Abstract

Artificially synthesized neopolyploids are commonly used to distinguish the direct consequences of polyploidization for plants from those that were formed in polyploid line during subsequent evolution. Colchicine is usually used for induction of somatic polyploids. In this work I tested the possibility of making neopolyploids by using colchicine in three selected plant species. Succcess of neotetraploids was 9,3 % of the species *Vicia cracca*, 31,6 % of the species *Centaurea phrygia* and 33,3 % of the species *Pimpinella saxifraga* when using a 0,2% solution of colchicine and the effect of 12 hours. When extending the exposure time to 18 hours at the same concentration of colchicine in *Vicia cracca* the success of polyploidization was 100 % but mortality of individuals threated with colchicine was nearly 98 % (when exposed 12 hours it was only 43 %). *Vicia cracca* was grown to the second generation of neopolyploid plants, but part of the individuals was aneuploid and they were not phenotypically different from the natural tetraploids. Natural diploids, tetraploids and neotetraploids were compared in the size of stomata, rate of germination and relative growth rate. The size of stomata of diploids was significantly different from tetraploids and neotetraploids so it is possible to say that polyploidization has a direct impact on their size. The rate of germination differed from each other in all three groups. So this property is likely influenced by polyploidy and subsequent evolution of the polyploid line. On the contrary the relative growth rate of the groups did not differ from each other. This property is probably not affected either by polyploidy nor by subsequent evolution.

In the second part of theses I tested the hypothesis that the tetraploids are able to adapt better to adverse environmental conditions than diploids. Specifically, I investigated how the cytotypes respond to the growing medium with toxic cadmium and how they respond to stress by drought and shading. Effect of ploidy on the accumulation of cadmium in plants was found only in leaves of *Centaurea phrygia* and more cadmium was accumulated in diploids. No ploidy effect was found in *Vicia cracca*. However in both species I observed effect of ploidy on intake of zinc and in both cases there was more zinc in tetraploids. The difference between cytotypes in response to water deficit and shading was observed only in *Centaurea phrygia*. Tetraploids were able to cope better

with drought and shading. I found no differences between ploidy level in *Knautia arvensis* and *Vicia cracca* in response to shading and drougt.

Based on the results it is possible to say that although somatic polyploidization by using colchicine is quick and easy method to get neopolyploid plants it is necessary to take into consideration possible presence of aneuploids as well as various chromosomal rearrangements, which occur after application of colchicine. Regarding the response of diploids and tetraploids to stress the results show that the effect of ploidy is strongly different between plant species but tetraploids probably don´t have a general advantage compared to diploids.

KEY WORDS: neotetraploids, colchicine, aneuploids, cadmium, zinc, photosynthesis, water stress and shading