



STUDY ON ALTERNATIVES OPTIONS FOR SUBSTITUTING EGGS IN BROWNIE

Neil Rohan Fernandies, Mr. Denzil D'costa

Department of Hospitality Science Milagres Degree College, Mangaluru 575001, Karnataka, India

Article DOI: <https://doi.org/10.36713/epra14726>

DOI No: 10.36713/epra14726

ABSTRACT

The objective of this research paper is to conduct a comprehensive investigation into the utilization of eggs in brownies and explore various applications of eggs in brownie recipes. Additionally, this study aims to explore and evaluate alternative options for substituting eggs in brownie recipes. Eggs play a vital role in traditional brownie recipes, contributing to texture, moisture, and structure. The investigation will involve a series of controlled experiments, comparing the sensory attributes, texture, and overall quality of brownies made with different egg substitutes. These experiments will be conducted using a standardized brownie recipe as the control, and variations will be made by replacing eggs with different alternative options.

KEYWORDS: eggs, brownies, alternative options, substitution, sensory evaluation, texture, dietary restrictions.

1. INTRODUCTION

Everyone of all ages loves brownies as a treat. A baked chocolate treat known as a "brownie" or simply "a brownie" Depending on their density, brownies can take on a range of shapes and textures, ranging from cakey to fudgy. The top crust of brownies frequently, but not always, has a shiny "skin". Nuts, icing, cream cheese, chocolate chips, and other items could also be present. Blond brownies or blondies are a version made with brown sugar and vanilla instead of chocolate in the batter. In the United States, the brownie was created at the end of the 19th century, and it became very popular there in the first half of the 20th century.

Traditional brownie recipes frequently call for eggs, which are essential to the outcome's excellence. Understanding the precise roles that eggs play in brownies can help with recipe development, component replacements, and potential texture, structure, and flavour enhancements.

In brownie batters, eggs act as binders and strengthen the product's structural integrity. During baking, the proteins in eggs coagulate and form a network that supports the structure of the brownie. This section examines the protein interactions and coagulation procedures related to the function of eggs as binders.

2. LITERATURE SURVEY

2.1 Study 1

Kim, M., Ustunol, Z. (2001). Functionality of egg components in angel food cakes and brownies. *Journal of Food Science*, 66(9), 1304-1309 [1].

This study investigated the functionality of different egg components (yolk, white, and whole egg) in brownie formulations. It explored the effects on brownie volume,

texture, and sensory attributes.

2.2 Study 2

Vasanthan, T., et al. (2008). Effect of whole egg, egg yolk, and egg white on the rheological properties and quality characteristics of brownies. *Food Research International*, 41(5), 439-445 [2].

This research focused on the rheological properties and quality characteristics of brownies by incorporating different egg components. It examined the impact of eggs on brownie texture, moisture content, and sensory attributes.

2.3 Study 3

Fuste, C., et al. (2016). The influence of egg addition on the quality attributes of brownies. *Food Science and Technology International*, 22(4), 292-300 [3].

This study evaluated the influence of egg addition on the quality attributes of brownies, including sensory characteristics, texture, and moisture content. It analyzed the optimal egg content and its impact on overall brownie quality

2.4 Study 4

sahin, S., Sumnu, G. (2010). Optimization of formulation and baking conditions of gluten-free rice cakes containing egg white. *Food Science and Technology International*, 16(1), 35-43 [4].

- Although not specific to brownies, this research investigated the role of egg white in gluten-free rice cakes, which share similarities in texture and structure with brownies. The study provided insights into the use of egg white as a functional ingredient.

2.5 Study 5

Devi, A., et al. (2021). Influence of egg substitutes on physicochemical, textural, and sensory attributes of brownies. *Food Science and Technology*, 41(Suppl. 1), 222-228 [5].

- This study examined the influence of various egg substitutes on the physicochemical, textural, and sensory attributes of brownies. It compared the effects of different substitutes, such as applesauce, yogurt, and mashed bananas, on the overall quality of brownies.

3. RESEARCH GAP

Based on the literature survey, it is evident that there is no sufficient studies regarding the utilization of eggs in brownie recipes.

4. OBJECTIVES

- To comprehensively investigate the utilization of eggs in brownies and explore its various applications in brownie
- To explore and evaluate alternative options for substituting eggs in brownie recipes.

