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# Organoleptic and nutritional evaluation of value added food products incorporated *Houttuynia Cordata*, Figer Millet and foxtail millet

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### Abstract

The present investigation was undertaken with an objective to prepare cookies, Dhokla and Idli partial replacement of wheat flour, gram flour and rice at different proportion of *Houttuynia cordata*, finger millet and foxtail millet and to study its effects on the physical, chemical and sensory characteristics. The study was focused on standardizing the acceptable level of *Houttuynia cordata*, finger millets and foxtail millet flour in cookies, Dhokla and Idli. Replacement of wheat flour, gram flour and rice with *Houttuynia cordata*, finger millet and foxtail millets increased the protein, fibers and calcium contents proportionately to the level of substitution.

**Keywords:** *Houttuynia cordata* (chameleon), finger millet, foxtail millet, cookies, Dhokla, Idli, health benefits, nutrition.

### Introduction

Finger millet is a staple grain grown in more than 25 African and Asian countries, with Uganda, Nepal, China and India being the world's leading producers. The small, deep red grain is a rich source of nutrients, including protein, fiber, iron, calcium, etc. It is also gluten free and low in fat that is mainly unsaturated. All these make it one of the healthiest millets in the world. It helps in weight loss, controls diabetes, treat anemia and increase bone strength. Zucco *et al.* (2011) [21]. Foxtail millet (*Setaria italica*), also known as Setaria or Italian millet is a common food in parts of India. Like other millets foxtail millets is a power house of nutrition. Rich in vitamin B12 these tiny seeds can offer a daily dose of ample protein, good fat, carbs, and amazing dietary fibre content. Besides copious amount of lysine, thiamine, iron, and niacin, it also offers copious amount of calcium. Foxtail millets help to manage diabetes, strengthen nervous system, boots cardiac health and builds immunity. Salazar *et al.* (2011) [22]. Chameleon plant (*Houttuynia cordata Thunb*) is one of the important plants of the family *Saururaceae*. It is native to mountainous region of Eastern Asia and occurring up to an elevation of 2500 m ASL. *Houttuynia cordata*, also known as fish mint, fish leaf, rainbow plant, chameleon plant, heart leaf, fish wort, or Chinese lizard tail, is one of two species in the genus *Houttuynia* (the other being *H. emeiensis*). *Houttuynia cordata* grows in moist to wet soil or slightly submerged in water, as long as it is exposed partially or fully to the sun. Chameleon Plant's effects against allergies and asthma, issues partly characterized by excessive release of histamine. It is widespread in North-eastern (NE) region of India and is known with different local names, viz. Ja-myrda or Jmyr-doh in Khasi; Machha-turi in Garo; Ashunday, Tengalai, Dimasa - Mojoukhmo, Hmar-Ai thang and Pnar-Jarmendo in Assam; Mumbre, Siiyahamang, Muchandariin, Hwya in Arunachal Pradesh; Toning khokin in Manipur; Uithinthang in Mizo; Nuichua or Nokana in Nagaland; Gandhi Jhar in Nepal and Ghandhayjhar in North Bengal and Sikkim. It is inhabited by more than 150 tribes with variegated systems. Traditional *Houttuynia* medicinal uses have included being a treatment for respiratory conditions, inflammation, urinary tract infections and skin sores. Cookies, Dhokla and Idli are good carrier of nutrients like carbohydrate and fat which can be enriched with protein by partially replacing refined wheat flour with protein rich flour up to an acceptable level. Protein energy malnutrition can be combated with such high protein cookies. In this study wheat flours were replaced with the incorporated flour i.e. finger millet, foxtail millet and *Houttuynia cordata* flour at different replacement level (10, 15 & 20 per cent) and cookies of the above blend were developed.

## Materials and Methods

### 1. Experimental site

The study was carried out in the Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj-211007, India.

### 2. Procurement of raw materials

Raw materials like finger millet and chameleon leaves were collected from Yazali town (Arunachal Pradesh), foxtail millet were procured from the SHUATS and sugar, sesame seeds; refine flour, and other ingredients were purchased from the local market (Aahar) Prayagraj.

