INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

IJARIIT

**ISSN: 2454-132X**
**Impact factor: 4.295**
***(Volume 4, Issue 3)***
Available online at: www.ijariit.com

# Development of functional multigrain cookies incorporating different flour blends

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## ABSTRACT

***To study the development of multigrain cookies comprising of Water-chestnut flour, Buckwheat flour, chickpea flour and all-purpose flour, which is extremely important as it takes an important place among the crops, which are a good source of protein, minerals and trace elements. The functional properties of different blends of composite flour were studied. Cookies were prepared by using different ratios of composite flour. The various compositions of each flour were estimated to find out which composition has gained maximum acceptability level based on the sensory evaluation. Proximate analysis, mineral content, and antioxidant properties of water chestnut flour (WCF) were compared with refined wheat flour. WCF was found to have higher phenolic compounds, flavonoids and mineral content (K, Mg, Zn, and Cu) than wheat flour. WCF showed greater retrogradation tendency but lower peak viscosity than wheat flour.***

**Keywords:** *All-purpose flour, Buckwheat flour, Chickpea flour, Chia seeds, Pearl millet, Proximate Analysis, WCF.*

## 1. INTRODUCTION

The development of new products is a new strategic area of the food industry. Consumers are demanding in these days, foods that show two main properties: the first-one deals with the traditional nutritional aspects of the food, as well as, a second feature, additional health benefits are expected from its regular ingestion. These kinds of food products are often called functional foods. Functional foods have gained tremendous attention worldwide over the past few years due to healthy lifestyle changes. One of the interesting reasons to shift to a healthier lifestyle is the increasing number of people suffering from cardiovascular diseases (CVDs), high blood pressure, obesity, diabetes, and other related diseases. These conditions are commonly due to an inactive lifestyle and poor diet where the daily food consumed contains high amounts of saturated fatty acids (SFAs). The total dietary fiber (TDF) has become an important component in the daily diet because intake of TDF has health beneficial effects. One of the major challenges in baking industry is the production of gluten-free products. Gluten, important for dough development, is usually associated with gluten intolerance and gluten sensitivity that has recently been categorized as two different medical conditions and are associated with the consumption of gluten protein. Usually, those gluten-free sources are preferred for incorporation in bakery products that are rich in starch. Cookies are widely accepted and consumed in developing countries. Traditionally cookies are made from wheat flour. The name “Cookie” derives from the Dutch word ‘Koekie’ or ‘Koekie’ that means little cake. Cookies, like cakes, are chemically leavened with baking soda and baking powder. Cookies, however, have more sugar and shortening and less water proportionately. In this study, we attempted to access the suitability of replacement of “Maida” by using other flours.

Nutritional enrichment is of current interest because of consumer trends, government guidelines and changing demographics. These factors are causing the industry to be aware of the need for nutritional food products. Protein supplementation is one way to meet the need for nutritious foods, particularly baked products. The nutritional significance of the bakery products is well recognized. Attempts are being made to enrich the products with high-quality non-wheat flours. Bakery products can serve as a good vehicle for carrying the added proteins to target populations for use in combating the protein malnutrition prevalent in many parts of the world.

 

Cookies are considered better for supplemented/composite flours due to their ready-to-eat form, wide consumption, relatively long shelf-life and good eating quality (Tsen *et al.*, 1973). Cookies with high sensoric attributes have been produced from blends of millet/pigeon pea flour (Eneche, 1999), raw rice and wheat (Singh *et al.*, 1989), black gram and wheat (Singh *et al.*, 1993), chickpea and wheat (Singh *et al.*, 1991), wheat, fonio and cowpea (McWatters *et al.*, 2003). Nutritional and functional properties of banana peel power could be well suited for baked products like cookies, muffins, bread, crackers, pastries, and pancakes.

The above work was focused on the following objectives

- Development of functional multigrain cookies.
- To study the proximate analysis of prepared cookies samples.
- To study physic-chemical of flour and spreadability of each composition of cookies.

## 2. METHODOLOGY

All the raw materials were procured from local market of Dadri, Greater Noida. Similarly, Buckwheat flour, chickpea flour & WCF were procured from local market Dadri, Greater Noida. Chia seeds sample was obtained from the research farm of CFTRI, Mysuru.

