Original Research Article   https://doi.org/10.20546/ijcmas.2021.1007.012

Studies on Physico-chemical Analysis of Bajra (*Pennisetum glaucum*) used for Formulation of Cookies

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A B S T R A C T

The present investigation was carried out to study the Studies on Physico-chemical Analysis of Bajra (*Pennisetum glaucum*) used for formulation of Cookies During present work, physico-chemical properties of bajra and bajra fortified cookies were investigated. Bajra was investigated for its physical quality parameters, chemical, mineral attributes and functional attributes. The efforts were also made to develop the technology for formulation and process standardization of bajra fortified cookies. The results obtained during present investigation are presented and discussed with respect to experimental data obtained during the course of study and relevant information available in scientific literature under suitable headings and subheading.

Introduction

Pearl millet/ bajra (*Pennisetum glaucum*) is the most widely grown variety among all millets in India. It is highly suitable for cultivation in semi-arid zones. It is a highly nutritious coarse cereal grain. Bajra ranks third after rice and wheat, and is a major source of dietary energy and nutritional security for the rural population in many parts of India. It has high levels of protein with better amino acid balance than other major cereals such as rice, wheat and maize. It also has high levels of fat content, dietary fibre, and several minerals, including iron and zinc. Studies at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, have shown large availability of Iron and Zinc in Bajra i.e. iron content varying from 42 to 67 mg/kg and zinc content varying from 37 to 52 mg/kg in different cultivars. Grant Thornton India Llp (2016).

Millet's are high energy, nutritious foods comparable to other cereals and some of them

are even better with regard to protein and mineral content. They are particularly rich in dietary fibre, iron, calcium and B vitamins. Though millet's have diversified high food value, their consumption has declined as compared to other cereals like rice, due to change in the life style. In recent years, there has been growing demand for functional bakery products because they are generally perceived as healthier than their counterparts. Millet, being the staples for the poorer sections of population could be the choice of fortification. Being comparable and even superior to many cereals in terms of mineral and micro-nutrient contents, the major use of minor millet's as food has remained only in the area where it is cultivated and to the traditional preparations. These millet's have good potential of providing nutritional security to the consumers (Kanchana *et al.,* 2018).

Original definition of cookies is called as "little cakes," cookies are made up of sweeten dough or batter and baked can be eaten out-of-hand. Cookies are of different types it is depends on method of preparation they are as of drop method, molded, pressed, refrigerated, bar and rolled methods. History the word cookie originally came from the Dutch "keokje" meaning "little cake." In addition, the Dutch first popularized cookies in the United States. In 19th century British took a liking to them by incorporating into their daily tea service and calling them biscuits or sweet buns, as they do in Scotland. (Blessy *et al.,* 2017)

The bakery industry in India produces bread, biscuits, cakes, buns in lake of tones annually in which the share of biscuits is highest. Biscuits, cookies industries are generally facing a problem of nutritional value as cookies are low. An approach was made in the present study, to replace the wheat flour in cookies by bajra flour (low gluten flours) in

order to increase the protein, fibre and other nutrients. Keeping the above views, the present investigation has been developed to prepare nutrient rich cookies.

Materials and Methods

Bajra procured from local market of Aurangabad. Chemical required for analysis Bajra and cookies used from Department of Food Chemistry and Nutrition,

MGM College of Food Technology, Aurangabad. Proximate composition of Bajra and cookies was examined according to Official Methods of Analysis of A.O.A.C. (1990).

Analyses and Finding

Physical characteristics of bajra

The knowledge of physical properties of seeds helps in development of processing technology. In order to characterize various physical characteristics of Bajra viz., 1000 kernel weight, bulk density, true density, porosity etc. were investigated and data on these physical properties are depicted in table 1.

The colour of bajra was generally with light brown to grayish in colour. The result of length, breadth, and thickness was measured using vernier digital caliper as 2.95mm, 2.45mm, and 1.95mm respectively. The geometric mean diameter and arithmetic mean diameter of bajra were obtained as 2.80mm and 2.75mm respectively. The test weight of bajra was found to be 740gm. The lesser the moisture content, the lower the thousand kernel weight as per that the result of 1000 kernel weight was 167.26gm observed. The test weight and thousand kernel weight help in the simulation and design of food processes, which also gives information about the

product quality. Bulk density of bajra grains was observed 350kg/m3, bulk density is an essential factor that determines the grade and test weight of grains during drying, storage, and processing. The true density or particle density of bajra grains was observed to be 1520.8kg/m3. The result showed of percent porosity was bajra grains were 41.16. The porosity increases with an increase in the moisture content of grains which will affects the quality of product. The results obtained for various physical properties of bajra are more or less similar to the findings given by Ramashia *et al.,* (2018).

