Cladosporium spores in the air of selected Polish cities in 2015

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Abstract: The aim of the study was to compare the concentration of *Cladosporium* spores in the cities of Katowice, Cracow, Olsztyn, Piotrkow Trybunalski, Szczecin, Warsaw, and Zielona Gora in 2015. Measurements were performed by the volumetric method (Burkard and Lanzoni pollen and spores sampler). *Cladosporium* season was defined as the period in which 90% of the annual total catch occurred. The *Cladosporium* season started first in Zielona Gora on the 27th April and in the other cities it started during the next days. The latest the fungal season started in Szczecin. The number of days with spores count above 2800 spores in 1 m^3 ranged from 15 to 63.

Key words: aeroallergens, spores, mould, *Cladosporium*, 2015

Introduction

Fungal spores are the most widely represented biological particles in the air, their number definitely exceeds number of pollen grains. Because of their widespread occurrence in the external environment and inside the premises, as well as their small size, they can easily penetrate upper and lower respiratory tract [5, 8, 9]. It was also confirmed that one grain of grass pollen occupies the same volume as 200 *Cladosporium* spores [5, 8].

Cladosporium is the most isolated fungal component of air, usually accounting for 30–85% of all spores recorded and thus a common cause of symptoms on the part of respiratory system [1, 4]. People with hypersensitivity to fungi allergens may suffer for inhalation allergy seasonally or throughout the year with a clear intensification of symptoms during summer and autumn, due to significant and cyclical increase in the concentration of spores in this period [8]. The concentration of *Cladosporium* spores in the air is known to fluctuate according to the meteorological parameters. Although these spores are presented in any temperature, the weather values displaying the strongest correlation with daily spore counts is almost always temperature . The optimal conditions for high concentrations are usually recorded at temperatures ranging from 23ºC to 29ºC and relative humidity values around 80%.

Exposure to harmful effects of fungi is usually caused by inhalation; however it is necessary to

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remember about their harmful effect by ingestion and after a direct contact with the skin [2, 3, 9]. Based on current studies it has been estimated that depending on geographical area, the symptoms of allergy to fungi allergens include from 5% to 30% of people with atopy [8].

Data from the European Community Respiratory Health Survey demonstrated that among adults aged 20–44 years in the general population, the prevalence of positive skin tests using *Cladosporium* extracts ranged from 0% to 11.9% with an average of 1.7%. As a part of the project Epidemiology of Allergic Diseases (ECAP) supported by the Department of Health it was demonstrated that every fourth Pole is allergic to allergens inside the rooms amongst which fungi have an important role. Additionally, there is a constant increase in cases of allergy, asthma, allergic rhinitis and hives [5].

In persons with hypersensitivity to allergens from *Cladosporium* type, the number of spores needed to trigger disease symptoms was determined on a level of 3000 spores in 1 m^3 of air for the world population [4, 9]. However, Polish sources present value of 2800 spores/1 m^3 [7, 8]. Nasal obstruction is regarded as dominate allergy symptoms to *Cladosporium* spores, and at high concentrations – dyspnea and paroxysmal cough [7].

There are numerous reports about connections of asthma appearance and its activation in case of high concentrations of spores in air. However, asthma symptoms may be caused by two different pathomechanisms. Spores can both cause an immune response, as well as to penetrate in a form of small particles and irritate the lungs [3, 6]. Also connection of high concentration of spores with an increase in the number of asthma cases requiring treatment was indicated in hospital conditions, as well as with frequent deaths due to asthma [3, 9].

An aim of the study was to compare the concentration values of spore from *Cladosporium* type in 2015 in a few Polish cities. Analysis was carried out based on data collected from Katowice, Cracow, Olsztyn, Piotrkow Trybunalski, Szczecin, Warsaw and Zielona Gora.

Materials and methods

The concentration of *Cladosporium* spores has been studied using volumetric spore trap. In each examined city it was Hirst-type trap, which is recommended by International Association of Aerobiology. In the study specified date during the season with the highest concentration of spores in cubic meter of air was selected as well as the number of days with spores count above 2800 per day occurred (after exceeding this level allergy symptoms may appear).

Results

Appointed with 90% method the sporulation season of *Cladosporium* type earliest began in Zielona Gora at the end of April. The shortest season was in Szczecin – the latest began (24th of June) and as first ended (20th of September). In other cities time of the season came to an end over the next four days. The exception was Cracow, where the season ended much later (10th of October). The latest season began in Szczecin, 24th of June (tab. 1, ryc. 1–7).

