

METHODS OF INCREASE OF RESISTANCE AND PRODUCTIVITY OF WOODY PLANTS

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The absolute majority of plant organisms is stationary in space and is unable to avoid the influence of negative factors by moving to more comfortable conditions. Therefore, the search for ways to increase resistance to the action of a whole spectrum of stressors is always relevant in all branches of production related to plant cultivation. The maximum bioproductivity of plants, like other organisms, is observed under comfortable growth conditions in the so-called "norm of reaction" zone. Such conditions are possible only when cultivating plants in a human-controlled environment. But during normal plant growth, changes in environmental factors occur constantly, which causes the need for constant changes in metabolism in order to resist and adapt to negative environmental factors. In turn, this need for permanent changes leads to a decrease in overall bioproductivity due to additional expenditure of energy and nutrients for repairs and restructuring of metabolism.

The search and development of methods for increasing the resistance of plants to ensure maximum useful productivity have always been and will be relevant in all fields related to the cultivation of plants in an open environment.

Currently, many methods of increasing the resistance and productivity of plants have been developed, which are classified as classic and modern. Classical methods established historically and received maximum development in the 20th century, although their improvement continues even now too. The modern methods are developing as much as possible in our time, thanks to the achievements of fundamental and applied science and the development of technologies in the 21st century.

Classical methods include two groups: selection and agrotechnological. In forestry, as a specific branch of plant cultivation, agrotechnological methods are called forestry or forest technological.

Classical selection methods in forestry are complicated by a long growing period, late maturing, the difficulty of controlling the transfer of genetic material and other factors. But still, their use is partly widespread with the use of advantages of plus trees and plantations, selective selection of better seeds, cultivation of permanent forest seed plantations, etc.

Agrotechnological methods in forestry are possible to use in full in fact only at the stage of cultivation in forest nurseries, creation of forest crops and initial care for them. At a later age, agrotechnological methods are actually reduced to a complex of forestry measures by means of felling, formation and improvement of forests until reaching the age of maturity of the plantation.

The use of classical methods in forestry causes significant skepticism among scientists around the world, since their effectiveness is naturally low compared to the use of these methods in field agricultural production.

Therefore, the latest methods, the use of which in forestry is effective on a par with agricultural production, have been widely developed over the past two decades. Such methods include genetic engineering and metabolomics (other names are molecular-cellular or physiological) methods.

Genetic engineering methods developed thanks to the emergence of the possibility of deciphering the genomes of humans, animals and plants at the beginning of the 21st century. The possibilities of genome analysis, modeling, editing and modification of the set of genes have given prospects for purposeful creation of organisms with improved genetic capabilities for the purposes of increasing resistance to various conditions and increasing useful productivity.

Metabolomic methods were widely used already in the 20th century, but their use was more phenomenological without understanding the aspects of molecular-cellular influence. In the 90s of the last century, thanks to the advanced achievements of biophysics and biochemistry, it was possible to decipher the signaling pathways of plants that ensure the formation of adaptive responses to various stressors. Currently, metabolomic methods are mainly associated with the use of plant treatment with natural physiologically active substances and their mimetics, which are able to stimulate the formation of induced resistance and, as a result, the field bioproductivity of plants.

Thus, due to the complexity and low effectiveness of the use of classical methods of increasing the resistance and productivity of plants in forestry, scientists should focus on research and development of the modern methods for the forestry of Ukraine and ensuring their wide implementation in production, including on legislative, educational, scientific popular and methodical-recommendatory levels.