

EFFECT OF PROCESSING PARAMETER ON FLAT BREAD

Dissertation Report-1

Submitted by-

Prashant

Reg. no- 11718963

PROGRAMME – M.Sc. (Food Technology)

SECTION – H1730

SCHOOL OF AGRICULTURE

LOVELY PROFESSIONAL UNIVERSITY, PHAGWARA



UNDER THE GUIDANCE

Dr. Anil Panghal

Associate Professor

Department of Food Technology and Nutrition

School of Agriculture

Lovely Professional University

MAY 2018



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CERTIFICATE

This is to certify that **Prashant** (Registration No.11718963) has personally completed report entitled, “**Effect of processing parameters on flat bread**” 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 pre-dissertation has ever been submitted for any other purpose at any University.

The project 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.

Date: 14 May, 2018

Signature of Supervisor

Dr. Anil Panghal

Associate Professor

School of Agriculture

Lovely Professional University

DECLARATION

I hereby declare that the work presented in the Dissertation 1 report entitled **“Effect of processing parameters on flat bread”** 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: 14 May, 2018

Prashant

(11718963)

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

Date: 14 May, 2018

Dr. Anil Panghal

Associate Professor

Lovely Professional University,

Phagwara, Punjab, india

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INTRODUCTION

Wheat is the main food crop in the world. India, USA, Russian, France, Canada, Germany, and Pakistan are the wheat producer countries. Flat Bread is the most significant wheat based edible that is the developer throughout the world. First bread was ready before 12,000 years. The Egyptian country peoples are generally consumed bread.

Flat bread is commonly produced by salt, flour and water. Water and flour is the major ingredient that can be consequence on the aroma, texture and chew capability of the flat bread. They are made from the flour extraction rate. This contains high water absorption capacity; medium gluten strength and more starch damage. Salt amounts are used in flat bread, ranging from 0.5% to 2% of flour weight which improve the flavor. The consumers claim for fresh flat bread has increased day by day due to industrialization. The new inventions helps to gather the ingredient, flour distinct and process can helps to maintain the quality of flat bread. Due to the preparation of flat bread, the wheat varieties and ingredients can improve the sensory and texture quality of final product.

The Middle East region imports substantial quantities of wheat and wheat flour. Thus there is a continuing need to estimate wheat flour quality in Arabic bread. Requirement of baking procedure include small sample size for testing level and correct control of condition at all platform of test procedure and methods of quality assessment. The very high oven temperature and sheeting of the dough made complex to the control of testing condition. Such products have distinct quality parameter to be fine.

Middle East peoples are add different types of flours in flat bread which can be impact on water absorption, protein, starch gelatinization and moisture content. An accurate balance of visco-elastic properties is useful during the sheeting and molding steps of flat bread. The manufacture steps include the mixing of flour, yeast and salt with water to get the optimum development of the dough. This can be estimable when the dough appearance changes from rough to smooth and silky. The dough constitution and the gluten are evolved by the biological action of the fermentation due to gas production. This helps the condition of the dough and catalyze about its mellowing.

PROBLEM BACKGROUND

Today many of the people are suffering from deficiency disease problem such as celiac disease, anemia, gall bladder dysfunction, protein energy malnutrition (PEM) due to insufficient supply of nutrient. Due to the addition of multiple grains in the flat bread are rich in fat, protein and also contain minerals and have antioxidant property which are beneficial for the human and children also who are suffering from the disease. Flat bread provides the proper nutrition for health benefit and cure disease.

REVIEW OF LITERATURE

Flat bread is made in most of the countries. Flat bread varieties are chapatti, pita bread, tandoori roti, balady flat bread, phulka, kulcha etc. Some flat bread is show dissimilar behavior as relate to the high volume pan bread. Flat bread crumb and crust ratio is high as relate to pan bread. When kept in the room temperature they rancid within the few hours and become hard and rough. Chapatti are usually ready twice a day and consume directly after preparation, it get difficult to bite (Shalini and laxami, 2007).

Ingredients impact on flat bread baking-

The characteristics of wheat flour are (14.5% moisture, 13% protein, 0.55 Ash and ph 5.7-6.1), (Zanoni et al., 1993). Flat bread ingredients are 2% yeast, 4% sugar, 2% salt. In the bread fermentation caused by an organism in the yeast is 'Saccharomyces Cerevisiae'. Commonly sugar is added to the fermentation and Salt is added to make expansion of growth. Ghee and mar genie is added to increase mechanibility.

