



# A STUDY ON PHYTONUTRIENTS OF THE DEVELOPED FOOD PRODUCT USING INDIGENOUS PLANTS AVAILABLE IN TRIBAL AREAS OF VIKRAMGADH WITH A VIEW OF PRESERVING THEM

<sup>1</sup>Unmesha Patil, <sup>2</sup>Rima Ved, <sup>3</sup>Aarti Jain, <sup>4</sup>Dr. Ratnaraje Thar

<sup>1</sup>M.Sc. CND II, <sup>2</sup>Field research assistant, <sup>3</sup>Research associate, <sup>3</sup>Research director

<sup>1</sup>Dept. of Clinical Nutrition and Dietetics

SNDT Women's University

<sup>1</sup>Dr. B.M.N. college of Home Science, 338, Rafi Ahmed Kidwai Marg,  
Matunga, Mumbai 400019, India.

**Abstract:** Indigenous vegetables are nutritious and available only in rainy season. These are grown naturally with no pesticide or chemical uses and are cost-effective. The aim of the study is to evaluate the phytonutrient content in developed food products using indigenous vegetables and to analyse the shelf life of the products. The study comprises at collection of indigenous vegetables from Vikramgad of Palghar district and development of food products using them. These products are analysed for moisture content, ash content, phytochemical analysis, shelf life study using sensory evaluation and microbial testing. Nutritional assessment of all the developed food products was done using review of existing literature and “Indian Food Composition Table” (IFCT 2017) by Indian Council of Medical Research (ICMR) for other ingredients used in the preparation. The main indigenous vegetables used in this study are ambadi, nal bhaji, kardu, kartoli, bamboo shoots which are found to be low in calories, fats and rich in dietary fiber and various micronutrients as well as phytonutrients. With an idea of making healthy vegetable snacks and to increase the consumption of these underutilised vegetables for extended period of time in the diet, baked food products such as ambadi mathri, kardu sticks, nal bhaji sev, kartoli chips and pickle made from bamboo shoots were developed. These developed food products have shelf stability of more than a month. The overall acceptability of the food products was good. All the developed food products were observed to be better than their commercial food products counterparts as these vegetables are rich in antioxidant and have therapeutic application. These underutilised vegetables are useful in prevention of chronic diseases.

**Keywords:** Indigenous vegetables, Cost effective, Healthy vegetable snacks, Micronutrients, Phytonutrients, Antioxidant.

## I. INTRODUCTION

Indigenous or wild edible plants grow in the wild and various parts of these plants can be safely consumed. These vegetables are acceptable and used in the diet of rural and urban people as a daily diet, habit and tradition. Some of the vegetables are gathered when in season. In the tropics, indigenous vegetables are abundant immediately after the rainy season and very scarce during the dry season. These vegetables constitute essential components of the meal by contributing protein, vitamins, iron, fiber, ascorbic acid and other nutrients which are usually in short supply in daily diets, especially in areas of low socio-economic group. Nutrients derived from plants are important to human health for their medicinal and nutritional value. The phytochemicals in wild vegetables protect human body from a large number of ailments.

Indigenous crops contain more micronutrients than non-native species of vegetables. These underutilised species play an important role in food security, financial gain, food culture and can contribute to nutrient needs. By taking into consideration present study was designed to evaluate the nutritional and phytochemical content of the developed food product using indigenous plants available in tribal areas of Vikramgad. As these indigenous vegetables are seasonal and only available in monsoon season, the product was developed with increased shelf life with a view to preserve them.

## II. RESEARCH METHODOLOGY

### Aim :

To study the phytonutrient content in developed food product from indigenous plants and to study the shelf life of the product.

### Objective :

- To explore and collect the indigenous plants from tribal areas.
- To explore the preserving methods of indigenous plants.
- To develop the product using indigenous plants.
- To do the sensory evaluation of the product.
- To do the microbial testing of the product.
- To check the acceptance of the product.
- To study the phytonutrient content of the product.

### Flow chart of methodology

#### Exploration of indigenous plants

A visit was made to “Phulora Utsav Ranacha” fest organised by Dr. M. L. Dhawale Memorial Trust at Bhopoli, Tal- Vikramgad, Palghar. There they had displayed 26 local indigenous vegetables which are available only in monsoon season, out of that some vegetables they had cooked and kept for tasting.

