Formation of Uro-lac

IT was suggested[1] that the optical activity of lac is a useful property which could be of considerable value in investigating the reaction of ureas and other substances with lac, which is widely practised with a view to improve the quality of lac in certain directions. Treatment of lac (*Kusum* bleached) in butyl alcohol with urea (10 per cent. on the weight of lac), in presence of anhydrous sodium sulphate and refluxing the reaction mixture at the temperature of boiling water for 24 hours, results in the formation of uro-lac, lac in which urea exists in the combined state. The free and uncombined urea in the reaction mixture is eliminated by repeatedly washing the butyl alcohol solution with water until a portion of the washings does not show any trace of urea as determined by the urease test.

A control experiment without urea was also conducted. Similar sets of experiments were carried out with sclero- and soft-lacs both of which were prepared from *Kusum* bleached lac. The following table gives the figures for the acid value, specific rotation and the total nitrogen of the resulting products:

	Acid value	Specific rotation $[\alpha]_D^{25°C.}$	Total nitrogen %
Lac ..	63·81	54·34	0·05
Lac-*uro* ..	57·94	60·06	1·30
Sclero-lac ..	52·82	47·96	0·00
,, *uro* ..	49·94	47·55	1·12
Soft-lac ..	82·39	49·19	0·00
,, *uro* ..	78·50	51·28	1·32

A decrease in acidity accompanies treatment of lac or its components with urea, while a definite increase in optical activity is registered with urea compounds of lac and its soft component. Treatment of sclero-lac with urea does not appear to bring about any change in its optical activity, although it has entered into combination with about the same quantity of urea. It has been found that under the conditions of the experiment, about 2·8 per cent. of urea can be made to react with lac and its components.

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[1] *Curr. Sci.*, 1939, 8, 165.

Detection of Adulteration in 'Ghee' (Clarified Butter) by the Ultra-Violet Fluorescence Technique

IT has long been known that many substances show a fluorescence under ultra-violet light and this property of the ultra-violet light has of late been increasingly utilised in the detection of adulteration in certain drugs, *e.g.*, alkaloids, cod liver oil.[1,2] While engaged in the analyses of cod liver oil in the laboratory, one of us (M.C.M.),* who had considerable experience in the analysis of food materials like butter and 'ghee' at the Sind Government Laboratory at Karachi, suggested that the fluorescence technique could be extended to the field of 'ghee' analysis.

(1) To start with, about 20 to 25 samples of 'ghee' from various sources were purchased from the local market. These were all melted at a low temperature and were exposed simultaneously under the ultra-violet fluorescence lamp (Hanovia-Muir type). A number of common adulterants of 'ghee' such as groundnut oil, cocoanut oil, cotton seed oil, hydrogenated oil (*Dalda vanaspati*), gingelly oil, lard, margarine, tallow, etc., were secured and treated in

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the same manner under the ultra-violet lamp, the distance from the ultra-violet ray tube and the time of exposure remaining constant in both cases. The results are indicated in the following table:

TABLE I

No.	Article	Nature of flourescence	Remarks
1	Cow ghee	Deep green	Slight difference in shade
2	Buffalo ghee	,,	,,
3	Groundnut oil	Bright blue	Shades slightly different from each other
4	'Dalda vanaspati'	,,	,,
5	Cocoanut oil	,,	,,
6	Cotton seed oil	,,	,,
7	Gingelly oil	,,	,,
8	Lard	Strong blue	,,
9	Margarine	,,	
10	Beef tallow	Light blue	
11	Mutton tallow	,,	

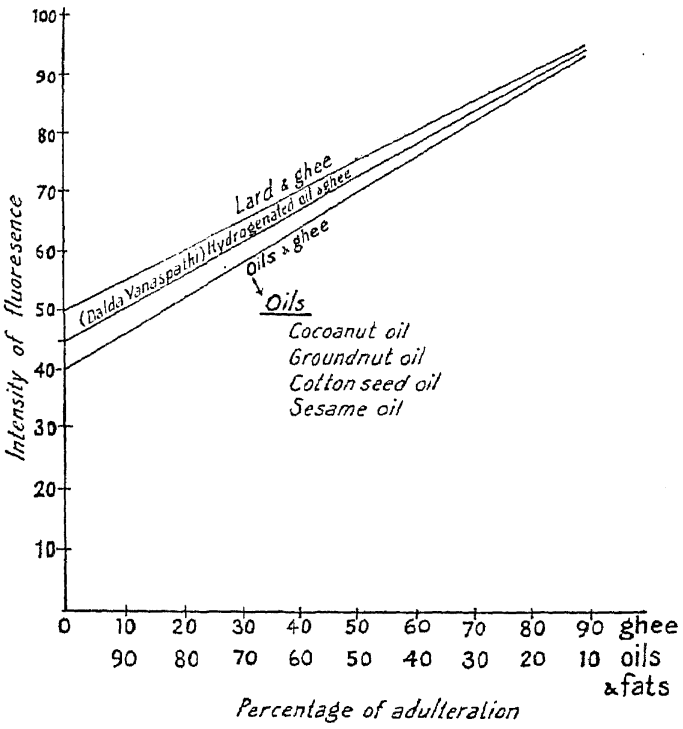
It will be noticed from the above observations that 'ghee', both from cow and buffalo milk, yielded a deep bright green fluorescence which was quite characteristic and differed significantly from the colour and intensity of the fluorescence emitted by all the common adulterants of 'ghee'. This observation naturally indicated that if genuine 'ghee' was mixed with varying proportions of the above adulterants, the resulting adulterated product would be characterised by a mixed green-blue fluorescence, in contradistinction to the deep bright green of the pure 'ghee'.

