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# RESEARCH STUDY ON THE BEST FERTIGATION SOLUTIONS FOR VAN SWEET CHERRY TREE VARIETY USING ASFAC BC 04 GROWTH STIMULATOR

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***Key words:*** *sweet cherry tree Van variety, biostimulator,* ASFAC BC 04

## INTRODUCTION

The Van variety of sweet cherry tree was obtained in Canada and authorised for use in breeding and cultivation in Romania in 1981. It became well adapted to the climatic conditions of Moldavia, which recommended it for introduction in assortment.

The tree presents medium to high hardiness and it bears fruit in bunches on medium-sized branches in the month of May. It is highly productive, frost-resistant and a good pollinator.

The above-average fruit of 6.5-7 g has a globular shape, it is bright red and its stone represents about 3% of the fruit weight. Its organoleptic properties such as shape, colour and taste were made prominent during tasting contests (Budan S, Grădinariu G., 2000, Sumedrea D., si colab., 2014. Gică Grădinaru, 2002. Gheorghe Mladin si colab., 2011).

ASFAC BC O4 (Fig 1) represents a biostimulating product which can be universally applied in agriculture, viticulture, horticulture and silviculture. Applied correctly, the stimulator contributes to a significant growth in the agricultural production. In addition to its yeilding better fruit production, it also improves product quality. ASFAC BC O4 is devoid of toxicity, being the only non-toxic fertilizer which can be applied during any vegetative phase, including blooming time.

In case of overdosing, the risk is zero, given that it does not produce turgescence, burning or necrosis on the leaves. It is easily applicable and does not involve additional costs. It is also compatible with herbicides and other pesticides, which allows its being applied concomitantly with them and reducing labour costs.

The way the product takes action is systemic as long as it penetrates the plant structure and, thus, favours an increase in chlorophyll content. It also has a positive effect on seed germination and physiological processes in plants, leading to increased resistance and production. The product benefits from a two-year guarantee period (Technical data sheet of ASFAC BC O4).


Fig 1. Biostimulator product ASFAC BC-04 spraying ( original photo)

## MATERIAL AND METHOD

This study was conducted on a plantation of SC Ceravis SA located in Itesti village of Bacau County. The trees are 30 years old and they are engrafted on a frank parent stock in the system of retarted flattened vase-like crown tops, with a density of 350 trees/ha. The plantation is in excellent agricultural and phytosanitary condition, the trees having good yield potential. Production and regeneration-oriented cuttings were performed during the vegetation stage followed by 6-7 phytotosanitary treatments.

The treatments with ASFAC BC 04 were undertaken in two stages: before blossoming (when only 10% of the flowers opened) and at the end of the blossoming period (when the trees lost 50% of their flowers). The fruit harvested for our research were sampled from trees which were either untreated or treated with SFAC BC 04 at the physiological maturity of specific harvesting of the variety.

The biometric and biochemical fruit analyses were conducted in the laboratories of the Biology, Ecology and Environmental Protection Department, "Vasile Alecsandri" University of Bacău, according to specific research methods (Cociu V., Oprea Şt., 1989. Artenie V., Tănase Elvira, 1981).

The yielding evaluation of the Van variety treated and untreated with ASFAC BC 04 was performed in the field in the cherry plantation SC Ceravis SA Bacău in 2013 and 2014.

**Biometric determinations of VAN cherry fruits treated with ASFAC BC 04**

The biometric determinations targeted 5 indicators: fruit height (mm), large diameter (mm), reduced diameter (mm), length (mm) measured with a digital gauge as well as the shank weight (mg) for fruit coming from trees treated or not treated with ASFAC BC 04 in 2013 and 2014 (Fig 2).

Fig 2. Laboratory aspects with determinations of VAN cherry tree variety: fruit weight (mg), biometric mesurements

**Dynamics of fruit weight, dry matter and sugar content, pulp density and acidity of VAN cherry tree variety under treatment with ASFAC BC 04**

Fruit weight (g) was determined using an Axis AGN50C analytical balance.

