

A FUROSTANOL GLYCOSIDE USED IN GRAPE VINE GROWING

UTILIZAREA GLICOZIDEI FUROSTANOLICE ÎN CULTURA VIȚEI DE VIE

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Abstract - Moldstim is a furostanol glycoside and represents a natural substance belonging to the class of saponines (found in *Capsicum annuum* seeds). This compound was obtained by alcoholic extraction from pepper seeds and represents a bioactive substance of vegetal origin, having a wide range of biological activities, especially antitumoral, antimicrobial and antifungal properties. The goal of this paper was to estimate the biological activity of this bioactive compound. The influence of the natural compound with steroidal glycoside structure was studied on the grapes plantation, from the lassy vineyard. The treatments consisted in spraying the aqueous solution of Moldstim, at different doses and ways of using. The results pointed out the favorable effects of treatments on the plant growth and development, according to the phenological phase and used concentration.

Key words: bioactive compound, steroidal furostanol glycoside, natural biostimulators, grapes.

Rezumat - Moldstim - ul este o glicozidă furostanolică, reprezentând o substanță naturală ce aparține clasei saponinelor (întâlnită în semințele de *Capsicum annuum*). Acest compus a fost obținut prin extracție alcoolică din semințe de ardei iute și este o substanță bioactivă de origine vegetală, având numeroase proprietăți biologice, în special proprietăți antitumorale, antifungice etc. Scopul acestei lucrări constă în evaluarea activității biologice a acestui compus bioactiv. S-a studiat influența compusului natural cu structură glicozid - steroidică asupra plantației de viță-de-vie din podgoria Iași. Tratamentele au constat în pulverizarea cu soluție apoasă de Moldstim, în diferite doze și moduri de folosire. Rezultatele au subliniat efectele favorabile ale tratamentelor asupra creșterii și dezvoltării plantelor, în funcție de fenofază și de concentrația folosită.

Cuvinte cheie: compus bioactiv, glicozidă steroidică furostanolică, biostimulatori naturali, plantație de viță - de - vie

INTRODUCTION

The use of biological active substances (BAS) in agriculture, for quantitative and qualitative crop increase, has a tradition for over 50 years (Croitoru et al., 1988) all around the world. After a period of deconsideration (in the

'50-'70), when synthetic chemical compounds polarized all the attentions, the BAS recover in force during the last three decades because of the eco-agriculture demanded from the market.

The efficient obtaining of BAS from different natural sources, became a concern of many groups of researchers, being yet faraway in term of yields as compared to compounds obtained from synthesis (*Tschesche and Wulff, 1972; Kofler, 1972; Bobeico, Chintea, 1991; Sato, Sakamura, 1973; Tschesche, 1971*).

The emphasis of this work was to test the new obtained steroidal extract in vineyard technologies, as grow up factor for grapes.

MATERIALS AND METHODS

Investigations were carried out in the experimental field of the Faculty of Horticulture from Jassy, on grapes (*Vitis vinifera*), Fetească albă Variety, grafted on kober 5 BB rootstock. The plantation was set up in 1985, having planting distances of 2.2 x 1.2 m. The fructification pruning was done in fruit - bearing chains, made of 4-6 eye fruiting shoots and 1-2 eye renewal spurs, on each vine stock being about 50 eyes. The training technology was specific to Jassy Vineyard.

For testing the Moldstim compound, before flowering, 28 vine stocks were treated by leaf spraying, the following variants being established: V_1 - Moldstim 0.0001%; V_2 - 0.001%; V_3 - 0.005%. The experimental variants were compared to the untreated control.

During the vegetation period, the observations and determinations carried out were: content of leaf pigments, vine stock productivity, grape yield and its quality.

RESULTS AND DISCUSSIONS

The leaf application of the Moldstim has an important role as concerns the plant growth and development, having direct consequences on the metabolism of grape yield and its quality.

Tables 1-3 presents the results of the investigations concerning the influence of some steroidal glycoside biopreparations on the photosynthesis efficiency of grapes leaves in dynamics, during the vegetation period (July, August and September). In July, the lowest values of the content of assimilating pigments per 1 g fresh matter were found in the control (3.04 mg/g fresh matter).

