THE ANTIOXIDANT CAPACITY OF VEGETABLES AND FRUITS

Cristina MIHALACHE-ARION[1]

1 University of Agricultural Sciences and Veterinary Medicine
e-mail: cristina_mihalache82@yahoo.com,

A diet rich in fruits and vegetables is a basic recommendation of specialists for a healthy nutrition.

Fruits and vegetables are excellent sources of antioxidants, vitamins and minerals, essential nutrients that stimulate the body's health and can help to offset certain diseases, be more energic and healthier.

Antioxidants are natural compounds that we find in fruits and vegetables and have shown an important role in stimulating and maintaining the health of the body, enabling it to deal with attacks from both external environment and internal. With antioxidants natural immune system can fight and neutralize aggression more quickly and thus prevent imbalances, diseases, inflammation, degenerative processes, aging and even activation and abnormal cell replication (typical cancers).

***Key words**: antioxidants, free radicals, vegetables – fruits*

Life is an ongoing dynamic process of cell combustion / oxidation, and cell and nuclear membranes, and DNA from nuclear cells continuously attacked by the excess of oxygen and free radicals.

Free radicals are molecules characterized by the presence of an electron "odd" or "free", being that extremely unstable and chemically reactive, "aggressive" even.

The age of the individual is an absolutely essential element in this equation as a human being is genetically programmed to produce ever more antioxidants to the age of about 40 years. After this age, the amount of antioxidants produced by cellular metabolism decreases slowly and progressively, the cell becomes more vulnerable and fragile and is inherently aging (M. Murray, 2006).

Therefore it is recommended to consume as much raw food - "live" with antioxidants that it contains unditroyed through the process of cooking food (the oven, cooked, microwave etc.) (Beceanu D., 2003).

Because discoveries in the past 20 years in the therapeutic and nutritional interest in antioxidants for the treatment of human diseases and their role in diet in the prevention of disease has become increasingly.

MATERIAL AND METHOD

We have been studied a vast bibliographical material, able to assess the importance of fruit and vegetable consumption and antioxidant content.

Focuses on specific questions related to the contents of vitamins, carotenoids, flavonoids, minerals and antioxidant proantocianidine.

RESULTS AND DISCUSSIONS

Most important sources of antioxidants found in nature, the complex forms and never alone. Complexes polyvitamin provided fruit and vegetables are beneficial to the entire body and help stimulate the immune system making protective against a wide range of diseases. Over time scientists have analyzed the antioxidant content of more than 100 species of fruits, vegetables, cereals, and spices.

The latest research, the antioxidant content prunes excess berries. These fruits could increase immunity and prevent many diseases because of the content in iron, calcium, potassium, selenium, vitamins A, B and C. Dr Luis Cisneros, one of the authors of the study conducted by the Center for American AgriLife Research, Texas recommends consumption of two or three prunes a day to increase body immunity. Fruits must be consumed unshelled, because in the shell is concentrated the greatest amount of antioxidants.

Similar results were obtained by Claudio Di Vaio et al. (2001), the University of Naples, who carried out a comparative study of the antioxidant activity of peach. The skin of the fruit was found the highest activity of antioxidants. Moreover, the research carried out that result and maintained at a temperature of 4 degree C for 5 days, preserved fruit antioxidant content.

The team of researchers from the University of Padova, led by Urška Vrhovsek (2004) highlighted the antioxidant capacity of apples, causing the total polyphenol content and ascorbic acid. Renetta variety proved to be the highest total polyphenol content (300 mg/100 g), followed far away from Red Delicious variety. The opposite is the variety Fuji (150 mg/100g). With regard to ascorbic acid content, the first fall variety Braeburn (8.1 mg/100 g), followed by the variety Golden Delicious (7.7 mg/100 g), the lowest value recorded is the variety Royal Gala (0.4 mg/100 g).

Increased consumption of fruit and vegetable intake secure major antioxidants, Minim appropriate body, from the period of growth in old age.

Total antioxidant power of foods can be measured by a test developed by Tufts University in Boston determined that "oxygen radical absorption capacity (ORAC). The method consists of measuring the oxidative degradation of a fluorescent molecule (beta-ficoeritrina or flouresceina) after being mixed with the initiators generate free radicals of nitrogen (methyl-orange, dietildiaze, azobisisobutironitril).

By heating producing nitrogen radical initiators peroxil fluorescent molecule that attacks resulting in loss of fluorescence. The antioxidants are able to protect

the fluorescent molecule by oxidative degradation. Fluorescein is currently the most used fluorescent methods.

The degree of protection may be determined by fluorimetric. Commercially available equipment is automatically measured and calculated antioxidant capacity. (Biotek, Roche Diagnostics). Degradation of fluorescein is determined as antioxidant slows its decay.

Fluorescent intensity with decreasing oxidative degradation, the intensity is usually recorded during the 35 minutes. after adding the initiators of nitrogen. According to recorded data, carry out a graph of intensity and degradation of fluorescein-timp and intensity.The degree of antioxidant protection is quantified using a standard antioxdant: trolox (vitamin E analogue).

