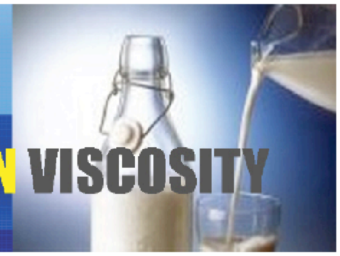

# CHECKING DAIRY PRODUCTS FOR CONSISTENCY IN VISCOSITY

Cultured dairy products, like yogurt, exhibit several physical properties that are important to consumers: firmness, creaminess, thickness and even heaviness or lightness.

This article compares two analytical test methods involving viscosity that effectively characterize these physical properties. To determine viscosity, rotate a vane spindle in the product as shown in Figure 1; this rotating action quickly destroys the "set" gel structure first observed when these products are opened. Figure 2 shows a large drop in viscosity as soon as the measurement begins.

**Figure 1: DV-III Ultra with Brookfield Vane Spindle**

The viscosity data in Figure 2 are for three separate products: non-fat yogurt, low-fat yogurt and full fat yogurt of the same brand. This shows how the initial gel structure is being broken up, just as would happen when the consumer stirs the product. By using this test method of specifying rotational speed and vane spindle initial firmness can be indicated and the break up of the gel structure can be monitored.

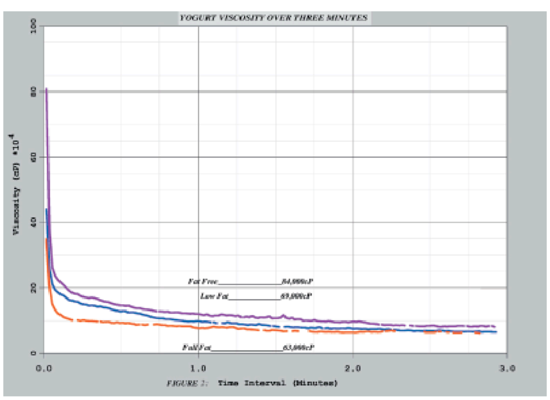


**Figure 2: Yogurt Viscosity Over Three Minutes**

The effect of continuous stirring can be determined by running the test until the viscosity levels off. In the case shown in Figure 2 such a test would take about 2 ½ minutes. Final viscosity of the low fat sample is about 10 percent higher and the non-fat is 33 percent higher than that of the full fat variety.

An important parameter that cannot be accurately determined from the above test is the strength or firmness of the gel before it is disturbed. While the curve for the non-fat yogurt in Figure 2 does appear to start out at a much higher level than that of the full fat yogurt, it is difficult from this test to pin-point exactly how much higher.

Measuring the undisturbed stiffness, or strength of the set gel structure, of cultured dairy products can indicate its "spoon-ability," which is the characteristic allowing the product to be scooped without dripping. An analytical measurement of this property can easily be done with a separate test using a vane spindle. Such a spindle may be lowered into the product with minimal disturbance of the product, and therefore minimal destruction of the gel. The test is conducted by applying a steadily increasing torque on the vane spindle until it begins rotating. The torque required to begin spindle rotation is determined by the stiffness of the gel, and defines the yield stress point of the gel.

Figure 3 shows the results of this "stress" test for all three types of yogurt. The full fat variety has the softest gel structure as indicated by the lowest yield stress curve. The gel structure of the low fat variety is 60 percent stronger, and the non-fat variety is the stiffest with a gel 125 percent stronger that of the full fat yogurt.

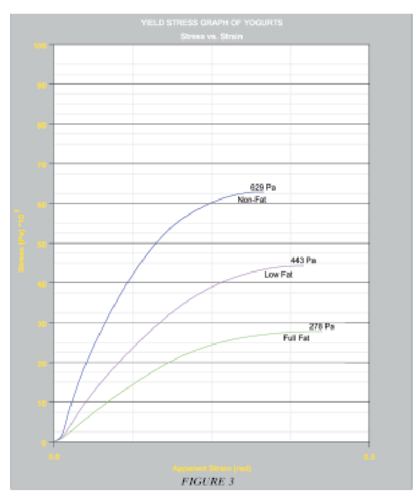


**Figure 3: Yield Stress Graph of Yogurts**

To the consumer all of these products have very different firmness upon opening the containers. This result may seem surprising since the viscosity profiles appeared to be so similar. However, if one looks at the difference in viscosity at the beginning of the test, a similar result is indicated.

Both the flow-ability (viscosity) and spoon-ability (yield stress) of cultured dairy products may also be compared by using a single instrument to run both viscosity tests, namely the Brookfield DV-III Ultra Rheometer.

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