COMPARATIVE ACTION OF STEROID GLYCOSIDES FOR BARLEY PLANTS

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Abstract. *The article presents the results of studies on the effect of steroid glycosides isolated from the aerial part of plants of the Scrophulariaceae family on the parameters of growth, photosynthetic activity and productivity of spring barley plants, when they grow in the field, in comparison with the well-known growth regulator Ekostim.*

Keywords*: Growth regulator, Ecostim preparation, Spring barley varieties, Plastid pigments, Productivity*

INTRODUCTION

The ability of growth regulators of steroid nature in extremely low concentrations to stimulate the growth and development of plants, increase their resistance to extreme environmental factors and increase productivity characterizes them as biorational and environmentally friendly growth regulators (Andreitov V., 1998; Derendovskaia A., Nedranco L., Druta A. et al., 1997; Josan (Secrieru) S., 2005; 2009; Kintea P.,1993; Prusakova L., Cijova S., 1993). Some of them (*Moldstim, Ecostim, Pavstim*) have passed the State Test and are included in the list of chemical and biological preparations approved for use in agriculture in the Republic of Moldova (Danilov N., Gomoja G., Ciobanu V. et al., 2003).

In recent years, there has been an active search for new substances belonging to the group of steroid hormones. A new growth regulator was obtained from wild flora - the *Scrophulariaceae family*, which (active substance) are genistifoliosides isolated from the aerial parts of *Linaria vulgaris* plants collected during the period of their flowering activity. The stimulatory effect of these biologically active substances was tested in laboratory conditions on individual representatives of the cruciferous family. The isolated substances had a significant effect on the primary processes of seedling growth. Their action is manifested in the concentration range of 0.0001% ... 0.1%. Along with this, scientific and applied results of the practical application of genistifoliosides as an element of technology for presowing treatment of carrot seeds were obtained (Kintea P., 1993; Mascenko N., Kintea P., Gurev A. et.al., 2008; Mascenko N., Borovskaia A., Gumaniuc A. et al., 2018). Morpho-physiological features of the action of this growth regulator on winter barley plants are presented in the studies of Andreitov V., 1998; Josan (Secrieru) S., 2009.

MATERIAL AND METHODS

The field small-plot experiment was established in 2018 at the site of the State Commision for Grops Variety Testing of Republic of Moldova (SCGVT RM), in the village of Bacioi, Chisinau.

Plants of spring barley variety Iney in the phase of the end of tillering - the beginning of the exit into the tube were sprayed with solutions of preparations containing steroid glycosides: tomatzids – Ekostim (ES) preparation and genistifoliosides - a preparation referred to by us as Genistim (GE) - at a dose of 25 mg/l. According to (Josan (Secrieru) S., 2009), this dose is optimal for barley plants. In the control variant, the plants were sprayed with water. Under the

conditions of a field small-plot experiment, the area of one plot is $2m^2$, the repetition of the experiment is 4-fold.

The characteristic of growth processes and parameters of photosynthetic activity in the studied variety of spring barley was carried out in the main phases of ontogeny - budding and heading, given that in grain crops the period of highly efficient operation of a unit of sowing area is very short, associated with the death of the lower leaves and the transfer of photosynthetic activity to the upper ones. leaves and spike.

Determination of growth parameters of shoots and leaf surface was carried out by the method of linear changes; accumulation of raw and absolutely dry biomass in plant organs by weighing; the content of plastid pigments (chlorophylls a, b and carotenoids) - in the alcohol extract on SF-26, expressed in mg/g of absolutely dry biomass (Derendovskaia A., Nedranco L., Druta A. et al., 1992; Josan (Secrieru) S., 2009); variety productivity according to (Josan (Secrieru) S., 2009); mathematical processing of research data according to (Dospekhov B., 1985).

RESULTS AND DISCUSSIONS

The study of the specifics of the growth of spring barley plants of the Iney variety and the establishment of a relationship between photosynthetic activity and productivity was carried out in the main phases of ontogenesis, budding and heading. It has been shown that the treatment of vegetative plants with solutions of steroid glycoside preparations leads to an increase in plant growth parameters. There is a general pattern of increase in plant height, length and diameter of the stem in the studied variety under the influence of steroid glycoside preparations.

In the phase of budding, plant height increases by 15.5..8.6 cm, stem length by 19.9..13.8 cm, shoot diameter by 0.14..0.06 cm, leaf area surface by 1.3..1.2 times (table 1).