(2) To determine to what extent the nature and degree of adulteration could be correlated with the intermediate shades of fluorescence between the green on the one end and the blue on the other, a quantity of 'ghee' was prepared† from a sample of genuine and certified butter obtained from a local dairy firm and this was mixed with the different adulterants in proportions varying from 10 per cent. to 90 per cent. and exposed to ultra-violet light under the Hanovia-Muir Lamp in the same manner as described in (1) above. It was noticed that an adulteration extending from 20 per cent. upwards could be easily recognised by the naked eye by watching the gradual preponderance of the blue shade over the characteristic bright green of pure ghee. The difference in the nature and degree of fluorescence in the cases in which the adulterants occurred in proportions of less than 20 per cent., however, was not sufficiently marked to enable any definite opinion to be given. Further, it was realised that this method could only be used as a rough qualitative 'spot-test' for the detection of adulteration of 'ghee' in general, and that this method would not lend itself to accurate quantitative measurement unless the intensity of fluorescence could be measured and expressed in numerical terms.

(3) An attempt was therefore made to measure the fluorescence intensity and to establish a relation between the intensity of fluorescence and the degree of adulteration of genuine 'ghee'. The Pulfrich Photometer with

† The butter was divided into two portions—the first half was turned into ghee at a low temperature while the other half was exposed to a temperature over 100° C. Both samples gave fluorescence (Green) of equal intensity. On chemical analysis the samples gave the following results: B. R. value—42·5; Polenski value—2·2; R. W. value—31·6, indicating that it was genuine ghee.

the attached Analytical Quartz Lamp assembly, was used for this purpose and was found to be of particular advantage in investigating fluorescence phenomena. The samples of pure 'ghee' and the adulterated mixture dissolved in chloroform‡ were placed in 5 mm. glass cell in immediate proximity to the light source employed to excite the fluorescence (*e.g.*, Analytical Quartz Lamp). The fluorescence emitted by the ultra-violet light falling on the samples was then measured by interposing in the light path a red colour filter (L. 1). This filter was found after repeated trials to be the most suitable for our purpose. In the accompanying graph,|| the values obtained for the fluorescence intensity



are plotted against the different concentrations of the adulterated mixtures of ghee with vegetable oils, 'Vanaspati', lard, etc.

From a reference to the graph, it will appear that the intensity of fluorescence is more or less directly proportional to the degree of adulteration and that even minor degrees of adulteration up to 10 per cent. or perhaps to a lesser degree can be recognised by this method. This measure of fluorescence intensity can therefore be employed as a reliable guide in estimating the amount and perhaps the nature of the adulterant. If this technique can be perfected, it will place in the hands of the analysts a method which is not only easy and rapid but is likely to give a much more accurate and reliable information regarding adulteration of ghee and may obviate all the laborious chemical procedures now employed in the detection of adulteration in 'ghee', which is by far the commonest article found adulterated in the Indian dietary.

We wish to acknowledge our indebtedness to Colonel R. N. Chopra, C.I.E., I.M.S. (R.), for placing before us all facilities for work and to Prof. G. Sankaran and to Mr. P. K. Seshan for the use of the ultra-violet ray-Pulfrich Photometer assembly.

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‡ The samples were originally liquefied at 40° C. before putting into the glass cells. As there was a tendency to solidification of the 'ghee' during experiments, a solution in chloroform, which was found to be non-fluorescent, was employed.

|| For convenience of presentation, the actual readings are not plotted but the points are joined to form a smooth line.

[1] Common, R. H. (1937): *Analyst*, Vol. XXII, p. 784.
[2] Iyengar, N. K. and Mukerji, B., *Ind. Med. Gaz.*, Vol. LXXIV, p. 215.

Calcium Utilisation from Green Leafy Vegetables

It is well known that rice is deficient in calcium. Of the many rice varieties (mostly South-Indian) investigated in this laboratory, the maximum calcium content was about 20–25 mg. per cent. Rau and Ranganathan[1] have shown that the quantity of calcium obtained from a rice diet is not more than 0·1 to 0·15 gm. per day while the daily requirement of an adult (according to Sherman) is 0·5 to 0·6 gm. The present investigation was taken up with a view to find how far the green leafy vegetables (which are rich sources of calcium) would supplement a low calcium rice diet.