Asian Journal of Chemistry Vol. 16, No. 1 (2004), 174–178

Storage Behaviour of Simarouba Seed, Oil and Cake

C. RAMESH BABU, P. RAGHUNANDAN and K.N. JAYAVEERA*
Oil Technological Research Institute
Jawaharlal Nehru Technical University, Anantapur-515 001, India

Simarouba glauca seed stored over a year under normal conditions did not undergo spoilage. The stability order of crude Simarouba oil, bleached oil and refined Simarouba oil towards hydrolytic and oxidative rancidities follows the order crude Simarouba oil > bleached oil > refined Simarouba oil. Expeller Simarouba cake developed high FFA after a few months of storage.

Key Words: Storage behaviour, Simarouba seed, Oil, Cake.

INTRODUCTION

Simarouba glauca D.C., popularly known as Aceituna, belonging to the family of Simaroubaceae, is a tall tree growing to a height of 15 meters. It is native of El Salvador in Central America. It has been introduced into India from El-salvador by the National Bureau of Plant Genetic Resources at the Regional Station, Amaravati, Maharashtra, exclusively for soil conservation purpose, specially earmarked for eroded waste lands, bald hills and degraded lands. In view of its excellent performance, plantations of *Simarouba glauca* were propagated extensively in the states of Orissa, Bihar, Madhya Pradesh, West Bengal, Andhra Pradesh, Karnataka, and Tamil Nadu.

No studies are available on the storage behaviour of Simarouba seed, its oil and cake. Simarouba oil is made edible at Oil Technological Research Institute, Anantapur. To study the storage behaviour of Simarouba seed, oil and cake the present work was taken up .

EXPERIMENTAL

Simarouba seed was procured from Bhubaneswar, Orissa state. Crude, refined, bleached oils and cake were got by processing the above seed. Storage studies on oils were extended to two other samples.

The physico-chemical characteristics of the samples were determined according to AOCS methods[1].

Storage of Simarouba seed

50 kg of cleaned Simarouba seed was taken in a clean gunny bag and was stored in a well-ventilated place at ambient room temperature. Samples of seed were drawn periodically and were analyzed for moisture, oil, FFA and protein contents. A part of the sample drawn was pressed in cold in a laboratory model hydraulic press. This oil was tested for peroxide value, colour, FFA and IV values. The results are given in Table 1.

Storage of Simarouba Oil

A bulk consignment of the seed, a part of which was stored as described above, was crushed in a table expeller. A part of the crude oil was alkali-refined and part

of the latter was bleached with a mixture of bleaching earth and activated carbon. The crude, refined and bleached oils were drawn periodically and analyzed for their characteristics (Table-2).

To check up the trends of certain characteristics in the storage behaviour of crude, refined and bleached oils, two more samples of different crude Simarouba oils were refined and bleached and the changes in these characteristics of the oils on storage recorded in comparison with the first set of samples. Comparative results of three sets of samples are given in Table-3.

Storage of Simarouba cake

The expeller cake obtained was taken in gunny bags and kept for storage under the same conditions as seed and oil were stored. Results are given in Table-4.

In general, the commodities were stored in a godown with free access to air and diffused light. The materials were so kept as not to be accessible to rodents and insects like cockroaches.

RESULTS AND DISCUSSION

Storage of Simarouba Seed (Table-1)

For a storage period of 375 days, the moisture content did not show much variation. The oil content showed slight but not significant fall taking into account the high level of oil content in the Simarouba seed and analytical errors in dealing with high oil content material. There was slow and steady rise in the free fatty acids of the oil from the seed, from 2.3 to 2.9, a rise by about 40 per cent over the initial value. The oil expelled from the seed even after one year's storage would still be acceptable conforming to official standards. The protein content of the seed was more or less constant throughout the period of storage. Peroxide values fluctuated erratically but were, nevertheless, very low. The high value reached was 5.2. The low free fatty acid contents (FFA) and peroxide values show the extraordinary stability of Simarouba seed towards hydrolytic and oxidative rancidity respectively under satisfactory storage conditions.

