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THE DETERMINATION OF THE INFLUENCE OF ASFAC BC 04 BIOSTIMULATOR ON STANLEY PLUM FRUITS

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Key words: *Stanley plum tree variety, biostimulator, bioproductity, fruit quality*

INTRODUCTION

Description of STANLEY plum tree variety

STANLEY plum tree variety originates in America where it was created in 1957 and it was extensively introduced in Romania in countrywide tree plantations. The tree has medium hardiness and early fruiting with partly vigurous frame branches displaying fruit clusters, which are mostly May clusters. This variety is tolerant to *Plum-pox,* self-fertile and highly productive.

It is an excellent pollinator for self-sterile varieties. The medium-sized (35-45g) oval-shaped fruit presents a deep lateral slit along the entire fruit, its flesh is yellowish and its skin is covered with dense bloom (Fig 1). The harvesting season is the end of August and the beginning of September. The taste is good, sweet with a refined fragrance and the fruits can be consumed fresh or industrialised (Dorin Sumedrea si colab., 2014, Cociu V., Oprea Șt., 1989, Gheorghe Mladin si colab., 2011).

The usage of ASFAC BC 04 biostimulator in fruit farming has been tested on several varieties of sweet and sour cherry trees, apple tree and plum tree with positive results in terms of physical production and fruit quality. Part of the findings were communicated in 2013 within the Scientific Symposium with international participation "Ecology and protection of ecosystems", 10th edition, Bacau. ASFAC BC O4 is devoid of toxicity, universally applicable in agriculture, viticulture, horticulture and silviculture.

It is also compatible with herbicides and other pesticides, which allows its being applied along with them and reducing labour costs (Technical data sheet of ASFAC BC O4 product). This product was tested by the ICPA National Institute of Research-Development for Pedology, Agrochemistry and Environmental Protection Bucharest on different rape, maize, sunflower, potato and grape culture; the good results were detailed in the report Second year

Testing of ASFAC BC 04 plant growth biostimulator in different cultures for final authorization of use in the agriculture of Romania.'' (http://www.fertilizator.ro/datacenter/asfac/ICPA.pdf

Fig. 1. Stanley plum fruits treated with ASFAC BC 04 and plum leaves

MATERIAL AND METHODS

The current study was conducted on a Stanley plum tree plantation covering a surface of 2 hectares with 9-10 year-old trees at a 5-metre planting distance between rows and 3 metres on the row, corresponding to a density of 667 pomi/ha.

The treatment with ASFAC BC 04 was undertaken two times, under conditions similar to the ones for cherry trees.

Biometric determination of Stanley plum fruits in 2013-2014 under conditions of treatment or no treatment with ASFAC BC 04

The determinations and measurements perfomed at the Phytopathology, Microbiology, Vegetal Physiology Laboratory of BEPM Deparment, at "Vasile Alecsandri" University of Bacau involved samples of 100 fruits for the treated variant and another 100 fruits for the untreated variant.

The measurements of height, diameter and shank length of Stanley plums was performed upon harvesting day using lab devices such as Sartorius scales and a digital caliper (Fig. 2).

Fig. 2 Biometric determination of Stanley plum fruits

The determination of bioproductively significant indicators for Stanley plum fruits

Bioproductively significant indicators for Stanley plum fruits refer to the dry matter content, sugar content (Brix degrees), flesh density (mg/cm^3) and acidity (mg citric acid/100ml suc) under conditions of treatment with ASFAC BC 04 in 2013-2014.

To this purpose, a Zeiss handheld refractometer was used (Fig 3).

The procedures for this determination comply with the protocol described by Cociu and colab., 1989; STAS 2213/8-68.

Fig.3. Determination of sugar content (%) with Zeiss handheld refractometer

The determination of the amount of assimilation pigments in Stanley plum leaves treated and untreated with ASFAC BC 04

The content of assimilation pigments was quantitatively determined by a LIBRA 22 S) spectrophotometer in 2013, by means of Mayer-Bertenrath method, adapted by Ştirban and Fărcuş. Their extraction was performed using acetone 85% (Bădăluta Nicoleta et al, 2014, Rați I., V.et al, 2010, Artenie V., Tănase Elvira, 1981).

RESULTS AND DISCUSSIONS

Biometric determinations of Stanley plum fruits untreated and treated with ASFAC BC 04

The results of the biometric measurements of STANLEY plum fruits treated and untreated with ASFAC BC 04 for 2013-2014 are indicated in Table 1.

The average fruit height untreated with ASFAC BC O4 ranged between 51.03 mm in 2013 and 49.10 in 2014.

