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Preparation of Wheat Jaggery Cookies

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Abstract: This particular study we are going to research on making a healthy cookies or an healthy afternoon or morning snacks. Three trials of the research study were carried out, with the major ingredients—whole wheat flour and jaggery powder—being used in each experiment, and the amount of added fat varied to determine which trial would be most acceptable to the consumer. An effort was undertaken to create wheat jaggery cookies with value addition that had acceptable sensory qualities. According to information gathered from the sensory examination, cookies scored higher on average for color, appearance and texture, aroma, mouthfeel, taste, and overall approval. As per the proximate analysis results, the cookies had a moisture content ranging from 3.68% to 3.78%, an ash content of 0.86%–0.91%, a fat content of 7.21–9.31%, a protein content of 11.51–13.84%, and a carbohydrate content of 67.98%–73.54%. Their inflexible physical constructions are predicted to maintain the preference for PET (polyethylene terephthalate) and PP (polypropylene). An airtight container was used to packed the cookies For as long as 45 days, the cookies were warmly received. Stored for up to 60 days are wheat-jaggery cookies.

Key Word: Snack,whole wheat, jaggery powder, fat, sensory, proximate analysis, airtight container

I. Introduction

The food industry's new tactical component is the advancement of novel characteristics in products. Because people's lives are so chaotic these days, they have a growing desire for ready-to-cook meals that are tasty, nutritious, easy to make, and require less time to cook (Realini et al., 2022; Ceballos and Guadarrama, 2020). Thus, the goal of this study is to incorporate all of these appealing aspects into the cookie. All age groups love to eat processed foods like cookies as a snack. It is more widely available and produced globally. (Aziah et al., 2012). Nowadays, consumers look for food to have two primary, essential qualities: Two aspects of the food are discussed here: first, its conventional nutritional qualities; second, its predictable supplemental health advantages from regular consumption. Due to changes in healthy lifestyle choices, foods with high nutrition have received a lot of attention recently, both domestically and internationally. Adeleke, R. and Odedeji, J. (2010).

Natural food has fewer heavy metals and is devoid of artificial additives such as chemical fertilizers and pesticides. Produced by condensing the extracted sugarcane juice, jaggery is a natural, traditional sweetener. Some regions of Latin America, Africa, and India utilize a lot of jaggery. Jaggery, also known by several regional names around the world, is a natural and traditional sweetener prepared by concentrating sugarcane juice or palm sap (Thakur, 1999). In addition to being a culinary ingredient and sweetener, jaggery is also favored for its therapeutic qualities. According to Anwar et al. (2011), it has cooling, diuretic, aperient, refreshing, throat-improving, sperm and semen-normalizing, aphrodisiac, lactogenic, and heart tonic properties. It is strongly advised that those who deal with dust on a daily basis take a daily dose of jaggery. They can avoid respiratory problems like asthma, colds, coughs, and chest congestion by doing this (Nath et al., 2015). Whereas wheat flour another main ingredient were used. Various flours are used to make cookies; these flours are distinguished by their high sugar, shortenings, and generally low water content. Whole wheat flour has more nutrients than white flour, which is used to make commercially available cookies (Chavan et al., 1993). More than one-third of the world's population depends on wheat (Triticum aestivum L.), which is also one of the most significant grains grown in Ethiopia for baked goods due to the unique protein known as gluten. Compared to other cereal crops, it provides the global diet with higher calories and proteins (Adams et al., 2002; Shewry, 2009). The rubbery mass that remains after washing wheat dough to remove starch granules and water soluble elements is known as gluten, the protein component of wheat that is responsible for the dough's elasticity and strength. People's broad understanding of organic food products has been rapidly catching up. Because consumers are more aware of their health, they are choosing more organic food products. The availability of new organic food kinds increases in proportion to demand. allowing room to create new, valuable organic products. One category where there needs to be more diversity in organic food products is bakery goods. Because baking goods made with organic components have a greater potential to improve both the qualitative and quantitative aspects of the food product, the study was conducted with the goal of making wheat jaggery cookies. Venkatasubramanian, C., 2011.

II. Material And Methods

Preparation of wheat Jaggery cookies were undertaken in the department of food technology, at Ballarpur Institute of Technology Bamni-Ballarpur, Chandrapur (Maharashtra) from Dec 2023-Jan 2024.The preparation process of wheat jaggery cookies, making healthy cookies or healthy morning or afternoon snacks that can be enjoyed by people of all ages was also the subject of research.