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Table 1. *Spore season for Cladosporium in selected Polish cities.*

City	Start of season	The day of maximum spores concentration	The number of days with a spore count that will elicit allergy symptoms (above 2800 spores in 1 m^3)
Katowice	23.05	15.07	15
Cracow	14.06	29.06	32
Olsztyn	7.05	19.07	53
Piotrkow Trybunalski	9.05	9.07	61
Szczecin	24.06	8.07	45
Warsaw	4.05	26.07	49
Zielona Gora	27.04	18.07	63

Figure 1. *Cladosporium spores in the air of Katowice in 2015.*

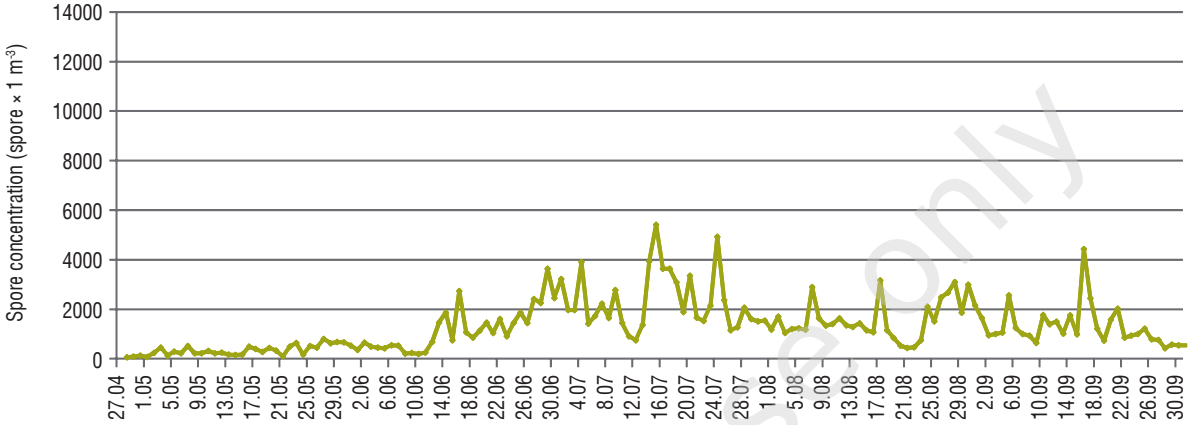


Figure 2. *Cladosporium spores in the air of Cracow in 2015.*

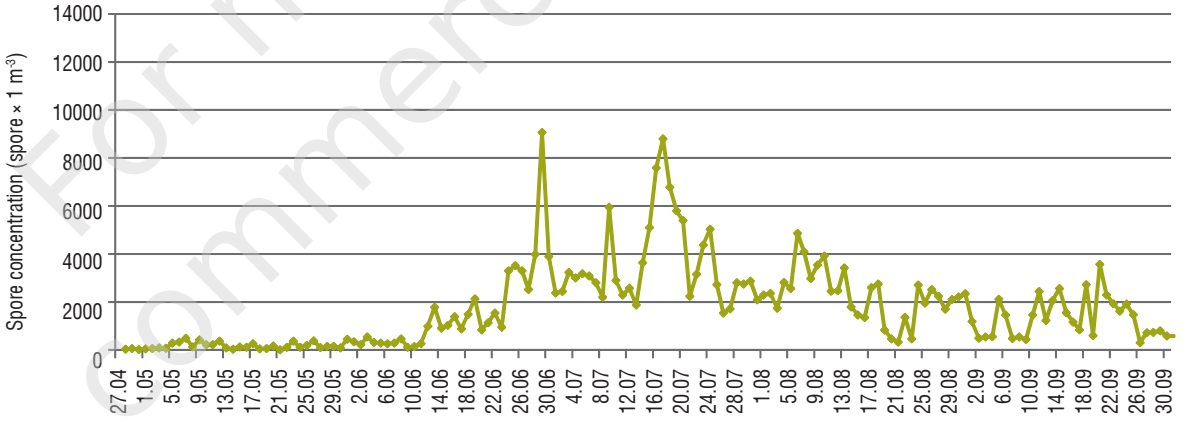


Figure 3. *Cladosporium spores in the air of Olsztyn in 2015.*

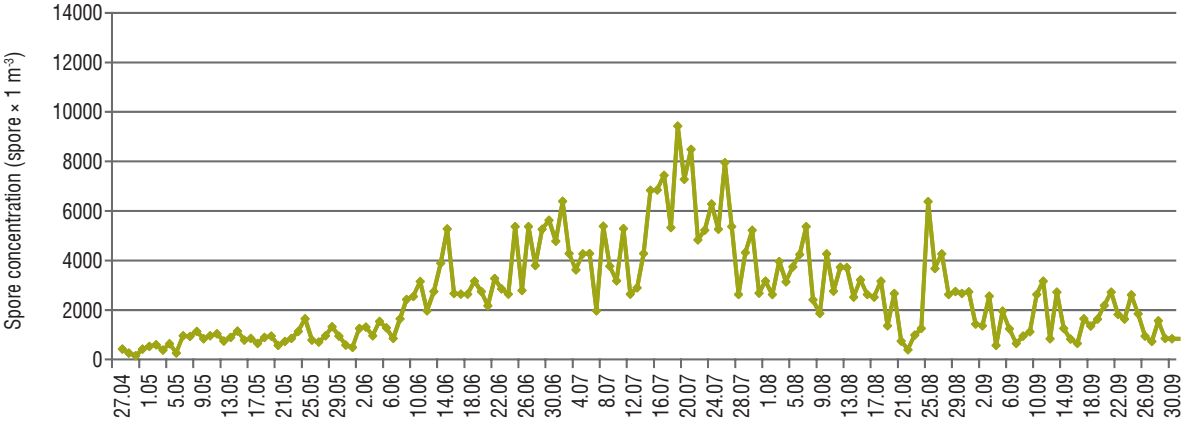


Figure 4. *Cladosporium spores in the air of Piotrkow Trybunalski in 2015.*

