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# Development and quality evaluation of value added Khakhra using different variety and proportion of flour

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**Abstract**
Khakhra is a popular vegetarian roasted 'Gujarati' Indian thin cracker bread or snack item made from whole wheat flour and oil. In present investigation efforts were made to prepare khakhra by using different proportions and variety of flours i.e. $S_0$, $S_1$, $S_2$, $S_3$, $S_4$, $S_5$ and $S_6$. Considering all sensory quality parameter, the overall acceptability of $S_2$ was found highest followed by $S_1$ and $S_3$. Physico-chemical and nutritional profile of final product i.e. khakhra was carried out. The results revealed that khakhra contained 17.2 cm diameter, 2.85mm thickness, 15g weight and 1.67 kg hardness respectively. Chemical profile analysis revealed that 11.07% crude protein, 1.83% crude fat, 69.57% carbohydrates and 5.33% ash respectively. Mineral profile analysis revealed that khakhra contained 12.75% Iron.

**Keywords:** khakhra, nutritional characteristics, organoleptic evaluation

## Introduction
Food is classified into various groups and subgroups according to their sources. Cereals comprises single largest food group providing the bulk to human race particularly for poor people in the developing countries.
Khakhra is a traditional ready-to-eat snack or breakfast item popular in the North Western part of India. This product is very popular in the state of Gujarat. As a convenient snack it is popular during travels because it does not require any further processing at the point of consumption, need minimal packaging and has long shelf-life. A nutritious Indian diet snack. Very crispy, crunchy, mouthwatering tasty nutritious and very light in weight snack. Favorite among children and teenagers. Available in many different flavors. It is usually eaten with coffee, tea, chutney, pickles, butter, ghee, topped vegetable, cheese or yoghurt. Easy to carry and most of the people of Gujarat carry these as snack during travel.
Value addition of khakhra from fortified Garden cress seed powder will give the people novel profits. It will further provide consumers a new alternative to traditional khakhras. More over this research will bring a new potential to the existence after consumption. Today, we find that the people are becoming more aware about their health and various problems related to it. Thus, with changing life style and the changing mindsets of people they are also making a trend towards eating nutritious as well as that remaining healthy or becoming fit should be accompanied by having such food, which is liked for that individual.
Wheat is the most important stable food crop for more than one third of the world population and contributes more calories and proteins to the world diet than any other cereal crops. Wheat is considered a good source of protein, minerals, B-group vitamins and dietary fiber although the environmental conditions can affect nutritional composition of wheat grains with its essential coating of bran, vitamins and minerals; it is an excellent health-building food (Kumar *et al.*, 2011) [5].
Buckwheat are rich in protein 16%, carbohydrates 62%, sugars from 3.0 to 5.0%, oil 3%, fiber 14% and contains some salts of metal such as iron, calcium, phosphorus, copper, zinc, boron, iodine, nickel, cobalt also contains organic acids and some vitamins such as B2 and B 1. It is rich in iron (100 mg/100g) and also contains several nutraceutical components. The seeds possess fair levels of protein (22.50%), fat (27.50%), dietary fiber (30.00%) and calcium (0.377 %) and thus an important nutraceutical grain for nutrient enrichment **(**Kotagi *et al*., 2013).
Garden cress (*Lepidium sativum*) is a fast-growing annual herb that is native to Egypt and West Asia, although it is now cultivated in the entire world. Garden cress belonging to the family *Brassicaceae* (*Cruciferae*), believed to have originated primarily in highland regions.

Its seeds are rich source of proteins, dietary fiber, omega-3 fatty acids, iron, other essential nutrients and phytochemicals. **(**Doke and Guha, 2014) [3].

## Materials and Methods

### Material Requirement

**Selection of raw material:** A raw material for preparation of khakhra was whole wheat flour, Buckwheat flour, Edible oil, Salt, Red chilli powders, Turmeric, Amchur were purchased from the local market of the Allahabad. Garden cress seed were purchased from Maharashtra.

**Processing equipment:** Sieve, Electronic weighing balance, stainless-steel pots, soxhlet apparatus, micro-Kjeldahl apparatus, muffle furnace, grinder (mixer).

