

## INFLUENCE OF NATURAL ANTIOXIDANTS ON PEROXIDE VALUE OF SOME VEGETABLE OILS

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### Abstract

The purpose of this work is the comparative study between the antioxidant activity of the methanolic extracts of Rosemary (*Rosmarinus officinalis* L.) and beta-carotene. Rosemary extracts provide a major source of natural antioxidants used commercially in foods. Beta-carotene is also a powerful antioxidant, and has been shown to help guard against cancer and heart disease.

Rosemary extract was prepared under refluxing condition, and beta-carotene was prepared by extraction of carrots. These extracts were used as antioxidants at a concentration of 0,02%, to improve the stability against oxidation in following samples: sunflower oil ( $S_1$ ), extravirgin sunflower oil ( $S_2$ ), lard ( $S_3$ ) and soybean oil ( $S_4$ ). We used the volumetric method (tiosulphatometria) for determination the peroxide value not only at soft thermic treatment (60 °C) but also at some advanced (microwave) for various periods of time.

The peroxide value of the samples was determined when the samples were without antioxidant (control), and after being aged at 60<sup>0</sup> C in the dark for 7, 11, 14 days, respectively. The decrease in the rate of formation of peroxides was used as a measurement of the antioxidant activity of the extracts. Increasing temperature, the efficiency of antioxidants decrease in all the samples. Addition of antioxidants slowed down the formation of peroxides in the samples stored in clear glass bottles at room temperature under diffused daylight. Beta-carotene is more active than Rosemary extract in some concentration and some samples; it is though that both of extracts as natural sources of antioxidants. Totally, antioxidant efficiency decreased with increasing temperature.

**Keywords:** antioxidant activity, *Rosmarinus officinalis* L., beta-carotene, thermic treatment

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## 1. INTRODUCTION

The presence of antioxidants in spices, specifically Rosemary is well known. However, the extracts of such spices usually have a strong odor and bitter test and therefore cannot be used in most food products.

At present, addition of synthetic antioxidants such as Butylated Hydroxytoluene (BHT), Butylated Hydroxyanisole (BHA), and Tertiary Butyl Hydroquinone (TBHQ), is the most popular way to delay oxidation in foods.

Use of such compounds has been increased greatly for improving the stability of lipids. However, application of synthetic antioxidants is questioned as a results of vast evidences that show toxicity of such compounds (*Madhavi et al., 1995*).

They are added to a wide variety of foods on the market. However, they are quite volatile

and easily decomposed at high temperatures. Furthermore, they are not effective in vegetable oils and in preventing the development of initial off-flavors, such as the reversion flavor. However, it does not seem to retard the development of objectionable flavors. In any event, there is a tendency for the consumers to reject synthetic antioxidants (*Hovari, 2003*).

The possible toxicity of the synthetic chemicals used as antioxidants have been a subject of study for many years (it is known the effect on gastrointestinal tract mucosa and the conversion into toxic substances) (*Fook Yee Chye, 2008*).

Therefore, great efforts have been done in order to find, extract, separate and identify safe and natural antioxidants (*Hinnerburg I. et. al., 2006; Yu-Ling Lee et. al., 2007*).

All this, leads to the interest of preparing antioxidants from natural food stuffs by extraction, purification and fractionation.

Certainly, there is no assurance that a fraction or a compound isolated from natural food is safe (Matthaus, 2002).

The present paper reports the preparation of a natural antioxidant from Rosemary and carrots their uses in food products to retard autoxidation.

Rosemary extract provide a major source of natural antioxidants used commercially in foods. Carnosic acid and carnosol are the most important active components of rosemary extracts and rosmarinic acid is a minor constituent. Rosemary extract, carnosic acid, and rosmarinic acid were more active in bulk corn oil than carnosol (Frankel E. N. 1991, 1996). However, rosemary compounds were less active in corn oil emulsion than in bulk corn oil, and rosemary extract, carnosic acid and carnosol were more active than rosmarinic acid. The polar hydrophilic components of rosemary extracts were less active in the emulsion system because they partitioned into the water phase and became less protective than in the bulk oil system.

## 2. MATERIALS AND METHODS

A natural antioxidant it was prepared by extraction with an organic solvent, which includes: hexane, benzene, ethyl ether, chloroform, methanol.

Preparation of antioxidant from Rosemary: 100 g of Rosemary which had been ground to a fine powder were extracted with 240 ml of ethyl ether under refluxing condition for 2 hours. The mixture was filtered and the residue could be extracted again with fresh solvent. The combined filtrate was freed of solvent to yield up to 26 g of crude antioxidant depending upon the number of extraction.