Dry matter and sugar content were determined by means of the refractometric method using a Zeiss portable refractometer which expresses dry matter in percentages and sugar quantity in Brix degrees.

Pulp density was determined by the method described by Cociu si colab, 1989 based on the water volume displaced by a number of 30 fruits.

Cherry leaf acidity was indicated according to STAS 2213/8-68 using a titratable acidity procedure which expresses results in citric acid quantity (mg) / volume of fresh juice.

**Content determination in assimilation pigments in VAN variety**

Chlorofyll content a,b and the carotenoidic pigments were determined in 2013 on the leaves collected from trees which were untreated and treated with ASFAC BC 04 in the experimental field (Fig 3). The quantitative analysis of pigments was performed with a LIBRA 22 S spectrophotometer according to Mayer-Bertenrath method, adapted by Ştirban and Fărcuş, using 85% acetone in the extraction process (Badaluta Nicoleta si colab., 2014., Artenie V., Tănase Elvira, 1981).

Fig 3. Determination of chlorophyllian pigments for cherries

**The determination of the indicators of damage by *Monilinia frutigena* for van sweet cherry fruits in June 2013**

The indicators of damage (intensity (I%), frequency (F%), degree of damage (GA%) caused by *Monilinia frutigena* were calculated by percentages in agreement with the standing operating procedure (Rati I. V, Raducanu Dumitra., 2008. Parvu M., 2010. Rati I. V. et al., 2014).

**The determination of fruit quality VAN cherry fruit quality**

The method of evaluation of fruit quality consisted of conducting two sets of analyses: d*istribution into categories of freshly picked fruit* (Fig 4). Sets of 480 fruit were analysed under conditions of treatment or no treatment and they were distributed into two categories of cracked and not cracked fruits. Depending on their size, they were catagorized into large fruits **(**D>22mm), medium-sized (D=18-22) and small (D<22mm).

Fig 4. Quality evaluation of sweet cherry fruit of Van varieties, under conditions of treatment with ASFAC BC 04

*This organolepctic evaluation* was performed on a randomly selected group of 5 students. The

tasting of treated and untreated fruit was achieved under laboratory conditions using standard tasting sheets according to methodological procedures (Fig. 5). Evaluations were performed on the exterior aspect of the fruit (size, form, colour) and pupl characteristics (colour, consistency, juiciness, state and aroma) (Cociu V., Oprea Șt., 1989). For a better evaluation, the untreated Boambe de Cotnari variety was also introduced in the samples to be tasted.

Fig 5. Tasting activity for cherry fruit

The evaluation of sweet cherry production after using ASFAC BC 04

The procedure consisted of weighing the quantity of fruit/tree (Cociu V., Oprea Șt., 1989) Fruit harvesting was performed at physiological ripeness in five-kilo fruit crates placed on pallets, refrigerated at 1 C and delivered by cold-storage cars.

## RESULTS AND DISCUSSIONS

### Results concerning the biometric analyses

The biometric determinations were performed on fruit harvested from trees treated or untreated with ASFAC BC 04 in 2013 and 2014. Five indicators were selected: fruit height, large diameter, small diameter, shank length and weight (Table 1).

The height of the untreated fruits had values ranging between 19.10 mm in 2013 and 20.27 mm in 2014. Under conditions of treatment, we recorded growth in 2013 (19.24mm) and decline in 2014 (19.40 mm) compared with the untreated ones.

The large diameter of the untreated fruits registered values varying from 23.24 mm in 2013 to 22. 87 mm in 2014. When treated, the values are higher as follows: 24.62 mm in 2013 and 24.52 mm in 2014.

The small diameter of the untreated fruits registered values ranging between 20.12 mm in 2013 and 21.70 mm in 2014. For treated fruit, the values increased in 2013 to 21.50mm and decerased to 21.47 in 2014.

