

Educational (191 /) Department.

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Indian oils and fats" read by A. Kesava
Menon, State Technical Scholar before
the Society of Chemical Industry,
London.

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68
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EDUCATIONAL DEPARTMENT.

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2

1911.

Subject.

ENCLOSURES.

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No. 99

Station, *Madras*, Dated the *8th* February 1911.

From (Name) *J. R. Henderson, Esq.,*
M. B., C. N., F. L. S.,
(Designation) *Ag. Superintendent,*
Government Museum,
To The Secretary to the Government of Madras,
Educational Department,

Sir,

Referring to G. O no 665
Educational dated 27th December
1909, I have the honour to forward
for the information of Government
a reprint of a paper, entitled
"Some Indian oils and fats" read
by Mr. A. Kesava Menon, State

PD
9-2-11

2/27
Technical Scholar, before the Society
of Chemical Industry, embodying
the results of his research on
the sample oils and oil seeds
supplied to him by this Museum.

I have the honour to be,
Sir,
Your most obedient servant,

J. R. Henderson.

Ag. Superintendent,
Government Museum.

J.R.

Incl. to Dec 29/7

3
REPRINTED FROM THE JOURNAL
OF THE
Society of Chemical Industry.

LONDON SECTION.

DECEMBER 31, 1910.

SOME INDIAN OILS AND FATS.

BY

A. KESAVA-MENON, B.A.

LONDON:

VACHER AND SONS, LTD., WESTMINSTER HOUSE, S.W.
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[Reprinted from the *Journal of the Society of Chemical Industry*, Dec. 31, 1910. No. 24, Vol. XXIX.]

London Section.

Meeting held at Burlington House, on Monday, December 5th, 1910.

MR. E. GRANT HOOPER IN THE CHAIR.

SOME INDIAN OILS AND FATS.

BY A. KESAVA-MENON, B.A.

The following fats and oils, received from reliable sources in India, were examined by me in the laboratory of Dr. Lewkowitsch.

Ghi.

"Ghi," as known in India, is the melted and clarified butter fat from which all the adhering water has been removed by evaporation. It is generally prepared from the milk of buffaloes, cows, sheep, etc., by adding fermented butter milk to boiled milk, when the "thyre," i.e., a curdled mass, separates on the top. This "thyre" is skimmed off, churned, heated, and the clarified fat poured off for use.

Buffalo milk yields more ghi than does cow's milk. Buffalo ghi is also harder and whiter than cow ghi. One quart of buffalo milk yields 3—3½ ozs. of ghi.

An enormous amount of ghi is imported across the Northern Frontiers into India, as will be gathered from the following table:—*

Imports	1902-1903	1903-4	1904-5	1905-6	1906-7
Cwt.	130,638	164,262	165,463	168,264	185,752
£	353,905	427,042	479,598	505,760	604,895

There is also a large internal trade in ghi carried on, especially from Kashmir, where very little ghi is consumed on account of the religious beliefs of the people, to the rest of India. The Central Provinces, the United Provinces, and some parts of the Madras Presidency send considerable quantities of ghi to the port towns of Calcutta, Bombay and Madras, whence it is exported to Ceylon, to the Straits Settlements, Aden, Natal, British East Africa, and other places for consumption by Indian settlers.

The total exports from India to these places are given in the following table:—

	1902—1903	1903—1904	1904—1905	1906—1907
Cwt. ..	57,304	48,133	54,445	43,609
£.....	181,783	152,722	177,816	151,029

The coasting trade from Bengal and Madras to Burma was estimated at £113,440 during the year 1905—1906.

Besides the ordinary uses of ghi as a foodstuff, it is largely employed as a medicinal preparation for rheumatism. It is burned in the Hindu temples of Southern India, and used for anointing the idols. For this purpose only cow ghi is employed, as ghi from buffalo and other animals is considered impure and unholy.

The samples of cow ghi and buffalo ghi I have analysed were specially prepared for me in my home in India, so that I can guarantee their purity. The cow ghi was prepared from the milk of two cows of an age of six and eight years.

* Watson: "The Commercial Products of India."

Physical and Chemical Characteristics of Ghi.

