Research in: Agricultural & Veterinary Sciences
Vol.5, No.2, 2021, pp.50-54

FEATURES OF RHIZOGENESIS OF AZERBAIJANI GRAPE VARIETIES MADRASA AND BAYAN SHIREY

Sevil J. Suleimanova*

Research Institute of Fruit and Tea Growing of Ministry of Agriculture of Azerbaijan Republic, Guba, Azerbaijan

Abstract. The article presents the results of a study on the study of the peculiarities of rhizogenesis of local grape varieties adapted to the conditions of Azerbaijan. The rooting of grapes in in vitro culture is determined by the mineral and hormonal composition of the nutrient medium, the morphological development of regenerated plant varieties. The culture of grapes, on average, takes root well both in natural conditions and on artificial nutrient media. However, obtaining a high quality root system (branched, without callus tissue at the base of the root) requires the determination of a suitable nutrient medium and cultivation conditions. The objects of the study were microcuttings of local grape varieties of Madrasa and Bayan Shirey, as well as Murashige and Skoog (MS) medium, modified with various combinations and concentrations of auxins and cytokinins (IBA, BAP, 2ip) in 9 variants. The research results showed that the main factors affecting the intensity and quality of rooting are the concentration and type of auxin in the nutrient medium. So, the optimal medium for in vitro rooting of both grape varieties was MS medium with an IBA content of 1.0 mg/l, except for the number of roots, the maximum number of which was obtained on MS medium with a 2.0 mg/l IBA content.

Keywords: *Azerbaijani grape varieties, in vitro, rooting, IBA.*

****Corresponding Author:*** *Sevil J. Suleimanova, Research Institute of Fruit and Tea Growing of Ministry of Agriculture of Azerbaijan Republic, Zardabi settlement, Guba, Azerbaijan, Tel.: +994552423178, e-mail: suleymanovas81@mail.ru*

Received: *19 May 2021;* ***Accepted****: 11 July 2021;* ***Published:*** *30 August 2021.*

1. Introduction

The introduction of local Azerbaijani grape varieties into in vitro culture is due to the need to start work on the elimination of grapes from systemic diseases (bacterial, viral and phytoplasmic). The collection and preservation of the unique gene pool of Azerbaijan grapes in *in vitro* culture is the first step to start these studies, since numerous theoretical and practical studies have proven that in vitro culture completely frees plants from fungal and bacterial infections and contributes to the elimination of viral diseases. In addition, in *in vitro* culture, it is possible to carry out work on thermal and chemotherapy, which makes it possible to completely remove viruses from explants (Doroshenko, 2014; Spiegel, 1993).

The conservation of grapes in their natural habitat (in situ) is currently the main way to create collections. The main disadvantages of such collections (damage under unfavorable weather conditions, the risks of over-pollination, the need for large land areas and significant material human resources) can be leveled out during storage of genetic collections in tissue culture in vitro. These storage method help to reduce the costs and space for maintaining collections, allow you to quickly multiply, adapt and use stored genotypes in your work, exchange material without quarantine procedures.

The main problems in preserving landrace and varieties of our own selection is the lack of data on the introduction of these forms into in vitro culture, the peculiarities of the modes of their cultivation and deposition (Doroshenko, 2014; Doroshenko, 2011; Reshetnikov, 2014; Spiegel, 1993).

At the Research Institute of fruit and tea growing of Ministry of Agriculture of Azerbaijan Republic, work has begun on the development of a technology for micro-propagation of valuable local varieties of grapes of Madrasa and Bayan Shirey (Suleimanova, 2018a, 2018b). A scheme for sterilizing explants, compositions of nutrient media for micropropagation were developed, and optimal cultivation conditions were selected.

The aim of this study was to reveal the features of rhizogenesis of the Madrasa and Bayan Shirey microcuttings obtained in vitro.

2. Material and methods

Description of the study objects is given below:

Madrasa is one of the best wine grape varieties of Azerbaijani national selection. A cluster of medium size or large, broadly conical, branched, of medium density, weighs a maximum of 140 g. A medium-sized berry weighing 100-135 g (100 berries). Skin color is dark blue. The skin of the berry is covered with a waxy coating on top. The pulp of the berry is very juicy, light green in color, sweet and sour. Bushes of medium vigor. Madrasa grape variety not resistant to frost. Grapes are relatively drought and chlorose resistant.

