newport scientific world 2

THE TECHNICAL JOURNAL OF NEWPORT SCIENTIFIC®
DECEMBER 2004
ISSN 1449-1311

Use of the RVA™ for Measuring Cake Flour Heat Treatment

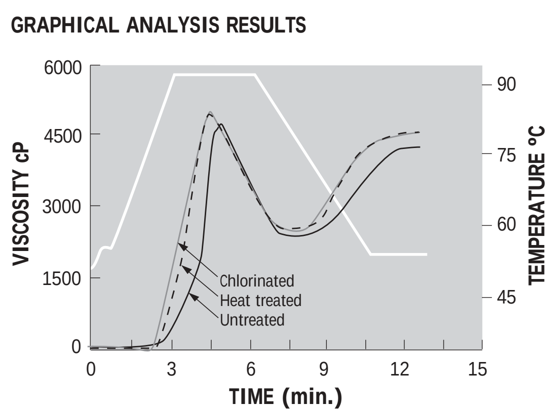
Kirsty Germaine, Ken Quail & Chuck Walker, BRI Australia Ltd, PO Box 7, North Ryde NSW 1670, Australia

Heat treatment of cake flours is currently used as a substitute for chlorine treatment of high ratio cake flours. Heat treatment results in changes to the flour properties, and most notably the starch properties. These changes are similar to those seen in chlorinated cake flours (Figure 1). Work conducted at BRI Australia Ltd showed that the RVA could be used to measure the changes to starch properties caused by flour heat treatment.

Highlighted below (Figures 1 & 2) are the RVA results achieved when Australian soft cake flours were heat treated to various flour temperatures. In Figure 1, the starch pasting curve is shown for an optimally heated cake flour, as compared with an untreated and chlorinated cake flour. In Figure 2, the results show a comparison of optimally treated flour, over treated flour and untreated flour. For all analyses flour weight and distilled water were adjusted for the flour moisture content (14%) to give a constant dry weight, and a standard 1 profile and standard analysis were used.

The pasting curves of the chlorinated and untreated flours in Figure 1 show quite different profiles. Typically, chlorinated flours have a higher peak viscosity, shorter time to peak and a higher final viscosity than untreated flours. These changes in the pasting properties caused by flour chlorination allow the addition of higher sugar levels in cakes and produces cakes which are less prone to collapse.

When flour is optimally heat treated (Figure 1), the pasting properties of the flour changes and becomes more like the chlorinated flours. Figure 2 demonstrates the effect of increasing heat treatment on starch pasting properties. With increasing heat treatment the RVA time to peak decreases, indicating that flour heat treatment leads to an earlier gelatinisation time. With optimal heat treatment, the RVA peak viscosity, holding strength and final viscosity are also noted to increase. These shifts in the RVA pasting properties between the untreated and optimally treated samples correlate well with an increase in cake quality. Optimally heated flours produce cakes which have an improved resilience, similar to the chlorinated flours.



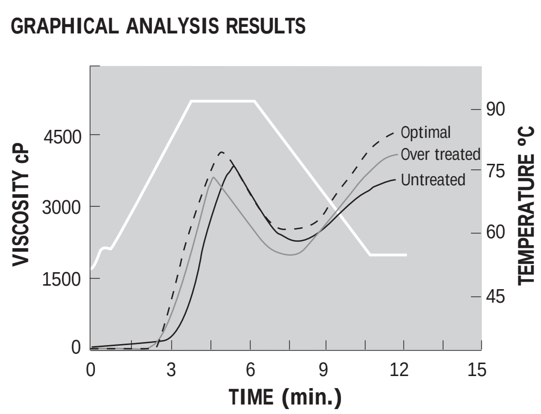


Figure 1
The pasting profiles of chlorinated, heat treated and untreated soft flours.

Figure 2
The pasting profiles of optimally heated, over heated and untreated flours.

Low viscosity applications

Post-harvest grain quality

Newport Scientific News

When flours are over heated their quality is noted to decrease. Seen in Figure 2 are the pasting properties of a flour which has been over treated. With over heat treatment, the RVA time to peak decreased, as did the peak viscosity, holding strength and final viscosity. This is believed to be caused by starch dextrinisation. The deterioration in flour quality detected by the RVA also resulted in flour browning and a decrease in cake quality.

When RVA analysis was used to evaluate other heat treated flours similar trends in the RVA profiles were noted. These results indicate that due to the ability of the RVA to detect improvements in flour quality caused

BRI AUSTRALIA LTD
TEL 61 2 9888 9600
FAX 61 2 9888 5821
EMAIL briaust@bri.com.au

by heat treatment and the ability of the RVA to detect a decrease in flour quality with over treatment, it is a useful tool in determining the quality of heat treated cake flours.

