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INFLUENCE OF THE PREPATATION ECOSTIM ON THE PARAMETERS OF PHOTOSYNTHETIC ACTIVITY AND PRODUCTIVITY OF WINTER BARLEY VARIETIES

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Abstract: The results of studies by the action of the drug Ecostim on the growth parameters, photosynthetic activity and productivity of Czech winter barley varieties Luran and Lancelot in the conditions of the South of the Republic of Moldova are presented. It has been shown that spraying plants in the tillering phase - the beginning of their emergence into the tube with a growth regulator of a steroid nature - stimulates plant growth, accumulation of plastid pigments in assimilation organs, the formation of raw and absolutely dry biomass and an increase in the yield of varieties. It was shown that the response to processing depends on the varietal characteristics, manifests itself to a greater extent in the Lancelot variety, which is characterized by lower parameters of photosynthetic activity and productivity, compared to the Luran variety.

Keywords: growth regulator, Ecostim preparation, winter barley varieties, plastid pigments, productivity.

INTRODUCTION

Barley crop is the second most important and produced grain crop in the Republic of Moldova (RM). Due to global climate change, as well as weakening economic relations in the RM and increasing costs for fertilizers, plant protection products, etc., it is necessary to develop such technology models that would allow increasing the yield of winter barley at the lowest cost.

In recent years, new generation growth regulators *of steroid nature* have become widely used in plant growing practice [9; 11]. Interest in this group of compounds is due to the broad spectrum of their effects on plants, the ability to specifically regulate individual stages of plant growth and development, with the aim of mobilizing potential opportunities and increasing the yield of agricultural crops. They have a mild type of action, give the desired effect in endogenous concentrations. Such substances of secondary origin as steroid glycosides meet these requirements. They are widely distributed in higher plants and have biological activity [7; 1]. The aim of the research was to study the effect of a steroid growth regulator the preparation Ecostim (ES) on the growth parameters, photosynthetic activity and productivity of winter barley varieties in the conditions of the southern region of the Republic of Moldova. The prepation ES (*tomatoside*) of natural origin

is included in the list of chemical and biological preparations approved for use in agriculture of the Republic of Moldova. [2].

MATERIALS AND METODS

The experiment was carried out on the varieties of Czech selection Luran and Lancelot (created at the Institute of Selection Luzan, "SELEGEN" of the Czech Republic), intensive type, forage direction of use, in agrophytocenoses of the farm SRL "Terra-Vitis", Burlaku village, Kahul district. The varieties are characterized by resistance to lodging and seed fall, low temperatures, drought, some viral and fungal diseases. [12; 13]**.** Winter barley plants were sprayed with a solution of Ecostim (ES) at a dose of 25 mg/l in the phase of late tillering – beginning of tube emergence [7]. Plants not treated with the growth regulator served as a control.

The characteristics of growth processes and parameters of photosynthetic activity in the studied varieties of winter barley were carried out in the main phases of ontogenesis - emergence into the tube and earing, taking into account that in grain crops the period of highly effective work of a unit of sowing area is very short, associated with the death of lower leaves and the transfer of photosynthetic activity to the upper leaves and ear.

The growth parameters of shoots and leaf surface were determined by the method of linear changes; accumulation of raw and absolute dry biomass in plant organs by weighing; the content of plastid pigments (chlorophylls a, b and carotenoids) - in an alcohol extract on SF-26, calculated by the Halm-Wettstein formula [3], expressed in mg/g absolute dry matter; productivity of varieties according to [4]; mathematical processing of research data according to Dospekhov B.A. [6].

RESULTS AND DISCUSSIONS

It was found that in the Lancelot variety, in the tube emergence phase, the plant height is 62,0 cm, the stem length is 56,4 cm, the diameter in the middle part is 0,44 cm, the leaf area is 58,7 cm^2; in the Luran variety, these indicators are higher and are, respectively, 86,4, 64,8 and 0,46 cm, the leaf area is 66,0 cm^2.

In the earing phase, the growth indicators of the studied varieties increase and are: plant height – 80,8 and 97,9 cm; stem length – 62,3 and 69,6 cm; diameter in the middle part of the stem – 0,48 and 0,47 cm; leaf area – 82,2 and 94,7 cm^2.

Treatment of vegetative plants with the ES preparation solution leads to an increase in growth parameters. A general pattern of an increase in plant height, length and stem diameter by 1,1 times, regardless of varietal characteristics, is observed; the leaf surface area increases by 1,5 (*Lancelot*) and 1,1 times (*Luran*) (Table 1).

Table 1. Growth parameters of winter barley plants, depending on varietal characteristics and treatment with Ecostim, *Earing phase*

Variety	Experience options	Plant height, cm	Stem length, cm	Stem thickness, cm	Leaf surface area, cm^2/plant
Lancelot	Control	80,8	62,3	0,48	82,2
	Ecostim	86,2	69,9	0,53	126,2
Luran	Control	97,9	69,6	0,47	94,7
	Ecostim	99,8	74,4	0,56	100,5

During ontogenesis, accumulation of raw and absolute-dry biomass by winter barley plants depends on the vegetation phases and the action of the growth regulator. Thus, in the earing phase, the contribution of individual organs to their accumulation changes in winter barley plants. Due to the drying of the lower leaves and the outflow of assimilates to the reproductive organs, the size of the leaf surface decreases.

The absolute values of green leaf biomass in the control variants, compared to the tube emergence phase, decrease, but the proportion of shoots with leaf sheaths and ears increases. The level of total absolute dry biomass in the control variants for the Lancelot variety is 39,17 g, for Luran – 44,07 g/10 plants.

