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# RESEARCH ON FRUIT QUALITY OF SEVERAL APPLE CULTIVARS FROM DIFFERENT LOCATIONS IN THE AREA OF WESTERN ROMANIA

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***Abstract***

*Known since ancient times, the apple remains one of the most appreciated fruits of temperate climate, contributing to a good functionality of the human body through its complex chemical composition, being recommended in the prophylaxis or control of many diseases, such as: liver, cardiovascular, renal, insomnia, rheumatic diseases et al. In Banat, Șiria area in Arad County, is among the areas with tradition in the cultivation of this fruit species. This paper, part of a larger research conducted in a doctoral thesis, aimed at a comparative study of the fruit quality on apple cultivars found in the private orchards of several families in Șiria area and cultivars purchased from various supermarkets in Arad and Lipova. The paper presents results on the fruits quality in three cosmopolitan cultivars: Starkrimson, Florina and Golden delicious, which could be purchased both from private orchards and from various stores. For example, in terms of the size and appearance of the fruit studied in the Starkrimsom cultivar, it was found that the fruit from three locations had higher values than those from the store; the content in mineral substances (g/100 g product) varied between 0.144 for the fruits in the store and 0.662. respectively 0.900 for the fruits from the same two locations; the sugar content had quite close values between samples, however, one of the private locations was highlighted (15.3°Brix); the total polyphenol content exceeded the value in the supermarket in four of the five locations.*

*The fruit weight of Florina cultivar apples was higher than those from the supermarket, with one exception. The content in minerals and sugars exceeded in two locations the fruits from the store; while the polyphenols exceeded in all five private orchards the value of the fruits purchased from the store (1491.7 ppm compared to 650.9 ppm). In the Golden delicious cultivar, the appearance and fruit weight were superior in the case of those in the supermarket, but the content in mineral substances and in the sugars was higher for the local fruits than for those in the store. The polyphenols accumulated in the fruit exceeded in three of the five locations the value of those from the fruits purchased in the store.*

***Key words****: Malus domestica*, organic system, supermarket, biometry, chemical composition.

## INTRODUCTION

The global apple production in 2017 was 83.1 mil. t, China producing 50% of the total. Europe, including Turkey produced approx. 17% of the total. Therefore, the apple production is divided as follows: China 41.4 mil. t, USA 5.2 mil. t, Turkey 3.0 mil. t, Poland 2.4 mil. t, India 2.3 mil. t, Iran 2.1 mil. t, Italy 1.9 mil. t (FAOSTAT, 2017).

The apples, are most frequently consumed as fresh fruits, being well known as a source of carbohydrates, vitamins, minerals, fibres, pectines and certain classes of polyphenols, all of these contributing to the health improvement (Boyer and Liu, 2004).

Phytochemical concentrations vary greatly between different cultivars. The level of some chemical compounds varies during maturation of the fruits in response to available light, stage of fruit development and to some types of fertilization (Boyer and Liu, 2004; Iordănescu, 2012).

The fruits content in chemical compounds, respectively the nutritional value, depends on genotype, tissue structure, fruit maturation, pedoclimatic conditions and the culture technology used but also on harvesting and storing conditions (De Jager A., de Putter H., 1999; Drogoudi, 2011; Stănică, 2008; Stopar et al., 2002).

R. Veberic and F. Stampar (2005) considered that the fruits of organically grown apples, which are exposed to higher stress due to pests and diseases, have higher contents of phenolic compounds as well as different composition of sugars and organic acids compared to the apples of integrated production. The content of

phenolic compound is highly dependent on the apple cultivar and various cultivation technologies (Mikulic-Petkovsek M., Slatnar A., Stampar F. & Veberic, 2010).
Apples cultivars are often organically cultivated and contain high levels of nutrients and phenolic compounds. Antioxidant activity of apples differs between cultivars, and was positively associated with the level of total phenolic content (Mikulic-Petkovsek, Slatnar, Stampar & Veberic, 2010; Mikulic-Petkovsek, Stampar & Veberic, 2007).
The consumption of fresh fruits or juice, food pastes, jellies, jams assure the vitamins for a better life. Câmpeanu et al. (2009) considered that apples are a part in all food diets and its therapeutic value is well known for different illnesses (determines the absorption of gastric secretions, the elimination of toxins, has diuretic effect, etc.).

