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Development and quality assessment of *chakli* (crunchy snack) prepared incorporating garden cress seed, green gram flour and rice flour

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Abstract
Traditional foods play an important role in local identity, consumer behaviour, the transfer of cultural heritage for future generations, and the interaction of this heritage with the rest of the world. "Chakli" is one of the traditional fried snacks that can be produced using different combination of ingredients. Cereal chakli is popular product and at present they are mostly made from garden gram, rice and green cress etc. Considering the physico-chemical and nutritional composition of garden gram, rice and green cress. The present investigation of development and quality assessment of *chakli* (crunchy snack) prepared by incorporating garden cress seed, green gram flour and rice flour by the standardization of recipe and study its effect on nutritional composition and sensory characteristics. From the results it was observed that the carbohydrate decreased in the ranged from (61.84 - 51.90 per cent) and increased in Protein(10.96-15.06per cent) and fat (22.06-27.27 per cent) , Crude fibre(3.03-3.43 per cent),ash%(2.22-3.00 per cent),moisture% (2.58-2.72 per cent) Anti-oxidant(3.98-11.12 per cent) in chakli formulations. Sensory evaluation like (color and appearance, body and texture, flavor and taste and overall acceptability) was evaluated by trained panelist using 9 point hedonic scale. The most acceptable chakli was analyzed for organoleptic analysis of chakli has colour & appearance (8.67 - 7.65), Flavour and taste (8.70 - 7.46), Body and texture (8.82 - 7.12) and overall acceptability (8.73 - 7.41) of product. The different formulations of garden cress seed, green gram flour and rice flour in the ratio of T1 (100:00:00), T2 (70:25:5) and T3 (70:20:10) and T4 (70:15:15) are prepared. The chakli was found to be significantly improved in nutritional value. Hence the prepared chakli may become nutritionally balanced and have nutraceutical properties.

Keywords: *Chakli,* garden cress seed, green gram flour and rice flour, organoleptic analysis

Introduction
In India, a number of snack 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) [7]. "Chakli" is a common term for a variety of fried snacks that can be made using different combination of ingredients. The main ingredient for all types of "Chakli" is rice flour "Chakli" are delicious savouries that are generally made at home and kept in airtight containers for eating as fancied as well as enjoyable, crunchy and satisfactory snack. Cereal Chakli is popular in diwali festival products and at present they are mostly made from gram, rice etc. By suitable processing it might be feasible to produce Chakli from sorghum. Ready to eat products like chakli is very popular being crisp and friable in texture. The relatively smaller size and quick hydration of millets make them most suitable for the production of chakli. (Chavan*et al*., 2016) [3].
Rice is the seed of the monocot plant *Oryza*sativa (Asian rice) or *oryzaglaberrima* (African rice). As a cereal grain, it is the most important staple food for a large part of the world's human population, especially in Asia and the West Indies. Rice has historically, nourished more people for 2.5 billion people.
Garden cress has been considered as an important nutritional and medicinal plant in India since the Vedic era (between 500- 1700 B.C.). In Ayurveda, the indigenous medicinal system, it is described as hot, bitter, galactogogue and claimed to destroy vata (air) and kapha (phlegm). Seeds are also rich source of omega 3- fatty acids which helps to lower cholesterol in hyper cholesterolemic patients (Agarwal and Sharma, 2013) [4].
Green Gram Flour Legumes are vital source of dietary protein for large sector of the world's population.
The composition is predominant in countries where utilization of animal protein is limited owing to poverty, non-availability, religious or cultural lifestyles (Boye*et al.*, 2001) [5]. Legumes are high in protein and complex hydrocarbons. Along with presence of appreciable quantity of bioactive ingredients and minerals (Bazzano*et al.*, 2010) [6].

Materials and Methods
Procurement of row materials
All most care should be taken in choosing the raw materials for the preparation of the chakli quality was the major factor in choosing raw material purchased from the local market in Prayagraj.
Preparation of chakli: chakli were prepared by the standard method for the preparation of chakli. Garden cress seed, rice flour and green gram percentages were 05, 10, and 15% as

