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INFLUENCE OF ENDOGENOUS DETERMINANTS ON THE ADAPTATION OF ALMOND PLANTS *IN VITRO*

Endogenous determinants, including hormones and varietal traits, significantly influence the growth and development of almond regenerants. It was established that a balanced combination of external conditions and endogenous regulators significantly enhances the effectiveness of adaptation and further cultivation of regenerants in vitro. Among the studied cultivars, Alex is the most promising for further cultivation, and the use of synthetic hormones at concentrations of BAP 0.125 mg/L and IBA 0.75 mg/L provides the best biometric indicators at the adaptation stage.

Key words: Benzylaminopurine (BAP), Indole-3-butyric acid (IBA), survival rate of regenerants, root growth, growth regulators.

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ВПЛИВ ЕНДОГЕННИХ ДЕТЕРМІНАНТ НА АДАПТАЦІЮ РОСЛИН МИГДАЛЮ *IN VITRO*

Ендогенні детермінанти, зокрема, гормони та сортові особливості, значною мірою впливають на ріст і розвиток регенерантів мигдалю. Встановлено, що збалансоване поєднання зовнішніх умов та ендогенних регуляторів дозволяє значно підвищити ефективність адаптації та подальшого культивування регенерантів in vitro. З досліджуваних сортів Алекс є найперспективнішим для подальшого культивування, а використання синтетичних гормонів у концентраціях БАП 0,125 мг/л і ІМК 0,75 мг/л забезпечує найкращі біометричні показники на етапі адаптації.

Ключові слова: бензиламінопурин (БАП), індолілмасляна кислота (ІМК), приживлюваність регенерантів, приріст коренів, регулятори росту.

The life activity of the plant object (from cell to whole organism) is carried out through the realization of the genetic program. External conditions influence the speed and "quality" of its implementation. In cells and tissues, the content and activity of endogenous determinants change [1, 2].

Exogenous and endogenous hormones determine the development of regenerants according to the Skoog-Miller rule [3].

Regenerants were grown under standard conditions [4]. In our previous studies, it was established that for successful adaptation of regenerants, it is recommended to maintain a temperature of 22–24°C, humidity of 75–85 %, and a light regime of 16 hours of light and 8 hours of darkness. This ensures optimal growth and reduces the

risk of stress.

It was established that the optimal combination of external factors (temperature, humidity) and internal factors (endogenous hormones, genotype) significantly enhances the effectiveness of adaptation and development of regenerants in vitro.

We studied the impact of a complex of endogenous factors based on the following changes:

- regenerants grown in media with different contents of synthetic hormones;
- regenerants of different ages;
- varietal characteristics. We assessed survival rates and growth of vegetative organs during post-septic adaptation.

An excess of cytokinins induces branching of the shoot, while a predominance of auxins leads to apical dominance of the shoot's terminal bud and root formation.

Hormones, accumulated in the mother plant, are transmitted to the offspring during cutting [1, 4]. We compared the survival rate of regenerants and the growth of their vegetative organs after different previous in vitro cultivation conditions on the following variants of media:

- BAP 0.125, IBA 0.75 mg/L;
- BAP 0.75, IBA 0.125 mg/L;
- BAP 0.125, IBA 0.125 mg/L.

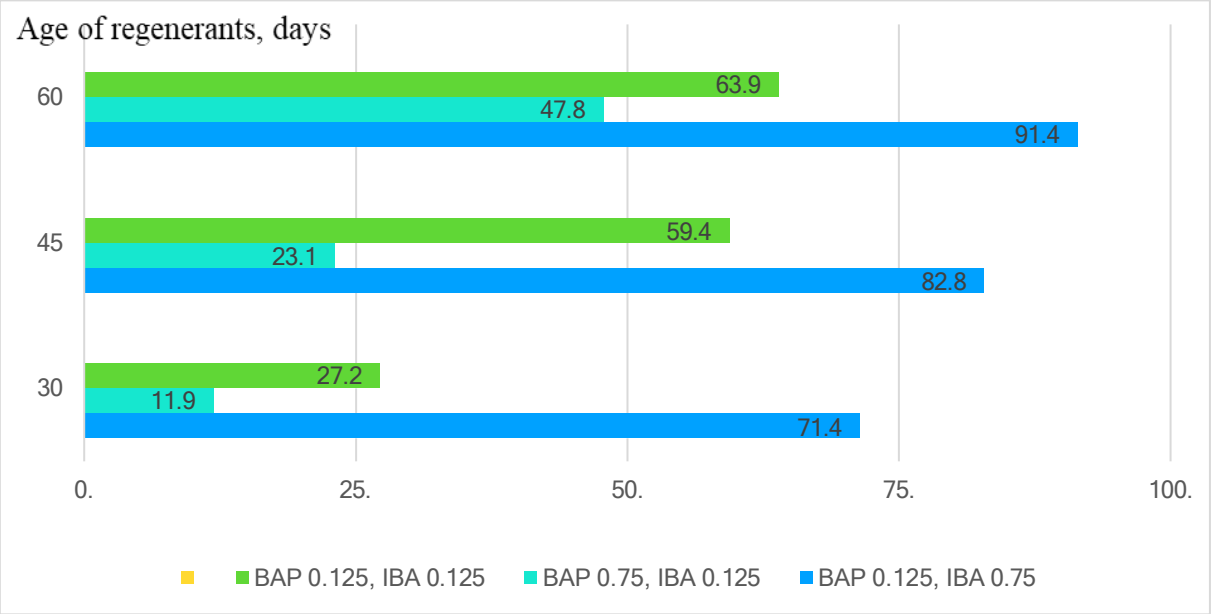

Fig. 1. **Survival (%) of almond regenerants of different ages in vitro depending on the hormonal composition of the nutrient medium**.

