



Progress Report: Fall Recipe Flour Type Test

prepared for

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Background

The Bon Appétit Test Kitchen Team has conducted experiments with four different types of flour to determine which flour will be used in a new recipe in the Bon Appétit October publication. We baked chocolate chip, pumpkin muffins with four different types of flour: all-purpose, whole wheat, almond, and coconut. Data from our baking results has been collected for analysis. Currently, our collected data consists of weight, density, and two taste tests. This report reviews our team's adherence to costs and the timeline, the results of the density and taste tests, and issues we encountered during the experimental trials.

Adherence to Costs

Our projected cost was \$55.20 for all new ingredients from the store. While adherence was within a few dollars of the projection, there were substitutions made along the way to adjust to special circumstances. First, two team members were unable to locate banana flour at local grocery stores, so it was agreed upon to use coconut flour instead. Second, a team member adjusted her ingredients to suit a vegan recipe, substituting eggs with soy yogurt, and vegetable oil with applesauce. As a result of these minor alterations to the original projected cost, the resulting cost to each team member varied only slightly.

Adherence to Timeline

Following our team's planning stages, the schedule was followed in order of tasks, however, adherence to the original five-day schedule was prolonged by two days. Ultimately, this did not affect the experiments, analysis, or collection of data. Modification to the original timeline was made to allow team members time to purchase additional ingredients (coconut flour) and conduct additional tests.

Results

We, the Bon Appétit Test Kitchen Team, have made considerable progress on the Fall recipe project. Thus far in the experiment, two taste tests (including seven participants total) have been completed along with one collection of density measurements. Scores from two tastes tests are broken down by trials in the tables below.

I. Erin's Trial: Taste Test Score

Types of Flour	Total Score
All-purpose	41
Whole Wheat	27
Almond	37
Coconut	18

II. Kimberly's Trial: Taste Test Score

Types of Flour	Total Score
All-purpose	26
Whole Wheat	21
Almond	33
Coconut	10

The average taste test scores are shown in *Figure 1*. Almond flour came in first with all-purpose flour at a close second. Whole wheat flour performed third best and coconut flour received the worst scores. The results of the density measurements are shown in *Table 1*. The all-purpose flour muffins were the least dense at 207.5 grams per cup. This means that using all-purpose flour in the chocolate chip, pumpkin recipe produced the fluffiest muffins.

