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Standardization and Preparation of Buckwheat Incorporated Vegan and Gluten free Cupcakes

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ABSTRACT

The cake referred to a cupcake is a small cake designed to serve one person. Cupcakes may be topped with frosting, fruit, or pastry cream. Due the increase of consumption of vegan foods and gluten free foods made to formulate the cupcakes. Buckwheat (*Fagopyrum esculentum* Moench), is a highly nutritious whole grain which is consider to be a super food. Among its health benefits, buckwheat may improve heart health, promote weight loss, and help manage diabetes. The study investigates the formulation and preparation, acceptability of the cupcakes. It is concluded that the variation III (20 g of buckwheat flour) was the best formulated product. The sensory evaluation was done with 25 people in basis of 5 point hedonic scale. By comparing variation I, II, III, IV, the variation III has good sensory characteristics. The Buckwheat incorporated vegan and gluten free cupcake had the value, Energy – 357.88 kcal, Carbohydrates-53.48g, Fat -13.1g, protein-5.83g, fibre-4.72g, ash-1.65g, moisture-25.84g.and the total plate count value was 38 cfu/g. This study indicates that a good quality value added product and it is vegan, it also has the medicinal and health benefits to all age group.

1. INTRODUCTION

Cupcakes are one of the popular sweet snacks known all around the world. People suffering for lack of nutrition and health issues are unable to consume them because they are traditionally prepared from refined wheat flour with added eggs, sugar, oil or fat and milk, yeasts or baking powder. Nowadays, scientific data is available regarding gluten-free cupcake prepared from different types of flours, like chickpea (Herranz et al. 2016), rice (Nozawa et al. 2016; Singh et al. 2015, 2016), corn (Marcet et al. 2015) or buckwheat (Ciesarová et al. 2016). Buckwheat (*Fagopyrum esculentum* Moench) ,is a highly nutritious whole grain that many people consider to be a super food. Among its health benefits, buckwheat may improve heart health, promote weight loss, and help manage diabetes. Buckwheat has been grown for centuries and now it is one of the most important alternative crops and a valuable raw material for functional food production. Many nutraceutical compounds exist in buckwheat seeds and other tissues. It is a rich source of starch and contains many valuable compounds, such as proteins, antioxidative substances, trace elements and dietary fiber. Buckwheat proteins have unique amino acids composition with special biological activities. Besides high-quality proteins, buckwheat seed contain several components with healing benefits: flavonoids and flavones, phytosterols, Fagopyrum‟s and thiamin-binding proteins. The allergenic proteins and their derivatives are also present in the buckwheat seeds. For the food industry, the most attractive trend is development of new functional foods, but production of health benefit products has also perspective. (B Krkošková, Z Mrazova - Food Research International, 2005).

2. MATERIALS AND METHODS

2.1 ROLE OF INGREDIENTS

2.1.1 BUCKWHEAT FLOUR

Buckwheat is a good source of protein, fiber, and energy. Buckwheat does not contain gluten, so for people with celiac disease or gluten intolerance, buckwheat and buckwheat flour are excellent dietary alternatives. Buckwheat is a wheat crop that grows throughout the United States. Buckwheat is an ingredient in many food products, such as breakfast foods, flour, and noodles. Farmers also use it for livestock feed. (Aaron kondola 201

Nutrients	Quantity
Protein	5.86g
Fat	1.04g
Carbohydrates	33.5g
Fiber	4.5g
Potassium	148mg
Phosphorous	118mg

Table 1 – Nutrients in buckwheat flour

2.1.2 Brown sugar

Brown sugar consists of between 3% to 7% molasses as is naturally moist. Brown sugar particles are in most cases less granulated than white sugar particles. It does not contain any fats at all. There are different types of brown sugar, depending on manufacturing process. Light and dark are the two most common styles of brown sugar. In general, the lighter the brown sugar, the more delicate the flavor. Very dark or old-fashioned brown sugar has a more strong molasses flavor. (Harvard 2017)

2.1.3 Coconut milk

Coconut milk comes from the white flesh of mature brown coconuts, which are the fruit of the coconut tree. The milk has a thick consistency and a rich, creamy texture. Thai and other Southeast Asian cuisines commonly include this milk. It's also popular in Hawaii, India and certain South American and Caribbean countries. Solids in the coconut flesh is mixed with water to make coconut milk, which contains about 50% water.