Arabic bread (made up of durum wheat) is obtained soft texture as equate to the wheat flour bread. There is more starch reduction of Durum wheat as compare to soft wheat flour by grinding process. With high balance of starch reduction, water absorption and high starch gelatinization the crumb get softer (coskuner et al., 1999).

Genetically five different sorghums are ground and equal substituted for the bread in U.S. As like to other sorghum species Brown sorghum are produced a good quality dough and advanced bread volume. Bread volume decline with increasing level of sorghum simulate. Crumb and crust color is straight related to sorghum verities and level of simulate. In Egyptian 'balady' bread 30% of ground sorghum added as compare to the wheat flour (M. M. Morad, C. A. Doherty 1984).

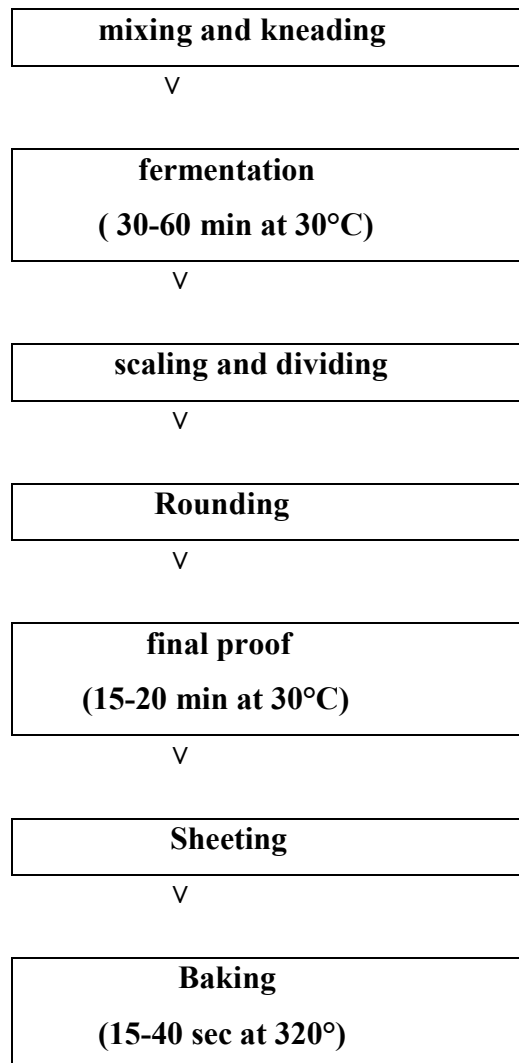
Nutrition value of cereal and the impact of milling in flat bread-

Cereal are rich in vitamin B, protein, minerals such as potassium and phosphorus, unsaturated fat, antioxidant and photochemical. Cereals are rich in glutamic acid, proline leucine and asparatic acid and they are lack in lysine. Generally cereal grains are subjected to diverse process

to prepare them for human consumption. These processes much affect their chemical composition and nutrition value.

Wheat is milled in to flour, which can be used in many types of flat breads. Milling process removes the fibrous layers of grains. Refined cereals don not have the same nutritional and health profit as evaluate to the whole meal. . Without bran and germ, there is 45% protein, 80% fiber, 50-80% vitamin, 20-80% minerals and 99.8% phytochemical are lost. Some fiber, vitamins and minerals may be added back into refined cereal product. But it is not possible to re-conduct the phytochemicals lost during processing (Rosell, 2007b).

