https://doi.org/10.53040/cga11.2021.007 CZU: 631.147+60+004.9

MOLECULAR TECHNIQUES AND INFORMATION TECHNOLOGIES IN MODERN AGRICULTURE

Maria DUCA
Moldova State University, Center of Functional Genetics, Republic of Moldova

E-mail: *mduca2000@yahoo.com*

The paper represents the effort to consolidate some aspects of using advanced technologies and genetic engineering instruments in modern agriculture. The paper addresses as well as contain examples of methods of Molecular Genetics, Bioinformatics and Geographic Information Systems, the use of which becomes indispensable in contemporary agriculture both for the development of complex strategies for cultivation and achievement of expected productivity results and for efficient management of agro-climatic diversity.

Plant growth and cultivation has an innovative history of centuries. New molecular tools, used in the early 1980s by several specialized companies in biotechnology industries, continue this long tradition by offering increased precision and efficiency in working with genetic material.

After the implementation of heterosis and the *green revolution*, genetically modified organisms (GMOs), created by genetic engineering (GM) methods, revolutionized the history of agriculture, contributing to the creation of unique genotypes with valuable economic characteristics, in short periods of time.

The efficiency of modern biotechnologies implies the creation of Gene Banks and Scientific Databases and, for their correct and fast capitalization, the use of different mathematical algorithms and Bioinformatics tools.

Modern agriculture benefits from GM, contributing to the production of sustainable foods. Farmers' yields have largely increased in recent years with the introduction of high-productivity, abiotic and biotic resistant hybrids, supplemented by agricultural inputs, especially pesticides and fertilizers. However, the approval of new varieties and the improvement of cultivation technologies does not diminish their dependence on climatic conditions. Regional climate change is one of the major threats to sustainable development and is one of the biggest environmental problems, with negative consequences for agriculture. It is known that the biological potential of hybrids, varieties and varieties in most crops is realized at the level of 35-45% of the possible potential, about 65-70% of losses, being caused by the vulnerability to climate change - the risks, intensity and the frequency of their manifestation has increased in recent decades.

The use of Geographic information systems (GIS) offers possibilities for analysis of environmental components, their mapping and visualization of complex information spatially related to real geographical coordinates, offering opportunities for analysis and correlation of high complexity, impossible to achieve efficiently through classical techniques. GIS were used to characterize agro-climatic diversity and delimit sunflower-specific adaptation areas, important correlations were revealed between sunflower cultivation intensity, climate and productivity. The spatial framework and database are used to examine where sunflower technology could have the greatest impact in combating parasitic weed infestations.

This study was funded by the project of the State Program 20.80009.5107.01 - Genetico-molecular and biotechnological studies of the sunflower in the context of sustainable management of agricultural ecosystems.