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Reaction of table grape cultivar on the inflorescence treatment by Gobbi Gib 2LG (GA_3)

A study was carried out in the central and southern zones of wine growing of Moldova Republic, to evaluate the influence preparation Gobbi Gib 2LG (GA3) on the morphological and biological parameters and productivity of vines and quality of grapes. It was established that the treatment of inflorescence of the seeded grape varieties Cardinal, Muscat gamburgskii, Codreanka, Prezentabil and seeded grape varieties with functionally-female type of flower Talisman by gibberelic acid leads to increasing in the size and weight of clusters and berries, productivity of vines and grape quality. Productivity of vines increases in 1,3-1,9 times and depends on biological particularities of grape varieties. We have established that optimal treatment conditions for seeded grape varieties are GA_3-50 ppm in phases of postfertilisation.

***Keywords*:** gibberelic acid, Gobbi Gib 2LG, productivity, table seeded grape variety, grape varieties with functionally-female type of flower.

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GROWTH REGULATOR MELAFEN IN THE CULTURE OF VINE *IN VITRO*

The paper presents the results of testing of Melafen which is a new growth regulator of polyfunctional activity while the clonal micro propagation of vine. Positive effect on the survival rate of micro-cuttings, yield and the qualitative characteristics of plants in vitro were found out.

Keywords: grapes, clonal micro-multiplication, the regulator of an increase in Melafen, concentration, the regeneration of plants, an improvement of the qualitative characteristics.

For the production of vine planting stock of high quality we proposed a biotechnological system. The system releases the grape plants from a range of viruses and produces a virus-free planting stock. The system includes the following methods: biological testing of plant for viruses, the meristem culture, thermo or chemotherapy in the conditions of in vitro, cultivation of organs and tissues and production of regenerated plant, adaptation of test-tube plants in vivo, planting of basic and certified nurseries.

The key moment of the system was regeneration of normal viable plant from apical meristems size 0,1- 0,2 mm, having weak regenerative ability. The success of in vitro cultivation and obtaining normal plants is directly related to the optimization of the conditions at each stage. As a rule, even a small deviation from the optimum lead to an abrupt decrease of growth and propagation, as well as to the deterioration of the physiological state of the regenerants.

The aim of this research was to find out the possibility of optimization of nutrient substrate's composition for clonal micro-propagation of grapevine in vitro culture using Melafen - new polyfunctional perspective preparation for agriculture, biotechnology and ecological biotechnology.

Melafen is unique. It was created at A.E. Arbuzov Institute of organic and physical chemistry. There are no analogues of it in the world. Melafen is a melamine salt of bis (oxymethyl)-phosphinic acid.

Melafen's growth-stimulating effect is caused by the activation of energy processes, especially, respiration and photosynthesis. The preparation mostly effects on cyclic photophosphorylation.

At the same time it increases the total rate of heat production, which characterizes the cell's energy efficiency. The Melafen has a high polyfunctional physiological activity at low concentrations. It is recommended as a plant growth regulator. The preparation answers to the demands of modern technology for testing at leading agricultural crops. [1]

Melafen operates in extremely low concentrations, and it is safe for environment. Its synthesis is simple, that is why its price is rather low in comparison with preparations of the same purpose.

It is known about Malaren's impact on germination energy and germination of seeds, increasing of yields and quality of crops [RU2158735 C1, publ. 10.11.2000, bull. No. 31; RU2390984 C1, publ. 10.06. 2010, bull. No. 16; RU2354106 C2, publ. 10.05.2009, bull. No. 13].

It is known about the application of Melafen in biotechnology, namely in the ways of getting alkaloids in growing culture of tissue's cells, for example, Rauwolfia serpentine Rauwolfia Serpentina Benth [RU2394100 C2, publ. 10.07.2010, bull. No. 19; RU2174555 C1, publ. 10.10.2001; RU2323972 C1, publ. 10.05.2008, bull. No. 13].

We didn't find any information about Melafen's application for cultivation of vine in vitro.

Taking into account the positive effect of Melafen on grain - crops and in biotechnology, we studied the impact of the preparation on the stage of micro-cloning in standard conditions of cultivation.

For this purpose we selected vine plants, regenerated from apical meristems size 0.1-0.2 mm and propagated by in vitro cultivation. The cultivation was carried out on solid modified nutrient substrate Murasige and Skooga with addition of sucrose (10 g/l), mesoinositol (50 mg/l), pyridoxine and thiamine (0,2 mg/l), pH 5,7-5,9.

The plants were taking out from the test tubes and in aseptic conditions they were divided into micro cuttings size 10-12 mm with bud and then they were put into fresh substrate with

addition of Melafen in concentrations 10^{-5} ,10^{-7}, 10^{-9}, 10^{-11}%.

