STUDIES ON THE INDIAN SARDINE OIL

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Sardines along with other Clupeids comprise nearly 20% of the total catch which is roughly one million tons per annum. Among the sardines the oil sardines (*Sardinella longiceps*) form the most important group along the West Coast and the fishery spreads over October–March. During the heavy seasons the bulk of the catch is utilized for the manufacture of fish oil and fish guano. The correct assessment of the oil production is not possible as it is manufactured by the private merchants all along the coast. A rough estimate is possible from the oil sardine landings. The approximate percentage of the extractable oil from fresh sardines is 5%. The general method which has undergone very little improvement since its inception which dates back as far as forty years (1921) consists in boiling the fish with water in large iron pans over open fire and pressing the boiled mass in coir bags with the aid of vertical screw presses. The liquid is drained into settling tanks which are interconnected at top and bottom for the separation of oil and water. The separated oil is stored in tins or tanks until it is finally exported. The oil so prepared is mostly used for painting boats and for tempering steel. The versatile uses of the fish-body oils and their products have not assumed much importance in India, due to its uncertain quality and the non-availability of the good oil.

Much work was done on the liver-oils by Kini (1945), Kini and Jayaraman (1947), Sarangadhar (1947) for their Vitamin A content and other chemical characteristics as these are medicinally important. In this paper the author has studied the chemical quality of the commercial sardine oil samples. Good quality sardine oil prepared at Malpe has been used for comparison.

The commercial sardine oil samples collected at various places were manufactured in the traditional method described earlier with very little variations. Along with the commercial samples, sardine oil was prepared in Malpe by boiling the thoroughly washed fish in sufficient quantity of water to avoid scorching of the fish. The oil was pressed from the material through

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thick canvas bags. The oil was allowed to settle and the clean oil was centrifuged and destearinated. The good quality oil so obtained was yellow in colour as compared with commercial oil samples, which were dark brown to black. The chemical constituents were determined for the good quality oil and the commercial samples by the AOAC methods. All the samples were stored in air-tight glass bottles at laboratory temperature (28–32° C.) and the changes during the storage period were observed.

The analysis for the various chemical constituents like the specific gravity, refractive index, acid value, peroxide value, saponification value, unsaponifiable matter and Iodine value for the commercial oil samples are given in Table I. The changes in the acid value, peroxide value, free fatty acids and Iodine value during the storage of the good oil obtained in Malpe are given in Table II *a*. Table II *b* represents the storage quality of the commercial oil samples.

From Table I it is seen that the colour varied from yellow to black in the commercial oil samples. The acid value, free fatty acids and the peroxide values are comparatively higher in the commercial samples than the good quality oil. The dark colour of the commercial samples was due to the scorching of the fish during boiling and prolonged storage with the nitrogenous matter at the bottom of the tanks. The low saponification and high acid value in the Pudiangadi sample shows the hydrolysis of glycerides. The acid values are generally increased during the storage period but the increase was little in the good quality oil when compared with commercial samples (Table II *a* and II *b*). The oils were having an objectionable odour which is due to the degradation products of proteins which are presumably present in the samples. The peroxide value has shown very little increase during its one year storage period in the good quality oil. The results in Table II *a* show that the good quality oil can be preserved for one year without much deterioration. The commercial samples spoil quickly due to the suspended protein material which deteriorates during the storage period. The peroxide formation was delayed in the body-oil samples as compared with liver-oil samples from *Dasyatis and Acetomylacys maculetus* (Kamasastri, 1959). This may be due to the possible presence of enzyme systems in the body oils or of inhibiting substances present in the fish. This problem needs further investigation. The diversity in the range of chemical constants in the commercial oil and the fluctuations in the sardine fishery (raw material) prevents its use in the leather industry (Nayudamma, 1956), even though the good quality sardine oil possesses the characteristics required for the leather industry. At present imported oils and oil products are used in the leather industry. Besides its uses in the leather industry fish-body

TABLE I

Analysis of commercial sardine oil samples collected during the 1957 season

Sl. No.	Place of collection	Duration of storage (months)	Type of preparation	Colour of the oil	Specific gravity	Refractive index	Acid value	Free fatty acids as % oleic	Iodine value	Peroxide value	Saponification value	Water-soluble fatty acids %	Water-insoluble acids %	Unsaponifiable matter %	Moisture %
1	Kozhikode I ..	4	Kept in sun and oil extracted	Dark-brown	0·933	1·475	13·23	6·66	114·2	4·1	196·5	1·09	87·50	1·06	0·31
2	,, II ..	4	Fish boiled and oil extracted	,,	0·941	1·476	13·01	9·28	107·60	1·4	213·2	1·30	85·60	1·03	0·79
3	Pudiangadi I ..	2	,,	Black	0·920	1·470	90·63	45·63	99·40	6·3	140·5	1·42	85·94	1·50	..
4	,, II ..	1	,,	,,	0·922	1·471	99·26	49·98	134·20	6·7	157·8	1·34	77·76	1·56	..
5	Pudiappa I ..	4	,,	,,	0·926	1·474	40·27	20·27	126·80	1·39	203·1	2·12	89·33	0·84	0·53
6	,, II ..	1	,,	,,	0·921	1·473	85·07	42·84	149·05	3·07	205·5	2·00	86·34	1·00	0·50
7	Mangalore I ..	Fresh	,,	Dark-brown	0·928	1·475	20·29	10·52	150·7	2·00	207·0	2·23	87·16	1·47	0·92
8	,, II ..	6, 7	,,	,,	0·918	1·471	71·64	35·91	147·2	1·8	203·0	3·43	90·05	1·47	..
9	Malpe ..	1	,,	Brown	0·925	1·475	11·52	5·8	161·0	Nil	195·6	0·09	94·12	0·58	0·15
10	Malpe (good oil extracted)	Fresh	,,	Yellow	0·925	1·475	11·50	5·79	161·0	Nil	195·6	0·09	94·12	0·58	0·15

TABLE II *a*

Storage studies on the good quality sardine oil obtained from Malpe

(Storage period)

Chemical constants	Fresh	45 days	120 days	180 days	210 days	285 days	345 days
Acid value ..	11·50	11·40	11·5	11·98	12·43	12·96	19·72
Free fatty acids ..	5·79	5·74	5·80	6·03	6·26	6·53	9·88
Iodine value ..	161·0	160·00	156·2	150·0	154·6	138·0	135·9
Peroxide value ..	Nil	Nil	Nil	Nil	Nil	Nil	0·38

TABLE II *b*

Analysis of seven months' old sample (commercial)

Chemical constants	Pudiappa 210 days	Pudiangadi I 245 days	Pudiangadi II 210 days
Acid value ..	118·5	98·63	103·2
Free fatty acids ..	59·65	49·66	51·74
Iodine value ..	149	145·7	134
Peroxide value ..	2·1	1·05	1·3

oils, find versatile uses in textile, cosmetics and various food industries. In an organised exploitation of the sardine fishery, application of modern wet reduction processes and strict quality control are necessary for the production of good quality sardine oil.

SUMMARY

The commercial sardine oil samples were analysed and the deterioration in the quality during storage was studied along with the sardine oil prepared in controlled conditions. The good quality oil can be preserved for one year without much deterioration.

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