In the heading phase, in comparison with the booting phase, growth rates increase slightly, this is due to insufficiently favorable meteorological conditions. Lack of rain leads to soil and atmospheric drought (stress). Despite this, growth regulators in this phase also contributed to an increase in the size of the photosynthetic apparatus (leaf surface area), which leads to an increase in the leaf working time during the growing season.

Plant growth is manifested in a change not only in size, but also in the mass of the organism. We have established that the accumulation of raw and absolutely dry biomass by plants and its distribution among organs depends on the severity of meteorological conditions in the year of research.

Table 1.

Influence of steroidal growth regulators on the growth parameters of spring barley variety Inei, SCGVT RM 'Bacioi"

Experience options	Plant height, cm	Stem length, cm	Stem diameter in the middle, cm	Leaf Surface Area, cm^2/plant
Phase out of the handset				
Control-H_2O	40,1	26,5	0,33	75,3
ES-25mg/l	55,6	46,4	0,47	94,8
GE-25mg/l	48,7	40,3	0,39	84,9
Heading phase				
Control-H_2O	65,3	46,2	0,34	33,8
ES-25mg/l	67,7	46,5	0,35	37,0
GE-25mg/l	64,9	46,2	0,35	36,1

Barley plants of the Inei variety are characterized by medium growth vigor. In the phase of entering the tube in the control variant, the mass of green leaves in the Inei variety is 7.18; yellow -1.62 and shoots - 15.50 and total biomass -24.30 g/plant. Under the action of the drug

Ecostim, the accumulation of total wet biomass by plants increases by 2.3 times, and by the drug Genistim - by 1.4 times.

In the heading phase in barley plants, the level of raw biomass increases, and the contribution of individual organs to its accumulation changes. In the total biomass, in comparison with the booting phase, the share of leaves and the share of stems decreases, but the share of ears increases. Treatment of vegetative plants with solutions of steroid glycosides leads to an increase in wet biomass by 1.1..1.2 times compared with the control. Similar results are observed for the accumulation of absolutely dry biomass by plants (figure 1)

Photosynthesis is a unique process that forms plant productivity and depends on a number of endo- and exogenous factors. The influence of various conditions, the structure and functions of the photosynthetic apparatus change at different levels of its organization (*leaf – plant – cenosis*) (Tarchevsky I., Chikov V., Andrianova Yu. et al. 1975; Tarcevski I, Andrianova Iu., 1980).

According to Josan (Secrieru) S., 2009, the formation of the leaf surface, or assimilation apparatus, is closely related to the accumulation of plastid pigments in the leaves. In variants with the use of steroidal glycosides, the content of *chlorophyll a*, *chlorophyll b* and *carotenoids* increases, the chlorophyll and carotenoid indices increase. The greatest differences in the concentration of chlorophyll a, b and carotenoids can be traced in the early stages of development - in the phase of entry into the tube. In the heading phase in plants, the total amount of pigments increases and the contribution of individual organs (*leaf, stem, ear*) to their accumulation changes.

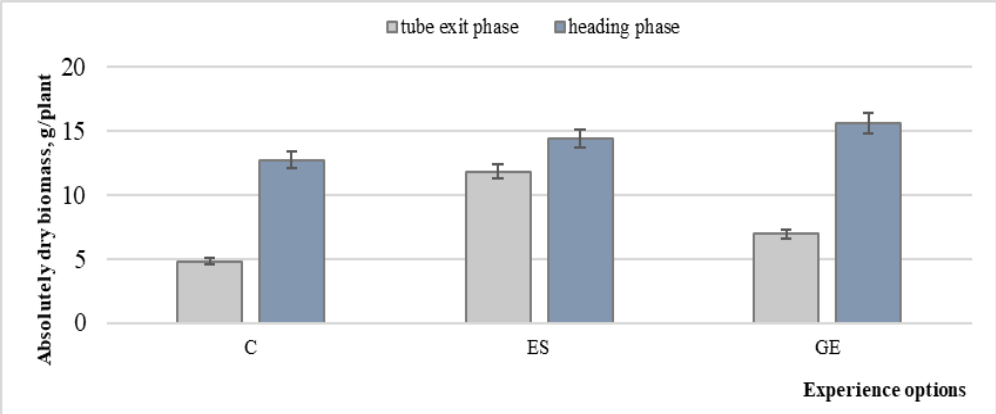

Figure 1. The effect of steroid glycoside preparations on the accumulation of absolutely dry biomass by plants of spring barley variety Iney, SCGVT RM 'Bacioi", 2018.
Experience options: 1.Control; 2.ES-25mg/L; 3.GE -25mg/l.

