Impact of ingredients and raw material on flat bread quality

(Report)

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CERTIFICATE

This is to certify that **Sanaullah Sana** (Registration No.11714658) has personally completed review paper entitled, **"Impact of ingredients and raw material on flat bread quality"** under my guidance and supervision. To the best of my knowledge, the present work is the result of his original investigation and study. No part of dissertation has ever been submitted for any other purpose at any University.

The dissertation report is appropriate for the submission and the partial fulfillment of the conditions for the evaluation leading to the award of Master of Food Technology.

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DECLARATION

I hereby declare that the work presented in the Dissertation 2 report entitled **"Impact of ingredients and raw material on flat bread quality"** is my own and original. The work has been carried out by me at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India: under the guidance of Dr. Anil Panghal, Associate professor (Food Technology) at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India, for the award of Degree of Master of Science in Food Science and Technology.

Date:

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I certify that the above statement made by the student is correct to the best of the knowledge and belief.

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1. Introduction

In India, Afghanistan, North Africa, Middle East and many other numbers of countries, majority meal of population depends to flat bread (Akanksha, et al. and Amarjeet et al. 2016) Bread is not only as a good source of carbohydrates but it is transferable and compressed and it became important part of diet since thousands years. Flat bread can prepare from different ingredients but the main ingredients are formed by wheat flour, yeast, water, and salt , also can fortify or enrich with other foods sung as sweet potatoes and wheat brain to increase nutritional value.(Al-Saqer et al. 2000; Hsu et al. 2004). The flat bread specifies in to two major groups, single and double layered. In Middle Eastern and African countries two layer flat breads are widely used, and these breads are increasingly becoming popular in western countries. Two layer flat bread is commonly produced from high extraction flour and making it widely acceptable as high dietary fiber food. (Izydorczyk et al. 2008). Flat breads are can be leavened and unleavened and risen by a process of yeast fermentation, due to this barbari, lawash, etc. are classified as leavened one single layer, flat bread and parotta are classified as unleavened one single layer bread, flat bread and Arabic or pitta, baladi, etc. are two layered flat bread. (Shalini et al. and Laxmi, et al. 2007).Flat breads are usually consumed freshly baked and produced at home (traditionally) and at bakeries (commercially).The formation of flat bread is different in each area, but the basic ingredient of flat bread is same. (Mondal, et al. and Datta, et al. 2008) The main ingredients of flat breads are flour, salt, yeast and water which are used in different types of flat bread in several countries because that the mentioned four main ingredients are the fundamental pillars of any types of flat bread recipe. But for different purposes some other ingredients such as butter or oil, sugar, nigella seed. sesame, and different types of grain flour are added. By adding of ingredients such as butter, non-fat dry milk and vegetable may be enhancing taste and aroma but the quality of bread is partly related to initial selected raw material. (Srivastava, et al. and Meyer, et al..2002). Flat bread is simple bread made from dough of flour, salt, yeast, water, and other optional ingredients. The manufacturing of flat bread require specific characteristics in flour and dough, optional ingredients may be added for processing help which are have essential role particular in the bread making process. To improve the quality and fortify to have more nutritive value bread, milk, egg, honey powder, oil, butter, skim milk powder, other cereals flour such as dates, sorghum, barley, rice, corn, dried fruits such as cassava, green banana, sesame, flaxseed, black seeds, and dried of fresh herbs may be added to the bread making recipe Addition of vitamins. protein, minerals and fibres are the most commonly additive ingredients to fortify flat breads. (Al-Dmoor et al 2012). Freshly some of baked flat bread is soft and elastic, when kept at room temperature, it stale within few hours become strict and hard for example chapattis are generally baked twice per day, for lunch and dinner and should eaten immediately after baking. Because they rapidly become hard and difficult to chew. (Shalini and Laxmi, 2007).

2. Problem and background

The people are needed for breads with health benefits, high quality and superior sensory properties. Consumption of flat bread from wheat flour is very famous, but wheat flour which is the most essential ingredient used for preparation of different types of flat bread contain lower nutritional quality protein, to compare with milk, soya bean, pea and other ingredients, also wheat protein is deficient in some essential amino acids such as lysine and threomine. Recently bread consumers are aware of the need to eat high quality and healthy bread which can name as functional food, Functional foods are contain ingredients which provide health benefits further the basic nutritional requirement is increasing. Therefore prepared bread of whole grain flour and other functional ingredients also known as health bread of functional foods.

