Potential for yellow pea ingredient utilization in breaded mozzarella stick coatings as determined by functional, sensory and nutritional properties

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Introduction.

• Canada is the global leader in pea production; however, the majority of its peas are sold unprocessed to international markets (1).

• Value can be added to peas by milling them into flour or fractions (starch, fiber, & protein) then incorporating them into popular, prepared foods like breaded mozzarella sticks (MS).

• Peas have a low glycemic index, are gluten-free, environmentally friendly & nutrient dense (↑ fiber, protein & minerals).

Objectives

• To investigate how the addition of pea ingredients affects the functional, sensory & nutritional properties of MS coatings.

• To formulate an optimized MS coating utilizing the benefits of pea ingredients (starch, flour & fiber).

Materials and Methods

Experimental design

• The control included traditional MS ingredients (corn starch/flour, wheat flour/gluten & guar gum).

• 2 pea starches (wet & dry milled), 3 pea flours (whole & split), 3 pea hull fibers (wet & dry milled) from Canada's three main pea processors were evaluated.

• An optimized pea MS was then formulated by fully replacing traditional MS ingredients (starch, flour, gluten & gum) with pea ingredients.

Sample Preparation

• Breaded mozzarella sticks were prepared based on a commercial formula & process provided by Newly Weds Foods.

• A 6-step coating system was applied (batter, pre-dust, batter, pre-dust, batter & breader).

• 4 replicates of each MS type were prepared on separate days & pooled for sensory testing.

• Samples were par-fried at 380°F for 20 sec, frozen overnight & fully fried in a commercial deep fryer at 350°F for 90 sec.

Methods

• Batter viscosity, coating pick-up & par fry yield were measured.

• A trained sensory panel (n=10) evaluated colour, crispness, beanie flavour & overall quality of fully fried mozzarella sticks using category scales.

• Nutritional composition of par fried mozzarella sticks was determined by SGS Canada Inc. (Figure 2).

Statistical Analysis

• Significant differences were determined by ANOVA using SPSS software.

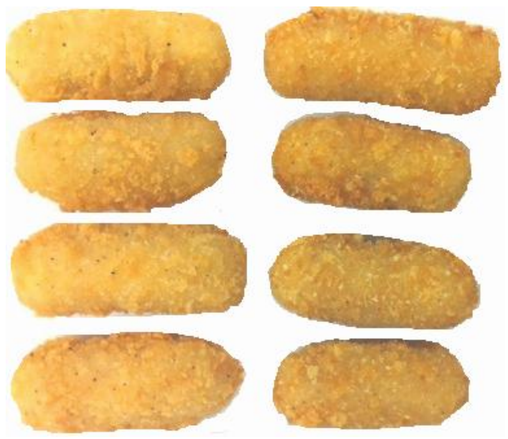
• Differences were considered significant at $p \leq 0.05$.

Table 1. Functional & sensory properties of control & optimized pea MS

Property	Control	Optimized Pea	p≤0.05
Batter Viscosity[a] (cP)	199.67[y]	167.50[x]	0.036
Coating Pick-up[b] (%)	62.87	62.45	0.879
Par Fry Yield[b] (%)	102.35	102.82	0.290
Colour[c]	2.00[x]	3.25[y]	0.000
Crispness[d]	3.50[y]	2.75[x]	0.031
Beanie Flavour[e]	1.25[x]	2.13[y]	0.008
Overall Quality[f]	6.00[y]	4.38[x]	0.012

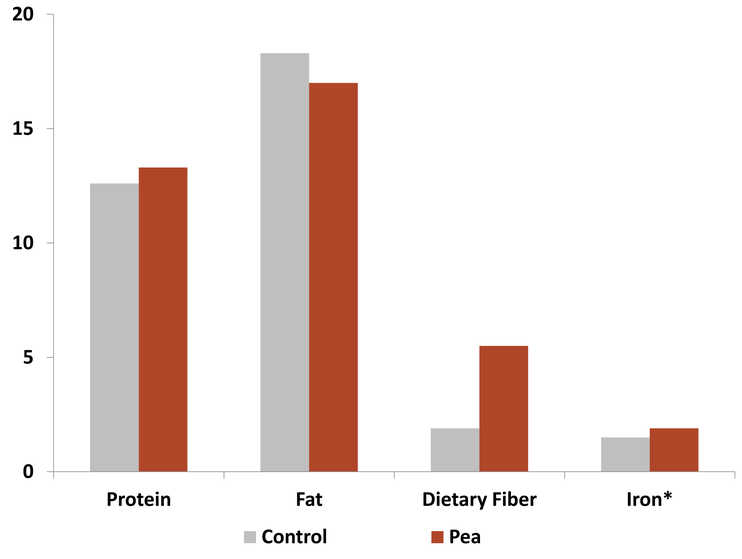
[a] measured with Brookfield viscometer with spindle 3 at 100 RPM for 15 sec
[b] % based on raw batch weight
[c] scale of 1 (light) to 6 (dark) using Newly Weds Flour Breader Fry Colour Chart
[d] scale of 1 (not crispy) to 4 (extremely crispy)
[e] scale of 1 (none) to 4 (extreme)
[f] scale of 1 (extremely low) to 8 (extremely high)
[xy] means in the same row with different superscripts are significantly different (p≤0.05)

Figure 1. Photograph of fully fried control & optimized pea MS



Control Pea

Figure 2. Nutritional comparison[a] of par fried control & optimized pea MS (g/100g)



[a] based on analysis from SGS Canada Inc.
* mg/100g

Results

• Addition of pea ingredients to MS had no significant impact on coating pick-up & par-fry yield despite significantly ↓ batter viscosity compared to the control (Table 1).

• Optimized pea MS was rated significantly ↑ than the control for brown colouring & beanie flavour (Table 1). Some panellists indicated that they preferred the colour & flavour depth of the optimized pea MS (Figure 1).

• Crispness of optimized pea MS was rated significantly ↓ than the control & was the major factor for ↓ overall quality (Table 1).

• Protein, total dietary fiber, & iron content were ↑ while the fat content was slightly ↓ in the optimized pea MS compared to the control (Figure 2).

• Wet milled pea starch & hull fiber & whole pea flour were chosen to incorporate into the optimized pea MS due to ↓ beany flavour vs. dry milled starch, ↓ viscosity vs. dry milled fiber & ↑ fiber vs. split flour, respectively (results not shown).

Conclusions

• Pea ingredients (starch, flour, & fiber) successfully replaced traditional ingredients in MS coatings with limited effects on functional & sensory properties & enhanced nutritional properties.

• Pea ingredients can potentially replace gums, gluten & modified corn starch resulting in a cleaner ingredient list.

• The optimized pea MS contained 3x more total dietary fiber than the control allowing a "source of fiber" nutrient content claim.

• Good potential exists for utilization of pea ingredients in MS coatings as they enhance colour, flavour & nutritional content & create opportunities for gluten-free coatings.

Acknowledgements

• Funding for this research was provided by the Alberta Crop Industry Development Fund, Alberta Pulse Growers, Manitoba Pulse Growers Association, Pulse Canada & Parrheim Foods.

• Materials and technical support was provided by Newly Weds Foods, Parrheim Foods, Best Cooking Pulses & Nutri-Pea Ltd.

References

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