The shank length of the untreated fruits registered values varying from 37.09 mm in 2013 and 30.30 mm in 2014. Under treatment conditions, the shank extended to 35.60 mm în 2013 and 34.37 mm in 2014.

The shank weight was determined only in 2013 and ranged from 0.056 g for untreated fruit to 0.042 g for treated ones. Under conditions of treatment with ASFAC BC 04, changes in fruit dimension are registered to the extent that they influenced both fruit size and shape.

During the two years of study, the large size of treated fruit increased (Fig 6 ) of 5.48% in 2013 and 7.21% in 2014 in relation to untreated fruit.

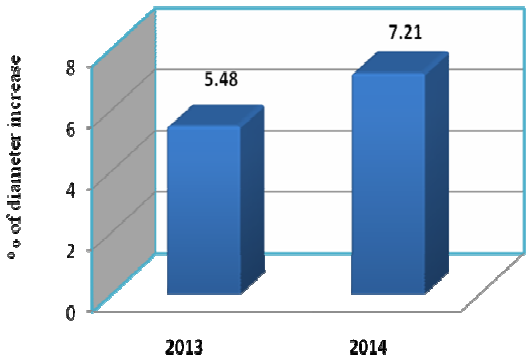


Fig 6. Fruit diameter increase in sweet cherry of VAN variety under conditions of treatment with ASFAC BC 04 in 2013 and 2014

**Results concerning the dynamics of fruit weight, dry matter and sugar content, pulp density and cherry fruit acidity for VAN variety under conditions of treatment with ASFAC BC 04.**

The measurement of fruit weight and density was performed in the laboratory on average samples of 100 fruits collected from both treated and untreated trees (Fig. 7).

Table 1. Biometric determinations of sweet cherry fruit, VAN variety under conditions of treatment with ASFAC BC 04 in 2013-2014 at SC CERAVIS SA BACAU

| Conditions of treatment with ASFAC BC-04 | Fruit height (mm) | | Large diameter (mm) | | Small diameter (mm) | | Shank length (mm) | | Shank weight (g) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| Untreated | 19,10 | 20,27 | 23,34 | 22,87 | 20,12 | 21,70 | 37,09 | 30,80 | 0,056 | - |
| Treated | 19,24 | 19,40 | 24,62 | 24,52 | 21,50 | 21,47 | 35,60 | 34,74 | 0,042 | - |

Fig. 7 Laboratory aspects - biometric determinations of cherry fruit

The weight and size of sweet cherry fruit are essential parameters to the quality that influences directly the yield and, implictly, the profits (freshly consumed or industrialised). Under conditions of treatment with ASFAC BC 04, the increase recorded in fruit weight during the two years of study was of 7.13 g in 2013 and 7.08 g in 2014 (Table 2).

The weight of treated fruit had lower values: 6.35 g in 2013 and 6.22 g in 2014.

Pulp density was determined in 2013 and registered values of 1.04g/cm$^3$ when not being treated and 1.06 g/cm$^3$ with treatment.

Table 2. Cherry fruit weight and density, VAN variety in 2013-2014 at SC CERAVIS SA Bacău

| Conditions of treatment with ASFAC BC-04 | Fruit weight (g) | | Pulp density ( g/cm$^3$) | |
|---|---|---|---|---|
| | 2013 | 2014 | 2013 | 2014 |
| Untreated | 6.35 | 6.22 | 1.04 | - |
| Treated | 7.13 | 7.08 | 1.06 | - |

The content of dry matter and sugar under conditions of treatment with ASFAC BC 04 increased. The dry matter had values of 14.52 % in 2013 and 14.41% in 2014, while the sugar content amounted to 12.40 Brix % in 2013 and 12.42 Brix % in 2014 (Table 3.).