By increasing of information regarding healthy bread, on consumption of bread containing whole grain, multi grain or other functional ingredients, will increase. I will combine the different nutritional ingredients to prepare the bread as functional, it will contain high nutritional quality which can get all poor people to complete their body nutrient deficiency specific in third world countries to prevent the martially of those poo people who are not able to get other functional foods for their body necessity.

3. Literature review

The increasing of information about consumption of functional foods, the bakery industries are attempt to bake bread with different ingredients as functional food, because bread form the main diet of many countries population. Breads containing whole grain, multi grain or any other type of functional ingredients especially from legumes increasingly being more important in the bakery industry. (Dewettinck, 2008). The bread prepared from soy content high protein, therefore this bread had nutritional importance in most developing countries such as Nigeria the people can obtain hardly high proteinous foods because of the expensive costs. Therefore it needs to increase the nutritional value of breads with combination of access ingredients to offer for any consumer bread with health benefits and rich of nutrients. The purpose of this study to prepare the develop functional breads from whole wheat flour with other composite flours and evaluate the nutritional value, baking properties, quality and overall acceptability.

Table 1, types of flat breads with usage countries and ingredients. (Parimala et al. and Sudha et al. 2013, Al-Dmoor et al. 2012).

Country	Type of bread	Name of bread	Main ingredients
Afghanistan	Flat bread	Tannour, naan	Wheat flour or refined flour, water yeast, salt
	Flat bread	Kulcha	Same ingredients, oil, milk, sugar, egg.
Armenia	Paper thin	Lawash	Wheat flour
Egypt	Flat bread	Aish Merahrah	Prepared from fenugreek seeds and maize, wheat flour, yeast, salt.
	Pocket bread	Baladi	Whole wheat flour and wheat flour
India	Flat bread	Chapatti	Wheat flour or refined flour, water, salt
		Roti	Same ingredients
		Parotta	same ingredients and baked in oil
Iran	Persion flat bread	Sangak	Wheat flour
	flat bread	Barbari	Whole wheat flour
	single layer bread	Lavash	Wheat flour
Norway	Flat bread	Lefse	Wheat flour, potato, milk and cream

Other Asian countries	Flat unleavened bread baked in tandoor	Chapatti Roti	Whole wheat flour, salt, water, Same ingredients, refined flour
	Leavened flat bread	Naan	Same ingredients, yeast, oil,
Russia	Thin pancake	Blintz/blini	Wheat flour
Italy	Elongated white bread, flat like	Ciabatta	Whole wheat flour, yeast
South and central America	Unleavened flat bread	Arepa Tortilla	Cornmeal Corn flour with wheat flour
Mali	Flat bread	Ngome	Millet, water, and vegetable oil
middle east comprise	Fermented flat bread	Pita	Wheat flour, yeast, water, salt
Sirilanka	Flat bread	Bhatura	Same ingredients, oil, yogurt,
Thailand	Flat bread	Khanom buang	Rice flour
Turkey	Flat leavened bread	Chickpea bread	Wheat flour, chickpea flour, yeast

Tannor bread

Lawash bread Chapatti

Figure 1, shows some popular flat bread

4. Flat bread making procedure

Flat bread preparing from flour, water, yeast, salt, and some other optional ingredients, Adding of ingredients may be used for different aims, especially in bread making recipe different ingredients used for purpose of quality improving and nutritional value of bread. (Al-Dmoor, et al. 2012).

