SECTION 2. EXPERIMENTAL BOTANY

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PROTEIN DISTRIBUTION IN BIOTECNILOGICAL VARIANTS NICOTIANA TABACCUM L. IN VITRO UNDER SALT STRESS CONDITIONS

РОЗПОДІЛ ПРОТЕЇНУ В БІОТЕХНОЛОГІЧНИХ ВАРІАНТІВ NICOTIANA TABACCUM L. IN VITRO ЗА УМОВ СОЛЬОВОГО СТРЕСУ

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The significant deterioration of the global environmental situation is becoming a major challenge for the world's population. Abiotic environmental stresses are exacerbated by various anthropogenic pressures. In this case, pollution becomes complex. It is believed that among all harmful factors, salinity of any type is the most impressive in terms of its spectrum of pathogenic transformations. The peculiarities of the toxic effect are the osmotic and ionic components, which increase with the length of the salinity and can cause irreversible pathological changes in plants [1, 3, 7]. In this case, the need for variants with an increased level of resistance increases.

Obtaining plant forms with an increased level of resistance to abiotic stresses using the latest biotechnological methods is becoming increasingly important. However, along with the undeniable achievements, there are problematic issues that require special attention. The range of such issues includes theoretical (biological), methodological and social problems.

Among biotechnological techniques, cell selection plays an important role. Cellular selection was used to obtain biotechnological plants with an increased level of resistance to osmotic stress.

Cell breeding is a priority biotechnological method that can provide plant forms with improved characteristics. Cellular selection using heavy metal ions (HMI) is a promising way to obtain variants resistant to salinity [6, 7].

To obtain salt-tolerant tobacco (*Nicotiana tabacum* L.) variants, we improved the method of cell selection with the addition of lethal doses (LD) of heavy metal ions (HMI), namely, Ba^{2+} cations [2, 7, 8, 9].

A number of publications have shown that Ba2+ cations interact with physiologically necessary K^+ cations [2, 4, 5]. Since the toxic effect of salinity is mostly caused by the loss of K^+, it was hypothesised that it is possible to select salt-resistant variants in modelled in vitro systems containing Ba^{2+} ions. Further, resistant cellular variants (RCVs) of tobacco were selected on selective media containing lethal Ba^{2+} ions for cell cultures.

To determine the level of salt tolerance of the variants, they were tested under conditions of direct exposure to chloride, sulfate-chloride (sea water salts) and sulfate salinity. It was found that Va-resistant tobacco cellular variants went through the entire cycle of cell culture development, grew and developed under conditions of lethal salinity of any type. This is evidenced by the relative growth of callus, Δm: Δm = (mk – mp)/ mp; where mk is the mass of callus at the end of the passage; mp is the initial mass. This integral indicator is constantly used in cell selection to confirm the fact of culture proliferation. At the same time, it is not possible to judge the characteristics of the culture's vital activity by this indicator.

This is evidenced by synthetic processes. We studied the redistribution of cellular and extracellular proteins in the Va resistant cell line during the cell cycle. Under normal conditions, a decrease in the content of cellular protein and an increase in the content of extracellular protein were observed. The complete identity between the Va-resistant variants and the control was also observed. It is known that an increase in the extracellular protein pool is often associated with phosphorylation at tyrosine sites and determines the status of the culture [7, 9]. Such an event of protein redistribution was observed during the cultivation of Ba – resistant tobacco cellular variants under lethal chloride and sulfate salinisation. At the same time, the protein content in cells under stress conditions was lower. The observed phenomena reflect the peculiarities of cell functioning, and in general may indicate the normal vital activity of the variants under stress pressure.

Thus, the effectiveness of using Ba2+ ions for the selection of variants and forms of plants resistant to salinity was demonstrated.

Our data, despite the complexity of their interpretation, showed the prospects of the applied method. At the same time, we need to keep in mind the constant need for its improvement.

Recently, in plant genetics, the focus of scientific efforts has been shifting from classical genetics to the study of molecular genetic mechanisms of biological processes. The advantages of the new principles are already widely recognised and do not require proof. New approaches also require new research objects.

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