**INTRODUCTION & OBJECTIVE**

Changes to the recommended daily intake of dietary fibre have resulted in the need for foods with enhanced dietary fibre. To help consumers meet their daily requirements, addition of whole grain (WG) barley flour and WG pulse flours offers interesting alternatives to traditional fibre sources. WG barley flour is a good source of insoluble and soluble β-glucan fibre and WG pulse (pea, lentil, chickpea and bean) flours are good sources of insoluble fibre. The objective of this study was to evaluate the processing characteristics and quality of pasta made by partially substituting durum semolina with WG barley and pulse flours.

**MATERIALS & METHODS**

**Flours**
- CDC McGwire and Millhouse (both 2-row hulless, regular starch) and CDC Fibre (2-row hulless, zero amylose starch) were hammer milled into WG flour at Dover Mills, Saskatoon, SK.
- Chickpea, yellow pea, and white navy bean flours were obtained from commercial supplier as follows: chickpea flour – Brue Natural Flour Mills, Winnipeg, MB; yellow pea flour – Grain Processing Enterprises, Scarborough, ON.
- Canada Western Amber Durum (CWAD) wheat was roller milled (32%). Spaghetti was processed on the CIGI lab scale pasta mill.
- Protein, moisture, and ash contents are reasonable. The use of barley varieties with normal starch contents are recommended. Flavour and textural properties were also more pronounced in the yellow pea spaghetti than navy bean flour spaghetti.

**Pasta Processing**
- Barley flour was substituted for durum semolina at a level of 100%.
- Chickpea flour was blended with durum semolina at several levels (10-50%).
- Yellow pea flour and navy bean flour were substituted with durum semolina at a level of 30%.
- Barley flours blends were mixed (12 min) at a fixed proportion (32%). Spaghetti (Table 2) was processed on the CIGI Bühler pilot mill.
- Wheat was pressed through a teflon spaghetti die (1.8 mm diameter), and cut by hand to appropriate lengths. The spaghetti strands were dried using a commercial scale Bühler batch dryer (Bühler, Ulwil, Switzerland) using an 85°C drying cycle.
- For the pulse flour blends, spaghetti was processed using a commercial scale Bühler Polymatic extrusion press (Uzwil, Switzerland). Water was added to maintain a 40 kg pressure at the extrusion head. Dough was pressed through a teflon spaghetti die (1.8 mm diameter), and cut by hand to appropriate lengths. Spaghetti was dried using the commercial scale Bühler batch dryer using a 70°C drying cycle.

**Analysis of Flours**
- Protein, moisture, ash, β-glucan, starch, and dietary fibre contents were determined on the flours according to AACC standard methods. The results are shown in Table 1 for barley flours.
- Flours were substituted with barley flour to create a varied product set. The results are shown in Table 2 for barley flours.
- Chickpea flour
  - The addition of chickpea flour significantly increased the total dietary fibre and protein content of the spaghetti (Table 3).
  - As chickpea flour content increased, cooking loss increased; instrumental and sensory firmness increased probably because of increased protein content, and elasticity decreased probably because of gluten dilution (Table 3).
  - With increasing levels of chickpea flour, the spaghetti was darker (lower L* values), less yellow (lower b* values), and had more redness (higher a* values) (Figure 2 and Table 3).

**RESULTS & DISCUSSION**

**WG Barley Spaghetti**
- Spaghetti made from the normal starch WG barley flours
  - CDC McGwire and Millhouse had similar cooked texture and cooking losses as the 100% durum semolina spaghetti (Table 2).

**Cooking Pulses, Portage la Prairie, MB; navy bean flour – Grain Processing Enterprises, Scarborough, ON.**

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