	Cow ghi.	Buffalo ghi.
<i>Fat:—</i>		
Specific gravity, d 100°/100°	0.8961	0.8965
" " d 100°/15°	0.8616	0.8619
Acid value	1.49	2.00
Saponification value	218.25	206.8
Reichert-Meissl value	25.70	18.24
Titration No. of insoluble volatile acids		
1/10 KOH	2.07	0.74
Unsaponifiable matter per cent.	0.59	0.73
Butyro refractometer at 25° C "degrees"	49	—
" " 40° C "	40.6	44.5
" " 45° C "	—	42.0
<i>Fatty Acids (total insoluble):—</i>		
Per cent.	88.05	90.65
Titer test	39.75	45.30
Neutralisation value	210.4	204.9
Mean molecular weight	266.6	273.8
Iodine value	32.8	30.7

In the stearic acid test, cow ghi fatty acids yielded 1.21 per cent. of crystals melting at 61.1° C., while the buffalo ghi fatty acids gave 25.8—30 per cent. of crystals melting at 64.1° C. On again recrystallising from stearic acid solution, no crystals were obtained from cow ghi while the amount fell to 2.29—4.9 in buffalo ghi, thus showing that even buffalo ghi does not contain appreciable amounts of stearic acid. The melting point of the crystals was 65.6° C. instead of 68° C. of pure stearic acid.

Adulteration of ghi is practised to such an enormous extent in India that in some districts laws have been enacted or are in the course of being enacted to protect the genuine article against fraudulent practices. All the common oils, such as ground nut oil, sesamé oil, coconut oil, cotton seed oil, etc., are used as adulterants; but recently castor oil, illipe butter, and rice starch are being indiscriminately mixed with ghi.

Bassia oils.

The *Bassia* family yields solid fats which may become of commercial importance. Genuine seeds, of known origin, supplied to Dr. Lewkowitsch by Mr. D. Hooper of the Indian Museum, Calcutta, have been examined.

Bassia butyracea.—Ver. names: Phulvara, churi, yel, etc. (Hindustani). The fat is obtained from the seeds of *Bassia butyracea*, a tree indigenous to the Himalayas. The seeds are small, about 1 cm. in length. The kernels on extraction with petroleum ether yielded 64·8 per cent. of a solid fat having the consistence of lard. The fat has an agreeable odour and pleasant taste, and is used largely for edible purposes.

Bassia latifolia.—Ver. names: Illupi, Mowrah, Mowa, etc. *B. latifolia* is a tree widely distributed in the Northern Provinces of India, and especially in Bengal. The fruit encloses one to four seeds, which are almond-shaped, and about 2—3 cms. long. The kernels are reddish-brown and have a bitter taste. On extraction with petroleum ether, the kernels yielded 45·7 per cent. of a solid fat of a yellowish-white colour. The fat is used for various purposes in India, for burning, as an ointment for the skin and as an adulterant of ghi. The oil cake is used to poison fish and the smoke from burning it is said to kill insects and rats.

Bassia longifolia.—Ver. names: Illupi, Elupi, etc. *Bassia longifolia* is a tree commonly met with in Southern India, propagating itself by self-sown seedlings. No attempt has been made to cultivate this species in a systematic manner. The seeds are longer and less rounded than those of *B. latifolia*. Encased within a glossy, hard and strong shell, is the kernel, having a reddish-brown appearance and possessing a bitter taste. On extraction with petroleum ether the kernels yielded 53·0 per cent. of a white fat softer than that from *B. latifolia* and *B. butyracea*. The uses to which this fat is put are almost similar to those of the fat from *B. latifolia*. The oil cake known in India as "*Illipi poonac*," is rubbed on the body for cleansing purposes. A variety of the above species is *Bassia Malabarica* (ver.: Irupe (Mal.)), a tall tree found in the Western Ghats from Kanara to Travancore and the Anamalais. The fat has almost the same properties as that from *B. longifolia*.

The value of the exports of Mowa or Mowrah seeds from India to European countries from the year 1899—1909 is given in the following table:—

TABLE I.

Countries.	1899—1900	1900—1	1901—2	1902—3	1903—4	1904—5	1905—6	1906—7	1907—8	1908—9
France	£ 80,320	£ 5,700	£ 110,853	£ 31,326	£ 71,400	£ 115,697	£ 49,360	£ 32,877	£ 140,661	£ 61,012
Belgium	18,147	5,261	25,898	26,262	58,648	48,581	13,667	6,697	88,746	57,490
United Kingdom	—	—	1,426	2,200	8,225	28,931	52,289	3,375	61,922	42,202
Other countries	2,422	26	57,073	40,707	31,831	12,209	5,988	7,470	2,763	5,457
Total	100,889	10,987	195,250	100,555	165,104	205,418	119,304	50,419	297,092	166,161

TABLE II.

