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Identification of Food Content Test using Reagents

Hajar Syifa Fiaran*

Universitas Jember, East Java, 68121, Indonesia

**hajarsyifa.fkip@unej.ac.id* *(Corresponding Author)*

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ABSTRACT

This article discusses the importance of evaluating food quality through biochemical testing to ensure the safety and health of the products consumed. The research was conducted at the Basic Chemistry Laboratory of Universitas Jember, focusing on testing the content of amylum, glucose, protein, and fat in various food ingredients, including white bread, soybeans, boiled egg whites, bananas, candlenuts, and margarine. The methods used include an amylum test with Lugol's solution, a glucose test with Benedict's solution, a protein test with a combination of NaOH and CuSO4, and a fat test using opaque paper. The test results show that each food ingredient has a different nutritional content, which is reflected in the color change that occurs after the addition of reagents. For example, white bread and bananas showed a black discoloration on the amylum test, signaling the presence of carbohydrates, while soybeans and margarine showed transparency on opaque paper, signaling fat content. This study highlights the challenges in the accuracy of test results due to variations in methods and interpretations, as well as the importance of developing more efficient evaluation techniques. With a better understanding of the nutritional components in food, it is hoped that it can help consumers and the food industry in choosing healthier and safer products. This research has made a significant contribution in increasing awareness of the importance of food quality in daily life.

INTRODUCTION

The body needs nutrients such as carbohydrates, proteins, fats, and sugars obtained from daily food to support activities. Carbohydrates are found in staples such as rice, bread, and cassava. Proteins are divided into vegetable and animal proteins. Other important substances are vitamins, minerals, and air. Food plays an important role in supporting growth, health, and thinking ability. Eating unhealthy or preservative foods can damage the body, reduce thinking and concentration, and negatively affect health (Silvia & Fajar, 2023).

The main carbohydrates consumed come from flours such as wheat, corn, rice, and potatoes. In addition, carbohydrates also play a role as structural components in the form of fibers such as cellulose, pectin, and lignin. Carbohydrates are classified into monosaccharides, disaccharides, and polysaccharides. (Fitri et al., 2020).

The benedict test is a semi-quantitative carbohydrate test that is sensitive to all types of reducing sugars (Hani et al., 2023). Amylum is a carbohydrate that is included in the type of polysaccharides. Polysaccharides are macromolecules, polymers with several monosaccharides linked by glycosidic bonds (Imbia et al., 2024). Proteins are important macromolecules with many levels of structure and many functions. The function of protein itself is as the main ingredient for the formation and growth of the body. As the main ingredient in formation, protein serves as a source of energy when the amount of carbohydrates and fats in the body decreases (Ginting Windi Maretta, et al, 2024).

Biochemical tests are important steps to ensure food is safe and healthy by analyzing components such as amyl, glucose, protein, and fat. The main challenge is the inaccuracy of test results, so research is needed to develop more accurate and efficient methods. (Mukti et al., 2018).

MATERIALS AND METHODS

This article is an experimental study of food tests conducted in the Basic Chemistry Laboratory room, Universitas Jember, on September 2024. The scope of discussion revolves around experiments on the process of amylum test, fat test, glucose test, protein test and the results of changes that occur in the sample as an experimental object.

The tools used in the biochemical test research are, 6 pieces of test tubes, porcelain cups, Bunsen burners, 2 pieces of opaque paper. The food ingredients used in this study are white bread, soybeans, boiled egg whites, bananas, hazelnuts, and margarine. The solutions and materials used are opaque paper, Lugol, benedict, NaOH and CuSO4.

1. Amylum Test Using Lugol Solution

The amylum test is carried out by administering a lugol solution. The lugol solution is dripped as many as 5 drops into a test tube containing foodstuffs, namely white bread, soybeans, boiled egg whites, bananas, hazelnuts and margarine that have been crushed using porcelain cups. Then observe the color change that occurs in the foodstuffs.

2. Glucose Test Using Benedict Solution

Glucose testing was carried out by administering Benedict's solution. Benedict's solution is dripped as many as 5 drops into a test tube containing foodstuffs, namely white bread, soybeans, boiled egg whites, bananas, hazelnuts and margarine that have been crushed using porcelain cups. Then observe the color change that occurs in the foodstuffs.

3. Protein Test Using NaOH and CuSO4 Solution

Protein testing was carried out by administering NaOH and CuSO4 solutions. The solution of NaOH and CuSO4 is dripped as many as 5 drops into a test tube containing foodstuffs, namely white bread, soybeans, boiled egg whites, bananas, hazelnuts and margarine that have been crushed using porcelain cups. Then observe the color change that occurs in the foodstuffs.

4. Fat Test Using Opaque Paper

The fat test is done using opaque paper. An indicator that a sample contains fat is when the opaque paper becomes transparent (Mustafidah et al., 2022). Fat testing is carried out using opaque paper, drip mashed foodstuffs such as white bread, soybeans, boiled egg whites, bananas and hazelnuts on opaque paper. Then observe the changes that occur.

