Volume 23(1), 11- 13, 2019
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

Quality comparative study between apples and apples juices

Alda S.[1], Bordean Despina Maria[1]*, Moigradean Diana[1], David I.[1], Danci M.[1], Popa Adriana[1], Alda Liana Maria[1]

[1]Banat University of Agricultural Sciences and Veterinary Medicine "King Mihai I of Romania", 300645 Timisoara 119, Calea Aradului, Romania;

*Corresponding author. Email: despina.bordean@gmail.com

Abstract This study aim to realize a comparative assessment of heavy metal content and total antioxidant capacity of apple and apples juice. The minerals: Fe, Mn, Zn, Cu, were determined by FAAS (flame atomic absorption spectrometry) and total antioxidant capacity by CUPRAC method. The results show that for both apple varieties (Golden Delicious and Idared), the juices registered higher values of minerals content and total antioxidant capacity than the fruits. Due to its high Fe and Cu content, as well as its significant total antioxidant capacity, we can conclude that apple juice is a significant source of bio minerals and antioxidants, and can be considered as a functional food.

Key words

antioxidants, heavy metals, CUPRAC method, FAAS

The literature abounds of informations regarding apple consumption benefits [4,7,8]. Apple juice is diuretic, muscle tonic, refreshing, intestinal antiseptic, laxative, blood depurative, antirheumatic and contains sucrose, cellulose, pectin, mineral salts and vitamins like B1, PP, A, C [9].

The essential nutrients the body needs but can not produce include inorganic substances found in foods, known as minerals. Fe, Cu, Zn and Mg are considered basic bioelements, being involved in important body functions [7].The daily requirement for iron is 15 mg for adult women and men. Pregnant women have a higher need for iron that can reach up to 30 mg during the last part of pregnancy. The body absorbs only 8% of the amount of iron ingested. Its transport and storage is dependent on specific proteins synthesized by the liver. Its absorption is favored by calcium, cobalt and vitamins B_{12}, B_9 and C[10]. Copper plays an important role in the production of enzymes that protect the body against certain toxic substances (free radicals, cadmium). The daily recommended dose of copper is 1.5-3 mg [11].

Researches made by Gerhauser C., 2008, revealed that regular consumption of one apple a day may reduce the risk for colon and lung and cancer [6].

The CUPRAC method is widely applied to analyze the antioxidant capacity for flavonoids, phenolic acids, hydroxycinnamic acids, thiols, synthetic antioxidants and vitamin C and E [1]. The principle of the CUPRAC method is similar to that of the FRAP method, only that ferric ion is replaced by cupric ion, and the ligand forming the copper-colored complex is neocuproin, which is used as an oxidizing agent [2]. This method is more advantageous than other electron transfer tests because the pH of this test is physiological pH [3]. The CUPRAC method applies to both hydrophilic and lipophilic antioxidants and exhibits selective action on antioxidant compounds without affecting sugars and citric acid normally present in food. The method has the advantage of a linearity over a wider range of concentrations, as well as the fact that it can also determine the antioxidant action of substances containing the sulfidyl group (-SH) - for example the proteins [2]. As reference substance, Trolox, which is both liposoluble and hydrosoluble, is an antioxidant that mimics the vitamin E structure [1].

Material and Methods

Total antioxidant capacity and biominerals content are used to highlight the health benefits of apple and apple juice.

Two apple varieties were taken from local market in our study: Golden Delicious and Idared. After washing, the apples were minced, squeezed and the juice was filtered. For each sample we determined the minerals (Fe, Mn, Zn, Cu) content using flame atomic absorption spectrometry.

The minerals determination was based on the method described by Gogoasa, 2015 [7]. For total antioxidant capacity, we followed the protocol described by Dumbrava, 2016 [5]. The mineral content of the samples was expressed in mg /100 g dry weight, while total antioxidant capacity (TAC) in mM Trolox /g dry substance.

Results and Discussions

The results regarding total antioxidant capacity of apples and apples juices are presented in figure 1. We observe that both apple juices registered high values of TAC, but Golden Delicious is superior to Idared apple varietie regarding this quality parameter.

