Evaluation of wheat flour quality using MixoLab® and SRC

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1. INTRODUCTION

MixoLab® and the automated Solvent Retention Capacity (SRC) (Chopin Technologies, France) were used to characterise wheat varieties. MixoLab® was used to study dough rheological properties and starch gelatinisation of flour while SRC was used to study water absorption capacity, glutenin, pentosan and damaged starch functionality of flour.

2. AIM

The main aim of this investigation was to:

- characterise rheological and thermal properties of wheat flour
- study suitability of wheat flour for a range of different products
- characterise the glutenin, pentosan and damaged starch functionalities of flour

3. MATERIALS AND METHOD

Flour samples

A range of wheat varieties differing in protein content from 8.2 to 15.3% were evaluated. All samples were milled on a Buhrer test mill and flour quality was tested using AACC International Approved Methods (AACC, 2011).

MixoLab® and SRC

Mixing and pasting behaviour of 100% wheat flour were analysed using the MixoLab® analyser. The MixoLab® measures (in real time) the torque (Nm) produced by the passage of dough between the kneading arms, allowing the study of physico-chemical behaviour. For the test protocol (Chopin+), 50 g (adjusted for moisture content) of flour samples were placed in the MixoLab® analyser bowl and tested at optimum water addition. The mixing speed used was 73 rpm. The settings used in the test were 8 minutes at 30°C with a temperature increase of 4°C/min until the mixture reached 90°C, at this point there is an 8 minute holding period at 90°C, after which the temperature was decreased at 4°C/min until it reached 55°C, followed by 6 minutes of holding at 55°C.

Four different solvents were used in SRC: deionised water, 50% sucrose, 5% sodium carbonate and 5% lactic acid.

The SRC testing was done in accordance to the AACC Approved Method 56-11. The test protocol (Chopin+) was used to test optimal water addition. The mixing speed used was 73 rpm.

For the test protocol (Chopin+), 50 g (adjusted for moisture content) of flour were mixed in the SRC analyser. The SRC measures (in real time) the torque (Nm) produced by the passage of dough between the kneading arms, allowing the study of physico-chemical behaviour. For the test protocol (Chopin+), 50 g (adjusted for moisture content) of flour samples were placed in the SRC analyser bowl and tested at optimum water addition. The mixing speed used was 73 rpm. The settings used in the test were 8 minutes at 30°C with a temperature increase of 4°C/min until the mixture reached 90°C, at this point there is an 8 minute holding period at 90°C, after which the temperature was decreased at 4°C/min until it reached 55°C, followed by 6 minutes of holding at 55°C.

End products

White Salted Noodles (WSN) were made from flour, water (32%) and salt (4%) using the Othake noodle machine. The final noodle thickness was 2.5 mm. Pan breads were baked using No Time Dough (NtD).

Acknowledgements

A typical MixoLab® profile is shown in Fig. 1 showing C1 (water absorption); C2 (protein weakening); C3 (starch gelatinisation); C4 (hot gel stability) and C5 (starch retrogradation).

4. RESULTS AND DISCUSSION

A typical MixoLab® profile of different flours used in baking and noodle trials is shown in Fig 2. In baking trials (Fig 2a), C2 measure of protein weakening as a function of mechanical work and temperature ranged from 0.35 to 0.54; C3 measure of starch gelatinisation ranged from 1.14 to 1.78; C4 measure of hot gel stability ranged from 1.14 to 1.73 while C5 measure of starch retrogradation in the cooling phase ranged from 1.91 to 2.80. The values of C3, C4 and C5 for WSN flour was higher compared to YAN flour. In addition the 'cooking stability' for WSN flour was also higher. This is consistent with earlier publication findings (Cato & Mills 2008) and related to the eating quality of noodles.

In this study (with the high sugar, high fat NtD baking method) no significant correlation between SRC lactic acid or sucrose and bread specific volume (BSV) was seen. This is probably due to the fact that many other factors contribute to the final bread volume including choices of processing method and equipment as well as ingredients (data not shown here).

References

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