Chemical composition of Bajra

The result pertaining to chemical characteristics of bajra grains were presented in following table 2. Proximate analysis were carried out as moisture, ash, fat, protein, carbohydrates, crude fiber etc of bajra grains. Moisture content and ash content of bajra grains were recorded as 6.75 percent and 1.63 percent respectively. The results obtained for moisture content of bajra are more or less similar to the findings given by Ramashia at et.,(2018). Carbohydrate content of bajra grains was found to be 74.35 percent. Protein content was found to be 10.23 percent. Fat and crude fiber was found to be 4.21 percent and 3.21 percent respectively. Carbohydrate protein fat findings were more or less similar to the Anubha M. and Uttara S. (2017).

Mineral Analysis of Bajra

Pearl millet contains various essential micro nutrients needed by the body. Overall mineral content of pearl millet is 2.3 mg/100g. It is rich in B-vitamins, potassium, phosphorous, magnesium, iron, zinc, copper and manganese. Calcium concentration in pearl millet is quite low. Analysis of mineral content of bajra was showed in following table No 3. Mineral content was carried out for analyzed of calcium and irons. Calcium and iron content of bajra grains were found to be 2.72% and 16.14% respectively. Calcium % was carried out with the help of flame photometer and iron content was analyzed by the Spectrophotometer.

Formulation of bajra fortified cookies

Formulation was prepared by blending whole wheat flour and bajra flour in different proportions. Following table No 4 depicted different combinations of whole wheat flour and bajra flour which were as (25, 50, 75) for the formulation of cookies respectively. Where C1 represented as control which means 100gm of Whole wheat flour without addition of Bajra flour. BC2 was fortification of 25gram of bajra flour with 75gm of whole wheat flour. BC3 made from combination of 50gm:50gm ratio of bajra flour with whole wheat flour. Formulation of BC4 was developed as 75gm of of bajra flour and 25gm of whole wheat flour. These all variations followed by stand recipe of cookies.

All the variation of bajra fortified cookies were selected for further study on the basis of organoleptic evaluation and the traditional recipe was again formulated by addition of bajra flour (25, 50, 75) and whole wheat flour as (75, 50, 25) to improve the organoleptic quality attributes and also for enhancing the consumer acceptability towards nutritional means. These were compared with control sample as whole wheat flour.

Table.1 Physical characteristics of bajra

Sr.No	Physical parameter	Average value
1.	Length(mm)	2.95±0.02
2.	Breadth(mm)	2.45±0.50
3.	Thickness(mm)	1.95±0.05
4.	Geometricmean diameter	2.80±0.10
5.	Arithmetic mean diameter	2.75±0.01
6.	Test weight(gm)	740±1
7.	Thousand kernel weight(gm)	167.26±2
8.	Bulk density(kg/m^3)	350±1
9.	True density/Particle density(kg/m3)	1520.8±1
10.	Porosity(%)	41.16±0.5

Table.2 Chemical composition of bajra

Sr. No.	Chemical characteristics	Average values
1.	Moisture (%)	6.75±0.1
2.	Ash(%)	1.63±0.05
3.	Carbohydrate(%)	74.35±0.2
4.	Protein(%)	10.23±0.5
5.	Fat(%)	4.21±0.2
6.	Crude Fiber(%)	3.21±0.1

Table.3 Mineral content of Bajra

Sr.No.	Chemical characteristics	Bajra
1.	Calcium (mg)	2.72
2.	Iron (mg)	16.14

Table.4 Formulation of recipe for preparation of bajra fortified cookies

Ingredients	Whole Wheat Flour (g)	Bajra Flour(g)	Sugar (g)	Fat(g)	Baking Powder(g)	Baking Soda(g)	Sodium chloride (g)
C1	100	00	40	50	2	2	0.8
BC1	25	25	40	50	2	2	0.8
BC2	50	50	40	50	2	2	0.8
BC3	75	75	40	50	2	2	0.8

The present study concluded that Bajra contain good source of energy, starch, protein, fibre and other essential nutrients which could be of benefit to humans. This study suggest that Bajra could be utilized as partial replacement in common cereal for

development of cookies and other bakery product, as source of energy and can also contribute to the improvement of nutritional status of prepared cookies.

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