In V_3 , the photosynthesis efficiency has increased very significantly, both on each pigment and on total pigments (16,78% against the control). V_2 has influenced positively the photosynthesis efficiency, resulting in an increase of 14,14% in the total content of pigments (distinctively significant increase against the control). In V_1 , photosynthesis was influenced positively, resulting in a significant increase of 7,89%, against the control (*Table 1*).

Table 1

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety) – July, 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
NO	BAS				mg/g fresh matter	dif. against the control	%	Signif.
V1 Moldstim 0,0001%		1.72	0.77	0.85	3.28	0.24	107.89	x
V2 Moldstim 0,001%		1.73	0.80	0.83	3.47	0.43	114.14	xx
V3 Moldstim 0,005%		1.75	0.81	0.89	3.55	0.51	116.78	xxx
V0 Control		1.63	0.66	0.75	3.04	-	100.00	-

LSD 5% = 0,23 mg/g ; LSD 1% = 0,35 mg/g LSD 0,1% = 0,52 mg/g

Table 2

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety) – August 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
No	BAS				mg/g fresh matter	dif. against the control	%	signif.
V1 Moldstim 0,0001%		1.78	0.79	0.93	3.54	0.08	102.31	xx
V2 Moldstim 0,001%		2.01	0.88	1.03	4.11	0.65	118.79	xxx
V3 Moldstim 0,005%		2.05	0.92	1,14	4,30	0,84	124,28	xxx
V0 Control		1.75	0,79	0,92	3,46	-	100	-

LSD 5% = 0,15 mg/g; LSD 1% = 0,25mg/g; LSD 0,1% = 0,39 mg/g.

Table 3

Influence of the application of MOLDSTIM on the photosynthesis efficiency in vine (Fetească albă Variety)–September, 2007

Variants		Chlorophyll a mg/g fresh matter	Chlorophyll b mg/g fresh matter	Carotene mg/g fresh matter	Total pigments			
No	BAS				mg/g fresh matter	dif. against the control	%	signif.
V1 Moldstim 0,0001%		1.71	0.65	0.75	3.11	0.12	104.01	-
V2 Moldstim 0,001%		1.78	0.73	0.79	3.30	0.31	110.37	xxx
V3 Moldstim 0,005%		1.81	0.71	0.81	3.33	0.34	111.37	xxx
V0 Control		1.62	0.63	0.74	2.99	-	100	-

LSD 5% = 0.14 mg/g; LSD 1% = 0.22 mg/g; LSD 0.1% = 0.27mg/g

In August, the highest values of the content of assimilating pigments were found in V₃, (4.30 mg/g fresh matter), with very significant positive differences against the control. In V₂, the photosynthesis efficiency has increased very significantly, both on each pigment and on the total pigments (4.11 mg/g fresh, as values close to V₃ (0,84 mg/g fresh matter). V₁ had also a positive influence on photosynthesis, but without significant increase against the control (2.31%). The lowest values of the content assimilating pigments were found in the control (3,46 mg/g fresh matter) (*Table 2*).

In September, the lowest values of the content of pigments were found at the control (2.99 mg/g fresh matter). Values close to the control, with insignificant differences, were obtained in V₁ (3.11 mg/g fresh matter). In V₃ and V₂, the photosynthesis efficiency has increased very significantly, both on each pigment and on total pigments (11.37% and 10.37%, respectively, against the control) (*Table 3*).

The productivity of vine stocks was greatly influenced by Moldstim. The number of grapes formed on the vine stock has significantly increased against the control in all the experimental variants. The highest values were found in V₃ (34.1) and V₂ (32.8). The lowest number of grapes formed on the vine stock was found at the control (29.3).

The mean grape weight has increased in variants V₃ and V₂, treated with Moldstim, against the control (80.2 g), with distinctively significant positive differences in V₃ (88.6 g). In V₁, the lowest value of the mean weight of a grape (79.2 g) was found, but with insignificant differences against the control.

Moldstim has also influenced the berry weight and diameter. The 100 - berry weight has significantly increased only in V₃ (14.8 g). In V₁ and V₂, the 100 - berry weight has registered close values to the control, with insignificant differences. The berry diameter has slightly increased in the experimental variants, by 0.8 mm in V₂ and by 1.1 mm in V₃ (*Table 4*).

