TEXTURE APPLICATION NOTE

YOGURT

APPLICATION

Analysis of low fat yogurt product using functional fat replacing ingredients.

TEST OBJECTIVE

Comparison of textural properties in order to identify differences between full and low fat product in relation to their sensory profile.

TEST PRINCIPLE

Back extrusion techniques are utilised in the measurement of fluid or semi-solid materials. The test technique consists of driving a cylindrical probe of defined geometry into a sample held within a specific container. When the test probe is driven into the sample, a volume of product becomes displaced. The driving action creates compression and extrusion forces to break the set nature of the yogurt allowing objective assessment of its "Hardness". A probe with a shallow 170^{o} conical taper was employed in this investigation to facilitate product flow and accommodate particulates within the sample

This simple method of controlled displacement provides a unique means of objectively analysing the subjective characteristics of yogurt texture.

BACKGROUND

The textural properties of yogurts are critical in establishing consumer preference. Variation in fat content of formulation has a direct influence on the set characteristics of the product. The elevated Solids Not Fat (SNF) content of low fat yogurts forms strong casein-casein bonds uncharacteristic in a full fat yogurt, where homogenised fat globules are partly covered with casein, facilitating protein-protein interactions. Fat becomes trapped within this protein network where it imparts a smooth creamy mouthfeel and spoonable glossy consistency characteristic of full fat yogurts.

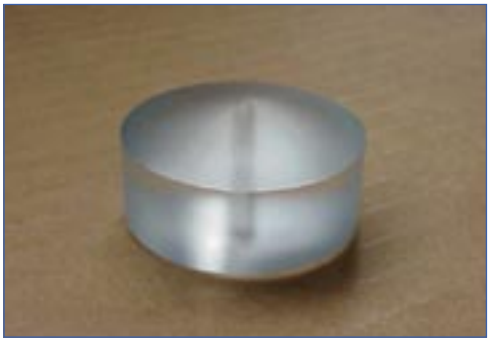
METHOD

Yogurt samples were removed from controlled refrigeration at 5^{o}C, tested in the center of 100g containers at an ambient temperature of 22^{o}C. The test probe was driven into the sample and the response evaluated.

DEFINITIONS

Hardness—force necessary to attain a given deformation; peak force of compression cycle.
Yield—the energy required to initiate flow
Adhesive force—force ncessary to break probe from the sample; height of negative peak.
Adhesiveness—work necessary to break probe from the sample area; area of the negative peak
Hardness1 work done—energy required to drive probe to hardness value; area under peak

The semi-solid yogurt sample is evaluated in its commercial container. The specially-designed probe is driven into the sample under controlled conditions and a volume of product is displaced. The energy input by the Texture Analyser and the hardness of the sample are key indicators of yogurt quality.



The angled taper of the test probe facilitates product flow and reduces the amount of air-pockets between the probe and sample interface. This helps with the measurement of adhesive characteristics and the movement of particulates between probe perimeter and container.

TABLE 1
Texture Analyser Test Settings

MODE:	Normal
TRIGGER:	4.5g Trigger
DISTANCE:	30mm
SPEED:	1mm/s

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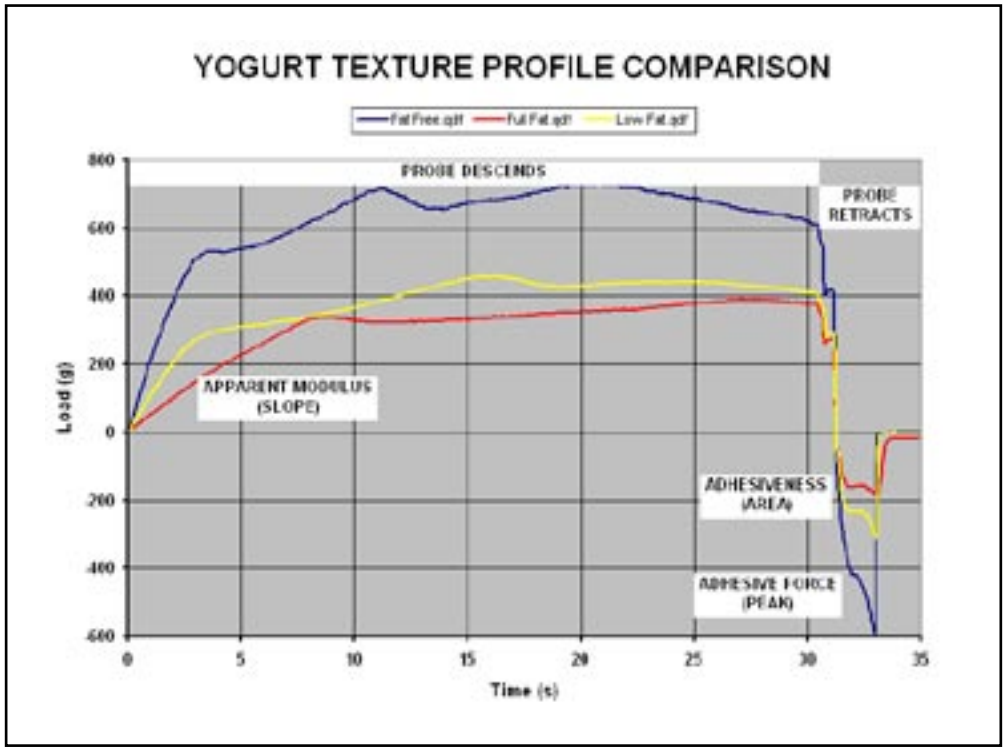

DISCUSSION

The full fat sample is much softer, showing a lower hardness value, than either the low fat or fat free yogurt samples. Visually, the full fat yogurt appears more glossy and smooth, while the low and fat free samples appear more grainy and less homogeneous. This visual distinction is reflected in the data as the relatively smooth, flat plateau seen with the full fat sample as the probe descends. The softer set of the full fat yogurt is characterized by the lower hardness value and the lower value of the work done to the peak, which is the area from zero to the hardness value.

The fat free sample has a much steeper initial gradient indicative of a higher modulus.

CONCLUSION

Simple compression and extrusion forces allow comparison of the textural properties of yogurt and other cultured dairy products, without removing them from their commerical containers.

This simple technique can be used to modify the formulation of reduced fat products and use fat replacing ingredients to help match the textural profile, and therefore the sensorial properties as well, of the more desirable full fat products.

SELECTED CALCULATIONS	Fat Free.qdf	Full Fat.qdf	Low Fat.qdf	Arithmetic Mean	Standard Deviation	Lowest	Highest	Units
Hardness	731.00	390.00	460.00	527.00	147.05	390.00	731.00	g
Apparent modulus	167.17	40.26	72.49	93.31	53.86	40.26	167.17	g/s
Adhesive force	-594.00	-187.00	-313.00	-364.67	170.13	-594.00	-187.00	g
Adhesiveness	-727.01	-334.61	-420.11	-493.91	168.48	-727.01	-334.61	gs
Hardness 1 work done	19054.35	9437.21	11728.80	13406.79	4101.55	9437.21	19054.35	gs

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