Name.	Average weight of one seed in grams.	Kernels per cent.	Husks per cent.	Fat extracted with petroleum ether on seeds per cent.	Fat extracted with petroleum ether on kernels per cent.	Residue extracted with ether on seeds per cent.
<i>Bassia butyracea</i>	1·00	67·48	32·52	43·75	64·82	2·76
<i>B. latifolia</i>	2·00	70·93	29·07	32·42	45·70	1·45
<i>B. longifolia</i>	1·40	74·46	25·54	38·46	53·0	1·06
<i>B. Payson oleifera</i>	0·64	71·95	28·05	40·58	56·34	1·10

TABLE III.
Physical and Chemical Characteristics of Bassia Oils.

Name.	Specific gravity.		M.pt. 0° C.		Acid value.	Saponifi- cation value.	Reichert- Meissl value.	Titration No. of insol. vol. 1/10 KOH.	Iodine value.	Butyro refractometer.		Unsaponi- fiable matter per cent.	Iodine value of unsap. matter.
	d100/1100	d100/115	Capillary tube method.	Over Hg.						" Degrees."	at 0° C.		
1. <i>E. butyracea</i> ..	0.8924	0.8580	46.70	43 to 51	66.4	104.65	1.25	0.54	41.22	{ 40.0 45.0	44.0	2.20	77.24
2. <i>B. latifolia</i>	—	—	47.8	47.5	153.00	187.6-190	1.6	0.36	50.4	{ 45.0 45.0	42.5	2.27	—
3. <i>B. longifolia</i> ..	—	—	30.2	26 to 29	26.63	185.60	1.75	0.33	58.24	{ 40.0 45.0	43.0	2.13	66.13
4. <i>E. Malabarica</i> *	0.8930	0.8586	—	32.0	12.10	187.2-188.5	1.35	0.55	63.6	{ 40.0 45.0	50.0	2.55	58.56
5. <i>Paysona odellera</i>	0.9033	0.8685	29.1	—	54.0	183.9-185.0	1.86	0.50	58.62	{ 40.0 45.0	49.5	2.03	50.79

TABLE III.—Physical and Chemical Characteristics of Basia Oils—(continued).

Name.	Insoluble fatty acids.												
	per cent.	Melting point 0° C.	Iodine value.	Neutralisation value.	Mean molecular weight.	Liquid acids per cent.	Melting point 0° C.	Iodine value of liquid acids.	Neutralisation value of liquid acids.	M.M.W. of liquid acids.	Stearic acid in total acids.	Melting point 0° C.	
1. <i>B. butyracea</i>	95.08	53.3	38.43	105.9	281.9	—	34.4	81.08	177.6	315.7	nil	—	
2. <i>B. latifolia</i>	93.95	48.3	48.54	189.9	295.2	59.54	34.4	87.33	173.8	322.7	13 to 25	66.9	
3. <i>B. longifolia</i>	93.7	45.6	52.07	188.7	297.1	29.50	30.2	—	—	—	12 to 20	67.2	
4. <i>B. Malabarica</i> *	94.00	45.8	59.50	192.1	291.9	—	—	—	—	—	nil	—	
5. <i>Pagena oleifera</i>	91.65	40.0	59.05	192.2	291.7	—	—	—	—	—	—	—	

* The fat expressed from the seeds examined.

Payena oleifera.—Ver. name: Kansive oil. *Payena oleifera* is a tree met with in Burma. The seeds are smaller than those of *Bassia butyacea*, but have otherwise the same appearance. The kernels on extraction with petroleum ether yielded 56.34 per cent. of a white fat with a slight reddish tinge. The fat is used for various purposes.

In India, the fats from the *Bassia* family are indiscriminately sold under similarly sounding names as illupi, ellupai, mowa, mowrah, etc.

The value of the exports of mowa or mowrah seeds from India to European countries for the years 1899—1909 is given in Table No. I.

In Tables II. and III. comparative data regarding the four species are collated.

Arachidic acid is absent.

