PULSE CANADA

Pulses in Pasta Applications

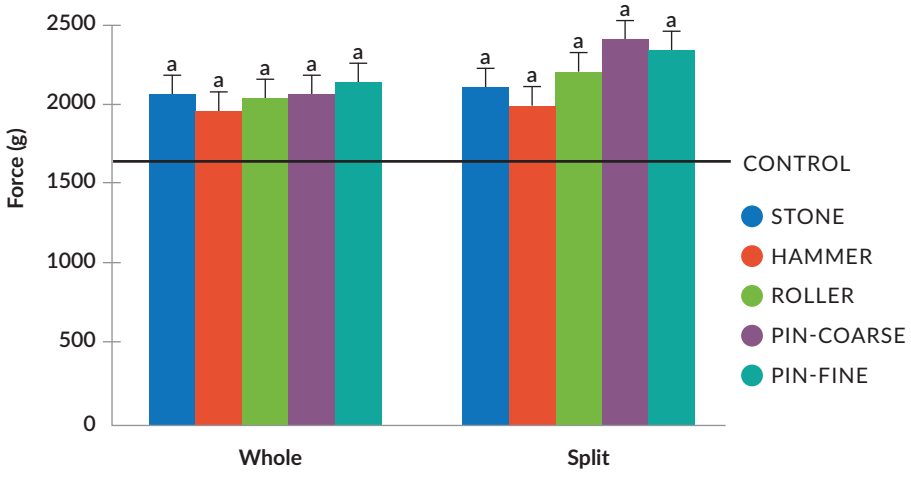
Optimizing formulation and processing parameters for spaghetti containing yellow pea flour is relevant for food manufacturers who are interested in improving the nutrition of pasta while maintaining high-end quality. The effect of milling technology, particle size, protein content, and drying regime on quality attributes of spaghetti containing yellow pea flours was evaluated.

MILLING TECHNOLOGIES

Yellow pea flour produced by pin, hammer, stone and roller milling techniques was incorporated into a spaghetti formulation at a 30% inclusion with durum semolina. Spaghetti prototypes using the milled whole or split yellow peas demonstrated that yellow pea flours could successfully be added as ingredients in spaghetti formulations with differences in quality parameters observed with the different yellow pea flours.

Incorporation of the yellow pea flour resulted in spaghetti which was less bright and more red, and firmer than 100% durum spaghetti **(Figure 1)**. At the optimum cooking time of 10 minutes, the yellow pea/durum spaghetti had a slightly higher cooking loss than the control. Split yellow peas gave a higher quality spaghetti product than milled whole yellow peas. Roller milling could be used to produce fine and coarse granulation yellow pea semolina with physical specifications similar to durum semolina.

FIGURE 1 Firmness of spaghetti made with 30% whole or split yellow pea flour milled using different milling methods after cooking for 10 minutes



Key Findings

- *Yellow pea flours can be added to spaghetti formulations to create spaghetti products with similar quality attributes to 100% durum spaghetti.*
- *Roller milled, fine or coarse split peas flours of medium protein content give the highest quality pulse/durum flour blends for spaghetti.*
- *Low temperature-long time (50°C for 16.5 hrs) drying regimes are recommended to minimize color and texture differences when incorporating yellow pea flour in spaghetti formulations.*

EFFECT OF YELLOW PEA FLOUR COMPOSITION ON SPAGHETTI QUALITY

Yellow pea flour of low, medium and high protein grades, as well as fine and coarse yellow pea semolina, were selectively produced in the roller milling process. All five flours were tested in the spaghetti formulations at 30% inclusion. A high temperature (85°C)-short time (5.75 hrs) drying regime was used. Flour blends containing 30% yellow pea flour and 70% durum semolina were analyzed for particle size, total starch, starch damage, water absorption capacity and peak viscosity. Amongst the different protein grade flours, differences were noted for total starch, starch damage, water absorption and peak viscosity. Significant differences were observed for particle size and peak viscosity between the fine and coarse yellow pea flours **(Table 1)**.

