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BANANA FLOWER POWDER AND BLACK RICE POWDER INCORPORATED WITH WHEAT BREAD

Ms.Sownthariya.v,Ms.L.Yamini

Student, Assistant professor

Department of Food Science and Nutrition

Dr.N.G.P Arts and science College, Coimbatore, Tamil Nadu, India

Abstract: Bakery is a time-honored activity that plays a key role in the food processing industry. Despite the introduction of completely automated and semi-automated bread and biscuit manufacturing factories, many people still prefer fresh bread and other bakery products. The demand for bakery products is gradually increasing due to the growing population and preference for fresh and ready-to-eat handy food items. To formulate banana flower powder and black rice powder incorporated wheat bread. To calculate yield and cost of the formulated bread. To determine the sensory characteristics, packaging and labeling of the formulated bread. To evaluate the nutrient composition and quality parameters for the formulated bread. The convection oven is used for the baking of bread. The cost is calculation is done by the quantity of ingredients used for making the bread with other expenses. Polythene covers are used for the packing and industrial vinyl stickers are used for the labeling of the product. The result shows that banana flower and black rice incorporated wheat bread was compared with wheat bread, that is rich in energy, carbohydrate, calcium, iron, β-carotene, antioxidant, niacin and vitamin E. when compared to other three variation the fourth variation is selected with highest mean score. The suggestions are they can test the storage stability and shelf life of the product. They can involve some other nutrient analysis for the product. They can add some other ingredients to improve the nutrient composition of the bread.

Index Terms **- wheat bread, Banana flower, Black rice, Antioxidant, Vitamin-E, Niacin, β- Carotene.**

INTRODUCTION

Wheat is the main stable food of large section of world population. It is the major food produced among all the cereal crops. Whole grain wheat flour has gained considerable attention as a bread making ingredients due to its nutritional and health benefits. When compared to refined wheat flour it contains high level of vitamins, minerals, fiber, antioxidants, and other phytochemicals such as carotenoid, flavonoids, and phenolic acids. **(Jonnalagadda et al., (2011)**

Banana blossoms are a popular cooking component and these tissues are high in fiber, protein, vitamin A, C, and E, phosphorous, calcium, iron, magnesium and antioxidants, among other minerals. **(Sheng, et al., (2010)**

Many alignments have been treated with the flowers of the musa species (banana). Menorrhagia, dysentery, diabetes mellitus, heart ache, diarrhoea, stomach cramps, and infantile malnutrition have all been treated using Musa flowers in the past. It has been started that floral extracts have therapeutic potential for illness such as diabetes, anaemia and malaria. **(*Bagavan* et al., (2010)**

The protein, vitamin and mineral content of black rice is higher than that of white rice. Black rice is high in critical amino acid like lysine and tryptophan as well as vitamin like B1, B2, and folic acid and minerals like iron, zinc, calcium, phosphorous and selenium. Black rice is high in fiber and even has plant based protein. It has the highest antioxidant, protein and dietary fiber content of any rice variety. **(Baenziger et al., (2009)**

The black rice contains the pericarp (outer part) of kernel, this rice is black colour due to a pigment known as anthocyanin, an antioxidant. Many people assume this rice as a panacea of many culinary diseases because of its high nutritive value and curative effect. This rice is supposed to enhance the longevity of life; hence it is also known as long life rice. This rice is free of gluten, free of cholesterol, low in sugar, salt and fat. Black rice is a whole grain, super nutritious type of rice that is high in fiber, anthocyanin, antioxidants, vitamins B and E, iron, thiamine, magnesium, niacin and phosphorous. **(*Shen et al.* 2009)**

Black rice is a good source of fiber and even a good source of plant-based protein. It contains the highest amount of antioxidants, protein and dietary fiber of all rice varieties. **(*Gani et al.,* 2012)**

Today black rice is becoming popular because of its health benefits. Black rice provides many health benefits including prevention and treatment of diseases and conditions such as heart disease, cancer, diabetes, high blood pressure and extend the quality of life. **(*Adom KK etal.,* 2002)**

The nutritional importance of wheat should not be underestimated, particularly in less developed countries where bread, noodles and other products (e.g.bulgar, couscous) may provide a substantial proportion of the diet. Wheat provides nearly 55% of carbohydrate and 20% of the food calories. It contains carbohydrate 78.10%, protein 14.70%, fat 2.10%, minerals 2.10% and considerable proportions of vitamins (thiamine and vitamin-B) and minerals (zinc, iron). Wheat is also a good source of traces minerals like selenium and magnesium, nutrients essential to good health. Wheat grain precisely known as caryopsis consists of the pericarp or fruit and the true seed. In the endosperm of the seed, about 72%of the protein is stored, which forms 8-15% of total protein per grain weight. Wheat grains are also rich in pantothenic acid, riboflavin and other minerals**. (Adams Ml, et al., 2002).**

