RVA WORLD
THE NEW STANDARD
May 1996 Issue No. 8

AACC Approval

The RVA Stirring Number method for rapidly measuring the native alpha-amylase activity in wholemeals and flours has now been adopted into the standards of the American Association of Cereal Chemists (AACC Method 22-08) which means, of course, that results can be compared between laboratories more easily. You'll find the Stirring Number method here.

Research Project Begins

In collaboration with the CSIRO Division of Food Science and Technology, Newport Scientific has received a grant from the Industry Research and Development Board for a graduate based project - 'RVA for Industrial Use'. Natalie Turner, who holds a Masters from the University of Western Sydney, has been appointed for the two-year program to research novel applications of the RVA in starch and protein rheology. Potential uses include custard, yoghurt, soy tofu, egg powder, egg white etc, and the project will involve surveying industry, targeting the most promising areas, and developing appropriate technologies.

Thermocline 1. 1 Released

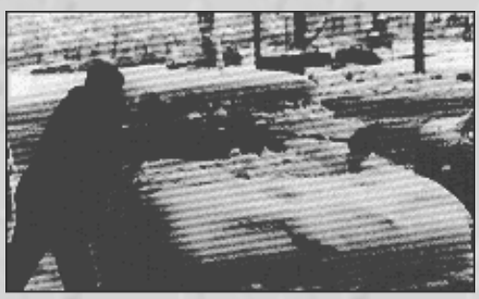
One of the most powerful features of the RVA is its ability to interface with a computer. Newport Scientific has released Thermocline for Windows Version 1.1 with its new and improved features - including true graphical export, colour printing, more sophisticated file handling and (you'll be pleased to hear) a number of bug fixes! We are also offering a free upgrade to existing users of Thermocline for Windows Version 1.0.

AACC Conference 1995

Newport Scientific attended the 1995 American Association of Cereal Chemists (AACC) Conference along with American agents Foss Food Technology Corporation to display the latest RVA-4. It was very pleasing to find that 15 poster papers at the Conference relied on information gathered using the RVA - it's a testimonial to the RVA's application and standing in the scientific community.

Italian Training Trip

Mark Bason, our Research Scientist, visited Italian agent Foss Electric Italia S.p.A. to train their sales and service team, also taking the opportunity to visit clients Roquette Italia S.p.A. who have recently purchased two RVA-4s. The fact that there were record snow falls and a seventeenth century opera house burned to the ground during his visit we like to think was coincidental. We have, however, decided to exercise a degree of damage control and keep him at home for a while.



Rolando Creston of *Foss Italia* coping with coincidence

Further Afield in China

In March Newport Scientific's Managing Director, Rodney Booth, visited the city of Harbin in China's most northern province, Heilongjiang. The purpose was to meet with Professor Wang of the Heilongjiang Academy of Agricultural Sciences who researches new varieties of cereals for use in traditional Chinese foods like steamed buns and is interested in applying the RVA. On his return to Beijing, Rodney visited laboratories already using the RVA to survey wheat varieties.

IN THIS ISSUE

THE RAPID PASTING AND STIRRING NUMBER METHODS - RESULTS OF TWO INTERNATIONAL COLLABORATIVE TRIALS

Mark Bason, Newport Scientific,
March 1996

Summary

The Stirring Number (SN) and Rapid Pasting (RP) methods using the Rapid Visco Analyser (RVA) were assessed in two international collaborative trials, following ICC methodology. The average within and between laboratory standard deviations for the RP Method were 2.5 and 6.9 RVU respectively for the combined peak, holding and final viscosity values. Corresponding values of 3.4 and 6.8 RVU were determined for the SN Method. These methods have since been adopted as ICC Draft Methods 161 and 162 and AACC Method 22-08 (SN Method).

Introduction

Two international collaborative studies, involving 15 laboratories (Plate 1), were carried out during 1994 to assess methods using the Rapid Visco Analyser (RVA) to measure pasting quality and endogenous amylase activity in cereals. These methods cover the two major areas of application of the RVA, which have been traditionally performed by the Brabender Visco/Amylo/Graph and Falling Number machine. Advantages of the corresponding RVA methods in speed, sample size, temperature control and utility under receival and processing conditions has led to their increasing use in industry and research. This has increased the need for standard methods to ensure consistency of results.