The kernels were extracted with petroleum ether so as to obtain the fats free from resinous substances for the analytical examination, and in order to reach this object as far as possible, the kernels had not been extracted exhaustively. The residual mass was further extracted with common ether to obtain the last quantities of fats which would, of course, be contaminated with resinous substances. That this was really the case is shown by the following abnormal results.

Name of fat.	Acid value.	Saponification value.	Unsaponifiable matter per cent.	Neutralisation value of fatty acids.	M.M. W.
<i>B. butyacea</i>	61.0	140.0	25.78	144	389.2
<i>B. latifolia</i> ..	135.5	209.9	8.9	186.4	300.9
<i>B. longifolia</i>	55.15	210.3	9.7	190	295.0
<i>Payena oleifera</i> ...	106.0	222.6	4.91	189.5	296.0

The following oils were received from the Government Museum, Madras. Oils expressed from the seeds have been examined, except in the case of the oil, from the seeds of *Sapindus trifoliatus*, which was obtained by extracting the seeds with ether. Hitherto no efforts have been made

in India to prepare the oils for other purposes than for medicinal use. As large quantities of these seeds are available, there would seem to be a prospect of exploiting them commercially.

Jatropha glandulifera.—Vernacular names:—Addalai, Uddalai (Tamil); Nikumba (Sanskrit). *Jatropha glandulifera* is a shrub or small evergreen tree, common at the outskirts of villages in Bengal, Burma, the Northern Circars, and Deccan, but rare in Oudh and the Punjab. In the Lower Provinces the shrub forms one of the most abundant of hedge plants. The plant is also prevalent in the waste lands of tropical Africa. The fruit forms a capsule of the size of a hazel nut, and contains three to four seeds, each of which has the size of a pea. On extraction with ether the seeds yielded 21.3 per cent. of a light straw-coloured oil which was turbid at a temperature of 55° F. This oil is prepared in India by collecting the capsules when they just begin to split open and change their colour from green to brown. The seeds are then thrown on a mat and covered with another mat, and thus exposed for a few hours' bright sunshine when the seeds readily separate from the shell. The oil is then obtained from the seeds in the ordinary way by expression. The seeds form 29.8 per cent. of the capsule. The oil is chiefly used by the natives as an embrocation against rheumatism and paralysis. Like other oils of the *Cucurbitaceae* family, it is employed as a purgative, and is considered a good remedy in cases of ulcers, ringworm, etc. The following characteristics have been ascertained:—

Fat:—Acid value, 15.79. Saponification value, 194.5. Reichert-Meissl value, 4.00. Insol. vol. acids titration no. 1/10 KOH, 0.41. Unsaponifiable matter, per cent., 1.38. Butyro-refractometer at 25° C. "Degrees," 76.5; at 40° C. "degrees," 68.5. *Fatty acids*: per cent., 89.01. Melting point, 35° C. Iodine value, 119.6. Neutralisation value, 187.3. Mean molecular weight, 299.4.

Luffa acutangula.—Ver. names:—Pikunkai (Tamil), Turi, Jurgi (Hindustani), Peechangai (Malayalam). *Luffa Acutangula* belongs to the family of *Cucurbitaceae*, and is met with in North-Western India, Eastern Bengal, Sikkim, and is distributed to Ceylon and Malaya. It is also cultivated in most parts of India, chiefly for the green fruit, which is cooked. The fruits, seeds, and leaves are employed

in their raw state in medicine as an emetic. The seeds are small (17 seeds weigh one gram), black, irregularly pitted, and two lobed at the base. The kernels form 48.0 per cent. of the seed. On extraction with ether the seeds yielded 20 per cent. of an oil of light green colour (= 41.6 per cent. calculated on the kernels).

The expressed oil is yellowish white in colour, and solidified at the ordinary temperature.

The following physical and chemical characteristics were ascertained:—

Fat.—Specific gravity (d 100/100) = 0.9363; (d 100/15) = 0.9002. Acid value, 93.7. Saponification value, 229.2. Reichert-Meissl value, 13.1. Titration no. of insol. volatile acids 1/10 KOH, 0.83. Iodine value, 40.12. Unsaponifiable matter, per cent., 1.09. Butyro-refractometer at 25° C. "Degrees," 73.0; at 40° C., 61.0. *Fatty acids* (insoluble) per cent., 82.3. Melting point, 44.1° C. Iodine value, 41.9. Neutralisation value, 215.0. Mean molecular weight, 260.9.

