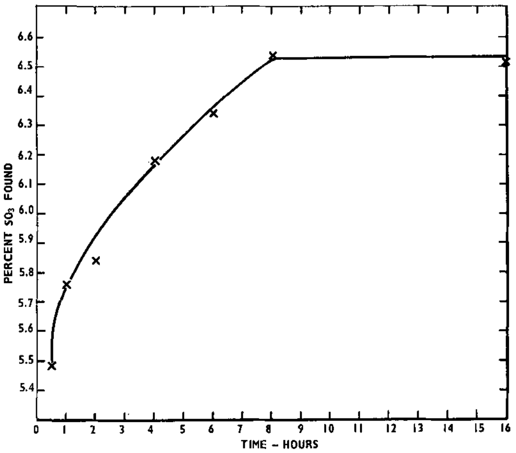

FIG. 1. Study of time under reflux vs. SO_3 content.

Based on the results obtained, the reflux period required for the determination of organically combined SO_3 in sulfated fatty acid esters should be extended at least 2 hr after both layers are clear. In practice, we have found it convenient to carry out the hydrolysis by heating the mixture under reflux overnight (ca. 16 hr) and titrating the samples the following day. Using this method, duplicate runs, by one operator, normally do not vary by more than 0.02% SO_3.

TABLE I

Analysis of Sulfated Materials for Combined SO_3 at Various Reflux Periods

Time under reflux (Hr)	Combined SO_3 (%)[a] 2	6	16	24	
Material sulfated					
n-Propyl tallate	7.32	7.86	7.92	7.92	(4)[b]
Iso-octyl tallate	5.98	6.30	6.34	6.34	(6)[b]
Propyl oleate	7.60	8.06	8.16	8.14	(4)[b]
Tall oil fatty acid	7.12	7.12	7.12	7.12	(1)[b]
Ricinoleic acid	4.34	4.42	4.50	4.50	(3)[b]
Castor oil	5.70	5.78	5.78		(2)[b]

[a] Per cent SO_3 was determined on material as is.
[b] Time (hr) required for both layers to be clear.

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• *Letter to the Editor*

Validity of Gunstone's Acyl Group Distribution Theory in Vegetable Fats Containing Appreciable GS_3

GUNSTONE (1) presented a theory of acyl group distribution of vegetable fats which he stated provides a satisfactory correlation for most of the available data and unifies earlier theories into one covering the whole range of vegetable fats. The validity of this theory was, however, illustrated with only two vegetable fats, *Sapium sebiferum* (2) and *Platonia insignis* (3), that contain more than traces of GS_3. Other data reported in the literature for several vegetable fats is not in full agreement with Gunstone's theory. The data were obtained by reasonably reliable oxidation and crystallization methods and are presented in Table I. The data is for fats wherein full glyceride type structures have been determined along with the proportions required according to Gunstone's and Kartha's theories (4,5) and the Tally Number for each fat with reference to each theory.

The Tally Number (TN) is a method for obtaining a reasonable numerical idea of the agreement between experiment and theory in glyceride type structure studies in keeping with present day stan-

TABLE I

Glyceride Type Structures of Some Vegetable Fats Containing Appreciable GS_3

Fat	1(c)[a]	2(c)	3(o)[b]	4(c)	5(o)	6(o)	7(o)	8(o)	9(o)
Sm	73	65	54	53	51	82	74	77.5	92.6
Glyceride type structure, experimental, moles %									
GS_3	21	20	9	8	9	57	42	47	81
GS_2U	77	55	54	54	48	33	40	40	17
GSU_2	2	26	28	32	31	8	15	13	2
GU_3	0	0	9	6	12	2	3	0	0
Glyceride type structure, calculated, Gunstone's theory, moles %									
GS_3	19	0	0	0	0	46	22	33	78
GS_2U	81	96	65	63	58	54	78	67	22
GSU_2	0	5	31	33	37	0	0	0	0
GU_3	0	0	4	4	5	0	0	0	0
Tally number	8	81	28	20	32	42	78	54	10
Glyceride type structure, calculated, Kartha's theory, moles %									
GS_3	19	20	9	8	9	55	40	46	80
GS_2U	81	58	53	51	45	36	43	41	19
GSU_2	0	19	30	33	35	8	15	12	1
GU_3	0	3	8	8	11	1	2	1	0
Tally number	8	13	4	6	8	6	6	4	4

[a] c–GS_3, GS_2U by crystallization.
[b] o–GS_2U by azelaoglyceride estimation: GS_3 by crystallization where S is above C_{16} and by acetic acid-acetone-permanganate oxidation where S is below C_{16}.

Key: 1. *Sapium sebiferum* (Meara and Gupta, *J. Chem. Soc.* p 1337, 1950).
2. *Platonia insignis* (Hilditch and Pathak, *J. Chem. Soc.* Suppl. #1, p 587, 1949).
3. Palm oil (Kartha, *JAOCS 30*, 326, 1953; *31*, 85, 1954).
4. Palm oil (Hilditch and Maddison, *J. Soc. Chem. Ind. 59*, 67, 1940).
5. Palm oil (Luddy, et al., *JAOCS 31*, 266, 1954).
6. *Myristica malabarica* I (Kartha, *J. Sci. Ind. Res. 13A*, 72, 1954).
7. *Myristica malabarica* II (Kartha and Narayanan, quoted in Kartha, *J. Sci. Ind. Res. 21A*, 577, 1962).
8. *Myristica attenuata* (Kartha and Narayanan, *J. Sci. Ind. Res. 21B*, 494, 1962).
9. *Myristica fragrans* (Kartha and Narayanan, *J. Sci. Ind. Res. 21B*, 442, 1962).

dards of experimental accuracy by the most reliable, though not necessarily the most modern, methods. TN is obtained by summing the numerical differences (irrespective of sign) between the experimental and calculated values for each of the four different glyceride types. The GS_2U can now be determined correctly to $\pm 0.75\%$ by gravimetric chemical methods and hence, according to present day standards, TN of 0–6 means good agreement, 7–12 fair agreement, and 13–20 means serious cause for disagreement, possibly due to the presence of some interfering non-fatty impurity. TN above 20 usually means irreconcilable disagreement between experiments and theory and may perhaps mean non-relevance of theory concerned in the context considered. With Sm (saturated acids, moles %) above 90% GS_3 contents according to random distribution and Gunstone's theory are too close together; hence, agreement at Sm above 90 has little significance. In the fats in Table I, TN for Gunstone's theory is 20 and above for 7 out of the 9 fats showing no resemblance of an agreement and it is in fair agreement only for a single fat with Sm below 90. The second theory considered shows good or nearly good agreement in all cases except one where the results quoted have been obtained by crystallization.

Adequate reliable data is already present in the literature to show that even among natural vegetable fats GS_3 contents and glyceride type structures are not just dependent on saturated acid content alone as claimed by Gunstone's theory. Kartha's theory leaves the GS_3 to a biologic source factor over all ranges of saturated acid composition subject to a maximum value as required by random distribution and merely outlines the changes in glyceride type structures produced when GS_3 differs from random distribution values for individual fats. It is clear (Table I) that it gives a good prediction of glyceride type structures from S and GS_3 contents in vegetable fats containing appreciable GS_3.

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