**Buckwheat Flour**: - A gluten-free seed and nutrient-packed abundantly consumed in Asian countries for centuries. Buckwheat is a gluten-free, eaters alike since it provides a high source of amino acids, vitamins, minerals, and antioxidants all with relatively few calories and practically no fat. A main benefit of buckwheat compared to other flour is that it has a unique composition of amino acid, which gives it special biological activities. These include lowering-cholesterol, anti-hypertension and improving digestion by relieving constipation.

**Chickpea Flour (*Sattu*)**:- One of the most indigenous protein sources of India, *sattu* is no stranger to the locals of Bihar, UP, and West Bengal. It served as a 'sharbat' by street vendors at the peak of summer. It has a near-instant cooling effect on the body. Apart from providing energy to the body, what makes *sattu* quite a unique ingredient is that its prepping process (dry roasting) keeps the nutritional values in place, and it can be stored for longer? It has high insoluble fiber, which makes it good for your intestines, and is lower in glycemic index, making it safe and in fact beneficial for the diabetics. In addition, it has good proportions of manganese, iron, magnesium, and is low on sodium too.

**Chia Seeds**: - The health benefits of chia seeds are not exactly new in fact; people have been eating them for more than 5,000 years. Originally from Mexico and Guatemala, chia i.e., *Salvia hispanica L.*, a member of the mint family was used by the Aztecs and Mayans in everything from meals to medicines to cosmetics. Chia seeds are rich in fiber, which helps with satiety, the feeling of fullness. A 25g portion of chia seeds contains approximately 9g of fiber. The daily recommended amount of fiber is 30g, so including a 25g portion of chia seeds, each day could be a useful contribution. Fiber is important for a healthy digestive system and many of us do not reach the recommended target.

**Water Chestnut Flour (*Singhara ka Atta*)**:- *Singhara* is widely used in an Ayurvedic system of medicine and is used to treat stomach, liver and kidney.WCF is a good source of minerals and vitamin. It is rich in vitamin B, and potassium. It also contains a number of antioxidants. The kernel of water chestnut contains a high level of protein. It offers up to 20 percent of protein and about 52 percent of starch. The fat content is about 1 percent. It also contains 3 percent sugar and minerals. Many studies and researches have proved that water chestnuts are beneficial to diabetics. So including water chestnut in your daily diet will keep your diabetes in check. Most people are unaware of the fact that *Singhara* flour has a remarkable nutritional composition.

**Table 1. Various compositions of different flour samples used**

| | BWF | APF/WF | WCF | EPF | PM | FAT | SUGAR | BS | BP | Additives |
|---|---|---|---|---|---|---|---|---|---|---|
| S.No | | | | | | | | | | |
| C 1 | | 10 | | 10 | 5 | 25 | 20 | 5 | | |
| C 2 | 32 | 64 | | | | 64 | 43 | 2.5 | 2.5 | Real mix juice and Peanut butter |
| C 3 | 30 | 70 | 40 | | 10 | 25 | 20 | 5 | | |
| C 4 | | 100 | 50 | | 5 | 20 | 15 | | 2.5 | |
| C 5 | 5 | 80 | 20 | 20 | 5 | 30 | 35 | 5 | 5 | 1 egg, vanilla essence & real juice 10 ml |

**Weight in Grams** **C = Composition type (Sample Type)**

BWF – Buck wheat Flour, APF/WF – All Purpose/ Wheat Flour, WCF – Water Chestnut Flour, PM – Pearl Millet, FAT – Butter, BP – Baking Powder, BS – Baking Soda, EPF – Egyptian pea Flour (Chick pea)

 