Mimusops elengi.—Ver. names:—Mulsari (Hindustani), magilamaram (Tamil). *Mimusops elengi* is a large ever-green tree belonging to the Sapotaceae. It is indigenous to the forests of the Northern Circars, Ceylon, and the Western Ghats as far north as Kandalla, and met with also growing wild in the Malay Peninsula.

The flowers contain a volatile oil which is used in perfumery. The fruit is a smooth ovoid containing a one-seeded berry, and is yellow when ripe and about one inch long. The kernel is of a yellowish-brown colour, and has a very bitter taste, and it is enclosed in a strong, glossy outer husk. The shells form 64.0 per cent. of the seeds. In Bombay a preserve is made from the fruits. On extraction with ether, the kernels yielded 18.47 per cent. of a yellowish-brown viscid oil (= 6.65 per cent. calculated on the seeds). The oil is used for culinary purposes, for burning, and is extensively employed in medicine for various purposes. The expressed oil has a light yellowish white colour, and "stearine" deposits on standing. The seeds are obtainable in fairly large quantities in Madras.

According to Col. Drury ("Drury's Useful Plants," p. 292), the oil is employed by painters; but its low iodine value of 66.5 would militate against its use as a drying oil.

The following physical and chemical characteristics were ascertained:—

Fat: Specific gravity (d 100/100) = 0.9129; (d 100/15) = 0.8777. Acid value, 45.5. Saponification value, 213.9. Reichert-Meissl value, 10.6. Titration no. of insol. vol. acids 1/10 KOH, 0.68. Iodine value, 66.5. Unsaponifiable matter, per cent., 1.56. Butyro-refractometer at 25° C. "Degrees," 73.5; at 40° C., 67.0. *Fatty acids*: per cent., 89.4. Melting point, 35° C. Iodine value, 68.11. Neutralisation value, 202.06. Mean molecular weight, 277.6.

Pithecolobium dulce.—Ver. names:—Vilati (Hindustani), Anli (Bombay), Korukapilly (Tamil). *Pithecolobium dulce* is a middle-sized, ever-green tree introduced from Mexico and now cultivated throughout India, especially along the railway lines of the Madras Presidency. The fruit ripens from April to June, and contains a number of large seeds each of which is enveloped in a sweet, whitish pulp. The seeds are black, shiny, partly immersed in an arillus, and replete with an edible pulp of a yellowish white colour. The pulp on extraction with ether yielded 18.22 per cent. of a yellowish white oil, with a beany smell, which solidified at a temperature of 15° C. (= 13.20 per cent. calculated on the whole seed). The expressed oil is yellowish white, and very viscous, and "stearine" deposits on standing. The kernels form 72.4 per cent. of the seed. Church (Dictionary of the Economic Products of India, Watt, Vol. VI, Part I, p. 282) states that 100 parts of bean contain: water, 13.5 parts; albuminoids, 17.67 parts; starch, 41.4 parts; fatty matter, 17.1 parts; fibre, 7.8 parts; ash, 2.6 parts.

Physical and chemical characteristics of Pithecolobium dulce:—

Fat: Specific gravity (d 100/100) = 0.9106; (d 100/15) = 0.8756. Acid value, 63.9. Saponification value, 205.9. Reichert-Meissl value, 8.41. Titration no. of insol. vol. acids, 1/10 KOH, 0.34. Iodine value, 56.60. Unsaponifiable matter per cent., 1.17. Butyro-refractometer at 25° C. "Degrees," 69.5; at 40° C., 62.0.

Fatty acids: per cent., 87.64. Melting point, 44.7° C. Iodine value, 57.59; Neutralisation value, 198.7. Mean molecular weight, 282.2.

Psoralea corylifolia.—Ver. names: Bavanchi (Hindustani), Bakuchi (Uriya), Karguva arishi (Tamil).

Psoralea corylifolia is a common herbaceous weed found in the plains from the Himalayas, through India to Ceylon. The seeds are somewhat ovate, of a dark brown colour and have an aromatic odour and a slightly bitter taste. The seeds have usually come to this country as an oil seed under the name of Bawchan seed. They are used in India for the treatment of cutaneous affections, and are used in pharmacy as a laxative and stimulant.

On extraction with ether the seeds yielded 20.15 per cent. of a thick reddish brown oil with a pleasant and very strong aromatic odour. The expressed oil is clear, and of a light brown colour and "stearine" deposits on standing.