Table 3. Dry matter and sugar content, cherry fruit acidity for VAN variety in 2013-2014 at SC CERAVIS SA Bacău

| Conditions of treatment with ASFAC BC-04 | Dry matter (%) | | Sugar (BRIX% degrees) | | Acidity (g acid citric/100ml juice) | |
|---|---|---|---|---|---|---|
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| Untreated | 13.10 | 13.42 | 11.22 | 11.71 | 3.46 | - |
| Treated | 14.52 | 14.41 | 12.40 | 12.42 | 2.60 | - |

Fruit acidity was determined only 2013 and decreased from 3.46 g citric acid /100ml juice (untreated fruit) to 2.60 g acid citric/100ml juice (treated fruit).

Dry matter under treatment conditions regisred an increase of 10.83 % in 2013 and 7.37 % in 2014 compared with treated fruits (Fig 8 ) .

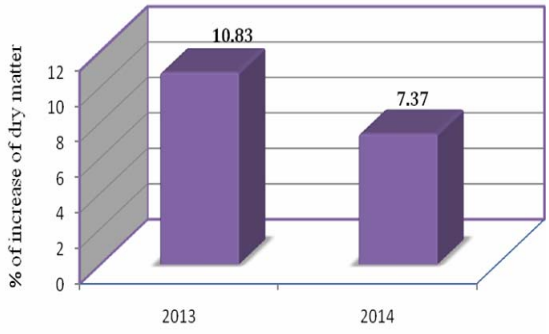


Fig 8. The increase of dry matter content (%) under treatment conditions in 2013-2014 at SC CERAVIS SA Bacau

**The determination of the content of assimilation pigments in VAN variety**

Chlorophyll a in untreated leaves recorded values of 0.883 mg/g while in untreated ones it was 0.903 mg/g.

Chlorophyll b ranged between 0.680mg/g (untreated) and 0.730 mg/g (treated). The content of carotenoidic pigments remained unchanged, its value raising to 0.0002 mg/g (Table 4.)

Table 4. The determination of the content in assimilation pigments for VAN cherry leaves, SC CERAVIS SA Bacau

| Conditions of treatment with ASFAC BC 04 | Chlorophyll a (mg/g) | Chlorophyll b (mg/g) | Pigmenti carotenoidici (mg/g) |
|---|---|---|---|
| Untreated | 0.883 | 0.680 | 0.0002 |
| Treated | 0.903 | 0.730 | 0.0002 |

Under conditions of treatment with ASFAC BC 04 chlorophyll a registers a growth of 2.26%, while in chlorophyll b, it was 7.35% (Fig 9).

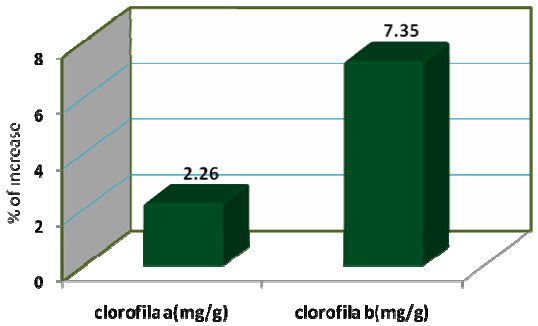


Fig 9. The increase in chlorophyll a and b content under conditions of treatment with ASFAC BC 04

The increase in chlorophyll content contributes to the intensification of the photosynthesis process in trees, which is clearly observable from their general aspect.

**Results concerning indicators of attack caused by *Monilinia frutigena* in VAN sweet cherry fruits in June 2013**

Observations concerning frequency, intensity, degrre of attack with pathogen agent *Monilinia sp* were made according to standard methodology (Table 5).

Table 5. The attack caused by *Monilinia sp.* in sweet cherry fruit under conditions of treatment or no treatment at SC CERAVIS SA

| Variety | Indicators | Untreated | Treated |
|---|---|---|---|
| VAN | Intensity I (%) | 11.2 | 21.2 |
| | Frequency F (%) | 30.2 | 31.3 |
| | Attack degree GA (%) | 3.38 | 6.63 |

Under conditions of treatment with ASFAC BC 04, all indicators under study registered higher values than the ones of treated trees (intensity 21.2%; frecquency 31.3%; degree of attack 6.63%).