Every food can be characterized by a number of ORAC units. Foods with high ORAC value are particularly help or otherwise oxidant action of free radicals in your body are recommended between 3600 and 6000 ORAC units per day. (t*able 1*).

Table 1

Antioxidant power in some fruits and vegetables (units ORAC/100 g food) (after www.mdsupport.org)

Fruits / vegetables	ORAC units / the 100gr	Fruits / vegetables	ORAC units / the 100gr
Prunes	5770	White grape	446
Raisins	2830	Maize	402
Blueberries	2234	Eggplant	386
Blackcurrant	2036	Cauliflower	377
Savoy cabbage	1770	Bananas	221
Strawberries	1536	Apples	218
Raspberries	1227	Tofu	213
Fresh spinach	1210	Green Beans	201
Spinach cooked in	909	Tomatoes	189
steam Broccoli	888	Courgettes	176
Beets	841	Apricots	164
Avocados	782	Peaches	158
Oranges	750	Pumpkin Yellow	150
Red grapes	739	Pears	134
Cherries	670	Iceberg Lettuce	116
Kiwi	620	Watermelon	104
Pink Grapefruit	483	Melon	97
Onions	449	Celery	61
		Cucumber	54

Antioxidant capacity may be expressed as: ORAC units (as µmol TE/100g); total phenolic content (expressed as gallic acid equivalent - GAE mg%) anthocyanin content (mg%), equivalent to Trolox (TEAC - Trolox equivalent antioxidant capacity, µmol/g), the Fe (II) (strike - Ferric reducing ability plasma), the DPPH (1,1 diphenil-2 - picrilhidrazil) ascorbic acid equivalent (AEAC - ascorbic acid equivalent antioxidant capacity, mg%).

Cao et al. (1998) (quoted Dejica D, et al. 2001) determined total plasma antioxidant capacity in response to ingestion of a diet rich in fruits and vegetables, using the oxygen radical absorption capacity (ORAC), one of the recent processes high fidelity.

Those selected were no diseases that can affect the ability of the organism AO, Smoking, drinks, and diet was the same for all volunteers, for a period of 15 days. Plasma ORAC was significantly higher in individuals who have used foods than it nutritional. It is considered that neither vitamin C, E or β-carotene are not responsible, for the first plan, for obtaining increased plasma antioxidant capacity. Flavonoids and other phenolic compounds appear to contribute most to the increase in antioxidant capacity after diet with fruits and vegetables. (Dejica D. et al. 2001).

The main antioxidant substances in fruit and vegetables

Vitamin C or ascorbic acid - is a very good antioxidant, strengthens the immune system, helps to prevent or counteract allergies and has an important role in improving iron absorption.

The fruit, a higher content of ascorbic acid have it black currants (28-216 mg/100 g, average of 177 mg/100 g) and strawberries (46-86 mg/100 g, mean values of 64 mg/100 g), red and white currants (40 mg/100 g). Low content of vitamin C have grapes, plums, pears, the nuts (3-5 mg/100 g).

In apples the average varies between values of 7-12 mg/100 g) of fresh product, the walls between 4.10 mg/100 g at 10-14 mg/100 g apricots and cherries in between 6-18 mg / 100 g.

At a higher content of vegetables are found in parsley (fresh leaves-200 mg/100 g), cabbage leaves (196 mg/100 g), green peppers (127-165 mg/100 g), broccoli (110-113 mg / 100 g), brussels sprouts (109 mg/100 g), winter radishes (100 mg/100 g), cauliflower (50-78 mg/100 g), kale (63 mg/100 g), cress (60 mg/100 g) asparagus (52 mg/100 g), spinach (51 mg/100 g), red cabbage (50-57 mg/100 g) and cabbage (46 mg/100 g). A low have mushrooms and aubergines (3-5 mg/100 g). (Beceanu D., 2009).

Vitamin E - is a very good antioxidant. Tocopherols (vitamin E) are a group of chemical compounds (7 related tocopherol.αsubstances), the most common and important biological activity is relatively large quantities of tocopherols (25-28 mg/100 g) found in fruits Nuts. Blackberries contain 9.10 mg/100 g 7.8 mg/100 g chestnuts, and between 1.0 and 3.0 mg g tocoferoli/100 have peas, leeks, spinach, asparagus, celery red cabbage, berries.

Provitamins A (carotenoids) are synthesized only by plants, accumulated during growth parallel synthesis of sugars. Carotenoids have important antioxidant role, helps to increase immunity and, as we all know, for a very good view. Foods rich in vitamin A: colored vegetables (carrots, tomatoes), green vegetables (parsley, spinach), fruit color (apricot, orange, melon, peach).

The amount is proportional pepper maturity, being 30 times higher in mature consumer than prematurity (25-35 mg carotenoizi/100g, of which 0.6 mg carotene).