5. METHODOLOGY

5.1 Egg Replacing Ingredients

Based on the characteristics of an egg four egg replacer ingredient were chosen after investigating egg substitutes. Based on the recommended use to minimise or replace whole eggs in brownies, a variety of egg replacement ingredients were chosen.

The percentage of eggs that should be substituted ranged from 20 to 100, and almost all vendors suggested maintaining the same moisture to dry ingredient ratio. Moisture must be reintroduced back in the form of water to a recipe that has had part or all of its liquid eggs removed in order to make it balanced. The ability of various egg substitute substances to absorb water varies. In order to get the proper batter viscosity to flow through production machinery, additional water may need to be added to the interact if a component absorbs an excessive amount of water.

5.2 Formula For Making Brownies

In the following sections, we explain the standard formula used in the studies.

5.2.1 Standard Formula

The standard formula consist of :-

- Bread flour
- Granulated white sugar
- Natural Cocoa
- Margarine Or Butter
- Milk
- Whole Egg
- Vanilla Extract
- Salt
- Baking Powder

5.2.2 Test Formula

Four type of egg replacer ingredient were tested in brownie formulas. Egg Replacers tested were :-

- Starch-based blend
- whey protein concentrate
- Blend of various ingredients
- Whole algal flour

Bread flour, granulated white sugar, natural chocolate, margarine, milk, whole eggs, vanilla extract, salt, baking powder, water, and the egg replacer were used to construct brownie test formulations.

5.3 Test

Both the Standard and egg replaced brownie batter is made and cooked, cooled brownies were analyzed using industry standard, brownie-specific tests. Brownies were all baked in the same conditions, in the same oven, on the same day. They were cooled completely before being stored in their tins with a plastic cling overwrap and plastic lid. Analytical tests were performed on the brownie batter immediately after mixing, and further analytical tests were performed on the baked brownies after they had cooled completely.

5.3.1 Analytical Tests

Baked good height

- Texture
- Moisture
- Water Activity
- Cooked Appearance
- Color
- Flavor
- Cooked Aroma

Here, The flavor and Cooked aroma tests are done with help of 30 people and 5 chef blind testing it on the sample containing half control sample and actual sample. Results are discussed in the next section.

6. RESULTS AND DISCUSSION

6.1 Baked good height or shape

Every sample created with the egg substitute had a form that was a tiny bit shorter in the centre than it was on the outside of the brownie tray. Standard, however, displayed the most uniformly distributed rise of all the samples. The middle of each of the Test formulas was lower and had a concave appearance, despite the fact that the bulk of their edges had height measurements that were similar to Standard. These results show that egg replacer efficiency depends on the source material and that solutions including blended ingredients may result in an uneven rise in brownies.

6.2 Cooked appearance and Color

Most of the samples seemed to lose some of their sheen and lighten in colour. Overall, there were small but discernible visual changes amongst the samples. These findings suggest that while egg substitutes do contribute adequately to the look, colour, and crust shine of brownies.

6.3 Cooked Aroma

Standard had a "just right" and "classic brownie smell," a little

powerful and moderately aroma.

Egg replaced brownie aroma intensity and likability was not that good with 71% (25 out of 35) of votes backing this claim. It indicates that egg replacers may have a negative effect on brownie aroma likability and intensity.

6.4 Moisture and Water Activity

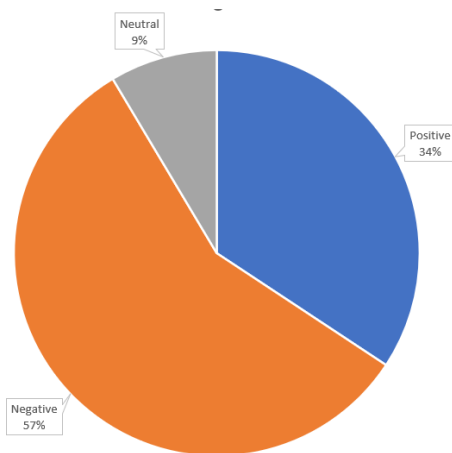
Standard had the highest average moisture content. According to the results, certain egg alternatives were superior to eggs at binding water in the brownie matrix.

6.5 Texture

The exterior texture of the brownie was replaced by an egg, which was nonetheless savoury and appetising. The texture could be more fudgy as a result of the dampness. The brownies are still able to develop a lovely crust despite being significantly less crunchy.