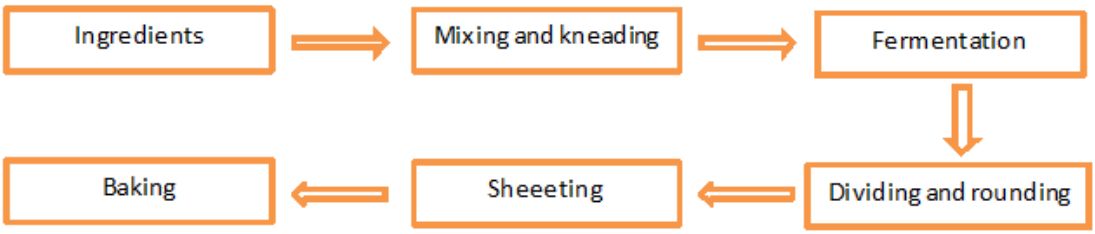

Figure 2, flat bread making procedure

5. Materials and ingredients

1.5. Flour

Flour is the body of any types of flat bread, it prepare the substance as well for leaven, the common used flour for making of bread is made of wheat flour, the wheat seeds harvested, dried and by grinding or milling make flour. The peel of the grain is removed before grinding. (Floyd et al. 2011). Flour is the important ingredient for any type of bread; it gives to bread good shape and structure. During the mixing of flour with water the existence protein of flour interact together and form gluten, this new formed compound give to dough elasticity property and ability to expand against production of carbon dioxide gas by leavening agent (Tavakolipour, et al. and Kalbasi Ashtari et al. 2007) the differential percentage of protein

related to the types of wheat flour, soft wheat flour contain lower protein percentage and it is suitable for baking of cakes, pastries and quick breads for their sensor texture, but hard wheat flour contain high percentage of protein and this type flour desirable for yeast breads. (Mutlu, H., 2003). The component percentage of wheat flour composition are mentioning as: starch (70–75%), moisture (12-14%), protein (10-12%), lipid (2%) and nonstarch polysaccharides (2-5%) in particular arabinoxylans. (Goesaert, and Brijs 2005).

Types of flour

- Whole wheat flour
- Refined flour
- Variety flour
- Composite flour
- Banana peels flours
- Chickpea flour
- Oat flour
- Flaxseed flour
- Green banana flour
- Cassava flour
- Soybean and barley flour

2.5 Water

Water is an essential component of flat bread in baking products; water is adding to flour during mixing it helps for homogenize mixing of dough components and gives a desire viscos elastic structure, (Elgun et al. and Ertugay, et al. 1995), The increasing of water decrease the consistency of dough, increasing of water from 50 to 74% effected on reduction of dough consistency. The 50% added water effected more greater than 74% water on hydration time, that means the high percentage of water has negative effect on hydration time and total energy. (Farahanaky, and Hill et al. 2003).

3.5 Salt

The word of salt in baking formulas refer to sodium chloride, salt is one of the basic components of flat bread, it used in an appropriate amount to get high quality bread, (Boyacioglu, et al. 1999). The role of salt in baking is stabilizing yeast fermentation rate, strengthening dough, increasing the dough mixing time and enhancing the flavor of the final product. Bread with fewer levels of salt 0.3 and 0.5% is no significant to have technological difference with bread contain of 1.2% salt with ratio to moisture content and specific volume.

The deletion of salt has remarkable changes regarding particle structures and rate of stalling after 3 days storage. (Lynch and Arendt 2009)

4.5. Yeast

Flat breads are prepared of leavened, (have a raising agent of yeast or sourdough) or unleavened (Qarooni, et al. 1996) the product of yeast fermentation is carbon dioxide and ethanol. One of the methods for leavening in bakery is yeast (Saccharomyces cerevisiae), when yeast added during dough preparation the starch is converted to sugar, alcohol and carbon dioxide. Some chemical leavening agent also used in bakery which called soda and it is more useful because of low cost and easy of transportation.(Bellido, et al. 2009). The metabolize of simple and maltose and converting to carbon dioxide caused the dough to rise so bread will take light and airy form. This characteristic makes yeast important ingredients for production of bread, normally 2% yeast added into 100% of wheat. (Mondal and Datta, 2008)