We have established differences in the accumulation of plastid pigments - *chlorophylls a*, *b* and *carotenoids* in plants of spring barley cv. It has been shown that the main photosynthesizing organ in barley plants during the tube entry phase is the leaf. At the same time, in the heading phase, there is a tendency to transfer the photosynthetic function from the leaves to the stem and ear (table 2).

In the heading phase in the leaves of the control variant, the content of *chlorophyll a* is 7.71, *chlorophyll b* -1.58, the total (*chl.a+b*) -9.29 mg/g absolutely dry biomass. Under the action of steroidal glycosides in the leaves of barley plants, an increase in the content of

chlorophyll by 1.1-1.3 times is observed, compared with the control, as well as a slight increase in the level of carotenoids. An increase in photosynthetic activity is also observed in ears.

In the reproductive organs (ears), the level of *chlorophyll a*, compared with the control, increases from 2.5 (ES) to 3.7 (GE) times, *chlorophyll b* - by 3.8 times, *carotenoids* by 2-3 times, regardless of the options experience. It should be noted that steroid glycosides enhance the work of the photosynthetic apparatus under stressful conditions, during a period of drought, stimulate the accumulation of chlorophylls, especially *chlorophyll b (*Muromtev G.,

Table 2

Influence of steroid growth regulators on the accumulation of plastid pigments by plants of spring barley variety Iney, mg/g absolutely dry biomass. Heading phase SCGVT RM 'Bacioi", 2018

Experience options	cl.a	cl.b	cl.a+b	carot.	cl.a / cl.b	cl.a+b / carot.
Leaves						
Control-H_2O	7,71	1,58	9,29	2,26	4,9/1	4,1/1
ES-25mg/l	8,62	2,96	11,58	2,51	2,9/1	4,6/1
GE-25mg/l	7,39	2,64	10,03	2,34	2,8/1	4,3/1
Steems						
Control-H_2O	1,41	0,59	1,90	0,51	2,4/1	3,8/1
ES-25mg/l	1,95	0,66	2,61	0,52	3,4/1	5,1/1
GE-25mg/l	1,26	0,57	1,83	0,45	2,2/1	4,1/1
Ears						
Control-H_2O	0,27	0,12	0,39	0,09	2,2/1	4,3/1
ES-25mg/l	0,73	0,46	1,19	0,20	1,6/1	5,9/1
GE-25mg/l	1,02	0,46	1,48	0,26	2,2/1	5,7/1

Cikanicova D., Culaeva D. et.al., 1978; Malashevich A., 1983).

It has been established that under the action of steroid glycosides there is an increase in raw and absolutely dry biomass, an increase in the concentration of chlorophylls and carotenoids in plant organs, which leads to an increase in the total chlorophyll content in spring barley plants of the Iney variety. In the heading phase, the total content of chlorophyll in terms of the plant in the control variant is 24.18 mg/plant. In the variants with the use of steroid glycosides, it increases by 1.4 times compared to the control.

An increase in the photosynthetic activity of plants under the action of steroidal glycosides leads to an increase in the productivity elements (ear mass, grain mass per ear, number of grains in them) and the yield of the variety (. In the control variant, the Inei variety has a low grain productivity potential and amounts to 3119 kg/ha, or 31.2 q/ha. In variants with the use of steroid glycosides, the yield increases by 11.3 (ES-25mg/l) and 7.7 (GE-25mg/l).

CONCLUSIONS

Steroid glycosides isolated from the aerial parts of plants of the family. *Scrophulariaceae* have a regulatory effect on spring barley plants of the Iney variety. Under the conditions of a small-plot field experiment, they stimulate the growth and development of plants. They enhance the photosynthetic activity of plants, the accumulation of plastid pigments in the assimilation organs of plants. They increase the accumulation of raw and absolutely dry biomass in plant organs and, ultimately, the potential productivity of plants.
Under unfavorable conditions (during the period of drought), they show an anti-stress effect of action, similar to the preparation Ecostim.

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