



## Studies on formulation and standardization chakali incorporated with spinach puree

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### Abstract

Chakali, a traditional savory product was identified as they are low in protein and mineral contents. Chakali is a highly preferred and most deep fried snack product in India due to its taste and easy preparation. The present investigation was carried out to standardize and formulation of spinach Chakali. Spinach is one of the most important and nutritious vegetables eaten raw or cooked it provides a very good amount of vitamins B6, Riboflavin, Folic acid, Niacin, soluble dietary fiber, omega -3- fatty acids and minerals. It is also rich in iron and it helps to prevent disease like osteoporosis, anemia, gastrointestinal disorders, stimulation in children and fatigue and also has been suggested it's used as an anticancer agents, antioxidant and anti- cancerous. The preparation of Chakali was carried out by using Rice flour and Bengal gram flour and incorporating of spinach puree at different variation viz., T0 (45:45:0), T1 (35:35:20), T2 and (30:30:30) and T3 (25:25:40) respectively. Further, the sample were allowed to deep frying and subjected to organoleptic evaluation by using 9 point hedonic scale. Results, revealed that T3 (25:25:40) shows highest sensory score as compared with other sample i.e. T1 (35:35:20) and T2 (30:30:30) and found more superior over other treatments. Finally, it can be concluded that 50% of incorporation of puree in the Chakali is more acceptable and shows better colour, Flavour, after taste and texture. Proximate composition of Spinach Chakali were found to be Ash content  $3.19 \pm 0.03\%$ , Moisture content  $2.4 \pm 0.08\%$ , Fat content  $26.49 \pm 0.12\%$ , Protein content  $12.04 \pm 0.88\%$ , Carbohydrate content  $49.80 \pm 0.33\%$  and Energy value  $485.77\text{kcal}$  respectively. It was concluded that the Chakali can be store for one month in High density polyethylene pouches at room temperature and Chakali satisfy consumer's needs.

**Keywords:** rice flour, bengal gram flour, spinach puree, formulation, sensory evaluation, proximate analysis, storage

### Introduction

Chakali, a traditional savoury Product was identified as they are low in Protein and Mineral contents. It is also a deep Fat fried Product as a result of which its Fat content is significantly high. So, Chakali was prepared using conventional deep Fat frying for control and variable Products. (Sarangam *et al.*, 2015) <sup>[1]</sup> "Chakli" is common term for a variety of fried snacks that can be made using different combination of ingredients. The main ingredient for all type of "Chakli" is rice flour. "Chakli" are delicious savouries that are generally made at home and kept in airtight container for eating as fancied as well as enjoyable crunchy and satisfactory snack. They are exclusively south Indian, but a different version of "chakli" is made in Western India under the name of chakkali; out of channa dal and sold as a packaged savoury (Anon.,2011) <sup>[2]</sup>.

India market is so diverse and large with over 1000 different snack products and almost 300 types of savoury items. In India, a number of snacks food items are prepared from a different raw materials like besan (Bengal gram flour) Maida (refined wheat flour), Urad (black gram) dhal, Moong (green gram) dhal, alone or in combination with other cereals and legumes /pulses. Their manufacturing processes may include cleaning, pre-treatment, soaking, roasting, frying etc. (Ravi *et al.* 2011) <sup>[8]</sup>. "Murruku" is a common term for a variety of fried Snacks that can be made using different combination of ingredients, The main ingredient for of

all types "Murruku at h" are delicious savories that are generally made at home and kept in airtight containers for eating as fancied and enjoyable with crunchy satisfactory. They are exclusively South Indian but a different version of "Murruku" is made in western India under the name of chakli, out of channa dal and sold as a packaged savory (Masshoud, 2011) <sup>[7]</sup>.

Spinach (*Spinacia oleracea*), belongs to Chenopodiaceous family, is one of the most important vegetables. It is a leafy cool-season vegetable with global cultivation usually consumed after boiling under fresh or frozen leaves or raw consumed in salad (Alessa *et al.*, 2017; Erikson *et al.*, 2016; Yoon *et al.*, 2017). The spinach is one of the rich source of nutrient such as moisture (92.1g), Protein (2.0g), Fat (0.7g), Minerals (1.7g), crude fiber (0.6g) energy (26Kcal), calcium (73mg), Phosphorus (21mg), & Iron (1.14) respectively. C. Gopalan, B.V. Rama Sastri *et al.*, (1971) <sup>[3]</sup>. Spinach is a rich source of fiber, vitamins A, C, K, E, B6, B2 and also magnesium, manganese, iron, calcium, potassium, copper, phosphorus, zinc, selenium, folate, betaine, folic acid, protein, niacin, omega -3 fatty acids, carotenoids beta-carotene and lutein, and bioflavonoid quercetin with many other flavonoids, spinach with poor source of fat is a suitable food for obese and diabetic people. It is also a good source of chlorophyll, which is known to aid in digestion (Roughani *et al.*, 2011; Gaikwad *et al.*, 2010; Verma, 2018) <sup>[9]</sup>. Spinach is a rich source of