Study Design: The process of making healthy cookies with wheat jaggery powder replaced by sugar.
Study Location: This study was done in the department of food technology at Ballarpur Institute of Technology, Bamni Ballarpur, Chandrapur (Maharashtra).

Methodology

Procurement of raw materials: The raw material required for the research includes Whole wheat flour(Aata), jaggery powder, ghee/clarified butter, hydrogenated vegetable oil, whole fat milk, pistachios, baking powder, and cardamom powder were procured from D-Mart, Chandrapur, whereas Hand Blender, Cooking Spoon, Oven, Baking Pan, Mixer, Molder procured from processing lab of food technology department, Ballarpur Institute of Technology, Bamni-ballarpur.

Formulation Development: To get the perfect blend of taste, texture, and nutrition, try substituting jaggery powder for sugar and making three formulations by utilizing three different types of saturated fat. Assess consumers' preferences using their senses.

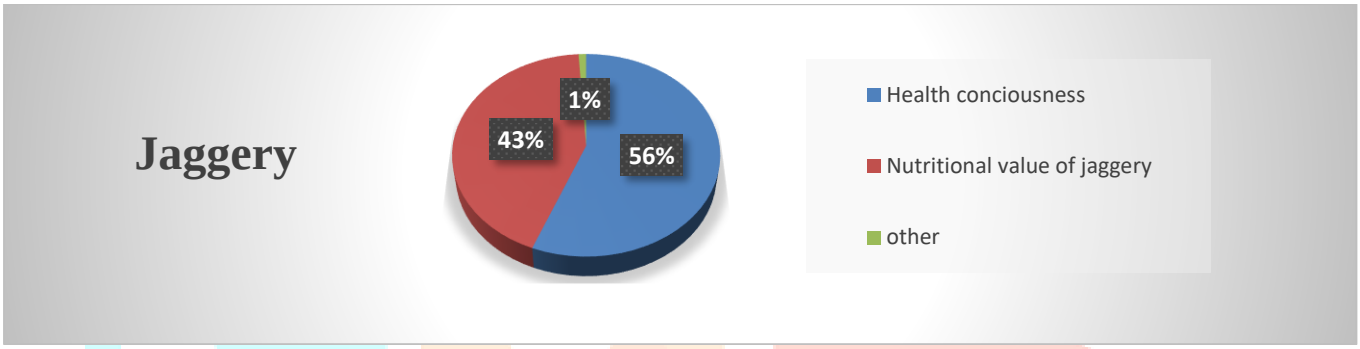

Fig.1. Reasons for preferring jaggery over sugar

Sr. No.	Ingredients	Formulation 1	Formulation 2	Formulation 3
1	Whole wheat flour(atta)	400gm	400gm	400gm
2	Jaggery powder	250gm	250gm	250gm
3	Ghee/clarified butter	250gm	175gm	-
4	Hydrogenated vegetable oil	-	175gm	250gm
5	Whole fat milk	65gm/70ml	65gm/70ml	65gm/70ml
6	Pistachios	25gm	25gm	25gm
7	Baking powder	3gm	3gm	3gm
8	Cardamom powder	3gm	3gm	3gm

Table no.1: Raw materials used to prepared product

Ingredients mixing

↓

Sieving Jaggery Powder & whole wheat flour Sieving of flours for removing foreign matter and uniformness of particle

↓

Combining jaggery powder and wheat flour

↓

Addition of Milk & Kneeding

↓

Dough making

↓

Dough (rest for 10 to 15 minutes.)

↓

Cut dough into pieces (by chef's knife)