The RVA was originally designed to rapidly test for sprout damage in wheat during receival (Ross et al 1987). The method assessed involves agitating water (25.0 mL) and wholemeal (4.00 g) or flour (3.50 g) at 95°C for three minutes. The end viscosity, in Rapid Visco Units (RVU; 1 RVU = approx. 12 cP), is known as the Stirring Number (SN). The amylase activity is detected through its ability to reduce the viscosity of the mixture by hydrolysing the endogenous starch which is gelatinised during the test, giving SN values from about 160 (low amylase activity) to 10 or less.

Addition of linearly ramped heating and cooling abilities to the RVA (see Wrigley et al 1996) expanded application of the RVA to include starch pasting tests through the classic heat-hold-cool profile in 13 min or less. The Rapid Pasting (RP) method assessed involves heating water (25.0 mL) and ground sample (4.00 g) or flour (3.50 g) from 50 to 95°C, holding at 95°C, then cooling to 50°C, causing starch granule swelling, disruption and polymer re-association. Peak viscosity and time, holding strength and final viscosity are measured to indicate sample pasting properties and/or amylase activity.

Materials and Methods

Six samples (three wheatmeals, one rye meal and two rye flours; FN range 96-430) were analysed five times each following ICC guidelines for both the SN and RP tests, using an RVA model 3CR (computer control) or 3D. Of the 15 participating laboratories, SN data was not received from one and was excluded for three others due to failure to follow the method in the specified testing time.

Results were analysed for outliers then for within laboratory repeatability and between laboratory reproducibility by Prof. Orsi, ICC Statistician. SN data was later also evaluated by Dr T. Nelsen, AACC Statistician, following AOAC Harmonization Guideline Procedures.

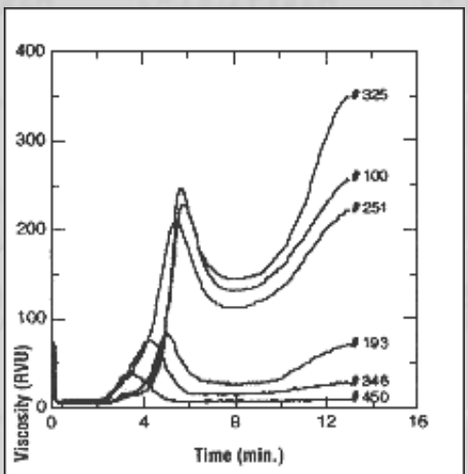


Figure 1.
Pasting curves of the various samples obtained from one laboratory.

Table 1. Averaged results of the collaborative trial to assess the Rapid Pasting Method using the Rapid Visco Analyser (ICC methodology)

Parameter	Labs	Min.	Max.	sr	RSDr	r	sR	RSDR	R
Peak Visc.	12.5	39.5	246	2.92	2.22	8.17	7.11	6.10	19.9
Hold Visc.	10.3	5.0	145	1.56	4.17	4.37	4.57	19.8	12.8
Final Visc.	11.7	7.8	337	2.90	3.14	8.11	9.28	13.89	25.98
Peak Time	12.7	3.28	5.73	0.045	0.993	0.125	0.092	1.988	0.258

Notes
a. Precision values are the weighted averages derived from each of the six samples (individual sample results available from author).
b. sr = Repeatability standard deviation (sd) (within lab), RSDr = Repeatability relative sd (within lab), r = Repeatability value (within lab), sR = Reproducibility sd (between lab), RSDR = Reproducibility relative sd (between lab), R = Reproducibility value (between lab).
c. Viscosity values in Rapid Visco Units, Time in min. relative standard deviations in %.

Results and Discussion

Precision results for the RP (ICC methodology) and SN (AACC methodology) data are given in Tables 1 and 2. The average within and between laboratory standard deviations (sr and sR) for the RP data were 2.5 an 7.0 RVU respectively, combining the peak, holding and final viscosity values. Corresponding values for the SN data were 3.4 and 6.8 RVU respectively. These results indicated satisfactory precision performance of the methods. The between laboratory relative standard deviations (RSDR) of samples 193 346 and 450 were relatively high due to the low mean values (high amylase activity) of these samples.

Based on these studies, the SN method has been adopted as ICC Draft Method 161 and AACC Method 22-08, and the RP Method has been adopted as ICC Draft Method 162.