Baking process of flat bread-



Effect of processing method on flat bread

Sr. no	Flat bread processing method	Impact of processing parameter on flat bread quality	Reference
1	Mixing and kneading	The dough sample mixed for 7 min showed that increase in the amount of veiling protein and sticky dough that was difficult to process. The sheeting effects on the phase of gluten expansion. The over mixed dough gave the best result of loaf score. Over mixing produced superior bread in term of internal properties.	(J. QAROONI, R. A. ORTH & M. WOOTTON, 1986)
		As the level of energy (per kg) dough in the mixer increases bread volume and deduction in cell size. Cell increased uniformity and evolved crumb softness. The role of energy during mixing effect on chemical and natural reduction will increase the site for oxidation. The extensive mixing time is forced to develop the gluten network of the flour which inclines to be used with sponge and dough process.	(S. Cauvain, BakeTran, Uk, 2012)
2	Fermentation	The main product of yeast fermentation is carbon dioxide and ethanol. Gas is hold and dough change leavened over fermentation. Sourdough fermentation impacts a positive result on flat bread quality. It increases flavor and shelf life due to the arrangement of antifungal compound.	(D GOCMEN, A. N. INKAYA & E. AYDIN, 2009.)
		The fermentation process is subdividing into two sections a phase before moulding called intermediate proofing and one after moulding, called final proofing. During the fermentation process the dough development is continued by stretching the gas cell membranes continuously in a biaxial way. This cause a hardening of the gluten network	(C Markus. E. Belz, Liam A. M. Ryan & Elke k. Arendt, 2011)

		which affect the gluten network. Proofing is also increase the specific volume of the dough piece and also to obtain the required bread properties during the baking process. The whole fermentation process is important for flavor development.	
3	Scaling and dividing	The dough is dividing into single loaf sized and Dough piece is made round in shape to get a gas retention capacity and good level.	(Hoseney, 1988) (Boyaceoglu, 1999)
4	Sieving	The particle size of wheat flour bigger than evolved wheat flour. It means that particle size of wheat flour synthetic (i.e bran or whole wheat) used in bread making can helps to increases or decreases loaf volume of flat bread.	(Casiana Blanca Villarino, Vijay Jayasena, Ranil Coorey, Sumana Chakrabarti-Bell & Stuart Johnson, 2014.)
5	Sheeting	Sheeting dough is a very big aspect in term of removing the gas inside its structure depending on the type of flat bread.	(Coskuner et al., 1999)
6	Baking	The different oven baking time and temperature impact on the physical characteristics of bread (540°C, 1 min, 415°C, 2min, 370°C, 3-4min, 260°C, 6-7min). Breads are baked at higher temperature and shorter time and it contain good quality than those are baked at lower temperature for longer time. When division of upper and lower crust be complete. Longer oven baking time and lower temperature resulted less water in bread. Lower temperature and longer baking time are also unsuccessful to yield breads with desirable bread crust.	H. A. FARIDI & G. L. RUBENTHALER, 1984)
		The baking temperature helps to keep the loaf volume, crumb moisture, loaf weight and density. Consequently more studies are required to correctly decide the response	(T.A. Shittu, A.O. Raji, L.O. Sanni, 2006)

		of sensory and storage property of the bread. To transform baking temperature and time as they are more essential for optimizing consumer suitability.	
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Health benefits of millets-

Finger millet-

It helps to reduce 39% of blood glucose level in diabetic experiment as compared to the diabetic control. Aldose reductase enzyme activity in the eye lens is low as compared to the diabetic control. Decrease the excretion of glucose, protein, urea and creatinine from urinary metabolism. Also manage the lesser serum cholesterol and triacyl glycerol level (43% and 62%) (Shobana, Harsha, Patel, Srinivasan and Malleshi, 2010).

Finger millet is also Improve the hemoglobin status in children's. A supplemented infant made up of finger millet and helps to get better the hemoglobin status (Tatala, Ndossi, Ash and Mamiro (2007).

It is also rich in phytochemicals, phytic acid, lower cholesterol and phytate which can be reduce the risk of cancer (Coulibaly et al., 2011). Also reduce the celiac disease irritated by the gluten content in wheat flour, it also help to reduce diabetic heart disease (Gelinis et al., 2008).

Sorghum- sorghum bran can use to increased stool weight of humans and reduce intestinal proceed time. Sorghum bran is also used to decrease serum and cholesterol level (L.W, Rooney, Awika, J M, 2005.

Food additives and preservative are used in flat bread-

Impact of preservatives used in bakery product helps to maintain such important growth factor is water activity, ph on the prevention of some fungal spoilage in flat bread.

Potassium sorbate-

It is the most useful preservative used in bakery products. It inhibits the fungal growth 0.90 water activity at ph 4.5. Due to the interaction of potassium sorbate with food component like proteins

and lipids it can be decreasing their level (Ledward, 1990, Jideani and Wedzicha, 1994, thakur et al., 1994).

