CZU: 581.4:631.523

ASSESSMENT OF THE MORPHOGENETIC AND REGENERATIVE POTENTIAL OF TRITICALE GENOTYPES IN *IN VITRO* CULTURE

Ciobanu Renata
The Institute of Genetics, Physiology and Plant Protection, Chisinau, Republic of Moldova
E-mail: renata.ciobanu@igfpp.md

The main focus of research is determined by the country's current and future need for food security. The global and regional climate, energy and food crises pose great challenges to the scientific society, especially to plant genetics and physiology, to obtain new fundamental and applied knowledge in highlighting, evaluating and directing the genetic-physiological mechanisms of the production process and ecological resistance of plants, in this case triticale, by improving adaptability to adverse climatic conditions: increasing resistance to water and heat stress and obtaining healthy yields. In recent decades, thanks to genetic advances in breeding, new varieties have been developed that are much more competitive than current cereal genotypes. These varieties are better because of their high yield capacity and useful agronomic characteristics (fall resistance, resistance to unfavourable environmental conditions, grain filling, etc.). From a technical point of view, triticale has a great capacity to adapt to the most diverse climatic conditions, which gives it undeniable advantages over other cultures that are more susceptible to natural factors. The importance of triticale to the economy is explained by the chemical composition of the grain, which gives it special properties for use in food, animal feed and industry.

The development of theory and new effective methods for plant breeding requires a deep understanding of the mechanisms that determine the spectrum of variability in genetic information. Biotechnological methods, through the application of in vitro culture techniques, are a reliable way to obtain pathogen-free biological material, the preservation of genetic resources and the fastest way to create and multiply genotypes. In view of these aspects, we proposed to establish methods of culture that would ensure the successful in vitro regeneration of agronomically valuable genotypes.

The biological material used in this study was represented by 3 genotypes of triticale: Ingen 35, Ingen 93, 188TR5021. Mature embryos including 120 embryos from each genotype were used as source material. The basic nutrient substrate was Murashige and Skoog (1962) medium modified and supplemented with L-asparagine, mesoinositol, glycine, sucrose and growth regulators: 2,4-D dichlorophenoxyacetic acid, naphthylacetic acid (NAA) and Kinetin (K), thidiazuron, BAP (6-benzylaminopurine), agar, pH 5.8.

In order to investigate callusogenesis processes, callus cultures were initiated from mature embryos in all genotypes studied. Intense differentiation of explants and the appearance of callus formation on culturing media were observed on day 4, which is in agreement with literature data. Massive callus formation was observed at day 7-8. It was found that, all genotypes tested have a fairly high capacity to induce callus. The frequency of callusogenesis varied from 80.19% (188 TR5027), 92.02% (Ingen 93 standard) and 98.45% (Ingen 35) depending on the genotype. Two types of callus formation were observed. The first type of callus is embryogenic - compact, structured, yellowish colour; the second - non-embryogenic, watery, white-yellowishcolour. Despite

evidence in the literature that a non-embryogenic callus is formed first, which either remains the primary callus during culture or is transformed into an embryogenic type, we observed that the non-embryogenic callus did not form meristematic foci throughout explant culture, and no somatic embryogenesis was observed.

The frequency of morphogenesis depends on the induction of embryogenesis and rhizogenesis. Genotypes Ingen 35 and 188 TR5027 formed embryogenic callus at a rate of 34.22% - 40.15%. A low morphogenetic potential is attested by genotype Ingen 93 - 29.24%. Obviously, this is due to the peculiarities of morphogenesis, which is carried out by the organogenesis pathway, with a predominance of the rhizogenous type.

The frequency of rhizogenesis compared to embryogenesis was found to be high with an average of 57.35%. Only in 34.53% of morphogenic callus, the development was embryogenic. This denotes that, the achievement of morphogenesis is determined by the genetic and physiological characteristics of the explant.

Stable plant regeneration is a prerequisite for the practical use of in vitro culture. The regeneration frequency averaged 35.07%. Regeneration potential varied significantly by genotype. If for genotypes Ingen 35 (49.03%) and Ingen 93 (40.70%) then for genotype 188 TR5027 it was only 15.50%, a low regeneration rate. The number of regenerants obtained from morphogenic callus was 0.2 and 1.3 pcs per callus. This is due to the fact that a large number of morphogenic callus developed by the rhizogenesis pathway, which precludes the possibility of obtaining plants.

Analysis of variance made it possible to identify significant factors influencing callusogenesis, morphogenesis and regeneration. The frequency of callusogenesis usually depends on a number of random factors. One significant factor for this indicator is genotype. Comparing the contribution of different factors and their interaction with each other, it should be noted that genotype plays a significant role not only in the process of callusogenesis, constituting 76.04%, but also determines regeneration capacity, showing an influence power of 69.15% with significant differences for $P < 0.05$.

***Acknowledgments*:** The study was performed in the framework of the project 20.80009.5107.03 "Efficient valorization of plant genetic resources and advanced biotechnologies to increase the adaptability of crop plants to climate change".

Keywords: triticale, varieties, agronomic characteristics, callusogenesis, regeneration, *in vitro* cultures.