↓

Shape the cut pieces into cylindrical pipe

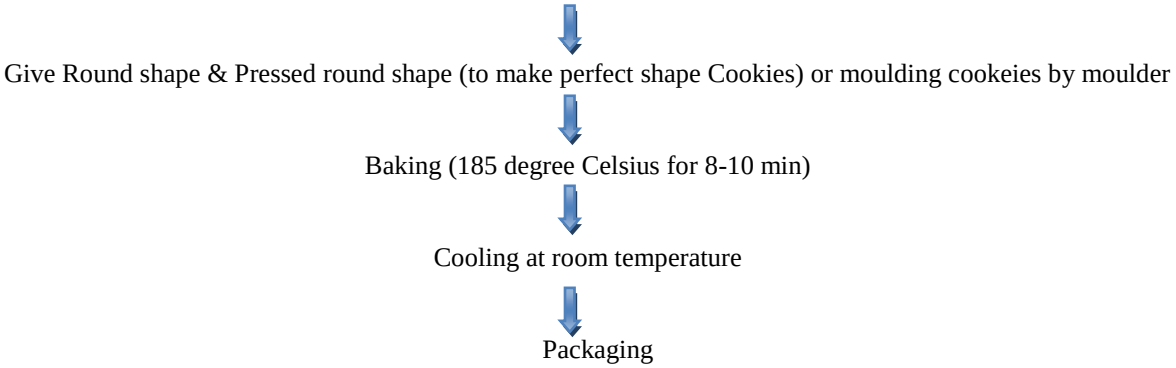

Fig.2: Flow sheet of prepared Wheat Jaggery Cookie

Formulation 1

In this experiment, used ingredients shown in table 1. These ingredients were used to make cookies that had a wonderful taste, were rich in nutrients, sugar-free, high in fiber, and suitable for individuals of all ages. 15-30 years old.The made cookies had a crispy, firm texture., some younger people, on the other hand, claimed that the flavor of ghee or clarified butter was too strong for them and disliked the way cookies felt in their mouths.

Formulation 2

Ingredients shown in table no. 1. in this experiment, we utilized both clarified butter and hydrogenated vegetable oil. After considering people's feedback, we chose to use hydrogenated vegetable oil instead of clarified butter because it is a more readily available and less expensive substitute. The texture of the wheat jaggery cookies improved after adding dalda, from hard to coarse crumb, and they are suitable for consumption by individuals of all ages. Meanwhile, a few people with a healthy consciousness despise this trial more than the previous trial because of the Dalda, which is added to improve the texture of the cookies. They treated this trial like any other cookie produced with flour and hydrogenated vegetable oil.

Formulation 3

In this third formulation, used ingredients shown in table 1.,we abandoned the use of clarified butter entirely in favor of hydrogenated vegetable oil. Children enjoy the manufactured cookies since the addition of dalda adds delectable flavors to them. After conducting the three studies described above, we can infer that the taste of the three trials was acceptable to persons of all ages. The cookies were made after three experiments that taught us about the roles of various ingredients as well as the temperature of the raw material added before mixing.

Proximate analysis of the developed product

The term "proximate examination" describes a procedure that controls the macronutrient values in food samples. These values are described in universal as nutritional proofs, which are typically displayed on the tags of finished or end-of-food products. However, they are also estimated throughout the manufacturing process. Since its inception in 1861, research on nutrition has undergone constant advancements, upgrades, and improvements

Estimation of Moisture Content:

One of the most important and widely utilized dimensions in food processing and testing is moisture estimate. Moisture is defined as the percentage of water present in a sample. A significant factor in creating ideal circumstances for food product storability, preservation, and packaging is moisture content. Using a mortar and pestle, a sample of the cookie was made. The oven drying method was used to determine moisture content. First, a prepared sample weighing around 10 g was placed to an empty Petri dish (W1), and the weight of the combination was recorded (W2). The Petri dish is now held at 105 oC for 4 hours in the oven. The Petri dish is removed from the oven and allowed to come to room temperature in the desiccator after 4 hours. Weighing the cooled Petri dish is the next step (W3).

The moisture content is determined by using the formula as given below:

Moisture (%) = [(W2-W3) / (W2-W1)] ×100

Where,
W1= Weight of empty Petri-dishes
W2= Weight of Petri-dish with sample before drying
W3= weight of Petri-dish with the sample after drying

Estimation of Ash Content :

A significant component of the proximate study for nutritional assessment is estimating a food's total ash content, which is frequently a crucial quality attribute for certain food trials. Materials' ash content indicates how much mineral matter is contained in them. A muffle furnace is used for the estimate of ash. A 5g portion of the prepared sample was used for incineration. Following crucible charring, it was placed in a muffle furnace and ignited for four hours at 550 °C. After moving the crucible outside, it was cooled in a desiccator.

