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DETERMINATION OF THE OPTIMAL CONCENTRATION OF IBA IN THE ROOTING STAGE OF THE PROCESS OF MICROCLONAL PROPAGATION OF RX1 WALNUT ROOTSTOCKS

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Abstract. The article presents the results of the study of the effects of different concentrations of IBA as a growth regulator in the rooting stage of the microclonal propagation of RX1 walnut rootstocks. In the nutrient media the rooting rate of explants was on average 16.2%, while in the concentration of IBA at 8.0 mg/l consumption rate, a high result 71.5% was recorded.

Key words: RX1 walnut rootstocks, microclonal propagation process, IBA (indole butyric acid), rooting parameters, root length, root number.

Introduction

The increase in the demand for food by the population of the earth increases the urgency and relevance of efficient use of agricultural land, the production and introduction of new innovative technologies. Walnut production is also important in meeting food demand, so world production of walnuts is 3,874 million tons. The main part of the cultivated crop is 57.8% on the Asian continent and 26.9% on the American continent. China is the world leader in the production of walnuts, producing 1.4 million tons. The USA produces 682 thousand tons of walnut, Iran 355 thousand tons and Turkey 355 thousand tons of walnut. The countries of Mexico and Chile take the lead in the next places, annually producing 177 and 153 thousand tons of products, respectively (FAO 2022).

The great importance of RX1 rootstocks of walnut in the process of microclonal reproduction is explained by many factors. RX1 rootstock is characterized by high adaptability, strong root system and stress tolerance in walnut cultivars [1,2]. This rootstock creates a favorable environment for plants development, increases productivity and enables plant to produce high-quality nuts. Microclonal propagation technology significantly helps in protecting RX1 rootstocks from various viruses and diseases, which in turn ensures the stability of walnut groves [3,4].

The main advantage of RX1 rootstocks compared to Vlach rootstocks is their high tolerance. RX1 rootstocks have strong protection against phytophthora and nematodes, and these rootstocks manifest high resistance to soil diseases [5,6]. At the same time, RX1 rootstocks have high adaptability to various agro-ecological conditions and are widely used among walnut growers. It is in these aspects that the RX1 rootstocks surpass the Vlach rootstock. Therefore, microclonal propagation and widespread use of RX1 rootstocks is important to ensure the sustainability of walnut production [7,8].

Materials and methods

The rooting stage of microclonal propagation of RX1 walnut rootstocks was carried out as follows: DKW (Driver and Kuniyuki Walnut medium) basal nutrient medium with a concentration of ½ strong macronutrients was used as a nutrient medium. Rooting index, the number and length of roots were analyzed in the experiments in which 0, 1.0, 3.0, 5.0, 8.0 and 10.0 mg/l indole butyric acid (IBA) was added to the nutrient medium. The pH level of the nutrient medium was 5.6-5.8, and the explants were kept in the dark for 7-10 days at a temperature of 25°C and under 60-70% humidity, and then for a week in the light for 16 hours and again for 8 hours in the darkness.

Results and discussions

As a result of the experiments, rooting index, number and length of roots of RX1 rootstocks increased with increasing concentration of IBA in nutrient medium (Table 1). However, when the hormone concentration reached 10.0 mg/l, the percentage of rooting did not increase and the quality indicators of the explants decreased, that is, yellowing and shedding of leaves were observed.

Table-1

The influence of indole butyric acid (IBA) concentrations on *in vitro* root formation of RX1 walnut rotstocks

IBA concentration (mg/l)	Rooting index (%)	Root number	Root length (cm)
0.0	16.2±1.3	1.1±0.2	1.4±0.3
1.0	37.4±1.2	2.4±0.4	2.7±0.1
3.0	44.4±1.6	3.7±0.2	2.9±0.4
5.0	63.3±1.1	4.3±0.6	2.9±0.3
8.0	71.5±1.6	4.7±0.3	3.4±0.4

10.0	73.2±1.4	4.5±0.4	3.4±0.6

The rooting rate of explants in hormone-free medium was 16.2% on average, and the highest result was 71.5% when 8.0 mg/l concentration of IBA was applied (Fig. 1). Considering that there was no significant change in the percentage of rooting, root number and length at 8.0 mg/l and 10.0 mg/l concentrations of IBA and the quality of explants decreased at 10.0 mg/l concentration of IBA, for the propagation of RX1 rootstocks at the in vitro rooting stage IBA concentration of 8.0 mg/l was found to be optimal.

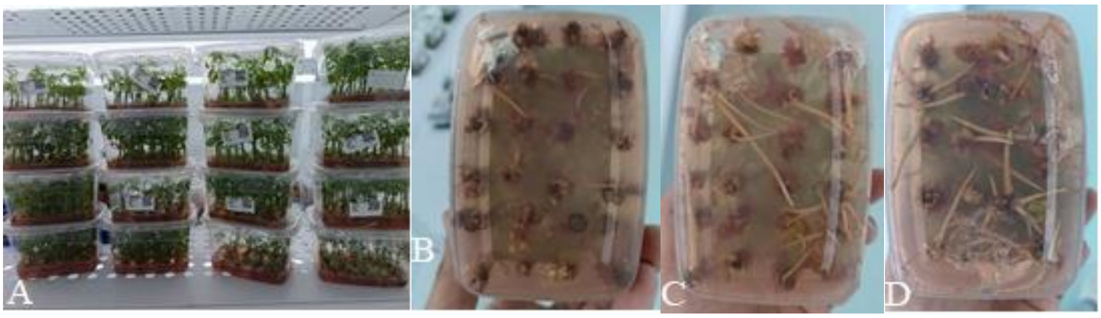

Figure-1. **Root formation of RX1 rootstocks at different concentrations of IBA: A – general view; B – hormone-free medium; C – 3.0 mg/l of IBA applied medium; D – 8.0 mg/l of IBA applied medium.**

Conclusion

RX1 rootstocks have advantages over other walnut rootstocks with high adaptability, strong root system and stress tolerance characteristics, and through microclonal propagation of these rootstocks, walnut plantations can be provided with quality rootstocks. In the rooting stage of rootstocks in the microclonal propagation, a high rooting rate (71.5%) and high-quality explants can be achieved in DKW nutrient medium applied with 8.0 mg/l concentration of IBA.

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