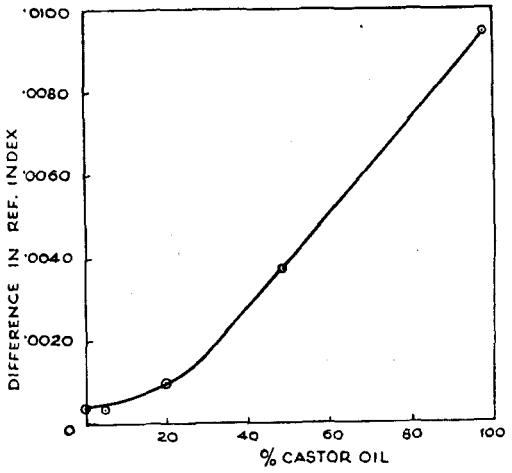

FIG. 1 — PERCENTAGE OF CASTOR OIL IN ADMIXTURE WITH GROUNDNUT OIL PLOTTED AGAINST DIFFERENCE IN REFRACTIVE INDICES AT 25°C. BETWEEN THE ORIGINAL AND ACETYLATED PRODUCT.

TABLE IV — FRESH & RANCID OILS

	Acid val.	Ref. index at 25°C.		
		Original	Acetylated	Difference
Fresh groundnut oil	1·2	1·4742	1·4738	−0·0004
Fresh sesame oil	0·5	1·4727	1·4731	+0·0004
Rancid groundnut oil	4·1	1·4708	1·4709	−0·0001
Rancid linseed oil	23·5	1·4863	1·4867	+0·0004

castor oil, e.g. rancidity, and reliable estimates of castor oil are not always possible. The time involved in the determination of acetyl value — 4 hr. for acetylation and washing, and 4 hr. for the estimation of bound acetic acid — is unduly long. In the procedure worked out by us, the time taken is considerably reduced, as only acetylation is involved, and the determination of refractive index is both rapid and accurate.

Effect of Rancidity — The refractive index procedure was applied to aged and rancid samples of groundnut and linseed oils, and to fresh samples of groundnut and sesame oils. The results (TABLE IV) obtained in this study indicate that rancidity has but little effect on the depression of refractive index.

The study is being extended to other oils. In the meanwhile, the results obtained so far are presented, as they may prove to be of help to other workers in evaluating castor oil when present in admixture with vegetable oils which do not contain hydroxy acids.

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STUDIES ON THE NUTRITIVE VALUE OF BLENDED *VANASPATI*: I—DIGESTIBILITY OF FATS

Vanaspati (SHORTENING) WITH THE DESIRED melting point (*c.* 37°C.) can be prepared by (1) straight hardening, according to which the whole batch is hardened to the required melting point, and (2) blending, according to which a portion of the oil (14-16 per cent in the case of groundnut oil) is hydrogenated to give a product with m.p. 45°-55°C., and the product so obtained is blended with the refined oil. The blending process is said to be cheaper and more flexible.

Data relating to the quantities of straight hardened and blended *vanaspatis* produced in India are not available. It is stated, however, that the majority of the *vanaspati* brands are straight hydrogenated products.

Extensive studies have been carried out on the nutritive value of straight hardened *vanaspati*[1-7] but information on the blended product is scanty. A comprehensive study of blended hydrogenated products has been undertaken in this laboratory, and the results on digestibility trials are reported in this paper.

Adult albino rats weighing *c.* 150 gm. were used as test animals. The experimental diet employed in these studies consisted of: casein, 15; fat, 15; sugar, 5; salt mixture, 4; and starch 60 parts. The animals were fed *ad lib*, each animal receiving daily 1 c.c. of Adexolin diluted 10 times with groundnut oil, 0·2 gm. of yeast (*Squibb*), 40 μgm. of thiamine and 70 μgm. of riboflavin.

The fats experimented with were: butter fat (ghee), coconut oil, refined groundnut oil, partially hydrogenated oils, and 3 blends of hydrogenated groundnut oil (m.p. 60°C.) with refined groundnut oil, melting at 38°, 45° and 51°C. respectively.

