The Effects of Fig Paste as a Fat Replacer in Baked Goods and Sauces

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ABSTRACT/INTRODUCTION:

- Fat is an ingredient that provides some or all of the function of fat in a food matrix, but yielding fewer calories than regular fat. With consumers' concerns of fat negatively influencing one's health, many "healthier" alternatives have surfaced such as margarine, vegetable oil, applesauce or mashed bananas are commonly known in vegan cooking as potential fat replacements.
- Fat stabilizes the structure, adds flavor, and maintains moisture in the products.
- Carbohydrate and fiber-based ingredients are used in the food industry to replace fat, for example, inulin, lupin extract, maltodextrin, corn fiber, rice starch.
- Many current commercial fat replacer ingredients do not mimic the full properties of fat.
- Fresh and dry figs are known for their nutritional value and physico-chemical properties. Dried figs have physico-chemical , which are used to produce versatile products such as fig concentrate, fig butter, fig paste and slurry that are further incorporated in a number of food formulations.
- Fig paste functions to form colloidal bonds with the component of food matrix — protein, fats, and water.
- This study is, therefore, focused on determining experimental evidence that fig paste slurry mimics the function of fats in selected products, where it could be used as a fat replacer.
- Fig paste was used as a fat substitute at 50-100% and its impact was studied as an independent variable while the other ingredients are controlled variables.
- Evaluation of results will be through organoleptic testing of flavor using sensory panels and texture measurement using a Texture Analyzer (compression testing).
- The sauce, rheological properties (viscosity, shear stress, and yield) were determined. Increased percentage of fig paste in a food matrix is hypothesized that it is directly proportional to the moisture retention because of the fig paste hydrocolloid and water retention properties.

MATERIALS:

Muffin 0% Fig (#1)	Muffin 100% Fig (#2)	Muffin 50% Fig (#3)
• 2 cups (260 g) all-purpose flour • 1/2 cup (100 g) granulated sugar • 1 tablespoon baking powder • 1/2 teaspoon salt • 1 cup (180 ml) milk, room temperature • 1/4 cup (50g) vegetable oil • 2 large eggs, room temperature • 1 tsp vanilla extract • 2 tablespoons coarse sugar, optional	• 2 cups (260 g) all-purpose flour • 1/2 cup (100 g) granulated sugar • 1 tablespoon baking powder • 1/2 teaspoon salt • 1 cup (180 ml) milk, room temperature • 1/4 cup (50g) fig • 2 large eggs, room temperature • 1 tsp vanilla extract • 2 tablespoons coarse sugar, optional	• 2 cups (260 g) all-purpose flour • 1/2 cup (100 g) granulated sugar • 1 tablespoon baking powder • 1/2 teaspoon salt • 1 cup (180 ml) milk, room temperature • 2 TBSP (25g) fig • 2 TBSP vegetable oil • 2 large eggs, room temperature • 1 tsp vanilla extract • 2 tablespoons coarse sugar, optional
Sauce 100% Fig (#2)	**Sauce 0% Fig (#1)**	**Sauce 50% Fig (#3)**
• 6 roma (plum) tomatoes, halved • 1 large red bell pepper, quartered • 6 cloves garlic • 5.3 oz fig • ¼+1/8 TBSP kosher salt • 2 oz wheat bread (1 slice) • 70 g toasted whole almonds • 120 ml red wine vinegar • ½ tsp Smoked paprika • ¼ tsp crushed red pepper flakes, or to taste	• 6 roma (plum) tomatoes, halved • 1 large red bell pepper, quartered • 6 cloves garlic • 160 ml olive oil • ¼+1/8 TBSP kosher salt • 2 oz wheat bread (1 slice) • 70 g toasted whole almonds • 120 ml red wine vinegar • ½ tsp Smoked paprika • ¼ tsp crushed red pepper flakes, or to taste	• 6 roma (plum) tomatoes, halved • 1 large red bell pepper, quartered • 6 cloves garlic • 2.82 oz fig • 80 ml olive oil • ¼+1/8 TBSP kosher salt • 2 oz wheat bread (1 slice) • 70 g toasted whole almonds • 120 ml red wine vinegar • ½ tsp Smoked paprika • ¼ tsp crushed red pepper flakes, or to taste

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PROCEDURE:

Muffin Preparation 100% Flg

1. Preheat your oven to 425°F. Line the cups with papers, and grease the papers.
2. Blend together the dry ingredients.
3. Beat the liquid ingredients together — milk, fig, eggs, and vanilla — until light.
4. Pour the wet ingredients into the dry ingredients. Take a fork or wire whisk and blend the two briefly — about 20 seconds should do it.
5. Fill the cups of the muffin pan two-thirds to three-quarters full. Sprinkle with sparkling white sugar, if desired.
6. Bake the muffins for 15 to 20 minutes, or until a toothpick inserted into the middle of one of the center muffins comes out clean. Remove them from the oven.

