

INFLUENCE OF PAVSTIM ON THE GROWTH AND DEVELOPMENT OF ORGANIC TOMATO CROP FROM POLYTUNNELS

INFLUENȚA PAVSTIMULUI ASUPRA CREȘTERII ȘI DEZVOLTĂRII TOMATELOR ECOLOGICE ÎN SOLAR

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Abstract. *Pavstim is a natural bioregulator substance with steroidal glycoside structure extracted from foxglove plant (*Digitalis purpurea*). The paper aim is to evaluate the influence of this bioactive substance, used in two concentrations (0.001% and 0.0015%) on two tomato hybrids: Winona F1 and Primadona F1. The variants were compared with the experimental average. The results highlighted the V₁ and V₄ variants (the untreated variants), with negative differences distinctly significant (-7.7 t / ha), respectively significant (-5.2 t / ha) and the V₆ variant (Pavstim applied in 0.0015% on Winona F1 hybrid) with significant positive difference (6.31 t / ha).*

Key words: organic tomatoes growing, natural substances, steroidal glycoside structure.

Rezumat. *Pavstimul este o substanță bioregulatoră naturală cu structură glicozidsteroidală extras din planta degetarul roșu (*Digitalis purpurea*). Lucrarea își propune să evalueze influența acestei substanțe bioactive, utilizată în două concentrații (0.001% și 0.0015%) asupra a doi hibridi de tomate: Winona F1 și Primadona F1. Variantele au fost comparate cu media experienței. Rezultatele au evidențiat variantele V₁ și V₄ (variantele netratate), cu diferențe negative distinct semnificative (-7.7 t/ha), respectiv semnificative (-5.2 t/ha) și varianta V₆ (Pavstim aplicat în conc. 0.0015% la hibridul Winona F1) cu diferență pozitivă semnificativă (+6.31 t/ha).*

Cuvinte cheie: cultura organică a tomatelor, substanțe naturale, structură glicozidsteroidală.

INTRODUCTION

Over the last decades of vegetable practice, the bioactive stimulating substances acquired a central role due to their positive contribution on physiological processes and therefore on final products by increasing precocity, quantity and quality of yield, while ensuring high economic efficiency (Stan et al., 1996).

Pavstim is such a bioactive substance, with steroidal glycoside structure, extracted from foxglove plant (*Digitalis purpurea* L.), a biennial herbaceous plant, and belonging to the *Plantaginaceae* botanical family, native in Europe. In

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molecular biology, the plant is used for digoxigenin (a steroid found in flowers, leaves and seeds of *D. purpurea* and *D. lanata* plant) as a molecular probe for detecting DNA or RNA. In medicine, the extract of *D. purpurea* is called digoxin or digitalis, and it is used to treat different types of heart failure, accompanied by atrial fibrillation.

The favorable effect of Pavstim over the vegetable crops is presented by Chintea et al., 1998: although they were sown in soil infested with different fungal pathogens, the treated seeds of tomatoes and cucumbers have generated healthy plants, with an accumulation of biomass and an increased rate growth of vegetative organs, compared with plants obtained from untreated seeds (control). Also, biochemically, treated plants recorded higher concentrations of total carbohydrate.

MATERIAL AND METHOD

The research was carried in the experimental vegetable field from "V. Adamachi" farm, part of U.S.A.M.V Iasi, in 2011. The tomato culture was established in a polytunnel of 400 m², using a set of two hybrids of Israeli origin: Winona F1 and Primadonna F1. It was cultivated in 2nd cycle, by seedlings produced in alveolar trays (without subculturing procedure). The experience included six variants, determined by differential application of Pavstim (0.001% and 0.0015%) on the two hybrids, alongside the untreated variants:

$V_1 = a_1b_1$ untreated x Primadonna F1;

$V_2 = a_1b_2$ Pavstim 0.001% x Primadonna F1;

$V_3 = a_1b_3$ Pavstim 0.0015% x Primadonna F1;

$V_4 = a_2b_1$ untreated x Winona F1;

$V_5 = a_2b_2$ Pavstim 0.001% x Winona F1;

$V_6 = a_2b_3$ Pavstim 0.0015% x Winona F1;

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.

The treatment effectiveness was emphasized by observations and biometric measurements over the plant's height, number of inflorescences, number of flowers and fruits, average fruit weight as well as by total yield for each variant.

The results were analyzed comparing them with the experience's average.

RESULTS AND DISCUSSIONS

Following the observations and measurements that we have taken, it stood out the positive influence of Pavstim treatment over tomato culture in polytunnels.

The measurements regarding the plant growth and development index took place in the first decade of September, two days before the first harvest.

The dynamics of plant growth in height highlights, for both hybrids, the variants on which has been applied greater Pavstim concentration (0.0015%), the difference to the untreated variants being of 10.87 cm for Primadonna F1 hybrid, respectively 25.53 cm for Winona F1 hybrid. In contrast, the variants treated with

Pavstim 0.001% reveal insignificant height differences, of only 2.87 cm for Primadonna F1 and 5.6 cm for Winona F1.

In terms of influence over the number of inflorescences/plant, are highlighted V5 (Winona F1 x Pavstim 0.001) and V6 (Winona F1 x Pavstim 0.0015) variants, with increases of +0.61, respectively +1.01 than the experience's average, which recorded 5.86 flowers / plant.

If we refer to the number of flowers/plant, we note that the experience's average was 13.54, emphasizing positively in this case the V3 and V6 variants (Pavstim 0.0015% variants), with increases of +2.64, respectively +2.06 flowers / plant.

