



# International Journal of Home Science

ISSN: 2395-7476  
 IJHS 2019; 5(2): 409-413  
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 www.homesciencejournal.com  
 Received: 11-03-2019  
 Accepted: 15-04-2019

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## Development and nutritional assessment of selected snacks using basil leaves

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### Abstract

Health of people of a nation is an inseparable element in the development process of a nation; good health is the prerequisite of good quality of life and adequate nutrition is the key to good health. Nowadays the school going kids are more inclined towards the consumption of junk food like Pizza, Burger, Pasta, Maggie etc. which build a nutritional gap. So an attempt is being taken by developing value added products by incorporating clove basil leaves (*Ocimum sanctum*) to fill the nutritional gap between their dietary intake and RDA's. This study was planned to prepare value added products by using Basil leaves (In different ratio) for school going children to fulfill  $\frac{1}{3}$  to  $\frac{1}{4}$  of their RDA.

In general use, herbs are any plant used for flavoring, food, medicine or perfume. Culinary use typically distinguishes herbs as referring to the leafy green parts of a plant (Either fresh or dried), from a "spice", a product from another part of the plant (Usually dried), including seeds, berries, barks, roots and fruits. Some herbs such as those in the mint family that are used for both culinary and medicinal purposes. Some plants contain photochemical that have effects on the body.

**Keywords:** nutritional assessment, snacks, basil leaves

### Introduction

The king of herbs, basil herb is one of the oldest and popular herbal plant rich in much notable health benefiting phyto-nutrients. This highly prized plant is referred as "holy herb" in many traditions all around the world. Basil belongs to the family of *Lamiaceae*, of the genus: *Ocimum*. Its scientific name is "*Ocimum basilicum*". Basil is originally native to Iran, India and other tropical regions of Asia having been cultivated three for more than 5,000 years. This bushy annual herbal plant is grown for its medicinally useful leaves and seeds. Basil grows best in warm, tropical climates. Fully-grown plant reaches on an average about 100 cm in height. Varieties of basil herb exist. "Mediterranean" cultivar is typically called sweet basil, has light green leaves as opposite to "Asian basil" (*Ocimum sanctum*) and has stronger 'clove' like flavor. There is also *lemon basil*, which has "lemon" flavor. Thai basil (*O. basilicum* 'Horapha') is similar in characteristics to Asian basil but features narrow with a sweet licorice aroma. Out of these, *Ocimum sanctum* is known to be most popular variety.

### Cultivation

Basil plant can be grown in a pot in the backyard so that fresh leaves are readily available for use whenever the need arises. Fresh basil leaves are always superior in quality and flavor over dried form of herb. However, sun dried as well as radiation-treated basil leaves may contain significantly decreased vitamin-C and carotene levels. But that can be retained to an extent by adopting shadow or oven dried technology.

**Table 1:** Nutritional composition of basil leaves as per 100g

<b>Calories</b>	<b>23kcal</b>
Calories from Fat	5.8kcal
Total Fat	0.64g
Total Carbohydrates	2.65g
Dietary Fiber	1.60g
Protein	3.15g
Calcium	177mg
Iron	3.17mg
Carotene-B	3142µg
Vitamin C	30mg

(Source: <http://www.lifemojo.com/food/calories-in-basil-fresh-940864?size=50352>)

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### Benefits of basil leaves (Fresh)

Basil also includes flavonoids and antioxidants. The biochemical compounds such as orientin and vicenin act as antioxidants. Basil leaves contain eugenol, citronellol, and limonene, which are used in anti-inflammatory.

**DNA protection plus anti-bacterial properties:** The unique array of active constituent called flavonoids found in basil provides protection at the cellular level. *Orientin* and *vicenin* are two water-soluble flavonoids that have been of particular interest in basil, and in studies on human white blood cells; these components of basil protect cell structures as well as chromosomes from radiation and oxygen-based damage.

**Nutrients essential for cardiovascular health:** Basil plays a crucial part in minimizing chances of cardiovascular arrest or heart attack. Basil is also rich in magnesium that helps cardiovascular health by strengthening muscles and helping blood vessels to relax.

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**Skin-acne, eczema:** Holy basil leaves, crushed with *neem* leaves, provide immediate relief from eczema symptoms.

**Indigestion:** Basil is often used in tonics for digestion and is known to reduce and even prevent indigestion. Including basil regularly in the diet can even help prevent acid reflux.

