

# Development of Nutrient Rich Biscuits by Incorporating Avena sativa and Moringa oleifera Leaves in Wheat Biscuits

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**Abstract** – Biscuits are a type of baked product that are becoming one of the vital snack foods worldwide because of their taste, stable shelf life and crispiness. This study was conducted to enhance the nutritional content of biscuits by incorporating moringa leaves extract and Avena sativa(oat) flour. Moringa oleifera is from Moringaceae family. It is most widely grown in tropics and subtropics. These leaves are highly nutritious and are rich in proteins, iron, beta carotene, vitamin A, C and potassium[1]. Avena sativa commonly known as oats. It is rich in fibre, vitamins, minerals, essential amino acids and antioxidants[2]. Different compositions of oat flour and moringa leaves extract are mixed with wheat flour along with lecithin, salt, shortening, baking powder and palm sugar. The prepared dough is baked at 175°C-180°C for 15 minutes. The results showed that with the increasing addition of Moringa leaves extract and oats flour within the recipe, increases the protein, dietary fibre, total fat and sugar contents and also showed considerable changes in sensory attributes and in physiochemical properties also.

**Keywords**– Biscuits, Avena sativa, Moringa oleifera, nutrition, sensory attributes.

## I. INTRODUCTION

Consumption of bakery products has been on increase now a days. Bakery industry is one of the biggest food processing sectors in India. Bakery products are classified into three types : breads, biscuits and cakes. Biscuits are made by blending basic ingredients such as flour, sugar, shortening, water and finally the dough is baked. Biscuits are made up of high calorie ingredients and also contains non caloric sugars which are when taken/consumed for too long may causes negative health effects on consumers.

But this Avena sativa (oats)flour and moringa leaves incorporated biscuits which will have positive effect on consumer health because of their nutrient content. Moringa leaves are considered as one of the most nutritious leaves in the world. They are abundantly available, inexpensive but still are under exploitation or go waste because most of the people are not aware of these leaves. It is rich in bioactive compounds and antioxidants. It has also a considerable amount of protein, vitamin A, B2, B6, C and magnesium[3]. It can increase blood antioxidant levels because the levels are rich in quercetin and chlorogenic acids. Moringa leaves are also a good source of high density lipoprotein which in high

levels protect humans from heart related diseases. Moringa leaves also contains essential amino acids such as tryptophan, methionine, lysine and cysteine[4].

Avena sativa commonly known as oats is a good source of beta-glucan and this may lower cholesterol and glucose in the blood. Oat is a great source of fibre, antioxidants, vitamins and minerals than most of the other grains[5]. Oats contains avenanthramides, an antioxidant which may help to reduce blood pressure. The beta-glucan in oats helps to reduce cholesterol, promotes healthy gut bacteria and may improve insulin sensitivity[6]. Palm sugar is used as a sugar replacer here because of it's higher nutrition content. It is a good source of antioxidants, vitamins, minerals such as iron, zinc and potassium[7].

The main purpose of this study is to develop value added biscuits by incorporating Avena sativa (oats)flour and moringa leaves extract in wheat flour biscuits. These combination of ingredients will enhance the nutritional value of biscuits and also helps to utilize the nutrients of Moringa leaves in a easy and effective way.

## II. MATERIALS AND METHODS

Wheat flour, oats, moringa leaves, palm sugar, shortening, baking powder, salt and lecithin were purchased from local market and were taken to the laboratory for processing. The entire processing of this

biscuits took place at Department of Food Technology, JCT College of Engineering and Technology, Tamil Nadu.



Fig.1. Fresh Moringa leaves.

### 1. Preparation of Moringa leaves extract and oats flour

Moringa leaves were purchased from local market. They were cleaned using distilled water and the leaves are separated carefully from the stalks. Then their size was reduced by dicing and finally leaves are grinded into fine paste. Small amount of water is added and the mixture is filter pressed to obtain the extract.

Oats was purchased from the local market and was grinded into fine powder.



Fig.2. Moringa leaves extract.



Fig.3. Oats.

### 2. Preparation of biscuits

Wheat flour is mixed with moringa leaves extract and oats flour at different proportions. All other ingredients are carefully weighed and added in the mixture. This mixture is mixed well until the required consistency is achieved. Kneading is done for 5 minutes to obtain a soft dough. The dough was divided into small portions and rolled flat

evenly using rolling pins. Then they were cutted using cookie die/cutter. The biscuits were baked at 175°C-180°C for 20 minutes. After baking, the biscuits were cooled and packed in sealed polyethylene bags.