fiber, vitamins A, C, K, E, B6, B2 and also magnesium, manganese, iron, calcium, potassium, copper, phosphorous, zinc, selenium, folate, betaine, folic acid, protein, niacin, omega -3 fatty acids, carotenoids beta -carotene and lutein, and bioflavonoid quercetin with many other flavonoids, spinach with poor source of fat is a suitable food for obese and diabetic people. It is also a good source of chlorophyll, which is known to aid in digestion (Roughani *et al*, 2011; Gaikwad *et al*, 2010; Verma, 2018) [9].

Rice (*Oryza sativa*) is a dietary staple food, one of the most important cereal crop, especially for people in Asia. Rice is great source of complex Carbohydrates. The rice is one of the rich source of the Nutrient such as Moisture (13.7 %), carbohydrate (72.2%), protein (6.8%), fat (0.5%), crude fiber (0.2%) respectively. Gluten is major protein of Rice (Khetarpaul *et al*. 2005) [5].

The protein content have can be increased and the flour preparation containing as much as 26% protein have been obtained. Aflatoxin is an Anti-nutritional factor may contain in rice (Manay and Shadaksharaswamy, 2008) [6] Rice has various health benefits such as it is an excellent food to include in a balanced diet. Rice has no Fat, no cholesterol and is Sodium free. Bengal gram or chick pea (*cicer arietinum*) is an annual legume of the family *Fabaceae*, *subfamily Faboideae*. It was a cultivated crop grown in tropical, subtropical and temperature regions. The plant grows to 20-50 cm (8-20 in) high and has, small feathery leaves on either side of the stem. Bengal gram is a cool season food legumes (Gaur *et al.*, 2013) [4].

The chickpea is a good of Carbohydrate and Protein which together constitute about 80% of the dry mass. The nutritional value contain in Bengal gram are Energy (372 Kcal), Protein (20.8g), Fat (5.6g), calcium (56mg), Iron (9.1mg), Thiamine (0.48mg), riboflavin (0.18mg), Niacin (2.4mg), vit-C (1mg), & vit. A (129mcg) respectively Gopalan *et al.*, (1971) [3]. In chickpea, the Anti- nutritional factors are Trypsin (8.1-15.7%), chymotrypsin Inhibitor (6.1- 8.8%), Amylase Inhibitor (5.0-9.7%), Polyphenols (1.9- 6.1%) (Sultana *et al.*, 2014) [12].

It could have beneficial effects on some of the important human diseases such as Cardio- vascular disease, Type 2 Diabetes, Digestive diseases and some Cancer (Jakanti *et al.*, 2012). It is also used for blood purification, they can also assists in lowering of cholesterol in the blood steam (Sanghi, 2013) [10].

The need to develop new product is driven by the widening tastes of consumers who are looking for convenience, value – for money and variety without compromising on the nutritional aspects. The value added Chakali developed by rice flour, Bengal gram flour and Spinach Puree. It is like due to crunchiness in texture therefore it's suitable even for young and old people. Hence, keeping this above information in view, the present investigation was undertaken basically increase the utilization of little millet by incorporating replacing it in Chakali -a highly preferred and most popular and deep fried snack of India and also to develop a nutritious snack with rice flour and spinach puree.

## Material and Methods

### Procurement of Raw Material

Raw materials required during present investigation were procured from local market of Murbad such as Spinach, Rice flour, Bengal Gram flour, Red Chilli Powder, Ajwain, Sesame Seed, oil, Salt etc. the raw material were cleaned and made free

from husk and other foreign matters. Most of the chemicals and equipment used in this investigation were of analytical grade which are obtained from college of Food Technology Saralgaon, Thane

### Physical Properties of Chakali

The colour of Chakali was determined by visual observation. The Shape of Chakali was determined by visual observation. The Diameter of Chakali was determined by Measuring Scale and the Thickness of Chakali was determined by vernier calliper scale.

### Chemical Properties of Chakali

Proximate composition such as moisture, ash, crude fat, Crude protein and crude fibre of all the Ingredients and Crackers was determined according to the procedures given in AOAC (2000). For moisture determination samples were dried in oven at 130°C for 60 minutes. For ash Determination samples were placed in muffle furnace at 550°C to burn out all carbon compounds leaving in organic Part (ash). Fat was determined by fat extraction unit by using Hexane. For fibre determination, samples were treated with 1.25% Sulphuric acid and Sodium Hydroxide solution. After filtration of digested material it was washed with hot water and then ignited. By calculating loss of weight after ignition, crude fibre contents were determined. Protein contents were determined by using Kjeldahl's unit.

