

# Acceptability of Adding Pea Powder Protein to Pumpkin Spice Muffins to Make a “Good Source” and “Excellent Source” of Protein

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## Abstract

Consuming recommended amounts of protein is vital to ensure adequate health and proper function of the body. Specific populations such as vegans and vegetarians may find consuming recommended amounts of protein from the diet challenging. Therefore, the addition of alternative sources of protein in baked goods was the primary focus in this study. Pea Powder Protein Isolate from the dry yellow pea was utilized. Pumpkin Spice Muffins were manipulated to contain various amounts of Pea Powder Protein to create a “good source” of protein and an “excellent source” of protein in addition to a control containing no added protein. Data was collected to determine if an identifiable change in physical properties existed as a result of the added protein. Data for the sensory and objective tests were evaluated using ANOVA, Tukey’s LSD and Chi-Squared Analysis. Fifty nine judges evaluated and provided sensory data. Results of the sensory tests for Pumpkin Flavor Intensity, Tenderness, Moistness and Preference indicated the Pumpkin Spice Muffin prepared as a “good source” of protein was an acceptable product compared to the control. Objective data for Cone Penetration Force, Moisture Content, Muffin Height and Density Index indicated although the moisture content was greater in the muffins prepared as a “good source” and “excellent source” of protein, the control was the most tender. It can be concluded a Pumpkin Spice Muffin prepared as a “good source” of protein using the Pea Powder Protein is an acceptable product, while the Pumpkin Spice Muffin prepared as an “excellent source” of protein is not.

## Introduction

Protein is an essential macronutrient required by the body to ensure adequate health. Failure to consume the recommended amount of protein can lead to a variety of health problems. The RDA of protein for an average adult is 0.8g/kg (1). The addition of Pea Powder Protein to a food product could benefit vegetarians, vegans and those with restricted diets due to intolerances and allergies. Pea Powder Protein is an isolate and is created without the use of animal proteins, soy, dairy, artificial colors, sweeteners or fillers and on its own is gluten free (2). This Pea Protein is extracted from the dry yellow pea and undergoes a wet process treatment to guarantee an isolate with at least 85% protein (2). Protein plays an important role in the structure and texture of baked products; therefore, the addition of Pea Powder Protein will affect the eating quality of Pumpkin Spice Muffins. Since gluten needs to be hydrated in order to become elastic, it can be hypothesized the addition of another protein would compete for water. However, the addition of Pea Powder Protein to dough did not affect the mixing properties in previous studies; although, greater amounts of water were needed for proper dough formation (4). Given the fact many individuals could benefit from additional protein in their diet, the purpose of this study is to investigate the impact added Pea Powder Protein will have on the acceptability of Pumpkin Spice Muffins.

## Methods

- Mini Pumpkin Spice Muffins used for sensory and objective evaluation
- Ingredients: Spice Cake Mix (Betty Crocker), Canned Pumpkin (Kroger Co.) and water; solid to liquid ratio kept at (2.2:1)
- 82.6 grams Pea Powder Protein added to “good source”, 165.2 grams added to “excellent source”
- 59 untrained judges used for sensory testing

## Sensory Testing

- Preference measured using a 9-point hedonic scale
- Pumpkin Intensity measured using a nine-point intensity scale: 1=no pumpkin flavor, 5=moderate pumpkin flavor, 9=strong pumpkin flavor
- Tenderness measured using a non-structured scale with anchors: Firm (0mm) to Soft (128.7mm)
- Moistness measured using a non-structured scale with anchors: Dry (0mm) to Moist (117.9mm)

## Objective Testing

- Cone Penetration Force measured using a Universal Texture Analyzer (TA.XT2)
- Moisture Content (% moisture) determined by measuring weight change following overnight heating in a Convection Oven at 150°F
- Muffin Height measured using Digital Calipers, height measured in (mm)
- Density Index calculated by mass (g) / height (mm)

