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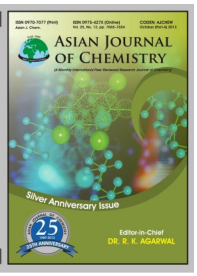

Effect of Some Medicinal Tea Extracts on Some Oxidative Parameters of Sesame Oil

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In this study, the antioxidant activity of some medicinal tea extracts at different concentrations (0.3 and 0.5 %) on the oxidation parameters of sesame oil at 80 ºC was determined. Butylated hydroxy anisole was used as positive control in experiment. All the extracts exhibited antioxidant activity compared to butylated hydroxy anisole upto 14 days. When antioxidant effect of extract concentrations were compared with butylated hydroxy anisole, the effect of 0.5 % extract concentration was more remarkable for sesame oil upto 14 days. All of seed extracts was effective at 80 ºC in comparison with control. On the other hand, the peroxide and viscosity values during the experiment period increased. It concluded that tea extract could be used as an oxidative inhibitor agent in oil and oil products.

Key Words: Medicinal tea, Extract, Viscosity, Peroxide, Oxidation, Sesame oil.

INTRODUCTION

Sesame is an excellent source of high quality oil and protein. Its oil is odourless and close in quality to olive oil. The oil is excellent edible oil that has high preservative qualities. It prevents rancidity, even though the seeds are prone to rancidity, the oil is resistant to oxidation and this is because of the natural preservative within the oil called sesamol[1,2]. Recently, the use of spices and herbs as antioxidant agents in foods is becoming of increasing importance. Antioxidants have been widely used as food additives to provide protection against oxidative degradation of foods[3-8]. These effects have been attributed to antioxidant components such as plant phenolics, including flavonoids and phenylpropanoids[9]. Sources of natural antioxidants are primarily phenolics that may occur in all products and parts of a plant such as fruits, vegetables, nuts, seeds, leaves, roots and bark. Due to their potential antioxidant action, plant phenols and polyphenols, with their potential to act as antioxidants play a major role in the prevention of various pathological conditions[10]. Phenolic compounds are the major bioactive compounds found in spices. Phenolic compounds act as antioxidant to scavenge reactive oxygen species and to chelate metals[6,11,12]. Spices are usually consumed after thermal cooking. Bioactive components of spices such as curcumin (turmeric), zingerone (ginger). Allicin (garlic) inhibit lipid peroxidation[13]. Lipid peroxidation is one of the major causes of deterioration in foods that results in the formation of potentially toxic compounds. Synthetic antioxidants, such as butylated hydroxy anisole (BHA), butylated hydroxytoluene (BHT) and *tert*-butyl hydroquinone (TBHQ) are widespread food additives used to preserve against deterioration. However, their use is increasingly restricted, due to their potential health risks and toxicity[14]. Numerous studies were carried out on some of these plants, *e.g.*, rosemary, sage and oregano which resulted in a development of natural antioxidant formulation for food, cosmetic and other applications. Therefore, the aim of this study was to determine the *in vitro* viscosity, antioxidant activities, total phenol of the extracts of some condiments on sesame oil oxidative stability.

EXPERIMENTAL

Summer savory (*S. hortensis* L.), tilia (*Tilia cordata* L.), mountain tea (*Sideritis syriaca*) were obtained from a spice company in Konya, Turkey. A voucher specimen is kept in the herbarium of the Department of Food Engineering, Faculty of Agriculture, University of Selçuk and identified by Dr. Bagci. Plants are stored in a dry, dark and cool room and were grounded before used. Sesame oil was provided from Gesaþ Company in Konya. The peroxide and viscosity values of cold pressed sesame oil were determined as 1.57 meq/Kg and 35.2 mPa, respectively.

Antioxidant and total phenol: The spices were dried, grounded and extracted in 90 % methanol + 9 % water + 1 % acetic acid mix. The extraction duration were 24 h. After

filtration, the filtrate were evaporated under vacuum, less than 45 ºC. Folin-Ciocalteu colorimetric method were applied and the results were expressed as mgGAE/Kg extract[15]. Antioxidant activities in the latter samples were determined *in vitro via* scavenging of the ABTS (2,2%-azino-*bis*-3-ethylbenzthiazoine-6-sulphuric acid) radical, generated by a metmyoglobin:hydrogen peroxide system, as described previously[16]. Samples were diluted 1/6 with the extraction solvent. Free radical scavenging activity were determined by DPPH method and the results were expressed as IC_{50} (mg/mL), minimum extract required to inhibit the 50 % of 1,1-diphenyl-2-picrylhydrazyl[17].

Peroxide value: All extracts exhibited antioxidant activity compared to butylated hydroxy anisole upto 14 days viscosity and peroxide values of the sesame oil stored at 80 ºC by using extracts. Analyses were applied according to the AOCS[18]. A calculated quantity of the butylated hydroxy anisole (0.2 %) and extracts (0.3-0.5 %) were added directly into sesame oil at room temperature and dissolution was obtained by manual homogenization for about 5 min. A control sample was prepared under the same conditions without addition of any antioxidant. Fifty gram of each sample was stored in 8 cm × 10 cm beherglass at 80 ºC in the dark. For the determination of peroxide number, a given weight of sesame oil was dissolved in a mixture of acetic acid:chloroform (CH_3COOH:$CHCl_3$) (3:2, v/v) and saturated solution of KI (1 mL) was then added. The liberated iodine was titrated with sodium thiosulphate solution (0.01 N) in the presence of starch as an indicator[18]. For the free fatty acidity, a known weight of sesame oil was dissolved in a mixture of diethyl ether/ethanol (1:1 v/v). The mixture was titrated with phenolphthalein as an indicator.

