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RVA™ Viscosity of Chickpea Flours

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ALSO IN THIS ISSUE

Dough mixing

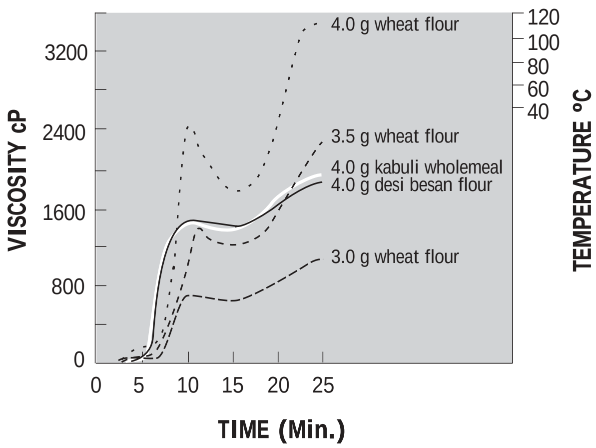
Chickpeas (*Cicer arietinum*) are divided into two types: desi (small, angular seeds with dark-coloured and thick testa) and kabuli (large, round seeds with near-white/opaque, thin testa). Australia produces approximately 250,000 tonnes of chickpeas and around 95% of this is exported. The desi type is often de-hulled and ground to produce chickpea flour (besan). Recent increases in the availability of smaller kabuli types have lead to a new practice of substituting wholemeal kabuli flour into besan flour to reduce production costs.

The RVA viscosities of desi besan (cv. Howzat) and kabuli wholemeal flour (cv. Kaniva) were compared, including a reference hard wheat flour (cv. Drysdale). The RVA Standard Method 2 profile and analysis were used with 4.0 g flour at 14% MB in 25 mL water. All samples were also examined using 3.0 g and 3.5 g in 25 mL water, however only the wheat samples are shown.

The suggested chemical composition of chickpea and hard wheat from literature are shown in Table 1.

Chickpea flour produced lower viscosities than wheat (comparing 4.0 g flours) as was expected due to the lower starch content of chickpea. The higher lipid content of chickpea may also be involved in lowering the peak viscosity by forming lipid-amylose complexes. The chickpea flours showed very broad peak viscosities (possibly due to the biphasic nature of C-type starch granules) with little breakdown and small setback indicating greater stability of these flours under heat and shear conditions. Despite the kabuli chickpea flour containing around 4% testa (wholemeal), the viscosity curve was not dissimilar to that of the desi chickpea besan flour and suggests that substitution may have little adverse effect on end-product performance.

Further work will be conducted. Please send any comments or suggestions to jenny.wood@agric.nsw.gov.au or call +61 (02) 6763 1157.



Sample	Testa (%)	Protein (%)	Lipid (%)	Starch (%)	Amylose in Starch (%)	Starch Granule Sizes (µm)
Kabuli Wholemeal	~ 4.0	19-24	~ 5.0	45-47	31-35	2-31
Desi Besan Flour	0.0	20-23	~ 6.0	40-45	30-36	5-30
Hard Wheat Flour	0.0	11-12	~ 0.7	60-70	23-32	2-24

Table 1
Chemical composition as suggested by literature.

Sample	Peak 1	Trough 1	Breakdown	Final Visc.	Setback	Peak Time	Pasting Temp.
Kabuli Wholemeal	1381	1246	135	1747	501	9.27	75.10
Desi Besan Flour	1403	1307	96	1655	348	10.00	75.45
4.0 g Wheat Flour	2446	1698	748	3744	2046	9.13	81.45
3.5 g Wheat Flour	1321	1037	284	2342	1305	8.93	83.85
3.0 g Wheat Flour	675	572	103	1345	773	8.80	85.80

Table 2
RVA results for desi and kabuli chickpeas compared to wheat at various shear rates.

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Changing names

When Newport Scientific began publishing *RVA World* in 1991, it was initially to provide you with some technical information about the RVA. A little later we added a small snapshot of who we are and what we do. Back then, we didn't envisage the company growing to the extent that it has.

In 1998, *Newport Scientific News* took over the news role while *RVA World* focused as the technical journal. Now, with our broadening range of products we have decided that it's time for *RVA World* to have a name change to

Newport Scientific World.

We welcome you to our first issue.