#### ➤ List of Indigenous Vegetables :

Table 2.1 : List of indigenous vegetables displayed in “Phulora Fest”. (Deshpande et al., 2019)

Sr. No.	Local Name	Botanical Name
1.	Khurasani cha pala (Ajwain)	Hyoscyamus niger
2.	Tera	Colocasia
3.	Kavala Bhaji	Smithia sensitiva
4.	Lot	-
5.	Aambat Bibali	-
6.	Ransuran	Amorphophallus commutatus
7.	Kosaba	-
8.	Ambadi	Hibiscus sabdariffa
9.	Kartoli	Momordica dioica Roxb. Ex Willd
10.	Karadu	Celosia argentea L.
11.	Kharshenga	Radermachera xylocarpa (Roxb.)
12.	Bambu (Shind)	Bambusa vulgaris
13.	Pendhara	-
14.	Mordina	-
15.	Mathbhaji	Amaranthus paniculatus L.
16.	Ranchiku (Alava)	-
17.	Nal bhaji	Ipomoea aquatica
18.	Taklyacha Pala	-
19.	Udadacha Pala	Vigna mungo (L.) Hepper
20.	Kadukand (Vali)	Dioscorea bulbifera L.
21.	Kakad	Garuga pinnata
22.	Bafali	-
23.	Aabhaichya Shenga	Canavalia ensiformis (L.) DC
24.	Shevga	Moringa oleifera
25.	Alu Leaves	Colocasia leaves
26.	Deth	-



### Selection and collection of the indigenous plants

5 indigenous vegetables were selected that are Ambadi, Kardu, Nal bhaji, Kartoli and Bamboo shoots for developing the food products. (Figure 2.1, 2.2, 2.3, 2.4, 2.5)

To collect these vegetables a visit was made to the local vegetable market at Boisar, Dist. Palghar where local ladies were selling these vegetables.



### Exploration of preserving methods of selected indigenous plants

During the Phulora fest, the discussion was done with the people living in that area to know the different traditional methods of preserving these vegetables.



### Development of 5 food products using indigenous plants

With an aim to relish these vegetables for extended period of time and can gain the nutritional benefits of it, healthy vegetable snacks and, baked food products such as ambadi mathri, kardu sticks, nal bhaji sev, and kartoli chips were developed and pickle was made using bamboo shoots. (Figure 2.6, 2.7, 2.8, 2.9, 2.10)



### Shelf life study by doing microbial testing and sensory evaluation of the developed food product

Shelf life study of the developed food products was done by doing microbial testing after 1 month of product development and the sensory evaluation was done by using 50 subjects to check the acceptance level.



### Ash and moisture test of the product

The ash and moisture content of the developed food products was estimated to check the mineral content of the product.



### Phytonutrients testing using Soxhlet for product extraction followed by TLC Test (Thin Layer Chromatography)

TLC test was done to see the phytonutrient content which has antioxidant properties.

## III. RESULTS AND DISCUSSION

### ➤ **Traditional methods of preserving selected indigenous vegetables and development of food product using them :**

Bamboo shoots are preserved by applying salt to it and stores it in air tight container. This preserved bamboo shoots they use throughout the year. With this preserving idea bamboo pickle was made by adding some spices which was tastier than just preserving it in the salt.

The other vegetables from the selected indigenous vegetables for the study are not preserve instead they use them to cook with seasoning and spices. By adding some millets flour and spices to these vegetables shelf stable food products such as ambadi mathri, kardu sticks, nal bhaji sev, and kartoli chips were developed.

### ➤ **Assessment of the developed food products:**

- **Shelf life study :**
- **Sensory evaluation :**

Sensory evaluation was done by students of Gnanjyoti Community College. For sensory evaluation 50 students were asked to taste and evaluate products based on the sensory attributes like appearance, aroma, texture, taste, overall acceptability. The result of sensory evaluation showed that the developed food products were well accepted till 1 month.

