TEXTURE APPLICATION NOTE

BUTTER

APPLICATION

Evaluation of Butter and Margarine Characteristics using 45° Cone Probe (Adaptation of Traditional Penetrometer Test).

TEST OBJECTIVE

To determine the spreadability of butter and margarine following principles of traditional cone penetrometer test..

BACKGROUND

Spread-ability of Butter and margarine is related to its firmness. Firmness is directly related to fatty acid composition and storage temperature. Saturated animal fats, such as those found in butter, result in a firmer product. Lower temperatures increase the fat solidity.

Firmness or hardness is typically quantified as the force attained at a given deformation, such as the force required to initiate spreading of the product before “work softening” commences. “Work softening” is softening caused by applying small stresses to the sample. Product spread-ability has traditionally been tested as relaxation under a constant load, such as in a cone penetrometer test. Penetrometer tests measure the distance travelled by a 100g probe. Once a 100g load is reached, creep is measured over a 30 second period. Creep is sample deformation under a constant load.

METHOD

The LFRA uses distance as its target measure. Stress Relaxation tests can be run by deforming the sample to a set distance, then monitoring the decrease in load over time as the distance is held constant.
Samples were removed from refrigeration at <8°C and tested within their original packaging. 3 readings from each sample were taken and average values for each parameter calculated.

TABLE 1
LFRA Settings

MODE:	Normal (Measure force in compression)
SPEED:	1mm/s
DISTANCE:	4mm
TRIGGER:	4.5 g

PROBE:	Brookfield TA 15 - 45° Perspex (acrylic plastic) Cone

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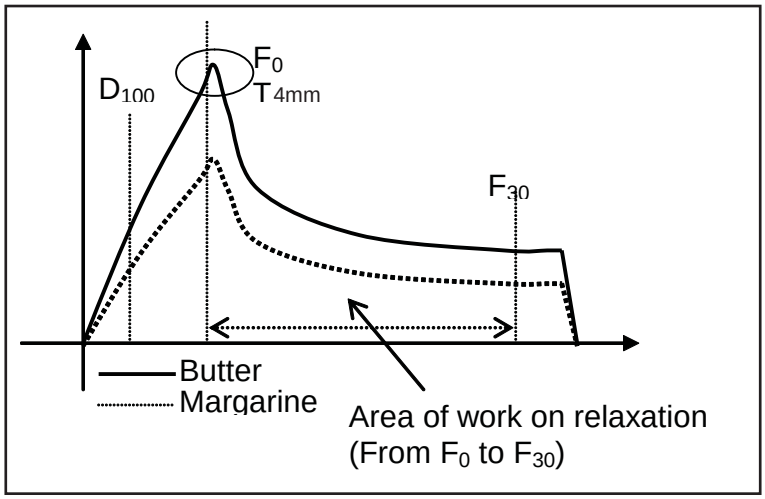
PARAMETERS

D_{100}	Distance travelled to attain 100g force
F_0	Peak force at target distance (4mm)
T_{4mm}	Time peak target reached and start of relaxation
F_{30}	Final force after a 30-second hold
AREA F_0:F_{30}	Area of work in Joules between peak and final force. Representative of spreadability.
% RELAXATION	% value of F_{30} to F_0. F_{30}/ F_0 x 100 = % RELAXATION

RESULTS

	BUTTER				MARGARINE			
	1	2	3	Ave.	1	2	3	Ave.
D_{100}	2.64	2.7	2.86	*2.75*	2.86	4.18	3.68	*3.57*
F_0	255.6	213.6	217.6	*228.9*	169.8	141.6	144	*151.8*
T_{4mm}	4.51	4.4	4.4	*4.43*	4.34	4.95	4.46	*4.58*
F_{30}	112.2	82.2	99	*97.8*	90	72.6	75	*79.2*
AREA F_0:F_{30}	3587.4	3091.9	3156.2	*3278.9*	2727.9	2344.3	2156.6	*2409.6*
RELAX%	43.9	38.5	45.5	*42.6*	53	51.3	52.1	*52.1*

READING



DISCUSSION

Sample firmness and spreadability are correlated. However, “work softening” occurs when butter or margarine is subjected to small stresses over time. Margarine “work softens” much easier than butter, hence margarine is more easily spread even when hardness values are initially the same as that of butter. The results show that the margarine sample was initially softer (i.e., lower firmness, than the butter product, confirming that the higher content of unsaturated glycerides results in a softer product. This is again shown in the increased D100 values of the margarine where it was necessary for the apparatus to penetrate around 1mm further to achieve the 100g target force.

The areas of work between points F0 and F30 are much greater for the butter samples than the margarine, highlighting that the butter had reduced Spreadability compared to the margarine. This difference is confirmed by the higher percentage relaxation values of the margarine.

CONCLUSION

Simple compression and extrusion forces allow The margarine sample had lower Firmness and higher Spreadability than the butter.

ISO 9001:2000 CERTIFIED

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