



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; 6(5): 651-655

© 2018 IJCS

Received: 25-07-2018

Accepted: 30-08-2018

Shaivya SinghCentre for food technology,
Gwalior, Madhya Pradesh, India**Ekta Batra**Centre for food technology,
Gwalior, Madhya Pradesh, India

Chakkuli: Bag full of precious gems

Shaivya Singh and Ekta Batra**Abstract**

The primary purpose of snack is to take the edge off pre-mealtime hunger without exceeding your everyday caloric need. Snacks are very convenient to carry even at work place so it is a good nutrient supplement. There are different types of snacks available in Indian market chakli is one of them. Chakli, a savory snack usually is a deep fried product. Chakli available in market are generally made from rice flour, In this study innovation is done incorporating Sorghum, Water chestnut and Flaxseeds as they have high nutritional value. Comparable to conventional snacks Healthy snacks which improves health, curbs cravings and gives energy for this the objective of the study was emphasized on development of baked chakli over deep frying for lowering the calories percentage i.e. Baked *chakli* formulated by Sorghum, *Singhara* & Rice. Studies suggest that these flours are rich in antioxidants and have many health benefits. Water chestnut used as an anti-inflammatory agent & in free radical scavenging. Sorghum is an excellent source of protein and carbohydrate & is beneficial in diabetes too. Flaxseeds have high content of ALA (alpha-linolenic acid), dietary fiber, and high quality fiber. It contains omega 3 fatty acid. ALA is one of the essential polyunsaturated fatty acid & anti-inflammatory properties. ALA is known in reducing blood lipids & CVD. Thus a baked chakli using the above described ingredients was formulated and from various trails few trails fulfilled the needs of the sensory evaluation. The results of the hedonic scale showed that the product was good in acceptability.

Keywords: sorghum, water chestnut, flax seed, antioxidants, cardio vascular diseases**Introduction****Sorghum**

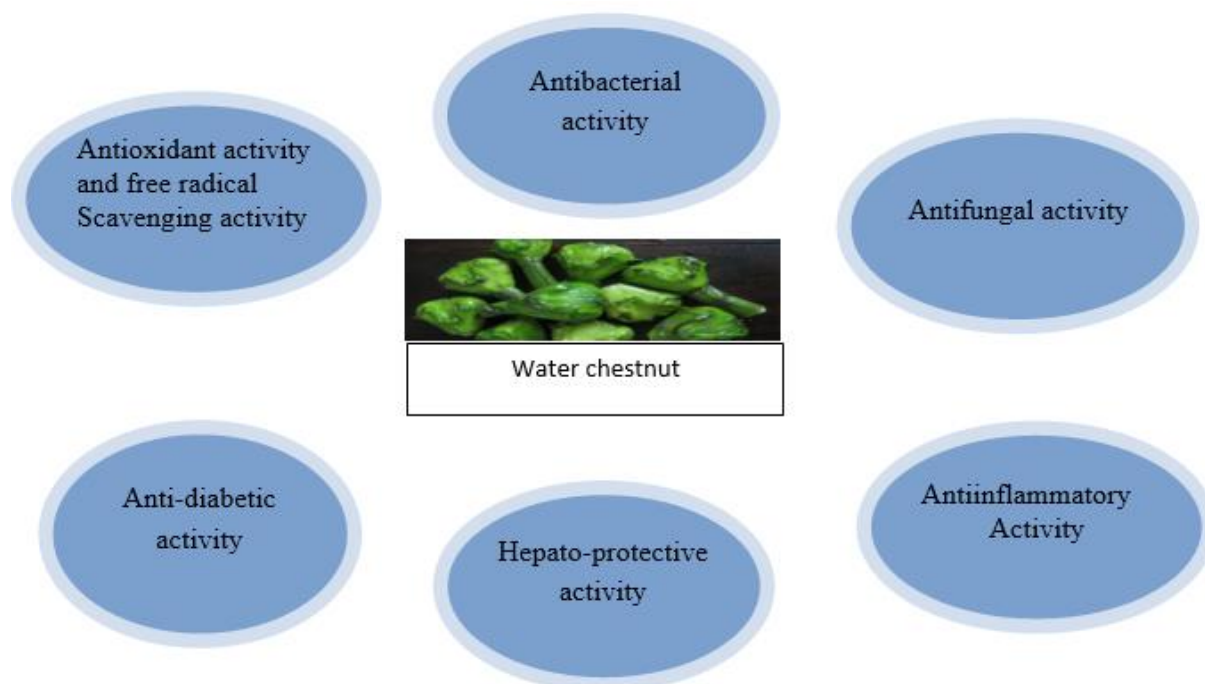
Sorghum (*Sorghum bicolor*) which belongs to family Poaceae is an important cereal in drier tropical regions. Africa is centre of origin of sorghum [1]. Sorghum is grown around the world, and ranks fifth in global cereal production after maize, rice, wheat and barley. Sorghum is an important cereal grain food, grown globally, that is rich in nutrients, dietary fiber and bioactive components [2] components implicate effects on energy balance, glycemic control, lipids, gut micro biota and cell-mediated immune responses including anti-oxidant and anti-inflammatory effects [2]. The phenolic compounds in sorghum grain exhibit high antioxidant activity through their ability to scavenge free radicals.