RESULTS AND DISCUSSION

The results of the research on the data obtained from the practicum results are recorded in the observation data table.

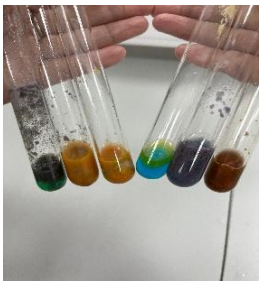
Table 1. Tightening Test Results

No.	Groceries	Color Change After Dripping			
		Lugol	**Biuret**	**Benedict**	**Opaque Paper**
1	White bread	Deep Black	Cream	Red Brick	Not Transparent
2	Soybean	Light Green	Brown	Green	Transparent
3	Hard-boiled egg whites	Yellow	Bronze	Yellow	Transparent
4	Banana	Black	Clear	Yellow	Transparent

No.	Groceries	Color Change After Dripping			
		Lugol	**Biuret**	**Benedict**	**Opaque Paper**
5	Candlenut	Yellow	Blue	Bronze	Transparent
6	Margarine	Yellow	Blue	Blue	Transparent


Amylum Test


Protein Test


Glycose Test


Fat Test

Figure 1. The observation to test foodstuffs

From the observation table data above, *Lugol* used to test foodstuffs containing carbohydrates (amylum). Carbohydrates are compounds of carbon, hydrogen, and oxygen found in nature (Fitri et al., 2020). Foodstuffs that contain amylum (carbohydrates) when dripped will turn blue and black. The darker the color, the more carbohydrate content the food is (Hani et al., 2023). The amylum test was carried out using an iodine solution that produced a blue color change as an indication of the presence of amylum (Puspita Lena et al., 2020).

In the amylum test of foodstuffs in lugol drops as many as 2 drops, each of these ingredients changed color, in white bread and bananas turned dark black and contained amylum (carbohydrates). Meanwhile, hazelnuts, soybeans, and margarine do not contain amylum (carbohydrates) because they do not turn deep black but turn yellow.

Biuret (NaOH and CUSO4) are reagents used to test protein content. Foods containing protein will turn purple after being dripped by biuret. This happens because there is a protein bond with the biurete that results in the basis of a coordinated complex reaction between Cu2+ with the group – C = O and NH peptide bond in an alkaline solution. Produces a color change to purple or lavender (Herlianty et al., 2024).

Protein tests often use methods such as biuret, which involves changing color to purple if protein is present (Puspita Lena et al., 2020). Some studies also use microchemical methods to detect proteins in processed food products such as soy milk, where proteins give off a specific color reaction as an indicator of their presence. Protein test on food, namely white bread, soybeans, boiled egg whites, bananas, margarine, and hazelnuts after dripping using a biurete solution (NaOH and CuSO4) in boiled egg whites, changed color and contained protein, on the other hand, white bread, hazelnuts and margarine turned blue and did not contain protein. Then soybeans also do not contain protein because they change color to brown. Furthermore, the color of bananas changes color because they do not contain protein.

Benedict is a reagent used to test the gloccure content of foodstuffs. Foodstuffs containing glucose will turn brick red after being dripped by benedict and then heated (Fikayuniar et al., 2022).

Glucose tests are usually done using the Benedict or Fehling method. Benedict's test results in the deposition of a brick-red color when glucose is present. This test is widely used to detect monosaccharides such as glucose in various food samples (Fikayuniar et al., 2022). In the glucose test, benedict was used as a solvent, to find out the results of the color change that occurred benedict and then heated for 1 minute and there was a color change in white bread, which is brick red and contains glucose in it. On the other hand, soybeans, margarine, boiled egg whites, hazelnuts and bananas do not contain glucose because they do not change color to brick red. Opaque paper is used

as a fat test. Foods that contain fat will make the opaque paper transparent if applied to the opaque paper.

Opaque paper is used as a fat test. Foods that contain fat will make the opaque paper transparent if applied to the opaque paper (Susiloningsih et al., 2020). When the foodstuff is applied, it makes the opaque paper transparent, namely on soybean foodstuffs, boiled egg whites, bananas, candlenuts, and margarine. As for white bread, it is not transparent because it does not contain fat.

CONCLUSION

Biochemical tests on foods, such as amylum, protein, glucose, and fat tests, are an important step in evaluating the quality and safety of food products consumed. Through the use of reagents such as lugol, biuret, and benedict, we can detect the presence of nutrient components in various food ingredients, such as white bread, soybeans, boiled egg whites, bananas, hazelnuts, and margarine. The test results show that not all foodstuffs contain all types of nutrients, which can affect our food choices. Therefore, further research is needed to improve accuracy and consistency in food quality evaluation, so that it can assist the food industry in ensuring safe and healthy products for consumers. With a better understanding of the food content, we can make better choices for our health.

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