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PREPARATION OF FIBER RICH KHAKHRA USING BANANA PEEL AS A FUNCTIONAL INGREDIENT

Abstract:

The present study was planned to prepare khakhra by incorporating an edible waste i.e., banana peel powder, at different levels and also to check its sensory acceptability, nutrient content as well as the storage stability of khakhra.The banana peel powder was incorporated at 5, 10 and 15 % levels to khakhra. Results indicated that increasing the amount, increased the nutrient content.Increasingthe amount of banana peel powder in khakhra increased the soluble and insoluble fibre content. The khakhra containing 5% banana peel powder had the maximum acceptability .No change was observed in all types of khakhra till 21 days of storage at roomtemperature.

Key words: Banana, Banana peel, Antioxidant, Dietary fibre.

Introduction:

Food is one of the basic need for survival. Adequate food with good nutrition is requiredfor healthy living. Nutrition is a science of nourishing body. Properbalance diet provide nutrients which are required for normal growth, maintenance and repair of the body. This is done by providing adequate amount of calories, vitamin, avoidance of dangerous foods and attention to all source of fibre. Adequate nutrition requiredselection of the proper food whether snacking, eating outside from home.In early stages the focus of nutritional science had centred mainly on macro and micro nutrients such as proteins, fats, carbohydrates, minerals, vitamins and also on the indigestible component of diet i.e., ithasbeen considered that fibre has little impact on health. But recent research on nutrition shows the importance of fibre in health promotion and in management of specific disease. (Shrilakhsmi,1996).

Now a days the rapid increasein the burden of chronic diseases is anindicator of global public health. In developing countries, already 79% of deaths occursdue to chronic diseases,predominantly in middle aged men (WHO, 2002). On the bases of recent evidence, chronic disease risks begin in foetal life and continue into old age (WHO, 2002).The causes (risk factors) of chronic diseases are well known and well established; these risk factors are changeable and same in men and women i.e. eating unhealthy diet, less physical activity, use of tobacco. So, this type of common risk factors are responsible for development of the main chronic diseases.

People eat diet according to their cultural variety which emphasis people's health, growth and development. Martino et. al., (2013) reviewed on the roles of dietary fibres and nutraceuticals for primary prevention of cardiovascular disease from childhood.There are many health benefits of Dietary Fibre in childhood also.Research suggests that they may prevent obesity and lower blood cholesterol levels with a very good impact on the risk of future cardiovascular disease incidence.There are many observational studies in adults, which showed that the consumption of large amounts of DF is related with lower rates of CVD, stroke and peripheral vascular disease and the main causes of cardiovascular disease (hypertension, diabetes, obesity and dyslipidaemia) are less common in subjects with increased consumption of DF (Anderson ,2009).

Chronic diseases are long-term diseases that are not communicable disease and largely contrasting. They are the most common cause of death in the world and have a great impact on society, specifically diseases like obesity, diabetes, cardiovascular disease, cancer, dental disease, and osteoporosis. The risk of chronic disease may reduce by making improvement in diet and physical activity. The world's poorest nations facing the most ravage problems i.e. hunger and malnutrition which may leads even

death. Simultaneously, due to rapid changes in the food and living styles among certain population groups, many of these countries have seen an increase in chronic diseases, such as obesity and heart disease. (WHO / FAO,2003).

As Dietary fibre and whole grains contain a very good mixture of bioactive components including resistant starches, vitamins, minerals, phytochemicals and antioxidants. Various research regarding their powerful health benefits has received considerable attention in the last several decades. Epidemiological and clinical studies demonstrate that intake of dietary fibre and whole grain is inversely related to obesity, type two diabetes, cancer and cardiovascular disease (CVD). Recent research has come into existence to find out the dietary fibre and determine if increasing their levels in a diet is beneficial to human health.

After consumption of carbohydrate rich diet, soluble dietary fibre (DF) decrease postprandial glucose responses, as well as it lowers total and LDL cholesterol levels (Jenkins2000). As soluble DF has viscous and/or gel-forming properties it delayed the gastric emptying and macronutrient absorption from the gut.

Fruits and Vegetables are an important part of human nutrition, because they are good sources of nutrients, dietary fibre, and phytochemicals. As, it is uncertain whether the risk of certain chronic diseases can be decreased by increased consumption of fruits and vegetables.