Storage of Simarouba Oil (Tables 2, 3)

Expelled oil samples were taken up for periodical analysis. The free fatty acid contents of crude oil increased from an initial value of less than 2.3 to 3.3 in a storage period of 450 days. There is a gradual increase in the peroxide values of crude oil from initial low values of 10, 17.2 and 12 to 36.2, 32 and 31 respectively in samples 1, 2 and 3. Peroxide values of refined and bleached oils show interesting trends. These peroxide values are the highest for the refined category of all the three categories of oils, namely, crude, refined and bleached at any period of storage in the case of all the three samples studied. This points out to the fact that Simarouba oil should not be stored in the refined state but should be stored in crude state and be refined as and when required for use. While the initial stages, the gap between the peroxide values of refined and bleached oils is wide, but a storage period progresses, it is levelling up. Thus from 360 days onwards, the peroxide values of refined and bleached oils are close.(Table-2). This trend is also confirmed in the study of samples 2 and 3, in Table-3. If the level of peroxide value of 50 is taken up as an acceptable one, then crude oil

could be stored for about 10 months. Lovibond colours decrease perceptibly in crude oils but very slightly in refined and bleached oils.

TABLE-1
STORAGE OF SEED

S.No.	Storage period in days	Moisture (%)	Oil (%)	FFA (%)	Total protein (%)	Peroxide value	Lovibond colour 1 inch units
1	Initial	2.4	65.8	2.1	47.0	4.2	15.5
2	15	2.6	65.8	2.4	47.2	4.1	15.2
3	35	2.5	62.2	2.2	47.1	4.0	15.5
4	47	2.6	65.6	2.6	47.0	3.8	15.8
5	67	2.7	65.7	2.6	46.9	4.0	15.2
6	77	2.8	65.5	2.7	46.8	5.2	15.5
7	107	2.3	65.8	2.9	47.1	5.1	15.4
8	137	2.3	65.9	2.9	47.2	4.8	15.7
9	167	2.6	65.7	2.3	47.4	4.9	16.1
10	197	2.6	65.3	2.2	47.1	4.4	16.2
11	225	2.1	65.4	2.3	47.0	3.9	16.1
12	255	2.2	65.2	2.1	47.2	4.7	16.5
13	315	2.6	65.1	2.0	47.3	4.6	17.0
14	345	2.3	65.8	2.1	47.1	3.7	17.2
15	375	2.2	65.6	2.1	47.1	4.1	17.3

FFA = free fatty acid.

TABLE-2
STORAGE OF CRUDE, REFINED AND BLEACHED SIMAROUBA OIL (SAMPLE I)

Storage period in days	Crude oil				Refined oil			Bleached oil		
	FFA	PV	LBC	IV	PV	LBC	IV	PV	LBC	IV
0	—	—	—	—	—	—	—	—	—	—
30	2.3	10.2	14.2	52.5	—	—	—	—	—	—
60	2.5	14.3	13.8	—	35	6.2	50	2	2.8	53
90	2.7	18.2	14.5	52.5	42	5.8	—	8	2.1	—
120	2.5	22.5	15.5	—	52	5.8	50	15	2.0	53
150	2.7	30.0	15.5	—	60	5.9	—	20	2.0	—
180	2.5	36.2	16.2	—	68	6.0	50	26	2.6	53
210	2.7	42.2	14.2	52.5	78	6.0	—	32	2.7	—
240	2.7	49.5	13.8	—	83	6.2	—	39	2.7	53
270	2.9	55.2	13.8	—	94	6.5	—	44	3.0	—
300	2.6	61.1	12.9	—	98	5.9	50	51	3.1	—
330	2.8	68.2	12.4	52.5	110	5.6	—	56	2.5	53
364	2.9	75.5	13.8	—	120	5.4	50	59	2.4	—
390	3.0	80.1	13.8	—	128	5.4	50	62	2.3	—
420	3.1	83.0	13.6	52.5	134	5.2	—	66	2.2	53
450	3.3	88.0	12.9	—	140	5.1	50	70	2.0	53