The following physical and chemical characteristics were ascertained:—

Fat: Specific gravity (d 100/100)=0.9107; (d 100/15)=0.8756. Acid value, 39.18. Saponification value, 204.6. Reichert-Meissl value, 6.9. Titration no. of insol. volatile acids 1/10 KOH, 0.71. Iodine value, 79.9. Unsaponifiable matter per cent., 1.73. Butyro-refractometer at 25° C. "Degrees," 79.5; at 40° C., 71.5.

Fatty acids (insoluble): per cent., 88.3. Melting point, 32.8° C. Iodine value, 83.06. Neutralisation value, 192.4. Mean molecular weight, 291.5.

Sapindus trifoliatus.—Soap nut tree of Southern India. Ver. names: Ritha (Hindustani), Puvandi (Tamil), Uruvangi kai (Malayalam).

Sapindus trifoliatus is a large, handsome tree commonly met with in the villages of Southern India and Ceylon.

The fruits are coriaceous or fleshy, two or three slightly united and each has the size of a cherry. The seeds are subspheroid. The pericarp contains Saponin which according to Dymock (Dymock, Warden and Hooper Pharmacographia Indica 1—367) amounts to 11.5 per cent. and lathers strongly with water. Brant (Dictionary of the Economic Products of India, Watt, Vol. VI., II. part, p. 470) is of the opinion that no saponin is con-

tained in the woody stone, seed, or husk. The fruits are used by gold- and silversmiths in India for polishing ornaments. The fruits are also valuable for washing silk and woollen fabrics. The kernels on extraction with ether yielded 44.67 per cent. of a semi-solid, yellow oil (=15.8 per cent. calculated on the seeds=5.7 per cent. calculated on the fruit). The kernels form 12.5 per cent. of the whole fruit and the seeds form 36 per cent. of the fruit. The expressed oil had a dirty brown colour. It solidified completely at the ordinary temperature and exhibited a characteristic odour. The fat is employed medicinally, but its high price precludes its general use. The tree has not yet been cultivated with a view to the production of oil.

The following physical and chemical characteristics were ascertained:—

Fat: Specific gravity (d 100/100)=0.8542; (d 100/15)=0.8213. Acid value, 42.75. Saponification value, 191.8. Reichert-Meissl value, 1.61. Titration no. of insol. vol. acids 1/10 KOH, 0.37. Iodine value, 58.58. Unsap. matter per cent., 1.1. Butyro-refractometer at 25° C. "degrees," 74; at 40° C., 65.

Fatty acids (insoluble): per cent, 93.9. Melting point, 54.4° C. Iodine value, 57.0. Neutralisation value, 188.6. Mean molecular weight, 297.3.

Thespesia populnea.—Ver. name: Puvaras (Malayalam). *Thespesia populnea* is an evergreen tree of moderate size found in the coast forests of India, Burma, the Pacific Islands, the Andaman Islands, and Ceylon. It is largely cultivated along the roadside, especially in Madras. The tree is known in India as the Tulip or Portia tree. It is said to yield a gum and the capsules and flowers are said to give a yellow dye. The seeds are small, triangular shaped, a light slightly feathery shell enveloping a dark brown, soft mealy pulp. The latter on extraction with ether yielded 41.7 per cent. of a very viscid reddish brown oil possessing a characteristic odour (19.60 per cent. calculated on the whole seed). The kernels form 47 per cent. of the whole seed.

The expressed oil is dark red and of a syrupy consistency; on standing "stearine" deposits. The oil is used in India in the treatment of cutaneous affections.

The following physical and chemical characteristics were ascertained :—

Fat: Specific gravity (d 100/100)=0.9018; (d 100/15)=0.8670. Acid value, 48.10. Saponification value, 201.4—204.0. Reichert-Meissl value, 5.9. Titration no. of insol. vol. acids 1/10 KOH, 0.55. Iodine value, 71.5. Butyro-refractometer at 25° C. "degrees," 81.5; at 40° C., 73.0.

Fatty acids (insoluble): per cent., 93.5. Melting point, 43.9° C. Iodine value, 75.3. Neutralisation value, 196.9. Mean molecular weight, 284.7.

