

A decorative border composed of stylized molecular structures, featuring spheres in grey, blue, and green connected by lines, framing the central text.

Achievements and perspectives of flax – biotechnology –

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prof. UPWr

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Lecture title: Achievements and perspectives of flax biotechnology

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Abstract

In recent years, we have observed a huge progress in the use of genetic modifications of plants, especially crops. Crop plants are modified in order to improve their qualitative and quantitative properties. One of the species for which genetic transformation methods have been well developed is flax *Linum usitatissimum* L. Flax is a plant grown in a temperate climate to obtain valuable fibers and seeds, containing essential fatty acids. The possibility of using genetic engineering techniques to modify the flax genome is particularly important because flax is a self-pollinating plant, therefore it is characterized by low genetic variability, and traditional crossbreeding methods are long-lasting.

In the field of genetic transformation of flax, traits such as plant resistance to pathogens, abiotic stresses and the quality of flax fiber were successfully modified by reducing the lignin content or by synthesis of a new poly- β -hydroxybutyrate (PHB) polymer. The obtained fibers with new properties were used to prepare biocomposites with a matrix of polypropylene, polylactide or polycaprolactone. The generated composites can be used in industry, agriculture and medicine. Regarding the improvement of flax resistance to abiotic stresses, a gene encoding PHA synthase (phaC1 gene) from *Pseudomonas aeruginosa* bacteria was introduced into the genome of these plants. Transformed plants exhibited improved resistance to salinity and to diseases caused by fungi *Fusarium oxysporum*, which is the most important pathogen of flax in economic terms.

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Curriculum Vitae

Dr hab. Magdalena Wróbel-Kwiatkowska is an accomplished academic who holds the position of associate professor at Wrocław University of Environmental and Life Sciences, specifically in the Department of Biotechnology and Food Microbiology. With expertise in plant biotechnology, she has established herself as a leading figure in this field. Throughout her career, Dr Wróbel-Kwiatkowska has been actively involved in a range of research activities. Her primary focus has been on the modification of plant (flax) traits through genetic approaches. Additionally, she has undertaken studies in areas such as composite preparation using modified flax fibres and biomedical applications of composites. Dr Wróbel-Kwiatkowska has also undertaken work on the isolation and identification of bioactive compounds from plants and plant tissue cultures. Dr Wróbel-Kwiatkowska's academic qualifications are exemplary. She completed her Master of Science degree at Adam Mickiewicz University in Poznań, specializing in molecular biology, in the year 2000. Her Master's thesis titled "Pseudouridine synthase 55 from lupin *Lupinus luteus* var *ventus*-establishment of isolation steps and analyses of its enzymatic activity" demonstrated her early passion for research. In 2004, Dr Wróbel-Kwiatkowska gained the degree of Doctor of Biological Sciences in the field of biochemistry by the University of Wrocław, Institute of Biochemistry and Molecular Biology (now known as the Faculty of Biotechnology). Her doctoral thesis, "Modification of chosen flax traits by genetic engineering methods," was a significant contribution to the field of plant biotechnology. In 2016, Dr Wróbel-Kwiatkowska submitted her habilitation thesis to Wrocław University of Environmental and Life Sciences, Department of Biotechnology and Food Microbiology. The title of her habilitation thesis was "Genetically modified flax as a source of a new fibre with potential use in composites and raw material for biogas production." This thesis represented a significant achievement in her career and cemented her position as an expert in plant biotechnology. Dr Wróbel-Kwiatkowska is a respected academic, with an impressive record of academic achievements and research contributions.