FFA = free fatty acid per cent
PV = peroxide value, milli equivalents per kg of fat
LBC = Lovibond colour in one inch cell in Lovibond Tintometer

TABLE-3
STORAGE BEHAVIOUR OF CRUDE, REFINED AND BLEACHED SIMAROUBA OILS IN RELATION TO CHANGES IN CERTAIN CHARACTERISTICS

Storage period in days	Simarouba oil sample	Sample numbers					
		Peroxide value			Lovibond colour		
		1	2	3	1	2	3
0	Crude	—	17.2	12	—	15.8	14.0
(initial)	Refined	—	32	30	—	7.0	5.2
	Bleached	—	4	6	—	3.0	2.9
30	C	10.2	16.8	11	14.2	15.4	13.8
	R	—	40	38	—	6.8	5.8
	B	—	8	10	—	3.0	2.7
60	C	14.3	15.5	15	13.8	15.0	13.2
	R	35	46	46	6.2	6.4	6.0
	B	2	10	16	2.8	3.2	3.1
90	C	18.2	19.2	18	14.5	16.2	14.2
	R	42	52	54	5.8	6.9	5.8
	B	8	14	28	2.1	3.4	2.8
120	C	22.5	21.4	22	15.5	16.4	15.3
	R	52	60	61	5.8	7.1	5.4
	B	15	20	36	2.0	3.2	3.0
150	C	30	26	28	15.5	16.6	16.1
	R	60	64	60	5.9	6.9	5.6
	B	20	22	44	2.0	3.5	2.8
180	C	36.2	32	31	16.2	17.1	16.4
	R	68	70	69	6.0	6.8	5.4
	B	26	30	50	3.5	3.5	2.8

1,2,3 are sample numbers
C = crude oil
R = refined oil
B = bleached oil
FFA = free fatty acid percent
PV = peroxide value, milli equivalents per kg of fat
LBC = Lovibond colour in one inch cell in Lovibond Tintometer

TABLE-4
STORAGE OF SIMAROUBA CAKE

S. No.	Storage period in days	Moisture (%)	Oil (%)	FFA (%)	Total protein (%) (deoiled cake)
1	0	6.2	12.2	14.6	51.8
2	150	6.2	12.0	54.5	52.0
3	165	6.8	11.4	52.8	50.6
4	180	5.9	10.9	52.4	51.7
5	195	5.2	10.9	58.1	51.9
6	210	5.7	11.3	57.2	52.0
7	225	5.9	12.1	56.8	51.7
8	245	6.3	12.2	55.9	51.8

Storage of Simarouba Cake

Moisture, oil and total protein contents do not change on storage but the free fatty acid content has risen from 14.6 to 55.9 in 150 days and remains at that level for a further 95 days. It may be presumed that at ambient room conditions, the free fatty acid content of Simarouba cake will reach a value round about 50 per cent in a few months.

REFERENCES

1. Official Tentative Methods, American Oil Chemists' Society, 3rd Edn. (1975).
2. T.S. Ma. and G. Zuazaga, *Ind. & Engg.Chem.*, **14**, 280 (1942)
3. K.V.S.A Rao and G. Lakshminarayana, *J. Food Sci. Tech.*, **20**, 176 (1983).
4. P. Budowski, R.T. O'Connor and E.T. Field, *J. Am. Oil Chem. Soc.*, **27**, 307 (1950).
5. V.C. Mehlenbacher, The Analysis of Fats and Oils, pp. 191–193 (1960).
6. Mario Lewy.van severan, *J. Am. Oil Chem. Soc.*, **30**, 124, (1953).
7. S.P. Rath, Srinivasulu and S.N.Mahapatra, *J. Oil Tech. Assoc. (India)*, **19**, 64 (1987).
8. G. Biswal and K. Pradhan, *J. Oil Tech. Assoc. (India)*, **19**, 57 (1987).
9. P. Budowski, F.G.T. Menezes and F.G. Dollear, *J. Am. Oil Chem. Soc.*, **27**, 377 (1950).

(*Received*: 25 March 2003; *Accepted*: 10 September 2003) AJC–3161