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THE INFLUENCE OF EXOGENOUS PLANT GROWTH REGULATORS THERE UPON THE BLACK CURRANT *(Ribes nigrum L.)* PRODUCTIVITY AND ITS BERRY QUALITY

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As a result of investigations on growth and development processes in vegetative and generative organs for black currant plants the effectiveness of exogenous plant growth bioregulators Bioglobin, EpinTM and Emistim S was determined concerning its influence upon the productivity and berry quality the black currant variety Leleka, which is growing in the first time with using such technology.

Problem statement. The main task of modern science and world practice in horticulture is obtaining high and stable yields not by increasing areas, but through using the intensive technologies, which provide a reduction of expenses for care and maintenance, increase crop yield and improve a quality of product from fruit plantations [1]. Therefore investigations, which are directed on creating the special conditions for cultivation and searching the ways of increasing productivity and quality of harvest for of black currant (Ribes nigrum L.) as to soil and climatic conditions of Right-Bank Forest-Steppe of Ukraine are actual.

The theme is topical, because more and more entrepreneurs, who have noticed a growing public demand for the fruits of black currant, are interested in increasing crop yield and improving quality and merchantability of berries. They raise products to new levels of implementation, from spontaneous market to supermarket in full assortment (fresh and frozen berries, juice, jelly, and confectionery), side by side with such exotic fruits like kiwi, banana, and pineapple. This requires an increase in gross harvests of qualitative and ecologically clear currant fruits [2, 5, 9].

Berries of a black currant bush contain the most quantity of vitamin C, the whole complex of vitamins and biologically active substances (BAS), namely: A, B1, B2, PP, cumarins, nitrogen, tannins, essential oils, mineral salts, sugars (12%), and organic acids. This BAS complex is extremely important for the medical treatment of gastrointestinal diseases, kidney stones, rheumatism, tuberculosis, atherosclerosis, scrofula, quinsy. Juice of black currant is the anti-influence drug against viruses A2 and B. The aqueous extract from its leaves exceeds the antimicrobic activity of tetracycline, penicillin, biomitsin.

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In view of increasing the demand for berry products of black currant, there is a problem to provide it under conditions of modern global warming. The solution of this problem is possible through using exogenous regulators of plant growth and development, which intensify the plant resistance to adverse biotic and non-biotic factors and increase the crop yields [7–10, 13].

The attention of the scientists in last years is increased to the problems of introduction to growing technologies for horticultural crops the preparations with growth-regulating activity [3, 6, 9, 12, 14].

The aim of research was an investigation of forming vegetative and generative organs and a productivity of black currant with using plant growth bioregulators (Emistim S, EpinTM and Bioglobin).

The methods of research. Researches are performed at the base of educational laboratory "Tests of selection achievements and ecological estimation of growing technologies for fruit, berry, vegetables, medicinal, floral and ornamental crops", which is belong to NULES of Ukraine. The berry fields of black currant were installed in autumn 2010 in the Northern Forest-steppe zone at an altitude of 180–200 m above sea level, on sod-medium-podzolic easy-loam soil. Experiments with plant growth regulators were fulfilled in 2012–2014 years on a black currant variety Leleka [11]. The arrangement of plants was 3.0 × 0.7 m. The soil within rows was covered with mulch; the space between rows was remained in natural sod.

There were four experimental variants (in the triple repetition), that is foliar spraying with aqueous solutions of preparations EpinTM (0.02%), Emistim C (0.01%), Bioglobin (0.15%), with a clean water (control). This procedure was carried out twice: in the beginning phases of flowering and berry ripening.

EpinTM (a synthetic analogue of phytohormone 24-epibrassynolid) was synthesized at the Institute of Bioorganic Chemistry, National Academy of Sciences of Belarus [10]. Preparations of natural origin Emistim S and Bioglobin were produced in Ukraine by "Agrobiotech" and "Medbiokom Ltd" [14].

Some phytometric parameters (a length of annual growth of shoots, a length of basal shoots, quantity of brush per bush) were determined during the vegetation period, and the harvest of berries was gathered. Statistical processing of data was carried out according to the method [4].

The results of research. In information of planting black currant productivity taken part the morphobiological processes, which estimated growing vegetative and generative organs in plants – basic components of planting yield.

The results indicate, that Leleka variety during every year forms of 3–4 basal shoots per 1 bush (table 1). Their length increased by action of bioregulators: EpinTM on 37–52%, Emistim S – 32–53%, Bioglobin – 29–46% (in average means for 3 years – on 41%) compared with the control (water treatment). At the same time length of annual growth of shoots per 1 bush of black currant were increased in 2012–2014 years: EpinTM on 48–92%, Emistim S – 58–73%, Bioglobin – 46–64% (in average means for 3 years – on 61% to control).

The weather conditions along 2012–2014 years were fully favorable for planting of black currant. However, in 2013 turned out to be less favorable, but using of plant bioregulators promoted for increasing vegetative and generative productivities for abilities in average means for 3 years – on 41–61%.

