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# FORMULATION AND STANDARDIZATION OF BAJRA COOKIE USING AMARANTH FLOUR AS PARTIAL REPLACEMENT

Healthcare

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## ABSTRACT

Millets are one of the oldest of cereals, cultivated since ancient times. The millets are best known for their drought resistance, shorter cultivation cycle and capability to grow in poor soils. Millets provide a wide range of health benefits and they are a good source of energy, proteins, minerals, vitamins and essential amino acids. India is the largest producer of pearl millet/bajra. It gives nutritional security to poor farmers and consumers. It is an essential phytonutrient, lignin, which is very essential for the human body. When bajra cookie is combined with amaranth flour, it produces a gluten-free food as well as a source of complete protein, and contains all the essential amino acids, including lysine. The present study was undertaken to standardize bajra cookie and modify them by incorporating amaranth flour at various levels and analyzing its acceptability and nutrient composition. All products were subjected to organoleptic evaluation in order to find their appearance, colour, flavor, texture, taste and overall acceptability. The nutrients analysed were energy, carbohydrate, protein, fat, dietary fibre, iron and calcium.

## KEYWORDS

Millets, Phytonutrient, lignin, Gluten-free, Protein, Lysine, Organoleptic, Bajra, Amaranth Flour.

### Introduction

Humanity relies on a diverse range of cultivated species; atleast 6000 such species are used for variety of purposes. It is often stated that only a few staple crops produce the majority of the food supply. Until recent past agricultural research has traditionally focused on these staple crops, while relatively little attention has been given to minor crops particularly pseudocereals in developed countries (Campbell. 2009). In spite of abundant food supply in the world, malnutrition still stands as a hurdle to achieve better quality of life amongst people. Various forms of malnutrition including under nutrition, micronutrient related Malnutrition, obese and overweight and diet- related non communicable diseases has manifested itself into the human community leading to numerous deaths.(WHO, 2017)

According to WHO, 462 million population of adults belonged to underweight category and about 1.9 billion population of adults belonged to the category of obese or overweight in 2014. Child malnutrition also has been a challenge in developing healthy individuals, which can affect the future of mankind. Adequate nutrition is the key to solve the problem of malnutrition in the world. This strengthens the need for development of foods that can tackle the problem of malnutrition at a larger scale. Amaranth, a grain that is not widely used can be a solution to malnutrition on effective usage.

Amaranth is an excellent vegetarian protein source that can be used in the food. The presence of micronutrients like vitamin B, vitamin A, vitamin C, iron, zinc, calcium and magnesium makes it more useful and it also widens the potential benefits that it can provide on using it on a regular basis. It also contains soluble fiber that can give the feeling of satiety. On quantifying the amount of micronutrients present in amaranth, it clearly overtakes wheat which is known to be one of the most important staple foods. Being gluten free it protects from the inflammation that can occur by using gluten containing foods such as wheat. It also contains a wide range of antioxidant molecules namely, tocotrienols, tocopherols, polyphenols, flavanoids, squalene and anthocyanins that helps in restricting cholesterol synthesis thus preventing from heart diseases. The presence of antioxidant molecules proves the potential of amaranth as a nutraceutical. (Pawel Pasko, et.al(2007), (Beatriz Valcárcel-Yamani and Suzana Caetano da Silva Lannes, (2012)

Gopalan et al., 2007 found that Amaranth Seeds (100 gm) contain 319kcal of energy, 1.9g of fat, 60.7gm of carbohydrates, 14.7kg of protein, 3.1gm of minerals, 397mg of phosphorus, 11mg of iron, 9.6gm of crude fiber, 510mg of calcium and 10gm of moisture. Amaranth is easy to grow, nutrient rich and underutilized pseudo cereal that can play an important role in actions against hunger and malnutrition that occur due to low rainfall conditions. The presence of proteins and varied antioxidants with calorie values equivalent to wheat makes Amaranth an excellent food to be used as a protein rich food.

