic disease are connected with the concentration of aeroallergen, e.g. hazel pollen allergen the subjects are exposed to [2].

Morphologically *Corylus*-type pollen includes three species of hazel occurring in Europe (*C. avellana* L., *C. colurna* L. and *C. maxima* Miller). Of those *Corylus avellana* is the most widespread species. It occurs across almost the whole of Europea far as the Caucasus Mountains and the Crimean Peninsula. *Corylus avellana* is the only hazel species occurring in Poland. It is common in forests and clearings in the whole area including the lower montane forest zone [3].

In Poland the threshold value for first clinical symptoms for *Corylus* pollen grains for the majori-

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ty of sensitised patients is visible during exposure to the concentration of 35 pollen grains in 1 m^3 of air. Symptoms were noted in all the subjects sensitized to alder pollen at the concentration of approximately 80 grains/m^3 of air. During exposure to the concentration of 150 pollen grains per m^3 the symptoms were acute [2].

Aim

The aim of the study was to compare the hazel pollen concentrations in the air of Szczecin, Drawsko Pomorskie, Bydgoszcz, Olsztyn, Warsaw and Bialystok in 2017.

Material and method

Measurements of bioaerosols were carried out in the northern cities of Poland: in Szczecin, Drawsko Pomorskie, Bydgoszcz, Olsztyn, Warsaw and Bialystok in 2017.

Measurements were performed by the volumetric method. The used devices, which are recommended by the IAA (International Association for Aerobiology), take air samples (Burkard and Lanzoni as the Hirst type pollen sampler) in volumes corresponding to average human respiratory parameters.

The duration of the pollen season was determined by the 98% method [4], assuming that the onset and end of the season were days with recorded 1% and 99% of the annual total of pollen grains, respectively.

The total pollen count over this period was expressed by the SPI (Seasonal Pollen Index). On the basis of literature data, the number of days with Hazel genus pollen concentrations exceeding the threshold values at which the consecutive allergy symptoms develop were determined (tab. 1) [2].

Results and discussion

The prevalence of respiratory allergic diseases is increasing especially in developed areas. High airborne pollen concentrations (such as hazel pollen) during February–March coincides with the heating season in Central Europe, when increased levels of contaminants such as SO_2, NO_2, CO_2 and O_3 occur. Also increasing number of people suffering from allergy with morphological and biochemical changes within the pollen grain caused by air pollutants have been conducted [5]. These changes can cause a more frequent occurrence of inhalant allergies or can lead to genetic mutations and thus to changes in protein's secondary structure (including allergenic proteins) [1, 6]. Additionally the contribution of pollen transport conditions (long range transport and transport from local sources) to the interannual variability of the seasonal pollen index (SPI) is 15–20% for birch and 5–15% for grass [7]. Probably the same pattern applies to hazel.

In 2017 *Corylus* pollen season started between 6th and 22nd February and lasted until the beginning of April. In 2015 the hazel pollen season in most northern Poland's cities started 13th January in Wroclaw, i.e. 3 weeks earlier than in 2017. Also in 2015 the maximum daily concentration was observed between 1st and 12th March [8]. In this study the dates of maximum concentrations were noted a half weak earlier (tab. 1; fig. 1–3).

The highest daily pollen count was noted in 2017 in Szczecin (221 g/m^3) (tab. 1) and the highest annual sum of hazel pollen grains (SPI) was observed also in Szczecin and it was about very similarly in other cities (423–754).

The highest *Corylus* pollen allergen hazard occurred (above 35 g/m^3) in Bydgoszcz, Olsztyn and Warsaw (only 6 days). Pollen concentration causing severe clinical symptoms (above 80 g/m^3) was noted also in Bydgoszcz (3 days). The comparison of hazel

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

Features of pollen season	Szczecin	Drawsko Pomorskie	Bydgoszcz	Olsztyn	Warsaw	Bialystok
Duration of pollen season (number of days)	8 II–1 IV (42)	20 II–24 III (33)	11 II–26 III (38)	20 II–25 III (34)	22 II–24 III (31)	6 II–5 IV (44)
Seasonal Pollen Index – SPI (total)	754	423	727	747	587	521
Peak value and peak date	221 (27 II)	67 (5 III)	123 (3 III)	115 (5 III)	95 (28 II)	131 (4 III)
Days ≥ 35 g/m^3 [2]*	4	3	6	6	6	4
Days ≥ 80 g/m^3 [2]**	2	0	4	3	1	1