From Figure 2, we note that, as regards the copper content of the analyzed samples, it recorded the following ascending trend: Golden Delicious apple < Idared apple < Golden Delicious apple juice < Idared apple juice.

Regarding zinc level, Golden Delicious apple juice registered the highest value, 0.9 mg/100 g dry weight, followed by Idared apple juice with 0.75 mg / 100 g dry weight.

The manganese content of the analyzed samples is relatively low in all analyzed samples.

Apple juices recorded very high Fe content (over 9 mg Fe / 100 g dry weight), values which are in line with the literature [7].

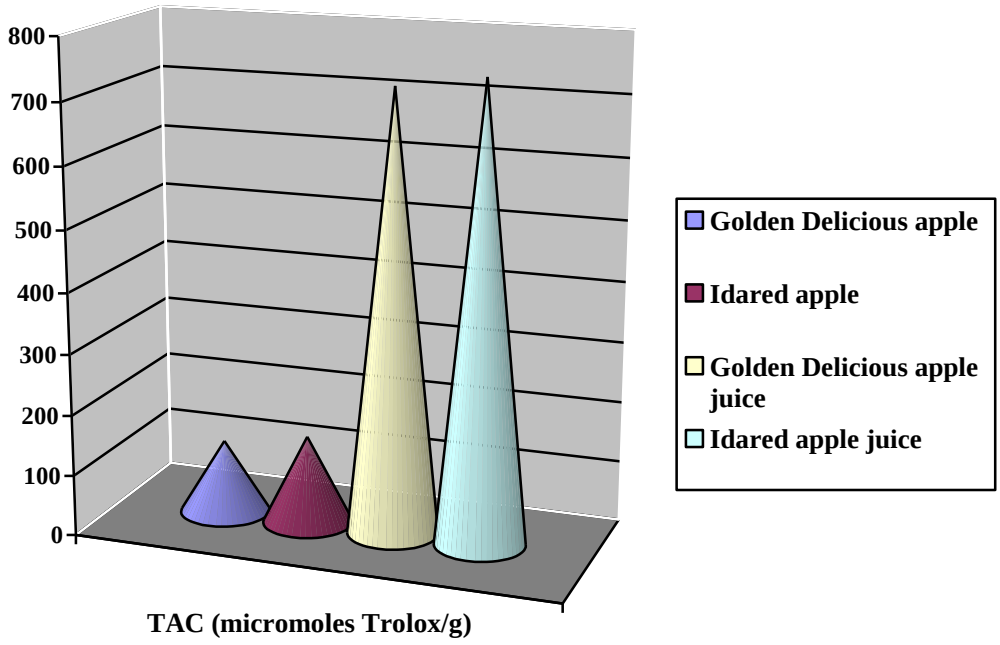

Fig. 1. Total antioxidant capacity (TAC) of apples and apples juices

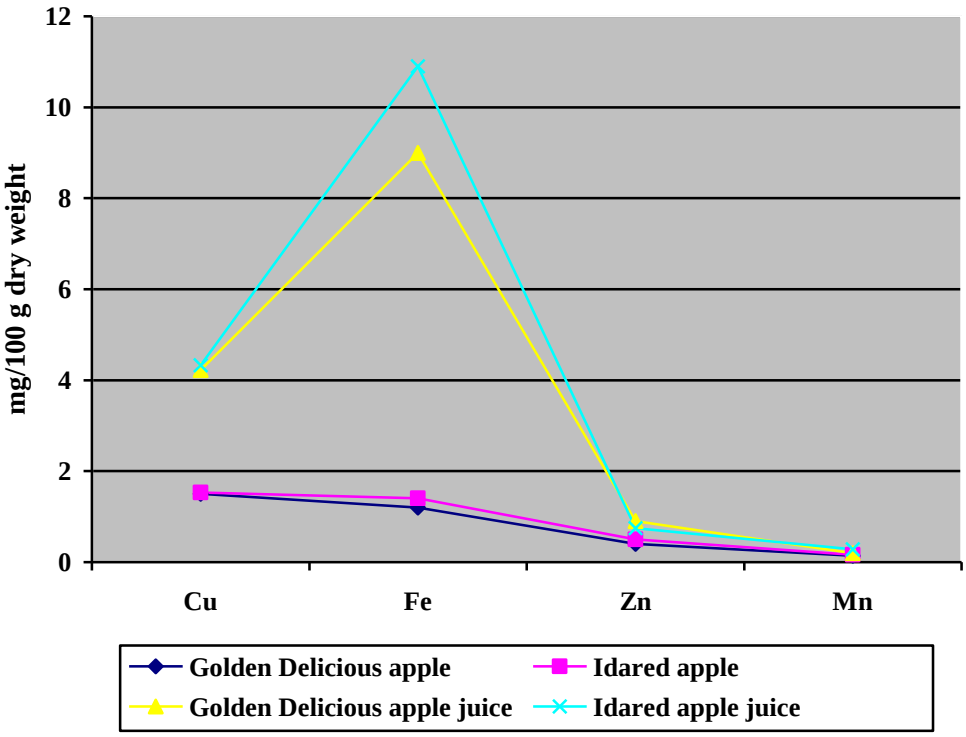

Fig. 2. Essential microelements content (Fe, Cu, Zn and Mn) of apples and apples juices

Conclusions

The results obtained justify us to formulate the following conclusions:
-both apple juices registered high values of total antioxidant capacity;
-Golden Delicious apple varietie is superior to Idared apple varietie regarding total antioxidant capacity;
-apple juices recorded very high Fe content (over 9 mg Fe/100 g dry weight),
-apple juice, regardless of the variety, is a significant source of bio minerals and antioxidants, and can be considered as a functional food.

References

1.Apak R. et al, 2013- Methods of measurement and evaluation of natural antioxidant capacity/activity (IUPAC Technical Report) Pure Appl Chem 2013; 85: 957-998;