Vernonia anthelmintica.—Ver. names: Vapachi (Hindustani), Kattugirakam (Malayalam)

Vernonia anthelmintica is a tall, robust, leafy annual plant, met with throughout India to Ceylon and Malacca, ascending to 5,500 ft. in the Himalayas and Khasi mountains. The seeds are said to possess powerful anthelmintic and diuretic properties, and are also used as an ingredient of a powder prescribed in cases of snake bites. The seeds are cylindrical, tapering towards the base, marked with about 10 pale longitudinal ridges. They are about an eighth of an inch long and are of a brown colour. The taste is nauseous and bitter. The seeds are used for the treatment of cutaneous affections and for preserving woollen goods from the attacks of insects. In India, the oil is never prepared for sale. The seeds on extraction with ether yielded 18.25 per cent. of a dark brown coloured and strong smelling oil with some resinous matter. The expressed oil is of a light yellow colour and very viscid; "stearine" deposits on standing.

Physical and chemical characteristics of *Vernonia anthelmintica*:—

Fat: Specific gravity (d 100/100)=0.9168; (d 100/15)=0.8835. Acid value, 58.2. Saponification value, 202.88. Reichert-Meissl value, 7.88. Titration no. of insol. vol. acids 1/10 KOH, 0.35. Iodine value, 71.00. Unsaponifiable matter per cent., 1.79. Butyro-refractometer at 25° C. "degrees," 75.0; at 40° C., 67.5.

Fatty acids: per cent., 91.6. Melting point, 35.6° C. Iodine value, 73.4. Neutralisation value, 195.1. Mean molecular weight, 287.4.

DISCUSSION.

The CHAIRMAN asked with reference to the previous discussion, whether the iodine determinations had been made with the Wijs solution and how long they had been allowed to stand. He thought some definite procedure should be fixed for the determination of these constants of fats and oils; and it was well that this procedure should be always indicated. He gathered that only one of these oils was being imported into Europe; but if they were cheap and plentiful in India, there should be a considerable opening for their export. All the oils struck him as being very rancid; was that a standing feature, or was it merely due to the fact that they were prepared on a very small scale and had therefore been exposed to oxidizing influences?

Dr. J. LEWKOWITSCH said that these oils, with the exception of the butter fats, had been prepared a long time ago and had then become rancid. The ghi showed how, by a natural process, those who were forced to eat fat of one kind or another hit upon a mode of preparing one of the most important foodstuffs in such a manner that it did not easily become rancid. The butter fats exhibited were obtained by simply taking out the water and the putrescible substances, so that the fat could be kept for a long time and could be transported over long distances. This process was also practised in Siberia, China, and Turkey, all of which countries consumed butter in the form of butter fat. In South Germany also butter fat was a well-known article of commerce and was sold in considerable quantities. The practice extended in South Germany even to the preparation of large quantities of "margarine fats" prepared in that way from margarine. The high veneration in which the ghi was held was shown by the fact that in Southern India butter fat was burned in the temples. This was also the case in the lamaseries of Tibet, where butter-fat was burnt before the idols. The commercial side of the question was undoubtedly of very great importance. The value of the exports of oil seeds and fruits from India, allowing for fluctuations in prices, amounted to from £8,000,000 to £12,000,000 per annum; the principal were linseed, cotton seed, rape seed, sesame seed, arachis nuts, copra, and castor seed. It seemed curious that a country of that size and wealth was unable to produce the oils and fats which had to be manufactured

in Europe. The habit of the natives, produced through the long oppression by the Mohamedans, of hoarding their silver had to a large extent militated against the erection of factories. The amount of adulteration which went on in small villages, where all those oils were produced by simply grinding the seeds between stone, was incredible. The natives had even found that linseed cake could carry any amount of stuff which was not linseed if put in so that the cake would not show it on simple inspection. Only recently Indian "Native linseed cake" had been exported to the Continent, the buyers believing that the name indicated that it was really pure linseed, but which contained heavy admixtures of mowra seed, which was bitter and most injurious to animals. All those things would have to be altered. What India wanted was, not only commercial enterprise exploitation of their natural resources, but also a staff of young men who were able to carry out scientifically all that was done now in the ordinary industrial procedure in this country.

Mr. E. R. BOLTON said the Reichert-Meissl value of the buffalo butter seemed abnormally low; was that the only sample or had there been others of which that figure was an average? There were some figures published by Richmond some little time ago which were very high; and in a recent paper (*Analyst*, 1910, 343), of which he was joint author, they had obtained figures for pure ghi much higher than that now shown; but they had not the advantage of knowing for certain whether they were for buffalo or cow's butter. Their paper confirmed Mr. Menon's statement that ghi was largely adulterated. Out of a number of samples which they had analysed, they had only been lucky enough to find a few pure ones. He was continually impressed by the accuracy and reliability of Wijs' solution. When one once got into the way of working it, one could hardly go wrong and he hoped, for the sake of uniformity of results, that in time every analyst would use it.

