



The flowering seasons of *Betula* spp and Poaceae partially coincide in Ukraine, reflecting the effect of climate change

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Background: Since pollen is a significant factor in allergies, and sensitized individuals often experience polysensitization to various allergen groups, breaks in the plant pollination season, providing patients with relief from allergic symptoms, are crucial times within the high allergenic period.

However, due to climate change and the prolongation of pollen seasons - the early start of some and the late end of others - a trend has been observed in Ukraine towards the convergence of the flowering seasons of grasses and trees, particularly birch.

Birch and Poaceae pollen are known to be among the most dangerous airborne allergens in Ukraine, each triggering allergic reactions in approximately 40% of pollen-allergic individuals.

Allergy symptoms induced by grass pollen last the longest, as different species of the Poaceae family bloom sequentially over an extended period. Although the main season runs from May to July, concentrations of grass pollen can remain at significant levels, provoking hay fever symptoms in patients until mid or even late August.

Therefore, we decided to analyze annual monitoring data and compare the timing of grass and birch pollen seasons.

Method: From 2009 to 2023, pollen was collected using volumetric methods with a Burkard trap positioned at a 25-meter height above the ground on the roof of a building at Vinnytsya Medical University. The recorded pollen counts were subsequently converted into pollen concentrations per cubic meter of air. Analysis of the samples was conducted at a magnification of $\times 400$. Subsequently, a statistical analysis was performed using Excel.

Results: It is known that, for birch, the beginning of the season is considered when there are 25 pollen grains per 1 m^3 of air. For grasses, this quantity is 10 grains of pollen per 1 m^3 . After conducting a statistical analysis, we found that the start dates of the flowering season for both *Betula* and Poaceae are gradually approaching each other. While in 2014 and 2015, the interval between the start dates was 41 and 38 days, respectively, starting from 2019, the difference gradually decreased. In 2022, the gap between the start of the *Betula* and Poaceae pollen seasons was 30 days, and in 2023, it was only 14 days.

Furthermore, it is worth noting that the duration of the flowering seasons of both plants tends to lengthen, negatively impacting individuals with high sensitization to birch and grass pollen.

Over the last 5 years, starting from 2019, the initiation of grass pollen coincides with the birch pollen season, beginning from late April and sometimes even mid-April. However, the number of days when the pollen levels of both plants reach causally significant concentrations remains limited. Particularly in 2022, when birch pollen was particularly intense, periods of clinically significant concentrations of both plants coincided from May 17 to May 25.

Taking into account literature data indicating that a threshold of 10 grains/m^3 of air is a trigger for the widespread onset of grass pollen allergy symptoms and that initial symptoms can be observed when grass pollen concentrations exceed 1 grain/m^3 , the period of overlapping flowering seasons of both plants, which is hazardous for individuals sensitive to both types of pollen, can last from 2 weeks to a month - depending on the nature of pollination, especially birch, which has a pronounced two-year cycle with more active pollination in even years.

Conclusions: Over time, the risks of allergic reactions due to the coincidence of birch and grass pollen seasons may significantly increase due to the prolongation of the birch pollen season and the early start of the grass pollen season.

This may affect the duration and intensity of allergic reactions in sensitive individuals.

It is especially important to pay attention to patients who are sensitive to both plants simultaneously and separately, as changes in pollen seasons can influence the nature of the body's allergic response, requiring adjustments to treatment approaches and improving the quality of life for patients during the flowering season. Additionally, during this year's monitoring, special attention should be given to the birch and grass pollen seasons.

Primary authors: KAMINSKA, Olha (National Pirogov Memorial Medical University, Vinnytsya, Ukraine); Prof. RODINKOVA, Victoria (National Pirogov Memorial Medical University, Vinnytsya, Ukraine)

Presenter: KAMINSKA, Olha (National Pirogov Memorial Medical University, Vinnytsya, Ukraine)