## Results

### Sensory and Objective Evaluation of Pumpkin Spice Muffins

Pumpkin Muffin	Control	Good Source	Excellent Source
	← (Mean ± Standard Deviation) →		
<b>Sensory Test</b>			
Pumpkin Intensity <sup>1</sup>	3.9 ± 2.1 <sup>a</sup>	4.0 ± 2.4 <sup>a</sup>	3.0 ± 2.6 <sup>a</sup>
Preference <sup>2</sup>	6.7 ± 2.2 <sup>a</sup>	7.0 ± 2.0 <sup>a</sup>	4.6 ± 2.3 <sup>b</sup>
<b>Objective Test</b>			
Cone Penetration Force <sup>3</sup>	83 ± 18 <sup>a</sup>	204 ± 39 <sup>b</sup>	488 ± 84 <sup>c</sup>
Moisture Content <sup>4</sup>	35.4 ± 1.9 <sup>a</sup>	41.8 ± 3.0 <sup>b</sup>	44.6 ± 2.9 <sup>b</sup>
Muffin Height <sup>5</sup>	29.3 ± 1.9 <sup>a</sup>	33.2 ± 1.8 <sup>b</sup>	29.5 ± 1.1 <sup>a</sup>

<sup>a,b,c</sup>Different superscripts indicates significant (p<0.05) difference within a row. ANOVA, Tukey’s LSD

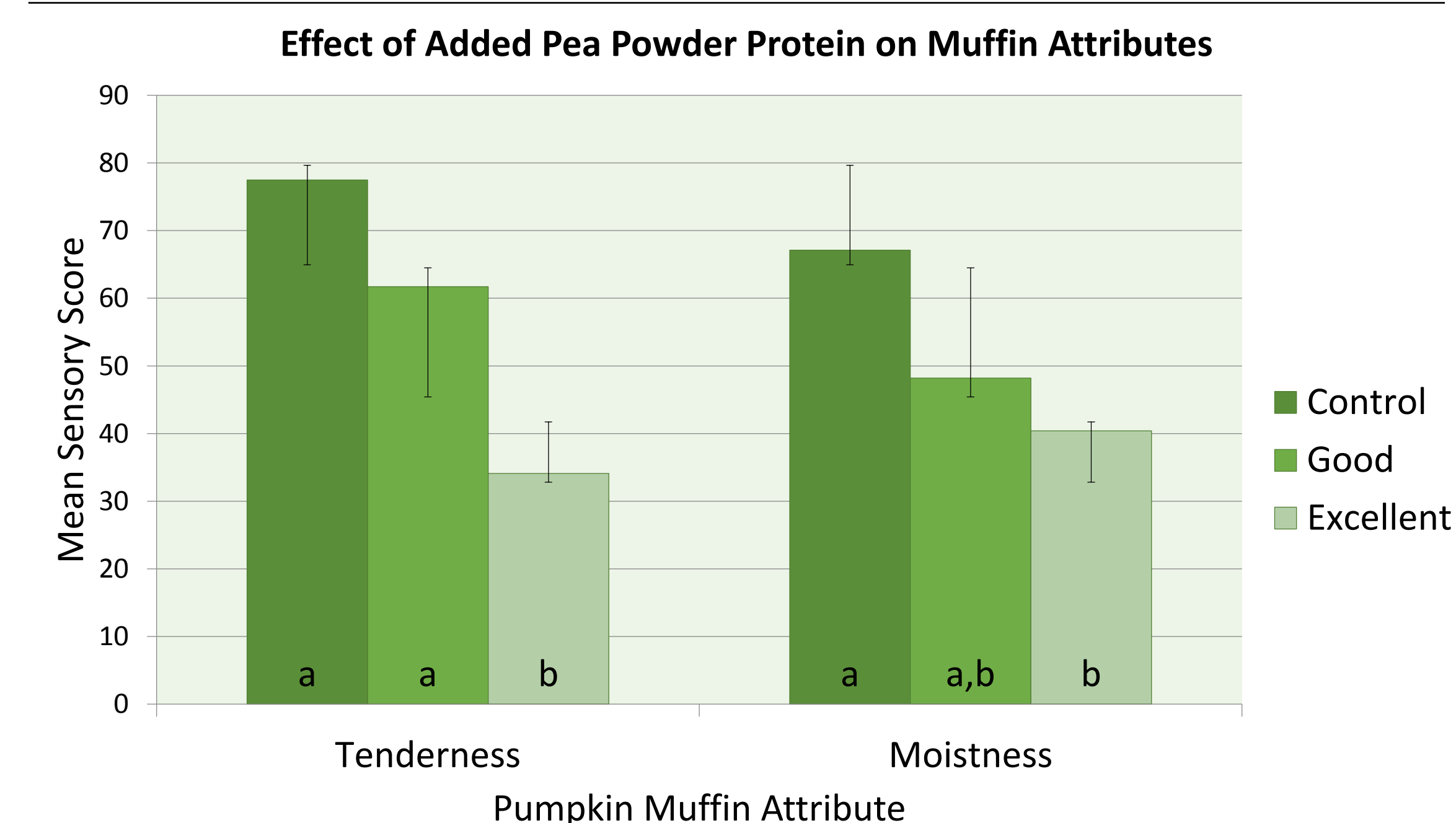
<sup>1</sup>Nine-point intensity scale: 1=no pumpkin flavor, 5=moderate pumpkin flavor, 9=strong pumpkin flavor