### Development of cookies

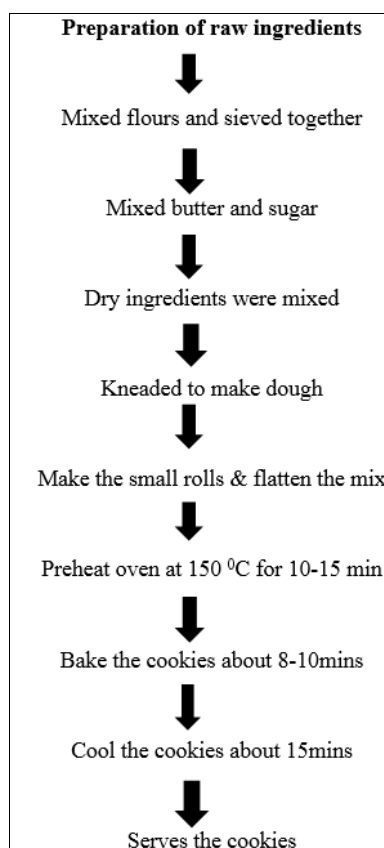


Fig (a): flowchart for the preparation of cookies (Tanwar, 2003)

### Development of Idli

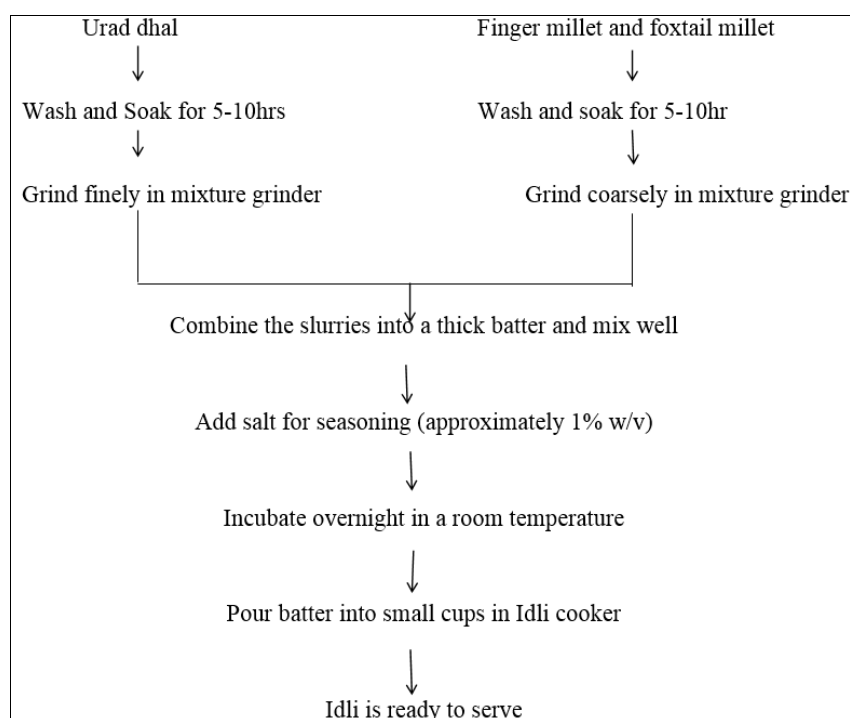


Fig (b): flowchart for processing of Idli cooking (Steinkraus, 1983)

