THE INFLUENCE OF SOME NATURAL BIOREGULATORS SUBSTANCES APPLICATION ON THE GROWTH AND DEVELOPMENT OF TOMATO CROP CULTIVATED IN POLYTUNNELS INTO AN ECOLOGICAL SYSTEM

INFLUENȚA APLICĂRII UNOR SUBSTANȚE BIOREGULATOARE NATURALE ASUPRA CREȘTERII ȘI DEZVOLTĂRII CULTURII DE TOMATE ÎN SOLAR ÎN SISTEM ECOLOGIC

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Abstract. *The paper aims to determine the influence of three different natural substances with glycoside structure (Pavstim, Ecostim and Moldstim) on tomatoes grown in polytunnel into an organic system. The efficacy of the treatments was assessed by observations and biometric determinations on plant height, number of inflorescences, number of flowers and fruits and average fruit weight for each variant. The results revealed the following variants: Pavstim. 0.001% (with a total production of 54.14 t/ha), Pavstim 0.0015% (with a yield of 59.82 t/ha) and Moldstim 0.0015% (with a yield of 58.35 t/ha), reported to the control variant (44.65 t/ha). The yield differences were significant positive for the first version, respectively distinctly significant for the second and third version.*

Key words: organic vegetable growing, natural bioregulators substances, tomatoes.

Rezumat. *Lucrarea îşi propune să determine influența a trei substanțe naturale bioregulatoare cu structură glicozidsteroidală (Pavstim, Ecostim şi Moldstim), asupra plantelor de tomatelor cultivate în solar, în sistem ecologic. Eficacitatea tratamentelor a fost evaluată prin observații şi determinări biometrice referitoare la înălțimea plantei, numărul de inflorescențe, numărului de flori şi fructe legate şi greutatea medie a fructelor pentru fiecare variantă. Rezultatele au pus în evidență variantele: Pavstim 0,001% (cu o producție totală de 54,14 t/ha), Pavstim 0,0015% (cu o producție de 59,82 t/ha) şi Moldstim 0,0015% (cu o producție de 58,35 t/ha), raportate la varianta martor (44,65 t/ha). Diferențele de producție față de martor au fost semnificative pentru prima variantă, respectiv distinct semnificative pentru a doua şi a treia variantă.*

Cuvinte cheie: legumicultură organică, substanțe bioregulatoare naturale, tomate

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INTRODUCTION

The Solanaceous vegetable growing in polytunnels requires performing a series of correlations between different technological links, in order to achieve their optimization. Most of the times, the difference between the success and the failure of a crop is given by the skill of the engineer/technologist arised from his own experience (Munteanu et al, 2009).

Regarding ecological vegetable growing, where the use of most of the substances from a conventional horticulture system is prohibited, the proper application of naturally substances, at the optimal dose and at the key phenophases, is a *sine qua non* element. In this context, the application of various natural a bioactive substance knows a remarkable progress, highlighted by the growing number of such new products come onto the market and also by the competition for the approval of those who have proven their effectiveness.

Among these are some natural bioactive substances extracted from plant parts of well-known species (*Hipophae rhamnoides L., Capsicum annuum L., Lycopersicon esculentum L., Digitalis purpurea L.,* so.). Basically, these substances have glycoside steroid structure, which gives them biostimulating qualities.

Several products have been successfully used in vegetable growing practice such as Pavstim, Ecostim and Moldstim so. (Stan et al., 1996).
In fact, the contribution of this three glycoside structure substances upon which investigations have been performed in tomato culture is highlighted by the scientific literature: Pavstim stimulates the storage of biomass, photosynthetic pigment concentrations, fruit weight and productivity (Chintia et al., 1998). Moldstim used in 0.001% concentration increases the yeald by 15-20%, extend the fructification season and reduce nitrate content of fruit (Khushtov and Daurov, 2007). Ecostim applied to tomato seeds by soaking solution induced a faster development of seedlings, reducing the critical sensitivity of soil fungal pathogens attack (Chintea et al., 1998).

These results determined us to test the efficacy of these substances to a culture of tomatoes in polytunells, in ecological agriculture circumstances.

MATERIALS AND METHODS

The researches were conducted during 2011 in "V. Adamachi" vegetable experimental field of UASVM Iasi. The tomato culture in polytunells (Primadona F1 variety), 2nd cycle (29 May – 30 October), was established by seedling produced in alveolar trays (without subculturing procedure).

The experience contained seven variants (including the control version), shown in table 1.

The treatments were performed with a Vermorel sprayer device, by spraying fine and uniform solution throughout the whole plant, weekly. The first treatment was carried out two weeks after planting.

The experience has been organized in a randomized block device with three repetitions, each repetition parcel containing five plants.

We pointed the effectiveness of treatments through observations and biometric determinations on plant height, number of inflorescences, number of flowers and fruits, average fruit weight and also on overall production for each variant.

Table 1

The experimental variants

Variant no.	Bioactive substance applied	Origin	Concentration %	How it was applied
V_1(C)	-	-	-	-
V_2	Pavstim	*Digitalis purpurea*	0.001	Weekly treatment
V_3	Ecostim	*Lycopersicon esculentum*	0.001	Weekly treatment
V_4	Moldstim	*Capsicum annuum*	0.001	Weekly treatment
V_5	Pavstim	*Digitalis purpurea*	0.0015	Weekly treatment
V_6	Ecostim	*Lycopersicon esculentum*	0.0015	Weekly treatment
V_7	Moldstim	*Capsicum annuum*	0.0015	Weekly treatment

RESULTS AND DISCUSSIONS

The results highlights that the treatments performed had a significant influence on plant growth and development.