Spaghetti color was the primary quality attribute affected by protein content. Increasing the protein content led to increased redness (higher a* value) of the spaghetti. Protein content of yellow pea flours had no effect on spaghetti texture, optimum cooking time, or cooking loss. Granulation of pea flours affected texture and cooked weight where coarse spaghetti had lower firmness and cooked weight. Granulation did not affect color, optimum cooking time or cooking loss.

EFFECT OF DRYING CONDITIONS ON SPAGHETTI QUALITY

The five yellow pea flours of varying protein content and granulation were blended at a 30% inclusion with durum semolina. Water was added to the flour blends during mixing at amounts that were adjusted to the extruder head pressure. Two drying methods were followed for each spaghetti formulation: high temperature-short time (HTST) drying of 85°C for 5.75 hours, and a low temperature-long time (LTLT) drying of 50°C for 16.5 hours.

The LTLT drying method reduced redness (a*) by over 50%. LTLT drying also increased brightness (L*) of fine and coarse granulation yellow pea flour spaghetti by over 20%. LTLT dried spaghetti containing high protein, and fine and coarse granulation yellow pea flour had texture that was about 30% less firm after 10 minutes of cooking compared to HTST dried spaghetti. LTLT drying resulted in an increase in cooking loss in the coarse granulation, and medium and high protein yellow pea flour containing spaghetti. Optimal cook time and cooked weight were not changed by LTLT drying.

TABLE 1 Physical and functional properties of 30/70% blends of pea flour grades/durum semolina processed by a HTST drying regime

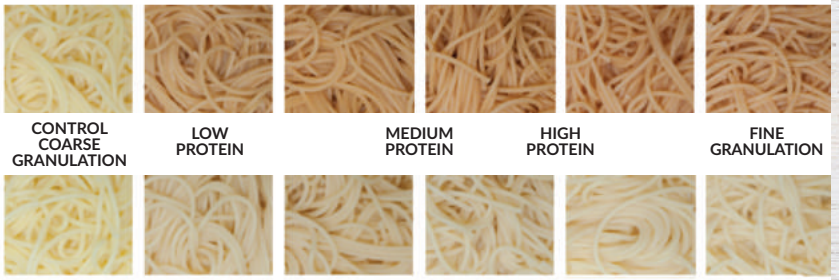
FLOUR BLEND[1]	PARTICLE SIZE (µm) [2]	TOTAL STARCH (%)[2]	STARCH DAMAGE (%)[2]	WAC (g/g)[2]	PEAK VISCOSITY (RVU)[2]	PROTEIN CONTENT (%)[2]
100% Durum Semolina Control	382.25	79.45	3.4	0.79	293	14.6
30% Low Protein Yellow Pea Flour	346.40	73.55	3.7	0.77	244	16.58
30 % Medium Protein Yellow Pea Flour	319.42	72.60	3.1	0.74	232	17.42
30% High Protein Yellow Pea Flour	308.97	70.15	3.3	0.67	222	18.14
30% Fine Yellow Pea Semolina	377.32	71.50	2.7	0.75	228	18.68
30% Coarse Yellow Pea Semolina	516.67	68.25	2.5	0.69	186	18.59

HTST = Temp of 85°C, time of 5.75 hrs; WAC = water absorption capacity; RVU = rapid visco units

[1]Flour blends are composed of 30/70% yellow pea flour/durum semolina

FIGURE 2 Spaghetti made with 30/70% blends of yellow pea flour/durum semolina, prepared under high temperature-short time drying conditions.

FIGURE 3 Cooked spaghetti made with flour blends containing 30/70% yellow pea flour/durum semolina, prepared under HTST drying conditions (top row) and LTLT drying conditions (bottom row).



Overall, medium protein yellow pea flour spaghetti and both fine and coarse yellow pea flour processed with LTLT drying had the best color development **(Figure 3)** and end-quality most similar to traditional durum semolina spaghetti, and would be recommended for future spaghetti product development.

This research was conducted by the Canadian International Grains Institute.

For more information, contact:

Pulse Canada: office@pulsecanada.com | 204-925-4455 | *www.pulsecanada.com*