### Methodology

#### Formulation and Standardization of Bajra Cookies by Incorporating Amaranth Flour

The present study aims to develop and standardize Bajra cookies incorporated with amaranth flour. This is a process to find out the acceptability of Bajra cookies incorporated with Amaranth flour by incorporating amaranth flour. Standardization is the process of developing and implementing recipes using technical standards. The standard bajra cookie was prepared using 100 gm of roasted bajra flour and with other ingredients (honey, roasted sesame, palm supplement, butter, baking powder, vanilla essence, water and salt). Bajra cookie is formulated at random and standardized and it was incorporated with Amaranth flour at various levels (15 percent, 30 percent, and 60 percent).

**Table-1 Formulation of Bajra Cookies**

| Ingredients | Level of Substitution of Amaranth Flour | | | |
|---|---|---|---|---|
| | Control | 15% | 30% | 60% |
| Roasted Bajra Flour (g) | 100 | 85 | 70 | 40 |
| Amaranth Flour (g) | - | 15 | 30 | 60 |
| Roasted Sesame (g) | 10 | 10 | 10 | 10 |
| Palm Supplement (g) | 50 | 50 | 50 | 50 |
| Honey (ml) | 7.5 | 7.5 | 7.5 | 7.5 |
| Butter (g) | 30 | 30 | 30 | 30 |
| Baking Powder (g) | 2 | 2 | 2 | 2 |
| Vanilla Essence (ml) | 10 | 10 | 10 | 10 |
| Water (ml) | 10 | 10 | 10 | 10 |
| Salt (g) | 1 | 1 | 1 | 1 |

#### Sensory Analysis of the Formulated Bajra cookies

Sensory analysis is the science of studying the acceptability of foods based on the sensory characteristics. Sensory analysis plays a key role in the development of foods and beverage for consumption (Moskowitz, 1984). Acceptability trials were conducted on the formulated cookies using 9 point hedonic scale by a panel of 30 adult subjects between age group of 20 to 50 years. The different characteristics which were evaluated include appearance, texture, flavor, taste, colour and overall acceptability.

#### Nutrient Analysis of the Amaranth Flour and Formulated Bajra cookies

Nutrient analysis is the method of estimating the quantity of nutrients that is present in the sample. On analyzing the food items, not only the quantification of nutrients can be achieved but also the nutrient losses that might occur due to preparation methods can also be identified. The

selected cookies and amaranth seeds were taken for nutrient analysis to estimate the energy, carbohydrate, protein, fat, moisture, dietary fiber, iron and calcium. The analysis was done at Chennai Labs Private Limited, Guindy, Chennai which is a NABL accredited lab.

**The methods used for estimation of nutrients are**

- Carbohydrates - Difference Method
- Protein - Kjeldhal method
- Fat - Solvent extraction method
- Moisture - Drying at 105 degree celsius
- Fiber - Gravimetry
- Iron - Spectrophotometry
- Calcium – Flamephotometry

**Results and Discussion**

**Organoleptic Evaluation of the Formulated Bajra Cookies**

Incorporation of Amaranth Flour was done at various levels and the acceptability of the variations was tested. The various organoleptic characteristics like appearance, taste, texture of the formulated Bajra Cookies incorporated with Amaranth flour were compared with the Control and the results are given below:

| Test Scenario | Appearance | | Aroma | | Texture | | Flavour | | Taste | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Z value | Level of Significance | Z value | Level of Significance | Z value | Level of Significance | Z value | Level of Significance | Z value | Level of Significance |
| Control 15% | 1 | NS | 2.22 | * | 0.85 | NS | 3.01 | * | 2.18 | * |
| Control 30% | 0.65 | NS | 1.5 | NS | 0.56 | NS | 2.68 | * | 2.52 | * |
| Control 60% | 1.05 | NS | 0.44 | NS | 0.36 | NS | 2.08 | * | 0.55 | NS |
| 15% 30% | 1.7 | NS | 0.3 | NS | 0.07 | NS | 2.54 | * | 1.29 | NS |
| 15% 60% | 1.85 | NS | 1.69 | NS | 1.19 | NS | 3.01 | * | 1.25 | NS |
| 30% 60% | 0.05 | NS | 1.81 | NS | 1.13 | NS | 2.95 | * | 2.69 | * |