Sorbic acid-

sorbic acid is most suitable preservative in bakery industries due to the no residual taste and lower price as compare to the other preservatives. Its main drawback is effect on yeast activity and dough rheological property like loaf volume, dough become sticky and difficult to process (Legan 1993).

Carbon dioxide-

In the bakery products CO_2 is an operative preservative and it boosts the firming of flat bread. Without include of calcium propionate the microbial shelf life can be maintained at least 21 days and generally used to make barbari bread (A. H. Sourki, M. G. Davoodi, F. T. Yazdi, S.A. Mortazavi, M. Karimi, S. H. R. Jahromi, A. Pourfarzad, 2010).

Shelf life-

The present study discovers that incomplete baking and frozen storage can increase the shelf life and edible quality of chapattis. The frozen incomplete baked chapatties when placed in complete baking display expressive increase in size over that of chapatties. Increased in frozen storage can effect on texture characteristics of partially baked chapatties as equate to baked chapatties. Frozen storage can help to maintain the color, flavor, chewability of the product (H. S Gujral, G. S. Singh, C. M. Rosell, 2008).

In the bakery products CO_2 is an operative preservative and shows that it boosts the firming of flat bread. Without include of calcium propionate the microbial shelf life can be maintained at least 21 days and generally used to make barbari bread. With the increasing amount of carbon dioxide in head space, hard surface will increase. Due to the addition of carbon dioxide with mixture of gases in to the product can contain a partly vacuum and volume of package will decreased (A. H. Sourki, M. G. Davoodi, F. T. Yazdi, S.A. Mortazavi, M. Karimi, S. H. R. Jahromi, A. Pourfarzad, 2010).

When bread is kept out of oven and cooled for 10 min, keep the surface from spray with calcium propionate solution. The bread is packed in to the sterilized bag and no microbes are obtained during this method. The moisture content is decrease during storage for 30 days and after 30 days the moisture content move to equilibrium. High moisture content affects the firming rate of dough (H. HE. & R.C. Hosney, 1990).

RESEARCH OBJECTIVES

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

RESEARCH METHODOLOGY

Physical Analysis

Principle: To review the physical properties of millet grains (1000 grains weight, porosity, bulk density, true density, length, size). physical analysis indicate about the grains health like sound, plumpy, damage free, healthy, bulk density, true density, and thousand kernel weight (if more) indicates that the grain is healthy. Physical characteristics 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.

Equipment required: measuring cylinder, weighing balance, beaker, vernier caliper.

Procedure:

1000 kernel weight:

100 grains of millet are collected yourself or grains are spread on counting plate with 100 dents equal to the size of the grain. Grains are suspiciously 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. Replicate the experiment at least ten times and then report the average value.

Bulk density:

Take a measuring cylinder of 1000ml capability and fill it with grains for which density is to be calculated. The measuring cylinder should be filled to its maximum mark. Regulate the level of grains by repeated tapping take the weight of these grains in a digital/analytical balance. Replicate the reading five times.

True density:

Take 10 grains randomly from the lot. The correct volume of these grains is found by liquid displacement technique. For this take a 100 ml capability measuring cylinder and fill it with toluene to a fixed level. Randomly preferred 10 grams in the cylinder and remarks the change in volume exactly. 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

$$\text{Bulk density g/ml} = \frac{\text{weight of 10 grains in gram}}{\text{Volume of grains (ml)}}$$

$$\text{True density g/ml} = \frac{\text{weight of 10 grains (g)}}{\text{Volume of 10 grains (ml)}}$$

$$\text{Porosity} = \frac{\text{true density} - \text{bulk density}}{\text{True density}}$$

$$\text{Porosity\%} = \frac{1 - \text{bulk density}}{\text{True density}} \times 100$$

Grain characteristics like kernel weight, test weight, kernel length and width of all the samples were resolute according to standard trial.

Kernel weight generally expressed in grams per 1000 kernels is a function of kernel size or kernel density. Wheat kernels in general have a higher ratio of endosperm to non-endosperm mechanism than do lesser and less dense kernels. Weight (g) of 1000 kernels was recorded by the seed counter (Dexter et. al., 1984). Thousand kernel weight is possibly associated with milling extraction rate which is straight linked to grain size affecting the flour extraction. TKW better describes the wheat kernel mass and probable flour extraction. In general, wheat with higher TKW is predictable to possess larger potential for flour extraction.

