Current Botany 2011, 2(5): 16-19
ISSN: 2220-4822
www.scholarjournals.org

CURRENT BOTANY
www.currentbotany.org

Development of some New Micronutrient Rich Blends of Edible Vegeteble Oils

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Article Info

Article History

Received : 18-02-2011
Revised : 29-04-2011
Accepted : 30-04-2011

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Abstract

Fats and oils in the form of edible vegetable oils are integral to our diets, and comprises of an important source of calorie density in human diet. Besides, the edible vegetable oils have nutritional value and health benefits due to the presence of essential fatty acids and many micronutrients as unsaponifiable matter. The unsaponifiable matter of vegetable oils includes micronutrients such as tocopherols, tocotrienols, β-carotene, oryzanol, squalene etc, which have been reported for health benefits.

Key Words: Vegetable Blended Oil, Micronutrients, Tocols-(tocopherol, tocotrienols), Packaging, Storage Stability, RO-Rice bran Oil, MO-Mustard oil, MR-Mustard Rice bran oil blend

Introduction

Fats and oils in the form of edible vegetable oils are integral to our diets, and comprises of an important source of calorie density in human diet. Besides, the vegetable oils have nutritional value and health benefits due to the presence of essential fatty acids and many micronutrients as unsaponifiable matter such as tocopherols, tocotrienols, β-carotene, oryzanol, squalene etc, which have been reported for health benefits [1]. India occupies an important place in the world in production of major oilseeds [2].

However, their use is often limited by the presence of components that produces undesirable effects, if consumed in excess. For example, palm oil is rich in micronutrients but at the same time contains higher amounts of saturated fatty acid that are considered harmful in excess. Other oils such as rice bran oil in its crude form (and also refined form) has less saturated fatty acids and more micronutrients but is not acceptable to population due to its flavour and texture in crude form. Blending provides a solution to such problems. It cannot only dilute the effect of undesirable constituents (ex: erucic acid in mustard oil) but can also bring the advantage of micronutrients present in the blended oil [3]. In view of these facts, it was decided to formulate the edible vegetable oil blends that would be rich in micronutrients and at the same time would have other benefits such as the desired fatty acids. The specific micronutrients analyzed in this study include carotenes, tocopherol, tocotrienol, oryzanol, squalene, and phytosterols. The micronutrients were analyzed by the HPLC method [4].The major vegetable oils commonly used in different regions of India are mustard oil (MO), and rice bran oil (RO) in the shelf life study of these blends.

Materials and Methods

Materials

Refined vegetable oils, mustard oil were purchased from the local market of Alaknanda New Delhi city; rice bran oil (physically refined, from Eastman Agro Mills, Ltd., New Delhi, India). Without added antioxidants, were obtained from M/S Marico Industries, Mumbai, India. All reagents used were of analytical grade.

Vegetable oil blends preparation Base oils

Base oils rice bran oil was blended with mustard oil in the following weight ratios: (70:30).The procedure for blending was similar to that used earlier [5]. The blending oils (Rice bran oil) were chosen for their contents of nutritional interest, *viz*.

Oil storage studies

Schaal oven test [6] was conducted to evaluate the effect of antioxidants against oxidation during the accelerated storage of oils. The storage tests were carried out on three different vegetable oils like (Base oils Rice bran oil were blended with mustard oil). Refined, bleached, deodorized rice bran oil. Oil samples were stored in uniform pet (Amber, Transparent) and tin containers at 35°C and 60°C for a definite period in an incubator. The following sets of samples were included in the study. The above experiments were repeated with mustard oil, rice bran oil and its blends. The retention of the micronutrient components, *viz.*, β-carotene, and other micronutrient components including tocopherols were analyzed once at the beginning and at the end of six months and one

year of storage, containers were used plastic bottles and tin containers [7].

Micronutrient components determination

Tocopherol contents of the initial and stored oils were determined after saponification of the oils and extraction of the unsaponifiable matter followed by colorimetric determination using Emmerie Engel procedure as reported in the vitamin E panel method [8] and expressed as mg/kg oil. β-Carotene content was determined by reversed-phase high pressure liquid chromatography (HPLC) (LC-6A; Shimadzu Corporation) using an instrument equipped with a UV detector (SPD-6A) and fitted with a µ-Bondapack, 10 µm C-18 column (4.6 × 300 mm; Millipore, Milford, MA). The mobile phase was methanol/acetonitrile (1:1) at a flow rate of 1.0 mL/min, and the detector was set at 460 nm. A calibration curve using standard β-carotene was prepared in the range of 10–50 ng and used for the determination of β-carotene content of palm olein oil and its blends. All data were generated in quadruplicate from the two independent duplicate stored samples and then average was calculated.