The preventive ability of jaggery on smoker's smoke-induced lung lesions suggest the potential of jaggery as a protective food for workers in dusty and smoky atmosphere even for those who are engaged in woollen industries, the wool dust clogged in the food pipe could be cleared with jaggery. Thus, jaggery helps to breathe easier and counter pollution problems. It has moderate amount of calcium, phosphorous and zinc so that it helps to optimize the health of a person along with all its benefits, purifies the blood and prevents rheumatic afflictions and bile disorders and thus helps to cure jaundice. **(Solomon S et al.,(2013)**

The yeast is used in brewing and baking industries. It is also used as nutritional supplements for e.g., S. cerevisiae is excellent source of proteins and vitamins. Dried yeast cells contain 40 to 50% protein. Yeast cells are rich source of vitamin B complex. **(Fredlund E, et al., (2002)**

OBJECTIVES

- To formulate banana flower powder and black rice powder incorporated wheat bread
- To calculate the yield of banana flower powder and black rice powder incorporated wheat bread
- To determine the sensory characteristics of banana flower powder and black rice powder incorporated wheat bread
- To estimate the nutritive value of banana flower powder and black rice powder incorporated wheat bread
- To estimate the quality parameters of banana flower powder and black rice powder incorporated wheat bread
- To determine the packaging and labelling of the banana flower powder and black rice powder incorporated wheat bread
- To calculate the cost of banana flower powder and black rice powder incorporated wheat bread

RESEARCH METHODOLOGY

PRE PROCCESSING

All the raw materials are procured from the local market of Coimbatore, Tamil Nadu and it is stored in a room temperature. The good quality of banana flower, black rice, wheat flour, sugar, butter, guava, yeast and salt were selected and it is stored in a room temperature.

The diseased, decayed or damaged flowers were removed. The healthy flowers are collected and the pistil (stigma) and free tepel were removed. The damaged rice, stones were removed and washed with plenty of water for removing sand, spraying residues and dirt. Then black rice and banana flower are moving to dehydration process. The banana flowers and black rice are placed in sun drying for dehydration for few days. It gets completely dehydrated after that moving to grinding process. After grinding it will be changed to powder form and it get sieved for getting fine powder and removing dust from the flour. The other raw materials are collected and weighed and transfer it into separate bowls for processing

POST PEOCCESSING

The liquid ingredients guava juice, water, and brown sugar are added in a bowel. The yeast is added in the liquid mixture for their growth and it takes 10 minutes for their activation. Then add oil, to it and mixed well for making the liquid ingredients. The wheat flour, black rice powder, banana flower powder and salt were added and mix it well for making dry ingredients. (figure I and figure II)

The dry ingredients like wheat flour, banana flower powder, black rice powder and salt added this mixture taken in a bowl and add the liquid ingredients like guava juice, water, oil, yeast and brown sugar added mixture is taken in separate bowl are taken for the dough making. The dry ingredients are taken in three portions for proper mixing. The dry ingredients are taken and added to the liquid ingredients in three proportions. All the ingredients were mixed together and kneed the mixture to become soft bread dough. (figure III)

The dough was taken in oil greased bowl and placed the dough in a airtight container for fermentation. The timing for first fermentation is one hour. Fermentation is the process of changing complex carbohydrate to simple carbohydrate and it produces co2 (carbon dioxide) it helps to improve the appearance, volume, and texture of the product. After one hour the dough is taken from the bowl. Then move towards the process of kneading. (figure IV).

Kneading is a process of pushing the dough toward forward for a wider range, with the heel of your palm, folding it over itself with your fingers and pulling it back. It is a frequent process of making the dough softer, proper mixing of ingredients and make it as dough more elasticity and flexibility. After the one hour fermentation the dough get kneed and knock back for the even fermentation. This process helps to incorporate the air in the dough it helps in porous formation and improves the softness of the dough. Then move towards the process of proofing. figure IV

Proofing is the process of final fermentation of dough it takes place after the shaping of dough. The dough gets kneed then transferred into their desired container for the process of shaping the dough. After shaping the dough gets covered with the wet muslin cloth or foil or covers or lid for the process of final fermentation. This fermentation helps to increase the loaf volume and it helps to shaping the dough. The process of proofing gets two hours after the process of kneading. After proofing the dough is moving to the process of baking.

After the process of proofing, the dough is placed in a microwave oven for baking 170°F for 15 minutes. After the process of baking the dough, the banana flower powder and black rice powder incorporated wheat bread is obtained. It is ready to serve. figure v

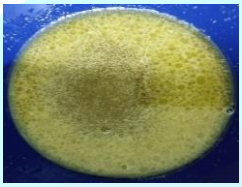
figure I


figure II


figure III


figure IV


figure v

STANDARDISATION OF BANANA FLOWER POWDER, BLACK RICE POWDER INCORPORATED WHEAT BREAD

table - I

S.NO	INGREDIENTS	VARIATIONI	VARIATIONII	VARIATIONIII	VARIATION IV
1.	Wheat flour	40	45	50	55
2.	Banana flower powder	25	20	15	10
3.	Black rice Powder	5	5	5	5
4.	Brown Sugar	10	10	10	10
5.	Yeast	3	3	3	3
6.	Guava	10	10	10	10
7.	Salt	2	2	2	2
8.	Oil	5	5	5	5

YIELD CALCULATION

The yield is calculated to constantly assess the productivity of a process. Productivity is measured as the ratio between the weight of the finished products and the weight of raw materials used to prepare the products. The product yield measures the weight of the products of a saleable quality could be prepared. The yield of the selected product was calculated using the formula.