The formation of generative productivities (a quantity of bunches per 1 bush) were detected some specificity: as to EpinTM a quantity of bunches increased – on 40%, Emistim S – on 14% and Bioglobin – on 7,3% (table 1). On total productivity of black currant

Table 1. The components of productivity 3-years planting of black currant variety Leleka after using the plant bioregulators

Variants	Total length of basal shoots per bush		The total length of annual growth of shoots per bush		Quantity brush per bush	
	cm	% to control	cm	% to control	number	% to control
2012						
Control*	236,9		116,5		27,7	
Emistim S	324,7	137	178,0	153	21,7	78
Epin™	361,3	152	224,3	192	35,7	129
Bioglobin	345	146	185,7	159	19,3	70
2013						
Control*	161		178,5		103	
Emistim S	213	132	308,0	173	118,3	115
Epin™	221,3	137	276,1	155	173	168
Bioglobin	207,6	129	298,1	167	113,3	110
2014						
Control*	174,9		513,6		73,3	
Emistim S	268,2	153	814,0	158	94	128
Epin™	242,7	139	759,8	148	89,8	123
Bioglobin	249,6	143	754,6	147	81,8	112

* Here and in table 2, 3 as a control was used with water treatment.

Table 2. Yield three-year plantings black currant variety Leleka for 2012–2014

Year of fruiting	Year of crop	Per bush, kg			
		Control*	Emistim S	Epin™	Bioglobin
1	2012	0,24	0,3±0,05	0,4±0,09	0,27±0,07
2	2013	0,7	1,0±0,01	1,1±0,02	0,9±0,05
3	2014	1,1	1,7±0,1	1,7±0,02	1,4±0,08
Average		0,7	1,0	1,1	0,9
		t/ha			
1	2012	1,2	1,4±0,22	1,9±0,43	1,3±0,32
2	2013	3,3	5,0±0,06	5,2±0,11	4,2±0,25
3	2014	5,4	8,3±0,43	8,1±0,1	6,7±0,4
Average		3,3	4,9	5,1	4,1
% to control		–	149	153	124

Table 3. The biochemical composition of berries by using of bioregulators for black currant Leleka

Variants	Sugars, %	To control, %	Acids, %	To control, %	Sugar/acid index	Vitamin C, mg/100 g of fresh berries, %
Control	5,3±0,088		2,5±0,047		2,1±0,043	160
Emistim S	5,9±0,083	111	2,4±0,057	103	2,4±0,057	170
Epin^{TM}	6,5±0,086	123	2,5±0,051	101	2,6±0,051	180

planting had also an influence a quantity of berries per bush and their mass.

In average means to 3 years the yield black currant in a calculation per bush (kg) and per area (t/ha) was increased with using the plant growth bioregulators accordingly: for EpinTM – on 53%, for Emistim S – on 49%, for Bioglobin – on 24% to control. The results of investigations in influence effect bioregulators on the productivity black currant variety Leleka indicates, that an yield was increased in every year and on third year of the using of EpinTM was augmentation on 2,7 t/ha, for Emistim S – 2,9 t/ha, for Bioglobin – 1,3 t/ha to control (table 2).

The biochemical analyses of berries demonstrated increasing of content for total sugars, vitamin C and decreasing quantity of organic acids. This influenced on value of sugar/acid index and gustatory quality of berries (table 3).

Conclusions

1. The use of exogenous plant growth regulators EpinTM, Emistim S and Bioglobin on black currant plantings had significantly stimulated the growth processes and formation of berry yield.
2. Among studied preparations the most effective was EpinTM – a synthetic analogue of phytohormone 24-epibrassynolid.
3. The specific reaction on the action of bioregulators was detected. EpinTM essentially increased the quantity of bunches per 1 bush, in consequence of yield was increased on 54%, as to Emistim S this result was some less (on 48%). Bioglobin had smaller influence on formation of bunches and therefore a productivity not exceed 24% to control.
4. Our results give the reason to recommended EpinTM and Emistim S for using in technologies of growing black currant.

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АНОТАЦІЯ

Подвигін О.А., Силаєва А.М., Шеренговий П.З. *Вплив екзогенних біорегуляторів росту рослин на врожайність і якість ягід смородини чорної (Ribes nigrum L.). // Біоресурси і природокористування. – 2015. – **7**, № 1–2. – С. 65–69.*

За результатами досліджень процесів росту і розвитку вегетативних та генеративних органів рослин смородини чорної визначено рівень ефективності дії екзогенних біорегуляторів росту Біоглобін, ЕпінТМ та Емістим С на врожайність та якість ягід сорту Лелека, вперше вирощуваного за технологією з використанням цих препаратів.

АННОТАЦИЯ

Подвигин А.А., Силаева А.М., Шеренговый П. З. *Влияние экзогенных биорегуляторов роста растений на урожайность и качество ягод смородины чёрной (Ribes nigrum L.). // Биоресурсы и природопользование. – 2015. – **7**, № 1–2. – С. 65–69.*

По результатам исследований процессов роста и развития вегетативных и генеративных органов растений смородины чёрной определен уровень эффективности действия экзогенных биорегуляторов роста Биоглобин, ЭпинТМ, Эмистим С на урожайность и качество ягод сорта Лэлэка, впервые выращиваемого по технологии с использованием этих препаратов.