

## SUMMARY

An important role in the DNA damage and repair is played by the degree of chromatin condensation, which depends on DNA methylation. Thus, DNA methylation may determine the sensitivity of the nuclear genome to mutagens - hypomethylated regions are more sensitive. Moreover, in response to stress, gene expression changes, which is correlated with a decrease or an increase in the level of DNA methylation at the loci of these genes.

The aim of the dissertation was to try to understand the role of DNA methylation in the response of *Brachypodium distachyon* cells to treatment with mutagens. The response of cells to the action of selected chemical mutagens characterized by different mechanisms of action: maleic acid hydrazide (MH) and N-nitroso-N-methylurea (MNU) was observed at the cytological level as micronucleus formation. The presence of the Alexa Fluor 488 antibody indirectly conjugated with 5-methylcytosine (5mC) and its intensity in the nuclei and micronuclei of control *B. distachyon* cells and after treatment with MH or MNU were analyzed. The research included a comparative analysis of changes in DNA methylation in cell nuclei after treatment with selected mutagens and the participation of methylated DNA in the micronuclei. An attempt was also made to understand the contribution and comparison of DNA methylation at the 5S and 35S rDNA loci in *B. distachyon* micronuclei after MH treatment, with sequential use of 5mC immunocytochemical detection and FISH technique with 5S and 25S rDNA probes.

The studies showed differences in the presence and level of DNA methylation in control cells and after treatment with mutagens. The 5mC fluorescence intensity in the cell nuclei changed after the treatment with mutagens and depended on the type of mutagen and the post-incubation time used. The fluorescence intensity of 5mC in the mother nuclei for micronuclei was lower than in the nucleus of cells without micronuclei. In addition, it was shown that micronuclei differ in the presence of DNA methylation at the 5S and 35S rDNA loci. The frequency of micronuclei with 5S rDNA signal, absent DNA methylation in this region, was twice as high as the frequency of micronuclei with DNA methylation present at this loci.

The level of DNA methylation in the *B. distachyon* nuclear genome changes after the action of selected chemical mutagens, and thus may play a role in DNA damage and the repair, determining the integrity and stability of the genome.