Many researches had been carry out for finding out the relation between intake of fibre and its effect on particular disease like diverticulosis, fissure ,colon cancer, constipation, coronary heart disease etc. and all of them shows a natural relationship between fibre intake and suggested specific disease.

After citrus fruits, banana is the second largest produced fruit and contributing about 16% of the world's total fruit production. From the world's banana production, India is largest producer of banana and contributing to 27% of production.(Mohapatra et.al. 2010).Banana is highly nutritious and easily digestible fruit than many other. The time for digestion of banana fruit is less (105min) than apple (210min). Bananas are famous for aroma, texture and easy to peel and eat, also it is rich in potassium and calcium and low in sodium content (Sharrock et. al, 2000; Wall M. M. 2006; Anhwanget. al., 2008).Apart from that it is rich in carbohydrate, antioxidants like dopamine and minerals like potassium and calcium (Kanazawa and Sakakibara 2000; Mohpatra et. al., 2010). Banana also has antimicrobial and therapeutic properties. It is rich in ascorbic acid (4.5-12.7 mg / 100 g fresh mass), β – carotene (50-120µg /100g fresh weight), Citric acid and malic acid, which can act synergistically as flavour producer when added to fruit juices and other finished products (Mohpatra et. al., 2009, 2010).

As banana peel, is an underutilized source of phenolic compoundsand it is a good source of antioxidants for foods andfunctional foods against cancer and heart disease. The Polyphenolic content in banana peel ranges from 0.90g – 3.0g /100 g dryweight(Nguyen et. al., 2003). The fruit peel of the contains different antioxidants compounds such as gallocatechin (Kanazawa and Sakakibara, 2000) and dopamine (Someya et. al., 2002). Banana peel contain higher amount of Total Phenolic Content (TPC) and Total Flavonoid Content (TFC) value than those of banana pulp. Apart from that green banana showed higher TPC and TFC values than those of ripe fruit. Radical scavenging activities (inhibition of DPPH) of the extracts ranged from 26.55 to 52.66 %.(Fatemeh et. al., 2012).

Out of the total weigh of fresh banana (Tchobanoglous,G., et.al., 1993) the peel contains about 40% and has been remain underutilized. According to the criteria designed by the National Cancer Standard Institute, banana peel extract is classified as non – toxic to normal human cells; therefore, it can be safely utilized as a natural source of antioxidants (Someya et. al., 2002).Banana peel is a rich source of starch (3%), crude protein (6-9%), crude fat (3.8 – 11%)(Emaga T H. et. al.,2008), total dietary fibre (43.2 – 49.7%) and polyunsaturated fatty acids,particularlylinoleic acid and α – linolenic acid , pectin, essential amino acids (leucine, valine, phenylalanine and threonine), and micronutrient (K, P, Ca, Mg) (Emaga T. H., 2007).Except for lysine, content of all essential amino acids are higher than FAO standard.

For the success of small farm operations complete fruit crop utilization is a key factor. Excess fruit crops can be used to create many value-added products. Now a days in many countries banana peel is either used as fertilizer or discarded (Zhang et al. 2005). As banana peel is rich in pectin content (99-22%) a number ofnon-conventional product can be produced from thatwithout incorporation of any gel additive. Standardized and developed jellies from banana peel are considered to be nutritive as well as health-beneficial (Lee et. al., 2010).

Thus the present study was planned to prepare khakhra by incorporating an edible waste i.e., banana peel powder , at different levels and also to check its sensory acceptability, nutrient content as well as the storage stability of khakhra.

Materialsand methods:

Wheat was purchased from local marketof Vallabh Vidyanagar. It was then cleaned and ground to prepare wheat flour. Banana was purchased from local market of Vallabh Vidyanagar. Banana peel was dried in a dehydrator at 70º cfor 24 hours and ground into powder form. The powder was incorporated into khakhra at different levels (Table 1). A composite scoring test was used to carry out the sensory evaluation. (Shrilakhsmi, 1996).

Khakhra preparation:

Wheat flour was sieved. Salt, jeera, Coriander powder and oil were added to it. Soft dough was made and thin khakhra was rolled. Khakhra was roasted till they become pink and crispy.Dry banana peel powder was incorporated at 5%, 10 % and 15% level to the wheat flour for preparing banana peel khakhra.