6.6 Flavor

The flavour strength of each sample (brownie with egg replacement) varied only little. As a result, brownie with egg replacement is weaker and less appealing. We took vote from 35 people including 5 chef. From that we received more negative response. Hence we concluded weaker and less appealing in taste.



6.7 Discussion

When eggs are removed and/or substituted, the qualities of brownies that suffer the most are their height, look, aroma, texture, and flavour. Egg substitutes do not significantly affect these characteristics, as seen by the lack of significant differences in moisture among the samples. The egg replaced brownie recipe was significantly different from the standard one. It had the most uneven rise of all the samples, was the most concave in shape, and had a significantly darker, less glossier crust. Aroma resembled Standard. egg substitute Analytical tests and sensory evaluation results vary between tests.

The starch-based egg substitute that performed the closest to Standard was slightly appealing' in overall likability. It

produced brownies with slightly darker crust color and a lower rise in the center than Standard. The aroma was slightly less intense and less appealing, and the texture was perceived to be drier.

The appearance of the whey-based egg substitute was comparable to Standard, but over time, the crust seemed lighter and drier. With a significantly lower overall likability rating than the starch-based or blended component egg replacer Tests, it had a more solid, slightly chewy texture and a moderately strong, mildly unpleasant flavour.

The substance made from algae fared the worst in a brownie application as an egg substitute. The sample had a somewhat less appealing aroma than Standard and had a fatty/slimy mouthfeel. It was also significantly darker and less smooth than Standard, but it did rise evenly from centre to edge. Its flavour was also the strongest, and its likeability was the lowest of all the samples.

Generalisations concerning egg substitutes might be challenging because they differ greatly amongst suppliers. Although some ingredient producers may give starting formulas and usage rate suggestions, many are unaware of how their product functions in various bakery applications. Product optimisation through the use of egg replacers can be time-consuming because manufacturer suggestions for introducing egg replacers into formulations can be hazy and challenging to follow. To obtain the required outcomes, formulators must choose the optimum ingredients for brownies by conducting practical testing on the bench and in the manufacturing facility, while balancing cost with functionality and flavour. In the end, that might entail making brownie recipes with real eggs.

7. CONCLUSIONS

In conclusion, the investigation into the utilization of eggs in brownies has shed light on their role and importance in the baking process, while also delving into alternative options for substituting eggs. Through this exploration, several limitations and challenges have come to the forefront when it comes to finding suitable substitutes.

It is crucial to acknowledge that individuals with specific dietary requirements or preferences may encounter difficulties in finding the perfect egg substitute for their needs. Each substitute brings its own set of characteristics and may require experimentation and adaptation of recipes to achieve optimal results. The search for the ideal substitute may involve considering factors such as taste, texture, binding properties, and nutritional value. Furthermore, it is worth noting that certain recipes heavily rely on eggs for their unique flavor or specific structural properties. In such cases, the complete elimination of eggs or their substitutes may significantly alter the final outcome. This highlights the need for individuals to carefully consider the intended outcome and adjust their expectations accordingly.



Ultimately, while the investigation has broadened our understanding of egg substitutes and their potential in brownie recipes, it is essential to recognize that finding the best substitute is not a one-size-fits-all solution. Instead, it requires a personalized approach, where individuals with specific dietary requirements or preferences must experiment and adapt recipes to discover the substitute that best aligns with their needs and preferences.

8. REFERENCES

1. Kim, M., & Ustunol, Z. (2001). *Functionality of egg components in angel food cakes and brownies*. *Journal of Food Science*, 66(9), 1304-1309.
2. Vasanathan, T., et al. (2008). *Effect of whole egg, egg yolk, and egg white on the rheological properties and quality characteristics of brownies*. *Food Research International*, 41(5), 439-445.
3. Fuste, C., et al. (2016). *The influence of egg addition on the quality attributes of brownies*. *Food Science and Technology International*, 22(4), 292-300.
4. Sahin, S., & Sumnu, G. (2010). *Optimization of formulation and baking conditions of gluten-free rice cakes containing egg white*. *Food Science and Technology International*, 16(1), 35-43.
5. Devi, A., et al. (2021). *Influence of egg substitutes on physicochemical, textural, and sensory attributes of brownies*. *Food Science and Technology*, 41(Suppl.1), 222-228.