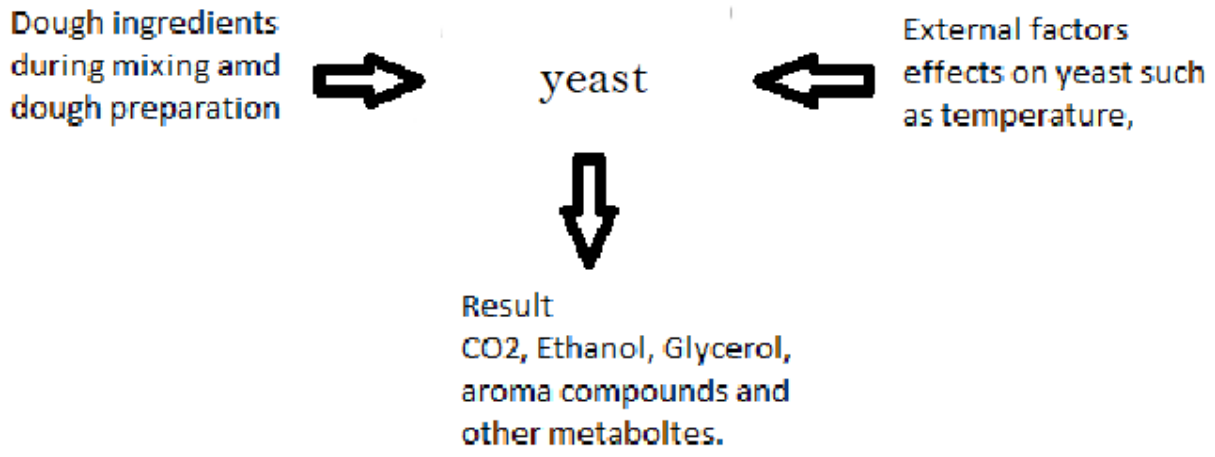

Figure 2. Dough fermentation process (Hemdane, et al. 2016)

6.5. Optional ingredients

These ingredients are used for different purpose, used for giving flavor, quality improving, giving more nutritional value for flat bread and also used to support the leavening agents. (Al-Dmoor et al. 2012)

- Sugar and honey
- Butter, oil and egg
- Olive oil
- Milk

6. Objective of study

1- To analyses the nutritional value and functional quality of flat bread.
2- Physic-chemical analysis of flat.
3- To estimate the acceptable replacement percentage of wheat flour with some other type of flour.
4- Optimization of different for multigrain flat bread.
5- To formulate and develop functional bread from whole wheat composite flour.

7. Proposed methodology

Flat bread will be prepared by using wheat flour with composite flour of different ingredients. Which already mentioned.

1.7. Physical analysis of grains:

To assess the physical properties of grains, (1000 grains weight, porosity, bulk density, true density, length, size) are necessary. Physical analysis indicate about the grains health (sound, plumpy, free from damage, healthy, bulk density, true density, and thousand kernel weight (if more) indicates that the grain is healthy. physical properties of grains such as size, shape, 1000 kernel weight, bulk density, true density, and porosity are useful for their processing and storage. They are important parameters for grading and pricing of the product.

1000 kernel weight: 100 grains are collected manually or grains are spread on counting plate with 100 dents equal to the size of the grain. Grains are carefully spread over the counting plate so that all the dents are filled. Extra grains are removed from the plate the weight of these grains is noted by weighing on an analytical balance. Repeat the experiment at least ten times and then report the average value.

Bulk density: Bulk density determination take a measuring cylinder of 1000ml capacity and fill it with grains for which density is to be measured. The measuring cylinder should be filled to its highest mark. Adjust the level of grains by repeated tapping take the weight of these grains in a digital/analytical balance. Repeat the reading five times.

True density: For true density determination, take 10 grains randomly from the lot. The exact volume of these grains is found by liquid displacement method. For this take a 100 ml capacity measuring cylinder and fill it with toluene to a predetermined level. Drop randomly selected 10 grams in the cylinder and notes the change in volume accurately. This gives the volume of 10 grains. Now weigh these 10 grains in analytical balance/digital balance

General calculation

Thousand kernel weight = weight of 1000 grains

$$Bulk\ density\ \left(\frac{g}{ml}\right) = \frac{weight\ of\ 10\ grains}{volume\ of\ grains}$$

$$True\ density\ \left(\frac{g}{ml}\right) = \frac{weight\ of\ 10\ grains}{volume\ of\ 10 grains}$$

$$Porosity = \frac{true\ dinsity - bulk\ dinsity}{true\ dinsity}$$

$$Porosity(\%) = \frac{1\text{-}\,\text{bulk dinsity}}{\text{true dinsity}} \times 100$$

2.7. Physicochemical analysis

- **Moisture content**

Moisture content of flour is an important parameter. It gives an idea about shelf life and milling conditions. The water is present in two forms free form and bound form. The free form of water is water which is freely available for the microbial growth and leads to spoilage of product and decrease the shelf life of the product. In bound form water is not available for microbial growth.

