Jurnal Medical Aradean (Arad Medical Journal)
Vol. XV, issue 1-4, 2012, pp. 61-66


# COMPARATIVE STUDY OF ANTIOXIDANT ACTIVITY OF TWO PLANT SUPPLEMENTS CONTAINING COFFEA SSP RESPECTIVELY CAMELLIA SINENSIS L.

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**ABSTRACT.** The study determined the antioxidant capacity of the polyphenols from *Camellia sinensis* L, as compared to the polyphenols in an antioxidant mixture consisting of sixteen herbs and coffee using Pharmanex Bio Photonic Scanner. Skin carotenoidic score values showed increased antioxidant activity for the phytocomplex present in Fitness Coffee Antioxidant ™ product because enabled antioxidants to act in network. This action is the result of various antioxidant present into the studied product. Although they are in small amounts in the Fitness Coffee Antioxidant ™ product they have a greater ability to neutralize free radicals in contrast to the green tea capsule , containing a high concentration of one type of antioxidant.

**Keywords***: Camellia sinensis* L., *Coffeae ssp.*L., antioxidant activity, free radicals, Bio Photonic Scanne.

## INTRODUCTION

Antioxidants are natural compounds (exogenous-external) or produced by the body (endogenous-internal) that are able to reduce or neutralize the toxic effects of free radicals, to neutralize unstable oxygen molecules, protecting cells.
Until a few years ago, researchers believed that antioxidants act independently. Now we know that they are working together as a "antioxidant's network ".

From the chemical point of view, when an antioxidant neutralize a free radical an electron donating moiety merges with. Thus, the antioxidant becomes unstable and receives a free radical which features relatively weak and harmless, which then decomposes. Fortunately, some antioxidants can be rehabilitated quickly and revert to original antioxidant form. In this way, some antioxidants work together to revitalize each other. For example, if vitamin E decomposes while neutralizing a free radical, vitamin C or coenzyme Q10 can donate electrons, bringing back to life vitamin E as an antioxidant. The purpose is to ensure the survival of the antioxidants network in the body. If the network wouldn't be maintained we should eat and synthesize incredible amounts of antioxidants. Only certain antioxidants have this capacity for resuscitation. Of these we include: vitamin E, vitamin C, glutathione, coenzyme Q10 and alpha lipoic acid.

Antioxidants play a crucial role in both pathological conditions already installed, as well as in prevention, being indicated in cardiovascular disease, antitumor therapy, inflammatory processes, immunosupress, type 2 diabetes, neurodegenerative diseases.

The objective of the study was to determine the antioxidant capacity of the polyphenols from *Camellia sinensis* L, as compared to the polyphenols in an antioxidant mixture consisting of sixteen herbs and coffee.

Green tea is a remarkable antioxidant, neutralizing free radicals in the body which produce unwanted effects from the cell level to the organs and systems. From the literature it appears that compared with green tea, coffee has a lower antioxidant content (especially polyphenols). In the experimental part this is compensated by the fact that in addition to coffee there is a mixture of 16 plants forming an antioxidant complex.

## MATERIALS AND METHODS

Materials used in the study were Pharmanex Bio Photonic Scanner (fig. 1) and vitamin A soft capsules 50,000 IU Tegreen 97®, Fitness Antioxidant coffee™.

Pharmanex Bio Photonic scanning is a non-invasive method of measuring the content of carotenoids in the skin, making it an important indicator of the general condition, especially the antioxidant defense system.

The operation of this scanner is based on Raman resonance spectroscopy. According to the Biophotonics technology, species of molecules in the body can result in a set of colored light when are stimulated by a laser beam. The color spectrum is an optical expression of the different single molecular species. The system transmits a laser light with a wavelength of 473 nm, and when the laser beam encounters a carotenoid molecule, generating a single spectrum with a maximum intensity of 510 nm. A green light is emitted from the skin and captured by an ultra light detector and then a computer analyzes the amount of light and indicates a value, called skin carotenoid score.