## MATERIALS AND METHODS

The biologic material studied represents three applecultivars: Starkrimson, Florina and Golden delicious, which can be found in both rural orchards (in this case, Șiria village, Arad county) and on the supermarket shelves (city of Arad).
The apple samples were harvested from the orchards of five families from Șiria (15 fruits/cultivar/orchard); the same cultivars were bought from the supermarkets in Arad (average samples of 15 fruits/cultivar).
It has to be mentioned that, in the private orchards in Șiria the simplest culture technology was used, people opting for fruits obtained in an organic system. From discussions with the owners, we found out that the only interventions on the trees were pruning and winter treatments, most of which were done with $CuSO_4$. The soil maintenance system is total grass covered, with mowing and optional use of mulch as natural fertilizer.
It is clear that, the fruits from the supermarket are obtained by using a differential culture technology which implies, apart from pruning, the usage of pest and disease repelling treatments and fertilization with different products.
From all cultivars samples for analysis (dry substance, ash, sugars, polyphenols, pH, acidity), were collected, weightings, measurements and photographies were made, in order to compare the apples from the rural areas, obtained organically, with the ones from the supermarkets, obtained by conventional cropping.
The fruit biometry implied the measuring of the big diameter and the height and then weighing with the precision scales. The biometric data served for calculating the fruit size index and registering the size categories. Determination of moisture content (SR 878/1996) was based on the principle of mass loss from the product subjected to the heating operation at $130 \pm 2^{\circ}C$.
The determination of the content of mineral substances (SR 878/1996) consisted in the incineration of the product at a temperature of $900 \pm 25^{\circ}C$ in the calcination furnace with air circulation, until the organic substances are completely burned.
Soluble dry matter was determined refractometrically, the results obtained being indicated on the Brix scale.
The fruit acidity was found by determining the pH using the pH meter 315i / SET.
The determination of the total polyphenols content with an UV-VIZ spectrophotometerwas performed by the Folin-Ciocâlteu method.
For some parameters, the results were statistically processed using the analysis of variance and for other indicators, the results were presented graphically.

## RESULTS AND DISCUSSIONS

### Biometriy of apple fruits of different origins

Concerning the fruit big diameter in Starkrimson cultivar (Table 1) it was found that, there are no major differences between the fruits purchased from different locations. However, the Șiria 5 location stands out, where the value of the diameter is significantly positive compared to the average, but also the Șiria 4 location, where the value although above average was not statistically assured. The fruit height (Table 2) exceeded the average value and the fruits in the supermarket in 3 locations (Șiria 5, Șiria 4 and Șiria 3). In the first case, the difference was significantly positive compared to the average, while in the other two cases, there were no differences.

Table 1. The fruit big diameter in Starkrimson cultivar from different locations

| Provenance | The big diameter of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 6.76 | 95.08 | -0.35 | - |
| Siria2 | 6.96 | 97.89 | -0.15 | - |
| Siria3 | 6.70 | 94.23 | -0.41 | - |
| Siria4 | 7.50 | 105.49 | 0.39 | - |
| Siria5 | 7.96 | 111.95 | 0.85 | X |
| Supermarket | 6.80 | 95.64 | -0.31 | - |
| Experiment average | 7.11 | 100.00 | 0.00 | control |
| DL5% = 0.8 cm DL1% = 1.08 cm DL0.1% = 1.44 cm | | | | |

Table 2. The fruit height in Starkrimson cultivar from different locations

| Provenance | The height of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 5.90 | 90.96 | -0.59 | - |
| Siria2 | 6.13 | 94.50 | -0.36 | - |
| Siria3 | 6.63 | 102.21 | 0.14 | - |
| Siria4 | 6.70 | 103.29 | 0.21 | - |
| Siria5 | 7.33 | 113.00 | 0.84 | X |
| Supermarket | 6.26 | 96.51 | -0.23 | - |
| Experiment average | 6.49 | 100.00 | 0.00 | control |
| DL5% = 0.75 cm DL1% = 1.01 cm DL0.1% = 1.34 cm | | | | |

The biometric data (Tables 3-4) taken in the case of the Florina cultivar showed less variations in the three measured indicators, statistically there were no differences between apples with different origins.