Water chestnut

Trapa natans is a small free-floating plant growing mainly in shallow water or swampy regions, native to Europe, Asia and Africa and commonly called as the water chestnut or *singhara* in India. Water chestnut exhibit Antioxidant activity and free radical scavenging activity [3].

The plant contains carbohydrates, minerals, calcium, phosphate, iron, copper, manganese, magnesium, sodium and potassium. The kernels contain some vitamins like thiamine, riboflavin, nicotinic acid, vitamin C, vitamin A, D-amylase and considerable amount of phosphorylases [4].

Correspondence**Shaivya Singh**Centre for food technology,
Gwalior, Madhya Pradesh, India



Rice

Rice (*Oryza sativa*) is one of the most important cereal cultivated^[12] and it is staple food^[13] in India. It is considered as a potential food vehicle for the fortification of micronutrients because of its regular consumption. Rice is rich in thiamine (vitamin B1), riboflavin (vitamin B2) and niacin (vitamin B3)^[14]. It has anti-oxidative or anti-inflammatory effects^[15].

Flaxseed

Flaxseed (*Linum usitatissimum*) belonging to family Lineaceae, is a blue flowering annual herb that produces small flat seeds^[6]. Flaxseed is rich in omega 3 fatty acid, omega 6

fatty acid & omega 9 fatty acid. The increased use of omega - 3 fatty acids is a powerful example of one such nutritional strategy that may produce significant cardiovascular benefits^[7]. Flaxseed possesses antioxidant (Antioxidants are vital molecules which protect the body from harmful effects caused by free radical induced oxidative stress. Proper diet is the best source of free radical scavenging antioxidants to the body of any organism)^[5] and hepatoprotective properties^[8].

Spices possess antioxidant activity. Sorghum and singhara and Flaxseed and spices (turmeric, red chilli, onion, garlic)^[9, 10, 11] exhibit anti oxidant activity which prevent from heart diseases and diabetes.

Spices and other ingredients used

S. No	Spices & Other Ingredients	Active Component	Properties
1.	Turmeric	Curcumin	Antioxidant activity, Antimicrobial activity,
2.	Red chilli	Capsaicin	Protect against hypercholesterolemia and obesity, reducing the risks of hypertension, type 2 diabetes, and atherosclerotic Cardiovascular disease.
3.	Onion	Quercetin	Onion serves as a good medicinal compound for cataract, cardiovascular disease and cancer due to its hypocholesterolemic, thrombotic and antioxidant effects
4.	Garlic	Allicin	Reduce the risk for cardiovascular diseases, have anti- tumor and anti-microbial effects.
5.	Mustard oil	Diacylglycerol (DAG)	Preventing body fat accumulation & obesity related disorders.

Amchur powder and salt were used to enhance flavor of the product.

