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EFFECT OF EXTRACT OF *GINKGO BILOBA* ON VEGETABLE OILS

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Abstract

In this paper, we studied the effect of active components of Ginkgo Biloba extract on vegetable oils. We used a commercial product of Ginkgo Biloba extract and an alcoholic extract of Ginkgo Biloba obtained from the commercial product. Influence of active compounds from Ginkgo Biloba, both in commercial and product of alcoholic extract was determined by peroxide and TBA index of vegetable oil. The extract added has no negative effects on the oil and it's good to know that the extract of Ginkgo Biloba in ethanol can be used as an antioxidant to prolong stability of oils. The results obtained indicate that oxidative processes have been slowed down both, for the commercial product and in the case of alcoholic extract. For a better demonstration of this data has been used, the notion of protection factor. After determination of the peroxide the best values were obtained for the samples with added Ginkgo Bioba extract in ethanol with a concentration of Ginkgo Biloba by 4 mg/mL, its oxidative stability increasing with 60% in relation to initial stability of oil without added.

Keywords: *Ginkgo Biloba extract, antioxidants, vegetable oils, peroxide value.*

INTRODUCTION

Ginkgo biloba (Ginkgoaceae) is probably the oldest species of tree known, dating back to 300 million years and it is often called the "living fossil". The female trees produce a fruit with an orange or yellow flesh surrounding a hard, tan shell containing the kernel of the seed, which is edible (Máriássyová, M., 2006). Antioxidants are found in various plant products such as fruits, vegetable, cereals, spices, teas and oils, which contain flavonoids, tannins, phenols, terpenoids and many others (Rhee, D.-Myers, J,2001; Máriássyová, M., 2006). In recent years, Ginkgo biloba is coming to the attention. Especially the leaves of Ginkgo biloba contain compounds possessing an antioxidant character.Antioxidant effects. The underlying principle behind the therapeutic action of the Ginkgo leaf extract on chronic ailments (such as neurodegenerative diseases, cardiovascular diseases and cancer) has focused on its antioxidant properties. The 2 proposed mechanisms of action are (1) directly scavenging free radicals and (2) indirectly inhibiting formation of free radicals. The Ginkgo leaf extract can scavenge reactive oxygen species (ROS) such as hydroxyl radicals ($OH^{\cdot}$), peroxyl radical ($ROO^{\cdot}$), superoxide anion radical (O^{2-}), nitric oxide radical ($NO^{\cdot}$), hydrogen peroxide (H_2O_2), and ferryl ion species (Mahady GB. 2002; DeFeudis FV, Papadopoulos V, Drieu K. 2003). Several studies assume its neuroprotective properties. Ginkgo biloba can enhance concentration, improve memory, but there was no effect observed on short memory (Byeoung-Soo, P.-Sung-Eun, L., 2000). There have been no studies aimed at the application of Ginkgo biloba extract as a potential natural antioxidant used in food industry.There have been isolated three main compounds from Ginkgo biloba with an antioxidant activity– kaempferol, quercetin and isoharmnetin (Spence, K. E.-Jane, J.4, 1999). The antioxidant activity of a ginkgo extract is determined mainly by flavonoids, which scavenge and destroy free radicals and the reactive forms of oxygen (Ellain Wojtaszek, M.-Krucynski, Z.-Kasprzak, J., 2002). The activated oxygen forms such as peroxide, hydrogen peroxide, hydroxyl radical and singlet oxygen may cause various diseases such as carcinogenesis, inflammation, atherogenesis, as well as food deterioration, for which the naturally occurring antioxidants may be effective (Rhee, D.-Myers, J, 2001). At present there are many commercially available preparations made from

Ginkgo biloba leaves, which results from the broad spectrum of its advantageous action on the human organism. The antioxidant effect is determined by the presence of flavonoids, capable of free radical scavenging (Kobus J. et al., 2009). Antioxidant potential of extracts from Ginkgo biloba leaves is comparable to that of ascorbic acid, glutathione or alphatocopherol (Kalisz O., Wolski T., Gerkowicz M., 2006).So far Gingko extracts have not been used as additives of antioxidant character in food production. Thus the aim of this paper was to assess the effect of an addition of ethanol extracts from green and yellow leaves of Ginkgo biloba (Ginkgo biloba L.) on oxidative stability of lipids in sunflower oils.