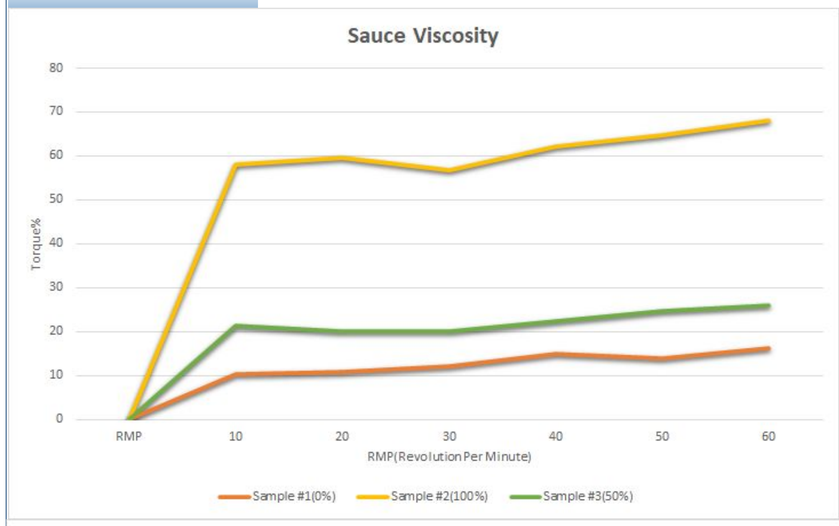
*For 50% fig and 0% muffin fig follow materials list amounts with the same steps

