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DEVELOPMENT OF IRON RICH PEARL MILLET MUFFIN AND ITS ACCEPTABILITY EVALUATION

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Abstract: Pearl millet (Pennisetum glaucum), a drought-tolerant cereal crop, has gained attention for its nutritional value and health benefits. The aim was to enhance the nutritional content of pearl millet while creating a convenient and palatable snack. The process involved the preparation of pearl millet dough, followed by baking and subsequent drying to achieve the desired crisp texture. The formulated pearl millet muffin was analysed for its physical, chemical, and sensory attributes. These included parameters such as moisture content, Ash, Protein, Fat, Iron, Colour, nutritional composition, and overall acceptability. Results revealed that the iron content increased with increasing addition of millet. Nutritional evaluation demonstrated that the muffin retained significant levels of moisture and dietary essential minerals present in pearl millet.

Keywords: Pearl millet, health benefits, convenient snack, dietary essential minerals

I. INTRODUCTION

Millets are more nutritious and they are non-glutinous and non-acid forming and easy to digest. Millets are good sources of energy, protein, fatty acids, vitamins, minerals, dietary fibre and polyphenols. Millets are rich in essential amino acids[1].

Pearl millet (Pennisetum glaucum) is a staple food in many developing countries and constitutes the major source of essential nutrients in semi-arid and arid regions of Africa. It's a good source of dietary protein, carbohydrates, fat, vitamins and minerals particularly iron and zinc. It has high levels of lipids, high quality and well-balanced proteins and diverse health promoting phenolic compounds. It is known to be nutritionally better than most other cereals[2].

Pearl millet is gluten free and retains its alkaline properties even after being cooked which is ideal for people suffering from gluten allergy and acidity. Due to the excellent nutritional properties and resilience to climate change, pearl millet along with other millets is renamed as nutri- cereals[3,4]. Health benefits of Pearl Millet: Pearl millet is helpful to patients with diabetes as it has a relatively low glycaemic index that helps to digest gradually and produce glucose at a slower rate than other foods.

This can sustain long periods of stable blood sugar levels. Pearl millet grain contains phenolic compounds in pericarp and grain testa, in particular flavonoids, which inhibit tumour production. It is high in iron and zinc content which may help in increasing HB and also preventing from anaemia[5,6]. Pearl millet grain is gluten-free, and it is one of the alternatives for the patients who have celiac diseases to consume a gluten free diet for anormal and healthy lifestyle. The pearl millet lignin and phytonutrients serve as good antioxidants and thus prevent heart related diseases. For this reason, pearl millet is considered good for cardiac health.[7]

II. MATERIAL AND METHODS

Collection of samples

Sample of Pearl millet grains were collected from Local market of Tamil Nadu. The sample was stored in sealed containers till their use in different experimental procedures. The other ingredients were purchased from the local market.

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Preparation of Millet Flour Incorporated Bakery Product

The muffin was prepared by incorporation of Pearl millet flour in various levels. The prepared muffin was analysed for their, texture profiles, nutrients and sensory qualities.

Muffin formulation and preparation

Firstly, take the vessel, add all fats in it and creamed with hand blender followed by addition of powdered sugar. Then mix all the flours along with baking soda and baking powder into previously creamed fats. Proper beating of dry and wet mixture used to prepare batter having a proper consistency. Fix the mixing direction. After preparation of batter pour the batter in greased muffins Mold and baking done at 1600C & allow the muffins to cool then store it at ambient temperature.

