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ECONOMICALLY USEFUL PLANTS OF SRI LANKA. PART VI.* EXPLOITATION OF SEED FATS OF MANGO AND RAMBUTTAN FOR THE PRODUCTION OF SOAP

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Abstract : Soaps have been prepared from the seed fats of mango and rambuttan. Their properties have been compared with those of commercial soaps. The results show that rambuttan seed, with its high fat percentage, could be exploited in the soap manufacture.

1. Introduction

Large quantities of mango and rambuttan seeds are discarded seasonally in Sri Lanka. In India, butter from mango seed fat is obtained and is used as food. The possibility of utilising mango seed butter in Sri Lanka has been suggested.[4] In this paper, the soap obtained from the mango seed fat is compared with soaps available in the market. Soap from another seed which is discarded seasonally, rambuttan, has also been prepared.

2. Results and Discussion

The mango seed, rambuttan seed and coconut kernel fat percentages are given in Table 1. All are solid fats. The rambuttan seed has a fat content of 43% whereas the mango seed has a fat content of only 7%. The fat content of rambuttan seeds is comparatively high and thus it could be economically exploited.

From Table 2, it can be seen that rambuttan seed fat has 50% saturated acids whereas the fat from coconut kernel has 92% saturated acids. The mango seed fat is not very different to that of rambuttan seed fat and has

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47% saturated acids. Mango and rambuttan seed fats are very similar in having high content of oleanolic acid. These seed fats, though solids, are more unsaturated than the coconut kernel fat. However, the melting points of the mango and rambuttan fats are higher since they contain longer carbon chain fatty acids than those of coconut fat. Like the coconut kernel fat, the solid fats from mango and rambuttan seeds could be used in the soap manufacture. These soaps have been prepared by saponifying the fats using sodium hydroxide by the cold-process.[2] The properties of these soaps have been compared with those of two common soaps available in the market. The results are given in Table 3. Though the matters insoluble in ethanol are high for the mango and rambuttan soaps, they are within the maximum weight per cent of 4 permitted for soft soaps.

Table 1. Fat Content of Coconut Kernel, Mango and Rambuttan Seeds.

Source (Botanical Name)	M. Pt(°C)	Fat (%)
Coconut Kernel *(Cocos nucifera)*	21–25	65
Mango Seed *(Mangifera indica)*	36–37	6.8
Rambuttan Seed *(Nephelium lappaceum)*	37–55	42.6

The present study therefore, shows that the seed fats of mango and rambuttan can be used to manufacture soap. We suggest that with the escalating prices of coconut oil (and hence soaps), attempts should be made in Sri Lanka to collect the discarded seeds, extract fats and use them either separately or mixed with coconut oil in the manufacture of soap. Rambuttan seed, with its high fat content, could therefore be economically exploited in the soap manufacture.

3. Experimental

Mango and rambuttan seeds were collected during their respective seasons. The kernels were separately extracted with light petrol. The per cent fat is given in Table 1. The seed fats were saponified using sodium hydroxide. The amount of sodium hydroxide required to saponify a known quantity of the fat was calculated from the saponification value of each fat.[3] The total fatty matter, substances insoluble in ethanol, free caustic alkali and total unsaponifiable matter were obtained for the mango soap, rambuttan soap and for two commercially available soaps (Sunlight and Lifebuoy) by the use of testing methods given by the Bureau of Ceylon Standards. The results are tabulated (Table 3). The pH values of these soaps are presented in Table 3. The acid components of the fats were analysed by gas chromatography (GC). The fats were converted to the methyl esters for GC analysis as follows: The fat (100 mg) was refluxed with benzene (1 ml), boron trifluoride in methanol (20% ; 0.1 ml), and methanol (2 ml) for 20 min. Solvent was evaporated,

Table 2. Percent Composition of the Acid Components of Fats

Source	Palmitic	Stearic	Oleic	Linoleic	Lauric	Myristic	Arachidic	Arachidonic	Caprylic	Capric
	C_{16}(S)	C_{18}(S)	C_{18}(U)	C_{18}(U)	C_{12}(S)	C_{14}(S)	C_{20}(S)	C_{20}(U)	C_{18}(S)	C_{10}(S)
Mango Seed[a]	7.4	39.8	49.4	2.3	–	–	–	1.1	–	–
Rambuttan Seed[a]	6.2	6.6	37.3	0.3	–	–	36.8	–	–	–
Coconut kernel[b]	9.0	2.1	5.7	2.6	48.0	17.5	–	–	7.9	7.2

S means saturated acid

U means unsaturated acid

[a] This work. Experimental error ± 5%

[b] Encyclopedia of Chemical Technology 6, p. 142

Table 3. Soap Specifications

Specifications	Mango Soap	Rambuttan Soap	Sunlight Soap	Lifebuoy Soap
Total fatty matter percent by weight	35.8	35.3	37.7	41.3
Matter insoluble in ethanol percent by weight	4.7	4.4	0.5	0.4
Free caustic alkali calculated as Na_2O percent by weight	0.2	0.2	0.2	0.3
Total unsaponified matter percent by weight	1.7	1.7	1.0	1.2
pH	10.1	10.1	10.0	10.0

water was added and the ester was extracted with ether. The ethereal layer was dried (anhydrous magnesium sulphate) and evaporation of ether gave the esters. GC analysis of the esters was carried out on a Varian model 2440 chromatograph equipped with a flame ionisation detector. The chromatograph was fitted with glass columns (1.8m x 2 mm i.d) packed with 10% SP 2340 coated on 100/200 chromasorb W. The column was maintained at 190°C. Argon was used as the carrier gas at a flow rate of 30 ml min^{-1}. The identification was by peak boosting and by comparing retention times. The fatty acids identified and their compositions are given in Table 2.

Acknowledgements

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