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RVA world

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APPLICATION:

Dairy Product Processing in the RVA™

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The RVA is potentially useful for simulating processing of dairy products such as soft cheeses, recombined products and chilled desserts, including ice-cream. This application describes the use of the RVA for simulating yogurt manufacturing conditions and determining the final viscosity of the fermented yogurt. Physical properties of yogurt can be affected by variability in milk composition and processing conditions. This application can therefore be useful for quality control of ingredients including cultures, quality assurance of products, troubleshooting ingredients, or processing problems associated with yogurt making.

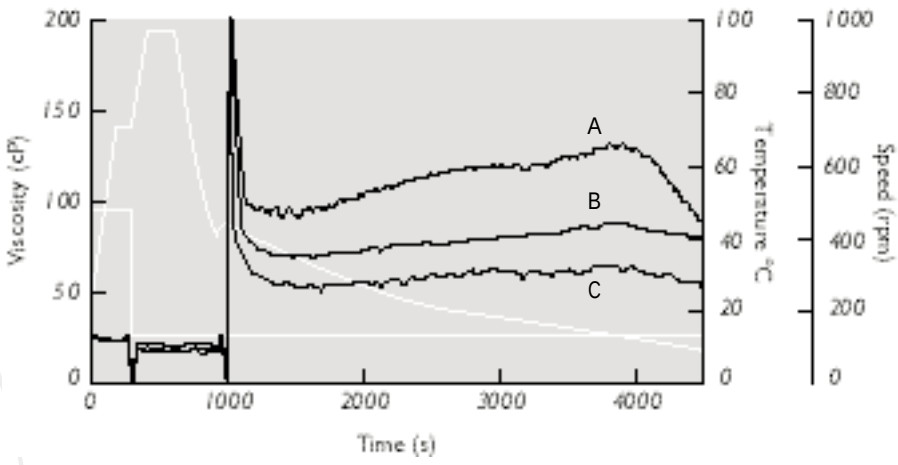
Stirred yoghurts were prepared from low, medium or high heat-treated skimmed milk powders (SMP), as follows: 3.0 g of SMP, 0.75 g of anhydrous milkfat and 21 g of water were mixed and warmed to 40ºC before homogenisation. The quantities of ingredients should be adjusted to yield the exact proportions of total protein, fat and moisture, as required. Exactly 15 g of the homogenised mixture was weighed into a sterile canister and pasteurised using method (a) in Table 1. The sample was inoculated by adding an aliquot (100 µl) of culture into the canister and mixing gently using the paddle. The canister and paddle were sealed with parafilm and incubated at 43ºC for approximately 6 hrs or until fermentation had progressed as required. After fermentation, the yoghurt was processed using method (b) in Table 1 and the final viscosity was calculated from the mean of the final 20 readings after equilibration to 10ºC. The coefficient of repeatibility of the method was 8.8%. The method may be modified to more closely simulate commercial formulation and processing practices, and additional quality indices of the yogurt can be measured, as required.

The changes in viscosity during the finishing cycle demonstrate the influence of processing histories of the SMPs on the final viscosity of the yogurt (Figure 1).

TABLE 1. RVA METHODS FOR (A) YOGURT PROCESSING AND (B) TESTING FINAL VISCOSITY.

	Time	Type	Value
(a)	00:00:00	Temp.	25ºC
	00:00:00	Speed	500 rpm
	00:03:00	Temp.	70ºC
	00:03:00	Speed	150 rpm
	00:05:00	Temp.	70ºC
	00:07:00	Temp.	95ºC
	00:11:00	Temp.	95ºC
	00:14:00	Temp.	43ºC
	00:17:00	Temp.	43ºC
	00:17:00	Speed	0 rpm
(b)	00:00:00	Temp.	43ºC
	00:00:00	Speed	500 rpm
	00:00:10	Temp.	43ºC
	00:00:10	Speed	150 rpm
	00:25:00	Temp.	20ºC
	00:50:00	Temp.	10ºC
	00:50:00	Temp.	10ºC
	00:55:00	Speed	0 rpm

Figure 1. RVA pasteurisation and finishing profiles for yogurts made from low (A), medium (B) and high (C) heat SMPs.



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Stirring Number Method at High Altitude

High altitude in South Africa (1500-1650 m) necessitates that ICC Method No. 161, for the determination of Stirring Number to estimate weather damage of wheat, must be modified to cook the paste at 91ºC instead of the conventional 95ºC so the sample does not boil.

PROFILE

Time	Type	Value
00:00:00	Temp.	91ºC
00:00:00	Speed	960 rpm
00:00:10	Speed	160 rpm

Idle temperature: 91ºC ± 1ºC
End of test: 3 minutes
Time between readings: 2 seconds