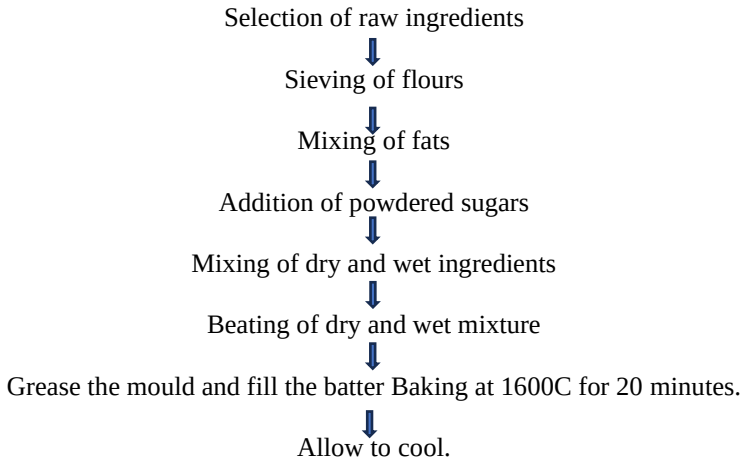

Fig.1 Flow chart for the preparation of muffin

Three formulations of muffins were prepared. Each formulation varied by ratio of Maida to Pearl millet flour.

Variations	Maida(g)	Pearl millet flour(g)
V0(control)	100	0
V1	70	30
V2	60	40

Table 1. Different formulations of muffins by increasing the pearl millet flour

PROXIMATE ANALYSIS OF MUFFINS

Moisture, ash, iron content was determined using different procedures. The methods used were:
1) Moisture (AOAC method, 2000)
2) Ash (AOAC method, 2000)
3) Iron (Colorimetric assay)

MOISTURE ANALYSIS:

Dry the empty dish and lid in the oven at 105*C for 3 hours and transfer to desiccator to cool. Weigh the empty dish and the lid. Weigh about 5g of sample to the dish. Spread the sample with spatula. Place the dish with sample in the oven. Dry for 3 hours at 105*C. After drying, transfer the dish with partially covered lid to the desiccator to cool. Reweigh the dish and its dried sample.

CALCULATION:

Moisture (%) = W1−W2/ W1* 100

- W1 = weight (g) of sample before drying
- W2 = weight (g) of sample after drying

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ASH ANALYSIS:

Place the crucible and lid in the furnace at 550*C overnight to ensure that impurities on the surface of crucible are burned off. Cool the crucible in the desiccator for 30 minutes. Weigh the crucible and lid to 3 decimal places. Weigh about 3g sample into the crucible. Heat over low Bunsen flame with lid half covered. When fumes are no longer produced, place crucible and lid in furnace. Heat at 550*C overnight. During heating, do not cover the lid. Place the lid after complete heating to prevent loss of fluffy ash. Cool down in the desiccator. Weigh the ash with crucible and lid when the sample turns to grey. If not, return the crucible and lid to the furnace for the further ashing.

CALCULATION:

Ash (%) = $Weight\ of\ the\ ash / Weight\ of\ the\ sample\ x\ 100$

Iron:

Pipette 10mL aliquot of ash solution into 25mL volumetric flask and add 1mL hydroxylamine hydrochloride solution. After 5 min, add 5mL buffer solution and 1 mL O - phenanthroline solution or 2mL of dipyridyl solution and dilute to volume. Determine absorbance of solution at 510 nm. From absorbance reading, determine Fe content present in aliquot of ash solution taken by referring to standard curve.

$$(\text{Fe/100gm sample}) = \frac{\text{Quantity of Fe in aliquot of ash solution (From calibration curve)} \times \text{Total volume of ash solution}}{\text{Aliquot of ash solution taken for determination} \quad \text{Wt. of the sample taken for ashing}}$$

III. EXPERIMENTAL RESULTS AND DISCUSSIONS

SENSORY EVALUATION OF MUFFIN BY INCORPORATING PEARL MILLET FLOUR WITH MAIDA.

The proximate composition of control muffin (100% refined flour) and variants were analysed. The results of sensory evaluation of Pearl Millet muffin for Appearance, texture, Aroma and taste are mentioned in Graph.