Statistical analysis

All experiments and measurements were carried out in triplicate. Analysis of variance and Tukeys studentized range test were performed on Statistical Analysis System to evaluate the significance of differences between mean values. Relationships of parameters were established using a linear regression method. Significance was accepted at the $p<0.05$ levels.

Results and Discussion

Micronutrient composition of base oils and blending oils

Micronutrient composition of the base oils, blending oils, and the blended oils are given in Table-1 and Table-2, these results are comparable to literature reports [5]. The tocopherol content of the oils used was in the range of 326–1508 ppm oil for the different oils. This study showed that there was a decrease in tocols content after one year's shelf life studies[8].

Table 1: Tocols analyzed in oil samples stored in different containers for six months at the 37˚C field temperature

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	Amber	Transparent	Amber	Transparent	
MO	655.14	463.1	409.5	418.1	380.7	413.2
RO	1508.6	580.0	520.30	501	480.1	589.5
MR	1212.73	669	489.1	540.7	443.7	510.9

**Values in ppm.*

Table 2: Tocols analyzed in oil samples stored in different containers for six months in oven 60˚C temperature

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	Amber	Transparent	Amber	Transparent	
MO	655.14	455.0	425.0	410.1	380.7	410.0
RO	1508.6	550.0	500.30	480.0	450.1	570.5
MR	1212.73	601.0	475.1	500.7	412.7	480.9

**Values in ppm.*

Table 3: Oryzanol in fresh oil samples and in samples stored in different containers at field temperature

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	Amber	Transparent	Amber	Transparent	
RO	6527.52	6213.57	6110.57	6125.33	6054.60	6212.3
MR	5931.17	5830.12	5720.23	5736.12	5612.87	5852.39

**Values in ppm.*

Table 4: Oryzanol in fresh oil samples and in samples stored in different containers in oven at 60˚C temperature

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	*Amber*	*Transparent*	*Amber*	*Transparent*	
RO	6527.52	6013.57	5810.57	5825.33	5754.60	5712.3
MR	5931.17	5130.12	5020.23	4936.12	5212.87	5852.39

**Values in ppm.*

Table 5: Phytosterols in fresh oil samples and in samples stored in different containers under field temperature (% = ppm/10,000)

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	Amber	Transparent	Amber	Transparent	
MO	0.7874	0.7058	0.6564	0.7271	0.571	0.684
RO	1.6584	1.5680	1.2530	1.4530	1.2030	1.4850
MR	1.4341	1.3045	1.1565	1.2530	1.103	1.323

*** (% = ppm/10,000)**

Table 6: Phytosterols in fresh oil samples and in samples stored in different containers on oven at 60˚C temperature (% = ppm/10,000)

		Pet Bottle		Glass Bottle		Tin
Oil	Fresh	Amber	Transparent	Amber	Transparent	
MO	0.7874	0.6958	0.6464	0.7071	0.5310	0.6714
RO	1.6584	1.5080	1.1530	1.3530	1.2030	1.2850
MR	1.4341	1.2045	1.1065	1.2030	1.103	1.2023

***(% = ppm/10,000)**

Storage behavior of base oils and blending oils

The micronutrients data are presented in Table-1 and Table-2 respectively. Palm olein oil showed a regular trend. The micronutrients composition of oil blends were similar to their corresponding base and blending oils (Table-1 and Table-2). All micronutrients components decrease values of the vegetable oil and its blends, during storage were observed [5].

