

Living plant cells are characterized by totipotency phenomenon what means the ability of differentiation in any cell type. Differentiation process often involves great changes in cell phenotype – shape and/ or size can be altered as well as cell wall and cytoplasm composition, and these changes are expression of function that cells will fulfil. Differentiation can be already “programmed” as natural result of plant developmental changes or triggered by various factors (chemical or physical). Non-growing cell with specific phenotype and function is defined as differentiated – however, cells can dedifferentiate under the influence of certain stimulus and this may result in, for example, callus tissue formation.

Grafting method can be the impulse that elicits cell (de)differentiation – this technique has been applied in horticulture for thousands of years. Grafting process is combining together the cut/ excised tissues or organs from plants of different species (heterografting), different plants of the same species (homografting) or fragments from the same plant (autografting). Within callus tissue, which is formed during regeneration and accreting, cell differentiation takes place and this leads to re-union of vascular systems from both parts. If everything proceeds appropriately, we obtain “2 in 1”, that is, initially separate parts become one functional body. Grafting has not only wide practical application in horticultural and agricultural industry but has been also applied in life sciences to study various aspects of plant development.

After mentioning the phenomenon and tool, an object of study will be introduced, that is apoplast – walls of plant cells and changes in their composition during cell differentiation triggered by grafting. Cell walls are composed of “frame” part, consisting of cellulose, and amorphous matrix, which includes heterogenous groups of such polysaccharides as hemicelluloses and pectins. Phenolic compounds, lipid substances and proteins (enzymatic and structural) are also present. Most of the compounds is considered as constitutive, what means that they occur as a basic set in cell wall. However, when differentiation starts, the rearrangements in composition occur, either of quantitative or qualitative nature (or both) – depending on the future function of differentiating cell. Although the cell wall is fundamental object of studies, auxin, the plant hormone, was also taken into account. Despite the fact that cell walls were first cellular structures to be observed by Robert Hook in 17th century, and currently their composition and organization are known to a large extent, there is still a need to study the involvement of these structures in cell life and differentiation processes. That is the reason for undertaking presented studies, which main goal is to determine whether analyzed wall components can be considered as markers of particular cell differentiation events and is there a correlation between auxin distribution and direction of cell differentiation. The plant material will be model dicotyledonous plant – *Arabidopsis thaliana*, mutants with altered cell wall composition and auxin mutants. Wild-type and mutant seedlings will be autografted. Studies will be carried out with the use of broad spectrum of monoclonal antibodies, raised against specific cell wall epitopes, and thin layer chromatography method applied in order to estimate quantitative changes in cell wall composition. The effect of presented studies will be determination of wall chemical compounds as markers accompanying plant cell differentiation in specific direction. Obtained results will give information about plant regeneration and allow for connecting the occurrence of particular cell wall compound with its function.