2.1.4 Cocoa powder

Cocoa powder and chocolate are made from an extract of the seeds of the fruit of *the Theobroma cacao* tree. In this study, we compared cocoa powder and cocoa products to powders and juices derived from fruits commonly considered "Super Fruits". Numerous popular media sources have developed lists of "Super Foods" and, more recently, "Super Fruits". Such distinctions often are based on the antioxidant capacity and content of naturally occurring compounds such as polyphenols within those whole fruits or juices of the fruit which may be linked to potential health benefits. (Stephen j Crozier 2011)

2.1.5 Flax seed

Flax seed or egg is a vegan egg substitute that is made up of ground flax seeds and water. It's 100% natural, vegan, gluten free, paleo, used as an egg replacement that is suitable for many vegan baking applications. Which does not imparts any off flavors, colors or change textures when it is added. It is a healthy alternative to other egg replacers due to their excellent source of omega-3fatty acids and protein content (Morris 2007).

2.1.6 Coconut oil

It contains 80 to 90% of unsaturated fat and they contains lauric acid (47%), with myristic and palmitic acids present in smaller amounts, which have been shown in research to raise harmful LDL levels. Also present in trace amounts are monounsaturated and polyunsaturated fats. . (Ghana Med J. 2016)

2.1.7 Soy milk

Soy milk is plant based nondairy beverage, often consumed as an alternative to milk. It is made from soy beans and it may be also fortified with vitamins and minerals such as vitamin D and calcium. Soy milk offers culinary diversity, creamy texture and healthful nutritional profile, including essential omega -3 fatty acidand flavonoids that exert antioxidant, anti- inflammatory, and cardio protective properties (Julieanna Hever,RD).

2.1.8 Baking powder

Baking powder is probably the most common aerating agent in baked products. It is made up of bicarbonate of soda and cream of tartar. Baking powder is a chemical aeration agent.

3. FORMULATION AND PREPARATION OF CUPCAKES

The Buckwheat cupcake was prepared with Variation as Variation I and Variation II and variation III and IV which is given in table

INGREDIENTS	VARIATION I	VARIATION II	VARIATION III	VARIATION IV
Buckwheat flour	40g	30g	20g	20g
wheat flour	40g	40g	40g	40g
Flak seed	14g	14g	14g	14g
brown sugar	80g	80g	80g	80g
Cocoa powder	30g	30g	30g	30g
Coconut milk	50ml	50 ml	50ml	-
Coconut oil	100ml	100 ml	50ml	50ml
Baking powder	7g	7g	7g	7g
Salt	2g	2g	2g	7g
Soy milk	-	-	-	40ml

Table 2 - Variations and Ingredients of Proportion for Buckwheat Incorporated Vegan and Gluten Free cupcake

Flowchart

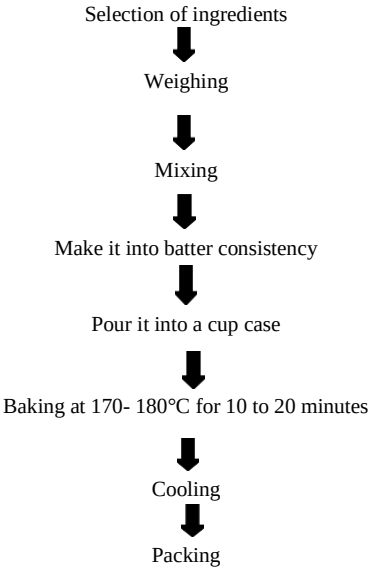


Figure 1-Preparation of Cupcake

Figure 2,3,4,5-buckwheat cupcake

4. Methods

4.1 Sensory Evaluation of the Buckwheat Cupcake

Buckwheat cupcake was prepared from the developed product and it was organoleptically analyzed by panel of 25 members on a 5 point hedonic scale. The parameters analyzed were color and appearance, texture, taste, flavor and overall acceptability. The score obtained from the sensory evaluation were calculated and average score was taken to find the most acceptable product.