Summary of the Paper: Dough Mixing on the Newport Scientific doughLAB™ Compared to the Standard Brabender Farinograph

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OBJECTIVES

The objectives of this study were to compare doughLAB and Farinograph results, compare 50 g and 300 g bowl effects, and assess the repeatability of the doughLAB.

MATERIALS AND METHODS

Instruments

Tests were performed using a prototype and a commercial doughLAB, and results obtained from an external Farinograph.

Samples

To compare instruments, 10 commercial wheat flour samples were obtained with Farinograph results, and were tested on the commercial doughLAB in a 300 g bowl. To compare bowls, 5 of the samples were tested on the prototype doughLAB in both a 50 g and 300 g bowl. To assess repeatability, 5 samples were tested in duplicate on the commercial doughLAB in a 300 g bowl.

Method

Samples were tested using AACC Standard Method 54-21 (AACC, 1983). 300 g or 50 g of each sample was tested without compensating for moisture content of sample, to match the Farinograph procedure used by the supplier.

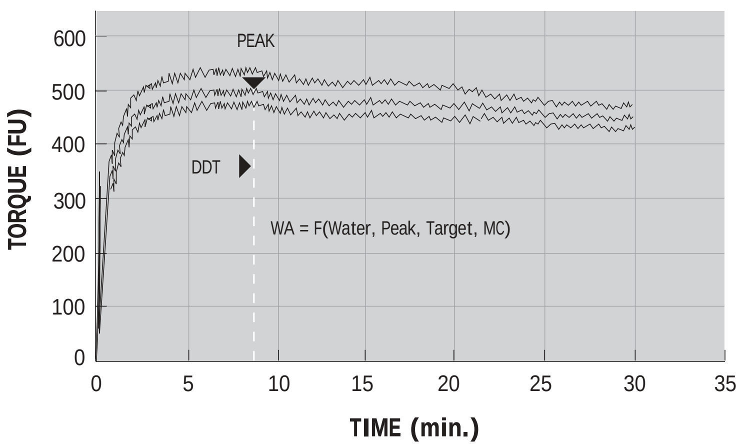


Figure 1

doughLAB curve parameters.

Data analysis

Water absorption (WA), peak consistency and dough development time (DDT) were derived from the data curves (Figure 1). Stability and softening data were not available from the Farinograph tests, so were not determined. WA was corrected to 500 FU assuming 0.5% change per 20 FU deviation from the peak consistency target of 500 FU. Instrument and bowl effects were compared by regression analysis, and repeatability by one way ANOVA with sample as the factor (Minitab ver. 13).

RESULTS AND DISCUSSION

Comparison of doughLAB with Farinograph

Results from testing the 10 commercial samples are summarised in Table 1. Farinograph and doughLAB WA results were well correlated (Table 2, Figure 2A). The average peak torque obtained from the doughLAB was 18 FU below that from the Farinograph (assumed 500 FU), resulting in a 0.45% lower estimation of WA by the doughLAB compared to the Farinograph. DDT was well correlated between the two instruments but was longer in the doughLAB (Table 2, Figure 2B). Differences could be due to bowl effects since different bowls were used on the doughLAB and Farinograph. We are currently investigating this further.

Table 1
Comparison of dough-mixing properties.

Sample	Faringraph		doughLAB		
	WA (%)	DDT (min.)	Peak (FU)	WA (%)	DDT (min.)
1	64.6	6.00	490	64.3	8.18
2	58.9	5.00	527	59.5	4.65
3	56.5	4.00	513	56.8	2.15
4	61.3	3.50	462	60.3	5.67
5	65.0	5.50	474	64.3	8.00
6	65.3	2.25	491	65.1	1.70
7	66.1	6.50	456	64.9	9.25
8	65.4	6.00	464	64.5	7.25
9	66.3	7.00	484	65.9	12.58
10	67.5	6.00	459	66.4	8.95
Mean	63.7	5.20	482.0	63.2	6.80

Table 2
Regression equations for WA and DDT.

Parameter	Regression	R^2	RMS[a]
WA	doughLAB WA = 0.877 Farino WA + 7.324	0.98	0.47%
DDT	doughLAB DDT = 1.998 Farino DDT – 3.547	0.79	1.60 min.

[a]RMS is the root mean square of residuals of the fit.