Control = Plain bajra biscuit, 20% = Bajra biscuit with 15% amaranth flour, 30% = Bajra biscuit with 30% amaranth flour

60% = Bajra biscuit with 60% amaranth flour, NS = Non Significant, * = Significant

On comparing the Z values of plain bajra cookies (control) and bajra cookies with varying proportions of amaranth flour (15%, 30% and 60%) it was observed that there was no significant difference in the appearance between the control and test group and also within the test group (15%, 30% and 60%). The Z values obtained on comparison of plain bajra biscuits (control) and bajra biscuits with varying proportions of amaranth flour (15%, 30% and 60%) revealed that there was no significant difference in the aroma between the control and test group 15%, 30%, 60% and also within the test group (15%, 30% and 60%) but there was a significant difference at 5% level between the control and 15% test group.

When the texture of the control Bajra cookies and Amaranth incorporated bajra cookies was compared, it was noted that there was no significant difference in the Z values of plain bajra cookies (control) and bajra cookies with varying proportions of amaranth flour (15%, 30% and 60%) for texture between the control and test group and also within the test group (15%, 30% and 60%). The texture of the Amaranth incorporated Bajra Cookies was similar to the Control Bajra Cookies. The Z values of plain bajra cookies (control) and bajra cookies with varying proportions of amaranth flour (15%, 30% and 60%) revealed that there was significant difference at 5% level in the flavor between the control and test group and also within the test group ( 15%, 30% and 60%).

On comparing the Z values of plain bajra cookies (control) and bajra cookies with varying proportion of amaranth flour (15%, 30% and 60%), it was observed that there was no significant difference in the sweetness between the control and the test group 15%, 30%, 60% and within the test group.

**Nutrient Analysis of the Amaranth Flour and Formulated Bajra cookies**

**The nutrient composition of Bajra cookies (Control) and the Amaranth incorporated Bajra Cookies are given below:**

| Nutrients | Control | 15% Amaranth | 30% Amaranth | 60% Amaranth |
|---|---|---|---|---|
| **Energy** | 557.89 | 560.20 | 563.00 | 567.90 |
| **Carbohydrate** | 50.21 | 50.43 | 50.80 | 51.32 |
| **Total Fat** | 36.54 | 36.89 | 37.00 | 37.17 |
| **Protein (N x 6.25)** | 6.43 | 6.54 | 6.80 | 7.22 |
| **Dietary Fiber** | 3.0857 | 3.87 | 4.27 | 5.76 |
| **Calcium as Ca** | 123.04 | 133.45 | 144.00 | 156.60 |
| **Iron as Fe** | 8.06 | 7.403 | 6.80 | 5.432 |
| **Moisture** | 4.93 | 4.61 | 4.25 | 3.68 |

From the above table, it can be observed that the calorie content of the incorporated Bajra cookies is higher than the Control Bajra Cookies. Carbohydrate content remains almost same through all the proportions. The fat content has increased gradually through the proportions. There is also an increase in the protein content of the cookies. The dietary fiber has increased from 3.0857gm in Control to 5.76gm in 60% Amaranth incorporated Bajra Cookies. The calcium content also showed increase from 123.04mg to 156.60mg. The non heme iron content showed a reduction when compared to the Control Bajra Cookies. Thus, the overall nutrient composition of the Amaranth incorporated Bajra Cookies showed an increase in the nutrients quantity when compared to the Control.

**CONCLUSION:**

In the present study, Bajra Cookie incorporated with Amaranth Flour was formulated and the acceptability and nutrient composition were analyzed and recorded. It was found that the Bajra cookies incorporated with Amaranth flour showed better acceptability compared to the Control. The nutrient analysis of the Incorporated Bajra Cookies revealed that the nutrient Quantity of the cookies were comparatively higher than the Control. This leads to the conclusion that the Incorporation of Amaranth flour gives a better product in terms of Acceptability and Nutrient Composition. Therefore, Amaranth Flour incorporated Bajra Cookies can be used as a healthy snack for promoting health.

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