**Packaging material:** Vacuum packaging is a method of packaging that removes air from the package prior to sealing. This method involves (manually or automatically) placing items in a plastic film package, removing air from inside, and sealing the package. Shrink film is sometimes used to have a tight fit to the contents. The intent of vacuum packing is usually to remove oxygen from the container to extend the shelf life of foods and, with flexible package forms, to reduce the volume of the contents and package. Packaging material was used to increase the shelf life of khakhra. Vacuum Packing pouches were specially used for packaging of khakhra.

**Chemical Analysis:** Determination of moisture, protein, fat, fibre, ash, by AOAC (2005), AACC (2003) method. The carbohydrates are estimated by using difference method. Mineral content viz. calcium, iron, etc, of khakhra was measured by the standard methods (Ranganna, 1986) [7].

### Methodology

**Formulation and Standardization of Value Added Khakhra Using Different Variety and Proportion of Flour.** Formulation and standardization of value added khakhra using different proportion and variety of flours *viz.* whole wheat flour, buckwheat flour and garden cress seeds flour was carried. The data are showed in table 1.

**Table 1:** Formulation and standardization of khakhra by using wheat flour, garden cress seed and buckwheat flour.

| Treatments | Whole wheat flour (%) | Garden cress seed Flour (%) | Buckwheat flour (%) |
|---|---|---|---|
| **$S_0$** | 100 | 00 | 00 |
| **$S_1$** | 90 | 05 | 05 |
| **$S_2$** | 80 | 10 | 10 |
| **$S_3$** | 70 | 15 | 15 |
| **$S_4$** | 80 | 20 | 20 |
| **$S_5$** | 50 | 25 | 25 |
| **$S_6$** | 40 | 30 | 30 |

### Experimental procedure

Whole wheat flour+ GCS Powder + Buckwheat flour

↓

Sieving

↓

Weighing all ingredient

↓

Addition of ingredients (i.e. salt red chili powder, turmeric, amchur,)

↓

Addition of oil

↓

Proper mixing

↓

Addition of water

↓

Preparation of dough

↓

Preparing equal size of balls

↓

Rolling in round shape

↓

Roasting on flat tawa

↓

Khakhra

**Flow sheet 1:** Process flow chart for value added khakhra

**Statistical analysis:** Statistical analysis was carried out by using (CRD) for different treatments as per the methods given by Panse and Sukhatme (1985) [6].

## Results and Discussion

Study had shown that efforts were made to formulate a reduced bulk nutrient dense health food i.e. khakhra as a nutritional and functional product. Prepared product for assessment of its nutritional characteristics and sensory acceptability of prepared khakhra. Furthermore, the formulated product was evaluated for storage and microbial characteristics in order to predict the shelf life. The results obtained are discussed as follows.

### Sensory analysis of value added khakhra

Sensory analysis of value added khakhra of sample $S_0$, $S_1$, $S_2$, $S_3$, $S_4$, $S_5$, $S_6$ was carried out on the basis of color, flavor, texture, taste, and overall acceptability with the help of sensory evaluation on 9-point hedonic scale and the results are depicted in Table-2.

**Table 2:** Sensory analysis of value added khakhra

| Sample | Color | Taste | Flavor | Texture | Appearance | Overall Acceptability |
|---|---|---|---|---|---|---|
| $S_0$ | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| $S_1$ | 7.77 | 7.22 | 7.33 | 8.00 | 8.00 | 7.44 |
| $S_2$ | 8.00 | 8.44 | 8.22 | 8.33 | 8.44 | 8.33 |
| $S_3$ | 7.77 | 7.11 | 7.11 | 7.55 | 8.00 | 7.55 |
| $S_4$ | 6.88 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| $S_5$ | 6.44 | 5.66 | 6.11 | 6.66 | 6.55 | 6.66 |
| $S_6$ | 6.00 | 5.22 | 5.33 | 5.77 | 6.00 | 5.33 |
| F- test | S | S | S | S | S | S |
| C.D. | 0.753 | 0.82 | 0.77 | 0.79 | 0.72 | 0.99 |
| SE(m) | 0.264 | 0.28 | 0.27 | 0.28 | 0.25 | 0.34 |
| SE(d) | 0.373 | 0.40 | 0.38 | 0.39 | 0.36 | 0.49 |
| C.V. | 10.68 | 12.19 | 11.31 | 11.22 | 10.11 | 14.21 |