The fruits treated in the two years registered an increase in fruit length (height) ranging between 1.47% and 5.80% (53.99 mm in 2013).

The average fruit diameter under treatment conditions showed an increase from 4.42% (2014) and 6.32% (2013) in relation to untreated ones. In 2013, we recorded values varying from 37.14 mm (untreated) to 39.49 (treated). In 2014 they were between 37.3 mm (untreated) and 38.95 (treated).

The shank average length in 2013 recorded values of 23.20 mm for untreated fruits and 22.04 mm in treated fruits.

In 2014 values ranged between 13.77 mm (untreated) and 10.9 mm (treated). In the two years of study, the shank of fruits treated with ASFAC BC04 decreased by 5.0- 20.85%.

The plum production quality is directly influenced by the dynamics of fruit growth. In treating trees with ASFAC BC O4, in the two years of study, we recorded some growth increase or decrease presented in Table 2.

The average weight of treated fruit registered higher average values 2013 (48.69 g) as compared to 2014 (39.89 g).

In 2013, the average weight of fruit flesh amounted to 46.2 g.

The percentage of fruit weight growth was of 5.9 % in fruits untreated with ASFAC BC 04 in contrast with 6.52 % in untreated ones.

Flesh density in fruits untreated with ASFAC BC 04 in 2013 indicated higehr values (1.7003g/cm^3) by comparison with those treated with ASFAC BC 04 (1.239 g/cm^3), that is, a density which is 27.14% lower than unterated ones.

The analysis of bioproductively significant indicators for Stanley plum leaves treated and untreated with ASFAC BC 04

The bioproductively significant indicators monitored in 2013-2014 for Stanley plum leaves treated and untreated with ASFAC BC 04 are presented in Table 3.

Table 1. Biometric determinations of STANLEY plum fruits treated and untreated with ASFAC BC 04 in 2013-2014 at SC CERAVIS SA BACAU

Conditions of treatment with ASFAC BC-04	Fruit height (mm)		Fruit diameter (mm)		Shank length (mm)	
	2013	2014	2013	2014	2013	2014
Untreated	51.03	49.10	37.14	37.3	23.20	13.77
Treated	53.99	49.98	39.49	38.95	22.04	10.9
Pertcent age (%) of increase / decrease	5.80%	1.7%	6.32%	4.42%	-5%	- 20.85%

Table 2. The growth dynamics of STANLEY plum fruits treated and untreated with ASFAC BC 04 in 2013-2014, at SC CERAVIS SA BACAU

Conditions of treatment with ASFAC BC-04	Fruit weight (g)		Stone weight (g)		Flesh density (g/cm^3)	
	2013	2014	2013	% of fruit weight	2013	pertcent (%) of increase / decrease
Untreated	40.78	36.42	2.66	6.5%	1.7003	-
Treated	48.69	39.89	2.48	5.09	1.239	-27.14%

Table 3. Dry matter and sugar content, flesh density and acidity of STANLEY plum fruits under conditions of treatment with ASFAC BC 04 in 2013-2014

Conditions of treatment with ASFAC BC-04	Dry matter (%)		Sugar (BRIX% degrees)		Acidity (g citric acid /100ml juice)	
	2013	2014	2013	2014	2013	procent of decrease treated %
Untreated	11,6	12,7	12,3	11,12	17,46	-
Treated	14,6	13,42	12,6	11,96	15,86	-9,17
Pertcent age (%) of increase / decrease	25,86%	5,66%	2,43%	7,5%	-	-

The dry matter content (%) of treated fruits increased with values between 5.56% in 2014 and 25.86% in 2013.

Sugar quantity (BRIX% degrees) recorded higher values in 2014 for fruits treated with ASFAC BC 04 (7.5%), which demonstrates that there is no direct relation between dry matter and the sugar content as long as they are influenced by environmental factors.

Fruit acidity (g citric acid/100ml suc) decreased with 9.17% in fruits treated with ASFAC BC 04 (15.86 g citric acid/ 100 ml juice) as compared to untreated (17.46 g citric acid /100 ml juice).

The determination of the content of assimilation pigments in Stanley plum tree leaves treated and untreated with ASFAC BC 04

There is an increase in chlorophyll a and b for treated plum leaves (Fig. 4).

Chlorophyll a recorded a growth rate of 39.60%, whereas chlorophyll b was 28.40%.

Chlorophyll a under untreated conditions recorded a value of 0.505 mg / g and chlorophyll b recorded a value of 0.169 mg /g, while carotenoid pigments were 0.0003 mg / g (Table 4).

Under treatment, there was a decrease in carotenoid pigments from 0.0002 mg / g, the percentage of decrease is 50%.

