

Biotechnological approaches in breeding and genetic research of soybean

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To obtain a new source material in soybean breeding in order to isolate valuable genotypes, we used the possibility to develop *in vitro* forms with the use of heavy metal ions as a mutagenic factor in nutrient media. The lines, which were obtained using Cd²⁺ ions from the initial forms of soybean varieties Hodson and Primorskaya 301, were analyzed by the method of allozyme analysis and according to a complex of biochemical parameters. Soybean variety Primorskaya 4 was taken as a standard. As a result of the research there were identified samples with low and high peroxidase activity which ranged from 0.2 to 167.5 u/mg of protein. Seeds of varieties Primorskaya 4, Primorskaya 301 and regenerant R 1577 possessed low specific activity of peroxidase. The highest specific activity of peroxidase was observed in seeds of Hodson variety and regenerants R 1590, R 1585, R 1606 and R 1567. The specific activity of catalase in soybean seeds varied from 27.5 to 249.9×10^{-3} u/mg of protein. The highest activity of catalase was revealed in seeds of three samples: R 1567, R 1585, variety Hodson. The lowest catalase activity was noted in seeds of varieties Primorskaya 4, Primorskaya 301, regenerants R 1597 and R 1577. The remaining samples are characterized by average values of enzyme activity. According to the study of electrophoretic spectra of peroxidases and catalases in the seeds of the studied lines, a cluster analysis was carried out. As a result, two clusters were formed. The first included the lines where the original form of them was variety Primorskaya 301. In the other line there were forms obtained from the soybean variety Hodson. Maximum genetic distances were detected between soybean variety Primorskaya 4 and lines 1567 and 1585 (I.F. Hodson) and 1568 (Primorskaya 301). The distance between clusters was 0.8, inside the cluster which was formed by the lines P301 from 0.07 to 0.3, and between the lines I.F. Hodson from 0.1 to 0.5. The studied lines demonstrate different level of variability depending on the genotype of the initial form. Thus, there were defined 4 variants of the genotype with the maximum level of genetic differences of 0.3 from 6 lines which were developed from P301. While there were defined also 4 variants from 7 lines of variety Hodson, but with big level of genetic distances – 0.5. Line 1606 according to isozymes content of catalases and peroxidases were identical as their initial form (variety Hodson). Samples with high enzyme activity and the highest number of isoenzymes potentially have the greatest resistance to stress factors. As a result of the analysis of the biochemical composition of seeds there was defined variation in the values of individual indicators both upward and downward relative to the standard. There were defined three lines R 1609, R 1605, R 1584 having advantages on a complex of traits: the fat content, oleic, linoleic and linolenic acids, have average values of enzyme activity, which does not allow them to be considered as resistant to stress factors. In relation to the initial form (Primorskaya 301) the greatest genetic differences has R 1605 (0.3365). As for R 1609 and R 1584, they have the same level of distance (0.1542). The line R 1576 is defined as a source of high protein and oleic acid content, has high values of enzyme activity. In relation to the initial form of Hodson variety it is characterized by an average value of genetic distances 0.2412.