Table 3. The fruit big diameter in Florina cultivar from different locations

| Provenance | The height of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 6.31 | 99.68 | -0.02 | - |
| Siria2 | 5.87 | 92.73 | -0.46 | - |
| Siria3 | 6.63 | 104.74 | 0.30 | - |
| Siria4 | 6.30 | 99.53 | -0.03 | - |
| Siria5 | 6.36 | 100.47 | 0.03 | - |
| Supermarket | 6.56 | 103.63 | 0.23 | - |
| Experiment average | 6.33 | 100.00 | 0.00 | control |
| DL5% = 0.82 cm DL1% = 1.11 cm DL0.1% = 1.48 cm | | | | |

Table 4. The fruit height in Florina cultivar from different locations

| Provenance | The height of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 6.31 | 99.68 | -0.02 | - |
| Siria2 | 5.87 | 92.73 | -0.46 | - |
| Siria3 | 6.63 | 104.74 | 0.30 | - |
| Siria4 | 6.30 | 99.53 | -0.03 | - |
| Siria5 | 6.36 | 100.47 | 0.03 | - |
| Supermarket | 6.56 | 103.63 | 0.23 | - |
| Experiment average | 6.33 | 100.00 | 0.00 | control |
| DL5% = 0.82 cm DL1% = 1.11 cm DL0.1% = 1.48 cm | | | | |

In the case of Golden delicious cultivar (Tables 5-6), the only fruits that exceeded the value of those in the supermarket were those from Șiria 4 location. Moreover, some had values below average (exp. those from Șiria 5 location) that allowed statistical assurance of results, being very significantly negative for both indicators.

Table 5. The fruit big diameter in Golden delicious cultivar from different locations

| Provenance | The big diameter of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 6.66 | 102.94 | 0.19 | - |
| Siria2 | 6.56 | 101.39 | 0.09 | - |
| Siria3 | 5.76 | 89.03 | -0.71 | - |
| Siria4 | 7.40 | 114.37 | 0.93 | X |
| Siria5 | 5.13 | 79.29 | -1.34 | 000 |
| Supermarket | 7.33 | 113.29 | 0.86 | X |
| Experiment average | 6.47 | 100.00 | 0.00 | control |
| DL5% = 0.73 cm DL1% = 0.99 cm DL0.1% = 1.32 cm | | | | |

Table 6. The fruit height in Golden delicious cultivar from different location

| Provenance | The height of fruit (cm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 5.86 | 102.99 | 0.17 | - |
| Siria2 | 5.86 | 102.99 | 0.17 | - |
| Siria3 | 5.16 | 90.69 | -0.53 | - |
| Siria4 | 6.40 | 112.48 | 0.71 | - |
| Siria5 | 4.26 | 74.87 | -1.43 | 000 |
| Supermarket | 6.63 | 116.52 | 0.94 | - |
| Experiment average | 5.69 | 100.00 | 0.00 | control |
| DL5% = 0.74 cm DL1% = 1.00 cm DL0.1% = 1.33 cm | | | | |

Concerning fruit size (Figures 1-3), reporting was made in accordance with the data from the specialized literature (Cosmulescu and Baciu, 2003; Mitre, 2005). In the Starkrimson cultivar, the fruits can be included in the group of large ones in the case of Șiria 4 and 5 locations and in the group of medium ones in the case of those from the rest of the locations.

For the Florina cultivar, the fruits from the location of Șiria 3 can be considered large,the ones from the locations of Șiria 1, Șiria 4, Șiria 5 and the supermarket were above medium size and the ones from the location Șiria 2 of medium size.