Calculation:

$$moisture\ contain\ (\%) = \frac{initial\ weight - final\ weight}{weight\ of\ sample} \text{x}100$$

- **Fat content**

Take sample of bread into a dry thimble. Petroleum ether will be used to extract with the boiling range of 60-80˚C for 6-8 hours. The fat extract will be collect in a weighed dry round bottom flask, separated from the solvent by evaporating over a hot water bath. The flask will be dry in an oven at 80-100˚C and cooled till constant weight is obtained (S. Butool and M. Butool., 2013).

Calculation:

$$Fat\ contain\ (\%) = \frac{iW4 - W1}{W3 - W2} \text{x}100$$

W1: weight of empty flask.

W2: weight of empty thimble.

W3: weight of thimble + sample.

W4: weight of flask + oil.

Protein content

Ground the powder place sample (accurately weighed) in a Kjeldahl flask, Add acid and catalyst digest until clear to get complete breakdown of all organic matter.

$$protein(\%) = \frac{sulfuric\ acid}{heat\ catalyst} = (NH4)2SO2$$

Dilute digest with water add sodium thio-sulfate to neutralize the sulfuric acid. The ammonia formed is distilled into a boric acid solution containing the indicators methylene blue and methyl red (AOAC Method 991.20).

Calculations:

Moles of HCl = moles of NH_3 = moles of N in the sample

A reagent blank should be run to subtract reagent nitrogen from the sample nitrogen.

$$N(\%) = NHCl \times \frac{\text{corrected acid volume}}{g\ of\ sample} \times 14g\ \frac{N}{mol} \times 100$$

Where: NHCl = normality of HCl, in mol/1000ml

Corrected acid volume. = (ml std. acid for sample) – (ml std. acid for blank)

14 = atomic weight of nitrogen A factor is used to convert per cent N to per cent crude protein. Most proteins contain 16% N, so the conversion factor is 6.25 (100/16 = 6.25). %N/0.16 = %protein or %N×6.25 = %protein. (Kjeldahl Method).

- **Ash content**

To determine the inorganic residues present in gain samples. Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food.

1) Note the tare weight of three silica dishes. Accurately weigh 5 g of sample into each. Char the material carefully on a burner or hot plate and transfer the dishes to a muffle furnace and ash at a temperature of around 525 C until a white ash is obtained. Moisten the ash in dishes with water. Dry on steam bath and on hot plate and re-ash at 525 C. Cool in a desiccator and weigh. Reserve the ash in one dish for determination of water-soluble and water-insoluble ash, in second dish for acid-insoluble ash, and the ash in the third dish for determining alkalinity of ash.
2) Transfer the ash from one of the three silica dishes, with the aid of about 20 ml distilled water, into a beaker. Cover with a watch glass and boil for 5 min. Filter through an

ashless filter paper (Whatman No. 41). Wash the entire residue with hot water until the filtrate no longer turns red litmus blue. (Reserve the entire filtrate for the determination of alkalinity). Dry the ashless paper with residue (water isolubles) in the same silica dish and transfer to muffle furnace and ignite at 525 C for 2 hours. Cool in a desiccator and weigh.

3) To the ash of the second silica dish, add 25ml of hydrochloric acid, cover with a watch glass and boil gently for 5 min. Filter through ashless filter paper. Wash the entire residue with hot water (> 85 C) until the filtrate no longer turns blue litmus paper red. Dry the ashless paper with the residue in the same dish and transfer to Muffle furnace and ignite at 525 C for 2 hrs. Cool in a desiccator and weigh.
4) To the ash in the third silica dish, add 10 ml of 0. 1 N HCl. Dissolve by warming on a water bath, cool and titrate the excess acid with 0. 1 N NaOH using methyl orange indicator. Alkalinity of ash is calculated as potassium carbonate ($K_2\ CO_3$).