<sup>2</sup>Preference Scores: 9-point hedonic scale, Chi-square analysis used to determine differences in frequency of low preference (1-3), moderate preference (4-6) and high preference (7-9)

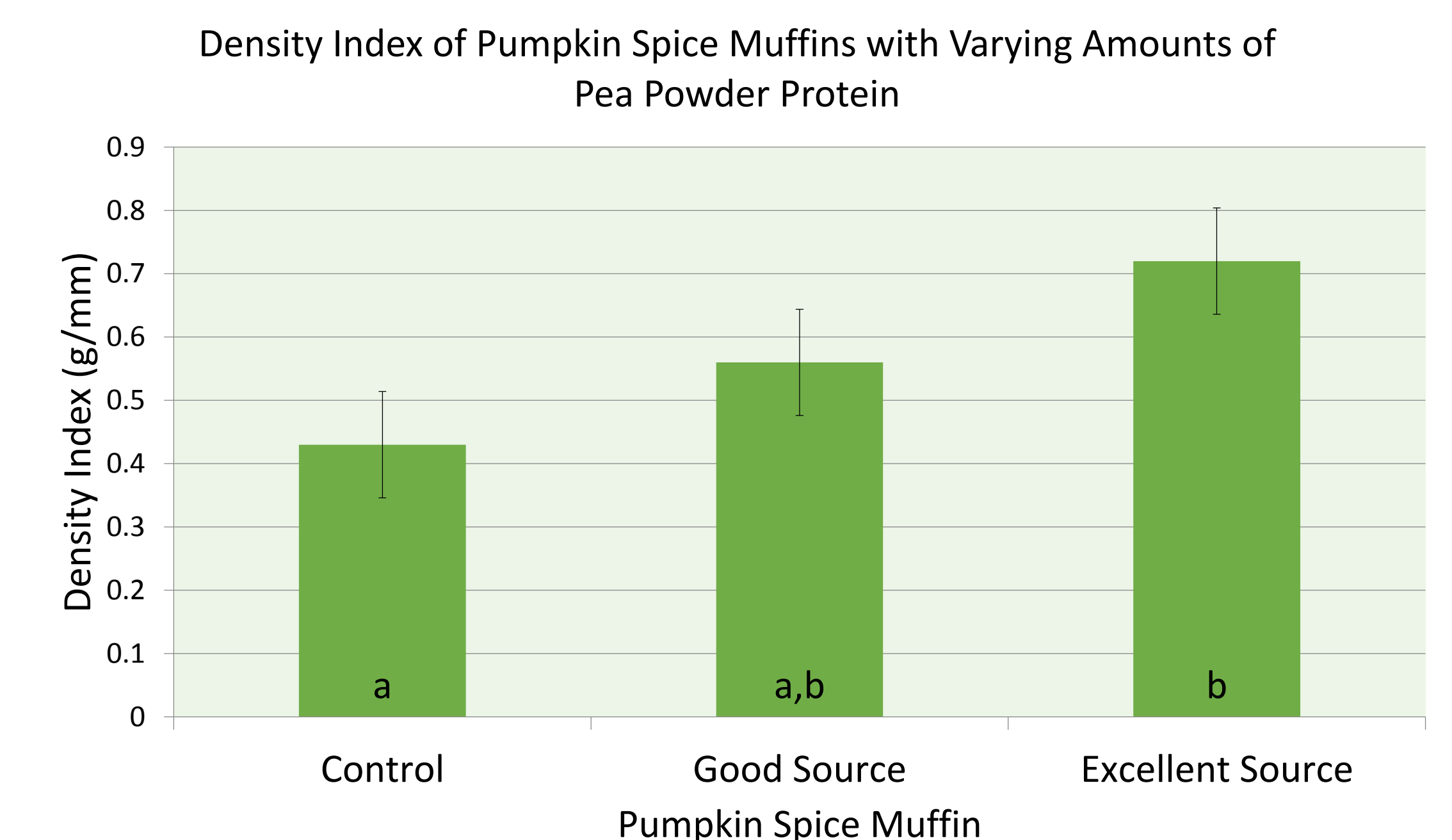
<sup>3</sup>Universal Texture Analyzer, TA.XT2, Acrylic Cone Probe, speed of probe=2mm/sec, distance probe traveled =15mm, peak downward force measured in grams