Table 1: Composition of banana peel khakhra:

Sample	Wheat flour(g)	Banana peel powder (g)	Salt (g)	Jeera powder (g)	Coriander powder (g)	Chili powder(g)	Cottonseed oil (g)
Sample 1	75.6	5	1.4	2.8	2.8	2.4	10
Sample 2	70.6	10	1.4	2.8	2.8	2.4	10
Sample 3	65.6	15	1.4	2.8	2.8	2.4	10

Sensory Evaluation:

Sensory evaluation of banana peel khakhra was carried out by using composite scoring test by a team of six panel members. Organoleptic qualities studied were colour and appearance, flavour, texture and overall acceptability.

Storage stability:

Storage stability of Khakhrapacked in a polythene bag was checked for their taste and aroma at 7^{th},$14^{th,}$ 21^{st} and 28^{th} day of storage.

PARAMETERS STUDIED:

Following parameters were estimated from the product:

1 Moisture(AOAC 1984)
2 Fibre (Kit no. TDF 100 A.-The method based on the official method of chemistry and analysis of the AOAC 1984).
3. Sensory Evaluation and storage stability using Composite Scoring test(Shrilakshmi, 1996).

4. Storagestability

Results and disccusion:

Table2: Soluble and insoluble fibre content of banana peel powder and wheat flour:

	Banana peel powder	Wheat flour
Soluble Fibre (g %)	18.89 ±00.56	0.04 ±0.00
Insoluble fibre (g %)	22.78 ±00.37	0.49 ± 0.20

Fig.01:

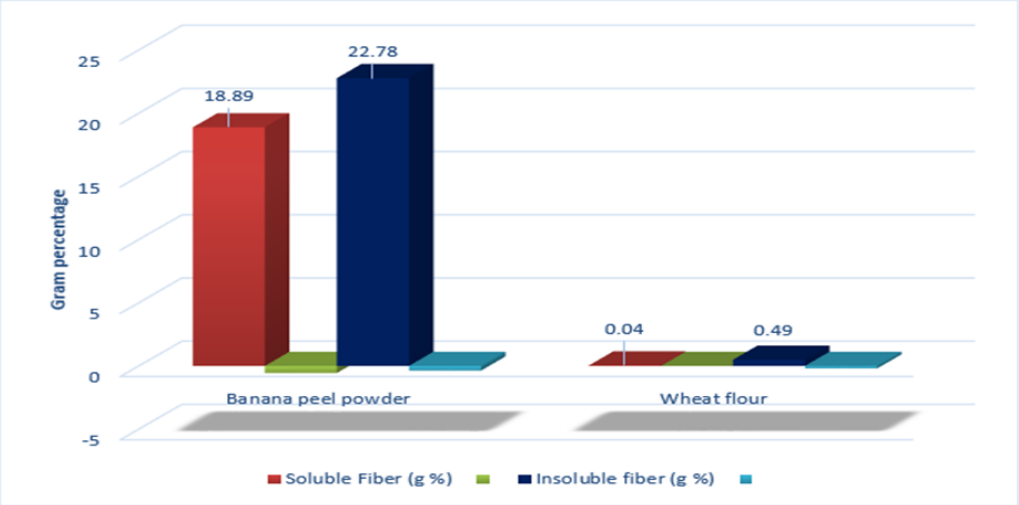


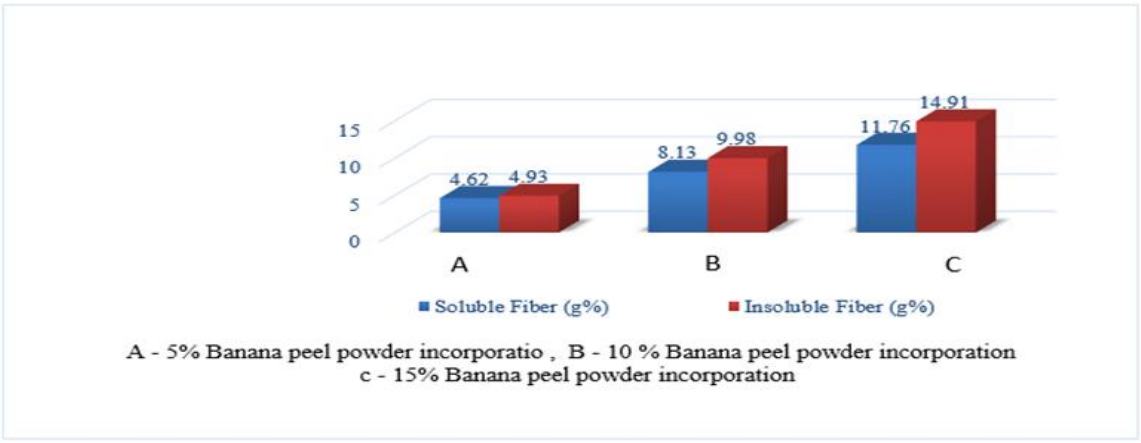
Table. 1 shows the soluble and insoluble fibrecontent of banana peel powder and wheat flour. Banana peel powder was found to contain 18.89 gm. % of soluble fibreand 22.78 gm. % of insoluble fibre. Wheat flour had a soluble fibre content of 0.04 gm. % while the content of insoluble fibre was 0.49 gm. %. (Fig. 1).

Table 3: Dietary fibre content of banana peel khakhra

Sample	Soluble Fibre (g %)	Insoluble Fibre (g %)
Sample 1 (5% Banana peel powder incorporation)	4.62	4.93
Sample 2 (10% Banana peel incorporation)	8.13	9.98
Sample 3 (15 % Banana peel incorporation)	11.76	14.91

Table.2 shows the dietary fibre content of banana peel khakhra 5% banana peel powder khakhra had the least soluble fibre (4.62 gm.%) while 15% banana peel powder khakhra had highest amount of soluble fibre (11. 76 gm.%). Khakhra containing 10 % banana peel powder showed a soluble fibre value of 8.13 gm. %. Insoluble fibre content of khakhra containing 5,10and 15 % banana peel powder was found to be 4.93, 9.98 and 14.91 gm. %, respectively. This shows that increasing the level of banana peel in the khakhra, the soluble as well as insoluble fibre content of khakhra also increased. (Fig. 2)

Fig.02: Dietary fibre Content of banana peel khakhra:



A - 5% Banana peel powder incorporatio , B - 10 % Banana peel powder incorporation
c - 15% Banana peel powder incorporation

Table4: Sensoryattributes of banana peel khakhra.

Sample	Colour and appearance	Flavour	Texture	Overall acceptability
A (5% Banana peel powder incorporation)	7.39 ±0.19	7.33 ±0.25	7.42 ±0.20	7.42 ±0.17
B (10 % Banana peel powder incorporation)	6.67 ± 0.29	7.14 ±0.22	7.22 ±0.23	6.94 ±0.28
C 15 % Banana peel powder incorporation)	5.53 ±0.35	6.39 ± 0.37	6.47 ± 0.30	5.97 ± 0. 36

Mean of three trials ± SEM

Table no. 3 depicts the results of sensory evaluation of banana peel khakhra. Khakhra containing 5% banana peel powder had the maximum overall acceptability while khakhra containing 15 % banana peel powder had the least overall acceptability. This can be attributed to the fact that the colour .appearance, flavour and texture of khakhra containing 5 % banana peel showed maximum score as compared to the khakhra containing 10 % and 15 % banana peel powder.

No change was observed in any of the sensory characteristics of khakhra containing 5 and 10 % incorporation of banana peel powder to khakhra resulted in the change in the taste of khakhra i.e. a slight bitter taste was developed which may be due to more quantity of addition of banana peel powder to the khakhra.

Conclusion:

Sensory evaluation showed that khakhra prepared by incorporating banana peel powder at 5% level had the maximum overall acceptabilityKhakhra prepared by the addition of 5%, 10% banana peel powder did not show any change in any of the sensory characteristics but 15% level of incorporation showed slight bitter taste.

The dietary fibre content of 15% banana peel powder khakhra had highest amount of soluble fibre (11. 76 gm. %).The highest amount of insoluble fibre content was present in the khakhra containing 15% of banana peel powder(14. 91 gm. %).

Thus it can be concluded, Khakhra containing banana peel powder would be beneficial to patients suffering from constipation, heart disease and diabetes because of its high content of soluble fibre.

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