ACKNOWLEDGEMENTS
This work was made possible through the support of the Value Added Wheat CRC and GRDC.

LOW VISCOSITY APPLICATIONS ON THE NEWPORT SCIENTIFIC RVA-SUPER4

Jennifer Dang

Jennifer Dang and Mark Bason. Newport Scientific, Unit 1, 2 Apollo Street, Warriewood NSW 2102, Australia

INTRODUCTION

Newport Scientific's new Rapid Visco Analyser (RVA) Super4 has a high-sensitivity motor, which allows testing at low viscosities. The objectives of this study were to assess and compare the sensitivity and repeatability of the RVA-Super4 against the standard RVA-4 in testing low viscosity products.

MATERIALS AND METHODS

Samples of soups (5 premixes, 4 canned), cooking sauces (2 premixes, 3 heat-and-serve), table sauces (3), dressings (4), and paper starches (2 ethylated, 2 cationic) were tested in duplicate on an RVA-4 and RVA-Super4 with the profiles below. Repeatability was evaluated by one-way analysis of variance of the final viscosity. Data from both instruments were compared by regression analysis.

Soup/sauce mix: 65/95/50ºC pasting profile
Cooking sauce: 95/50ºC cook and serve profile
Ethylated starch: 35/95/35ºC A.E. Staley profile
Canned soup: 80/50ºC heat-and-serve profile
Table sauce/dressing: 25ºC serve profile
Cationic starch: 50/95/65ºC high-shear A.E. Staley profile

RESULTS AND DISCUSSION

Overall, the RVA-Super4 achieved smoother and more repeatable curves compared to the RVA-4 (Figures 1 and 2, Table 1). The higher sensitivity of the RVA-Super4 was most noticeable in the soup mixes, where at very low viscosities, the RVA-Super4 was able to distinguish between the chicken noodle and tomato and vegetable soups, whereas the RVA-4 was unable to do so (Figure 1). At very low concentrations of ethylated starch, the stability of the Super4 allowed for more accurate measurement of curve parameters (Figure 2). Final viscosity data compared well between the two instruments, with coefficients of regression (R^2) of 99.3% and 98.9% for the whole data set and <1600 cP, respectively (Figure 3).

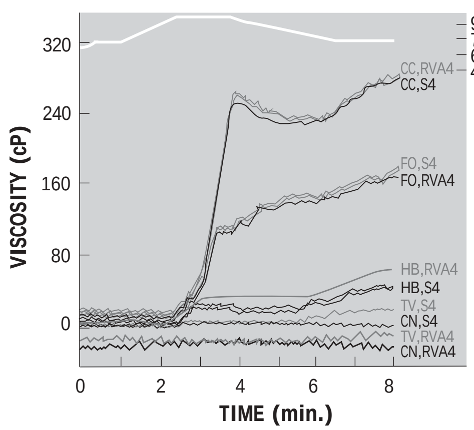


Figure 1
RVA curves of soup mix using the 65-95-50ºC pasting profile. RVA4=RVA-4, S4=RVA Super-4, CN=chicken noodle, TV=tomato and vegetable, HB=hearty beef, FO=French onion, CC=cream of chicken.

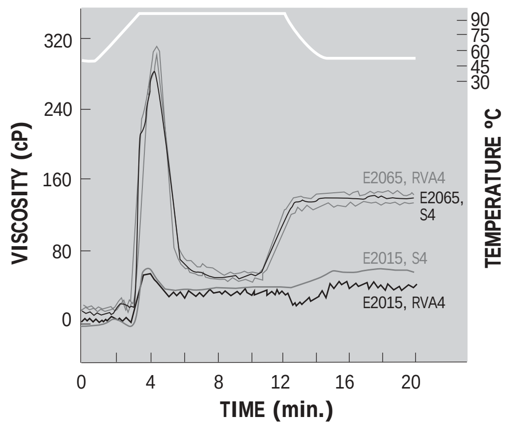


Figure 2
RVA curves of ethylated starch using the 35-95-35°C. A.E. Staley profile. RVA4 = RVA-4, S4 = RVA Super-4, E2065 = Ethylex 2065, E2015 = Ethylex 2015.