### Result of sensory evaluation

Table 3.1 : Result of sensory evaluation of the developed food products

Sensory Attributes	Ambadi Mathri		Kardu sticks		Nal bhaji sev		Kartoli chips		Bamboo pickle	
	Day 1	Day 30	Day 1	Day 30	Day 1	Day 30	Day 1	Day 30	Day 1	Day 30
Appearance	81%	80%	76%	75%	76%	73%	77%	75 %	83%	85%
Aroma	77%	75%	76%	72%	73 %	69%	73%	72%	68%	82%
Texture	78%	75%	77%	73%	74%	69%	78%	75%	73%	80%
Taste	86%	83%	84%	80%	73 %	69%	82%	81%	72%	85%
Overall Acceptability	90%	89%	88%	86%	83%	75%	88%	88%	88%	92%

#### o Microbial test :

Microbial testing was done after 2 weeks and 4 weeks after developing the food products to find out the shelf life. The pour plate method was used with 3 serial dilutions. Nutrient agar was used as a medium for microbial testing. Microbial testing also indicates that number of colonies of one month study were under the acceptable limits according to the microbial standards of "Food and Agriculture Organization" and "Bureau of Indian Standards". Hence, the developed food products had shelf stability of one month and were safe for human consumption.

### Result of microbial testing

Table 3.2 : Result of microbial testing of developed food products after a month

Dilution	No. of colonies				
	Ambadi mathri	Kardu sticks	Nal bhaji sev	Kartoli chips	Bamboo pickle
10 <sup>-1</sup>	162	140	10	31	45
10 <sup>-2</sup>	18	15	1	3	6
10 <sup>-3</sup>	1	1	0	0	0

#### • Moisture analysis and ash analysis :

According to food product standards of "Food Safety and Standards Authority of India" (FSSAI) these developed food products can be categorized under non-perishable food products. As these food products had low moisture content, the microbial growth was also low. For pickle in oil the vegetable pieces should be practically remaining submerged in oil which would help to lower the growth of microorganism on the pickle and to increase the shelf life. The products should be stored in the airtight packaging and keep in cool and dry place for better shelf life.

The result of ash analysis showed that developed food products had ash content within limits and showed that the products were natural and it had not undergone much processing while manufacturing.

### Result of moisture and ash analysis

Table 3.3: Result of moisture and ash analysis of the developed food products

Food Products	Moisture Analysis	Ash Analysis
Ambadi mathri	3.6%	1.2%
Kardu sticks	2.4%	2%
Nal bhaji sev	1%	2%
Kartoli chips	5.4%	5.4%
Bamboo pickle	64.2%	4.6%

- **Thin layer chromatography (TLC) :**

Two solvent system i.e. Toluene-ethylacetate-diethylamine & Chloroform- Methanol\_Glacial acetic acid was used to find out the bioactive compound present in the developed food products. The two solvent systems used for performing thin layer chromatography on the methanolic extract of developed food products revealed the presence of bioactive compounds such as alkaloid and saponin.

### Result of phytonutrient analysis

Table 3.4 : Result of phytonutrient analysis of developed food product's extracts by thin layer chromatography (TLC)

Phytonutrients	Solvent system	Food products	Rf Values
Alkaloid	Toluene: ethyl acetate: diethyl amine (35:10:5)	Ambadi mathri	0.22 0.31 0.53
		Kardu sticks	0.20 0.32 0.33
		Nal bhaji sev	0.06
		Kartoli chips	0.21 0.38
		Bamboo pickle	0.02 0.26
		Saponin	Chloroform: glacial acetic acid: methanol: water (6:2:1:1)
Kardu sticks	0.30 0.59 0.73 0.80		
Nal bhaji sev	0.81		
Kartoli chips	0.75		
Bamboo pickle	0.63		

- **Nutritive value :**

Nutritional assessment of all the developed food products was done using review of literature and Indian Food Composition Table (2017) by Indian Council of Medical Research (ICMR) for other ingredients used in the preparation.

All the developed food products was present with good amount of energy, dietary fiber, micronutrients and low amount of sodium and fat.

## Nutritive value

Table 3.5 : Nutritive value of developed food products.