## Development of *Dhokla*

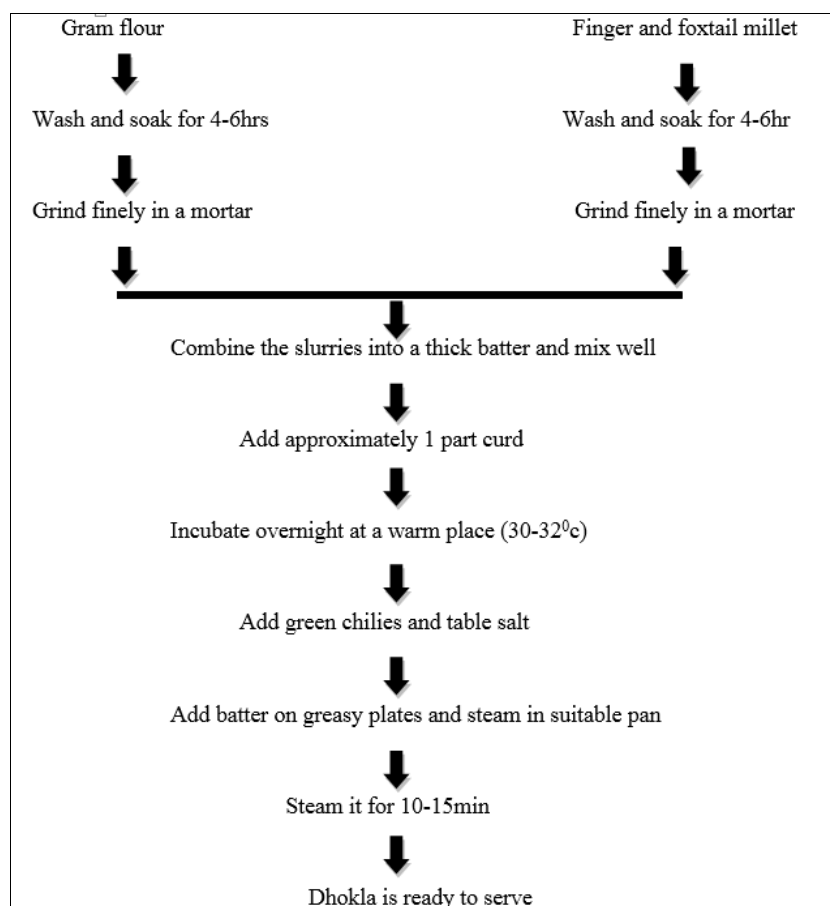


Fig (c): Flow chart for *Dhokla* (Ray, 2017)

### Preparation of value added food products

Preparation of value added food products such as Cookies, *Dhokla* and *Idli* with the incorporation of chameleon, finger millets and foxtail millets and other raw materials.

**Preparation of *Cookies* with incorporation of finger millets, foxtail millets, and chameleon powder:** T<sub>0</sub> (control) was prepared using 100g refine flour. T<sub>1</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 15gm chameleon powder and 10gm refine flour. T<sub>2</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 18gm chameleon powder and 12gm refine flour. T<sub>3</sub> the product was prepared using 30gm finger millet, 30gm foxtail millet, 20gm chameleon powder and 14gm refine flour.

**Preparation of *Dhokla* with incorporation of finger millets, foxtail millets, and chameleon powder:** T<sub>0</sub> (control) was prepared using 100g refine flour. T<sub>1</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 10gm chameleon powder and 10gm refine flour. T<sub>2</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 15gm chameleon powder and 12gm refine flour. T<sub>3</sub> the product was prepared using 30gm finger millet, 30gm foxtail millet, 20gm chameleon powder and 14gm refine flour.

**Preparation of *Idli* with incorporation of finger millets, foxtail millets, and chameleon powder:** T<sub>0</sub> (control) was prepared using 100g refine flour. T<sub>1</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 15gm chameleon powder and 10gm refine flour. T<sub>2</sub> was prepared using 30gm finger millet, 30gm foxtail millet, 15gm chameleon powder and 12gm refine flour. T<sub>3</sub> the product was prepared using 30gm

finger millet, 30gm foxtail millet, 20gm chameleon powder and 14gm refine flour.

**Sensory evaluation:** The samples of *Cookies*, *Idli* and *Dhokla* so prepared were further subjected to sensory evaluation by trained panel consisting of 6 persons using 9-point hedonic scale Ranganna (2016)<sup>[15]</sup>. Ranking was noted on the sensory score card. Based on sensory score the products sample was optimized for the best pulse which is suitable for increasing nutrient contents of the products.

**Calculation of the cost of prepared product:** Cost of the prepared products was calculated taking into account the cost of individual raw ingredients used in the preparation of food products as the prevailing market prices.

**Statistical Analysis:** The data was analyzed by Analysis of variance technique (ANOVA), Critical Difference and other appropriate statistical analytical methods and interpret the data.

### Results and Discussion

Value added food products that have been prepared using different ratios of finger millets, foxtail millets, chameleon herbs and sesame seeds. The acceptability of food products was judged by the panel of six semi-trained members. Sensory evaluation using Nine Point Hedonic Scale revealed that 70 per cent of panelists liked extremely the value added food products incorporated with protein, iron, calcium and fiber rich foods T<sub>2</sub>(finger millets + foxtail millets + sesame seed + chameleon herbs powder in the ratio of 5:85:3:2.5:5) had the highest score. The mean scores of “value added food

products” in relation to sensory attributes such as color and appearance, body and texture, taste and flavor and overall acceptability followed by T<sub>1</sub> (finger millets + foxtail millets + sesame seed + chameleon herbs powder in ratio of 5:80:2.5:2.5:5), T<sub>3</sub> (finger millets + foxtail millets + sesame seed + chameleon herbs powder in the ratio of 5:90:2.5:2.5:1.5). In case of food products T<sub>2</sub> scores the best with regard to all sensory characteristics *viz.* color and appearance (8.4±0.09), body and texture (8.3±0.12), taste and flavor (8.2±0.2) and overall acceptability (8.4±0.13). Sensory evaluation showed that the treatment T<sub>2</sub> (finger millets +

foxtail millets + sesame seed + chameleon herbs powder in the ratio of (5:80:2.5:2.5:5) was the most acceptable in food products showed that the treatment T<sub>2</sub> was found most highly acceptable Pratape *et al.*, (2010) [19]. The content of iron, calcium, carbohydrate, phosphorus and protein increased significantly in prepared food products. The incorporation levels of finger millets, foxtail millets, sesame seed, and chameleon herbs powder increased the cost also increased but it is comparatively cheaper than the control even though it was marginal.