Cultivation was carried out in a cultivational room with illumination of 2500 Lux, temperature 25-27 °C and photoperiod of 16 hours. The replication of each variant was triple, each replication had 14 plants, each variant had 42 plants.

We studied the effect of the preparation on the following indicators: survival of micro grarts, the number of newly formed roots, the length of roots, the length of rhizogenes area, the height of a plant, the number of leaves and the coefficient of polarity.

We examined the growth of Cimladar, Puhlyakovski and Varushkin grapes varieties while clonal micro-propagation throughout 3 months.

We obtained clear evidence of positive effect of Melafen on clonal micro propagation of grape Cimladar (table 1). Improvement of all quality plant indicators were registered after 23 days of cultivation in concentrations 10^{-5}, 10^{-7}, 10^{-9}, 10^{-11}%. The best results were registered with concentration of 10^{-7}%.Indicators with concentration of 10^{-9}% were slightly worse. Further reduction of concentration led to decrease of the positive effect.

Table 1

The effect of Melafen's application to micro propagation of Cimladar variety, 2013

Concentrations of Melafen	Survival, %	Roots			Height, sm	Number of leaves	Speed sm/day	Polarity fficient
		number	length, sm	rhizog/ zone, sm				
Measurements 23 days after planting								
Control	96,4	3,0	3,0	9,0	2,7	3,0	0,12	3,3
10^{-5}	78,6	3,3	2,6	8,4	2,9	3,0	0,13	2,9
10^{-7}	100,0	4,6	5,9	27,4	4,4	4,3	0,19	6,1
10^{-9}	100,0	4,3	3,6	15,2	4,3	3,8	0,19	3,5
10^{-11}	100,0	3,1	3,6	11,1	4,3	3,8	0,19	2,6
Measurements 48 days after planting								
Control	92,9	4,9	4,2	20,3	8,9	7,2	0,19	2,3
10^{-5}	71,4	4,2	4,7	19,7	9,2	7,8	0,19	2,1
10^{-7}	100,0	5,5	5,8	31,9	10,6	8,9	0,22	3,0
10^{-9}	100,0	4,6	5,5	25,6	10,5	9,0	0,22	2,4
10^{-11}	100,0	4,4	4,2	18,5	10,0	9,7	0,20	1,8

During further cultivation (48 days) the growth rate decelerated, but it was faster than the control variant in 1.2 times. Melafen's advantages are remained at concentrations of 10^{-7},10^{-9}, 10^{-11}%.

During the study of Melafen applied to Puhlyakovski and Maruskin varieties (tabl. 2, 3) the same clear data was not received, but there was a tendency of improvement of quality characteristics of treated plants.

The results obtained during cultivation of Puhlyakovski variety for 30 and 60 days are given in table 2. The data demonstrate the improvement of survival rate of plants at all studied concentrations, the increase of root length at concentrations of 10^{-9}, 10^{-11}%, the increase of rhizogene zone at the concentration of 10^{-11}%, the increase of height and quantity of leaves at concentrations of 10^{-7}, 10^{-11}% (30 days- long cultivation).

Table 2

The results of the study of the growth regulator "Melafen" during clonal micro propagation of Puhlyakovskiy variety, 2013

Concentrations of Melafen	Survival, %	Roots			Height, sm	Number of leaves	Speed sm/day	Polarity coefficient
		number	length, sm	rhizog. zone, sm				
Measurements 30 days after planting								
Control	92,9	3,5	4,5	16,0	5,9	5,6	0,19	2,7
10^{-5}	100,0	2,3	4,7	10,8	5,9	5,8	0,20	1,9
10^{-7}	96,4	3,5	4,3	15,1	6,1	5,8	0,20	2,4
10^{-9}	100,0	2,5	5,5	13,8	5,7	5,6	0,19	2,4
10^{-11}	96,4	3,3	5,4	17,8	6,1	5,8	0,20	2,9
Measurements 60 days after planting								
Control	92,9	4,2	5,4	22,7	12,0	12,4	0,20	1,9
10^{-5}	100,0	3,1	5,6	17,3	12,2	12,6	0,20	1,4
10^{-7}	92,9	3,7	5,5	20,3	12,7	12,2	0,21	1,6
10^{-9}	100,0	3,3	5,7	18,8	12,3	12,8	0,20	1,6
10^{-11}	96,4	3,4	6,7	22,8	12,0	12,9	0,20	1,9

And in the case of cultivation during 60 days – the increase of height and root length was observed at all concentrations, the increase of rhizogene zone was seen at the concentration of 10-11%, and quantity of leaves - at the concentrations of 10-9, 10-11%.

The results of the final measurements of Puhlyakovski variety made 3 months after planting demonstrated positive effect of Melafen on growth processes of the received mericlones (table 3) in the concentration of 10^{-11}%.