Bayan Shirey is also a local late-ripening Azerbaijani grape variety. Bushes are vigorous. Bunches of cylindrical and cylindrical conical shape, medium-sized. The color of the berries is greenish-yellow, covered with a waxy bloom on top. The pulp is juicy. Bayan Shirey grape variety is moderately resistant to mildew and powdery mildew. Not resistant to frost and drought.

The rooting of grapes in in vitro culture is determined by the mineral and hormonal composition of the nutrient medium, the morphological development of regenerated varieties of plants. The culture of grapes, on average, takes root quite well, both in natural conditions and on artificial nutrient media. However, obtaining a high quality root system (branched, without callus tissue at the root base) requires the identification of suitable nutrient media and cultivation conditions.

In result of research Bugaenko & Ivanova-Khanina, (2011) as found that the rooting of microcuttings of grapes Frumoasa alba is higher on a medium with an IAA concentration of 0.5 mg / l. The formation of an intensively growing shoot with 4-6 well-developed roots 32.7 ± 0.8 mm long was noted. With a further increase in IAA concentration in the medium, plant growth was inhibited, and thickened and shortened roots were formed. It was also found that the cultivation of microcuttings of grapes Cabernet Sauvignon in the medium with an IAA concentration of 0.5-1.0 mg/l promoted the formation of a well-developed root system.

Aazami (2016) for micropropagation of 2 Iranian grape varieties Soltanin and Sahebi used the MS culture medium with various hormonal supplements. On nutrient medias MS+1.5 mg /l BA and MS+1.0 mg/l IBA+1.5 mg/l BA, the author obtained the largest number of shoots from one apex (3.8-5.4 pcs). Then shoots the were subcultured twice on plant medium with 1.0 mg/l TZD and 1.5 mg/l GA_3. The resulting micro plants rooted on MS medium with 1.0 mg/l IBA.

Thus, the authors opinions on the composition of the nutrient medium for the rooting of grape microcuttings, on which it will be possible to obtain a high percentage of rooting and, finally, a full-fledged, fully formed plant, differ. The fact that for each individual variety it is necessary to select an individual composition of the nutrient medium became the main circumstance of the study, the purpose of which was to select the most suitable combination and concentration of growth regulators at the rooting stage to obtain full-fledged plants of the Madrasa and Bayan Shirey grape varieties.

The objects of the study were microcuttings of local grape varieties of Madrasa and Bayan Shirey, as well as the Murashige and Skoog (MS) medium modified with various concentrations of auxins and cytokinins in 9 variants.

Variants of the concentrations of auxins and cytokinins used in the nutrient medium:

1. 0,5 mg/lIBA
2. 1,0 mg/lIBA
3. 2,0 mg/lIBA
4. 0,5 mg/lIBA +0,5 mg/lBAP
5. 1,0 mg/lIBA +0,5 mg/lBAP
6. 2,0 mg/lIBA +0,5 mg/lBAP
7. 0,5 mg/lIBA +0,5 mg/l 2 iP
8. 1,0 mg/lIBA +0,5 mg/l 2 iP
9. 2,0 mg/lIBA +0,5 mg/l 2 iP

When assessing the results of the stage of rooting microplants of grapes of Madrasa and Bayan Shirey on nutrient media using 9 different hormonal combinations and concentrations, the following were taken into account: the number of shoots (n), the length of shoots (cm), the number of leaves on the shoots, callus formation, the percentage of rooting (the percentage of obtaining full plants,%), the number of roots (n) and their length (cm). Due to the fact that the shoots obtained at the stage of micropropagation at the next stage of rooting form axillary shoots, such indicators as the number and length of shoots were taken into account at the stage of rooting.

3. Results and Conclusion

The research results are presented in tables 1 and 2.