Under the influence of the ES preparation, the level of total abs.-dry biomass of plants increases by 12,4% in the Lancelot variety and by 7,1% in the Luran variety (Table 2).

Table 2. Content of absolute dry biomass in winter barley plant organs, depending on varietal characteristics and treatment with Ecostim, g/10 plants. *Earing phase.*

Variety	Experience options	Leaves		Stems	Ears of corn	Total	% to Control
		yellow	green				
Lancelot	Control	0,91	3,77	21,64	12,85	39,17	100,0
	Ecostim	0,65	6,51	22,41	14,44	44,01	112,4
Luran	Control	0,46	6,89	22,89	13,83	44,07	100,0
	Ecostim	0,34	7,29	24,24	15,33	47,20	107,1

According to Josan-Secrieru S. [7] the formation of the assimilation apparatus, the content of plastid pigments in it, depends on the varietal characteristics of plants and is closely related to the response of the variety to treatment with growth regulators.

In variants with the use of steroid glycosides in the assimilating organs of plants, the content of chlorophylls *a, b* and carotenoids increases, the chlorophyll index (*chl. a/b*) and the pigment index (*chl. a+b/carot*.) change. The author notes the greatest differences in the concentration of plastid pigments in plants in the earing phase. A similar pattern was found in the conditions of our experiment.

It was found that in the control variant of the Lancelot variety, the sum of

chlorophylls *(a + b)* is: in the leaves 5,29; in the shoots – 0,97 and in the ears – 0,37 mg/g of absolute dry matter; in the Luran variety – 4,58; 1,03 and 0,32 mg/g of absolute dry matter. When treating vegetative plants with the ES preparation, the chlorophyll content of the Lancelot variety increases: in the leaves - by 0,44, in the shoots - by 0,92 and in the ears - by 0,30 mg / g of absolute dry matter. in the Luran variety - by 0,62; 0,08 and 0,39 mg/g of absolute dry matter. A similar pattern is observed for the level of carotenoids.

In the figurative expression of Rubin A.B. [10] chlorophyll is a "*natural sensor*" of the state of algae and higher plant cells. Calculations of the total chlorophyll content in mg/10 plants (taking into account the absolute dry biomass) indicate significant differences in the chlorophyll content of the studied varieties.

Thus, in the control variants, the chlorophyll content of the Lancelot variety is 45,7 mg, and of the Luran variety – 59,6 mg. When treated with the ES preparation, the chlorophyll content of the Lancelot variety increases up to 2 times, and of the Luran variety - by 27,1% (Table 3).

Table 3. Chlorophyll content (a+b) in assimilating organs of winter barley plants, depending on varietal characteristics and treatment with Ecostim, mg/10 plants. *Earing phase*

Variety	Experience options	Leaves	Stems	Ears of corn	Total	In % to to control
Lancelot	Control	19,9	21, 0	4,8	45,7	100,0
	Ecostim	37,3	42,4	9,7	89,3	195,5
Luran	Control	31,6	23,6	4,4	59,6	100,0
	Ecostim	37,9	26,9	10,9	75,7	127,1

To characteristics the condition of barley crops, the density of plant standing, as well as the density of total and productive stem stand were determined. It was found that for the Lancelot and Luran varieties, per 1 m^2 there are: total number of plants - 220 and 285, total number of stems - 455 and 580, including productive - 443 and 560 things. The Luran variety has an increase in stem stand density (total and productive tillering) by 1,3 times, compared to Lancelot. The tillering coefficient of the studied varieties is 2,0.

The determining parameters of the production process are the mass of the ear, the number of grains in the ear and their mass. It has been established that the indicators of productivity elements change depending on the varietal characteristics (Figura 1).

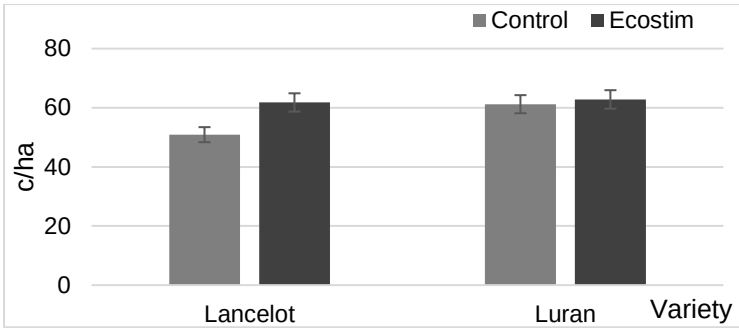


Figure 1. The effect of the Ecostim preparation on the potential yield of winter barley varieties, *SRL "Terra-Vitis"*.

Thus, the Luran variety, compared to Lancelot, has an increased ear weight, grain weight in an ear and the number of grains in them, regardless of the size of the ears. Treatment of vegetative plants with the ES preparation leads to an increase in the productivity elements and yield of varieties. It has been shown that in the control variants, the Lancelot variety yield is 50,9 c/he; for the Luran variety – 61,2 c/he. Treatment with the Ecostim preparation leads to an increase in the Lancelot variety yield by 1,2 times, while for the Luran variety it remains at the control level – 62,8 c/he.

CONCLUSIONS

1.It has been shown that spraying winter barley plants of Czech selection *Lancelot* and *Luran* in the tillering-early tube-forming phase with a steroid growth regulator stimulates plant growth, accumulation of plastid pigments in plant organs, formation of raw and absolutely dry biomass and an increase in plant productivity.

2.The reaction to treatment depends on the varietal characteristics and is more pronounced in the *Lancelot* variety, which is characterized by lower rates of photosynthetic activity and economic productivity, compared to the *Luran* variety.

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