The degree of attack/damage was significantly lower in untreated trees with a generally good phytosanitary conditions (Fig 10 ).

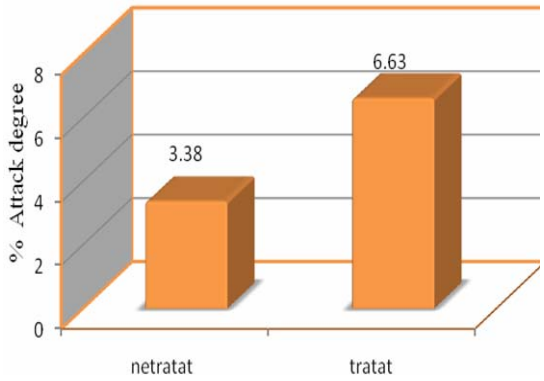


Fig 10 Degree of attack caused by *Monilinia frutigena* in VAN variety, SC CERAVIS SA Bacau

With no treatment, the degree of attack registered the value of 3.38% as compared with 6.63% treated. This requires a close phytosanitary supervision of the plantation (treated with ASFAC), given that the high content of dry matter in treated fruit represents a vulnerability of the pathogen agent (Fig 11).

Fig. 11 VAN sweet cherry fruits, cracked fruit (a) and attacked by *Monilinia frutigena* (b) on the plantation treated with ASFAC

**Results concerning cherry fruit quality, VAN variety**

Distribution depending on fruit qualities. During picking period there registered abundant rains and high temperatures which forced fruit ripening. We observed 480 treated and untreated throughout this period (Fig 12).

Out of the untreated fruits, 341 are uncracked and 139 cracked.

For treated fruits, 322 are uncracked and 158 cracked. The category of large uncracked fruit (D >22 mm) numbered 152 untreated and 153 treated fruit (Table 6).

Fig. 12. Treated and untreated sweet cherry fruit of VAN variety separated by dimension

Excessive humidity causes fruit cracking as cherries are susceptible to damage. This led us to classifying treated and untreated fruit acccording to their size and cracking degree (Fig 13).

Table 6. Sweet cherry fruit distribution (VAN variety), according to size, in June 2013 at SC CERAVIS SA Bacău

| Cherry Van variety | Cracked fruits | | | Uncracked fruits | | |
|---|---|---|---|---|---|---|
| | large (D>22mm) | medium-sized (D=18-22) | small (D<22mm) | large (D>22mm) | middle-sized (D=18-22) | small (D<22mm) |
| **Untreated** | 152 | 126 | 63 | 70 | 56 | 13 |
| **Treated** | 153 | 113 | 56 | 82 | 65 | 11 |

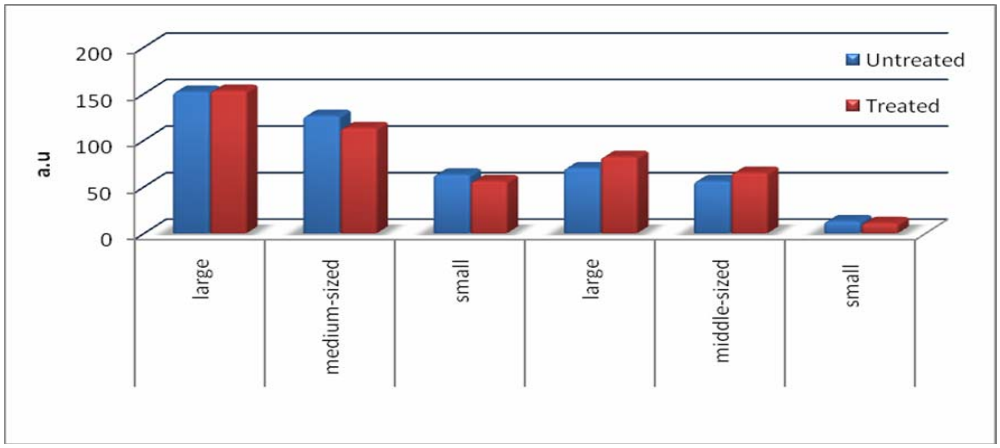


Fig. 13. Sweet cherry fruit (VAN variety) distribution on dimensions, under conditions of treatment with ASFAC-Bc-04 or no treatment in June 2013 at SC CERAVIS SA Bacau