given Table 1

Table 1

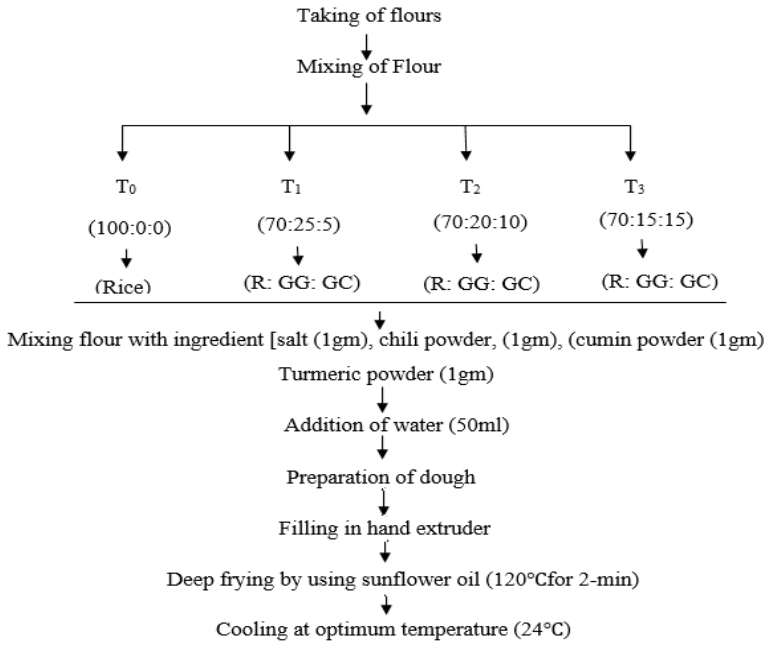
S. No	rice flour	green gram	garden cress
T_0	100	00	00
T_1	70	25	5
T_2	70	20	10
T_3	70	15	15

2.2 Chemical Analysis

Chemical constituents like moisture, protein, fat, and ash content of chakali were determined by AOAC, (2003) [1]. The crude fiber content of chakali sample was determined by the method as described in AOAC method (1995) [2]. Antioxidant was determined by DPPH method described in Ranganna (1986) [8].

2.3 Organoleptic evaluation

The samples were subjected to sensory evaluation as described in using a 9 point hedonic scale score card as suggested by Stone and Sidel (2004) [9].



*R- Rice
*GG- Green gram
*GC- Garden cress

Fig 1: Flow chart of garden cress seeds, green gram flour and rice incorporated chakali

Results and Discussion

Results given in table 1 revealed that Protein per cent significantly increases from (10.96-15.06), fat content was found to be (22.06 - 27.27), Crude fibre (3.03- 3.43), Ash (2.22 - 3.00), moisture (2.58 - 2.72) and antioxidant (3.98 - 11.12) in chakli formulation.

Table 1: Nutritional composition of chakli (Mean)*

Parameters	T_0	T_1	T_2	T_3
Carbohydrate%	61.84	57.29	54.15	51.90
Protein%	10.96	13.33	14.02	15.06
Fat%	22.06	24.21	26.27	27.27
Crude fibre	3.03	3.24	3.33	3.43
Ash%	2.22	2.78	2.96	3.00
Moisture%	2.72	2.58	2.60	2.70
Antioxidant%	3.98	10.20	10.47	11.12

*Average of five trials.

Table 2: Organoleptic evaluation

The score for colour & appearance (8.67 - 7.65), flavour and taste (8.70 - 7.46), body and texture (8.82 - 7.12) and overall acceptability (8.73 - 7.41) were summarized in table 2. Among all the treatments T1 is highly acceptable by the judges followed by 9 point hedonic scale score card.

Table 2: Organoleptic evaluation of chakali (Mean)*

Parameters	T_0	T_1	T_2	T_3
Colour &Appearance	8.39	8.67	7.99	7.65
Flavour and taste	8.30	8.70	7.64	7.46
Body and texture	8.35	8.82	7.54	7.12
Overall Acceptability	8.35	8.73	7.72	7.41

*Average of five trials.

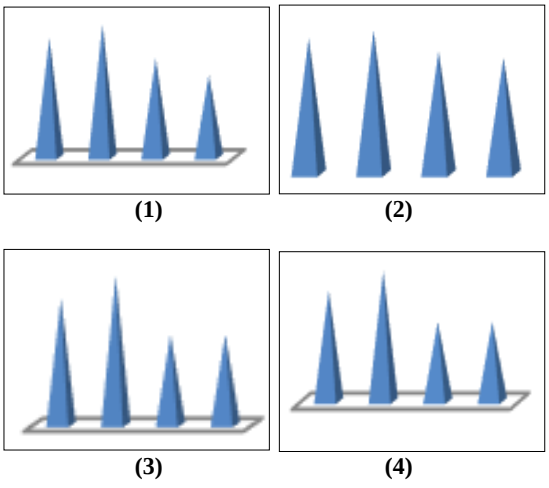


Fig 1: Organoleptic evaluation of chakli

Conclusion

The present study was concluded of preparation of chakli is nutritionally enriched with protein (15.06), antioxidant (11.06) per cent respectively. During organoleptic evaluation T1 had highest score in (color & appearance, body & texture, flavor & taste, overall acceptability).

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