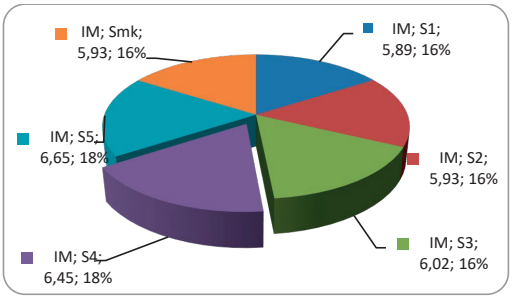


Figure 1. Fruits index size in Starkrimson cultivar

For the Golden delicious cultivar, the fruits above the average in size are those from the location of Șiria 4 and the supermarket, medium-sized fruits are those from the location of Șiria 1 and Șiria 2 and smaller are those from locations 3 and 5.

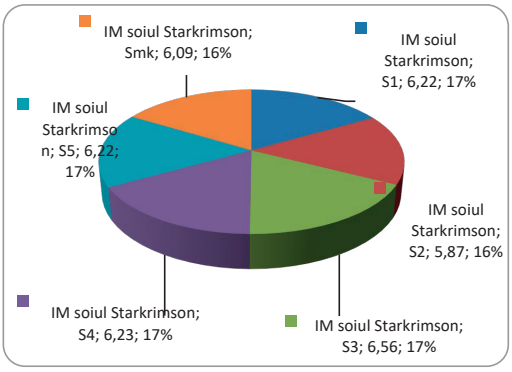


Figure 2. Fruit index size in Florina cultivar

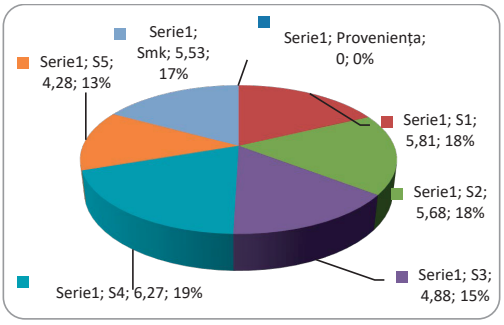


Figure 3. Fruit index size of in Golden delicious cultivar

Table 7. Fruit weight in Starkrimson cultivar from different locations

| Provenance | Fruit weight (g) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 141.00 | 85.83 | -23.29 | 000 |
| Siria2 | 140.30 | 85.40 | -23.99 | 000 |
| Siria3 | 137.30 | 83.57 | -26.99 | 000 |
| Siria4 | 191.30 | 116.44 | 27.01 | XXX |
| Siria5 | 224.60 | 136.71 | 60.31 | XXX |
| Supermarket | 151.30 | 92.10 | -12.99 | 000 |
| Experiment average | 164.29 | 100.00 | 0.00 | control |
| DL5% = 5.42 g DL1% = 7.32 g DL0.1% = 9.75 g | | | | |

The weight of the fruit in the Starkrimson cultivar was between 137.30 g for apples from the Șiria 3 location and 224.60 g for those from the Șiria 5 location.

The fruits from the Șiria 5 and 4 locations exceeded the average value, which were very significantly positive compared to the control and had values below the rest of the fruits, in all cases the difference compared to the controls being very significant negative. As a result, apples from the two locations (S5 and S4) bore very large fruits, the data agreeing with those in the literature (Zakia et al., 2018).

The weight of the fruit in the Florina cultivar was higher in apples from the supermarket, with one exception (Șiria 5).

Table 8. Fruit weight in Florina cultivar from different locations

| Provenance | Fruit weight (g) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 168.57 | 105.95 | 9.47 | XXX |
| Siria2 | 141.00 | 88.63 | -18.10 | 000 |
| Siria3 | 147.70 | 92.84 | -11.40 | 000 |
| Siria4 | 145.00 | 91.14 | -14.10 | 000 |
| Siria5 | 179.00 | 112.51 | 19.90 | XXX |
| Supermarket | 173.33 | 108.95 | 14.23 | XXX |
| Experiment average | 159.10 | 100.00 | 0.00 | control |
| DL5% = 5.17 g DL1% = 6.99 g DL0.1% = 9.31 g | | | | |