2.Apak R, Güçlü K, Demirata B, Ozyürek M, Celik SE, Bektaşoğlu B, Berker KI, Ozyurt D, 2007- Comparative evaluation of various total antioxidant capacity assays applied to phenolic compounds with the CUPRAC assay Molecules, 12:1496-547;
3.Beckman JS, Chen J, Ischiropoulos H, Crow JP., 1994- Oxidative chemistry of peroxynitrite. Methods of Enzymology. 233:229-40;
4. Dumbravă Delia, Moldovan Camelia, Raba Diana, Popa Mirela, 2012 - Comparative analysis of vitamin C content and antioxidant activity of some fruits extracts. Journal of agroalimentary Processes and Technologies, 18(3), 223-8;
5. Dumbravă Delia-Gabriela, Camelia Moldovan, Diana-Nicoleta Raba, V. M. Popa and Mărioara Drugă, 2016- Evaluation of antioxidant activity, polyphenols and vitamin C content of some exotic fruits, Journal of agroalimentary Processes and Technologies 22, no. 1, 13-16. ;
6. Gerhauser C., 2008 - Cancer chemopreventive potential of apples, apple juice, and apple components, Planta medica,74(13), 1608-1624;
7.Gogoasa I., Rada Maria, Negrea P., Negrea Adina, Alda Liana Maria, Bordean Despina,Velciov Ariana Bianca, Moigradean Diana, Gergen I., 2015- Apples: An important source of essential microelements. Journal of Agroalimentary Processes and Technologies, 21(3), 227-230;
8.Pirvulescu Luminita, 2015- Apples total antioxidant capacity, water and mineral content, Journal of Horticulture, Forestry and Biotechnology 19, no. 4, 13-16;
9.http://www.ziare.com/viata-anatoasa/sanatate/marul-adevarat-depozit-de-vitamine-si-minerale-1130863;
10. https://www.pro-sanatate.com/importanta-fierului-pentru-organism;
11.http://www.topsanatate.ro/articol/cuprul-19488.html