

# Artemisia pollen season in southern Poland in 2016

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**Abstract:** In the paper, mugwort pollen seasons observed in 2016 were compared in six cities of southern Poland, i.e. Cracow, Lublin, Opole, Sosnowiec, Wrocław, and Zielona Góra. The investigations of airborne pollen concentrations were carried out with the volumetric method using Lanzoni and Burkard devices. In 2016, the earliest onset of the mugwort pollen season was noted in Lublin (13.07) and the latest beginning was reported in Wrocław (24.07). High daily pollen concentrations were recorded between the third decade of July and the second decade of August. The highest annual pollen count and the greatest risk of development of allergies to mugwort pollen were noted in Opole and Zielona Góra. The highest daily concentrations for the taxon were recorded in all measurement stations in the first half of August. Maximum concentrations were noted in Wrocław (84 P/m<sup>3</sup>) and Lublin (79 P/m<sup>3</sup>).

**Key words:** aeroallergens, pollen count, mugwort (*Artemisia*), 2016

The *Artemisia* genus comprises 300 species growing in dry and warm in regions of Europe, Asia, and North America. Many of these species are useful plants, but some are common ruderal weeds. The tiny mugwort flowers gathered in small heads bloom at the end of summer (July–August) [1] and release abundant pollen into the atmosphere. One *Artemisia nilagarica* anther can produce 689 pollen grains [2], whereas pollen indexes (annual count) of *Artemisia* in different countries of Europe reach on average up to 2,287 [3]. *Artemisia* pollen contains strong allergens, which together with grass and birch pollen are the most frequent cause of hay fever in our climatic conditions [4]. Additionally, *Artemisia* pollen causes cross reactivi-

ty with pollen of other representatives of the *Asteraceae* family, i.e. ragweed, dandelion, sunflower, camomile, goldenrod, arnica, and daisy, and with food, in particular cumin, peppers, and celery [5–7]. Pollen-sensitive subjects develop the first allergy symptoms at a pollen concentration of 30 grains/1 m<sup>3</sup> of air; the content of 55 grains/m<sup>3</sup> causes allergic reactions in most patients, and 70 grains/m<sup>3</sup> cause trigger acute clinical symptoms [8].

## Aim

The aim of the study was to compare mugwort pollen seasons in selected cities of southern Poland in 2016.

**Material and method**

The investigations of airborne *Artemisia* pollen concentrations were conducted in Cracow, Lublin, Opole, Sosnowiec, Wroclaw, and Zielona Gora. The volumetric method, based on measurements with Lanzoni 2000 and Burkard devices in a continuous mode, was employed [9]. Microscopic slides were analysed at a 7-day cycle and 24-h evaluation intervals. For better visualisation of pollen grains, the slides were stained with basic fuchsin. The length of the pollen season was evaluated with the 98% method and annual pollen totals and maximum daily pollen concentrations were determined for each city. Additionally, the number of days characterised by pollen concentrations exceeding the threshold values, i.e. 30, 55, and 70 pollen grains/m<sup>3</sup> of air was indicated.

**Results and discussion**

It was found that the mugwort pollen season in 2016 in the different measurement sites lasted from 13.07 to 16.09, i.e. 58 days (tab. 1). In four cities, the length of the pollen season was similar, i.e. 60–65 days. It was shorter by approximately 2–3 weeks only in Opole and Cracow (tab. 1). The longest pollen season (65 days) was noted in Cracow and Zielona Gora, while Wroclaw was characterised by the shortest season (45 days). The first *Artemisia* pollen grains were recorded in the air of Lublin and 2 weeks later in the aeroplankton of Wroclaw. The pollen of the analysed taxon persisted for the longest time in the air of Zielona Gora and the shortest pollen persistence was noted in Opole and Wroclaw. The greatest amounts of mugwort pollen