Test weight or weight per unit volume is most widely used and simplest criteria of wheat quality. Test weight usually determines the plumpness of the grain. It is basically a rough measure of density of grain in terms of weight per unit volume i.e. the weight (lb) per volume bushel. Test weight or hectoliter weight of all the samples were determined. The samples were poured into a 100 ml stainless steel measuring cylinder. Excess wheat was leveled off with a round stoker,

and the weight of wheat grains in the cylinder was weighed to determine the test weight. The hectoliter weight (hL) represented as the weight in kg/hL (100 L).

Kernel shape and uniformity of kernel size are important factors affecting test weight, as these influence the manner in which the kernels orient themselves in a container. The other important factor influencing test weight is the density of the grain. Density is determined by the biological structure of the grain and its chemical composition including moisture content. Test weight gives an indication of the milling yield. Immature, badly shriveled, drought or disease affected wheat usually has a low test weight and gives correspondingly poor yield of flour. Test weight of wheat cultivars is an index of the density and the soundness of kernels.

Chemical Analysis-

Moisture-

Moisture was determined by standard AACC methods (AACC, 1995).

Procedure:

Pre-dried petridish, cooled in desiccators and weighed was taken. 10 g of sample was weighed in a petridish and dried in an oven at 105 °C for six h or till a constant weight was obtained. The sample was weighed after cooling it in desiccators. The total loss in weight due to moisture evaporation was calculated and expressed in percentage.

Calculation:

$$\% \text{moisture} = \frac{\text{Loss in weight (g)}}{\text{Weight of sample (g)}} \times 100$$

Moisture is one of most important quality parameter. It directly affects the specific weight, wheat quality and grain storability. Wheat or flour with high moisture content (greater than 14.5 percent) attracts mold, bacteria, and insects, all of which cause deterioration during storage. Wheat or flour with low moisture content is more stable during storage.

Ash

Ash was determined by standard AACC methods (AACC, 1995).

Procedure: 5 g of oven dried sample was weighed in the silica crucible; it was ignited till no charred particle remained in the crucible. The crucible was put in muffle furnace (550 °C) for 5-6 h till whitish grey ash was contained. All organic matter is oxidized to gases at such high temperature and leftovers residue is the inorganic mineral matter. The crucible was then cooled in desiccators and weighed.

Calculation:

$$\text{Ash (\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

Ash content of flour is defined as the residue left over after controlled burning of the flour. The ash content in wheat and flour has importance for milling. It represents the mineral content of the flour, individual elements of which may live in various forms in mixture with other flour constituents. Millers require knowing the whole mineral content of the wheat to get desired or particular ash levels in flour. Since ash is primarily concentrated in the bran, ash content in flour is an indication of the yield that can be expected during milling. Ash content also indicates milling performance by indirectly revealing the amount of bran contamination in flour. Ash in flour can change color, imparting a darker color to finished products. Some specialty products requiring predominantly white flour call for low ash content while other products, such as whole wheat flour, have high ash content.

Crude protein content

Total nitrogen of flour samples was estimated by Kjeldhals method (AACC method 54-10). Crude protein was calculated by multiplying %N with protein factor of 5.7 for wheat flour.

Reagents:

- a) Digestion mixture- K_2SO_4 , $\text{CuSO}_4 \cdot 6\text{H}_2\text{O}$, and SeO_2 in ratio of 10:20:1,
Digesting solution - H_2SO_4 and HClO_4 in 9:1.

- b) 0.2 N HCL,
- c) 4% boric acid,
- d) 10 N 40% NaOH,
- e) Mixed indicator solution- 0.5 g of Bromocresol green and 0.1 g of Methyl red was taken and dissolved in 100 ml of ethanol and the solution was adjusted with drops of dilute NaOH to bluish purple indicator.