Materials and methods

Acquirement of Raw material

Raw material was collected from local market of Gwalior to prepared chakli from sorghum, singhara and rice. Clean and Dry, pathogen free materials were collected. These grains were subjected to milling by grinded mill. Spices and oil was purchased from local grocery shop. Fresh and clean water was used.

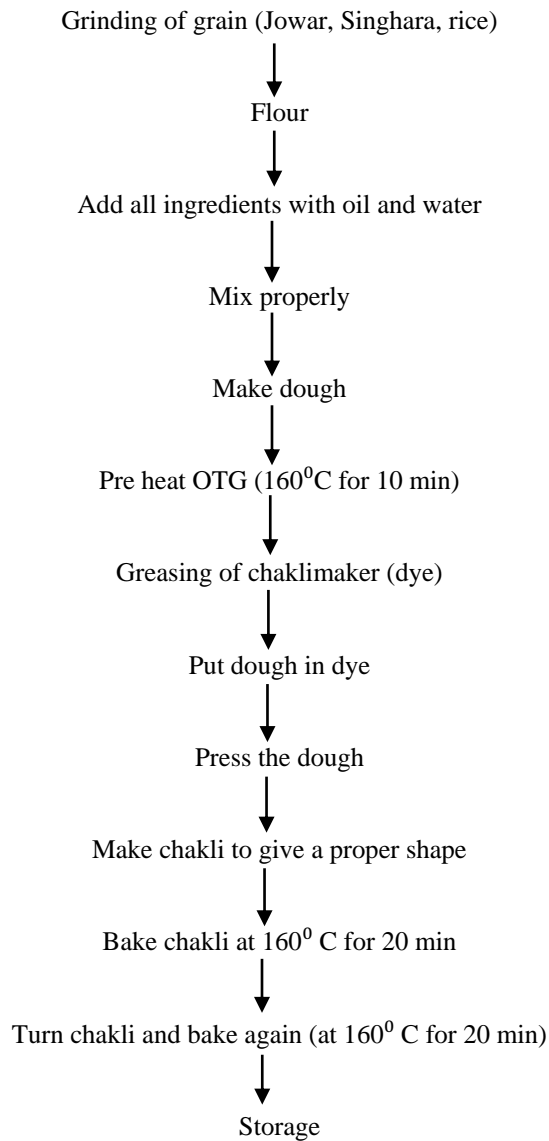
Method of Preparation of chakli

Ingredients

Water chestnut (Singhara) flour, Sorghum (Jowar) flour, Rice flour, Flax seed.