Scanning is performed at the palm area, since the fleshy layer has a thickness of 400 micrometer, in such a scanning beam, which penetrates to a depth of 50 micrometers. It is not influenced by the carotenoids present in other tissues or interstitial fluid. Hence the carotenoids are measured only in the skin.


Fig. 1 Pharmanex Bio Photonic Scanner

In humans, non-carotenoid antioxidants rely on carotenoids to defend and strengthen them so that they can continue to protect the cell. Therefore, a high level of carotenoids in the antioxidant network suggests high levels of other antioxidants.

The score card compares to a scale of values divided into 5 categories: red, orange, yellow, green and blue (fig. 2).

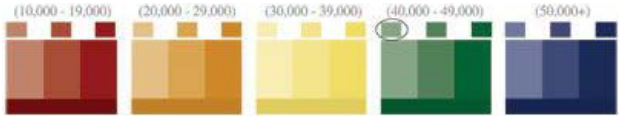


Fig. 2 Value scale for carotenoidic score

Red, with values of 19,000 or less is an unsatisfactory result, the person has an incorrect diet, do not consume supplements or they do not work, or the person is subject to genetic factors or smoke. Orange, between 20000 and 29000, are insufficient results due to a diet and / or supplements consumption with low efficiency. Yellow, between 30000 and 39000, is sufficient results with a relatively healthy diet, pretty rich in vegetables and fruits, with or without supplements relatively good. Green, with values between 40000 and 49000, is a good result, thanks to a healthy diet rich in vegetables and fruit and / or using the best supplements. Blue, with values above 50000, is a very good result and is due to a diet rich in vegetables and fruit and / or use of the excellent supplements. The apparatus starts scanning only after registration in the database of an existing unique bar code on the card. Each subject received a card. On these cards were marked carotenoid score values obtained individually. The values obtained by the subjects during the 3 months of study are the average of

carotenoid score in the last six months, which is based on the principle that the apparatus is operating.

**Vitamin A**

Vitamin A palmitate and retinol was used in the form of soft capsules with a concentration of 50,000 IU

**Tegreen 97®**

Tegreen is a food supplement that contains a standardized extract of green tea, concentrated in polyphenols and catechins, antioxidants that are found naturally in green tea. The contents of a capsule is 250 mg standardized extract of green tea,containing at least 97% pure polyphenols, including 162 mg catechins, of which 95 mg is EGCG.

**Fitness Antioxidant coffee™**

This product is in the form of powder, like a regular coffee ground, but has a more complex composition besides having a mixture of *Coffea arabica* and *Coffea canephora* (Robusta) and 16 other herbs.

Plants of Fitness Coffee Antioxidant composition are: cardamom seeds (*Elettaria cardamomum*) extract of gold root (*Rhodiola rosea*), powdered leaves of yerba mate (*Ilex Paraguaiensis*), green tea leaves (*Camellia sinensis*) orange peels sweet and bitter (*Citrus aurantium var. amara*, *Citrus dulcis*), dry rhizome of *Curcuma longa*, rhizomes of ginger (*Zingiber officinalis*), inner bark of the trunks and branches of cinnamon (*Cinnamomum zeylanicum*), licorice root (*Glycyrrhiza glabra*) , dried leaves of verbena (*Lippia citriodora*), mint leaves (*Mentha piperita*, *Mentha viridis*), dried flowers of clove (*Eugenia caryophillata*), crushed seeds and fruits of anise (*Pimpinella anisum*), Chinese star anise dried fruit (*Illicium verum*).

To conduct the study were selected 8 people, 2 men and 6 women, aged between 23 and 46 (fig. 3). The average age is 29. Each subject received a card by means of which the scans have been made. 8 people were divided into two groups, A and B. All subjects were initially scanned to determine the initial level of antioxidants. Study duration was 90 days (3 months). In the first month of the study, subjects have been given within 10 days 1 capsule of Vitamin A 50,000 IU. At the end of 30 days the second scan was performed. In the second month was given to all subjects again Vitamin A 50,000 IU 1 capsule / day for the first 10 days, but in addition to the group A was given Tegreen 97 ® 1 capsule / day for 30 days, and to the group B 200 ml decoction of Fitness Antioxidant coffee™, for all the period of 30 days. At the end of period both groups were scanned. In the last month of the study all subjects received Vitamin A 50,000 IU 1 capsule / day for the first 10 days of the month. To group A was administered decoction of Fitness Antioxidant coffee™ for 30 days and to group B Tegreen 1 capsule per day, all over a period of 30 days. At the end of period all subjects were scanned.

