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VARIABILITY OF CARYOPSIS IN *AVENA* AMPHIPLOIDS – A MICROSTRUCTURAL APPROACH

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Abstract. The research on microstructure of caryopsis in selected species and interspecific amphiploids of the genus *Avena* was conducted. We were concentrated on morphological and anatomical analysis of the endosperm, in particular aleurone layer. On this basis, a number of developmental and mutational disorders of this tissue have been identified. Additionally, the tissues located in the crease of caryopsis: vascular bundle, pigment strand and nucellar projection, were analyzed. In amphiploids, a large variability of transfer tissues in caryopsis was observed. Patterns of variation of amphiploids were compared to that described in parental species by numerical taxonomy methods.

Key words: *Avena*, amphiploids, caryopsis, endosperm, microstructure

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Analysis of endosperm is of particular importance due to the fact that this tissue plays an important role both as food and feed. It is associated with large content of starch, proteins and lipids in its cells. Endosperm of oats is an especially interesting object of investigation because there are many examples of instability of this tissue (Kosina & Tomaszewska 2010, 2011; Rutishauser & La Cour 1956). Hybrid stress in young amphiploids plays an enormous role and it can induce the growth of transposons activity (McClintock 1938). The stress also affects the occurrence of mitotic recombination, which is effective with different kinds of genetic mutations (Becraft & Asuncion-Crabb 2000; Becraft *et al.* 2002; Kosina 2007). Additionally, the differences in degree of expression of parental genomes may also be significant (Ehlenfeld & Oritz 1995; Johnson & Hanneman 1999). Furthermore, transfer tissues localized in the crease of caryopsis are important in the supply of assimilates into developing endosperm. Such knowledge prompted us to conduct microstructural analysis of the endosperm and crease in some amphiploids of oats.

The above-mentioned research is based on plant material composed of selected interspecific amphiploids of the genus *Avena*. These hybrids are distinguished by the composition of genomes and patterns of inheritance of morphological traits. Moreover, parental species were included in the study. Observations of isolated aleurone layers and transverse sections of the caryopsis were made. It appeared that the spatial arrangement of prismatic and cylindrical starch cells was highly variable in the species as well as in the oat amphiploids. In the youngest tissue of endosperm – aleurone layer we affirmed the mosaics of mutational or developmental nature associated with the variability of cell cycle length and the synthesis of hemicelluloses in the cell walls. The cytological status of aleurone layer was also diversified because of occurrence of macrovacuoles as well as different content of lipids, proteins and globoids in the cells. The analysis of the surface of aleurone layer allowed revealing the presence of starchy cells in that layer. The expression of starchy phenotype was observed as a single event or in the complex of sister cells. We believe that the sister cells' mosaic is caused by a somatic crossing-over.

The general pattern of the studied tissue is determined by relation between prismatic and isodiametric endosperm, presence of cellular clones, periclinal and anticlinal divisions and preference in development of high-protein subaleurone layer. In amphiploids, a regular

form of endosperm is disrupted by the creation of acellular and cellular domains of various structures. Intrusive growth of aleurone cells into the starch endosperm is one of the most interesting phenomena, especially in amphiploids.

We were also concentrated on the study of transfer tissues localized in the crease of caryopsis. The research revealed that vascular bundles are differentiated by the number of xylem vessels. Amphiploids and parental species show distinct variation in this trait.

The preliminary analysis of this material revealed that endosperm is characterized by considerable cytogenetic instability. According to our investigation, morphological and anatomical anomalies in endosperm are distinctly related to qualitative and quantitative cytogenetic changes.

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