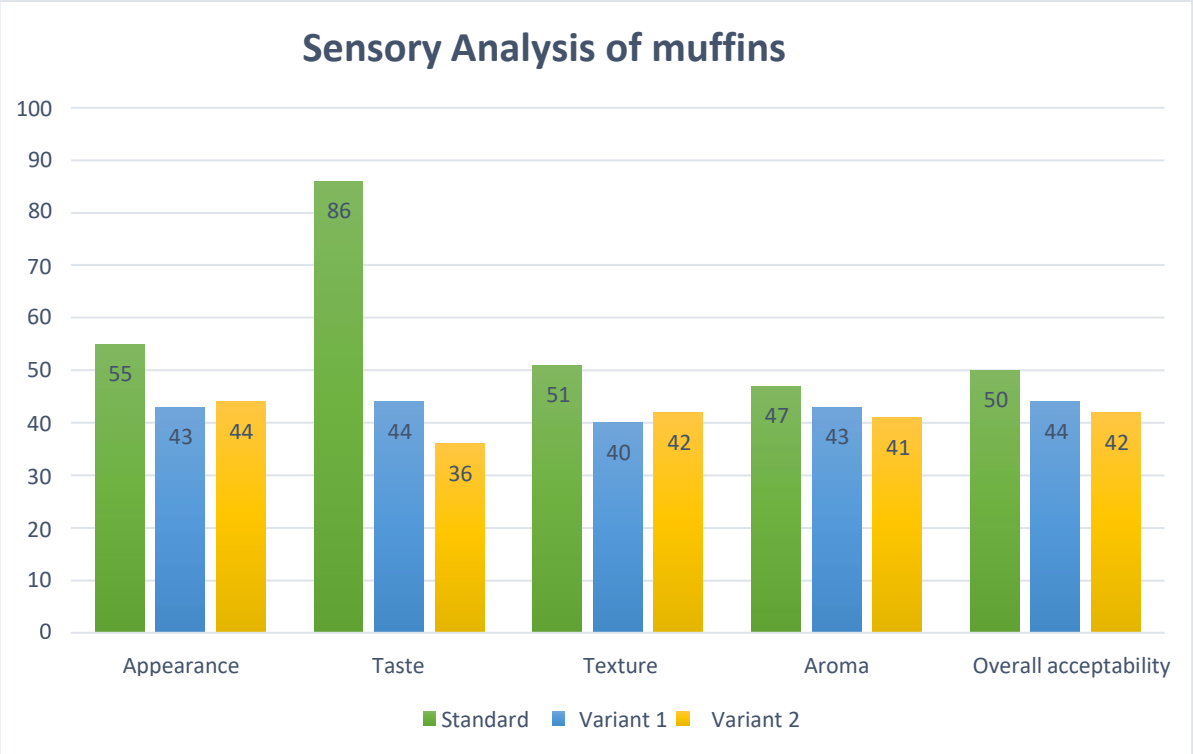

Figure 2: Bar graph representing the sensory analysis of Muffins.

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Proximate analysis of muffin control and selected muffin

The chemical composition of muffin prepared from pearl millet flour with Maida[standard], variation 1, and variation 2 are mentioned in Table. The moisture, ash, protein and iron profile are determined in the following table.

TREATMENT	MOISTURE (%)	ASH (%)	PROTEIN(g/100g)	FAT(g/100g)	IRON(mg/100g)
Standard	25.54	1.17	6.05	5.2	4.03
V1	26.06	1.32	7.03	6.1	7.5
V2	28.92	1.23	7.94	6.26	8.8

Table 2. Proximate analysis of muffin

The analytical data of control and formulated pearl millet muffins are represented. The experimental results show increased iron content in pearl millet enriched muffins. The moisture content and ash content were similar for the control muffin and the muffin formulated with oyster mushroom powder. The experimental results also revealed a clear increase in iron and protein content of the enriched muffin over the control muffin. The iron content of the control muffin was 4.03% whereas the iron content of the formulated muffin was 8.8%. The protein content of the control muffin was found to be 6.05% and the variation was 7.94%.

IV. CONCLUSION

The present study concluded on the basis of sensory evaluation, the most acceptable variant was variant 1 on the basis of results of sensory, though variant 2 was high in proximate and nutritional analysis. The highly nutritious variant was found. Developed iron rich muffins are more nutritious than standard. The iron rich muffin would be beneficial for iron deficiency anaemia because it contains all types of macronutrients and micronutrients especially in variant 1 such as protein, fiber, fat, and iron. These are healthier as compared to standard muffin.

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