The results concerning the number of fruit/plant and average fruit weight shows prevail of the cultivar's influence, revealed by the antithesis between the variants belonging to the two hybrids used in the experience. Thus, all Primadonna F1 variants have recorded a lower number of fruit / plant than control variant, but offset by the average fruit weight which has been higher at most variants (except V1 variant). The situation is opposite at Winona F1 variants: the number of fruit has been higher than the control variant, however, their average weight being lower in all three variants.

Besides the influence of the cultivar, it also stands out the influence of Pavstim's treatments. Therefore, within the two hybrid variants, the number of fruit/plant and average fruit weight increased proportionally with the dose of Pavstim applied.

The effect of Pavstim's treatments on the growth and development of tomatoes is illustrated in table 1:

Table 1

The impact of Pavstim's treatments on the growth and development of tomatoes

Variant		Growth and development index				
No.	Specification	Hight (cm)	No. of inflorescence/plant	No. of flowers	No. of fruits	Average fruit weight (g)
1.	Primadona F1	102.53	4.67	12.21	9.2	83.13
2.	Primadona F1 x Pavstim 0.001	105.40	5.6	14	10.86	94.3
3.	Primadona F1 x Pavstim 0.0015	113.40	6.15	16.18	12.78	97.87
4.	Winona F1	135.47	5.4	10.2	16.73	66.59
5.	Winona F1 x Pavstim 0.001	141.07	6.47	13.06	19	81.03
6.	Winona F1 x Pavstim 0.0015	161	6.87	15.6	20.27	82.66
7.	Media (Mt)	126.47	5.86	13.54	14.81	84.26

The dynamics of the production (table 2), highlights an extra yield recorded at the second and, especially at the third harvest (from a total of

four), periods that correspond with full physiological maturity of the studied hybrids, practically.

Table 2

The yield dynamics (t/ha)

No.	Variant Specification	The harvest appreciation date				Total
		7 IX	23 IX	9 X	20 X	
1.	Primadona F1	8.14	11.83	15.69	10.03	45.69
2.	Primadona F1 x Pavstim 0.001	9.81	13.74	18.13	12.46	54.14
3.	Primadona F1 x Pavstim 0.0015	10.17	14.54	17.98	13.72	56.41
4.	Winona F1	9.55	13.21	15.49	9.94	48.19
5.	Winona F1 x Pavstim 0.001	11.37	15.56	18.94	10.39	56.26
6.	Winona F1 x Pavstim 0.0015	12.27	15.74	19.11	12.59	59.71
7.	Average (C)	10.22	14.10	17.56	11.52	53.4

Regarding the significance of total production and differences in production, table 3 reveals that untreated variants recorded a lower total production compared to the control variant of -7.7 t / ha for Primadonna F1 hybrid, respectively -5.2 t / ha for F1 Winona F1 hybrid, differences in production being negative distinctly significant for V1 variant and significant for V4 variant. Positively speaking, it stands out variant 6 (Pavstim 0.0015% x Winona F1), with a total production of 59.71 t / ha, the difference from control version being significant positive.

Also, the relative production highlights the same V6 variant (Winona F1 x Pavstim 0.0015) with an increase of 11.81% than the control version.

Table 3

The variant's yield analysis

No.	Variant Specification	Total production (t/ha)	Difference over the control (t/ha)	Relative production (%)	Significance
2.	Primadona F1 x Pavstim 0.001	54.14	0.7	101.38	
3.	Primadona F1 x Pavstim 0.0015	56.41	3.0	105.63	
4.	Winona F1	48.19	-5.2	90.24	0
5.	Winona F1 x Pavstim 0.001	56.26	2.86	105.35	
6.	Winona F1 x Pavstim 0.0015	59.71	6.31	111.81	*
7.	Media (Mt)	53.40			

LSD 5% = 4.93 t/ha
LSD 1% = 7.01 t/ha
LSD 0.1% = 10.14 t/ha

In terms of quality, the tomato fruits, regardless of the hybrid or the concentration of Pavstim, fell within a percentage above 70% into extra grade, 23% in first quality class and a percentage between 1.25% and 7% in second quality class (table 4).

Table 4

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

Variant		Extra quality (%)	First quality (%)	Second quality (%)
No.	Specification			
1.	Primadona F1	70.50	22.50	7.00
2.	Primadona F1 x Pavstim 0.001	73.75	22.75	3.50
3.	Primadona F1 x Pavstim 0.0015	74.25	24.50	1.25
4.	Winona F1	72.25	21.75	6.00
5.	Winona F1 x Pavstim 0.001	74.00	23.00	4.00
6.	Winona F1 x Pavstim 0.0015	75.25	23.25	1.50
7.	Average (C)	73.30	22.90	3.80

CONCLUSIONS

1. The dynamics of plant growth in height points out that it is directly proportional to the increase in Pavstim's concentration, variants upon which has been applied the highest concentration showing a vigorous growth compared with untreated variants.

2. Variants treated with Pavstim showed a higher number of inflorescences, flowers and fruits than the untreated variants, indicating the positive effect of the treatments.

3. The main indicator of the treatment's effectiveness proved to be the average fruit weight, all the treated variants presenting an average weight of about 10g higher than the untreated variants.

4. Total and relative production has been higher at the variants treated with Pavstim, the difference to the control version being positive. The only variants with a negative difference to the control version were the untreated variants.

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