Table 1. Indicators micro plants varieties of grape of Madrasa and Bayan Shirey at the rooting stage

	Variants	Number of shoots, pcs		Length of shoots, cm		Number of leaves, pcs	
		Madrasa	Bayan Shirey	Madrasa	Bayan Shirey	Madrasa	Bayan Shirey
1	0,5 mg/l IBA	1,1	1,30	1,38	3,02	2,12	4,4
2	1,0 mg/l IBA	1,0	1,0	**2,46**	**3,25**	2,31	**5,13**
3	2,0 mg/l IBA	1,23	1,33	1,68	2,67	1,75	4,16
4	0,5 mg/lIBA + 0,5 mg/lBAP	**2,11**	1,90	1,86	1,71	**4,1**	3,3
5	1,0 mg/lIBA + 0,5 mg/lBAP	1,12	**2,11**	1,74	1,9	1,70	3,45
6	2,0 mg/lIBA + 0,5 mg/lBAP	1,24	1,89	1,25	2,07	3,22	3,8
7	0,5 mg/lIBA + 0,5 mg/l 2iP	1,6	1,43	1,93	2,04	3,82	3,45
8	1,0 mg/lIBA + 0,5 mg/l 2iP	1,12	1,15	2,09	1,71	2,67	2,8
9	2,0 mg/lIBA + 0,5 mg/l 2iP	1,33	1,1	2,06	1,2	2,58	2,70

As can be seen from Table 1, the largest number of axillary shoots was obtained for the Madrasa variety (2.11 pcs) in the 4th variant MS +0.5 mg/l IBA+0.5 mg/l BAP, and for the Bayan Shirey variety (2.11 pcs) in the 5th variant MS +1.0 mg/l IBA+0.5 mg/l BAP. It should be noted that, in general, at the stage of rooting, the shoot formation of microplants of the Madrasa variety was lower than that of the Bayan Shirey variety.

In terms of shoots length and leaf formation activity, Madrasa microplants were also inferior to Bayan Shirey microplants. Thus, the longest shoots (3.25 cm) and active leaf formation (5.13 pcs) were observed in the variety Bayan Shiray in the 2nd variant on MS medium with 1.0 mg/l IBA.

The study also revealed the fact that the media inhibiting shoot formation of both varieties had a positive effect on the length of the shoots. So, for the Madrasa and Bayan Shirey varieties the minimum number of shoots (1.0 pcs) and the maximum shoot length (2.46 and 3.25 cm) were observed on MS medium with the addition of 1.0 mg/l IBA (2nd variant).

Evaluating the root formation of both varieties (Table 2), we see that the longest roots are fixed in 1-st variant for the variety Bayan Shirey (3.9 cm) and in 2-nd variant for the variety Madrasa (3.47 cm) with 0.5 mg/l and 1.0 mg/l IBA respectively.

In terms of quantity, a larger number of roots both for the Madrasa variety (7.6 pcs) and for the Bayan Shirey variety (6.83 pcs) were formed on the MS +2.0 mg/l IBA.The maximum average length of roots formed in vitro for microplants of the Madrasa variety (3.34 cm) was recorded on MS +1.0 mg/l IBA, and for microplants of the Bayan Shirey variety (2.33 cm) on MS +1.0 mg/l IBA+0.5 mg/l BAP.

Table 2. Indicators of root formation of microplants varieties Madrasa and Bayan Shireyat the rooting stage

	Variants	Rooting, %		Longest root, cm		Average root length, cm		Average number of roots, pcs	
		Madrasa	Bayan Shirey	Madrasa	Bayan Shirey	Madrasa	Bayan Shirey	Madrasa	Bayan Shirey
1	0,5 mg/l IBA	10,0	80,0	0,5	**3,9**	0,34	2,29	0,2	3,7
2	1,0 mg/l IBA	83,0	82,0	**3,47**	2,74	**3,34**	1,93	2,6	5,2
3	2,0 mg/l IBA	90,0	80,0	0,47	2,67	0,27	1,63	**7,6**	**6,83**
4	0,5 mg/lIBA + 0,5 mg/lBAP	10,0	0	0,21	0	0,17	0	0,44	0
5	1,0 mg/lIBA + 0,5 mg/lBAP	18,0	65,0	0,08	2,84	0,08	**2,33**	0,10	0,89
6	2,0 mg/lIBA + 0,5 mg/lBAP	49,0	62,0	1,64	2,4	1,24	1,71	2,78	1,33
7	0,5 mg/lIBA + 0,5 mg/l 2iP	25,0	0	0,84	0	0,61	0	0,60	0
8	1,0 mg/lIBA + 0,5 mg/l 2iP	32,0	30,0	2,09	0,31	1,40	0,23	1,0	0,4
9	2,0 mg/lIBA + 0,5 mg/l 2iP	60,0	70,0	2,36	2,96	0,24	1,31	0,33	3,8