The 4 mg carotene carrots accumulate. Yellow varieties contain a lower amount than the red. Spinach contains 2.6 mg carotene. Maximum accumulation of

tomato is physiological maturity (6-12 mg carotenoizi/100 g, of which 0.6 mg carotene), and the fresh apricots, maturity consumption 3,2-4,2 mg/100g, which 0,5-0,6 mg carotene.

β carotene protects the body from the harmful effects of free radicals and skin from UV radiation. Slow down the aging process, helping to prevent diseases associated with aging. The amount of beta-carotene is directly proportional to the intensity of color. (Beceanu D., 2009)

Lycopene gives tomatoes their red color. It is a member of the carotenoid family. It protects plant cells against the sun and serves as fotoabsorbant pigment during photosynthesis. Lycopene is also seen as a powerful antioxidant that protects the body from the harmful effect of the oxidant. Several studies have examined the relationship between lycopene intake and certain cancers. Studies have concluded that lycopene reduced the risk of developing esophageal cancer, gastric cancer, colon cancer and the prostate.

Tomatoes, watermelon, papaya, apricots and pink grapefruit, all can be good sources of lycopene. (Beceanu D., 2009)

Vitamin B9 or folic acid - essential for the harmonious development of body. Helps form red blood cell, is a good heart protector. Foods rich in folate: green leafy vegetables (especially spinach, lettuce, lettuce, cress), green beans, peas, chickpeas or lentils, citrus and red fruit.

Bioflavonoids, also known as vitamin P, are powerful antioxidant that reduces the risks for many diseases you are looking in large quantities in vegetables, while the flowers or fruit are responsible for the reflection of a specific color to each.

Quercetin is, in many respects, as the most important flavonoids studied. Found to be active against many cancers, including breast, prostate, colon, stomach, head and neck, leukemia, lung, melanoma, liver, ovary. Flavonoids are found in nuts, seeds, soy.

Selenium by its antioxidant properties protect the body against free radicals and carcinogenic. Reduces inflammation, stimulates the immune system fight infection, supports the proper functioning of the heart and action of vitamin E. The male reproductive system and functioning of metabolism. We find selenium in nuts, apricot (0.1 mg), avocados (0.4 mg), bananas (1.0 mg), strawberries (0.4 mg), peaches (0.6 mg), Raspberry (0.2 mg).

Zinc - important for metabolism and a rapid healing of wounds. improves ability to cope with stress, help maintain the good health of the nervous system and brain (especially during the growing fetus), helps form bones and teeth and is essential for everyday energy. Important sources are legumes, nuts, apple (0.04 mg), cherry (0.07 mg), plums (0.10 mg), apricot (0.10 mg), peach (0.17 mg).

Magnesium - Important for efficient functioning of metabolic enzymes and skeletal development. It is found in nuts and legumes in amounts ranging from several milligrams to a few tenths of miligram/100 g product: raspberry (22mg), strawberry (13mg), cherry (11mg). (Hui, YH, 2006).

CONCLUSIONS

Antioxidants are substances that prevent the formation of free radicals by removing their intermediaries. They interrupt oxidation subjecting themselves into this process .

Antioxidants are not produced in sufficient quantities by the body, especially after a certain age, so it is important that we get through intake of vegetables and fresh fruit. Fruits and vegetables have a natural dietary value, with significant mineral content, dietary fiber, vitamins and antioxidants.

Some researchers say that the most effective vitamins and antioxidants found in fruits of the spectrum: violet-blue-red-purple-orange.

The current trend, the fight against disease of the century, the creation of a suitable diet, the test to predict effects of free radicals, shows, however, a sustained increase in consumption of vegetables and fruits.

BIBLIOGRAPHY

1. Beceanu, D., Chira A., 2003 - *Technology of horticultural products*. Edit. Economic, Bucharest.
2. Beceanu, D., 2009 - *Vegetable and fruit processing technology*. Edit. "Ion Ionescu de la Brad" Iasi.
3. Beceanu, D., 2009 - *Raw materials for food horticultural grapes, fruits, vegetables*. Edit. "Ion Ionescu de la Brad" Iasi.
4. Dejica, D. et al. 2001 - *Antioxidants and antioxidant therapy*. Edit. House Book of Science, Cluj-Napoca.
5. Di Vaio, C., et al, 2001 - *Attivita antiossidante di frutti di pesco*. Rev. Frutticoltura, no. 7-8/2001.
6. Hjui, Y. H. (coord), 2006 - *Handbook of fruits and fruit processing*. Edit. Blackwell, Iowa.
7. Michael, Murray, 2006 - *The condesed Encyclopedia of Healing Foods,* Edit. Pocket Books, New York.
8. Frederic, Le Cren, 2006 - *Vitamins and minerals for health and longevity*, *Antioxidants*. Edit. Polirom, Iasi.
9. Vrhovsek, Urška et al., 2004 - *Gli antiossidanti polyphenolic nella mela: quantité Attivita* Edit. Rev. Frutticoltura, no. 11/2004.
10. ***, 2009 - www.mdsupport.org. - A*ntioxidant values in fruits and vegetables* accessed July.