**Quality evaluation of cherry fruit quality VAN variety through organoleptic tasting.**

Evaluations were performed concerning the exterior aspect of the fruit and pulp characteristics. For a better evaluation, the untreated variety of Boambe de Cotnari was also submitted to tasting (fig 13).

The results obtained confirmed that the highest scores were registered by VAN variety under treatment conditions (Table 7).

Table 7. Organoleptic evaluation of Boambe de Cotnari and Van varieties, under conditions of treatment with ASFAC BC 04

| Qualities evaluated | Variety | | |
|---|---|---|---|
| | Boambe de Cotnari –untreated | Untreated VAN | Treated VAN |
| *External aspect of fruit (shape, form, colour)* | 9.25 | 11.75 | 12.75 |
| *Pulp characteristics (colour,k consistency, juiciness, taste, aroma)* | 22.58 | 26.16 | 28.5 |
| **Total points** | **31.83** | **37.91** | **41.25** |

Under treatment conditions (VAN variety), all indicators registered higher values than their untreated counterparts (untreated VAN and Boambe de Cotnari) (Table no 7) .

The exterior aspect of the untreated fruits scored 12.75 points, whereas pulp characteristics and taste obtained 28.5 points puncte, amounting to a total of 41.25 points. By contrast, Boambe de Cotnari variety obtained only 31.83 points.

The tasting of treated and untreated fruits was performed by 5 tasters in the laboratory using standard tasting sheets compliant with methodological norms (Fig 5 a,b,c,d).

**Increase in sweet cherry production using ASFAC BC 04**

The usage of ASFAC BC 04 product contributed to a significant increase in cherry fruit production during the two eyars of study. s (Fig 14 ).

The production increase on the surface tested at la SC CERAVIS SA Bacău was of 12.28% in 2013 and of 13.82% in 2014.

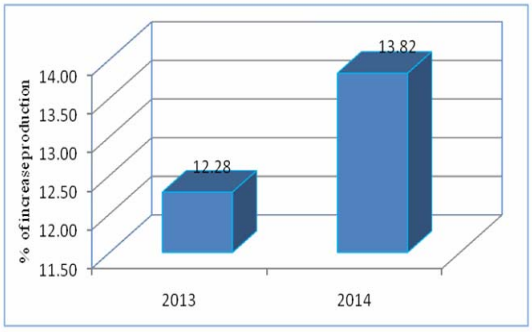


Fig. 14. Production increase in cherry fruits, VAN variety, under conditions of treatment with ASFAC BC 04 at SC CERAVIS SA BACAU (2013-2014)

## CONCLUSIONS

The usage of Asfac BC 04 product visibly influenced all the parameters analysed.

The increased photosynthetic capacity has positively influenced the metabolic activity of the plant, respectively the organoleptic and biochimical characteristics (dry matter and sugar).

During the two years of study, we registered an increase of 13.5% in the average production on the surface tested at SC CERAVIS SA Bacău.

## ABSTRACT

In this paper we have proposed evaluation of the biostimulator ASFAC BC 04 improve product quality of the Van variety sweet cherry fruits. This study was performed into a plantation of SC Ceravis SA located in Itesti village of Bacau County in 2013 and 2014. The biometric and biochemical fruit analyses were conducted in the laboratories of the Biology, Ecology and Environmental Protection Department, "Vasile Alecsandri" University of Bacău, according to specific research methods and all the data obtained indicates a visibly influence af all parameters.

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