Spices

Red chilli powder, Salt, Turmeric, Amchur, Garlic powder, Onion powder, Oil

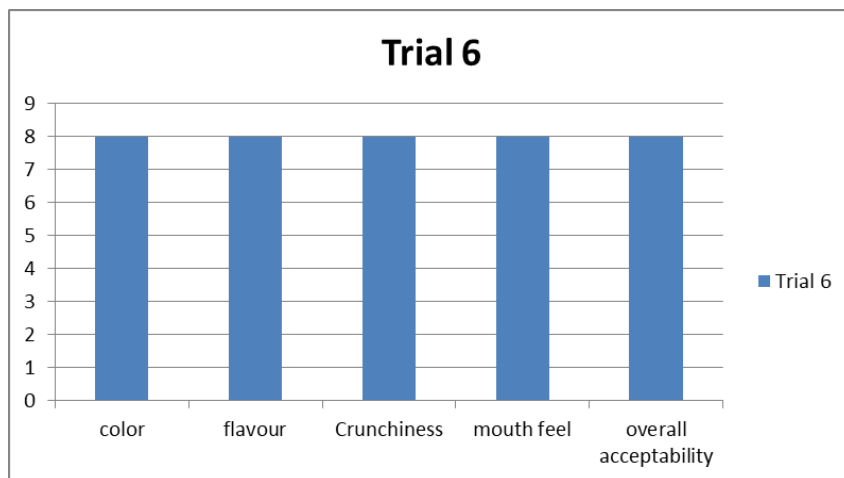
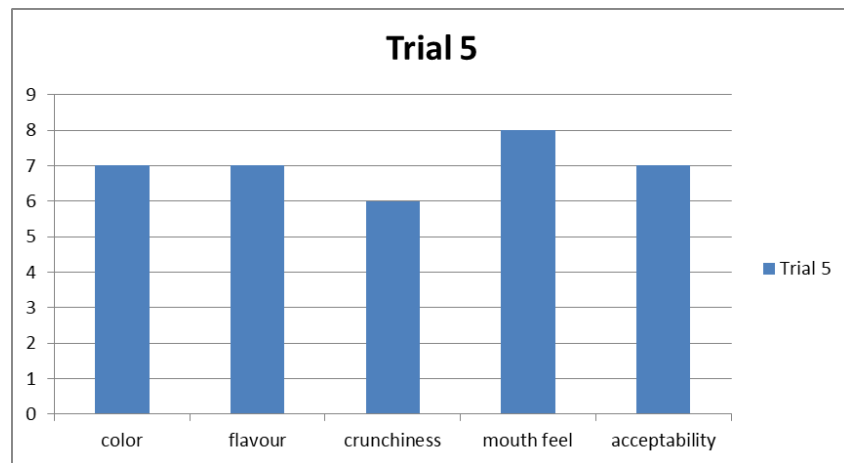
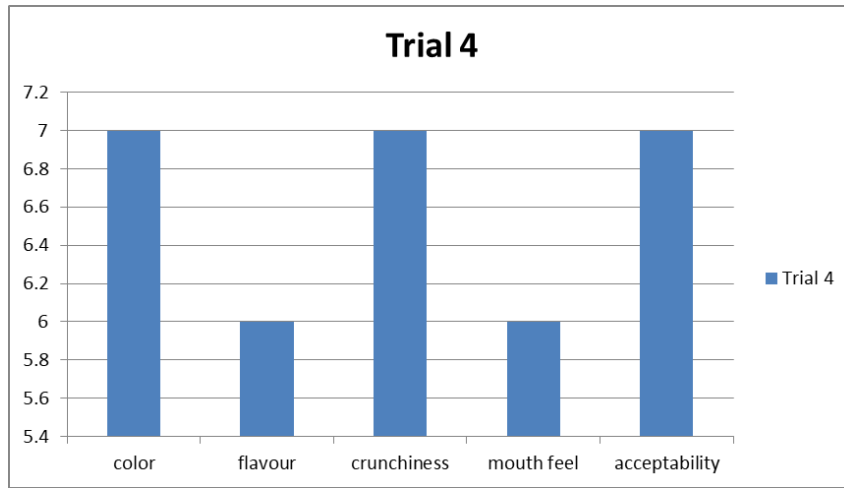
Flow chart of preparation of chakli**Nutritional value**

Trial	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Iron	Energy
6(Final)	10.052gm	4.756gm	56.05 gm	61.8 mg	251.68 mg	3.782 mg	304.04kcal

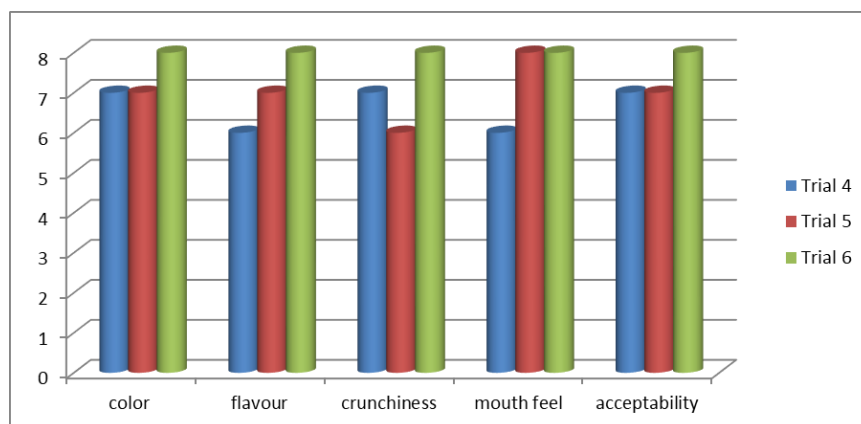
Sensory evaluation

Sensory evaluation of *chakkuli* is done by semi-trained panelists of department of centre for food technology, Jiwaji University. Hedonic scale (nine points) is used for

Sensory evaluation of product which have different sensory attribute like color, crunchiness (texture), flavor, appearance, aftertaste, overall acceptability.