Acknowledgments

The assistance of Dr Weipert, participation of the collaborating laboratories, and statistical analyses by Prof. Orsi, ICC and Dr Nelsen, AACC are gratefully acknowledged.

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Table 2. Results of the collaborative trial to assess the Stirring Number Method using the Rapid Visco Analyser (AACC methodology)

Sample	Labs	Mean	sr	RSDr	r	sR	RSDR	R
100	11	135.81	2.35	1.73	6.64	8.25	6.07	23.34
193	11	50.36	2.14	4.25	6.05	7.84	15.56	22.18
251	10	117.57	3.23	2.74	9.13	8.05	6.84	22.77
325	11	146.78	3.79	2.58	10.73	6.91	4.71	19.56
346	11	38.42	1.23	3.21	3.49	4.87	12.68	13.79
450	10	12.18	0.69	5.63	1.94	4.62	37.93	13.08

Notes
a. Abbreviations and units - see footnotes Table 1.
b. Samples: 100, 193 and 325 wheatmeal, 251 rye meal, 346 and 450 rye flour.

RAPID VISCO APPLICATIONS: ROLLED OATS

Malcolm Glennie Holmes, Special Chemist (Cereals),
NSW Agriculture, Agricultural Research Institute, Wagga Wagga.

Recently, rolled oats made from a single consignment of the new variety Yarran were found to be unacceptable to consumers, although none of the standard Quality Control tests identified a problem.

This might appear to be of little importance to the Australian cereal industry, until it's realised that one company alone makes over $50,000,000 worth of these products each year.

Figure 1 shows the rapid viscograms of the groats (oat grains minus husks) when ground with a Failing Number grinder and tested at 4 g / 24 mL at 90°C with a stirring speed of 960 rpm. Figure 2 shows the viscograms of the rolled oats after similar grinding and under the same conditions.

The Peak Viscosities (PV) of the groats were little different, with that of the Yarran slightly higher than those of the other cultivars Mortlock and Cooba. The PV of the oat flakes made from the Yarran, however, was below those of the other cultivars. More significantly, both the grain and the rolled oats of the unacceptable sample showed a delay in the Time to Peak Viscosity (TTP) when tested in the RVA. The difference was particularly noticeable in the rolled oats, with the Yarran having a TTP 1.6 times longer than on the other, acceptable, cultivars.

Yarran had a significantly higher oil content (10.2%) than the other cultivars (7.0% and 8.0%), and it may be that oil-starch interactions are responsible for the delayed TTP. The content of oil in oats is genetically determined, and while breeders seek high oil contents for oats for animal feeding, oats for human food use should have low oil to reduce rancidity.

Table 1.
Analytical data for three samples of oats

Variety	Protein	Moisture	Oil
Cooba	11.2	11.1	7.0
Mortlock	9.4	12.7	8.0
Yarran	8.7	10.2	10.2

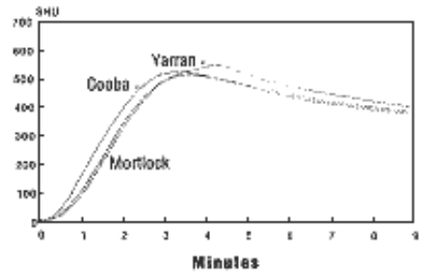

Figure 1
Viscogram of Ground Groats

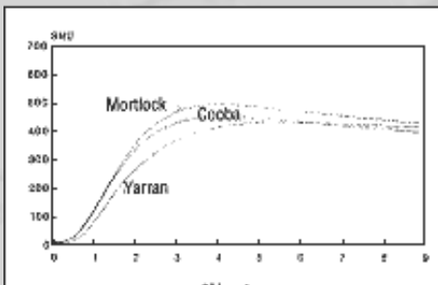

Figure 2
Viscogram of Ground Rolled Oats

Errata _ RVA World 7

The method flyer in RVA World 7 - General Pasting Method using the RVA - should contain the following moisture correction formulae:

M2 = (100 - 14) x M1 / (100 - W1)
W2 = 25.0 + (M1 - M2)

where M1 = sample mass class (as per table)
M2 = corrected sample mass (g)
W1 = actual moisture content of sample (% as is)
W2 = corrected water volume (mL).

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