The crude antioxidant was washed with 100 ml of cold water several times and then with 100 ml of 80<sup>o</sup> C water several times. It was then dissolved in methanol (10 % solution) and bleached with active carbon by stirring at 60<sup>o</sup> C for 15 min. Up to 20 % by weight of the crude antioxidant of carbon may be used. The bleached solution was freed of solvent to yield approximately 10 g purified antioxidant.

This extract was used as antioxidant at a concentration of 0,02%, to improve the stability against oxidation in following samples: sunflower oil (S<sub>1</sub>), extravirgin sunflower oil (S<sub>2</sub>), lard (S<sub>3</sub>) and soybean oil (S<sub>4</sub>).

The peroxide value of the samples was determined by the volumetric method (tiosulphatometria) (Choi Y. Et. al., 2006; Chu Y., Hsu H. F., 1999).

Rosemary extract was prepared under refluxing condition, and beta-carotene was prepared by extraction of carrots (the subjects of another paper).

## 3. RESULTS AND DISCUSSIONS

The antioxidants prepared from extraction of Rosemary and carrots showed an excellent antioxidant activity when added at a concentration of 0,02% into three samples: sunflower oil (S<sub>1</sub>), extravirgin sunflower oil (S<sub>2</sub>) and lard (S<sub>3</sub>).

The peroxide value of the samples was determined when the samples were without antioxidant (control), and after being aged at 60<sup>o</sup> C in the dark for 7, 11, 14 days, respectively. The decrease in the rate of formation of peroxides was used as a measurement of the antioxidant activity of the extracts (table 1 and 2). Increasing temperature, the efficiency (E) of antioxidants decrease in all the samples (Othman A. et. al., 2007; Maldhavi D. L. et. al., 1995).

**Table 1-Antioxidant activity of Rosemary extract into sunflower oil, extravirgin sunflower oil and lard**

Rosemary extract 0,02%		Peroxide value (meq/kg) after days at 60 <sup>o</sup> C			
		0	7	11	14
Sunflower oil	C	4,75	20	53,25	77,75
	S <sub>1</sub>	4,75	15,25	40,25	64,25
	E%	-	<b>24,70</b>	<b>24,41</b>	<b>16,82</b>
Extra virgin sunflower oil	C	9,75	37,25	64,25	75,25
	S <sub>2</sub>	9,75	31,7	54,80	64,25
	E%	-	<b>14,90</b>	<b>14,71</b>	<b>14,61</b>
Lard	C	1,25	6,25	16,20	22,25
	S <sub>3</sub>	1,25	3	11,4	16,25
	E%	-	<b>52</b>	<b>29,71</b>	<b>26,96</b>

**Table 2-Antioxidant activity of beta carotene extract into sunflower oil, extravirgin sun flower oil and lard**

Beta carotene 0,02%		Peroxide value (meq/kg) after days at 60 <sup>o</sup> C			
		0	7	11	14
Sunflower oil	C	4,75	20	53,25	77,25
	S <sub>1</sub>	4,75	16	43,85	65,5
	E%	-	20	17,65	15,08
Extra virgin sunflower oil	C	9,75	37,25	64,25	75,25
	S <sub>2</sub>	9,75	33,3	57,6	67,5
	E%	-	10,6	10,35	10,3
Lard	C	1,25	6,25	16,20	22,25
	S <sub>3</sub>	1,25	4,3	13	19,10
	E%	-	31,2	19,75	14,15

The samples were followed at room temperature and the results were showed in Table 3 and 4. Addition of antioxidants slowed down the formation of peroxides in the samples stored in clear glass bottles at room temperature under diffused daylight.

**Table 3-Antioxidant activity of Rosemary extract into sunflower oil, extravirgin sun flower oil, and soybean oil at room temperature**

Rosemary extract 0,02%		Peroxide value (meq/kg) after days at room temperature		
		0	14	35
Sunflower oil	C	4,75	10,25	18,2
	S <sub>1</sub>	4,75	7,4	13,6
	E%	-	27,8	25,27
Extra virgin sunflower oil	C	9,75	13,4	16,35
	S <sub>2</sub>	9,75	10,6	14
	E%	-	20,9	14,37
Soybean oil	C	2,4	8,5	14
	S <sub>4</sub>	2,4	4,8	8,5
	E%	-	43,5	39,28

#### 4. CONCLUSIONS

An effective antioxidant was prepared from Rosemary. Its antioxidant activity can be demonstrated in both animal fats and vegetable oils.

This extract is able to improve the stability against oxidation of sunflower oil, extravirgin sunflower oil, soybean oil and lard.

Beta-carotene is more active than Rosemary extract in some concentration and some samples; it is thought that both of extracts as natural sources of antioxidants.

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