Table 9. Fruit weight in Golden delicious cultivar from different locations

| Provenance | Fruit weight (g) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 130.00 | 102.87 | 3.63 | - |
| Siria2 | 138.00 | 109.20 | 11.63 | XX |
| Siria3 | 95.30 | 75.41 | -31.07 | 000 |
| Siria4 | 161.60 | 127.88 | 35.23 | XXX |
| Siria5 | 61.66 | 48.79 | -64.71 | 000 |
| Supermarket | 171.66 | 135.84 | 45.29 | XXX |
| Experiment average | 126.37 | 100.00 | 0.00 | control |
| DL5% = 6.76 g DL1% = 9.14 g DL0.1% = 12.18 g | | | | |

In the Golden delicious cultivar, the appearance and mass of the fruit were superior to those in the supermarket (171.66 g), however, the fruits from the locations of Șiria 4 and Șiria 2 were quite large, being very significantly positive and distinctly significantly positive compared tothe control.

***The chemical composition of apples in cultivars of different origins***

In Starkrimson cultivar, the humidity of the fruits varied between 81.04%, respectively 85.09% in the case of the fruits from Șiria 4 and 5 locations, both being very significant negative, going up to 85.87%, respectively 85.51% in the fruits from Șiria 1 and 2 locations, both being very significant positive compared to the control.

The apples mineral content varied between 0.144 ppm for fruits from the supermarket (very significant negative) and 0.900 ppm for fruits from the of Șiria 4 location (very significant positive).

A high content of mineral substances was also noticed in the apples from the Șiria 5 location, which were very positive compared to the control, while a lower content of mineral substances was noticed in the apples from the Șiria 2 location - very significant negative.

Table 10. Fruit moisture content in Starkrimson cultivar from different locations

| Provenance | The moisture content (%) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 85.87 | 103.24 | 2.69 | XXX |
| Siria2 | 82.19 | 98.81 | -0.99 | 0 |
| Siria3 | 85.51 | 102.81 | 2.33 | XXX |
| Siria4 | 81.04 | 97.43 | -2.14 | 000 |
| Siria5 | 81.09 | 97.49 | -2.09 | 000 |
| Supermarket | 82.57 | 99.27 | -0.61 | - |
| Experiment average | 83.18 | 100.00 | 0.00 | control |
| DL5% = 0.84% DL1% = 1.13% DL0.1% = 1.51% | | | | |

Table 11. Fruit mineral content in Starkrimson cultivar from different locations

| Provenance | Mineral content (ppm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 0.321 | 76.73 | -0.10 | 00 |
| Siria2 | 0.159 | 38.01 | -0.26 | 000 |
| Siria3 | 0.326 | 77.93 | -0.09 | 0 |
| Siria4 | 0.900 | 215.14 | 0.48 | XXX |
| Siria5 | 0.662 | 158.25 | 0.24 | XXX |
| Supermarket | 0.144 | 34.42 | -0.27 | 000 |
| Experiment average | 0.420 | 100.00 | 0.00 | control |
| DL5% = 0.08ppm DL1% = 0.10 ppm DL0.1% = 0.14ppm | | | | |

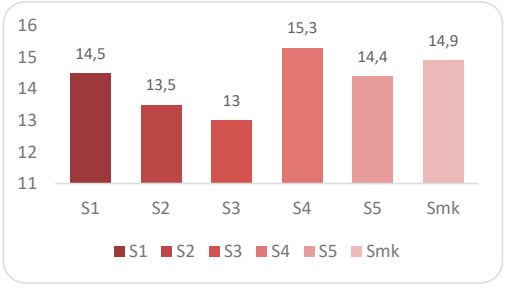


Figure 4. Total soluble solid content (°Brix) of Starkrimson fruits

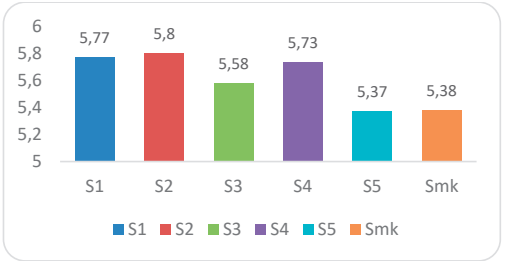


Figure 5. Fruits acidity (pH) in Starkrimson cultivar

The lowest sugar content of Starkrimson cultivar was recorded in fruits from the location of Șiria 3 (13.0°Brix) and the highest in those from Șiria 4 location (15.3°Brix). The apples from the supermarket also had a fairly high content, occupying the second position in terms of the sugar content of the fruit (14.9°Brix). The results obtained agree with those cited in the literature (Zakia, 2019).