The measurements regarding the plant growth and development index took place two days before the first harvest.

The plants height emphasizes within 0.001% variants the Moldstim one, with an average height of 119.87 cm, with 17.34 cm more than the control version. Ecostim and Pavstim variants have substantially the same average height with control version. The situation changes at 0.0015% variants: Ecostim variant has its height close to control version, Moldstim and Pavstim variants having an additional of 9.27 cm, respectively 10.87 cm.

Regarding the number of flowers / plant, it has varied from 4.67 to control version, till 6.27 at Moldstim 0.001% version.

The number of flowers per plant highlighted the variants treated with 0.0015%, mainly the Pavstim variant, with an average of 16.18 flowers / plant.

The number of fruits/plant revealed the Pavstim 0.0015% and Moldstim 0.0015% variants with 12.78 fruits / plant, respectively 12.26 fruits / plant.

The average fruit weight outlined the same variants, Pavstim 0.0015% and Moldstim 0.0015%, with an average weight of 97.87 g, respectively 98.06 g.

The main growth and development index are presented in table 2.

Table 2

The impact of bioactive substances treatements on the growth and development of the plants

Variant		Growth and development index				
No.	**Specification**	**Height (cm)**	**No. of inflorescence/plant**	**No. of flowers**	**No. of fruits**	**Average fruit weight (g)**
1.	Control (untreated)	102.53	4.67	12.21	9.20	83.13
2.	Pavstim 0.001	105.4	5.6	14.00	10.86	94.30
3.	Ecostim 0.001	109.8	4.87	13.13	9.66	90.73
4.	Moldstim 0.001	119.87	6.27	14.13	11.01	85.22
5.	Pavstim 0.0015	113.4	6.15	16.18	12.78	97.87
6.	Ecostim 0.0015	103	5.27	15.46	11.20	95.15
7.	Moldstim 0.0015	111.8	6.13	15.40	12.26	98.06

The dynamics of production reveals. within all variants. significant yields at the second and third harvests. The total yields fluctuated from 44.65 t/ha at control version to 59.82 t/ha at Pavstim 0.0015% version (table 3).

Table 3

The yield dynamics (t/ha)

Variant		The harvest appreciation date				
No.	**Specification**	**7 IX**	**23 IX**	**9 X**	**20 X**	**Total**
1.	Control (untreated)	7.89	11.67	15.87	9.22	44.65
2.	Pavstim 0.001	9.81	13.74	18.13	12.46	54.14
3.	Ecostim 0.001	10.06	11.32	16.57	13.56	51.51
4.	Moldstim 0.001	9.63	14.09	17.11	11.81	52.64
5.	Pavstim 0.0015	11.37	15.56	18.94	13.95	59.82
6.	Ecostim 0.0015	10.25	11.68	16.68	13.59	52.20
7.	Moldstim 0.0015	11.54	15.63	18.71	12.47	58.35

We should mention that in terms of quality, in an overwhelming percentage, the total production of each variant ranged in extra class, with values belonging to the interval 71.25% (control version) – 77.75% (Moldstim 0.0015 version). About one quarter of the production was part of first quality class, second quality class being underrepresented (the maximum recorded value was 4.25% at both the Control and Ecostim 0.0015 version) (table 4).

Table 4

Fruit quality (according to STAS no. 1421-81)

Variant		Extra class (%)	First class (%)	Second class (%)
No.	Specification			
1.	Control (untreated)	71.25	24.50	4.25
2.	Pavstim 0.001	74.50	22.75	2.75
3.	Ecostim 0.001	73.50	24.25	2.25
4.	Moldstim 0.001	76.25	20.50	3.25
5.	Pavstim 0.0015	74.75	21.75	3.5
6.	Ecostim 0.0015	73.25	22.50	4.25
7.	Moldstim 0.0015	77.75	19.50	2.75

The experimental data were processed by proper statistical and mathematical methods (ANOVA).

Thus, regarding this matter, stands out the V_5 and V_7 variants, with distinctly significant positive productions and V_2 variant with significant positive production. Also, the relative production highlights the same variants, with an increase of 33.97%. 30.68%, respectively 21.25% (table 5).

Table 5

The variant's yield analysis

Variant		Total production (t/ha)	Difference over the control (t/ha)	Relative production (%)	Significance
No.	Specification				
1.	Control (untreated)	44.65	0.0		
2.	Pavstim 0.001	54.14	9.5	121.25	*
3.	Ecostim 0.001	51.51	6.9	115.36	
4.	Moldstim 0.001	52.64	8.0	117.89	
5.	Pavstim 0.0015	59.82	15.17	133.97	**
6.	Ecostim 0.0015	52.2	7.55	116.90	
7	Moldstim 0.0015	58.35	13.70	130.68	**

LSD 5% = 8.09 t/ha
LSD 1% = 11.35 t/ha
LSD 0.1% = 16.03 t/ha

The F-test shows that differences in production are due to the studied experimental factor, mainly.

CONCLUSIONS

1. Regarding the dinamycs of plants growth in height, the most prominent is Pavstim 0.001% variant. However, it should be noted that all treated variants have greater height levels than the control version.

2. All the treated variants achieved a higher number of inflorescences, flowers and fruit, as well as a superior average fruit weight than the control version, particularly the variants treated with a concentration of 0.0015%.

3. The efficiency of applying biostimulating substances is shown by the overall production obtained at Pavstim 0.0015 and Moldstim 0.0015 variants, causing distinctly significant positive differences.

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