



Quality evaluation of Khakhra incorporated of *Moringa Oleifera* Leaves powder

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Abstract

Khakhra is popular Vegetarian roasted 'Gujarati' Indian thin cracker bread or snack item made from Wheat Flour, Oil and other ingredients. For more nutritious and nutritional point of view we used *Moringa Oleifera* Leaves Powder and Bajara, Oats and Bengal Gram flour. *Moringa Oleifera* Leaves contain calcium, iron, vitamin C, fibre, protein and β -carotene and Bajara, oats and Bengal gram contain high in protein, dietary fiber (beta-glucan), carbohydrates. In present investigation efforts were made to prepare khakhra by using different proportion and variety of flours and *Moringa Oleifera* Leaves powder i.e. T₀, T₁, T₂ and T₃. Considering all sensory quality parameter, the overall acceptability of T₁ was found highest followed by T₂ and T₃. Physic-chemical and proximate analysis of final product i.e. khakhra was carried out. The revealed that khakhra contain 15 cm diameter, 1.34 mm and thickness 22 g weight respectively. Chemical profile analysis revealed that 21.98% protein, 12% fat, 6.4% ash, 4.2% moisture, carbohydrate 127% and energy value 323.168 kcal. The finalized khakhra has good nutritional value with acceptable physico-chemical qualities.

Keywords: Khakhra, Bajara, *Moringa Oleifera* Leaves powder, proximate analysis, sensory evaluation etc

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. (Solanke *et al*, 2018) [27].

India is the largest producer of moringa. Every part of the drumstick tree is enriched with varieties of ingredients that contribute to its magical health benefits. Moringa leaves are round shaped with wild leafy flavour and slight bitter taste. They are the significant source of calcium, iron, vitamin C, fibre, protein and β -carotene. Due to its antibacterial and anti-inflammatory action it can be used as a treating agent for diarrhea, urinary disorder and gastric ulcer. Moringa leaves can successfully purify blood along with lowering of blood glucose and cholesterol level. Moringa, along with antioxidant properties, shows high protein content with all the essential amino acids and micronutrient composition indicating its potential to be used as food. (Sanjukta Kar *et al*, 2013)

Moringa are commonly consumed in India and are generally prepared in a similar fashion to green beans and have a slight asparagus taste. The seeds are sometimes removed

from more mature pods and eaten like peas or roasted like nuts. The flowers are edible when cooked, and are said to taste like mushrooms. The leaves are highly nutritious, being a significant source of beta - carotene, Vitamin C, protein, iron, and potassium. The leaves are cooked and used like spinach. In addition to being used fresh as a substitute for spinach, its leaves are commonly dried and crushed into a powder, and used in soups and sauces. Murungakai, as it is locally known in Tamil Nadu and Kerala, is used in Siddha medicine. Its leaves are full of medicinal properties. The tree is a good source for calcium and phosphorus (Pallavi Joshi* and Dipika Mehta, 2010) [22]. *Moringaoleifera* is the most widely cultivated species of a monogeneric family. The Moringa this is native to the sub Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. It had spread to most part of Asia, nearly the whole of Africa, South America, southern part of North America and some pockets in Europe. It is originated initially in the Northern part of India some 5000 years back and soon moved into the Southern parts as well. It is a subtropical species that is known by different regional names as benzolive, drumstick tree, kelor, marango, mulangay, nébéday, saijhan, mooringai and sajna. Presently, one of the most important trends in food and pharmaceutical industries is the growing demand for valuable natural sources of nutritional compounds. The leaves are also free of anti-nutritive factors such as phenols, tannins and saponins. It is a multipurpose and exceptionally nutritious vegetable tree with a variety of potential uses (Hradesh Rajput *et al*, 2017) [11].

'*Moringa oleifera*' is an excellent food source for human beings and is a multipurpose tree which can also be promoted as a fodder crop. Several other uses include medicine, dye, nutritional and industrial applications. *Moringa Oleifera* seeds can be used for water treatment as it

can remove up to 99% bacteria from water and purify it. Studies report the multipurpose use of different parts of drumstick tree in food for human consumption such as yogurt, cake, bread, biscuits and soup. Fresh Moringa leaf juice can be used as a growth hormone to increase the crop yields by 25-35 % (Sheetal Srinivasamurthy, *et al*, 2017) [31].

Material & Methods

Procurement of Raw Material

Raw materials required during present investigation were procured from local market of Saralgaon such as Bajara flour, Oats flour, Bengal gram flour, Wheat flour, *Moringa Oleifera* Leaves Powder, Chilli powder, Cumin seed powder, Carom seed powder, Turmeric, Salt, and Oil etc.

Physical Properties of Khakhra

The colour of khakhra was determined by visual observations, the length, breadth and width of khakhra was measured by vernier caliper. The weight of khakhra was measured on analytical weighing balance.

Chemical Properties Khakhra

Proximate composition such as moisture, ash, crude fat, crude protein and crude fiber of all the Ingredients and khakhra 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 muffled furnace at 550°C to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using n. Hexane. For fiber 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 fiber contents were determined. Protein contents were determined by using Kjeldahl’s unit.

Sensory Evaluation Khakhra

Prepared product were evaluated for sensory characteristics in terms of appearance, color, flavor, aftertaste, 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 9 point Hedonic scale with corresponding descriptive terms ranging from 9 ‘like extremely’ to 1 ‘dislike extremely’. The obtained results were recorded in sensory score card.

Statistical Analysis-

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.