MATERIALS AND METHODS

Ginkgo Biloba extract was purchased from Huisong Pharmaceuticals having in composition ginkgo flavonoids 24% and terpene lactones 6%. (Huisong, www.huisongpharm.com/manu.asp? id=82) The analyses were performed using sunflower oil (Spornic, manufactured by Prutul S.A.) and the following reagents: n-butanol (Chimopar), tiobarbituric acid (Merck), chloroform, glacial acetic acid, potassium iodide, sodium thiosulfate, freshly prepared starch, soya lecithin.To stabilize the sunflower oil was used the extract of Ginkgo Biloba in ethanol. To compare the antioxidant activity was used a commercial extract of Ginkgo Biloba. Concentration of the extract in oil was 40 mg of commercial extract in oil and 2 mg/mL and 4 mg/mL of the extract of Ginkgo in ethanol.Ginkgo Biloba extract was prepared according to the method developed by Lucia Zahradnikova et al., 2007, with small modification. Was used the commercial extract to do an extract in ethanol using 200 mL ethanol and 10 grams of extract.PEROXIDE VALUESPrimary oxidation products, namely hydroperoxides, were determined as peroxide values (PV) by iodometric standard procedure and expressed as meq kg-1 (Farmacopeea Romana, 1993) with small modification namely: for determination was used 15 mL glacial acetic acid, 10 mL chloroform, 1mL potassium iodide and freshly prepared starch for coloring.

Determination of the 2-thiobarbituric acid value: direct method. For the quantification of the end-products of lipid peroxidation, the most commonly test called a TBARS Assay (thiobarbituric acid reactive substances assay) was used according to the method provided in Standard Methods for the Analysis of Oils, Fats and Derivatives (7th Edition,2000). The reading was carried out at the 530nm and the T80 UV/VIS spectrophotometer (PG Instruments Ltd) was used.Expression of results:

$$TBA=\frac{50*(A-B)}{m}$$

A= the absorbance of the sample solution
B= the absorbance of the blank solution
m= the mass in mg of the sample
50= correction factor (A.Dieffenbacher,W.D. Pocklington)

RESULTS AND DISCUSSIONS

The antioxidant activity of the extracts was expressed as the protection factor *PF*. The values of $PF > 1$ indicate an antioxidant activity, the value of $PF = 1$ corresponds to no antioxidant activity and the values of $PF < 1$ mean prooxidative activity.
Oils without any additives were analysed as blanks and the antioxidant efficiency was expressed as the protection factor:
$PF = IP0/IP$,
where:
IP is the peroxide index of oil with addition of an antioxidant and,
IP0 is the peroxide index of oil without the addition of the antioxidant. (Ixtaina et al., 2012).
Analysing the results obtained it was observed that both extracts have antioxidant activity and increased oxidative stability of sunflower oil.

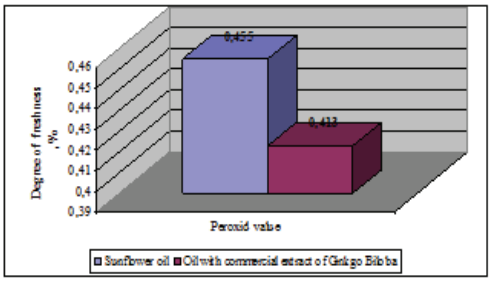

Figure 1. The values obtained from the analysis of peroxide value no oil addition and with the addition of a commercial extract of *Ginkgo Biloba*