Nutrients	Ambadi Mathri (30 gms)	Kardu Sticks (30 gms)	Nal Bhaji Sev (30 gms)	Kartoli Chips (15 gms)	Bamboo Pickle (10 gms)
Energy (kcal)	161.57	163.3	130.2	77.33	16.36
Carbohydrates (gms)	21.48	24.55	19.58	11.18	0.651
Proteins (gms)	4.71	7.4	4.23	2.77	0.364
Fats (gms)	5.96	3.7	3.56	2.32	1.49
Dietary Fiber (gms)	4.75	5.20	3.28	2.31	0.424
Vitamin A (mcg)	670.5	142.3	160.2	81051	-
Thiamine (mg)	0.133	-	18.07	0.918	-
Riboflavin (mg)	0.102	-	-	1.758	-
Niacin (mg)	0.8	-	-	1.076	-
Pantothenic acid (mg)	-	-	-	9.091	-
Pyridoxin (mg)	-	-	-	2.161	-
Folate (mg)	-	-	-	11.088	-
Biotin (mg)	-	-	-	3.30	-
Vitamin B12 (mg)	-	-	-	2	-
Vitamin C (mg)	0.34	8.4	20.55	19.7	0.48
Vitamin D (mg)	-	-	-	1.587	-
Vitamin E (mg)	-	-	1.69	-	0.052
Vitamin K (mg)	-	-	-	7.60	-
Iron (mg)	2.15	24.89	32.80	65.17	-
Calcium (mg)	71.41	54.41	70.65	372.75	32
Phosphorus (mg)	-	113.6	90.18	29.14	22
Magnesium (mg)	-	55.27	74.807	24.26	10
Zinc (mg)	3.24	1.703	1.077	-	-
Copper (mg)	0.37	0.497	0.19	0.895	0.029
Chromium (mg)	-	0.127	-	-	-
Manganese (mg)	1.01	0.919	0.664	4.456	-
Selenium (mcg)	-	-	-	-	0.68
Sodium (mg)	102.71	110.35	120.18	69.08	40
Potassium (mg)	151.83	164.98	950.54	235	92

## IV. SUMMARY AND CONCLUSION

The study comprises of collection of indigenous vegetables from Vikramgad of Palghar district and then develop food products using them.

Food products made from indigenous vegetables was present with good amount of micronutrients, dietary fiber and was very low in fat and sodium content as compare to the commercial food products. The TLC test result indicates that the developed food products had some bioactive compounds such as alkaloid and saponin. Hence, they had potential antioxidant properties which help in scavenging free radicals thus helping body to fight against various ailments.

Addition of food products made from indigenous vegetables as main component in diet instead of commercial food products helps to gain nutritional benefits of it. Increased use of indigenous vegetables can also help tribal people for income generation.

FIGURES

➤ Indigenous vegetables used in the study:

Ambadi bhaji



Figure 2.1 : Ambadi bhaji

Kardu Bhaji



Figure 2.2 : Kardu bhaji

Nal bhaji



Figure 2.3 : Nal bhaji

Kartoli



Figure 2.4 : Kartoli

Bamboo shoots



Figure 2.5 : Bamboo shoots

➤ Developed food products using indigenous vegetables:

Ambadi Mathri



Figure 2.6 : Baked ambadi mathri

Kardu Sticks



Figure 2.7 : Baked kardu sticks

Nal Bhaji Sev



Kartule chips



Bamboo pickle



Figure 2.8: Baked nal bhaji sev

Figure 2.9: Kartule chips

Figure 2.10: Bamboo pickle

## REFERENCE

- [1] Deshpande, S., Pawar, U. and Kumbhar, R. 2019. Exploration and documentation of wild food plants from Satara district, Maharashtra (India). International Journal of Food Science and Nutrition, Volume 4(1), 95-101. DOI : doi.org/10.22271/food
- [2] Longvah, T., Ananthan, R., Bhaskarachary, K. and Venkaiah, K. 2017. Indian Food Composition Table. Indian Council of Medical Research (ICMR). India: National Institute of Nutrition.
- [3] <http://www.ils-i-india.org/conference-in-microbiological-food-safety-management-details/Session-V/Mrs.%20Mabhullika%20Prakash%20&%20Mr.%20Chinmay%20Dwivedi.pdf>
- [4] <https://www.foodqualityandsafety.com/article/determining-moisture-content/>
- [5] [https://fssai.gov.in/upload/uploadfiles/files/Compendium\\_Food\\_Additives\\_Regulations\\_29\\_03\\_2019.pdf](https://fssai.gov.in/upload/uploadfiles/files/Compendium_Food_Additives_Regulations_29_03_2019.pdf)
- [6] [https://old.fssai.gov.in/Portals/0/Final\\_Regulations\\_2010.pdf](https://old.fssai.gov.in/Portals/0/Final_Regulations_2010.pdf)
- [7] [www.silicycle.com](http://www.silicycle.com)
- [8] Chapter II : Detection and identification of specific components. Thin Layer Chromatography. <https://shodhganga.inflibnet.ac.in>