4.2 Quality Testing of the Buckwheat incorporated vegan and gluten free cupcake

Quality is a degree to which a set of inherent characteristics fulfils requirements. The totality of characteristics of a product or service that bear on its ability to satisfy and implied needs. Quality testing can be of physical quality test, chemical quality test and microbial quality test. Those testing provide adequate confidence that a product or service will satisfy the consumer needs. It is the degree of excellence and uniformity of a food as measured by various factors or attributes or characteristics against a stand.

4.2.1 Physical parameters

Different parameters that can be easily assessed at the end of the process include physical parameters such as length, weight, thickness, width is calculated using verneir caliper. The physicochemical parameter tested was moisture using a hot air oven.

4.2.2 Nutritional analysis

The nutrient content of protein, carbohydrates, fat, protein .fiber, total ash, moisture been analyzed using standard AOAC method.

4.2.3 Microbial analysis

The microbial analysis is done using total plate count method to determine the mesophilic bacteria and fungi which grow under aerobic conditions. Psychotropic, Thermophilic , basophilic, and anaerobic bacteria, and microorganisms which require specific ingredients for growth may give a negative result, even if they exist in a significant number.

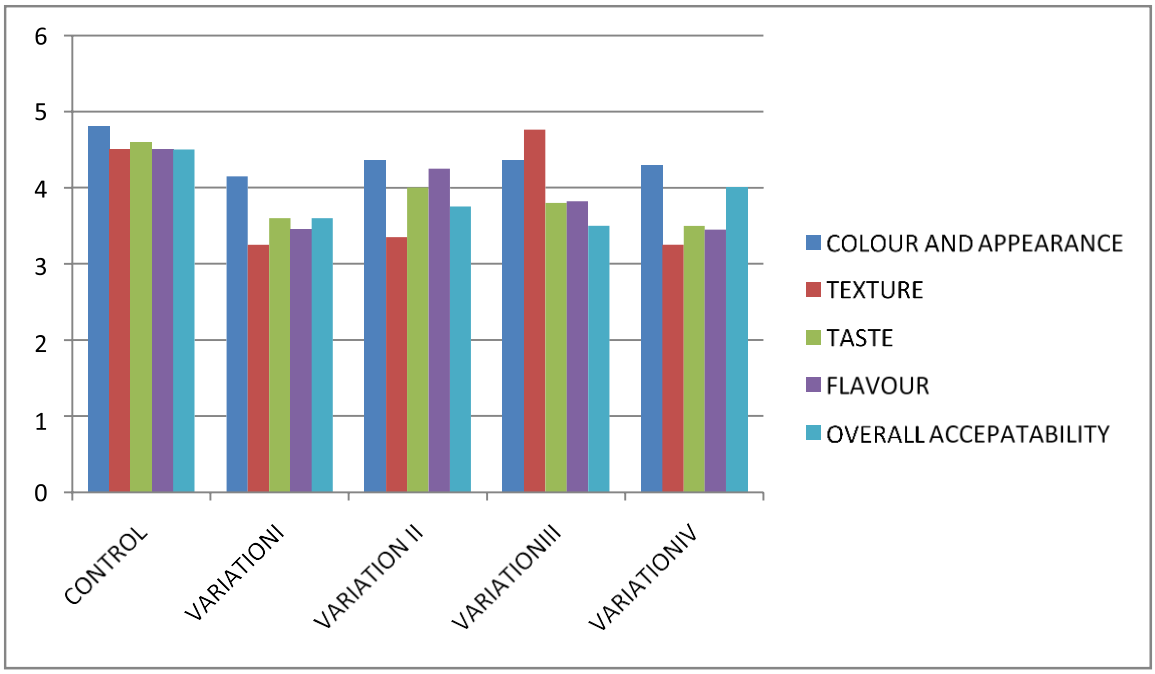
5. Result and Discussion

5.1 Sensory Evaluation

The overall acceptability of the cupcake made with variation VI was 4, variation III scored 4.25, variation I scored 3.6 and variation II scored 3.8 and control scored 4.5.The overall acceptability is high for variation III as it had high sores for its sensory characteristics.

CRITERIA	CONTROL	VARIATION I	VARAITION II	VARIATION III	VARIATION IV
COLOURAND APPEARANCE	4.8	4.15	4.36	4.36	**4.3**
TEXTURE	4.5	3.25	3.35	4.76	**3.5**
TASTE	4.6	3.6	4.	3.86	**3.25**
FLAVOUR	4.5	3.45	4..25	3.82	**3.5**
OVERALL ACCEPTABILITY	**4.5**	**3.6**	**3.75**	**4.25**	**4**

TABLE 3 , 4 – SENSORY EVALUATION



5.2 Quality testing

5.2.1 Physical parameters –

The average length was identified as and the average breadth was identified as and the average thickness was 3.3cm, 4.5cm and 2.5cm is identified by using venire caliper. The study by Peter Isah Akubor gave the result of length 5cm ,width 4.8cm and thickness 1.6cm in Cake supplemented with plantain peel flour.