Figure 1. Example of SN 95ºC Method in Sydney

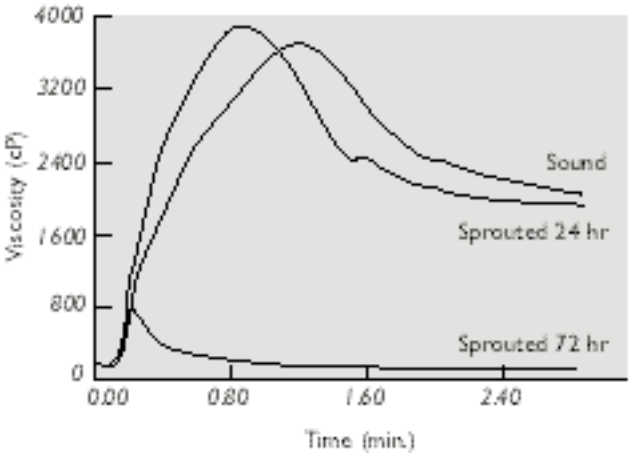
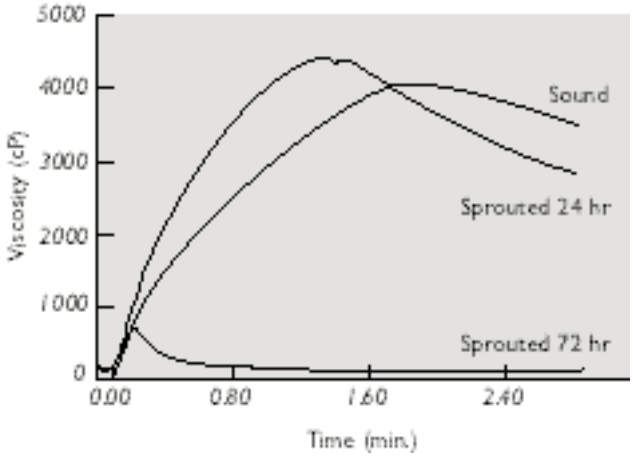


Figure 2. Example of SN 91ºC Method in Sydney



Repeatability

The method was trialled on RVA-Mini3 at the Small Grains Institute in South Africa during the 2000 grain harvest using weather damaged wheat (Table 1). A second experiment tested repeatability using sound wheat (Table 2). Results were collected in centipoise and automatically converted by the RVA to Stirring Number and Falling Number Equivalents.

TABLE 1. REPEATABILITY OF WEATHER DAMAGED SAMPLES

Variable	N	Mean	Median	TrMean	StDev	SE Mean
FNE Morning	20	162.86	162.80	162.96	3.70	0.83
FNE Afternoon	20	158.22	158.09	158.22	2.44	0.55
FNE Next Morning	20	158.38	158.76	158.34	3.86	0.86

TABLE 2. REPEATABILITY OF SOUND SAMPLES

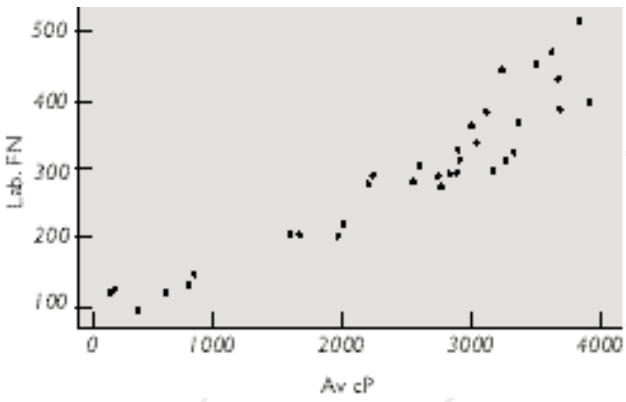
Variable	N	Mean	Median	TrMean	StDev	SE Mean
Falling Number	30	265.83	268.00	265.65	14.93	2.72
FNE (SGI)	30	287.73	290.53	287.19	14.97	2.73

Correlation

An excellent correlation with Falling Number Method was also developed during the trial:

Lab. FN = 35.79 + 0.1072 x cP, R^2 = 86.8%

Figure 3. Correlation with Falling Number Method



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TIPS & TRICKS

Solving Sticky Problems in the RVA™

Starch doesn't always behave just the way you think it will in the RVA, and sometimes a little chemical assistance can be called for. Use of chemicals will usually affect viscosity results, so chemical type, amount and sequence of addition should be standardised for comparative tests.

- *To moisten the sample, 2-4 g of ethanol or propanol before adding water aids the dispersion of pre-cooked starchy samples and stops the formation of lumps. Try shaking the can with an inverted stopper before starting the test to help the dispersion. If bubbles form during the test (often seen as 'jags' in the curve), delete the fast mix from the start of the RVA cycle, and remember that alcohol reduces boiling temperature, so reduce the maximum profile temperature to 90ºC.*[1]
- *To stop overflow of foaming samples from the can during the test, add 1-2 drops of anti-foaming agent such as hex-, sept- or oct- alcohols. It also helps to remove the fast mix from the profile.*
- *The addition of bases such as NaOH and KOH up to pH13 will help samples to gelatinise at a lower temperature. You will need to use coated RVA canisters and gloves and a fume cabinet when handling bases.*
- *Calcium chloride 3 Molar concentration will help samples to gelatinise at a lower temperature. This is useful for testing samples that are difficult to cook in water, such as high amylose or oxidised samples.*
- *To aid the dispersion of pre-cooked starchy samples and to stop the formation of lumps, moisten the sample with 2-4 g of ethanol or propanol before adding water.*
- *The addition of 90% aqueous dimethyl sulphoxide (DMSO) will dissolve starch without granule swelling (useful to separate swelling and dissolution effects). Use gloves and a fume cabinet when handling DMSO.*[2]

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STOP PRESS

RVA™ — The Latest Tool for Dairy Product Research

The RVA-4 is now being used for cheese sauce and other dairy product research at the University of Minnesota Department of Food Science and Nutrition (http://fscn.che.umn.edu/).

Assistant Professor Lloyd Metzger is something of an expert when it comes to the manufacturing, functional properties and methods of enhancing the nutritional benefits of cheese and fermented dairy products. His paper at the American Dairy Science Association Meeting, in July 2001, showed just what is possible when an RVA-4, American cheese and the University of Minnesota get together.

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