Table –I: Composition of ingredients

Ingredients	T1	T2	T3	T4	T5
Wheat flour(g)	100	90	80	70	60
Oat flour(g)	0	10	20	30	40
Moringa leaves extract(ml)	0	10	15	20	25
Fat(g)	20	20	20	20	20
Palm sugar (g)	25	25	25	25	25
Salt(g)	1	1	1	1	1

T1 = Wheat biscuits

T2, T3, T4, T5 = Wheat biscuits incorporated with different compositions of oats flour and moringa leaves extract.

### 3. Sensory evaluation

The sensory evaluation study was carried out by evaluating five major sensory attributes such as appearance, taste, texture, aroma and overall acceptability using nine point hedonic scale. Fifteen members including students and staffs from the department were used for this evaluation.

### 4. Biochemical analysis

**4.1 Moisture analysis:** The samples were weighed carefully using electronic weighing machine and we're taken in sample cups. They were dried in hot air oven at 95°C to 110°C and the calculation was done.

**4.2 Ash content:** A known amount of sample was powdered and taken in a crucible and then burnt in a muffle furnace. By using this method the ash content of the prepared biscuits were calculated.

**4.3 Nutrient content:** Kjeldhal method was used to estimate the protein content of the biscuits. The biscuit samples are first digested and the released nitrogen content is converted into protein content with a conversion factor of 6.25.

Carbohydrates content was determined using anthrone method.

Solvent extraction-gravimetric method was used for determining the fat content.

Vitamin C content was determined using 2,6 indophenol method. Liquid chromatography method was used to estimate beta-carotene value[8].

**4.4 Microbiological analysis of biscuits:** The total plate count was determined by pour plate method. Coliform present in the samples were also determined using appropriate methods[9].

### 5. Physical property analysis:

The weight of the biscuits were measured in an electronic weighing machine. The diameter(cm) and thickness(cm) were determined by using vernier caliper. The spread ratio of biscuits were obtained by dividing diameter(cm) of the biscuits by their thickness(cm)[10].

### 6. Shelf life study:

The prepared biscuits were packed and sealed in polyethylene pouches. The changes in water activity, sensory attributes such as texture, colour and overall acceptance were evaluated/investigated at an interval of one month up to three months. Visual observations were made daily to evaluate the microbial spoilage.

## III . RESULT AND DISCUSSION

The addition of oats flour and moringa leaves extract in wheat biscuits formulation resulted in enhanced nutrition content and sensory attributes.

The sensory evaluation was carried out by evaluating five major sensory attributes and the results were tabulated in table 2. It is shown that sample T3 has better characteristics than others.

Table : 2 Sensory evaluation of prepared biscuits

Samp les	Appeara nce	Tas te	Textu re	Aro ma	Overall acceptabi lity
T1	8.10	7.85	8.10	8.15	8.05
T2	8.05	7.95	8.15	8.15	8.07
T3	8.05	8.0	8.20	8.20	8.11
T4	7.80	7.75	7.90	7.85	7.82
T5	7.60	7.55	7.80	7.65	7.65
Mean	7.92	7.82	8.03	8.0	7.94

The nutritional content of the prepared biscuits were determined using different methods and the results are shown in table 3. This analysis showed that the wheat biscuits incorporated with oats flour and moringa leaves extract have much more essential nutrients than the usual wheat biscuit (T1).

Table –III: Biochemical analysis of prepared biscuits

Parameters	T1	T2	T3	T4	T5
Moisture(%)	12.3	11.9	11.5	11.1	10.7
Protein(%)	14.45	15.7	17.7	19.8	20.9
Carbohydrate(%)	68.77	71.3	73.5	75.1	76.2
Fat(%)	1.65	1.93	2.45	3.0	3.37
Ash(%)	2.36	2.78	3.25	3.96	4.35
Vitamin C(%)	0	5.8	8.9	12.1	14.3