Product	RVA-Super4	
	Mean ± Pooled Std	CV (%)
Soup mix	123.8 ± 3.49	2.8
Canned soup	281.3 ± 8.29	2.9
Table sauce	632 ± 6.5	1.0
Sauce mix	241.8 ± 3.35	1.4
Cooking sauce	1129 ± 10.8	1.0
Dressing (cold)	2273 ± 124.7	5.5
Dressing (hot)	843 ± 31.0	3.7
Ethylated starch	72.0 ± 2.55	3.5
Cationic starch	132.3 ± 1.12	0.8

	RVA-4	
	Mean ± Pooled Std	CV (%)
Soup mix	108.3 ± 8.17	7.5
Canned soup	267.5 ± 6.14	2.3
Table sauce	627 ± 18.2	2.9
Sauce mix	229.3 ± 6.18	2.7
Cooking sauce	1180 ± 12.5	1.1
Dressing (cold)	2263 ± 109.1	4.8
Dressing (hot)	926 ± 120.8	13.0
Ethylated starch	69.0 ± 9.43	13.7
Cationic starch	136.3 ± 8.50	6.2

Table 1

Final viscosities (cP) of various samples tested on the RVA-4 and RVA-Super4.

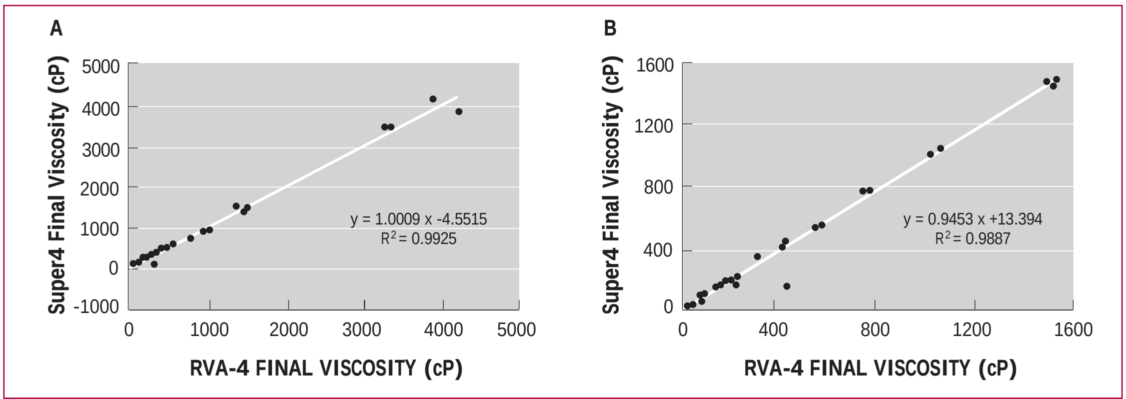


Figure 3

Comparison of final viscosity between RVA-Super4 and RVA-4 for samples of soup, cooking and table sauce, dressing and paper starch. (A) entire data set, (B) <1600 cP.

CONCLUSIONS

The RVA-Super4 produced more stable and repeatable curves than the RVA-4. The RVA-Super4 was able to differentiate between low viscosity samples that were not differentiated by the RVA-4. Its high sensitivity and ability to differentiate between samples at low viscosity make the RVA-Super4 an ideal instrument for testing low viscosity samples, such as those used in the soup, sauce, dressing, and paper starch industries.

NEWPORT SCIENTIFIC

For more information, please contact Jennifer Dang at jdang@newport.com.au

Using the RVA™ to Measure Post-harvest Changes in Grain Quality

Rainer Reuss[1]; Tracy Willis[1]; Cristina Gianibelli[1]; Jenny Dang[2]; Julie Cassells[1]; Jane Green[1]

Rainer Reuss

In Australia, grain may be stored for long periods before processing. Storability of the grain depends mainly on storage temperature, moisture content and length of storage. The aim of the storage process is to minimise damage to grain, maintain high levels of quality, improve the quality of early harvested grain, and tailor grain characteristics to industry needs. This can be achieved by selecting appropriate storage parameters and realising them with cooling, drying, and by modifying storage atmospheres. To be able to do this successfully, changes in grain quality have to be measured with reliable and rapid techniques.

