

**Institute:** Institute of Botany

**Topic:** Influence of environmental conditions on the profile of pollen proteins in selected allergenic vascular plant species

**Names of supervisors:** dr hab. Agnieszka Nobis, prof. JU,

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dr hab. Dorota Myszkowska (Jagiellonian University Medical College)

**Background information:**

Nowadays, pollen allergy in Europe refers to 25% of human population. Patients are especially sensitive to grass, birch and mugwort allergens, which provoke the clinical symptoms depending on the intensity of exposure. Pollen allergenicity results from the specific proteins content and their nature. It is supposed that the production, release and an allergenic potential of pollen grains can be altered by a wide range of different environmental factors, e.g.: temperature, shading, drought, UV, ozone exposure, pollution, soil properties and microbial infections of plants. Recent studies proved that pollen of plants growing in the polluted areas show higher allergenic potential than plants growing in less polluted areas. In Poland, there was hardly any research on the influence of the environmental conditions on protein content in vascular plant pollen.

**The main questions to be addressed in the project:**

The main aim of the proposed project is to examine the profile of pollen proteins in selected allergenic vascular plants species (native and/or alien to the flora of Poland) and to identify the main environmental factors influencing the pollen allergenicity. The variability in the pollen protein composition among study sites for a given taxon/specimen will be also assessed and there will be indicated sites of higher and lower allergenic potential as important from the prophylaxis of patients and the urban greenery planning point of view.

**Information on the methods/description of work:**

Pollen samples from inflorescences of the selected plant species will be collected at sites differing in terms of habitat/environmental characteristics e.g. edaphic properties and/or level of air pollution (the sites will be located both in urban areas characterized by a high degree of pollution, and in rural or natural areas characterized by low air pollution). Soil samples collected during the field studies will be subjected to a series of physicochemical analyses including: soil moisture, soil pH, content of macro- and microelements, heavy metals content. As far as air pollution is concerned the following pollutants, as important factors influencing plants allergenicity will be included : PM 2.5, PM10, NO<sub>x</sub>, SO<sub>x</sub>, CO<sub>2</sub>, ozon (data available in majority on the website of the Malopolska Inspectorate of Environment Protection). Protein profile will be estimated through: the total protein content measured by colorimetric method, the concentration of the main allergens by immunoenzymatic assay (ELISA) and the SDS-PAGE electrophoresis of pollen extracts. Pollen concentration in the air will be performed by the volumetric method using a Hirst type sampler and/or automatic devices. Multivariate statistical methods will be used for data analysis.

**Special requirements from the student:** A potential candidate should possess knowledge and experience in designing and conducting interdisciplinary research. Student should be familiar with both field and laboratory work. The candidate need to have ability to work in the research team. Excellent written and oral skills in English language are required.

**Name of potential foreign collaborator:**

Nicolas Visez, Associate-professor, Université de Lille, France

Célia M. Antunes, PhD Biochemistry, Group Leader Department of Health and Medical Sciences, School of Health and Human Development & Institute of Earth Sciences, University of Evora, Portugal

**References(3):**

[1] Cariñanos P., & Casares-Porcel M. (2011). Urban green zones and related pollen allergy: A review. Some guidelines for designing spaces with low allergy impact. *Landscape and Urban Planning*, 101(3): 205-214.

[2] Cariñanos P., & Marinangeli F. (2021). An updated proposal of the potential allergenicity of 150 ornamental trees and shrubs in Mediterranean cities. *Urban Forestry and Urban Greening*, 63: 127218.

[3] Mousavi F., Shahali Y., Pourpak Z., Majd A., & Ghahremaninejad F. (2019). Year-to-year variation of the elemental and allergenic contents of *Ailanthus altissima* pollen grains: an allergomic study. *Environmental Monitoring and Assessment*, 191: 1-10.