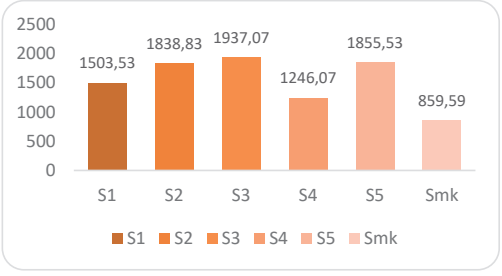


Figure 6. Fruits total polifenols content (ppm) in Starkrimson cultivar

The content in total polyphenols exceeded in all five locations the value of those in the supermarket and exceeds many of the values quoted by the literature (Otakar Rop et al., 2011). Khanizadeh *et al.*2007 considers that fruits antioxidant composition of varies among cultivars and genetics plays a significant role.

Table 12. Fruit moisture content in Florina cultivar from different locations

| Provenance | The moisture content(%) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 87.80 | 101.96 | 1.69 | XX |
| Siria2 | 91.12 | 105.82 | 5.01 | XXX |
| Siria3 | 87.25 | 101.32 | 1.14 | X |
| Siria4 | 85.42 | 99.20 | -0.69 | - |
| Siria5 | 82.43 | 95.73 | -3.68 | 000 |
| Supermarket | 82.67 | 96.01 | -3.44 | 000 |
| Experiment average | 86.11 | 100.00 | 0.00 | control |
| DL5% = 1.10%DL1% = 1.49%DL0.1% = 1.98% | | | | |

The fruits moisture content in Florina cultivar varied between 82.43% for those from the Șiria 5 location, respectively for those purchased from the supermarket (82.67%), both being very significantly negative compared to the average and 91.12% for those from the Șiria 2 location, which is very significantly positive compared to the control.

The fruits mineral content of Florina cultivar varied between 0.160 ppm for those from Șiria 2 location and 0.327 ppm for those from Șiria 1 location. The fruits from two family plantations and the supermarket had a high content of mineral substances being distinctly significantly positive and respectively significantly positive, from the other three locations. The content of mineral substances was below the value of the control, being distinctly significantly negative.

Table 13. Fruit mineral content in Florina cultivar from different locations

| Provenance | Mineral content (ppm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 0.323 | 135.71 | 0.09 | XX |
| Siria2 | 0.160 | 67.23 | -0.08 | 00 |
| Siria3 | 0.163 | 68.49 | -0.08 | 00 |
| Siria4 | 0.161 | 67.65 | -0.08 | 00 |
| Siria5 | 0.317 | 133.19 | 0.08 | XX |
| Supermarket | 0.306 | 128.57 | 0.07 | X |
| Experiment average | 0.238 | 100.00 | 0.00 | control |
| DL5% = 0.06ppm DL1% = 0.08ppm DL0.1% = 0.11ppm | | | | |

The fruits mineral content of Florina cultivar varied between 0.160 ppm for those from the Șiria 2 location and 0.327 ppm for those from the Șiria 1.

The fruits from two family plantations and the supermarket had a high content of mineral substances being distinctly significantly positive and respectively significantly positive, from the other three locations. The content of mineral substances was below the value of the control, being distinct significantly negative.

In the fruits of Florina cultivar, the content in mineral substances and sugars exceeded in two locations, the fruits coming from the store; while the polyphenols exceeded in all 5 private orchards the value of the fruits purchased from the store (eg. 1491.7 ppm to 650.9 ppm). The data obtained is in accordance with those in literature (Persic, 2017; Ticha, 2014; Iordănescu, 2012)