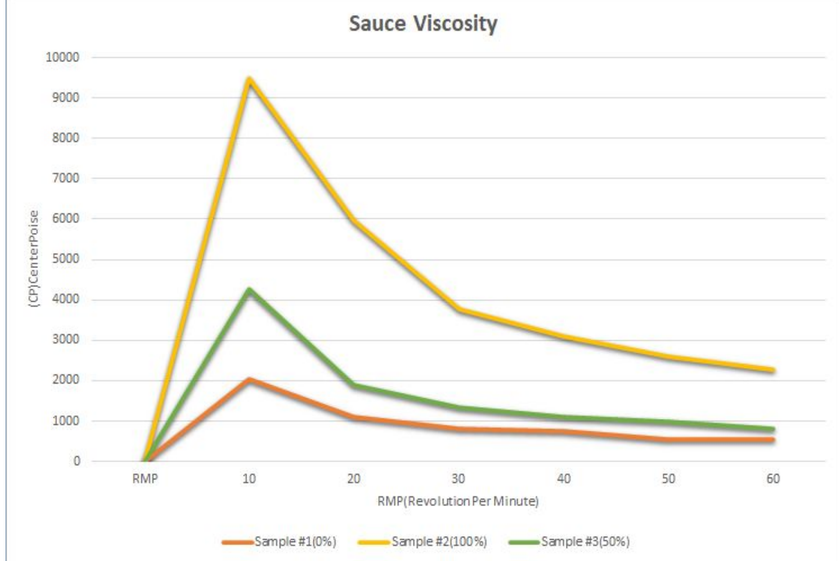
Sauce Preparation 100% Fig

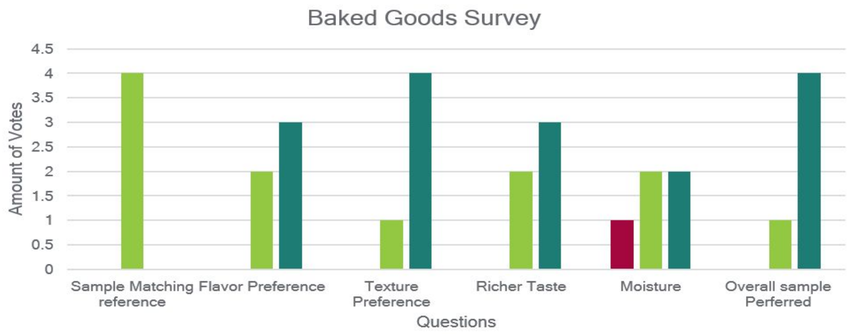
1. Preheat an oven to 425 degrees F .Line a baking sheet with aluminum foil.
2. Place the tomatoes, bell pepper, and garlic cloves onto the prepared baking sheet. Brush the with fig, then sprinkle 1/8 TBSP kosher salt. Bake for 15 to 20 minutes. Allow to cool for 10 minutes. While the vegetables are cooling, bake the bread slice on one of the oven racks until golden brown. Remove and allow to cool.
3. Scrape the vegetables and any juices from the pan into a food processor or blender. Break the bread into pieces, and add to the food processor along with the toasted almonds, vinegar, paprika, and red pepper flakes. Puree until finely ground, then drizzle in the remaining olive oil with the machine running. Season with additional salt .

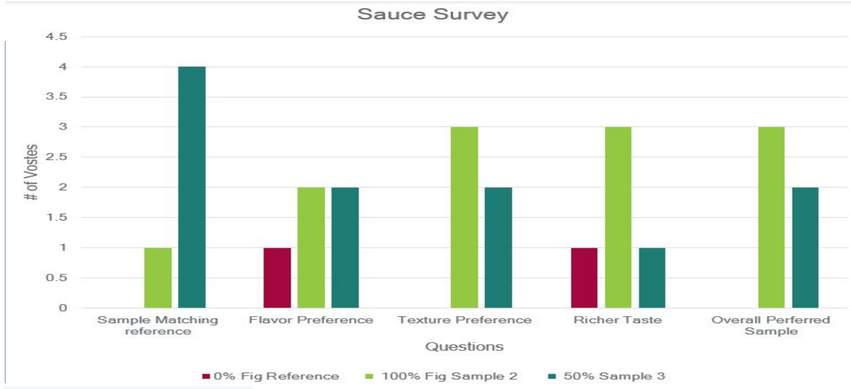
*For 50% fig and 0% sauce fig follow materials list amounts with the same steps except removing variable as instructed.

DATA:









METHODS:

- Determining the applied effect of fig as a fat replacer, will be done using multiple methods testing viscosity and olfactory sensory.
- Fats in baked goods is an important addition of binding and moisture, creating an even crumb in part of the gluten strand due to emulsification with the egg and liquids.
- Olfactory sensory is a subjective, but an important factor to determine the effects of fig as a fat replacer, since fat in baked goods is known to impart a tender texture, enhanced flavored and browning (Millard reaction).
- Surveys were given to 5 random subjects questioning the baked good and sauces taste, texture and overall appearance, compared to a reference, determining whether the addition of fig created a positive correlation to the sauce or baked good without it.
- Fat adds volume and smoothness to sauces or other liquids. A probe is placed in 60 ml of each sample and the viscosity machine is run at 10 RMP testing for torque and the final viscosity CP.
- The sauces texture is determined using a viscosity machine. The addition of fat in cooking can be used as a thinner in sauces or as a thickener depending on the fats state of matter.

RESULTS/CONCLUSION:

- The results allow enough evidence to continue experimenting fig as a fat mimetic use industrially.
- Possible ways to extract the figs available protein and carbohydrates would be to add pressure to extract fat mimetic components, which is used to make olive oil; sesame seed oil or canola oil and the remains are discarded.
- Utilizing the ultrasound machine, to not only thin the product, but using high amounts of pressure at different speeds to extract the components effectively and efficiently.
- Results from experimentation reveals the addition of fig correlates to higher ranking in terms of the viscosity for sauce and the continuous increase does favor higher scale ranking.
- Torque % results show the resistance comes from the addition of the fig, which explains the correlation to the viscosity of the sauce.
- Survey results shows the addition of fig does improve the flavor, texture and create a richer taste commonly associated with fat.
- In baked goods, there was a form of human error where the reference recipe was described as "rubbery". This did not match the intended texture, color, or flavor for a reference.
- Despite this human error, sample 3 with 50% fig had neutral to positive ranking overall, which divulges the fig adding more texture, flavor, emulsification and increase in volume,