Quality Characteristics of Edible Vegetable Oil Blends

Nasirullah*, K.N. Ankaiah, M.N. Krishnamurthy and **K.V. Nagaraja**
Analytical Quality Control Laboratory, Central Food Technological Research Institute, Mysore-570 013, India

Two edible oil blends, namely groundnut oil:rice-bran oil and mustard oil:rice-bran oil, were prepared in different proportions and stored for a period of three years. Their physicochemical characteristics were determined. The results agreed with expected values except for free fatty acid percents and butyrorefractometer readings, presumably due to rancidity. Fatty acid compositions of the blends were determined and ratios of characteristic fatty acids, like lignoceric to palmitic for groundnut oil:rice-bran oil blends, and erucic to palmitic for mustard oil:rice-bran oil blends, were calculated to identify individual oils in the blend.

KEY WORDS: Detection, fatty acids, oil blends, proportion, quality.

To promote the consumption of unconventional refined oils in India such as rice-bran oil, soybean oil, palm olein and cottonseed oil, blends of these oils with raw conventional oils, namely groundnut oil, mustard oil and sesame oil, might be permitted. Little work has been carried out on blended oils in India until 1986 (1). Reports on nutritional quality (2) and keeping quality (3-6) have been published but nothing about quality characteristics and compositional analyses has been reported.

*To whom correspondence should be addressed.

EXPERIMENTAL PROCEDURES

Physicochemical characteristics were determined following AOCS (7) procedures. Fatty acid methyl esters were prepared using sodium methoxide in methanol (8). Gas chromatography was carried out using a gas chromatograph equipped with a flame ionization detector and a stainless steel column of 10′ × ⅛″ packed with 15% diethylene glycol succinate on chromosorb-W (80-100 mesh). The column temperature was 185°C, the nitrogen flow rate was 25 mL/min.

RESULTS AND DISCUSSION

Two oil blends, namely groundnut oil:rice-bran oil (GR) and mustard oil:rice-bran oil (MR) were prepared in the proportions of 10:90, 20:80, 30:70, 40:60, 50:50 and 80:20 (v/v) and stored for a period of three years. Free fatty acid percent (FFA%), iodine value (IV) and butyrorefractometer reading (BRR) were determined at intervals of 6 months, and saponification value (SV) was determined at 18 months. Tables 1 and 2 show these values for the pure oils and blends of 20:80, 50:50 and 80:20 (v/v) for 12-month periods. Average values were determined for each blend, taking 0 and 36 months estimation as the initial and the final values. Further mean value was determined by taking all six average values in consideration. These mean values showed increases in FFA and BRR of GR, 1.9%, 2.6 units; MR, 0.8%, 1.3 units, respectively. Decreases were noticed in IV and SV to the extent of 3.1 units and 1.3

TABLE 1

Quality Characteristics of Groundnut: Rice-Bran Oil Blends During Storage

Blend ratio[a]	FFA %				IV				BRR				SV	
	0[b]	12	24	36	0	12	24	36	0	12	24	36	0	36
0:100	0.25	0.41	0.75	1.3	95.6	95.0	96.2	93.8	58.0	58.5	59.5	65.0	183.9	181.5
20:80	0.50	1.10	1.50	2.2	95.8	95.0	94.3	92.0	57.0	58.0	58.0	61.0	188.0	187.0
50:50	0.90	1.70	2.0	3.0	96.0	95.5	95.5	93.0	56.0	57.5	57.0	58.0	192.0	190.0
80:20	1.25	2.63	2.75	4.1	96.0	95.5	95.4	93.0	56.0	57.5	57.0	58.0	193.1	192.0
100:0	1.50	2.20	2.80	6.8	96.4	95.5	95.3	90.6	55.5	56.5	57.0	60.0	193.1	191.8

[a] GR (v/v).
[b] Months of storage.