Procedure:

1 g sample was weighed in Kjeldhal flask. Digestion mixture (1-2 g) and 20 ml of concentrated sulphuric acid were added to it. The content was heated on hot plate till colorless or light yellow colored liquid is obtained. After digestion, when the liquid was clear, cooled, diluted, and transferred in 100 ml volumetric flask and volume was made up 100 ml. After pipetting 5 ml into distillation flask, 10 ml of 40% sodium hydroxide was added then steam distillation was carried out, and about 25 ml of distillate containing ammonia was collected in to 5 ml of 2% boric acid along with three drops of mixed indicator. The ammonia which was in the form of ammonium metaborate was titrated with standardized N/70 hydrochloric acid. The % of protein was calculated based on the titer value. End point of the titration is blue to pink. Blank determination was carried out without sample as above and the amount of N/70 hydrochloric acid required subtracted from the sample reading.

Calculation:

$$\text{Nitrogen (\%)} = \frac{(a-b) \times \text{Normality}}{\text{Weight of sample}} \times 1.4$$

Where,

a – Volume of HCl used for sample,

b – Volume of HCl used for the blank

Protein content is related to many processing properties, such as water absorption and gluten strength and also to finished-product attributes, such as texture and appearance. Bakers use protein content to anticipate water absorption and dough development time for processes and

products, because higher protein content usually requires more water and a longer mixing time to achieve optimum dough consistency. Low protein content is desired for crisp or tender products, such as snacks or cakes. High protein content is desired for products with chewy texture, such as pan bread and hearth bread.

Mineral estimation

The mineral content of different wheat varieties was determined using Atomic absorption spectrometer (Software, Avanta 1.33).

Reagents:

Diacid mixture- (HNO_3 : HClO_4 , 5:1 v/v).

Procedure:

Two grams of dried and ground sample was placed in a 150 ml conical flask. To this was added 20 ml diacid mixture (HNO_3 : HClO_4 , 5:1 v/v) and the solution kept overnight. Next day it was digested by heating until clear white precipitates settled down at the bottom. The crystals were dissolved in double-distilled water. The contents were filtered through Whatman No. 42 filter paper. The filtrate was made to 50 ml with double-distilled water.

Estimation of fat content:

Equipment required:

Burette, soxhlet apparatus, extraction filter paper thimble, analytical balance, sample grinder, food sample, organic solvent(hexane, isopropanol, diethyl ether), acetone.

Principle: Fat and oils are soluble in organic solvents like hexan, isopopropanol but other constitutes are not. Hence, the fat present in food sample is dissolved into the solvent and afterwards solvent is removed by evaporation and distillation (boiling point of solvent is much less than that of oils/ fats).

Procedure:

1. Thoroughly wash the boiling flasks and rinse with commercial grade acetone to remove any residual oil/ fat.
2. Dry the flask by placing in hot air oven for 3-4 hours.
3. Weigh the flask and label them.

4. Weigh the extraction filter paper thimbles (in duplicate) and label them.
5. Transfer 2-5g sample in pre weighed thimbles and determine their accurate weight.
6. Plugged this thimble with non-adsorbent cotton and place them straight in the soxhlet extraction tube.
7. Fill the extraction tubes with sufficient amount of solvent so the siphon system starts working.
8. Now fix the soxhlet assembly properly and switch on the heaters.
9. As soon as the initiation of the boiling indicated stars the water connected to condensers and allows the extraction for 8 hours.
10. After 8 hours switch of the heaters and allow cooling.
11. The solvent is evaporated using vacuum ovens at 50C or a water bath and than flasks with oils are weighed.

General calculation:

The fat/ oil is calculated by the formula

$$\% \text{ of fat content} = \frac{W4 - W1}{W3 - W2} \times 100$$

Estimation of Dietary fibers.

Aim: To analyze dietary fibers by enzymatic methods.

Material required: Protease, Amyloglucocidase, ethanol, acetone, phosphate buffer, filtration assembly, driers.

Theory: 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 were obtained.

General calculation

$$\% \text{ of dietary fibers} = \frac{W2 - W1}{S} \times 10$$

FUTURE OUTCOMES

The main purpose is to prepared nutritious flat bread for those consumers, who cannot gain the nutrition requirement from other food. There are different ingredients such as corn, maize, barley, oat, sorghum etc. In flat bread recipe, grain effect as health beneficial for human body. The bread with mentioned ingredient plays as functional food in human life because of the high nutritional and quality.

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