Viscosity: The viscosity values of the control and essential oils added edible oils were also determined. Viscosity of oil was carried out using Brookfield. 35-45 mL sample of oil was put into the viscometer device. Value was recorded as mPas. Analyses were applied according to the AOCS[18].

Statistical analyses: Results of the research were analyzed for statistical significance by analysis of variance[19].

RESULTS AND DISCUSSION

The antioxidant effects of two different concentration of *Tilia cordata, Sideritis syriaca* and *S.hortensis* extracts are defined in sesame oil stored at 80 ºC for 2 weeks (Table-1). Viscosity values of extracts changed between 17.10 mPa (Tilia) to 30.70 mPa (0.3 % *S. hortensis*), peroxide values changed between 110.60 meq/Kg (0.5 % *S. hortensis*) to 140.60 meq/Kg (0.3 % Tilia) in the first week of experiment. In addition, while viscosity values of extracts were found between 49.40 mPa to 78.0 mPa (0.3 % *S. hortensis*), peroxide values were determined between 258.40 meq/Kg (0.5 % *S. hortensis*) to 271.20 meq/Kg (0.3 % *Sideritis*). The viscosity values of extracts were found low compared with control group at the second week. Peroxide values were increased partly at the second week (Table-1). Butylated hydroxy anisole is used as a positive antioxidant against control and extracts. All values are found below initial control group in the first week. A rapid increse is in the number of peroxide observed. The antioxidant effects are found similar to butylated hydroxy anisole and highly effective when compared to control group during the first week. It can be said that this is the result of phenolic substances in the extract. The 0.5 % concentration of extracts of three plants are found more effective. During the second week, both the peroxide and viscosity values have increased rapidly. When compared to first week, it can be concluded that approximately two-fold increase is observed during the second week. The decrease in viscosity values observed during the first week may be caused by the oil as it gets fluid properties at high temperature. This reduces the viscosity value in plant extracts than the control group. A high amount of peroxide value is observed during the second week. While the total amount of phenolic substance content ranges from 2.586 to 4.122, their antioxidant activity levels are between 37.816 and 72.917. These values are thought to have an effect on the preservation of stored oil at 80 ºC. As a result, it is thought that the usage of effective substances got from prufied extract components in lower doses may be much more useful. In comparison with our results, it is apparent that the free radical scavenging activity of the aqueous extracts were better than methanolic extracts that we studied on. Trolox equivalent antioxidant activity was reported as 0.36, 0.32, 0.25 and 0.12 by Mantle *et al.*[20] for *T. vulgaris*, *S. officinalis*, *M. spicata* and *S. sclarea* in 80 % methanol extracts, obtained from UK, respectively. There is a strong relationship between the total correlation equation between total antioxidant capacity and total phenolic. Many authors reported that high total phenol increase the antioxidant activity[21,22]. In addition, there is a linear correlation between phenolic content and antioxidant activity[23]. Oktay *et al.*[24] found a high correlation between phenolic content and DPPH radical-scavenging activity of fennel seed extract. It is well known that free radicals cause autooxidation of unsaturated lipids in food[25]. This composition explains the antioxidant activity of the extracts added to the analyzed

TABLE-1
VISOCITY AND PEROXIDE VALUE OF SESAME OIL DURING STORAGE AT 80 ºC

	First week		Second week	
	Viscosity (mPas)	Peroxide value (meq/Kg)	Viscosity (mPas)	Peroxide value (meq/Kg)
Tilia cordata (0.3 %)	17.1 ± 1.13*	140.6 ± 3.56	55.6 ± 1.56	270.1 ± 3.78
Tilia cordata (0.5 %)	19.4 ± 0.98	136.2 ± 2.78	67.0 ± 1.11	259.4 ± 4.61
Sideritis syriaca (0.3 %)	22.3 ± 1.27	140.1 ± 3.67	49.4 ± 1.38	271.2 ± 3.89
Sideritis syriaca (0.5 %)	22.1 ± 1.32	124.3 ± 2.79	76.1 ± 1.53	270.5 ± 4.78
S.hortensis (0.3 %)	30.7 ± 2.21	122.2 ± 2.32	78.0 ± 1.47	262.3 ± 5.31
S.hortensis (0.5 %)	25.3 ± 1.68	110.6 ± 2.69	50.9 ± 1.34	258.4 ± 3.78
Butylated hydroxy anisole (0.02 %)	31.0 ± 1.76	122.7 ± 2.54	43.7 ± 1.37	250.0 ± 2.89
Control	33.3 ± 1.89	240.4 ± 3.72	123.7 ± 1.63	248.8 ± 3.87

*Mean ± standard deviation.

TABLE-2
TOTAL PHENOL AND ANTIOXIDANT ACTIVITY

	Total phenol (mg GAE/Kg)	Antioxidant activity IC_{50} (mg/mL)
Tilia cordata	4.122 ± 0.223	53.157 ± 4.534
Sideritis syriaca	2.586 ± 0.117	37.816 ± 3.278
S. hortensis	4.069 ± 0.365	72.917 ± 3.763

*Mean ± standard deviation.

sesame oils. The degrees of influence of the extracts were different and it could change because of the chemical compositions and the own antioxidant capacity of sesame oils. So further researches are necessary on determination of chemical compositions of these extracts and edible oils and the correlation between their antioxidant effect and chemical compositions.

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