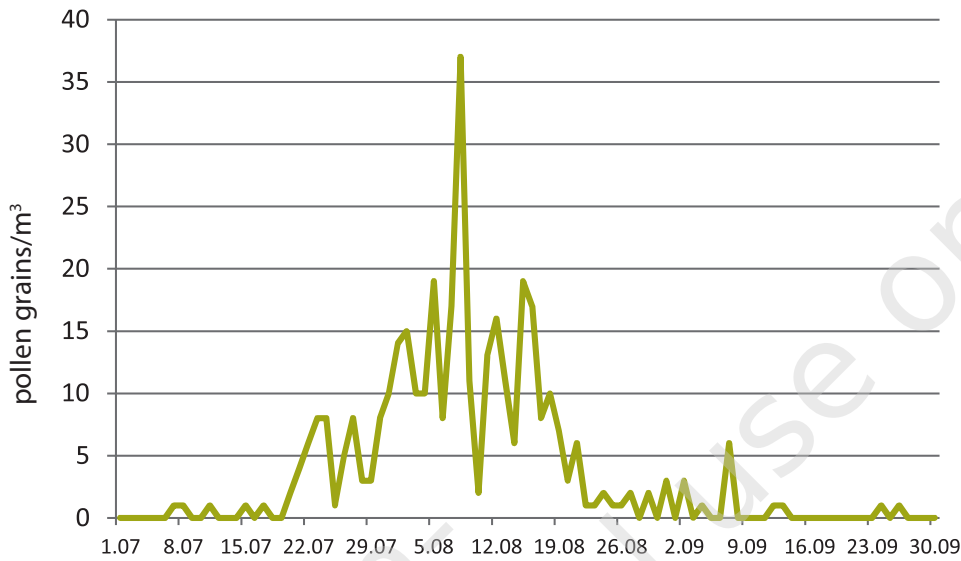
were recorded in the aeroplankton of Opole, and nearly four-fold lower quantities were recorded in Cracow (tab. 1). The highest daily pollen concentrations were found between the third decade of July (Zielona Gora) or the first days of August and the second decade of August. In all the analysed cities, the seasonal pollen maxima were noted in the first two weeks of August. The highest value was recorded in Wroclaw (84 P/m<sup>3</sup>) and Lublin (79 P/m<sup>3</sup>) (tab. 1, fig. 1–6). Sensitive patients in southern Poland were exposed to the risk of development of hay fever triggered by mugwort pollen (daily concentrations > 30 P/m<sup>3</sup>) on average for 10 days of the vegetation season in 2016; however, the risk persisted for 3 weeks in Opole and only 1 day in Cracow (tab. 1). Daily mugwort pollen concentrations causing acute clinical symptoms (> 70 P/m<sup>3</sup>) were noted only in Lublin (1 day) and Wroclaw (2 days) (tab. 1).

As in the previous year (2015), Zielona Gora, Opole, and Lublin were characterised by the highest annual sums of mugwort pollen grains in 2016, and sensitive subjects were especially exposed to the risk of allergy in these cities of southern Poland [10]. Comparison of the data of the *Artemisia* pollen seasons recorded in four measurement sites (Lublin, Sosnowiec, Wroclaw, Cracow) in 2016 with the average values of 2001–2013 revealed a nearly two-fold lower amount of airborne pollen in the analysed cities as well as substantially lower values of maximum pollen concentrations and similar dates of pollen occurrence [11]. The mugwort pollen season in 2016 was longer only in Cracow, while in the other cities it was by 10–11 days shorter. The dates of the onset of the pollen season (with the exception of Wroclaw) were similar, and the end of

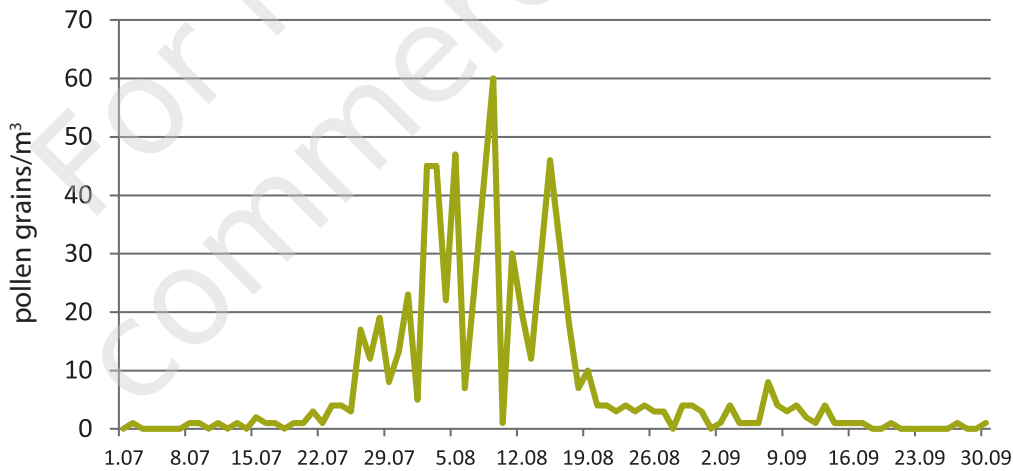
**Table 1.** Characteristics of *Artemisia* pollen season in 2016.