*Each value is a mean of three determination

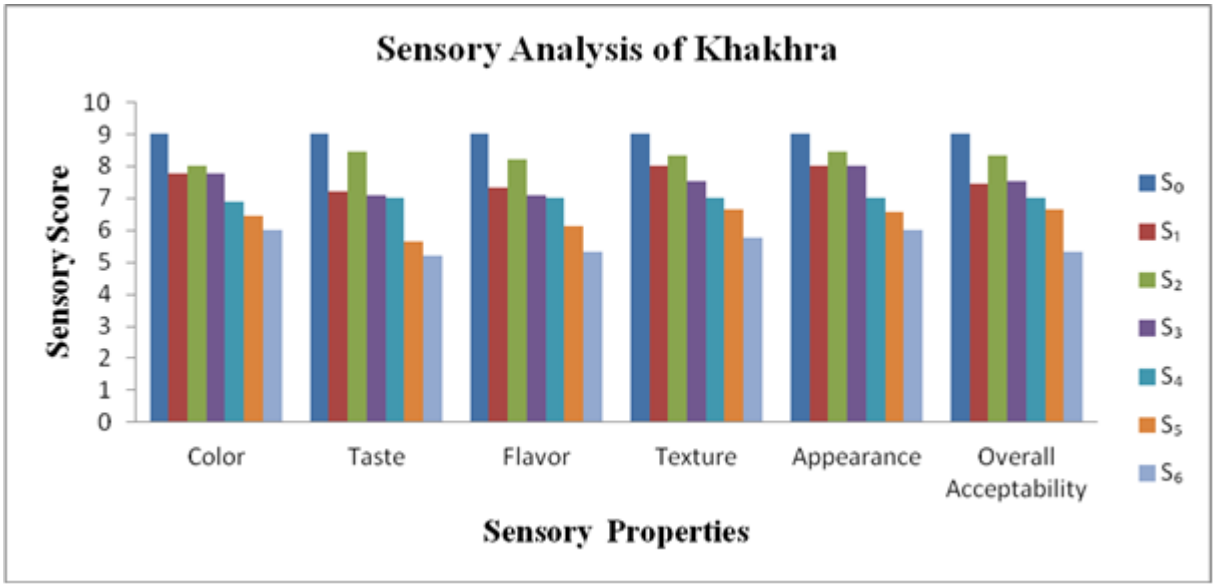


**Fig 1:** Sensory analysis of value added khakhra

Organoleptic characteristics are the most important properties of khakhra for its consumer acceptability. The data pertaining to organoleptic evaluation showed that colour, taste and appearance of $S_2$ was similar to that of control ($S_0$). Considering all sensory quality parameter, the overall acceptability of $S_2$ was found highest followed by $S_1$ and $S_3$. The overall acceptability score was varied significantly with respect to khakhra each other. The highest score was achieved by $S_2$ (i.e. 8.44).

It could be concluded that the further analysis of khakhra was carried out of sample $T_2$ due to its highest overall consumer acceptability.

### Physical properties of khakhra

The understanding of physical quality attributes is critical in designing end product and its use; different individual grains have different physical characteristics that may dictate end product quality and application. Physical characteristics of the selected sample viz. diameter, thickness, weight and hardness were studied. The results pertaining to physical properties of khakhra are presented in Table 3.

**Table 3:** Physical properties of khakhra

| Physical properties | Average value |
|---|---|
| Diameter (cm) | 17.2 |
| Thickness (mm) | 2.85 |
| Weight (gm) | 15 |
| Hardness (kg) | 1.67 |

*Each value is a mean of three determination

It was recorded from Table-3, that the diameter of the khakhra was found to be 17.2 cm and the thickness was 2.85 mm. The weight of the khakhra was found 15gm and the hardness was found to be 1.67 kg. The similar results were reported by Amudha (2006).