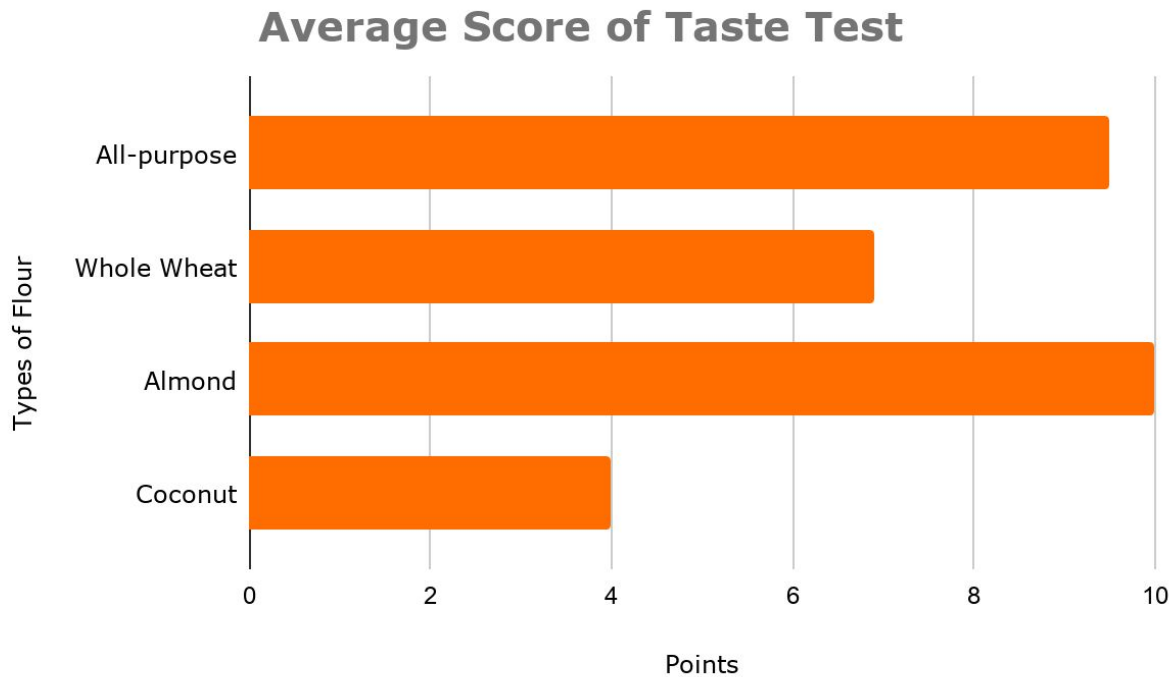


Figure 1: A bar graph of the average score of each flour type from a taste test taken by seven participants. The maximum possible score was 12 points.

Average Density of Flours

Flour Type	Weight (grams)	Density (grams/cups)
All-purpose	83	207.5
Whole Wheat	75	227.27
Almond	75	227.27
Coconut	62	248

Table 1: A table displaying the weight and density (weight divided by volume) of each muffin type.

Issues

A few problems were encountered during the baking process as team members attempted using new ingredients in the recipe or made other errors in the baking process.

Switching Flour Types

Two team members were unable to locate banana flour in any local grocery stores. The team received approval to use coconut flour instead. This is a readily available alternative flour in grocery stores everywhere and is a popular healthy substitute in baking recipes.

Baking Errors

All three members of Team Three have experienced baking issues with the almond flour and the coconut flour. The coconut flour resulted in muffins that were dry, unable to rise, and unable to bake properly. The almond flour resulted in muffins that were extremely moist, unable to rise, and unable to bake properly.

Kimberly conducted two trials of muffin baking using the coconut flour, but altering the dryness by using $\frac{1}{2}$ cup of water and $\frac{1}{4}$ cup of beer. The resulting muffins were more inedible and less baked than the first group. Kimberly also extended the bake time of the almond flour muffins by ten minutes to address the moisture content issue. While this provided muffins that were (mostly) baked, the resulting muffins were still exceedingly moist.

My switched out eggs and vegetable oil and replaced them with soy yogurt and applesauce when baking with the vegan flours, i.e. almond and coconut flours. This decision came from wanting to convert the regular recipe to a vegan recipe by substituting out non-vegan ingredients with more preferable vegan ingredients used for baking. The muffin batters from both of the vegan flours were extremely dry, so $2\frac{1}{2}$ cup of water was added to each batter in an attempt to remedy the particular condition. After 25 minutes of baking, the shape of the vegan muffins was noticeably distorted and the texture of the muffins still looked raw. From such observations, My excused the taste test for the vegan muffins, because they were evidently inedible.

Incomplete Tests

Only two members of the team, Kimberly and Erin, were able to complete the taste test, resulting in a sample size of seven participants. My was unable to perform a taste test on her muffins for reasons mentioned in the previous section. The taste test scores reviewed in *Figure 1* are the average scores taken from Kimberly and Erin's participants.

Density measurements were collected by both Kimberly and Erin. However, the results were so significantly different (over 45 grams per cup different between certain flour types) that the team realized there was a problem. Kimberly realized she may have overmixed the batters of her muffins by using an electric mixer. This could have altered how well her muffins rose during the baking process. Due to this, the team decided to only use Erin's density measurements which are listed in *Table 1*.

Conclusion

The Bon Appétit Test Kitchen Team has completed 40 percent of the tasks outlined in our proposal plan from September 14th. Since we have completed the flour type experiments, the team will divide to complete the last tasks of writing, editing, and submitting our final reports. These final reports will be directing the experiences and results of the group's tests towards individual topics, utilizing the data and research conducted.

My's plan for her final report is to write a feasibility study, implementing data from the team study comparing the results of commonly used flours and ingredients vs vegan flours and ingredients in order to determine if vegan flours are an acceptable substitute. Erin's plan for her final report is a video proposal using all-purpose flour and almond flour to provide a live comparison for viewers, educating them about alternative flours and health-conscious baking. Kimberly's plan for her final report is to write a research proposal to prove her company's flour is superior to the competitor's flours for advertisement purposes. Miguel Martinez will finalize the recipe for the chocolate chip pumpkin spice muffins using all-purpose flour to publish in the October publication.

Thank you,

Miguel Martinez

Erin McIntyre

Kimberly Voltaire

My Bui

Bon Appétit Test Kitchen Team

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