Mr. E. PARRY said he believed the remarks just made with regard to the Wijs solution were strictly accurate when dealing with the use of the solution on oils; but it was an admitted fact that with resins the Hübl figures and the Wijs figures differed. Dr. Langmuir agreed that dealing with resins, the figure was practically double with the Wijs solution.

Mr. KESAVA-MENON, in reply said the question regarding the rancidity had already been answered by Dr. Lewkowitsch. These oils were prepared, most of them, four or five years ago. He did not see why these seeds should not have been sent before from India in large quantities; but perhaps the mere fact that they had not been investigated might account for it. Occasionally a consignment of one of them came; but perhaps the want of production in large quantities prevented a continuance of the trade. The iodine value was ascertained in every case with Wijs solution, which he thought gave accurate and concordant results in all cases. He had employed it solely and found it quite satisfactory. Dr. Lewkowitsch had said it was to some extent owing to the want of studying these products scientifically, according to up-to-date methods that no progress was made; and he hoped many of his fellow countrymen would follow his footsteps and come to England to study, and then return with their knowledge to their own country and exploit some of those vast untouched stores of natural products, such as that of oil seeds. With regard to Mr. Bolton's remarks, the buffalo ghi was specially prepared for him in his own home according to his directions by his brother, who owned large farms and took every care to make the ghi as pure as possible. The figures were rather low, but the ghis were not rancid; the acid value of cow ghi was 1.49; and of the buffalo ghi, 2; the figures showed that the fats had been well preserved and there was no doubt as to their origin.

Mr. BOLTON said that after what Mr. Menon now said he might throw some light on the low Reichert-Meissl figure. Mr. Menon's brother, in his endeavours to prepare the sample as honestly and properly as possible, would no doubt heat it until quite free from water and might have over-cooked it, whereas the manufacturer, whose object was to obtain the minimum loss, would heat it only just sufficiently to drive out the water, and thus often under-cooked it. It was therefore possible that a difference in the amount of heating might account for the low figure as compared with some of the pure commercial samples.

Mr. KESAVA-MENON said it was probable that the samples Mr. Bolton had examined were prepared commercially

for the market. Many of such products were "under-cooked" in order that some amount of water might be left in. The samples he had shown had been properly cooked, neither "under-cooked" nor "over-cooked." There was no doubt that the samples sent to market in large cities would be always "under-cooked."

NOTES.

C. No. 297 From the S. G. M. No 99 dated 8. 2. 1911.

SUBJECT. Results of the examination of some Indian oils and fats by A. Kesava Menon, a State Technical Scholar.

The report may be recorded. It was called for at the instance of the Hon.ble Sir Murray Hamnitch - vide his orders on page 4 of G.O. No. 65 of 27-12-09.

2. The draft order placed below is submitted for approval.

PP
14-2-11 The paper may be submitted to the Hon.ble Sir Murray Hamnitch, K.C.S.G., C.I.E., for perusal.

RD
14-2-11 To H.M. for perusal. The report, as noted to ^{be} ~~the~~ paper, is very technical and does not convey any information of the commercial value of the products investigated. In the discussion the Chairman p. 17 observes "if the oils were cheap & plentiful in India, there should be a considerable opening for their export." & the author on p. 19 says he did not see why these seeds should not have been sent before from India in large quantities. The text mentions an error, as at least some of them e.g. the Tulip tree, p. 15 & the Kokapitai p. 17. For order while the author may be asked to report on the commercial value of the oils.

Sm
15/2/11

Circulated in
Box No 43.

Unique that to my point of interest here is the fact that our Scholar was able to read what apparently was a valuable paper. He seems to be making good use of his time. I don't think we need do more than read - The paper will be read in the Chemical world.

h
u - 4
25.

[S.O. No 118 Mis D 28-2-11]

” ” ” ” ” ” 191 .

C. No. 297, From the Sept, No. 99, dated 8. 2. 1911

191

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Miss

No. 118, dated 28. 2. 1911.

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To, the S. G. W.
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