**Nutritional properties of khakhra**

Nutritional composition generally represents the nutritional quality of product. It is necessary to observe the nutritional composition of khakhra so as to judge the nutritional quality of final product. The data pertaining to nutritional composition of khakhra is depicted in Table 4.

**Table 4:** Nutritional properties of khakhra

| Treatment | Moisture | Carbohydrate | Fat | Protein | Ash | Iron |
|---|---|---|---|---|---|---|
| $S_0$ | 4.36 | 78.96 | 1.42 | 8.32 | 3.40 | 3.60 |
| $S_1$ | 5.02 | 72.47 | 1.71 | 10.86 | 4.58 | 8.42 |
| $S_2$ | 5.62 | 69.57 | 1.83 | 11.07 | 5.33 | 12.76 |
| $S_3$ | 6.28 | 66.93 | 2.12 | 11.31 | 6.41 | 17.83 |
| $S_4$ | 6.93 | 63.25 | 2.40 | 11.49 | 7.62 | 22.80 |

***Each value is a mean of three determination

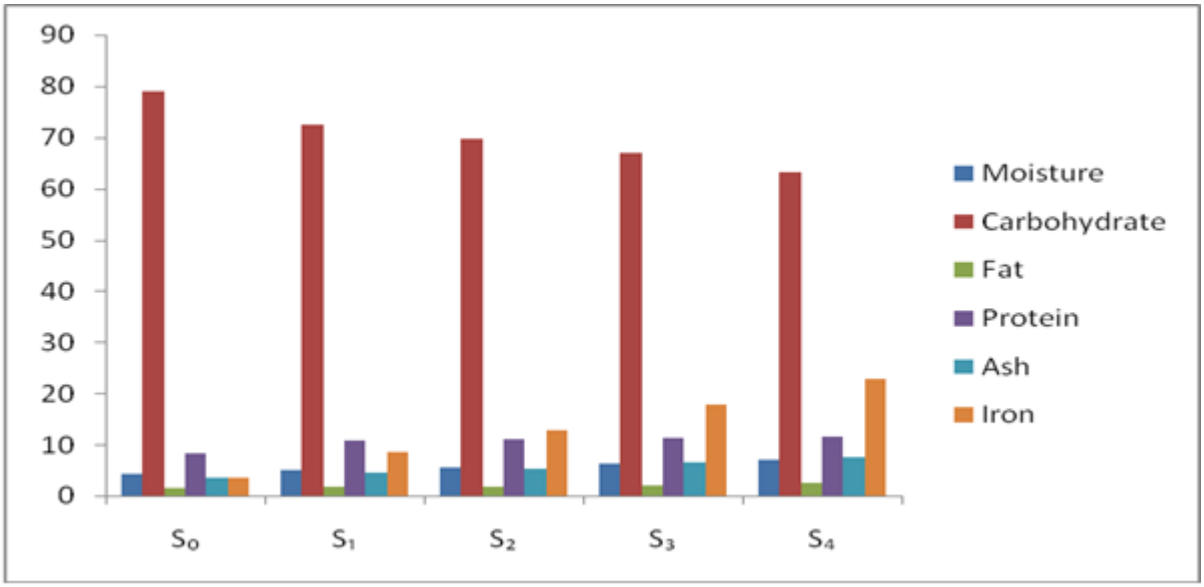


**Chart 2:** Nutritional properties of value added khakhra

**Conclusion**

It could be concluded that garden cress seeds are rich in iron and protein and possess better nutritional and mineral profile due to which it has potential in fortification of food stuffs. Better taste and superior nutritive value of khakhra justifies its high consumer acceptability. On the basis of results, it could be concluded that $T_2$ is ideal for preparation of khakhra.

After the preparation of value added khakhra it was packed in high barrier vacuum pouches. Then the physico-chemical properties were evaluated containing different various parameters. Physical parameter was as follow Diameter, Thickness, Weight, Hardness. The storage study of the khakhra was carried out in the intervals of 30, 60 and 90 days. In which the effect were check during storage condition like moisture content, carbohydrate content, iron content, fat content, protein content

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