Fig. 3 The cards used to scan

**RESULTS AND DISCUSSIONS**

In the treatment of vitamin A deficiency, according with pharmacological studies, it is administered up to 20000 IU of retinol palmitate per day for 6 weeks. At the end of treatment the total intake of vitamin A is 840 000 IU. If we divide the dose of 840.000 IU to the amount of retinol palmitate found in a capsule used in the study (50000UI), we observe that we need 16 days of treatment for a vitamin A deficiency. According to these calculations and taking into account that subjects participating in the study showed no evidence of vitamin A deficiency it was decided that the administration will be 10 days per month at the end of which the total amount of retinol palmitate was 500.000 IU. Retinol palmitate is a fat-soluble vitamin and the administration of higher doses than recommended, has the risk of toxicity due to accumulation phenomena. Therefore as a pharmacovigilance measure in our study, after 10 days of treatment with vitamin A has made a break of 20 days until the next administration. The results

obtained by the two groups in the study were recorded on individual cards and are listed in Table 1 for group A and fig. 4 respectively in Table 2 for group and fig. 5.

Table 1 Group A skin carotenoidic score values

| Subjects | Initial scan | First month: Vitamin A | Second month: Vitamin A+ Tegreen® | Third month: Vitamin A + antioxidant decoction |
|---|---|---|---|---|
| B.R. | 19 000 | 22 000 | 22 000 | 25 000 |
| C.B. | 30 000 | 23 000 | 28 000 | 26 000 |
| C.I. | 34 000 | 33 000 | 33 000 | 41 000 |
| T.C. | 20 000 | 24 000 | 22 000 | 27 000 |

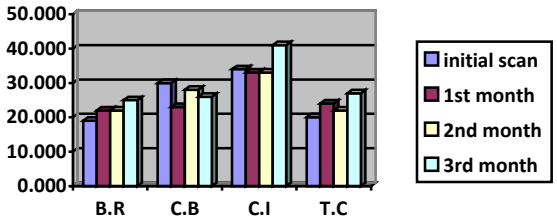


Fig. 4 Skin carotenoidic score of group A subjects

Table 2 Group B skin carotenoidic score values

| Subjects | Initial scan | First month: Vitamin A | Second month: Vitamin A + antioxidant decoction | Third month: Vitamin A+ Tegreen® |
|---|---|---|---|---|
| C.C. | 32 000 | 32 000 | 31 000 | 32 000 |
| C.M. | 27 000 | 28 000 | 33 000 | 24 000 |
| C.R. | 33 000 | 32 000 | 38 000 | 37 000 |
| S.M. | 46 000 | 45 000 | 43 000 | 38 000 |

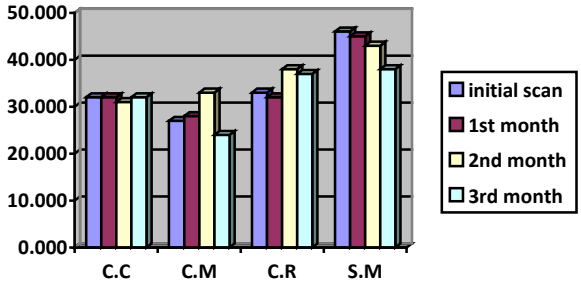


Fig. 4 Skin carotenoidic score of group B subjects

After the 90 –day of study it was observed an increase of Carotenoid Score values at administration of Fitness Antioxidant coffee™ in case of 5 participants. In the case of Green tea capsules growth has been observed only for 2 subjects. This result is due to presence into the product Fitness Antioxidant coffee™ of a phytocomplex, which gives opportunity to act on the network. Thus more antioxidants types, even if they are in small amounts, they have a greater ability to neutralize free radicals, when compared to a single type of antioxidant in a higher amount. The presence of several types of antioxidants can give Fitness Antioxidant coffee™ product the capacity of selection of individual -specific antioxidant network for the body. This is opposed to the green tea which does not contain diversified antioxidants and does not cover all the needs of individual subjects.