TABLE 2

Quality Characteristics of Mustard: Rice-Bran Oil Blends During Storage

Blend ratio[a]	FFA %				IV				BRR				SV	
	0[b]	12	24	36	0	12	24	36	0	12	24	36	0	36
0:100	0.25	0.41	0.75	1.3	95.6	95.2	96.2	93.8	58.0	59.0	59.5	65.0	183.9	181.5
20:80	0.40	0.52	0.78	1.2	96.7	96.0	97.5	94.5	58.0	59.5	59.0	60.0	183.1	182.8
50:50	0.63	0.73	1.00	1.5	102.5	102.0	101.7	96.3	59.0	60.5	59.5	59.0	182.0	181.0
80:20	0.90	0.92	1.10	1.5	103.7	103.0	103.0	98.1	60.0	61.5	60.0	60.0	176.1	175.0
100:0	1.00	1.05	1.37	2.4	107.2	107.0	105.3	100.9	60.0	61.5	61.0	61.5	173.0	171.0

[a] MR (v/v).
[b] Months of storage.

units for GR; 4.8 units and 0.9 units for MR, respectively. No appreciable changes were found in cloud point (CP) and Bellier turbidity temperature (BTT). The changes observed were expected, as during the storage period there is a possibility of oxidative and hydrolytic rancidity which increases the FFA and BRR (9) and, as a consequence, a decrease in IV and SV. Cloud point and BTT are hardly affected by this phenomenon.

Fatty acid compositions of pure groundnut, rice-bran and mustard oils showed the presence of 14:0, 0, 4.3, 0; 16:0, 11.9, 20.8, 3.5; 18:0, 1.7, 1.4, 1.6; 18:1, 41.5, 39.5, 13.2; 18:2, 36.8, 31.6, 16.0; 18:3, 0.9, 0.8, 10.3; 20:0 and 20:1, 2.8, 1.5, 7.2; 22:0, 2.1, 0, 3.3; 22:1, 0, 0, 44.9; 24:0, 2.2, 0, 0, respectively. Fatty acid composition of individual blends conformed with the calculated values. The percent weight of characteristic fatty acids present in the oil was used to calculate the ratio, which is specific for that particular blend and which can be used as a tool for detection of the proportion of individual oils in the blend. The ratio of the percent weight of lignoceric acid over palmitic acid for groundnut oil:rice-bran oil blend and erucic acid over palmitic acid for mustard oil:rice-bran oil blend were as follows: 10:90, 0.01, 0.22; 20:80, 0.02, 0.54; 30:70, 0.04, 0.76; 40:60, 0.06, 1.10; 50:50, 0.08, 2.00; 80:20, 0.13, 5.90, respectively. Ratios for each blend were clear by separation facilitating the determination of the proportion of an individual oil in the blend.

ACKNOWLEDGMENT

Authors thank the Director CFTRI for his keen interest in the work.

REFERENCES

1. Mehta, P., A. Patil and B. Herlenkar, *Indian J. Nutr. Dietet. 23*:126 (1986).
2. Devi, S., and R.B. Shanmugasundaram, *Ibid. 23*:299 (1986).
3. Murthi, T.N., M. Sharma, V.D. Devdhara, S. Chatterjee and B.K. Chakrabarty, *J. Fd. Sci. Technol. 24*:84 (1987).
4. Cowan, J.C., M.A. Helen, G.R. List and C.D. Evans, *J. Am. Oil Chem. Soc. 48*:86A (1971).
5. Murthi, T.N., and C.K. Sharma, *Indian Fd. Packer 36*:11 (1981).
6. Millwalla, R.H.H., and V.R.R. Subramanyan, *J. Oil Tech. Assn. India 18*:87 (1987).
7. *Official and Recommended Methods of the American Oil Chemists Society*, 3rd edn., edited by T.H. Hopper, AOCS, Champaign, IL, 1958.
8. Christie, W.W., *Lipid Analysis*, 2nd edn., Pergamon Press, 1982, p. 53.
9. Nasirullah, K.N. Ankaiah, M.N. Krishnamurthy, K.V. Nagaraja and O.P. Kapur, *J. Oil Tech. Assn. India 14*:55 (1982).

[Received May 10, 1990; accepted January 23, 1991]