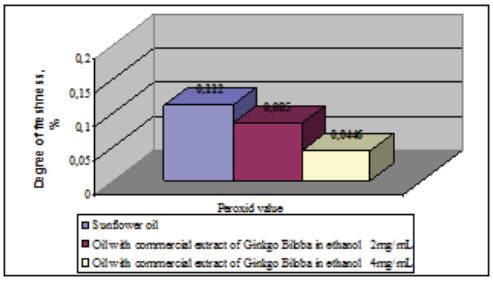

Figure 2. The values obtained from the analysis of peroxide value no oil addition and with the addition of natural Ginkgo in ethanol.

In Figure 1 and Figure 2 it can be seen that the greater stability of sunflower oil was obtained from Ginkgo Biloba extract in ethanol obtained in the laboratory at a concentration of 4 mg/mL in ethanol extract.

The addition of 40 mg of commercial extract in oil it is noted that there has been an increase in oxidative stability of oil with the addition of a commercial extract of Ginkgo with approximately 10% from the initial stability of oil without added.

When was added a quantity of 2 mg/mL of extract of Ginkgo Biloba in ethanol, it is noted that the oxidative stability of oil has increased by about 25% relative to baseline stability of oil without added, and to the addition of 4mg/mL of extract of Ginkgo Biloba in ethanol, it was noted that the oxidative stability of oil has increased by approximately 60% relative to baseline of oil stability without added.

As mentioned earlier, the protection factor (PF) for the commercial extract of Ginkgo Biloba in sunflower oil was 1.09, while for the added of 2mg/mLof extract in ethanol of Ginkgo Biloba the PF was 1,3 and for the added of 4mg/mLof extract in ethanol of Ginkgo Biloba the PF was 2,5. The results obtained can be summarized by starting that the added of 4 mg/mLof extract in ethanol of Ginkgo Biloba in sunflower oil has a better antioxidant activity.

In Figure 3 and Figure 4 it can be seen that the greater stability of sunflower oil was obtained from Ginkgo Biloba extract in ethanol obtained in the laboratory at a concentration of 4 mg/mL in ethanol extract.

At the addition of 40 mg of extract in oil it is noted that there has been a decrease in the value of the value of TBA in the oilwith addition of Ginkgo extract commercial with approximately 74% from the amount of TBA value of oil without added.

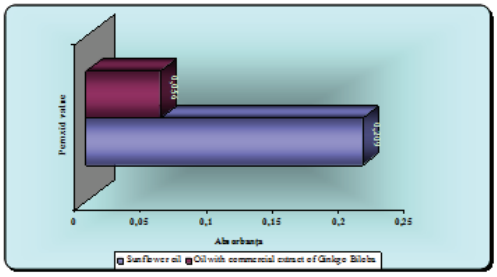

Figure 3. The values obtained as a result of determining absorbance of 2-tiobarbituric acid of the oil with no addition and with the addition of *Ginkgo Biloba* extract in ethanol.

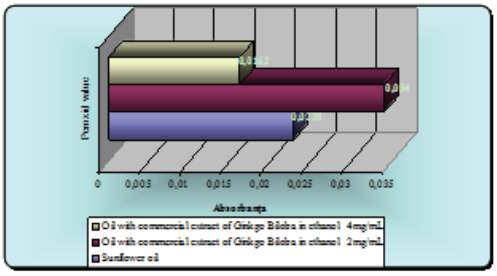

Figure 4. The values obtained as a result of determining absorbance of 2-tiobarbituric acid of the oil with no addition and with the addition of *Ginkgo Biloba* extract in ethanol in different concentration.

When was added a quantity of 2 mg/mL of extract of Ginkgo Biloba in ethanol, it is noted that there has been a decrease in the value of TBA by about 24% relative value of TBA of oil without added, and the addition of 4 mg/mL of extract of Ginkgo Biloba in ethanol, it is noted that there has been a decrease in the

value of TBA by about 61% relative the initial stability of oil without added.