These values can be influenced by a number of factors that low the Carotenoid Score and increase the level of free radicals in the body. The subjects participating in the study presented the following factors: stress, flu, inflammation of different etiologies: acute inflammation, chronic inflammation, nutrition, age.

Table 3 Factors that increase free radicals concentration

| Subjects | Stress | Flu | Inflammation | Age | Fruit consumption |
|---|---|---|---|---|---|
| B.R | Xxx | | | | • |
| C.B | xxx | | x | | • |
| C.I | xxx | | | | • |

| | | | | | |
|---|---|---|---|---|---|
| T.C | xxx | x | x | xx x | • |
| C.C | xxx | x | | | • |
| C.M | xxx | | xxx | xx x | • |
| C.R | xxx | | | | • |
| S.M | xxx | | | xx x | • |

Legend

x first month
x second month
x third month

- Daily fruit consumption
- 2-3 fruits per week
- Rare fruit consumption

For all subjects there were high levels of stress which may be involved in various diseases. The high level of stress increases the production of free radicals. Source of stress in subjects BR, CB, CI, CC, CR, was represented by the experiment during an exam session. For T. C., and C. M. subjects stress comes from the professional environment. For subject SM stress conditions are derived both from the family and from the professional, which is why this topic has recorded the largest decrease of carotenoid score.

The next factor that influences the carotenoid score is the condition present during the cold or flu in two of the subjects of the study. This type of factor generates free radicals and also increased consumption of antioxidants existing in the body.

Inflammatory factor acts by decreasing the level of antioxidants in the body in order to increase their use in combating inflammation. Inflammation was present in three of the subjects. Acute inflammatory processes are present at the subjects TC (the respiratory tract) and C.M. (in the joints). Chronic inflammation was present at subject CB, where the inflammation has been located in the kidneys.

Age is a physiological factor of production of antioxidants because after 25 years there is a decrease in the production of antioxidants, regardless of conditions. After this age it is required additional intake of antioxidants. Age negatively influenced the values of carotenoidic score in 3 of the subjects which were over the age of 25

Fruits consumption directly influences the level of antioxidants in the body, mainly red and orange fruits, due to high content of carotenoids. Also fruits are the main source of vitamins and minerals, which in turn contributes to the functioning of the network antioxidants. The subjects participating in the study, three had consumed fruit daily, favorably influencing the antioxidant carotenoid score, detected by BioPhotonic Scanner.

## CONCLUSIONS

The phytocomplex present in Fitness Antioxidant coffee™ product enables antioxidants to act in network. This action is the result of presence of various types of antioxidants, which although they are in small amounts , they have a greater ability to neutralize free radicals in contrast to the green tea capsule , containing a high concentration of one type of antioxidant. It also has an important role the human body selectivity that elects the compound that its individual antioxidant network needs.

Antioxidants such as polyphenol, such as chlorogenic acid, caffeic acid and ferulic acid enhance the skin absorption of product as provitamin A or Vitamin A.

Green tea is an atypical stimulant offering a relaxed mental state, yet alert. The unique chemical composition of tannins, polyphenols, provitamin A and selenium makes green tea an antioxidant complex which is effective in neutralizing free radicals. Due the antioxidant properties of green tea it is necessary to introduce it in the diet of people with pathological conditions associated with increased levels of free radicals , such as cancer , Alzheimer's or Parkinson's disease.

Compared to green tea, coffee has a moderate antioxidant capacity, but a stronger stimulating effect. Higher stimulating effect is due to the form in which the caffeine is combined with potassium chlorogenate, which enhances nerve stimulation.

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