СЕКЦІЯ XI.
БІОЛОГІЯ ТА БІОТЕХНОЛОГІЇ

METABOLISM OF TOBACCO CELL CULTURES UNDER THE INFLUENCE OF LONG-TERM SALINITY

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Global climate change and acute shortages of fresh water, even for drinking, impede the cultivation of valuable economic crops. Among abiotic stresses, the most harmful effect is osmotic stress - salinity [4, 8, 9]. There is a need to obtain plant forms that combine resistance to various stresses with satisfactory consumer qualities. The needs of the current moment determine the directions of scientific research and stimulate the development of new research methods. Currently, new biotechnological methods that use micro and even nanotechnology are being actively created. At the same time, the ideology of environmental safety is becoming a priority, both for the approach itself and for the product it produces [2, 3, 5].

One of the most promising ways to solve the problem of obtaining stress-resistant plant forms is cell selection [6, 10].

Cultures of plant cells exposed to pre-selected factors can be minimized to single cells from genetically altered variants. This creates prerequisites for cellular level analysis in objects that may be at different stages of development and have a diverse range of metabolic reactions. Therefore, indicators that testify in favor of active vital activity are of particular importance. Under stable conditions or against the background of regular changes in external influences (normal → stress), it is possible to determine the adaptive potential of both the variety in general and a specific representative. Cell cultures of plants of different origins, cultivated under normal conditions and under extreme influences, are becoming a promising object of research. In vitro biotechnological methods are now beginning to outpace traditional methods of obtaining genetically modified plant forms in terms of their popularity. However, like any method, they require constant improvement [6, 11].

The aim of the study was to evaluate the reactions of Samsun and Dubec tobacco varieties. Mature seeds were sterilized and germinated. Callus was induced from the seedlings, which was grown over several passages to obtain the required amount of biomass on Hamburg's B5 medium [1, 6].

In the experiment, the fully formed callus was exposed to sulfate-chloride (seawater salts) and sulfate (Na_2SO_4) salinization; toxicants were added at a concentration of 20,0 g/l.

The variants were kept under salinity for a standard passage (30 days). In the middle (15th day) and at the end (30th day) of the passage, the free proline content was determined in the cells [7]. Under the pressure of such stress, both physical and genetic differences of the studied form were to be revealed. This made it possible to separate general and specific characteristics of the organism.

A cell culture that develops under normal conditions is in the elongation stage on the 15th day. The mass of the callus increases due to the cumulative increase in cell parameters, which is a consequence of the maximum variety of synthetic reactions. Under salinity conditions, the level and spectrum of total metabolism is expected to be limited. At the same time, there are established indicators of functioning. They are special substances - compatible osmolytes, namely free proline.

The content of free proline (pro) in the cells of callus cultures of both tobacco varieties when cultivated under normal conditions was similar on the 15th day, amounting to 35,9±2,4 mg%/serum and simultaneously decreased slightly at the end of passage. Such events undoubtedly indicate the normal development of the culture.

Under the influence of salinity, the content of free pro increased significantly. On the 15th day of cultivation in the medium with sea water salts in the Samsun variety it amounted to 150,8±6,6 mg%/serum, and in the Dubec variety 95,4±4,2 mg%/serum. Under the influence of sulfate salinization, the level of amino acid was lower, respectively 98,1±3,7 and 75,4±7,3 mg%/crude matter in different varieties. At the end of the passage (30th day), there was a synchronous decrease in the content of amino acid; under the influence of sea water salts in Samsun and Dubec varieties, it was 18,3±3,4 mg%/crude matter and 21,4±4,6 mg%/crude matter; the effect of Na_2SO_4 caused a smaller decrease.

In our opinion, this course of reactions was aimed at the adaptation of tobacco plants to salinity. This was evidenced by the resumption of callus growth when transferred to normal conditions in the next passage.

In general, the test of tobacco cell cultures obtained from different varieties under conditions of long-term salinity showed complete analogy in their reactions. This revealed both physiological and genetic characteristics. This makes tobacco cell culture a reliable object for biotechnological manipulations.

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