TABLE II

Comparison of May and November Butterfat Samples [b]

(C/18) May sample: Saponification equivalent—250.1 Iodine value— 41.9

(B/36) November sample: Saponification equivalent—239.1 Iodine value— 33.8

	Component Acids—Mols. %													
	Saturated								Unsaturated					
	C_4	C_6	C_8	C_{10}	C_{12}	C_{14}	C_{16}	$C_{18}+C_{20}$	C_{10}	C_{12}	C_{14}	C_{16}	C_{18}	C_{20}
C/18 May														
Standard deviation	10.2 (0.17)	3.8 (0.25)	1.3 (0.17)	2.7 (0.10)	3.4 (0.21)	9.4 (0.17)	21.6 (0.25)	12.4 (0.15)	0.3 (0.06)	0.3 (0.06)	1.0 (0.06)	1.9 (0.15)	29.6 (0.15)	2.1 (0.0)
Standard error (E_A)	(0.10)	(0.14)	(0.10)	(0.06)	(0.12)	(0.10)	(0.14)	(0.09)	(0.03)	(0.03)	(0.03)	(0.09)	(0.09)	(0.0)
B/36 November														
Standard deviation	10.9 (0.39)	4.8 (0.26)	2.2 (0.0)	4.3 (0.22)	5.1 (0.31)	12.2 (0.40)	22.8 (0.20)	10.9 (0.40)	0.3 (0.0)	0.3 (0.0)	1.0 (0.07)	1.6 (0.17)	22.1 (0.29)	1.5 (0.37)
Standard error (E_B)	(0.22)	(0.15)	(0.00)	(0.13)	(0.18)	(0.23)	(0.12)	(0.24)	(0.0)	(0.0)	(0.04)	(0.10)	(0.17)	(0.29)
Difference (D) C/18-B/36	−0.7	−1.0	−0.9	−1.6	−1.7	−2.8	−1.2	+1.5	0.0	0.0	0.0	+0.3	+7.5	+0.6
$\frac{D}{E_D}$ [c] (9)	2.9	4.8	9.0	11.4	7.3	11.2	6.5	5.8	....	....	....	2.3	39.5	3.0
	(S)[a]	(HS)	(HS)	(HS)	(HS)	(HS)	(HS)	(HS)	....	....	....	(N)	(HS)	(S)

[a] S = Significant ($P \leqslant 0.05$), HS = Highly significant ($P \leqslant 0.01$), N = Non-significant ($P > 0.05$).

[b] Butterfat sample with laboratory numbers B/36 and C/18 were derived from butter supplied by the Rangitaiki Plains Dairy Co., Whakatane, New Zealand. The dates of churning were November 1946 for B/36 and May 1947 for C/18.

[c] D = Difference between two means (9)

Standard error of the difference $E_D = \sqrt{E_A^2 + E_B^2}$ (9)

oil and methyl palmitate, respectively, in all batches of iodine value and saponification equivalent determinations.

d) Improved and efficient electrically heated packed fractionating columns were employed.

Results

As illustrative of the degree of reproducibility of ester fractionation analyses of butterfat, triplicate analyses of one of the three samples studied is presented in Table I.

Two other butterfat samples (whose compositions are compared in Table II) were analyzed in triplicate. By statistical procedure the standard deviation for the total component acids within the three triplicated analyses is calculated from an analysis of variance (10) to be ± 0.26. For the saturated constituents alone the standard deviation within analyses is ± 0.29 while for the unsaturated it is ± 0.22.

As shown in Table II, statistical evaluation of the corresponding fatty acids in the two butterfats compared reveals that the differences in eight of the constituent acid groups (viz., the saturated acids C_6, C_8, C_{10}, C_{12}, C_{14}, C_{16}, $C_{18} + C_{20}$, and the unsaturated acid C_{18}) are significant at the 1% level ($P = 0.01$). These differences are interpreted as being highly significant. In both the C_4 saturated and the C_{20} unsaturated components, the variations are significant at the 5% level ($P = 0.05$). When comparing the values for the C_{16} unsaturated component however, the difference is calculated to be non-significant. Mean values for C_{10}, C_{12}, and C_{14} unsaturated acids were identical in the two analyses compared.

Summary

The ester fractionation method under the conditions described, has been shown to yield for triplicate fatty acid analyses of three different butterfat samples, results which are reproducible within an over-all standard deviation of ± 0.26.

Statistical interpretation of the differences between fatty acid analyses of two samples shows that the method used in this work is sufficiently accurate to detect seasonal variations in butterfat.

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11. Ibid. p. 30, p. 69.

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Correction

In reference to the paper on "Properties of Some Newly Developed Nonionic Detergents" by Vaughn, Suter, Lunsted, and Kramer, J.A.O.C.S., **28**, 294-299, July 1951, in the table on page 299, the carbon soil removal value for 0.1% Pluronic L62 + 0.01% Carbose in hard water should have been 43 instead of 159. This information has been supplied by M. G. Kramer of Wyandotte Chemicals Corp., Wyandotte, Mich.