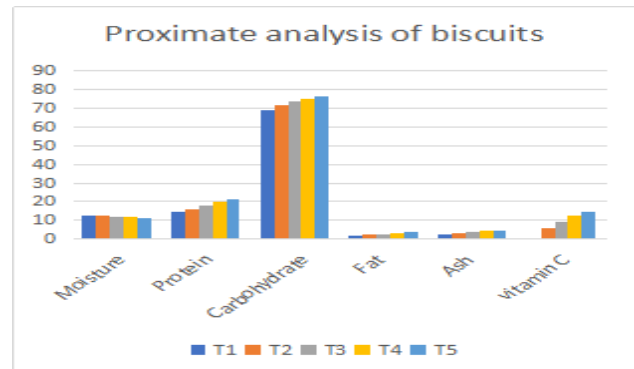


Fig.4.Graphical representation of proximate analysis of the prepared biscuits.

## IV. CONCLUSION

The incorporation of Moringa leaves extract and oats flour into wheat biscuits showed considerable changes in the nutritional content and the physicochemical properties of the biscuits.

The results showed that with increasing addition of oats flour and moringa leaves extract within the wheat biscuit recipe, increases the nutrients such as protein, dietary fibres, ash, sugar, fat in the biscuits. It also helps to utilize the nutrients in moringa leaves in a easy and effective manner. It is concluded from the study that oats flour and moringa leaves are successfully incorporated in wheat biscuits to yield biscuits of rich nutrition and with acceptable sensory attributes.

## REFERENCES

- [1]. Abdel-Samie MA, Abdulla G. "Effect of moringa leaves (*Moringa oleifera* Lam.) on some physicochemical and sensory properties of wheat flour cookies". *Journal of Agricultural Research*. 41(2014) 305-314.
- [2]. Manolache, Fulvia Ancuta. (2019). "Quality assessment for nutritive value of biscuits based on oat flour from *Avena nuda* l" *Science Bulletin*. 81. 3-12.
- [3]. Abdull Razis AF, Ibrahim MD, Kntayya SB. "Health benefits of *Moringa oleifera*". *Asian Pac J Cancer Prev*.15(2014):8571–8576. Doi:10.7314/apjcp.2014.15.20.8571
- [4]. Rathnayake, Heshani,Navaratne,Senevirathne. "Utilization of *Moringa olifera* Leaves as a Functional Food Ingredient in Bakery Industry".391(2017) 339-344. 10.21275/ART2017641.
- [5]. Sahay, Surbhi & Yadav, Upasana & Srinivasamurthy, Sheetal. (2017). "Potential of *Moringa oleifera* as a functional food ingredient: A review". *International Journal of food science and nutrition*. 2. 2455-4898.
- [6]. Duta, Denisa & Culetu, Alina. (2015). "Evaluation of rheological, physicochemical, thermal, mechanical and sensory properties of oat-based gluten free

- cookies". Journal of Food Engineering. 162. 10.1016/j.jfoodeng.2015.04.002.
- [7]. Wani, Sajad & Shah, Tajamul & Bazaria, Bindu & Nayik, Gulzar & Amir, Gull & Muzaffar, Khalid & Kumar, Pradyuman. (2014)."Oats as a functional food: A review". Universal Journal of Pharmacy. 03. 14-20.
- [8]. Srikaeo, Khongsak & Sangkhiaw, Janya & Likittrakulwong, Wirot. (2019)."Productions and Functional Properties of Palm Sugars". 16. 897-907. 10.14456/vol17iss2pp%p.
- [9]. Schierle J, Pietsch B, Ceresa A, Fizet C, Waysek EH. "Method for the determination of beta-carotene in supplements and raw materials by reversed-phase liquid chromatography: single laboratory validation". J AOAC Int. 2004;87(5):1070 - 1082.
- [10]. Nkere, Chukwuemeka & Ibe, Nnenna & Iroegbu, Christian. (2011)."Bacteriological Quality of Foods and Water Sold by Vendors and in Restaurants in Nsukka, Enugu State, Nigeria: A Comparative Study of Three Microbiological Methods". Journal of health, population, and nutrition. 29. 560-6. 10.3329/jhpn.v29i6.9892.
- [11]. Igbabul, Bibiana & Ogunrinde, Michael & Amore, Julius (2018)."Proximate, Micronutrient Composition, Physical and Sensory properties of Cookies Produced from Wheat, Sweet Detar and Moringa Leaf Flour Blends". Current Research in Nutrition and Food Science Journal. 6. 690-699. 10.12944/CRNFSJ.6.3.11.

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