Formulation of khakhra

Khakhra prepared with incorporation varying levels of Bajara flour, Oats flour, Wheat flour, Bengal gram, Pomegranate peel powder were investigated. The formulation was made by varying levels of Bajara flour, Oats flour, Wheat flour, Bengal gram, *Moringa Oleifera* Leaves Powder *viz.*, 00:00:60:20:00, 25:20:20:10:05,

20:20:20:10:10, and 20:15:20:20:15 percent T0, T1, T2 and T3 respectively. Caron Seed, Cumin Seed, Turmeric, Chilli Powder, and Salt were used at 2g, 2g, 1g, 2g and 3g respectively at levels in each formulation of Khakhra. Sample T1 of Khakhra was organoleptically acceptable and used for further study.

Preparation of Moringa Oleifera Leaves Powder

The clean and healthy leaves of Moringa were taken for preparation of Moringa leaves powder. The leaves were destalked in order to separate out for cleaning. The leaves then blanch at 82-85°C and then spread on trays for drain water. Then leaves are dry in cabinet dryer at 80°C for 2-3 hours. After drying leaves are grind into mixer for making powder. The powdered sample of Moringa leaves was stored in an air tight container until further use for various studies.

Preparation of Khakhra

Collect all ingredients such as Bajara flour, Oats flour, Wheat flour, Moringa leaves powder, turmeric, red chilli powder, cumin seed, carom seed, salt and oil mixed it. Add water and into soft dough. Divide the dough into equal size ball and rolling in very thin round shape, using a little wheat flour for rolling. Heat a non-stick flat pan and roast each khakhra on slow flame till golden spots appear on both sides. Continue cooking the khakhra on a slow flame, while pressing with folded cotton cloth. Till it turns crisp and brown from both sides.

Result and discussion

Physical and Chemical Properties of khakhra

Physical Properties of khakhra

Sr. no.	Physical Properties	Observation
1	Colour	Greenish
2	Shape	Round
3	Diameter	15cm
4	Thickness	1.34 mm

It was evident from the above table, Colour of Khakhra was Greenish due to contain of Moringa leaves powder which was determine by visual Observation. The diameter of khakhra was (15cm) which was measured by using measuring scale. The thickness of khakhra was (1.34mm) which was measured by vernier caliper scale.

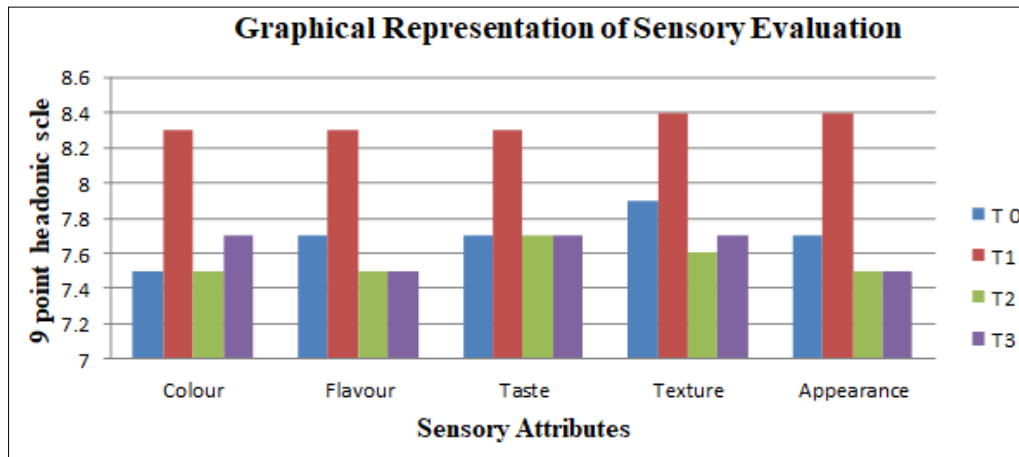
Chemical Properties of khakhra

Chemical Parameters	Selected Sample
Ash	6.4%
Moisture	4.2%
Fat	12%
Protein	21.98%
Carbohydrate	127 %
Energy value	323.168 kcal

It was evident from Table observation that chemical properties of khakhra Ash content 6.4 %, Moisture content 4.2 %, fat content in concentration 12 %, Protein content was found to be 21.98% and Energy Value found to be 323.168kcal respectively. Chemical properties shown that the prepared khakhra contain high amount of proteins and other nutrients.

Sensory Evaluation Khakhra

Graphical Representation of Khakhra: 9 Point Hedonic Scale



Khakhra incorporated with Moringa leaves Powder prepared scored highest. Sample T1 the score 8.3(T1) for colour where as lowest score was 7.5 (T2). The score recorded for flavor highest score 8.3 (T1) and lowest score get similler for T2 and T3 was 7.5. The highest scored get 8.3 (T1) for taste and lowest score get similler for T2 and T3 was 7.7. The score recorded for texture highest score 8.4 (T1) and lowest score get to T2 was 7.6. For appearance highest score 8.4 (T1) and lowest score get similler T2 and T3 7.5. overall acceptability choose T1 sample because this sample get highest score 8.5 compairing to other sample. according to senspry panel member sample T1 get high score.

Conclusion

It may concluded that the superior quality of khakhra with added Moringa leaves powder can be prepared by addition of Bajara 25%, oats%, bengal gram 15%, wheat flour 20%, Moringa leaves powder 5%, oil 5% and spices as the overall acceptance for treatment combination T1 was best in all the quality attributes. Sensory evaluation test furthermore improvements were done and sensory evaluation ranked the product "Excellent" by all the panel members and the product was then standardized. used ingredients like Bajara, Oats, Bngal gram and Moringa leaves powder khakhra rich in nutrients.khakhra good for the consumption and good in consumer acceptance.

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