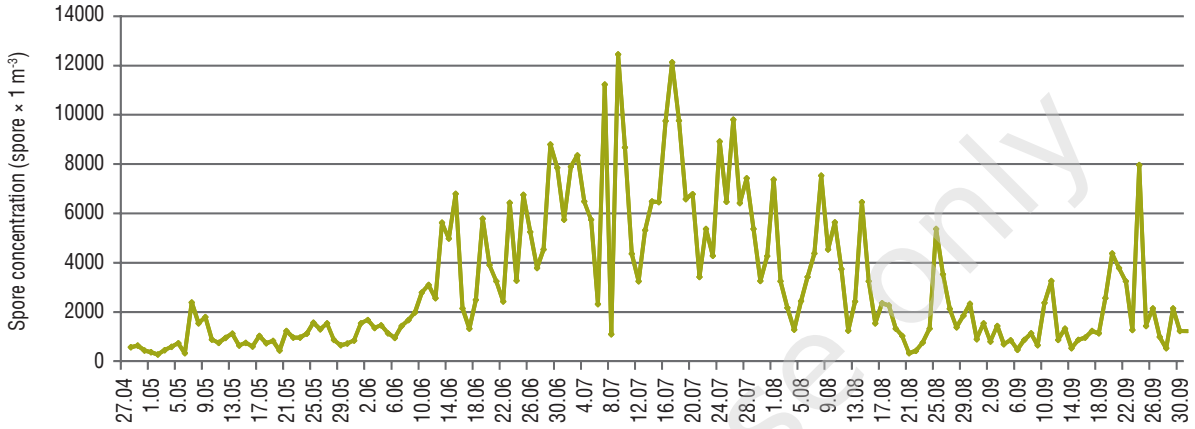


Figure 5. *Cladosporium spores in the air of Szczecin in 2015.*

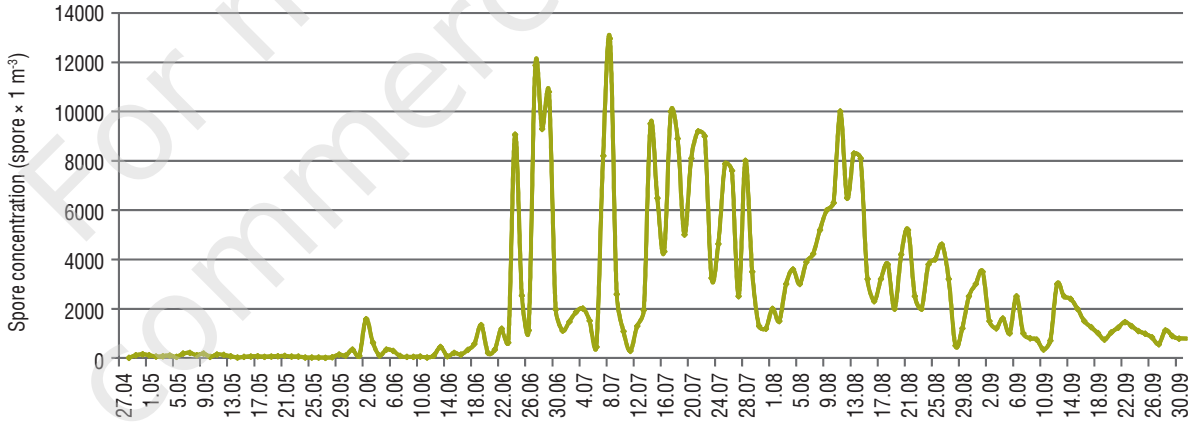


Figure 6. *Cladosporium spores in the air of Warsaw in 2015.*

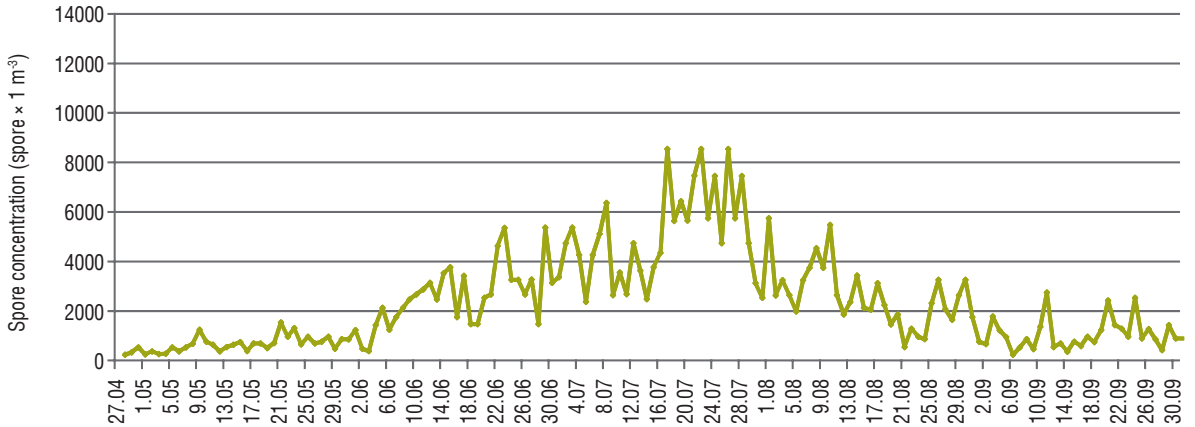
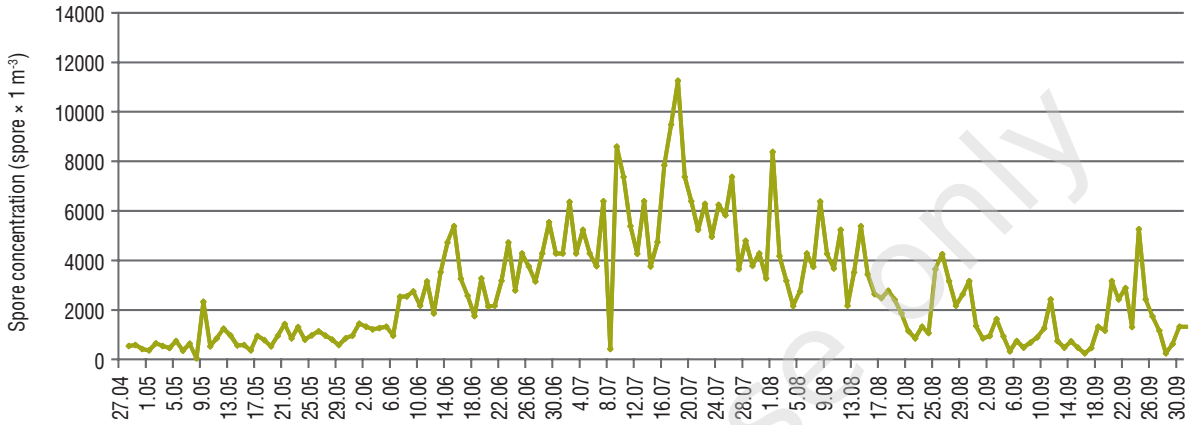


Figure 7. *Cladosporium spores in the air of Zielona Gora in 2015.*



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