Judging by the results of the study, plant mediums MS + 0.5 mg/l IBA and MS+ 0.5 mg/l IBA+0.5 mg/l BAP partially inhibited root formation in microplants of Madrasa variety (Table 2). MS medium with 0.5 mg/l IBA + 0.5 mg/l BAP and MS

medium with 0.5 mg/l IBA + 0.5 mg/l 2ip completely inhibited the process of root formation in microplants of Bayan Shirey variety (Table 2).

In general, the optimal results for in vitro rooting of both grape varieties were obtained on MS medium with a content of 1.0 mg/l IBA, except for the number of roots, the maximum number of which (table 2) was obtained on a medium with a content of 2.0 mg/l IBA. This medium (MS + 1.0 mg/l IBA) made it possible to obtain plants with good morphometric characteristics. Shoots reached 3 cm or more, each microplant had 3 - 5 internodes and a well-developed leaf system. The plant roots in culture in vitro were light, callus was absent at the base, the number of adventitious roots per plant was 3 - 5 pieces. These characteristics of microplants made it possible to transplant them for adaptation.

Thus, studies on the study of the peculiarities of rhizogenesis of local grapes, adapted to the conditions of Azerbaijan, varieties Madrasa and Bayan Shirey, show that the main factors influencing the intensity and quality of rooting are the concentration and type of auxin in the nutrientmedium. So, the optimal medium for in vitro rooting of both grape varieties was MS medium with a content of 1.0 mg/l IBA, with the exception of the number of roots, the maximum number of which was obtained on an MS medium with a content of 2.0 mg/l IBA.

References

Aazami, M.A. (2016). Effect of some growth regulators on “in vitro” culture of two Vitis vinifera L. cultivars. Bucharest: *Romanian Biotechnological Letters*, *15*(3), 5229-5232.

Bugaenko, L.A., Ivanova-Khanina, L.V. (2011). Morphogenesis of grapes in culture in vitro//- Simferopol: *Scientific notes of Tauride National University, Biology and Chemistry,* 2, 73-82.

Doroshenko, N.P. (2014). *Features of clonal micropropagation of grapes.* All-Russian Research Institute of Viticulture and Winemaking named after Ya.I. Potapenko.

Doroshenko, N.P., Kuprikova, A.S. (2011). Biotechnology of recovery and conservation of Don native grape varieties. Materials of the international scientific and practical conference *Genetic resources and selection support of modern viticulture*, 156-160.

Reshetnikov, V.N., Spiridovich, E.V., Nosov, A.M. (2014). Plant biotechnology and prospects for its development. Kiev: *Plant Physiology and Genetics*, *46*(1), 3-18.

Spiegel, S., Frison, E.A., Converse, R.H. (1993). Recent Developments in Therapy and Virus-Detection Procedures for International Movement of Clonal Plant Germ Plasm. St.Paul: *The American Phytopathological Society*. *Plant Disease, 77*(12), 176-180.

Suleimanova, S.J. (2018a). Introduction in in vitro culture grape varieties of Madrasa and Bayan Shirey. Materials of the republican scientific and practical conference *Academician Jalal Aliyev and Genetic Resources of Biological Diversity*, 154-158.

Suleimanova, S.J. (2018b). Biotechnology is the basis for the production of virus-free grape planting material. Materials of the international scientific and practical conference *Problems of ensuring the food security of the independent Azerbaijan and increasing the competitiveness of the agricultural sector*, 761-764.