Calculation;

$$Total\ ash\ (\%\ on\ dry\ weight) = \frac{(\mathrm{W2} - \mathrm{W1})\ \times 100\ \times 100}{(W1 - W) \times (100 - \mathrm{M})}$$

W_1 – Weight of silica dish + sample

W_2 - Weight of silica dish + ash

W - Weight of empty silica dish

M – Moisture (%) of the sample

$$\text{Water insoluble ash on dry weight basis } (\%) = \frac{(\mathrm{W2} - \mathrm{W}))\ \times 100\ \times 100}{(W1 - W) \times (100 - \mathrm{M})}$$

W_2 – is Weight of silica dish + water insoluble ash

Water soluble % by weight = A – B

A – Total ash % by weight

B – Water insoluble ash % by weight

$$\text{Water soluble ash of total ash } (\%\ \text{by weight}) = \frac{\text{water soluble ash}}{\text{total ash}} \times 100$$

$$\text{ash insoluble indilute HCL } (\%\ \text{on dry weight}) = \frac{(\mathrm{W2} - \mathrm{W})\ \times 100 \times 100}{(\mathrm{W1} - \mathrm{W}) \times (100 - \mathrm{M})}$$

Or easily can calculate total ash: Percent of ash in material = $\frac{W2-W}{W1-W} X100$

- **Estimation of Dietary fibers**

An enzymatic- gravimetric method was developed in which the sum of the soluble and insoluble polysaccharides and lignin are measured as a unit and considered to be total dietary fibers.

Procedure

1. 1g of defatted sample was taken, and phosphate buffer(50ml) PH-6
2. Add 0.2 ml alpha amylase and keep the beaker on boiling water bath for 30 min, shake the beaker.
3. Cool the solution to room temperature and adjust the pH to 7.5 with NaOH (0.2M) and add protease 5mg incubate the content for 30 min. at 60°C cool at room temperature.
4. Add 10ml phosphoric acid (0.2M) and adjust the PH of solution at approx. 4.5 use NaOH (0.2m) to set the pH if necessary.
5. Then add Amyloglucosidase (0.3ml) and incubation was given at 60°C for 30 min, cool the content.
6. Then wash the precipitate with 4 volume of ethanol.
7. Filtration of sample.
8. Washing with ethanol and acetone.
9. Drying
10. Total dietary fibers was obtained.

General calculation

% of dietary fibers = $\frac{W_1-W_2}{S} X100$

- **Carbohydrates (Biochemical Enzymatic) Methods**

Individual sugars can be determined by methods based on a specific property of the saccharide, and the use of enzymes provides such specificity. These methods involve treatment of the sugar with the appropriate enzyme and then determination of the reaction products by, for example, spectro-photometry. Examples of this approach are outlined below. Glucose- Glucose (specifically β-D-glucose) can be oxidized by glucose oxidase to produce hydrogen

peroxide. This is then reacted with a dye in the presence of peroxidase, and the concentration of the colored product (measured spectrophotometrically) is proportional to the initial glucose concentration. As an alternative, glucose is converted by hexokinase to glucose 6-phosphate, which is then oxidized by nicotinamide adenine dinucleotide phosphate (NADP) in the presence of glucose-6-phosphate dehydrogenase, and NADP is reduced to NADPH [3]. The concentration of the latter is measured spectrophotometrically at 340 nm.

Fructose- Fructose can be measured by employing the second method outlined above after the initial formation of fructose-6-phosphate. This is then converted to glucose-6-phosphate with phosphoglucose isomerase, and the sequence continues as for glucose.

Lactose- Determination of lactose is based on its hydrolysis by β-galactosidase to galactose and glucose. Galactose is then measured by its reduction of NADP in the presence of β-galactose dehydrogenase.

Maltose- The glucose procedure can be used for the determination of maltose after an initial hydrolysis to glucose with maltase (α-glucosidase). Sucrose, if present, must be determined separately, because with maltase treatment it is also a source of glucose.

Sucrose- Invertase (β-fructosidase) treatment of sucrose produces glucose and fructose, and the glucose can be measured by the hexokinase methods.

8. Expected and outcomes

The main aim is to prepare nutritious bread for those consumers who cannot gain the body requirement because of poorness, from other food.. By using of different ingredients such as corn, barley, oat, maize, sorghum etc. in flat bread recipe, these grains effects as health beneficial for human body. The bread with mentioned ingredients plays as functional food in human life because of the high nutritional and quality.

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