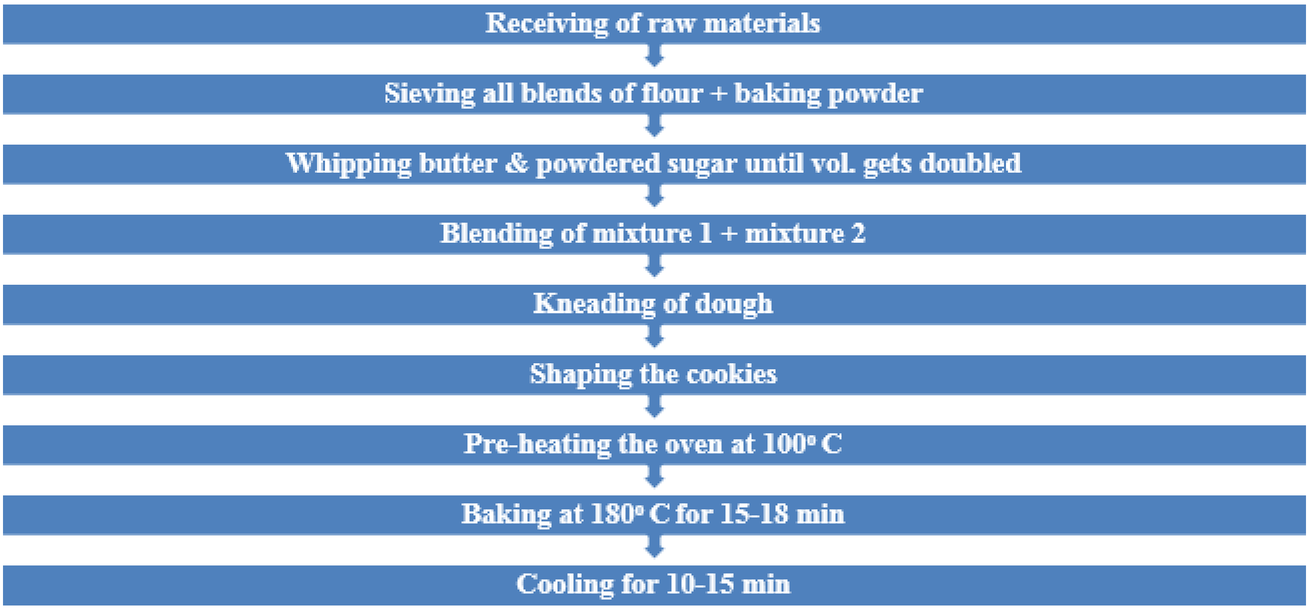


**Fig.1. A flowchart depicting standard preparation method for development of cookies**

**Estimation of Carbohydrate**

The carbohydrate content of each of the 5 cookies sample was estimated by methods laid down in the handbook of

"S. Ranganna" 1997 edition.

**Estimation of Fat:**

Fat content in the sample was estimated by Soxhlet extraction method (**Ranganna, 1997**). Moisture free sample was transferred to the thimble, which was then fixed into a stand and transferred to a pre-weighed Soxhlet beaker. The beaker was filled with petroleum ether. The beaker was then attached to Soxhlet apparatus and the sample was extracted for 2 hours at 60ºC. At the same temperature, the ether was evaporated for 2 hours after extraction. At the end of 4 hours, the ether left was dried in a hot oven at $100^0$C for 30 minutes. The beaker was then cooled in desiccator and weighed. It gives the amount of ether-soluble fat present in the sample.

Percent crude fat was calculated as under :

% Crude fat = (weight of fat) / (weight of sample) × 100

**Estimation of Protein:**

The protein content of samples was determined by Kjeldahl procedure (described in Ranganna,1997). 0.5 gram of sample was digested with 5 gm of digestion mixture (10 parts potassium sulphate and 1 part copper sulphate) and 20 ml of conc. Sulphuric acid in Kjeldahl flask until the contents were carbon-free. The digested sample was taken up to 100 ml. An aliquot of 10 ml was distilled with 20 ml of 30% sodium hydroxide and liberated ammonia was collected in 20 ml of boric acid containing 2-3 drops of mixed indicator (0.1% methyl red and 0.1% bromo-cresol green of 95% ethyl alcohol separately and mixed in the ratio of 1:5 respectively). The entrapped ammonia was titrated against titrated against 0.1N hydrochloric acid.

The Nitrogen content in the sample was calculated by the following expression:-

**% Nitrogen =[**(sample titre-blank titre)×normality of HCl×14×100×100] /(wt.of sample×aliquot taken for distillation×1000)]

A conversion factor of 6.25 was used to convert nitrogen into protein content.

**Estimation of Moisture:**

Moisture was estimated by oven drying method. Weighed sample (approx 2 gm) ($W_2$) pre-weighed petriplates ($W_1$) were kept in an oven for drying at 55° C for 5 hours. The samples were cooled in airtight dessicators to prevent moisture loss or gain from the environment. Drying was considered complete when readings of two consecutive weighing recorded at an interval of time did not vary by more than 5 mg ($W_3$). Moisture content was calculated by subtracting the dried weight from the sample weight and was expressed as percentage.

$$\% \text{ Moisture} = (W_2-W_3)/(W_2-W_1) \times 100$$

**Estimation of Total Ash:**

Ash determination was followed by the charing method (Ranganna, 1997). 2 gm of the sample taken in a silica crucible was ignited on a bunsen burner till the flumes stop coming (charing process) and then shifted to muffle furnace until clean ash was obtained. The temperature of the furnace was raised to 550$^0$C. The weight of residue was noted and percent ash was calculated as under:

% Ash = (wt. of residue) / (wt. of sthe ample) × 100

**Bulk density:**

The procedure of Akpapunam & Markakis (1981) was used to determine the pre-weighed ($W_1$) bulk density of the flour. A known weight of the flour was taken into a pre-weighed ($W_1$) measuring cylinder and the weight of the cylinder ($W_2$), as well as the volume of the flour (V1), was noted. The Loose bulk density (LBD) was expressed as:

$$LBD = W_2 - W_1 \div V_1$$

The flour in the cylinder was tapped gently to eliminate air spaces between the particles of the flour. The new volume (V2) of the sample and mass of the cylinder ($W_3$) was noted and the packed bulk density (PBD) was expressed as:

$$PBD = W_3 - W_1 \div V_2$$

**Spreadability Ratio:**

**Diameter** It was measured by using vernier calliper scale.

$$\textit{Diameter} = \frac{\textit{total diameter}}{\textit{no. of cookies}}$$

**Thickness** The thickness of individual cookies is measured with a centimeter, which given us information about the variation between tablets. Tablets should be within ± 5 % variation of a standard value.

$$\textit{Thickness} = \frac{\textit{total thickness}}{\textit{no. of cookies}}$$

## 3. RESULTS AND DISCUSSION

On the basis of proximate analysis of the 5 cookie samples, it was monitored that sample C3 had the highest carbohydrate content where as sample C1 had minimum carbohydrate content. The fat content of sample C3 was found to be maximum where as sample C1 had minimum fat content. The protein of sample C4 content was found maximum where as sample C1 had minimum protein content. The moisture content of sample C5 had maximum where as sample C4 had minimum content. The Ash content of sample C2 had maximum content where as sample C1 had minimum content.

**Table 2. Proximate Analysis of Cookies Samples**

| | Carbohydrate (gm) | Fat (%) | Protein (%) | Moisture (%) | Ash (%) |
|---|---|---|---|---|---|
| C1 | 64.78 | 1.03 | 28.29 | 2.68 | 1.03 |
| C2 | 76.02 | 1.93 | 56.58 | 4.61 | 1.56 |
| C3 | 76.72 | 9.40 | 50.98 | 3.44 | 1.24 |
| C4 | 73.08 | 7.12 | 73.39 | 2.30 | 1.06 |
| C5 | 68.66 | 1.72 | 50.98 | 4.88 | 1.07 |

It was found that spreadability ratio of sample C2 had a maximum value as compared to other samples as shown in table 3.

**Table 3. Spreadability Ratio of Cookies**

| Sample Types | Ratio (cm) |
|---|---|
| C1 | 2.69 |
| C2 | 2.33 |
| C3 | 2.10 |
| C4 | 1.86 |
| C5 | 2.5 |

It was found that bulk density of WCF was maximum compared to other samples and EPF had minimum value as shown in table 4.

 

**Table 4. Bulk Density of used flours**

| Flour name | Density (gm/m$^3$) |
|---|---|
| APF | 29.65 |
| BWF | 32.85 |
| WCF | 35.50 |
| EPF | 20.82 |

**Table 5. Sensory Evaluation: 9 Point hedonic Scale**

| | Taste | Colour | Texture | Odor | Chewiness | Overall acceptability (OAA) |
|---|---|---|---|---|---|---|
| C1 | 5 | 5 | 7 | 5 | 5 | 3 |
| C2 | 6 | 8 | 7 | 4 | 7 | 5 |
| C3 | 6 | 8 | 6 | 7 | 6 | 6 |
| C4 | 7 | 8 | 7 | 6 | 6 | 8 |
| C5 | 8 | 9 | 8 | 7 | 9 | 4 |

The above results are based on the sensory analysis (Hedonic scale based) conducted on 5staff members of "Food Processing & Technology Dept." and calculating their OAA. Sample C4 had maximum overall acceptability based on sensory evaluation.