**Table 1:** Average sensory scores of control and treated sample of *Cookies, Dhokla and Idli*.

Control and treatment	Colour and appearance			Body and texture			Taste and flavour			Overall acceptability		
	cookies	Dhokla	Idli	cookies	Dhokla	Idli	cookies	Dhokla	Idli	cookies	Dhokla	Idli
T0	6.83	6.83	7.4	7.17	7	6.47	7	7.93	7.17	7.4	7	7
T1	7.53	7.33	8.03	7.3	7	8.57	7.13	7.83	8.33	7.53	7.6	8
T2	7.3	7.2	7.17	7.33	8.5	6.97	7.73	8.47	8.5	8.12	8.17	8
T3	7.2	7.47	8.2	7.43	8.67	8	7.53	8	7.03	7.23	7.87	8.67
F-Test	S	S	S	S	S	S	S	S	S	S	S	S
C.D	0.681	0.54	0.481	0.16	0.20	0.30	0.058	0.632	0.754	0.542	0.643	0.142

The chemical composition of the best product (T<sub>2</sub>) increased with the incorporation of prepared mix powder, the moisture content in value added food products was found to be 25.23%, Ash content was found to be 5.6g/100g, Protein content is 3.26g/100g, Fat content was 2.17g/100g, Fiber in the product found to be 3.87g/100g, Iron and Calcium were found 1.01/100g and 164.56mg/100g, Carbohydrate content in product is 131.3g/100g, protein were found 3.45g/100g Demirkesen (2016) [5]. On applying the ‘t’ test it was found that moisture,

ash, fiber, carbohydrate, energy, calcium, iron, content significantly increased. The cost of the food products per 100g of dry ingredients at the prevailing cost of the raw materials was Rs. 8.6 for T<sub>0</sub>(control) Rs 11.1 for T<sub>1</sub>, Rs. 11.7 for T<sub>2</sub> and Rs. 12.9 for T<sub>3</sub>. This shows that as the incorporation levels of finger millets, foxtail millets, sesame seed, and chameleon herbs powder increased the cost also increased but it is cheaper than the control comparatively even though it was marginal.

**Table 2:** Nutritional composition of the developed food products

Nutrient/mg	Cookies		Dhokla		Idli	
	control	T <sub>2</sub>	control	T <sub>2</sub>	control	T <sub>2</sub>
Moisture	64.0	74.42	86.9	5.23	90.51	84.0
Protein	75	76.02	6.6	6.54	7.68	10.19
Fat	0.52	1.98	0.15	2.31	6.8	2.04
Crude fibre	20.3	2.59	7.15	6.04	3.37	4.2
CHO	20.7	7.62	6.7	9.99	56.35	15.43
Energy	20	52.36	42.5	66.6	59.15	80.52
Calcium	28	83.21	39	110.2	59	146
Phosphorus	40	58.81	30	57.3	25	51.51
Iron	80	75	8.05	1.45	7.78	12.10
Vitamin-C	0.06	1.05	0.33	0.58	0.57	1.03

## Conclusion

On the basis of findings, it is concluded that raw finger millets, foxtail millets and chameleon herbs powder found to be rich in iron, calcium, fiber, protein and phosphorus and it can be successfully incorporated in the preparation of the value added food products like *Cookies, Dhokla and Idli*. It helps to boost immunity, improves physical growth, good memory, control infectious seasonal disease, work as anti-aging, reduce fatigue, control cholesterol, diabetes, pneumonia, hypertension, constipation and hyperglycemia. Sensory evaluation of *Cookies* showed that the treatment T<sub>2</sub> (finger millets + foxtail millets + chameleon + sesame seeds in the ratio of 100: 3.5:2.5:3.8) was most acceptable. Also for *Dhokla* showed that the treatment T<sub>2</sub> (sesame seeds + chameleon powder + finger millets + foxtail millets in the ratio of 60:4.8:4.7:4.9) and sensory evaluation of *Idli* showed that the treatment T<sub>3</sub> (sesame seeds + chameleon powder + finger millets + foxtail millets in the ratio of 90:6:8:7.8) was most acceptable. It shows that the content of protein, iron,

calcium, phosphorus and fiber increased significantly in *cookies, Dhokla and Idli*. The incorporation level of finger millets, foxtail millets, and chameleon powder and sesame seeds increased the cost but it is comparatively cheaper than the control even through it was marginal.

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