### Sensory evaluation of Chakali

Prepared product were evaluated for sensory characteristics in terms of Appearance, color, flavour, after taste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a point Hedonic scale with corresponding descriptive terms ranging from 9 'like extremely' to 1 'dislike extremely'. The obtained results were recorded in sensory scored card.

### Statistical Analysis of Chakali

The analysis of variance of the data obtained was done by using completely randomized design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of  $p < 0.005$  level S.E and C.D. at 5 percent level is mentioned wherever required.

### Preparation of Flours

The Rice and Bengal gram were cleaned properly and then Rice and Bengal gram was grinded in household Flour mill. The flours were sieved through of BS 100mm-Mesh size. All the flours were stored in air tight container

### Formulation of Chakali

Chakali prepared with incorporation varying levels of Spinach Puree with Rice flour and Bengal Gram flour were investigated. The formulation was made by varying levels of Rice flour, Bengal Gram flour and Spinach Puree, *viz.*, 45g:45g:00g, 35g:35g:20g, 30g:30g:30g, and 25g:25g:40g percent respectively and data given are illustrated in table.

**Table 1:** Formulation for preparation of Spinach Chakali

Ingredients	Treatments			
	T0	T1	T2	T3
Rice flour	45g	35g	30g	25g
Bengal Gram Flour	45g	35g	30g	25g
Spinach Puree	-	20g	30g	40g
Sesame seed	3g	3g	3g	3g
Ajwain	2g	2g	2g	2g
Red Chilli Powder	3g	3g	3g	3g
Salt	2g	2g	2g	2g

Where,

T0- Control Sample

T1- Spinach Puree 20g +35g+ 35g respectively.

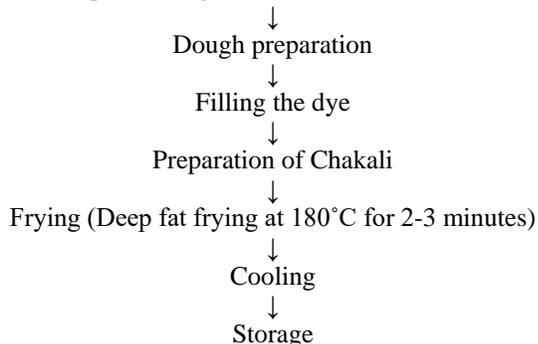
T2- Spinach Puree 30g+ 30g+30g respectively.

T3- Spinach Puree 25g+25g +40g respectively.

### Preparation of Spinach Chakali

#### Flow sheet of preparation of Chakali incorporated with Spinach puree

Mixing all Flours with Ingredients with spinach puree, red chilli powder, Ajwain, sesame seed, salt



### Result and Discussion

**Table 2:** Physical properties of Spinach Chakali

Physical Properties	Chakali
Color	Green
Shape	Round
Diameter	5.5cm
Thickness	0.44cm
weight	11.41g

Study concluded that the physical properties of spinach Chakali were color-Green due to spinach. The shape of spinach Chakali is round by visual observation. The diameter of spinach Chakali was (5.5cm) and thickness of spinach Chakali (0.44cm) measuring by using vernier calliper. Weight of spinach Chakali was (11.41g) measuring by using digital weighing balance. The cooking time of Chakali 180°C for 2-3 minutes.

**Table 3:** Chemical properties of Spinach Chakali

Chemical Parameter	Selected sample
Ash	3.19± 0.03
Moisture	2.4± 0.08
Fat	26.49±0.12
Carbohydrate	49.80± 0.33
Protein	12.04±0.88
Energy Value	485.77Kcal

It was evident from tabulated the chemical composition of Spinach Chakali incorporated with Spinach puree were found to be Ash content 3.19± 0.03%, Moisture content 2.4± 0.08%, Fat content 26.49± 0.12%, Protein content 12.04± 0.88%, Carbohydrate content 49.80± 0.33% and Energy value 485.77kcal respectively. It included that Chakali incorporated with spinach rich nutritional value.

**Table 4:** Sensory Evaluation Result

Sample	T0	T1	T2	T3
Color	8	8	7	8
Flavor	8	7.5	7.5	7.5
Taste	8	6	6.5	8
Texture	8	6.5	6	8
Appearance	8	7	5.5	8
Overall Acceptance	8	7	7.8	7.9

It was concluded that sample T3 has highest Score as compared to other samples. The overall acceptability of sample T3 7.9 while other samples. T3 more acceptable on its sensory attributes.

### Conclusion

In the present study finally it is concluded that Spinach Chakali prepared from different Variations of flour such as Rice Flour, Bengal Gram flour, and Spinach puree has high Nutrition quality and also it is rich source of Fiber, and Vitamins due to incorporation of spinach puree. The present investigation carried out T3 sample found more superior than other sample for information of spinach Chakali in which T1 and T2 so, T3 sample is more acceptable on its sensory attributes and consumer acceptable.

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