**Respiratory:** Apart from its usage in cough, it is used for asthma, bronchitis, and sinus infections. The compounds like vitamin-C, Camphene, Eugenol and Cineole present in the essential oils of basil do not only cure infections in lungs but also cure congestion of the lungs.

**Infections:** Basil oil is good for treating a variety of infections such as cuts, wounds, skin infections, bladder infections etc., due to its antibacterial properties.

### Objectives

1. To standardize the recipe of selected snacks using basil leaves.
2. Cost analysis of developed products.
3. To analyze nutrient composition of the standardized snack items.
4. To assess organoleptic quality of developed basil products.

### Significance of study

1. Basil leaves are selected as they are present locally and are free of cost.
2. Basil leaves are easy to store and the plant can be grown in any condition.
3. Selection of basil leaves are done as they are beneficial for all the age groups.
4. Basil leaves have good amounts of antioxidants and phyto-nutrients.
5. Basil leaves also have variety of vitamins and minerals.
6. Snacks made from basil leaves as selected as they will provide good nutritional status and other health benefits to all the age groups.

7. Snacks developed will fulfill  $\frac{1}{3}$ -  $\frac{1}{4}$  R.D.A. for school going children.
8. Snacks are easy to prepare as the leaves of basil are highly non-perishable and easy to store

### 4. Materials and Methods

This chapter will furnish the methodological details of the investigation on development and quality assessment of selected snacks using clove-basil leaves. Following were the steps involve during the course of investigation-

#### Selection of basil leaves (*Closimum sanctum*)

The basil selected for the present study is of *Lamiaceae* Family. The botanical name is *Closimum sanctum*.

#### Standardization

A standardized recipe is the one in which the amounts and proportions of the ingredients and methods will constantly produce a high quality product. The ingredients are carefully balanced for the number of servings same result of the standard recipe is used every time. There were around 7-8 products selected like cake, biscuits, breads, chakali, mathari and khakhara.

Out of these two were selected on the basis of feasibility of cooking procedure, raw material availability and cooking equipment accessibility. The two products selected for the present study were:

Mathari  
Khakhara

#### Procurement and storage of raw material

The leaves were procured from a farm at Bhilwara (INDIA) ample amount of leaves were grown in the area. The leaves were washed with running water and spread on paper for removing dripping water, and were stored in air tight containers in refrigerator.

#### Development of snacks

1. 4-5 snacks were developed on the basis of:
2. Semi-perishable nature
3. The nutrient content should be fulfilling  $\frac{1}{3}$  to  $\frac{1}{4}$  of R.D.A. for school going children.
4. In this respect the series of preliminary trials will be conducted on each snack with the different permutation and combinations of ingredients and methods of cooking.

#### Standardization of selected recipes

A standard recipe can be termed as the recipe which gives consistently the same result every time it was used. It gives the amount of the ingredients to be used and the procedure to prepare the dish. It also specifies the yield, number of portions and the size of the portion. Selecting a basic format for recipe is an important first step in developing procedures for recipe standardization. For the purpose of standardization the selected snacks will be prepared repeatedly until three consecutive uniform acceptable results obtain. In the present study, the recipes were carried out through various trails of basic recipe at the Foods and Nutrition Laboratory of The IIS University, Jaipur. After so many trails the most acceptable and accurate amount of ingredients, procedure used to standardize the recipes.

#### Standard procedures of selected recipes [F.R.H.S, C.G. (1992)]

**Table 2:** Mathari

Ingredients	Amount (g)
Maida	100
Suji	30
Oil	20
Salt	According to taste
Luke warm water	For making dough

**Table 3:** Khakhara

Ingredients	Amount (g)
Maida	50
Wheat flour	50
Besan	30
Oil	25
Salt	According to taste
Luke warm water	For making dough

### Formulation of products by adding basil leaves (fresh) in different proportions

Recipes selected for product development were Mathari and Khakhara. Basil leaves in different amount and variations were made. Therefore 3 recipes with variations were prepared in four basic categories of the selected products.

