Fractionation of Fatty Acids of *Cassia tora* Seed Oil with Urea

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The mixed fatty acids of *Cassia tora* seed oil have been fractionated by liquid-solid countercurrent distribution with urea. The percentage fatty acid composition of oil is: palmitic, 6.70; stearic, 7.56; lignoceric, 10.05; oleic, 39.55; and linoleic, 36.14.

THE SEEDS of *Cassia tora* Linn. (Family, *Leguminosae*) are reputed for their medicinal value in skin diseases in India (1, 2). The seeds of this plant have been examined by Elborne (3) for the presence of glycosides. The fatty acid composition of *C. tora* seed oil has been determined by Jois and Manjunath (4) and also by Tiwari and Gupta (5). In addition to lignoceric, palmitic, oleic, and linoleic acids reported by Jois *et al.* (4), Tiwari and Gupta (5) have found *C. tora* fatty acids to contain stearic acid and an appreciable amount of lignoceric acid (9.7%), a characteristic fatty acid of the seed fat of the *Leguminosae* family. In the present investigation, the mixed fatty acids of *C. tora* oil were fractionated by the liquid-solid countercurrent distribution of fatty acids with urea employing the method of Sumerwell (6). The results of the fractionation have been recorded in Table I and agree closely with those obtained by Tiwari and Gupta (5) by the methyl ester distillation method.

Table I.—Liquid-Solid Countercurrent Distribution of *C. tora* Fatty Acids with Urea

Fraction No.	Fraction wt.	NV	IV	Mixed Fatty Acids, Comp. Lignoceric	Stearic	Palmitic	Oleic	Linoleic
1	2.55	160.5	0	2.08	0.47	...	...	...
2	2.65	162.2	18.4	1.64	0.47	...	0.54	...
3	2.64	206.5	38.8	...	0.85	0.65	1.14	...
4	2.80	207.8	62.2	...	0.44	0.42	1.94	...
5	3.86	208.6	70.8	...	0.48	0.54	2.84	...
6	3.60	214.8	80.5	...	0.09	0.29	3.22	...
7	2.50	203.6	100.5	...	...	0.58	1.05	0.87
8	1.92	199.0	136.7	...	...	...	0.93	0.99
9	1.50	198.8	156.3	...	...	...	0.57	0.93
10	0.63	198.7	160.7	...	...	...	0.24	0.84
11	0.45							
Raffinate	11.90	198.7	164.2	...	...	...	2.16	9.74
Total	37.00	...	...	3.72	2.80	2.48	14.63	13.37
%				10.05	7.56	6.70	39.55	36.14
% by Tiwari and Gupta				9.70	7.30	7.50	38.40	37.10

EXPERIMENTAL

The oil from the seeds[1] of *C. tora* was saponified, and fatty acids were obtained from the soap after removing the unsaponifiable matter. For fractionation, a series of glass-stoppered conical flasks, numbered *2* to *11*, were charged with dry urea (5 Gm. each). A saturated solution of urea in a mixture of methanol (70%) and ethyl acetate (30%), sufficient for the number of stages was prepared at 5–6°, the temperature at which fractionation was carried out. The fatty acids (37 Gm.; iodine value, 103.2; neutralization value, 198.2) were dissolved in 120 ml. of a mixture of methanol and ethyl acetate (7:3) in flask *1* not containing urea and stored overnight in a refrigerator at 5° to 6° for possible crystallization of fatty acids. As no precipitate was observed, urea (6 Gm.) was added to the contents of flask *1*, warmed to dissolve, and placed in a refrigerator for 4 hr. for adduct formation. The supernatant liquid from flask *1* was transferred to flask *2*, and saturated urea solution (120 ml., 5°) was added to flask *1*. After dissolving the contents of the flask by warming in a water bath, the flasks were stored for 4 hr. in the refrigerator. The supernatant liquid from flask *2* was then decanted into flask *3* and that from flask *1* to flask *2*. Another 120 ml. of the saturated urea solution (5°) was added to flask *1*, and the process of adduction was repeated for flasks *1*, *2*, and *3*. In this way the fatty acids were distributed in 11 flasks, and the supernatant liquids from flask *11* were collected together to form the raffinate fraction. The solvent from this fraction was distilled under reduced pressure, and the residue as well as adduct fractions were treated with hot acidulated distilled water, followed by extraction with ether to obtain the fatty acids. Each fraction was analyzed for iodine value (IV) and neutralization value (NV). The composition of fractions was calculated by the method of Hilditch (7) and the results recorded in Table I.

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