Comparable data of best 3 trial





Result & Discussion

Many trials were formulated. Out of 6 trials T4, T5, and T6 were the trials which were concluded best in comparison to other and T6 was finalized. This innovation is mainly focused on sorghum, water chestnut & flaxseed as a therapeutic food. These ingredients are rich in antioxidants and help to reduce cardiovascular diseases, diabetes. Thus a baked chakli using above described ingredient was formulated & from various trial few trials fulfilled the needs of sensory evaluation. The result of hedonic scale showed that product was good in acceptability. In nutritional value Phosphorus, calcium & carbohydrate is high in chakkuli.

References

1. Cereal crops. Rice, Maize, Millet, Sorghum, Wheat. Prepared by Dr. Harold Macauley, director general of Africa rice. www.afdb.org
2. Sorghum. An underutilized cereal whole grain with the potential to assist in the prevention of chronic disease. Anita Stefoska-Needham, University of Wollongong, Eleanor Beck University of Wollongong, Eleanor Stuart K. Johnson Curtin University Linda C. Tapsell University of Wollongong, Itapsell.
3. Stoicescu I, Sirbu R, Pirjol TN, Cocia M, Balaban DP, Camelia B. *In vitro* antioxidant and antibacterial activity of *Trapanatans* aquatic plant from Danube delta area. Journal Academia Romana Rev Roum Chim, 2012.
4. Pharmacognostical evaluation and phytochemical studies on Ayurvedic nutritional fruits of *Trapanatans* L. Vandana Bharthi, Kavya B, Shantha TR, Prathapa Reddy M, Kavya N, Rama Rao V, Kalpeshkumar B Ishnawa, Venkateshwarlu G.
5. A study on antioxidant activity of some commonly used spices in India. Abdul Rasheed Md, veenavanimarka and prameela devi yalavarthy
6. Morris DH. Flax-a health and nutrition primer, 4th edn, 2007.
7. The cardiovascular effects of flaxseed and its omega-3 fatty acid, alpha-linolenic acid Delfin Rodriguez-Leyva MD PhD1, 2, Chantal MC Bassett PhD1, Richelle McCullough BSc1, Grant N Pierce PhD
8. Cunnane SC *et al.* High linolenic acid flaxseed (*Linum usitatissimum*): some nutritional properties in humans. Br J Nutr. 1993; 69:443-453.
9. Turmeric. The Golden Spice of Life Preeti Rathaur*, Waseem Raja, P.W. Ramteke and Suchit A. John
10. The Association of Hot Red Chili Pepper Consumption and Mortality: A Large Population-Based Cohort Study Mustafa Chopan*, Benjamin Littenberg.
11. Onion Dehydration. A Review Jayeeta Mitra & S. L. Shrivastava & P. S. Rao
12. Processing Conditions, Rice Properties, Health and Environment Poritosh Roy 1,*, Takahiro Orikasa2, Hiroshi Okadome1, Nobutaka Nakamura 1 and Takeo Shiina1,*
13. Rice In Health And Nutrition 1,2* Rohman, A., 3Siti Helmiyati, 3 Mirza Hapsari and 1Dwi Larasati Setyaningrum
14. Deepa G, Singh V, Naidu KA. Nutrient composition and physicochemical properties of Indian medicinal rice – Njavara, 2008.
15. Anderson JW. Whole grains and coronary heart disease: the whole kernel of truth. American Journal of Clinical Nutrition. 2004; 80:1459-60.