**Table 4:** Coding of recipes

Recipes	Variations
Mathari	A, B, C, D
Khakhara	A1, B1, C1, D1

**Table 5:** Formulation of Products

Name of product	Coding	Formula
Mathari	A1	Maida+ Suji
	B1	Maida+ Suji+ Basil (5g)
	C1	Maida+ Suji+ Basil (10g)
	D1	Maida+ Suji+ Basil (15g)
Khakhara	A2	Maida+ Besan+ Wheat flour
	B2	Maida+ Besan+ Wheat flour+ Basil (5g)
	C2	Maida+ Besan+ Wheat flour+ Basil (10g)
	D2	Maida+ Besan+ Wheat flour+ Basil (15g)

### Cost analysis of developed products

Cost of all the recipes with variations was calculated according to the market rate list.

### Nutritional analysis of basil products

The experiments were conducted at the Department of Home Science and Department of Biochemistry, The IIS University, Jaipur under the supervision of lab assistant.

**Table 6:** Estimations of Macronutrients

Name of nutrients	Method	Reference
Moisture analysing (g/100)	Hot air oven method	AOAC(2005)
Ash analyzing (g/100g)	Muffle furnace	AOAC(2005)
Protein analyzing (g/100g)	Micro-kjeldhal method	AOAC(2005)
Fat analyzing (g/100g)	Soxhlet extraction method	AOAC(2005)
Fiber analyzing (g/100g)	Acid alkali wash method	AOAC(2005)
Carbohydrate analyzing (g/100g)	Composite method	Aoac (2005)

**Table 7:** Estimation of Micronutrients

Name of nutrients	Method	References
Vitamin-c analyzing (mg/100g)	Titration method	NIN (2003)
Beta-carotene analyzing (mg/100g)	Column chromatography	NIN (2003)

### Analysis of data

On the basis of information obtained from the score cards for sensory evaluation, analysis was done by calculating mean for all the values.

The implementation of Arithmetic mean was used to get appropriate results.

### Acceptability test of the prepared recipes

In all, four different recipes were prepared using basil. The recipe prepared, standardized and then evaluated by panel of members. Panel of judges were selected through sensitivity threshold test. Selected members evaluated the formulated recipes for sensory characteristics like taste, appearance, after taste color and over all acceptability.

**Table 8:** Different ratio of basil added to Mathari

Product code	Amount of basil
A1	NIL
B1	5g
C1	10g
D1	15g

Mathari was prepared by deep frying them on low to medium

flame. Variation in Mathari was brought about by varying the ratio of basil in it.

**Table 9:** Different ration of basil added to khakhara

Product code	Amount of basil
A2	NIL
B2	5g
C2	10g
D2	15g

Khakhara was prepared by roasting it on low flame. Variation in Khakhara was brought about by varying the ratio of basil in it.

### Sensory evaluation

Sensory evaluation of the developed products was done for this purpose a trained panel of 7 judges was selected. Selection of the judges was done through threshold test and those who passed that test were selected as panelist. For this the panelists were provided with the five point rating scale for the attributes like color, appearance over all acceptability, taste, after taste.

### Results and Discussions

Results obtained during the course of investigation have been presented and discussed in context of the objectives framed for the present study conducted to develop and assess the quality of developed products in terms of their nutritional and sensory quality.

Experiments were conducted to standardize the recipe of

Mathari and Khakhara in view of their sensorial acceptance and nutrient content fulfilling  $\frac{1}{3}$ - $\frac{1}{4}$  of RDA for school going children. Therefore, in light of the same, a number of trials using different permutations and combinations for preparing each product were undertaken to finally arrive at a recipe of the products having the desired level of nutrient composition and organoleptic acceptability.

Two factors viz. type and proportion of flours and the amount of basil leaves as shortening corresponding to the quality of flours are known to play significant role in standardizing the recipe of mathari. Here, out of number of trails using variable quantities of basil leaves, three most acceptable levels of basil leaves i.e. 5g, 10g and 15g were selected.

Similarly, while preparing khakhara, besides standardizing the portion of flours and amount of basil in view of basic recipe adopted and preliminary trails, the quantity used was also

standardized.

During the process of standardization, the snacks prepared in each trial were got evaluated under the controlled laboratory conditions by selected seven judges for their acceptability on five point rating scale.

Sensory scores as designed by panel members for individual sensory attributes and overall acceptability were averaged out and presented in Table 10 and 11.

The data clearly portrays that the products prepared using different levels of ingredients could secure scores in range of 3.85 to 4.85 in mathari, which permits us to draw conclusion that overall acceptability status from neither liked nor disliked to as high as approaching a point of excellence.

However, in case of khakhara, one having higher amounts of basil (10g) as shortening was found to be better acceptable in comparison to respective counter parts.