The total ash content is determined by using the formula given below:

Ash (%) = (W2 − W1)/(W1) × 100

Where,
W1= Wight of empty crucible
W2= Weight of crucible with the sample taken for the test
W3= weight of crucible with ash

Estimation of Fat Content :

The Soxhlet technique was utilized to estimate the fat content. By weighing the fat that is recovered after extracting it from a sample with petroleum ether as a solvent, the amount of fat present can be measured. Grind the sample with a mortar and pestle until it is small enough to fit into the extraction thimble. After weighing the empty thimble (W1) and adding about 10 grams of sample, record the weight (W2). Weigh the round-bottom flask (RBF1) that is empty. Fill the flask with 150 milliliters of petroleum ether using a measuring cup. Set it on top of the mantle heater. Put the Soxhlet equipment together on a work surface, taking care to clamp everything in place. Since 70 oC is the boiling point of petroleum ether, turn on the heat source and adjust the temperature to that level. Sample extraction takes three hours. After the extraction time is over, remove the thimble and let the petroleum ether collect in the Soxhlet tube to be mostly distilled out. The sample was entirely evaporated after five minutes of continuous heating of the mantle. Once the flask is weighed, record the reading (RBF2).

Fat content is determined by using following formula:

Fat (%) = [(T2-T1)/(RBF2-RBF1)] × 100

Where,
T1= empty thimble weight
T2= thimble weight with sample
RBF1= empty round bottom flask
RBF2= round bottom flask weight after recovering the solvent

Estimation of Protein content

The Kjeldahl procedure, which consists of three steps for protein quantification—digestion, distillation, and titration—was used to estimate protein. According to the idea, concentrated acid and a catalyst are used to speed up the reaction in order to achieve the digestion of carbon-based materials. A suitable titration method can be used to estimate the amount of nitrogen released by the diet. The nitrogen content of the food sample is then used to calculate the overall amount of protein that is accessible in the food. The meal sample weighed 0.1 grams after being ground into a powder. Within the equipment, there were six digestive flasks in total. The first tube was used as a blank, meaning no test samples were introduced. Four grams of potassium sulfate, five grams of copper sulfate, and fifteen milliliters of concentrated HCl were added to the digesting flask. For one and a half hours, the tubes used for digestion were kept in place. The tubes were allowed to cool to room temperature when the digestive process was finished. Next, put a few droplets of methyl red indicator and 50 milliliters of 2% boric acid into a conical flask. Set it aside for the neutralization procedure against 50% NaOH. The conical flask is taken and titrated against concentrated HCl once the neutralization process is complete.

Calculation:
Nitrogen (%): [(TV-Blank) ×N of HCl×0.014/weight of sample] ×100

Where,
TV = titre value Protein (%) = N%×6.25

Estimation of total carbohydrate content

The phenol-sulphuric methood was used for the estimation of carbohydrate content present in the developed multigrain cookies. This method detects all classes of the carbohydrate which includes mono, di, oligo and polysaccharides. Sample preparation: The cookie was grinded into powder by using mortar and pistle. 0.1 gm of cookie was weighed. This 0.1gm of sample was diluted in 50 ml of water. It is vortexed for 5 minutes to homoginise the mixture. From this mixture 0.1 ml of sample was taken for the estimation of carbohydrate. The glucose standard was prepared. The glucose standard prepared was 25µgm/100ml. For standard, 6 clean test tubes were taken. To each test tube 0, 0.2, 0.4, 0.6, 0.8 and 1ml 0f standard glucose was added. Then, 1, 0.8, 0.6, 0.4, 0.2 and 0ml of distilled water was added to each test tube respectively. Then, another 4 test tubes were taken for the test samples. To each test tubes 0.1ml of prepared sample was added. To each test tube 1ml of 5% phenol and 5ml of concentrated sulphuric acid

was added. All the10 test tubes were incubated at room temperature for 20 minutes. After 20 minutes the color turned into orange brown. Then, the O.D i.e., optical density was read through calorimeter at 490 nm.

Calculation:
Carbohydrate (%) = (Unknown O.D × dilution factor × 100)/sample weight

Where,
O.D – Optical Opacity

Sensory Analysis:

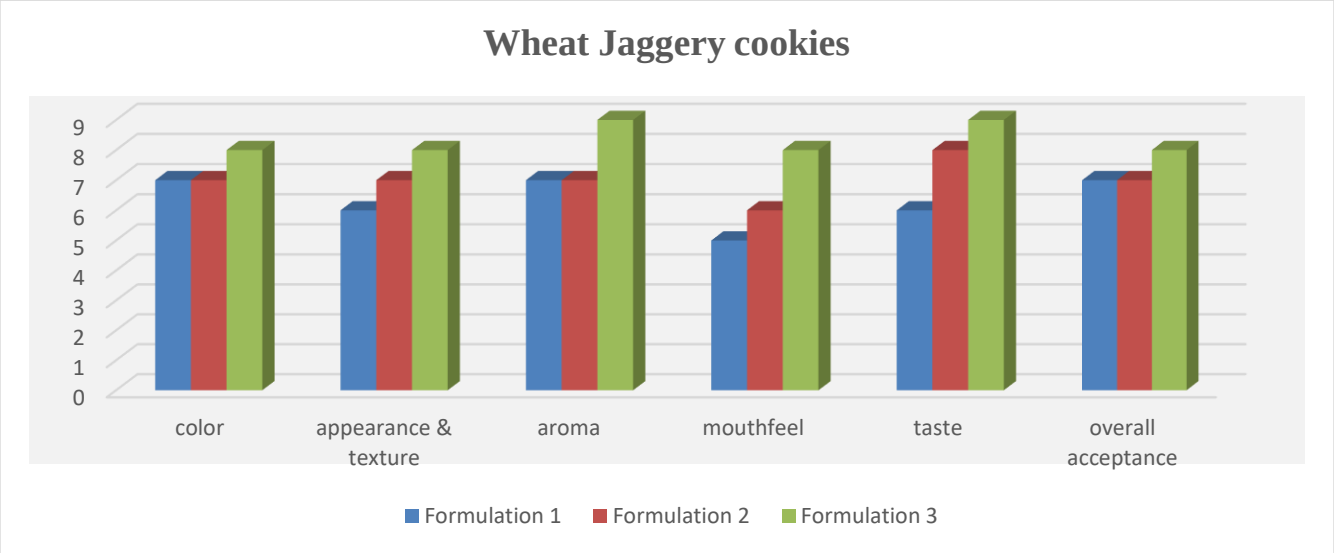

Fig.3: Sensory for prepared product

Twenty-four hours after the cookies were made, a sensory assessment was done. It was rated using the hedonic method. The Ballarpur Institute of Technology, Ballarpur-Bamni students in the Department of Food Technology were chosen to form a panel of 25–30 individuals, comprising adults, children, and the elderly, who were knowledgeable about the qualities of cookies. One requirement for choosing the panelists was that none of them have a cookie allergy.The nine point hedonic scale is used to rate the cookies' color, aroma, taste, texture, mouthfeel, appearance, and overall approval. nine likes and one very hate on a scale of 1. After evaluating and tasting each sample, the panelists were told to rinse their mouths with water. On the questionnaires that they received, they were also requested to freely comment on each sample that they had tasted. Although cookies in formulation 1 were approved for use by people of all ages, several younger individuals complained that the taste of ghee or clarified butter was too strong and that the cookies didn't feel well in their mouths. When dalda from hard to course scrum is added to formulation 2, the texture of the weed jaggery cookies gets better and they can be consumed by people of all ages. However, some people with healthy consciousness find that the addition of dalda causes the cookies to dispense more than they did in the previous trial. Children love the artificial cookies in this third formulation of wheat jaggery cookies, which have a delicious flavor thanks to the addition of Dalda. We may say that the three trials' tests were appropriate for individuals of all ages based on the results of the three studies mentioned above. After three studies concerning the functions of different ingredients and the temperature of the raw material supplied before mixing, the cookies were created.

Shelf Life study

Cookies have a shelf life that determines how long they may be used without losing quality. The shelf life of a cookie begins the moment it is prepared. The shelf life of cookies varies depending on factors such as component type, manufacturing method, packaging, and storage conditions. The majority of publications analyze cookie shelf life based on nutritional and sensory properties, microbiological count, moisture, free fatty acids, and peroxide value. Most publications evaluate shelf life based on nutritional properties. Moisture is critical to nutritional quality. Moisture content, also known as water activity, causes food to degrade because it is easily attacked by microbes. The prepared cookies have a shelf life of up to 60 days when stored at room temperature.