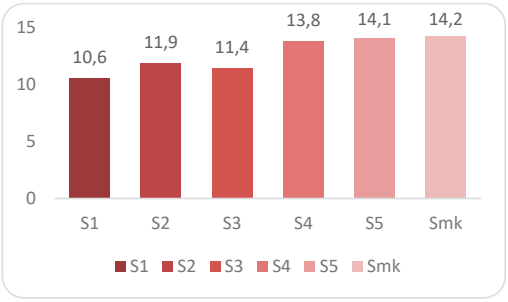


Figure 7. Total soluble solid content (ºBrix) of Florina fruits

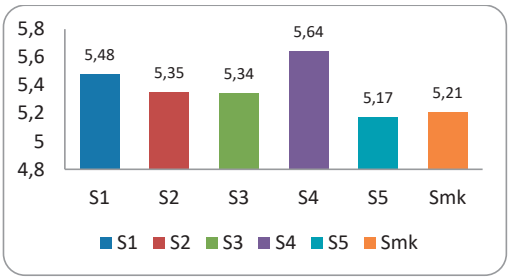


Figure 8. Fruits acidity (pH) in Florina cultivar

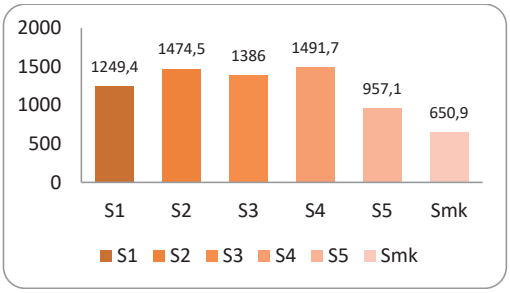


Figure 9. Total polifenols content (ppm) of fruits in Florina cultivar

The total polyphenol content exceeded the value of those in the supermarket, in all five locations. Compared to the data from the literature, they are above the quoted values, for example Otakar Rop et al. (2011) and Khanizadeh et al. (2007) considered that the phytochemical content of the fruits not only increases their quality, but it also, has a major impact on shelf life and susceptibility to diseases.

The moisture content of Golden delicious cultivar had quite close values in the experience, except for the fruits from the supermarket - very significantly negative and at the opposite pole, those from the Șiria 3 location - distinctly significantly positive. In all cases, the values obtained exceed to some extent those in the literature (Câmpeanu G. et al., 2009).

The highest content of mineral substances in *Golden delicious* fruits was recorded in the samples from Șiria 1 location and supermarket, both being distinctly significantly positive. The lowest mineral content was recorded from Șiria 3 fruits and 5, in both cases, the difference from the control being distinctly significantly negative.

Table 14. Fruit moisture content in Golden delicious cultivar from different locations

| Provenance | The moisture content (%) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 85.54 | 101.10 | 0.93 | - |
| Siria2 | 83.40 | 98.57 | -1.21 | 0 |
| Siria3 | 86.42 | 102.14 | 1.81 | XX |
| Siria4 | 85.05 | 100.52 | 0.44 | - |
| Siria5 | 84.79 | 100.21 | 0.18 | - |
| Supermarket | 82.51 | 97.51 | -2.10 | 000 |
| Experiment average | 84.61 | 100.00 | 0.00 | control |
| DL5% = 1.15% DL1% = 1.55%DL0.1% = 2.07% | | | | |

Table 15. Fruit mineral content in Golden delicious cultivar from different locations

| Provenance | Mineral content (ppm) | Relative value (%) | Difference towards the control value | Significance |
|---|---|---|---|---|
| Siria 1 | 0.324 | 133.06 | 0.08 | XX |
| Siria2 | 0.322 | 130.58 | 0.07 | X |
| Siria3 | 0.162 | 66.12 | -0.08 | 00 |
| Siria4 | 0.172 | 70.66 | -0.07 | 0 |
| Siria5 | 0.164 | 67.49 | -0.08 | 00 |
| Supermarket | 0.324 | 132.78 | 0.08 | XX |
| Experiment average | 0.240 | 100.00 | 0.00 | control |
| DL5% = 0.06ppm DL1% = 0.08ppm DL0.1% = 0.11ppm | | | | |