**Table 10:** Mean sensory scores of mathari with variations

Code	Appearance	Color	Taste	After taste	Texture	Overall acceptability	Overall mean score
A1	4.73	4.14	4.28	4.56	4.16	4.35	4.37
B1	4.16	4.35	4.64	4.60	4.18	4.42	4.39
C1	4.85	4.56	4.57	4.64	4.21	4.64	4.57
D1	4	4.42	3.85	3.85	4.14	3.85	4.01

The Table above shows the value of mean scores obtained from five point rating for different attributes like appearance, color, taste, after taste, overall acceptability, and texture for Mathari with varied amounts of basil. The product C1, having 10g of basil which had highest mean score 4.57, indicates that

product was liked very much. The sample with 15g of basil leaves was comparatively less acceptable because of after taste developed by basil leaves. The sensory attribute appearance was scored similar in almost all the four variations.

**Table 11:** Mean sensory scores of khakhara with variations

Code	Appearance	Color	Taste	After taste	Texture	Overall Acceptability	Overall mean score
A2	4.34	4.28	4.22	3.64	4.23	4.2	4.15
B2	4.14	4	4.28	3.78	4.12	4.2	4.08
C2	4.42	4.5	4.42	3.85	4.42	4.5	4.35
D2	4	3.57	4.07	3.08	4	4	3.78

The results of sensory evaluation of Khakhara depicted in Table 11 which showed the best rated sample was sample C2 with the highest mean score of 4.35 on the rating scale. The Khakhara sample D2 which was with the addition of 15g basil leaves was shown to be neither liked nor disliked on 5 point rating scale. The sensory attributes like color and after taste were responsible for deteriorating the mean score of sample D2.

#### Cost calculated for the variation in recipes

The cost of all the variations was calculated and the recipes were found to be cost effective. The cost of the products will not increase in any of the variations of the product developed using basil leaves in different proportions as the basil leaves are present abundantly free of cost. Hence, the price of all the products after incorporation of basil leaves will be same as the cost calculated for standard recipe which is according to the present market price list.

#### The nutritional composition of basil as analysed in laboratory

The nutritional composition of basil incorporated product Mathari is calculated as moisture (13.60%), Protein (2.268g), Fat (0.321g), Iron (0.42mg), Calcium (2.91mg), Carotene- $\beta$  (1263 $\mu$ g), Vitamin-C (4.38mg), Crude dietary fiber (1.7g), and Carbohydrate (11.331g).

On the other hand nutritional composition of basil incorporated product Khakhara is calculated as moisture

(11.84% ), Protein (3.78g), Fat (0.222g), Iron (0.36mg), Calcium (2.34mg), Carotene- $\beta$  (1183  $\mu$ g), Vitamin-C (3.84mg), Crude dietary fiber (2.36g) and Carbohydrate (11.168g).

#### Summary and Conclusions

Basil is derived from Greek word 'OZO' which means to 'smell', in reference to the strong odors of the spices within the genes. It belongs to Lamiaceae family. The basil variety *tulsi* is sacred herb in Hindu religion. As basil is a highly frost sensitive plant, it must be protected against temperatures close to freezing, it prefers to be grown in full sun, however will grow in partial shade. Basil is useful in culinary use and is beneficial in therapeutic uses as it is useful in cardiovascular health, digestion, blood circulation, eye treatment and skin care.

Sweet basil is low in calories, has almost no fat, and is a good source of vitamin A. Five fresh basil leaves (2.5 grams) has less than 1 calorie, but significantly good amount of vitamin A (96.6 IU), calcium (3.85 mg), potassium (11.55 mg), vitamin C (18 mg), vitamin E (0.80 mg), and other vitamins, minerals, protein and fiber. Basil seeds, in particular, are high in dietary fiber. Basil also includes flavonoids and antioxidants. The bio-chemical compounds such as orientin and vicenin act as anti-oxidants. Basil leaves contain eugenol, citronellol, and limonene, which are used in anti-inflammatory.

The present investigations of value added Basil based recipes

were developed. Standardization of recipes was done, sensory and nutritional quality was analyzed and the costs of developed products were also calculated according to the latest market price list. The basil recipes were standardized in the laboratory of the Department of Home Science, The IIS University, Jaipur.

On the basis of the present study it can be concluded that Basil and its various hybrid varieties has a great scope in the field of value added recipes development and commercialization.

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