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

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

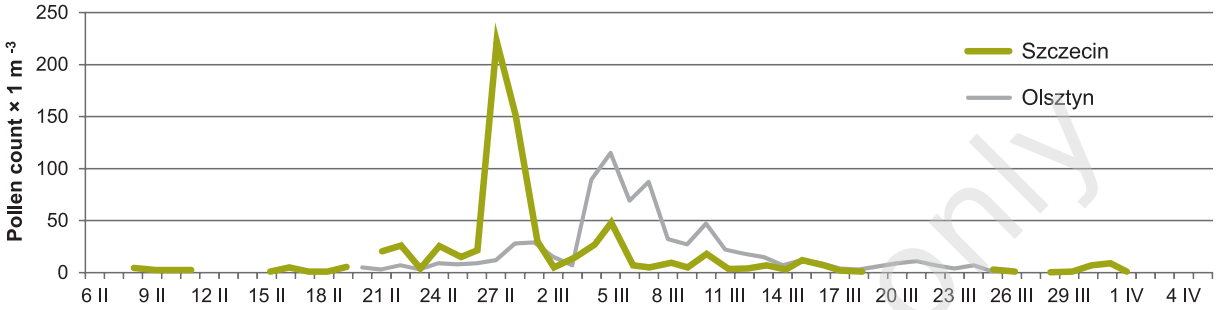


Figure 2. *Hazel pollen count in Drawsko Pomorskie and Bydgoszcz in 2017.*

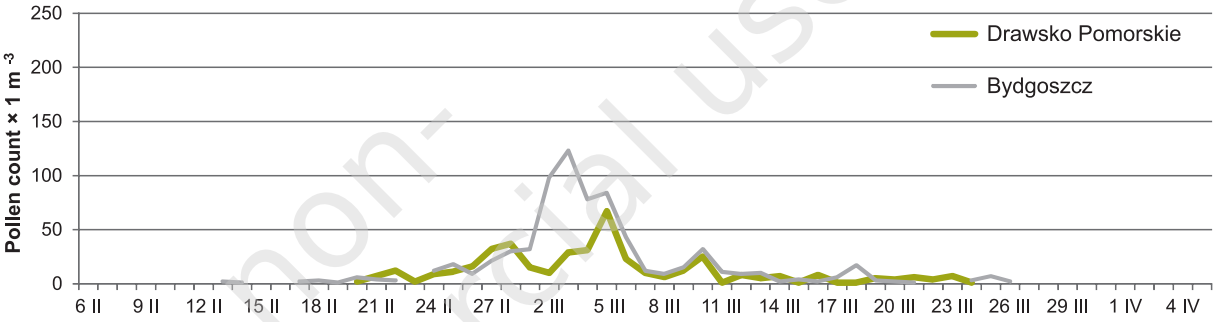
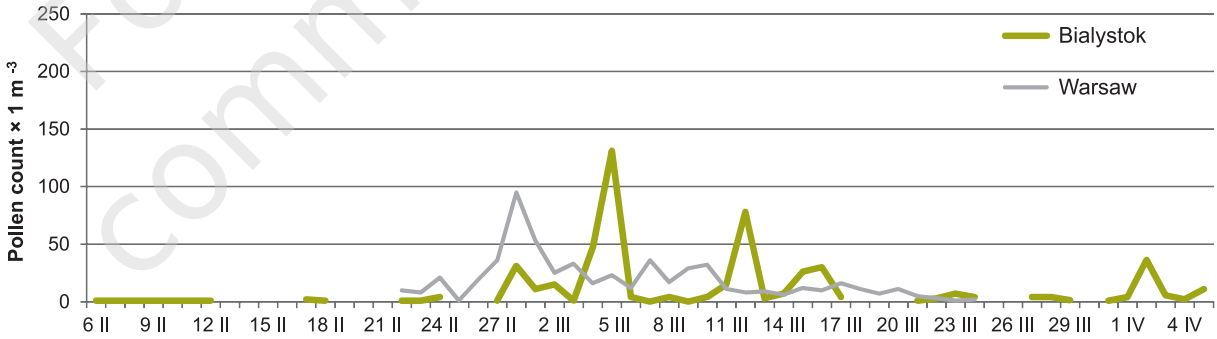


Figure 3. *Hazel pollen count in Warsaw and Bialystok in 2017.*



pollen seasons in previous years revealed that in 2015 [8] hazel pollen concentrations in Szczecin were much lower than in 2017. In comparison to data from 2015 [8] in northern Poland, in 2017 pollen concentration of hazel was low in all analysed cities.

The period with pollen counts exceeding the threshold value (≥ 35 g/m^3) lasted as long as 3 and 6 days.

The concentration of hazel pollen is higher when there are many local sources of pollen in the study area.

Conclusions

Hazel pollen season in most cities was 31–44 days long and was characterized by low total annual pollen (only to 754 g/m^3).

The start of *Corylus* pollen season in 2017 occurred in the beginning of February in Bialystok; and even at the end of February.

The highest hazel pollen allergen hazard occurred in 2017 in Bydgoszcz, Olsztyn and Warsaw.

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Puc M: 50%; Rapiejko P: 10%; Stacewicz A: 10% and other Authors: 6% each.
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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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