Experimental animals were allowed 5 days as a "period of orientation" and faeces

TABLE I

	Ghee	Coconut oil	Groundnut oil, refined	Hydrogenated oil,* m.p. 38°C.	Blended product, m.p. 38°C.	Hydrogenated oil,* m.p. 45°C.	Blended product, m.p. 45°C.	Hydrogenated oil,* m.p. 51°C.	Blended product, m.p. 51°C.
No. of rats	8	8	8	8	8	6	6	6	6
Av. wt. of rats, gm.	155	150	140	142	152	153	160	158	159
Av. change in body wt., gm.	+3	+1	+4	+3	+4	−1	+0	−6	−4
Av. fat ingested, gm.	9·5	10·0	9·8	10·1	9·2	10·2	10·8	9·0	9·1
Av. wt. of stools, gm.	4·6	4·5	4·1	4·8	5·0	7·5	6·3	10·8	9·9
Av. total fat excreted corrected for metabolic fat, gm.	0·36	0·42	0·47	0·38	0·32	0·846	1·10	3·54	3·12
Neutral fat and fatty acids, gm.	0·22	0·29	0·30	0·22	0·25	0·42	0·34	0·38	0·38
Soaps, gm.	0·28	0·36	0·38	0·40	0·32	0·75	1·13	3·2	3·0
Coeff. of digestibility †	96·2 ±1·2	95·3 ±1·3	95·7 ±1·08	96·2 ±1·20	96·5 ±2·6	92·3 ±1·5	90·2 ±0·8	60·5 ±1·4	66·3 ±1·6

TABLE II

	Ghee	Coconut oil	Groundnut oil, refined	Hydrogenated oil,* m.p. 38°C.	Blended product, m.p. 38°C.	Hydrogenated oil,* m.p. 45°C.	Blended product, m.p. 45°C.	Hydrogenated oil,* m.p. 51°C.	Blended product, m.p. 51°C.
Saturated fatty acids in the fat fed, % of total fat	57	84	18	30	34	38	40	60	65
Saturated fatty acids in faecal fat, % of total fat †	58±1·0	58±1·3	29±0·96	38±1·8	48±1·1	54±0·88	56±1·2	72±1·0	75±2·0

* Straight hydrogenated groundnut oils m.p. 38°, 45° and 51°C. respectively, were supplied by *Messrs Hindustan Vanaspati Manufacturing Co. Ltd.*, Bombay.

† Mean value.

± Standard error of the mean.

collected after this period. Individual collections were made daily and excreta preserved in an ice chamber.

The combined faeces for the first 8-day period was dried at 60°C. to constant weight, ground to powder and extracted with ether. The residue was dried, ground to a paste with 50 per cent sulphuric acid and the paste extracted with ether. The neutral fat and the fatty acids so obtained were weighed after drying at 60°C. The digestibility of the fats was calculated in the usual way (TABLE I).

The fat present in the second 8-day experimental period was saponified with 15 per cent KOH, neutralized and extracted with ethyl ether. The fatty acids were partitioned into solid and liquid fatty acids according to Twitchell's lead-salt method. The results are given in Table II along with the percentage of saturated fatty acids present in the ingested fat.

The digestibility of oil is not affected by incorporating in it fully saturated fats in the blends melting within the physiological range.

The quantity of saturated fatty acids present in faecal fat is significantly higher than that present in the fat fed to the animal.

Analyses shows no significant differences in the fats of faeces collected from animals fed on hydrogenated and blended fats with m.p. exceeding 45°C.

Saturated acids present in blends (m.p. 38°C.) tend to accumulate in faecal fat.

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1. LANGWORTHY : *Ind. Eng. Chem.*, 1923, **15**, 276.
2. DEUEL & HOLMES : *Amer. J. Physiol.*, 1921, **54**, 479.
3. Idem : *Bull. U.S. Dep. Agr. No.* 1033 (1923).
4. HOLMES : 1925, quoted by DEUEL : *J. Nutr.*, 1946, **32**, 69.
5. HOAGLAND & SNIDDER : *Bull. U.S. Dep. Agr. Tech. No.* 821 (1943).
6. CROCKETT & DEUEL : *J. Nutr.*, 1947, **33**, 187.
7. MISRA & PATWARDHAN : *Ind. J. Med. Res.*, 1948, **36**, 27.