City	Pollen season period by the 98% method; number of days	Maximum pollen count (P/m <sup>3</sup> ); date	Annual pollen sum	Number of days with concentration above threshold		
				30 P/m <sup>3</sup>	55 P/m <sup>3</sup>	70 P/m <sup>3</sup>
Opole	20.07–6.09 49	69 14.08	1306	22	5	0
Zielona Gora	14.07–16.09 65	68 6.08	1016	12	1	0
Lublin	13.07–10.09 60	79 5.08	915	10	3	1
Sosnowiec	16.07–12.09 61	60 9.08	700	8	1	0
Wroclaw	24.07–6.09 45	84 15.08	656	6	3	2
Cracow	16.07–12.09 65	37 8.08	357	1	0	0

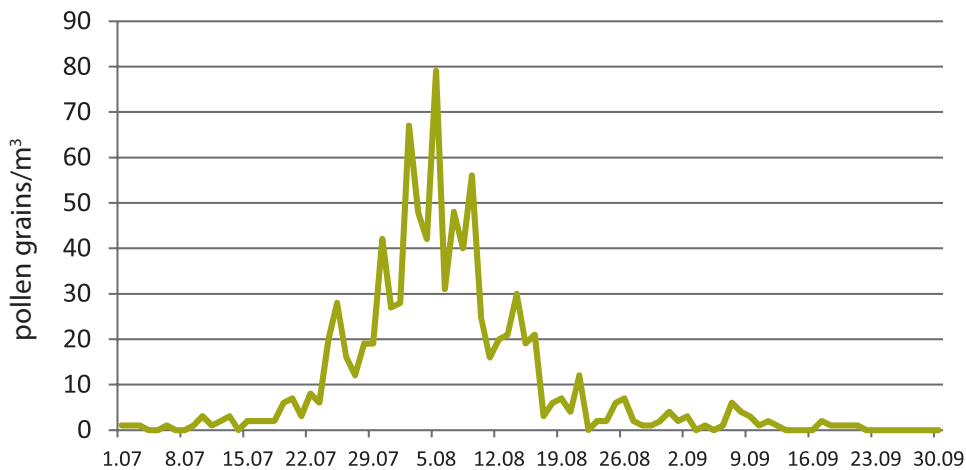
**Figure 1.** *Artemisia* pollen count in Cracow in 2016.



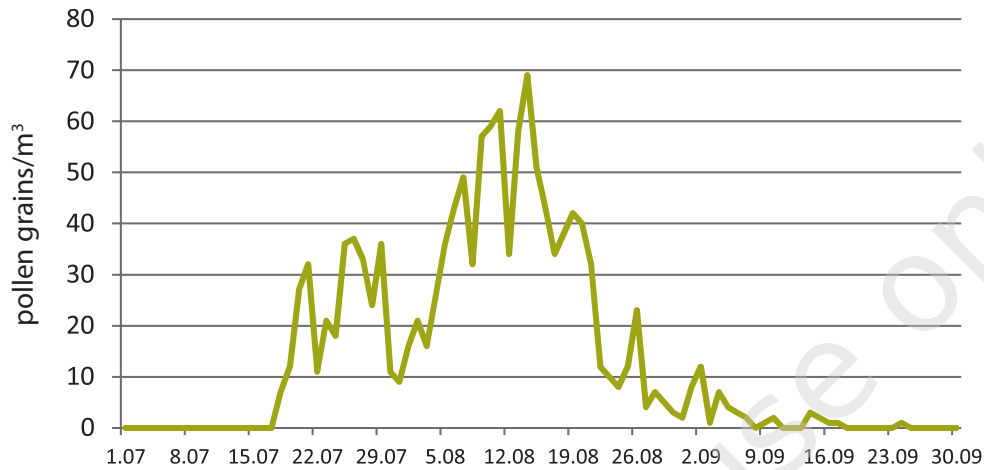
**Figure 2.** *Artemisia* pollen count in Sosnowiec in 2016.