The medium BAP 0.125 + IBA 0.75 provided the best survival results for regenerants across all age groups: 30 days – 71.4 %, 45 days – 82.8 %, 60 days – 91.4 %. The high concentration of IBA (0.75 mg/L) promotes better rooting and viability. This medium was particularly effective for older regenerants (45-60 days). The poorest

survival rates were observed with the BAP 0.75 + IBA 0.125 medium across all age groups: 30 days – only 11.9 %, 45 days – 23.1 %, 60 days – 47.8 %. The high BAP concentration (0.75 mg/L) inhibits development and reduces viability. This had a particularly negative effect on younger (30-day-old) regenerants, which almost failed to survive.

The synthesis of endogenous determinants depends on metabolism, including the synthesis of secondary metabolites. In turn, metabolism is influenced by determinants, including substances with hormonal activity. Thus, there is an interdependence, which also depends on the genotype and environmental conditions. Significant differences in survival and vegetative organ growth were observed across four cultivars.

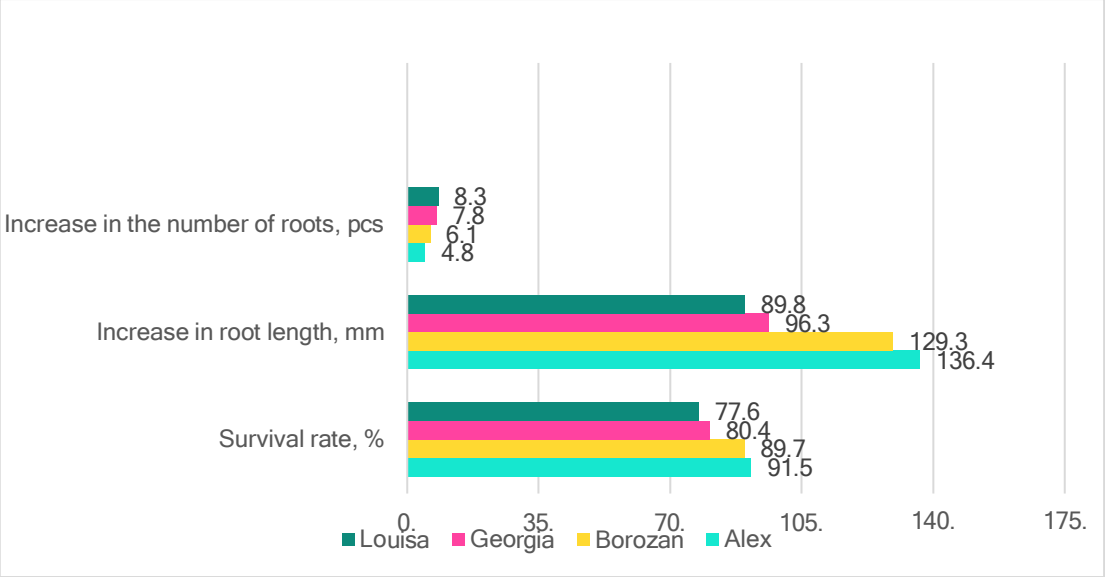

Fig. 2. **The effect of cultivar on growth characteristics during post-septic adaptation of almond regenerants in vitro.**

The effect of cultivar on growth characteristics during post-septic adaptation of almond regenerants in vitro. The highest survival rate was observed in the cultivar Alex – 91.5 %, indicating its high adaptability. Borozan had a survival rate of 89.7 %, also indicating good adaptation. The lowest survival rate was observed in the cultivar Louisa – 77.6 %, which may indicate its lower resistance to adaptation conditions. Regarding root length growth, the highest values were observed in Alex – 136.4 mm. The shortest roots were observed in Louisa – 89.8 mm. However, this cultivar had the highest number of roots per plant – 8.3, indicating compensatory mechanisms in Louisa. Borozan and Georgia cultivars also showed good results, with Borozan demonstrating high resilience under stress conditions.

In conclusion, regarding the effect of endogenous determinants, it was found that high concentrations of BAP (0.75 mg/L) inhibit growth and survival of almond regenerants in vitro across all age groups. The use of the BAP 0.125 + IBA 0.75 medium is recommended for maximal survival. For 30-day-old regenerants, lower BAP concentrations or intermediate concentrations should be considered. Genetic traits also play a crucial role: Alex cultivar demonstrated the highest survival rate (91.5

%) and root growth (136.4 mm), while Louisa, despite its lower survival rate, had the highest number of newly formed roots. A balanced combination of external conditions and endogenous regulators can significantly improve the adaptation efficiency and further cultivation of regenerants *in vitro*.

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