Both on vine stock and per ha, the grape yields were greater against the control in V₂ and V₃. The highest grape yield, with very significantly positive differences was obtained in V₃ (3.1 kg/ vine stock and 10.8 t/ha, respectively). In V₁, the grape yield was practically equal to that obtained by the control (2.5 kg/ vine stock and 8.7 t/ ha, respectively) (*Table 4*).

The sugar content was slightly influenced by Moldstim, with insignificant differences against the control. The highest sugar concentrations were found in V₁ (216 g) and at the control (213 g). A more reduced content, correlated negatively to the grape yield was obtained in V₂ and V₃, with 210 g/l and 209 g/l, respectively.

Acidity has shown close values at all the variants and it was slightly influenced by the level of grape yield; insignificantly higher values than the control were found in V₃ (5.03 g/l H₂SO₄).

In all the experimental variants, inclusively at the control, at full ripeness, grapes had a green - yellowish colour and a juicy pulp, specific to a wine grape variety (*Table 5*).

Table 4

Productivity of Fetească albă Variety, treated with Moldstim, Jassy Vineyard, year 2007

Variant		Mean no. of grapes/vine stock				Mean weight of a grape				100 - berry weight (g)	Mean diameter of a berry (mm)
No	BAS	no.	dif.	%	signif.	g	dif.	%	signif.		
	V1 Moldstim 0,0001%	30.4	1.1	104		79.2	1.0	98.7	-	117	9.7
	V2 Moldstim 0,001%	32.8	3.5	112	xx	83.4	3.2	104.0	x	130	10.5
	V3 Moldstim 0,005%	34.1	4.8	116	xxx	88.6	8.4	110.4	xx	148	10.8
	V0 Control	29.3	-	100.0		80.2	-	100.0	-	131	9.7

LSD 5% = 2.1 grapes
 LSD 1% = 3.3grapes
 LSD 0.1% = 4.7 grapes

LSD 5% = 4.1 g
 LSD 1% = 7.8 g
 LSD 0.1% = 10.7 g

Table 5

Grape yield and its quality in Fetească albă Variety Moldstim, Jassy Vineyard, year 2007

Variant		Grape yield					Sugar content				Acidity g/l H ₂ SO ₄	Berry colour
No	BAS	kg/stock	t/ha	Dif.	%	Sign.	g/l	Dif.	%	Signif.		
	V1 Moldstim 0,0001%	2.5	8.7	0.0	100.0		216	3.0	101.4	-	4.8	green - yellowish
	V2 Moldstim 0,001%	2.6	8.9	0.2	102.0		210	-3.0	98.6	-	4.79	green - yellowish
	V3 Moldstim 0,005%	3.1	10.8	2.1	124.0	xxx	209	-4.0	98.1	-	5.03	green - yellowish
	V0 Control	2.5	8.7	-	100.0	-	213	-	100.0	-	4.78	green - yellowish

LSD 5% = 0,6 t/ha
 LSD 1% = 1,5 t/ha
 LSD 0,1% = 2,3 t/ha

LSD 5% = 7.3 g/l
 LSD 1% = 10,1 g/l
 LSD 0,1% = 14,7 g/l

CONCLUSIONS

Applied in vine, Moldstim has shown a positive influence on the photosynthesis efficiency, on grape yield and quality.

The content of leaf pigments has shown superior values at the control, both on elements (chlorophyll a, chlorophyll b and carotene) and entirely, the highest pigment content being noticed in the first decade of August at the variants treated with Moldstim 0.001% and 0.005%. The increasing of the content of leaf pigments, has also resulted in increasing the photosynthetic efficiency.

Productivity and grape yield have significantly increased in the variants treated with Moldstim 0.001% and 0.005%, with values superior to the control, as concerns number of grapes formed on the vine stock, mean weight of a grape, 100 - berry weight, berry diameter and grape yield per vine stock. At the variant treated with Moldstim 0.001%, the values of productivity and grape yield were close to the control, without significant differences.

The quality of grape yield (sugar content and acidity) was similar to the control in all the variants, the low differences being mainly determined by the dimension of the grape yield.

The influence of Moldstim was positively correlated to the concentration of the solution used for treatment, the best results being obtained in V₂ (Moldstim 0.001%) and V₃ (Moldstim 0.005%).

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