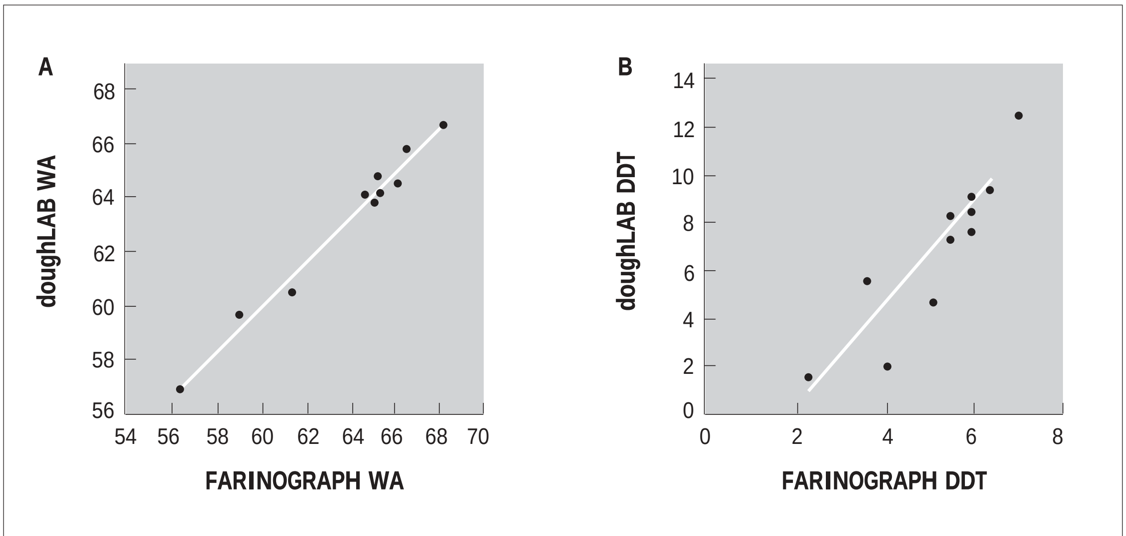
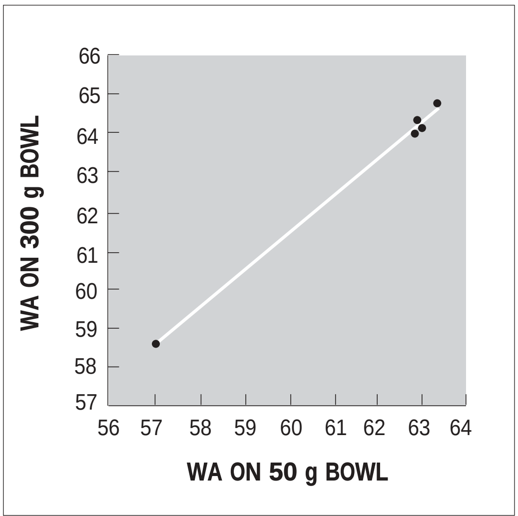


Figure 2
Comparison of WA (A) and DDT (B) between the Farinograph and doughLAB.

Comparison between 50 g and 300 g bowls

WA results between the 50 g and 300 g bowls showed a high degree of correlation (Figure 3). The average peak torque obtained from the 50 g bowl was 52 FU below that from the 300 g bowl, resulting in a 1.2% lower estimation of WA using the 50 g bowl compared to the 300 g bowl. Bowl effects were evident.

Figure 3
Comparison of WA using 50 g and 300 g bowls.



Repeatability

WA, peak consistency and DDT results repeated well overall (Table 3). The larger coefficient of variation for DDT was due to the strong flours used giving indistinct (flat) peaks making estimation of peak time variable. Sample effects were significant for all three parameters (P<0.01) indicating that the flours could be readily distinguished in the doughLAB.

Table 3
Repeatability of doughLAB results.

Statistic[a]	Peak (FU)	WA (%)	DDT (min.)
Rep SD	4.6	0.13	0.83
CV %	0.9	0.2	9.8

[a]Repeatability standard deviation and coefficient of variation

CONCLUSIONS

The doughLAB results were repeatable and well correlated with the Farinograph results. Bowl size effects were evident. The doughLAB can be used to assess water requirements and mixing properties of flour.

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