Table 4. The determination of the content of assimilation pigments for Stanley plum leaves at SC CERAVIS SA BACAU

Treatment conditions with ASFAC BC 04	Chlorophyll a (mg/g)	Chlorophyll b (mg/g)	Carotenoid pigments (mg/g)
Untreated	0.505	0.169	0.0003
Treated	0.705	0.217	0.0002

These changes in assimilation pigments directly influence the absorption of light quantity by the leaf during plant metabolism.

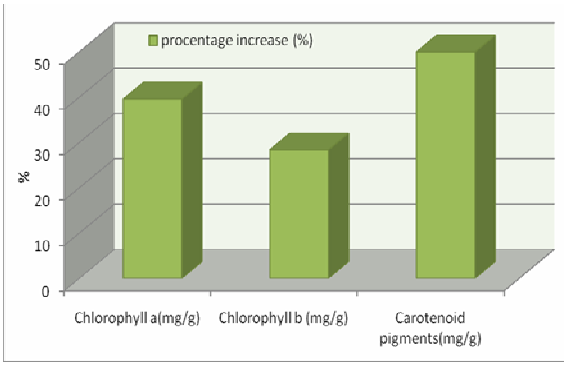

Fig. 4. Percentage increase (%) of chlorophyll a, b content (mg/g) and of carotenoid pigments (mg/g) for Stanley plum tree

Fruit production significant for fresh consumption, industrialization and distillation

Under conditions of treatment with ASFAC BC 04, an increase in the physical production of fruits of 19.36% was recorded for 2013 and 9.52% in 2014 (Fig 5).

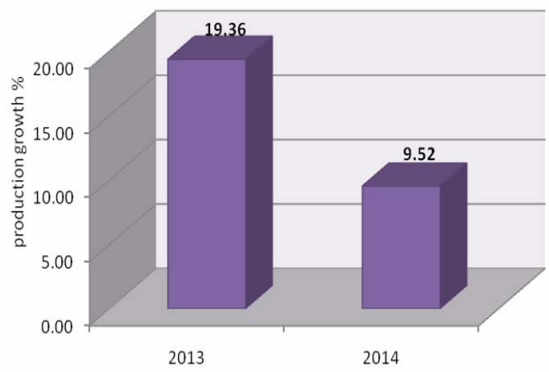

Fig 5. STANLEY plum production registered in 2013-2014

Table 4. Production growth obtained in STANLEY plum tree treated and untreated with ASFAC BC 04 in 2013-2014 at SC CERAVIS SA BACAU

Treatment with ASFAC BC-04 treatment	Production growth (%)		
	Fruit weight (%)	Dry matter (%)	Carbohydrates (Brix degrees)
2013	19.36	25.86	2.43
2014	9.52	5.66	7.55

Substantial increases (Table 4) were simultaneously recorded in dry matter content (%), between 5.66 % (2014) and 25.86 % (2013). This parameter has improved fruit quality both in terms of fresh and industrial consumption (dehydration, compote, jam).

The carbohydrate content (Brix) recorded increases of 2.43-7.55 Brix degrees in the two years of study that are not correlated with dry matter but directly dependent on environmental conditions. By increasing the sugar content, the fruit technical parameters improve so as to obtain distilled spirits.

CONCLUSIONS

The fruit in the lot treated with ASFAC BC 04 presented marketable qualities such as size and intense colour, specific to this variety, with waxy skin covered with dense bloom.

The sugar quantity increased in fruits treated with ASFAC BC 04 with a percentage of 7.5 % and the matter content with 25.87 % improving fruit quality in terms of fresh consumption and industrialization;

Under conditions of treatment with ASFAC BC 04 biostimulator, we registered an increase in the physical production of Stanley plum fruits of up to 19.36 %. Therefore, our findings recommend the usage of ASFAC BC 04 biostimulator in fertilization complexes.

ABSTRACT

In this paper we have proposed evaluation how the biostimulator ASFAC BC 04 improve product quality of the Stanley plum tree. This study was performed into a plantation of SC Ceravis SA located in Itesti village of Bacau County in 2013 and 2014.This covering a surface of 2 hectares with 9-10 year-old trees at a 5-metre planting distance between rows and 3 metres on the row, corresponding to a density of 667 pomi/ha. The fruit in the lot treated with ASFAC BC 04 presented a marketable qualities such as size and intense colour and a good productivity. For all biometric and biochemical parameter analyzed was registered a positive results.

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*** STAS 2213/8-68, Determinarea acidităţii şi alcalinităţii produselor zaharoase dulci.

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