**Fig.1 (a).Multigrain cookies using BWF, APF, WCF and Chia seeds**

**Fig.1 (b).Multigrain cookies using BWF, APF, WCF, EPF, PM, and egg**

## 4. REFERENCES


[1] "Evaluation of Physical and Textural Properties of Cookies Prepared from Pearl Millet Flour", A.A. Kulthe*, S.S. Thorat and S.B. Lande, Department of Food Science and Technology, MPKV, Rahuri – 413 722, (M.S.) India

[2]"DEVELOPMENT OF HIGH FIBRE CAKE USING GRAM FLOUR" 1Tanya Singh and 2*Neha Chaudhary 1Department of Food Technology, BFIT Institute of Technology, Dehradun India 2Assistant Professor, Department of Food Technology, BFIT Institute of Technology, Dehradun India

[3] "Comparative Study of Chickpea and Green Pea Flour Based on Chemical Composition, Functional and Pasting Properties", Sajad Ahmad Wani and Pradyuman Kumar* Department of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal 148106 (India).

[4] FOOD SCIENCE & TECHNOLOGY |Functional and sensory properties of cookies prepared from wheat flour supplemented with cassava and water chestnut flours Anu Bala1, Khalid Gul1,2* and Charanjit Singh Riar1

[5] International Journal of Applied And Pure Science and Agriculture www.ijapsa.com @IJAPSA-2015, All rights Reserved, e-ISSN: 2394-5532 p- ISSN: 2394-823X , Fatty acid profile of water chestnut flour and effect on dough rheology & cookies of wheat flour Walde, S.G.1*, Jeyarani, T.2 and Misra A.K.3 1*Dept. of FMBCT, CSIR-Central Food Technological Research Institute, Mysore 2Dept. of LSTF, CSIR-Central Food Technological Research Institute, Mysore 3CSIR-Central Drug Research Institute, Lucknow

[6] Buckwheat Grains and Buckwheat Products – Nutritional and Prophylactic Value of their Components – a Review, K. CHRISTA and M. SORAL-ŚMIETANA, Department of Functional Properties of Food, Division of Food Science, Institute of Animal Reproduction and Food Research of Polish Academy of Sciences, Olsztyn, Poland

[7] "Wheat-water chestnut flour blends: effect of baking on antioxidant properties of cookies"Musarat Shafi1,2 • Waqas N. Baba2 • Farooq Ahmad Masoodi2 • Rafiya Bazaz2,3. Revised: 8 September 2016/Accepted: 28 November 2016/Published online: 17 December 2016 Association of Food Scientists & Technologists (India) 2016

[8] "CHEMICAL AND TECHNOLOGICAL PROPERTIES OF IMPROVED BISCUIT BY CHESTNUT FLOUR" Nefisa A. Hegazy, Mohie M. Kamil, Ahmed M.S. Hussein* and Gamil F. Bareh Food Technology Department, National Research Centre, Dokki, Giza, Egypt. *Corresponding Author: a_said22220@yahoo.com Received on: 4th November, 2014 , Accepted on: 6th December, 2014

[9] PRODUCTION AND EVALUATION OF COOKIES FROM WHOLE WHEAT AND DATE PALM FRUIT PULP AS SUGAR SUBSTITUTE Peter Ikechukwu,A. 1; Okafor, D. C. 1; Kabuo, N. O. 1; Ibeabuchi, J.C. 1; Odimegwu, E. N. 1; Alagbaoso, S. O. 1 Njideka, N.E. 1 and Mbah, R. N. 1 1Dept. of Food Science and Technology, Federal University of Technology, Owerri, P. M. B. 1526 Owerri, Imo State, Nigeria

[10] International Food Research Journal 24(6): 2278-2284 (December 2017) Journal homepage: http://www.ifrj.upm.edu.my

[11]"Development of Nutritionally Superior and Eggless Vegetarian Cookies by Using Chiaseed Flour" Mansi Shaha*, Gayatri Mishrab and Nirali Christiana a College of Food Processing Technology and Bio-Energy, AAU, Anand-388110, Gujarat, India. bDepartment of Agriculture and Food Engineering, Indian Institute of Technology Kharagpur, West Bengal 721302, India.

[12] Organoleptic and Nutritional Evaluation of Cookies Supplemented with Oat and Finger Millet S. J. Giram1*, R. S. Agrawal2 and D. M. Shere3 1,3Department of Food Science and Technology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 4310402 2Assistant Professor, MIT College of Food Technology, Pune 412201 *Corresponding Author E-mail: agrawalrinku01@gmail.com Received: 24.07.2017 | Revised: 30.08.2017 | Accepted: 5.09.2017

[13] ] Tsen, C.C., Peters, E.M., Schaffer, T. and Hoover, W.J. (1973).High-protein cookies: Effect of soy fortification and surfactants. Baker's Digest. 47: 34-39.


 