One very useful tool for measuring pre-harvest sprouting and changes in quality during storage of cereal grains has been the RVA. During storage many quality traits peak, then decline. This applies to parameters important for bread quality, malting and brewing, and other end-uses of cereal grains. The challenge has always been to successfully and cost-effectively use post-harvest options to maximise quality. Research on the storability of wheat and barley carried out at CSIRO suggests that the RVA can be used to judge such options. For example,

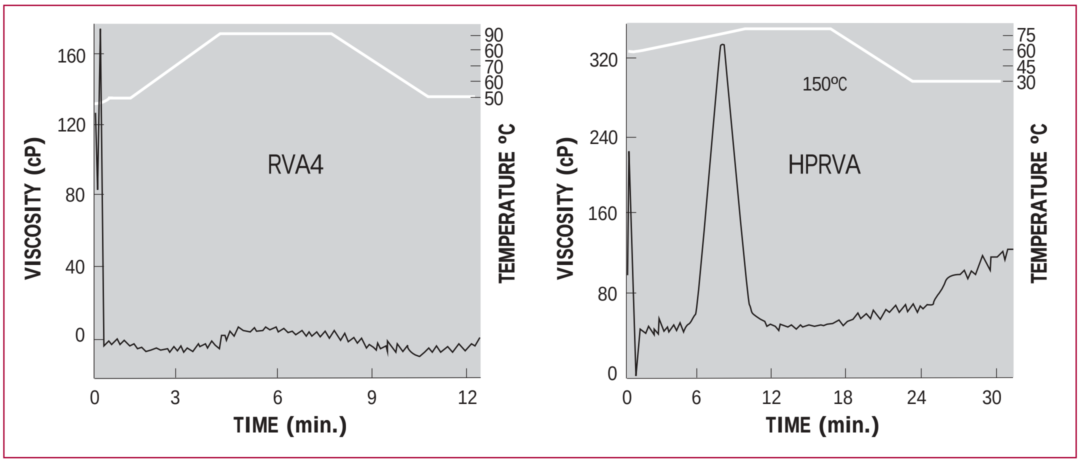


Figure 1
Heating curves of Hi-Maize™ starch tested with the regular RVA 4 (left) and the HPRVA (right). Please note that on the HPRVA profile temperatures are double what is shown on the graph.

Stirring Number (Newport Scientific Method 2) can be used to measure pre-harvest sprouting in grain as well as post-harvest changes in grain quality. Other tests, such as the general pasting method for wheat (Newport Scientific Method 1) and the sensitive ramped temperature test for malting barley (Newport Scientific Method 15) can be used to measure and investigate the post-harvest quality of grain. At its simplest, the RVA can ensure that the grain that went into the silo has the same properties when it leaves the silo on the way to final processing.

The market for grain products with health promoting properties is growing, and new cereal crops are likely to display unique storage challenges. To store new crops safely and cost-effectively, adjustment of equipment and techniques and modification of infrastructure and storage management need to be considered. Consequences of inappropriate storage of new crops may be the loss of functional properties, decreased nutritional value, the loss of final product quality, and unnecessary storage costs. The high levels of unusual starches found in some new varieties of cereals result in very different pasting characteristics compared to conventional cereals. Stirring number cannot be used to measure weather damage and other quality characteristics of such grains, because some of the starches they contain will not paste well at temperatures below 150°C, the gelatinisation temperature of amylose starches. Full hydration will also not be achieved under standard test conditions.

In a conventional baker's flour, some minutes into the test the flour will display a clear pasting peak. In contrast, the pasting curve of grain containing amylose starches is featureless and does not contain much information on the integrity of the starch. Some increase in response to the RVA temperature profile can be achieved by increasing the thickness of the test slurry. However, to determine reliably the peak viscosity of some grain, pasting temperatures above 150°C are required. Such temperatures can be achieved with the High Pressure RVA (HPRVA) under development by Newport Scientific, which uses pressure to allow pasting test at above the boiling point of water. Figure 1 shows the pasting characteristics of high-amylose maize starch ('Hi-MaizeTM') with a conventional RVA compared to the HPRVA. Until the HPRVA becomes available, we plan to use mixtures of difficult to paste material and wheat starch to measure storage-induced changes. In addition, we are still experimenting with the use of modified pasting profile in combination with thick water-meal slurries to determine if storage has affected the grain.

In summary, the RVA is a useful tool for monitoring quality changes in storage. However, some novel cereal varieties cannot be measured using conventional RVA techniques. By using mixes of novel cereal variety flours or starches and flour or starch of known properties conventional RVA techniques can still be utilised. Use of the HPRVA is the best solution for pasting pure samples of starches and flour which require high pasting temperatures.

1. CSIRO, DEPARTMENT OF ENTOMOLGY
Cnr Clunies Ross Street and Barry Drive, Black Mountain, Canberra, ACT 2601, Australia
TEL 61 2 6246 4001
FAX 61 2 6246 4202

2. NEWPORT SCIENTIFIC PTY LTD
www.newport.com.au
support@newport.com.au