Packaging

When it comes to shielding cookies from outside factors that could lower their quality, packaging is essential. It keeps cookies safe from the elements, air, and moisture so they travel and are stored in an undamaged, tasty state. Cookies keep their flavor and texture longer on the shelf when they are packaged properly. By acting as a barrier between the cookies and the outside world, cookie packaging upholds hygienic and safety regulations. By preventing contamination, it keeps cookies clear of possible allergies, dust, and debris. Cookies are delicate and crumble or smash quickly. It prolongs the cookies' shelf life, shields them from harm, and helps to keep their quality and freshness. In order to draw clients and boost sales, professional packaging is also essential. An airtight container was used to packed the cookies. The weight is going to be consistent. Depending on the container's size, it weight about 100 grams

Sr. No.	Ingredients	Quantity	Price
1	Whole wheat flour(atta)	400gm	22.00 Rs
2	Jaggery powder	250gm	16.00 Rs
3	Ghee/clarified butter	175gm	95.00 Rs
4	Hydrogenated vegetable oil	175gm	30.00 Rs
5	Whole fat milk	65gm/70ml	15.00 Rs
6	Pistachios	25gm	18.00 Rs
7	Baking powder	3gm	10.00 Rs
8	Cardamom powder	3gm	05.00 Rs

Table no.2: Cost analysis of prepared product

With the raw components listed above, we were able to produce roughly 1000 g of wheat. cookies with jaggery. A single cookie weighed approximately 10 grams. Thus, we produced about 100 cookies.
Therefore, 1 cookie piece = 211/100 = 2.11 Rupees.
A single cookie costs approximately two rupees. In cafes, the cookies can also be purchased separately for about five rupees each.

III. Result & Discussion

This study's analysis was used to create wheat and jaggery cookies that were enhanced with nutritious elements. The materials utilized in this specific investigation or study are commonplace household items. Individuals across all age groups find the study's findings to be acceptable. The study's primary goal was to find a substitute for refined flour, or maida, which is frequently used in all varieties of cookies. Because refined flour requires a lot more energy to digest than other flours and can cause a number of diseases, both adults and children should limit their intake of refined flour. While it does have a great taste after cooking, it is not as healthful as wheat flour because wheat flour has fiber, endoplasm, and other nutrients. One of the study's other goals was to find a different sweetening ingredient to replace the sugar. Jaggery was shown to be the most beneficial and healthful substitute for sugar in this specific study.

Proximate analysis of the developed product

Moisture Content: The moisture content of wheat jaggery cookies was founded to be 3.68%, 3.42% & 3.78%. which was compared with the moisture content of jaggery bagasse fibre cookies calculated by S.I Sharma (2017) which was 5.37%
Ash Content: The Ash content of wheat jaggery cookies was founded to be 0.86%, 0.91% & 0.87%. which was compared with the ash content of jaggery millet cookies calculated by E. Jyothsna (2019) which was 1.59%
Fat content: The fat content of wheat jaggery cookies was calculated as 7.21%, 9.31%, 8.33%. which was compared with the fat content of gluten free rice flour cookies Marinich Net (2023) which was 21.04%.
Protein Content: The Protein content of wheat jaggery cookies was calculated as 11.51%, 11.55%, 13.84%. which was compared with the fat content of jaggery bagasse fibre cookies calculated by S.I Sharma (2017) which was 11.04%.
Carbohydrates Content: The Protein content of wheat jaggery cookies was calculated as 70.21%, 73.54%, 67.98%. which was compared with the fat content of jaggery bagasse fibre cookies calculated by Marinich Net (2023) which was 11.04%.

Sensory Analysis

The hedonic scale rating system was used. The firm texture in formulation 1 caused arma, color, and mouthfeel to receive varying scores out of all the criteria. Taste in formulation 2 was highly rated in terms of scent, color, look, and texture. Both acceptability overall and mouthfeel are close to the high mark. On the other hand, formulation 3 had good scores for every attribute.

IV. Conclusion

In the current study, 75% wheat jaggery cookies were accepted. The third formulation of wheat jaggery cookies received good sensory scores in every attribute of all the prepared formulations. Based on the sensory data, the final selected formulations contained 100% of jaggery in place of sugar. Among the two formulations, the sample was found to be the good, depending on different sensory attributes like color, taste, flavor, texture, and overall acceptability. Consumer acceptability of final products was high, and people showed interest in purchasing wheat-jaggery-based cookies. The transparent packaging of method helps consumers to see the condition of their product transparently with their own eyes. Consumers today are conscious of their health and searching for newer products that satisfy both taste and health. Thus, these jaggery-incorporated wheat flour cookies are nutritious and can also prove to be beneficial in preventing malnutrition among children and adults. There was a significant increase in ash, moisture, carbohydrate, fiber, and peroxide content with increasing levels of jaggery.

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