Summary

Early reproductive processes in the young ovules of angiosperms are crucial for the proper development of the female gametophyte and the subsequent emergence of a new generation of plants. Their critical stages, such as the differentiation of the megaspore mother cell, the selection of the functional megaspore and the determination of cell identity in the female gametophyte, are conditioned by both tight genetic and epigenetic control and the activity of signalling molecules derived from an ovule's somatic cells. A number of recent scientific reports point to the potential role of signalling molecules in developmental processes, which is associated with the presence of callose, pectins and arabinogalactan proteins (AGPs). Cell walls, the chemical composition of which changes dynamically in the course of reproductive processes, are the source of these molecules. Such qualitative and quantitative changes occur over a very short time span, which may further prove their importance in intercellular communication.

The aim of the present study was to compare the distribution of callose, pectins and AGP proteins during early reproductive processes in the ovules of selected amphimictic and apomictic (aposporous and diplosporous) species from the Asteraceae family. Histochemical methods and immunolocalisation that employs monoclonal antibodies LM19, LM20 and JIM13 were applied. The findings indicate that neither callose nor AGPs can be considered as the early markers of the reproduction mode. The deposition of callose and the presence of AGPs identified by JIM13 are connected with early reproductive processes in the ovules of both amphimicts and diplosporous apomicts. Moreover, the pattern of callose deposition in the walls of the megaspore mother cell (MMC) of the analysed Asteraceae species is different from that identified in numerous Angiospermae. In most sexual and apomictic taxa, callose deposition begins at the micropylar pole of the MMC. Unexpectedly, this polysaccharide was also found to be present in the walls of aposporous initials. In the context of female sterility observed in the studied species, this may be linked to the progressive degeneration of cells that initiate the apomictic developmental pathway.

As regards pectins, it was evidenced that there were no significant differences in their localisation between the young ovules of amphimictic and apomictic species. In parallel, the dynamic changes in pectin methylesterification were seen to accompany ovule morphogenesis, regardless of how the female gametophyte develops. AGPs identified by JIM13 are the marker of germline cells that trigger

megasporogenesis and megagametogenesis in both amphimicts and diplosporous apomicts. The research also revealed that the dynamically changing levels of pectin methylesterification and the distinctive localisation of AGPs in developing ovules are not species-specific.

In summary, the findings presented in this dissertation, along with the quoted papers on the localisation and the potential importance of cell wall components in embryological processes, may serve as the starting point for advanced genetic and molecular studies.

Keywords: amphimixis, apomixis, arabinogalactan proteins, callose, cell wall, megasporogenesis, ovule, pectins

zaakceptowano 27.04.2023 r.