Stability of micronutrient components during storage

The contents of the micronutrient components, viz., oryzanol, tocopherol & tocotrienols, Phytosterols and β-carotene (Table-1 and Table-2) were assessed periodically. The contents of oryzanol and tocopherol (shown in the Table-1, Table-2) slightly change during process. The tocopherols content of base oils, blending oils, and their blends, viz., The results presented on the stability of micronutrient components, *viz.*, oryzanol and tocopherols, show that under the conditions used in the study, packaged oils and their blends may retain appreciable amounts of these natural antioxidants and therefore may provide adequate nutrition. Various methods are available for the determination of β-carotene in vegetable oils and related products based on the analysis of unsaponifiable matter using reversed phase C-18 columns and methanol/acetonitrile/methylene chloride [9], methylene chloride/acetonitrile [10], and 90% methanol [11] as the mobile phases. In this study, the β-carotene content was determined by injecting the oil sample solution directly into the mobile phase. The palm olein oil used in this study contained about 50 ppm of β-carotene. The data in Table-4 indicate that β-carotene is relatively stable in palm olein oil and its blends at 35°C for the period of study (12–50%) under the test conditions. In contrast, a substantial instability of β-carotene was observed in the initial three month of storage at 60°C in the PO and its blends (11–50%) (Table-4).The type of the containers used for storage does not seem to exert any effect on the oryzanol content of the blend. There is no appreciable change in the content of phytosterols and oryzanol on long-term storage in different containers, although tin containers retain slightly higher phytosterols and oryzanol on long-term storage. Tin containers retain slightly higher phytosterols and oryzanol than glass and pet bottles (Table-5, 6) [12]. However, there was a drastic change in tocols in MR, amber colored glass and pet bottles, which retained higher tocols as compared to transparent glass and pet bottles, retains the highest amount of tocols among all the containers.

Conclusion

Our study concluded that both the containers used for storage viz. Pet (Amber, Transparent) and Tin, are suitable for storage of various oils and their blends but tin provided slightly better results than pet-amber bottles. The results presented on the stability of micronutrient components, *viz.*, oryzanol and tocopherols, show that under the conditions used in the study, packaged oils and their blends may retain appreciable amounts of these natural antioxidants and therefore may provide adequate nutrition.

References

[1] Sarkar S, Bhattacharyya D K (1991) Nutrition of rice bran oil in relation to its purification. *J Am Oil Chem Soc;* 68: 956-962.

[2] Singhal S C (1998) India's Oils and Fats Industry. Inform; *9*:508–511.

[3] Singh R P, Khanna R K, Srivastava R (2001) Hypolipidemic effect of rice bran oil, safflower oil and their blends, *JOTAI*, Vol; 33: No.2.

[4] Renuka Devi R, Suja K P, Jayalekshmy A, Arumughan C (2000) Tocopherol and tocotrienol profiles of some vegetable oils by HPLC *J. Oil Tech. Assoc. India*; 32: 176-182.

[5] Gopala Krishna A G, Khatoon S, Sheila P M, Sarmandal C V, Indira T N, Mishra A (2001) Effect of Refining of Crude Rice Bran Oil on the Retention of Oryzanol in the Refined Oil. *J Am Oil Chem Soc; 78*:127–131.

[6] Sheila P M, Sreerama Y N, Gopala Krishna A G (2004) Storage Stability Evaluation of Some Packed Vegetable Oil Blends. *J Am Oil Chem Soc 81:* 1125–1129.

[7] Fennema O R (1976) Principles of food science, Part 1, Food chemistry, Marcel Dekker Inc.

[8] Anon (1959) Analytical Methods Committee Report Prepared by the Vitamin E Panel—the Determination of Tocopherols in Oils, Foods and Feeding Stuffs. *Analyst (London) 84*:356–372.

[9] Terao J (1989) Antioxidant properties. *Lipids* 24: 659.

[10] Nkpa N N, Osanu F C, Arowolo T A (1990) Storage studies with RBD palmolein in different containers. *Am Oil Chem Soc* 69: 259

[11] Ng J H, Tan B J (1988) Analysis of Palm Oil Carotenoids by HPLC with Diode Array Detection. *J Chromatogr Sci 26*:463–469.

[12] Linden W O Jr, Eitenmiller R R (1979) Application of Gel Permeation Chromatography and Nonaqueous Reverse Phase Chromatography to Liquid Chromatographic Determination of Retinyl Palmitate and β-Carotene in Oil and Margarine. *J Assoc off Anal Chem 62*:283–289.

[13] Thompson J N, Maxwell W B (1977) Reverse Phase High Pressure Liquid Chromatography of Vitamin A in Margarine, Infant Formula and Fortified Milk. *Ibid 60*:766–771.