variation	Length (cm)	Width (cm)	Thickness (cm)	Volume(cm^3)
Variation III	3.3	4.5	2.5	37.1

Table 5- Physical Parameters

5.2.2Nutrient analysis

- **Determination of Energy-** The energy of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 357.88 kcal. The study by Peter Isah Akubor gave the result of energy that determined by bomb calorimeter method and it was 363kcal in cake supplemented with plantain peel flour.
- **Determination of carbohydrates -** The carbohydrate of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 53.48 g. The study Peter Isah Akubor gave the result of carbohydrate as 75.3% by anthrone method in cake supplemented with plantain peel flour.
- **Determination of protein -** The protein of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 5.83 g. The study by Peter Isah Akubor gave the result of protein as 11.0% by kjeldhal method in cake supplemented with plantain peel flour.
- **Determination of fat-** The fat of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 13.18 g. The study by Peter Isah Akubor gave the result of fat that determined by soxhlet method 2.0% in cake supplemented with plantain peel flour.
- **Determination of fiber-** The fiber of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 4.72 g. The study by Peter Isah Akubor gave the result of fiber as 1.0% in cake supplemented with plantain peel flour.

5.2.3 Microbial Analysis

- **Total plate count-** The Total plate count of the prepared Buckwheat incorporated vegan and gluten free cupcake was determined as 38cfu/ g.The study by S.N. Chaudhari gave the result of total plate count as 38 count Cfu/g in microbial analysis of Ragi cake.

Nutrients	Quantity
Fat	**13.18g**
Protein	**5.83g**
Moisture	**25.84g**
Total ash	**1.65g**
Carbohydrate	**53.48g**
Energy	**357.88kcal**
Fiber	**4.72g**
Total plate count	**38 cfu/g**

Table 6 –Quality testing

CONCLUSION

The Buckwheat incorporated vegan and gluten free cupcake was formulated and best variation was chosen based on the sensory attributes then the nutritive value and quality parameters revealed that the buckwheat incorporated vegan and gluten free cupcake was healthy and nutritious. Hence, it is concluded that the buckwheat incorporated vegan and gluten free Cupcake is nutritive and healthy for all age groups at minimal cost.

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