Table 3

State of the vines of Puhlyakovskiy variety after 3 months of cultivation on nutrient substrate with the preparation Melafen, 2013

Concentrations of Melafen	Roots			Shoots		Leaves			Polarity coefficient
	number	length, sm	rhizog. zone, sm	length, sm	weight, mg	number	area, sm	weight, mg	
Control	3,8	41,1	156,2	10,1	0,05	12,1	35,4	0,05	10,1
10^{-5}	2,9	32,4	93,9	6,1	0,04	12,8	38,6	0,04	6,1
10^{-7}	2,7	35,0	94,5	6,2	0,05	13,2	31,8	0,05	6,2
10^{-9}	2,7	32,2	86,9	5,3	0,05	14,5	29,8	0,04	5,3
10^{-11}	4,7	47,0	220,9	15,9	0,06	15,9	32,7	0,05	13,8

The increase of length (47,0 sm and 41,1 sm in control) and number of roots (4,7, and 3,8 in control), increase of rhizogene zone (220, 9 sm and 156,2 sm in control), the increase of length (15,9 sm and 15,4 sm in the control) and weight (0.06 mg in the control 0.05 mg) of shoots, and number of leaves (15,9 and 12,1 sm in control) are the evidences of efficiency of the concentration.

High rates of polarity coefficient point to dominating development of the root system at this concentration.

The data from the tables 1-3 prove that Melafen's appliance as a growth regulator alter increases of plants' morphgenesis in cultivation in vitro, stimulates efficiency of clonal micro

propagation due to improving of growth rate at first stage of cultivation and quality characteristics of plants.Tthe use of Melafen as a growth regulator led to increasing of survival rate and development of micro grafts, reduction of the period micro grafts' development in 1,5-3 times and their regeneration into plants. Melafen allowed improve root formation, development of rhizogenes zone, growth and number of leaves, the readiness of the plants to adapt to non-sterile conditions, the output of plants with improved quality characteristics and to increase the efficiency of clonal micro propagation of grapes.

Thus, as the result of the research we proposed a new method of clonal micro propagation of vine in vitro using non-toxic, stable in time, water-soluble, synthetic growth regulating preparation Melafen, effective at the concentration of 10^{-7} - 10^{-11}%. Using of the offered method allows increase the output of plants due to more efficient survival rate of micro stem and plant regeneration and due to improvement of their qualitative indicators. Taking into account the low cost of the preparation and high effect, this method is economical.

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Регулятор роста Мелафен в культуре винограда *in vitro*

Приведены результаты тестирования Мелафена – нового регулятора роста полифункционального действия клонального микроразмноженияя виноградной лозы. Было обнаружено положительное влияние на выживаемость черенков, выход и качественные характеристики растений в пробирке.

Ключевые слова: виноград, клональное микроразмножение, регулятор роста Мелафен, концентрация, регенерация растений, улучшение качественных характеристик.

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НОВЫЕ ВЫСОКОКАЧЕСТВЕННЫЕ ТЕХНИЧЕСКИЕ СОРТА ВИНОГРАДА ДЛЯ НЕУКРЫВНОЙ КУЛЬТУРЫ В ЗОНАХ ВИНОГРАДАРСТВА С НЕСТАБИЛЬНЫМИ УСЛОВИЯМИ ЗИМНЕГО ПЕРИОДА

Представлены основные характеристики новых технических сортов винограда селекции СКЗНИИСиВ: Курчанский, Дмитрий, Владимир. Из урожая описываемых сортов получают красные столовые вина с высокими показателями качества. Сорта обладают повышенной устойчивостью к низким температурам зимнего периода и рекомендуются к возделыванию без укрывки кустов на зиму в зоне укрывного виноградарства южных регионов, и в том числе сорт Дмитрий – в корнесобственной культуре.

Ключевые слова: технические сорта винограда, селекция, морозостойкие формы винограда, красные вина.

Современный сортимент промышленного виноградарства должен соответствовать потребностям рынка и включать в себя сорта с высокими показателями продуктивности, качества, устойчивости к биотическим и абиотическим стрессовым факторам. Оптимизация зональных сортиментов в соответствии с требованиями времени - один из важнейших факторов развития и стабилизации отрасли. В последние годы возрастает интерес к так называемому винному туризму. В связи с этим возделывание отечественных сортов региональной селекции для производства оригинальных местных вин становится всё более актуальным.

Краснодарский край – один из основных регионов возделывания винограда в Российской Федерации. Природный почвенно-климатический потенциал Краснодарского края позволяет выращивать виноград столовых, технических и универсальных сортов с высокими потребительскими свойствами продукции для потребления в свежем виде и в качестве сырья для промышленной переработки. Низкие температуры зимнего периода являются не только основным лимитирующим фактором в продвижении культуры