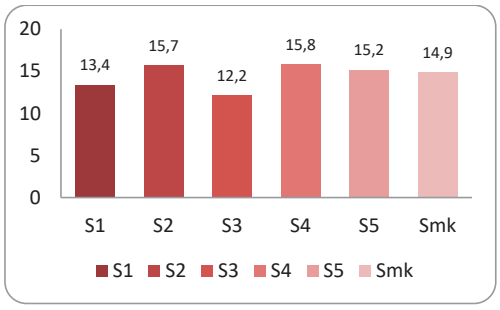


Figure 10. Total soluble solid content (°Brix) of Golden delicious fruits

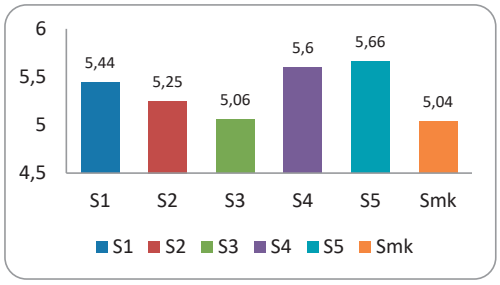


Figure 11. Fruits acidity (pH) in Golden delicious cultivar

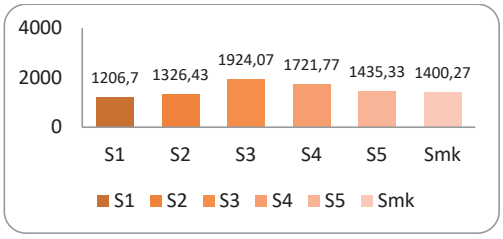


Figure 12. Total polifenols content (ppm) of Golden delicious fruits

The sugar content in the fruits of the *Golden delicious* cultivar exceeded the value of 15.0 °Brix in those coming from the locations of Șiria 4, 2 but also from the supermarket, the lowest content being registered in the fruits coming from the location Șiria 12.2 °Brix.

It should be noted that the fruits of the *Golden delicious* cultivar have accumulated high amounts of sugars in the locations Șiria 4, 2 and 5, values that exceed the data cited in the literature (Campeanu, 2009; Pleić, 2015; Persic, 2017; Asif, 2004)), in the other cases the results agreeing with other authors (Ticha, 2014; Šic Žlabur J. et al., 2013).

The acidity of the fruits had quite close values, the lower limits being registered in the fruits coming from the supermarket and from the location of Șiria 3, while the highest values were registered in Șiria 5 and Șiria 4 locations. Overall, the fruits acidity recorded higher values compared to those cited in the literature (Šic Žlabur J. et al., 2013).

Apples content in total polyphenols had the highest value from the Șiria 3 location (1924.07 ppm), followed by those from the Șiria 4 and 5 locations (1721.77 ppm, respectively 1435.33 ppm), all the others having lower values.

Compared to the data in the literature, the concentration in polyphenols was higher (Boyer, 2004, Chang Y., 2012, Pleić, 2015), fruits from private orchards accumulating larger quantities, thus having a stronger antioxidant action.

## CONCLUSIONS

The study aimed the comparison of some physical and chemical features of three apple cultivars of different origin, starting from the fact that the fruits coming from the commercial orchards in which a proper crop technology is applied, have superior qualities in comparison to those coming from private orchards, which tend to produce fruits in an organic system, with minimal technological interventions.

Surprisingly, in some cases the aspect of the organicaly produced fruits was close to those bought from the supermarket. Therefore, Starkrimson and Florina fruits produced in Șiria 5, 4 and 3, overpassed in size the ones from the supermarket. In the case of Golden delicious cultivar, the values were closer, although the fruits from the Șiria 4, 1 and 2 locations overpassed the ones from the supermarket.

Regarding the chemical composition of Starkrimson cultivar, the ones form Șiria 4 accumulated the largest sugars and minerals content. The polyphenols content was higher in all the cultivars from the private orchards. In case of Florina apples, the minerals content was high in Șiria 1 and 3 locations, but the sugars content was below the supermarket samples. Golden delicious cultivar in Șiria 1 had the same minerals content as the supermarket apples, in the other cases, being somehow lower, but the sugars content exceeded the

supermarket apples in three out of five locations. The total polyphenol composition had closer values, with the apples from S 3, S 4 and S 5 standing out.

All in all, the Șiria area proved that it has a pedoclimatic potential that allows, even in organic system, the production of high-quality apples that can compete with the fruits coming from the supermarket and produced in a conventional cropping system.

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