As mentioned earlier, the protection factor (PF) for the value of TBA using the commercial extract of Ginkgo Biloba in sunflower oil was 3.7, while for the added of 2mg/mLof extract in ethanol of Ginkgo Biloba the PF was 0.7 and for the added of 4mg/mLof extract in ethanol of Ginkgo Biloba the PF was 1.4. The results obtained can be summarized by starting that the added of 4 mg/mLof extract in ethanol of Ginkgo Biloba in sunflower oil has a better antioxidant activity.

CONCLUSIONS

The purpose of this work was to analyze the effects of the extracts of Ginkgo Biloba in terms of their active compounds over the sunflower oil, through two different methods: determination of hydrogen peroxide by titration and determination of TBA-standardization.

The results obtained using our methods of analysis Ginkgo Biloba extract obtained by extraction with ethanol seems to be much better in the oxidative stability of sunflower oil. In terms of results, it was observed that both extracts have antioxidant action.

REFERENCES

1. Byeoung-Soo, P.-Sung-Eun, L.: Antioxidative activity of Ginkgo biloba leaves − derived components on free radicals and active oxygen species. Food Science and Biotechnology, 9, 2000, pp. 317-321.2. DeFeudis FV, Papadopoulos V, Drieu K. 2003. Ginkgo biloba extracts and cancer: a research area in its infancy. Fundam Clin Pharmacol 17:405−17.3. Ellain Wojtaszek, M.-Krucynski, Z.-Kasprzak, J.: Variations in free radical scavenging activity of Ginkgo biloba leaves in the period of complete development of green leaves to fall of yellow ones. Food Chemistry, 79, 2002, pp. 79-84.4. Farmacopeea Romana, 1993, Editura medicala, Bucuresti.5. Huisong Pharmaceuticals, (www.huisongpharm.com/manu.asp? id=82) 6. Ixtaina V.Y., Nolasco M.S., Tomas M.C., Oxiative Stability of Chia (Salvia hispanica L.) Seed Oil: Effect of antioxidants and storage Conditions, J.Am.Oil Chem. Soc. (2012) 89:1077-1090, DOI10.1007/s11746-011-1990-x.5. Kobus J., Flaczyk E., Siger A., Nogala-Kalucka M., Korczak J., Pegg R.B., 2009. Phenolic compounds and antioxidant activity of extracts of Ginkgo leaves. Eur. J. Lipid Sci. Technol. 111.6. Kalisz O., Wolski T., Gerkowicz M., 2006. Miłorząb japoński (Ginkgo biloba) i jego preparaty w terapii zaburzeń krążenia mózgowego i obwodowego [Ginkgo biloba (Ginkgo biloba) and its preparations in therapy of cerebral and peripheral circulation disorders]. Ann. Univ. Mariae Curie-Skłodowska 61, 2, 11-17.7. Mahady GB. 2002. Ginkgo biloba for the prevention and treatment of cardiovascular disease: a review of the literature. J Cardiovasc Nurs 16:21−32.8. Máriássyová, M.: Antioxidant activity of some herbal extracts in rapeseed and sunflower oils. Journal of Food and Nutrition Research, 45, 2006, 3, pp. 104-109.9. Rhee, D.-Myers, J.: Complementary and alternative medicine for glaucoma. Survey of Ophthalmology, 46, 2001, 1, pp. 43-55.10. Spence, K. E.-Jane, J.: Chemical and physical properties of ginkgo starch. Carbohydrate Polymers, 40, 1999, pp. 261-269.11. Trevisan Maurizio, Browne Richard, Ram Malathi, Muti Paola, Freudenheim Jo, Carosella Ann Marie, Armstrong Donald, Correlates of Markers of Oxidative Status in the General Population, Am. J. Epidemiol. 2000.

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