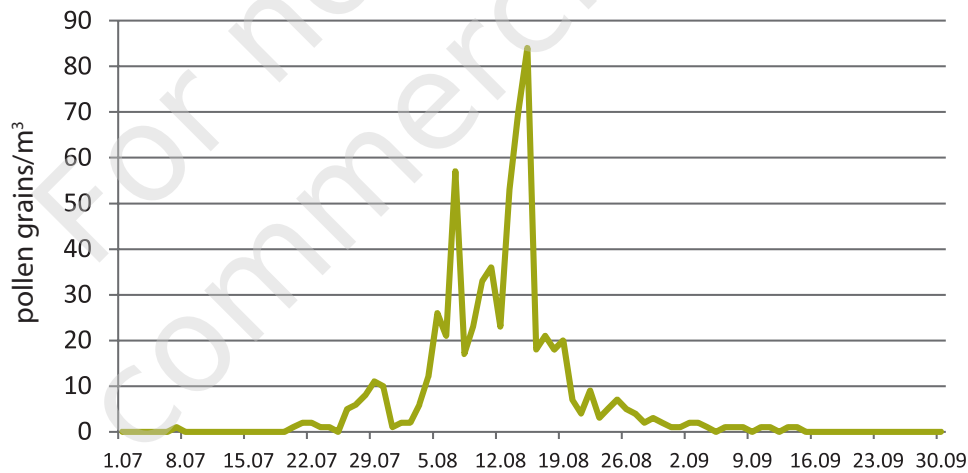
**Figure 3.** *Artemisia* pollen count in Lublin in 2016.



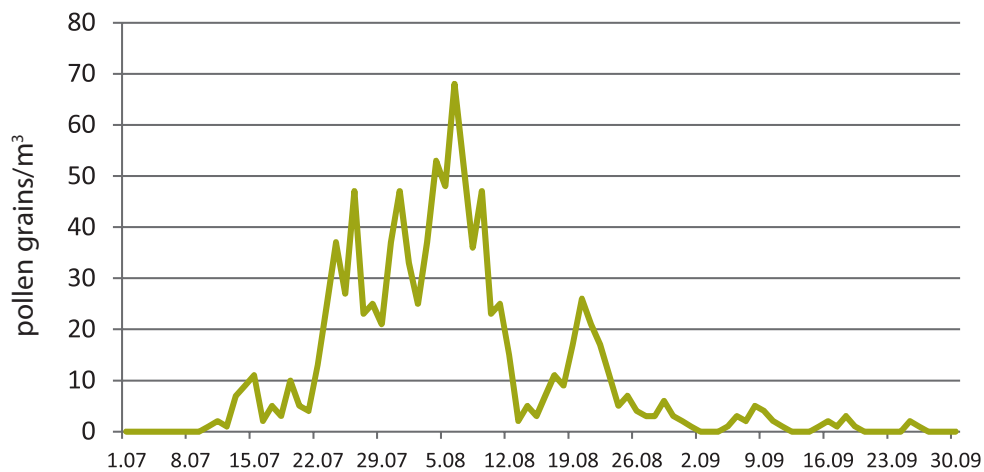
**Figure 4.** *Artemisia* pollen count in Opole in 2016.



**Figure 5.** *Artemisia* pollen count in Wroclaw in 2016.



**Figure 6.** *Artemisia* pollen count in Zielona Gora in 2016.



the season in Lublin and Sosnowiec was noted earlier in 2016, compared with the average date from previous years.

### Conclusions

1. In 2016, the highest daily concentrations of mugwort pollen at the selected measurement sites in southern Poland were recorded between the third decade of July and the second decade of August.
2. The highest annual sums of mugwort pollen grains were noted in Zielona Gora and Opole, and the maximum daily concentrations were recorded in Wrocław (84 P/m<sup>3</sup>) and Lublin (79 P/m<sup>3</sup>).
3. Mugwort allergen-sensitive subjects were exposed to the highest risk of development of hay fever in Opole, Zielona Gora, and Lublin.

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#### Authors' contributions:

Sulborska A: 60%; Piotrowska-Weryszko K: 5%; Lipiec A: 5%; Rapijko P: 5%; Jurkiewicz D: 5%; Malkiewicz M: 5%; Chłopek K: 5%; Dąbrowska-Zapart K: 5%; Ziemianin M: 5%.

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The authors declare that they have no competing interests.

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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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