<sup>4</sup>Moisture Content (% moisture) determined using a Convection Oven at 150°F

<sup>5</sup>Height measured using Digital Calipers, height measured in (mm)



The addition of Pea Powder Protein creates a perceived less tender and less moist muffin. The “excellent source” was significantly less tender than the “good source” and the control (p<0.05). No significant difference in tenderness between the “good source” and the control. The “excellent source” was significantly less moist compared to the control (p<0.05). The “good source” was just as moist as the “excellent source” and the control. <sup>a,b</sup>Indicates significant (p<0.05) difference. ANOVA, Tukey’s LSD



The addition of Pea Powder Protein creates a more dense muffin. The “excellent source” was significantly more dense compared to the control (p<0.05), while no difference in density index existed between the “good source” and the control and between the “good source” and the “excellent source”. <sup>a,b</sup>Indicates significant (p<0.05) difference. ANOVA, Tukey’s LSD

## Discussion

The “excellent source” was significantly less preferred than the control as foreshadowed by the results from the sensory tests. However, no significant difference in pumpkin flavor intensity existed between the three muffins. Previous studies indicate the addition of Pea Powder Protein will coagulate and thicken the batter making a less tender and denser product (5). The “excellent source” required more force to be penetrated compared to the control (p<0.05) and was the most dense muffin. As Pea Powder Protein was added to the mixture, corresponding amounts of water was added, an explanation to the “good source” and “excellent source” having significantly greater moisture content compared to the control (p<0.05). It is speculated the “good source” had the optimal amount of gluten formation; however, the gluten in the “excellent source” wasn’t able to be hydrated and expand to a desirable height. Results of the muffin height test indicated the “good source” was significantly taller compared to the control and the “excellent source” (p<0.05).

## Conclusion

The results from this study indicate the addition of Pea Powder Protein creates significant differences between the Pumpkin Spice Muffins. Producing an acceptable Pumpkin Spice Muffin as a “good source” of protein is possible, and produced muffins just as tender and moist as a Pumpkin Spice Muffin with no added protein. No significant impact on pumpkin flavor was observed. However, Pumpkin Spice Muffins prepared as an “excellent source” of protein created an unacceptable muffin and was significantly less tender and moist.

## References

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