Percentage of yield = weight of the final product /weight of the raw material * 100

SENSORY EVALUATION

When the quality of a food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic. Every time the food is tasted after that the judgement is made. Sensory quality is a combination of different sense of perception coming into play in choosing and eating a food. Appearance, flavour, and mouth feel decide the acceptance of food. The effective characteristics is not the property of the food, but the subject reaction to the sensory qualities of foods. The reaction is highly conditioned by a variety of psychological and social factors and in the final analysis plays a vital role in the acceptance and preference of food. The sensory evaluation was determined using the nine point hedonic scale or like ability scale for the control and formulated bread. The sensory aspects like appearance, texture, taste, flavour, and overall acceptability were evaluated by a semi- trained panel of 50 members from the Department of food science and nutrition. The nine hedonic scales are

- Like extremely- 9
- Like very much- 8
- Like moderately- 7
- Like slightly- 6
- Neither like nor dislike - 5
- Dislike slightly – 4
- Dislike moderately – 3
- Dislike very much – 2
- Dislike extremely – 1

NUTRIENT ANALYSIS:

The formulated bread is subjected to nutrient analysis like energy, carbohydrate, protein, fat, fiber, iron, calcium, antioxidant, β- carotene, niacin, and vitamin E. The physiochemical analysis are analyzed like moisture and ash using a standard AOAC method. The microbial analysis are done like total bacterial count @ 37^{0}c.

QUALITY PARAMETER ANALYSIS OF PRODUCT

The quality parameters are used to measure the quality of the product. The selected bread was subjected to quality parameter analysis like length of the product, breath of the product, loaf volume, specific volume, weight, bulk density, true density and porosity using a standard protocol.

- LENGTH OF THE PRODUCT

The length of the product was measured by using the measuring tape. The banana flower powder and black rice flower powder incorporated wheat bread was prepared. The prepared bread was placed in the plate after that measure the length of the bread by the measuring tape the values are noted and the values are used for the further calculation.

- BREADTH OF THE PRODUCT

The breadth of the product was measured by using the measuring tape. The banana flower powder and black rice powder incorporated wheat bread was prepared. The prepared bread was placed in the plate, measure the breadth of the product by using the measuring tape the values are noted and the values are usedfor the further calculation.

- WEIGHT OF THE PRODUCT

The weight of the product was measured by the digital weighing balance and it is expressed in grams (g). The bread was placed in the weighing balance. The bread weighed and the values are noted and the values are used for further calculations.

- LOAF VOLUME OF THE PRODUCT

The volume of the bread loaf is measured as weight of the loaf displaced container gets multiplied by volume capacity of the container and it get divided by weight of the seed that filled in the container. This gives the volume of the bread loaf.

Volume of the loaf = **W2*V / W1**

W_2 – weight of the loaf displaced container ,

v1 - volume capacity of the container

W_1 – weight of seed that filled in the container

- SPECIFIC VOLUME OF THE PRODUCT

The specific volume of the bread loaf is measured as the ratio between the volume of the loafin (ml)and the loaf weight in (g). This gives the specific volume of the bread.

Specific volume of the bread = Volume of the loaf (ml) / Weight of the loaf (g)

- BULK DENSITY OF THE PRODUCT

The bulk density is found by taking the product in container. The volume of the container is found. The weight of the container is found separately. The bread is placed in the desired volume of the container and weighed. Bulk density is the ratio between weight of the product and the volume of the product (including pore space).

BULK DENSITY (g/cm^3) = weight of the bread (g) / volume of the bread (cm^3)

- TRUE DENSITY OF THE PRODUCT

The true density is calcutated by taking the product in the container. The volume of the container is noted. The weight of the container is found separately. The bread is placed in the respective volume of the container completely without any air space inside the container and weighed. It is the ratio between mass ofthe true volume of the bread (excluding the pore space).

TRUE DENSITY (g/cm^3) = weight of the bread (g) / volume of the bread (cm^3)

- POROSITY OF THE PRODUCT

Porosity was calculated as ratio of the difference in the true and the bulk density value. Porosity isexpressed in percent (%).

POROSITY = True density – bulk density / true density

PACKAGING AND STORAGE

Packaging design and construction play a significant role in determining the shelf life of a good product .The right selection of packaging materials and technologies maintains products quality and freshness during distribution. The bread was stored in polyethene zipped bags and aluminium foil to ascertain its quality and safety. Overall the best and most acknowledged by the sensory panel as compared to remaining treatments, i.e., T3 (polythene zipper bags), and T5 (alluminium foil).

The durability of the product is assessed by taking stability test. The character of the product properties and quantities under the storage condition. These storage condition get extended by cover the new developed product. The present study was done to evaluate different food packaging techniques which can prevent the spoilage of food and ensure its safety status towards human health.

The labeling is essential for all the food products. It gives the general information about the product. The labeling of the product should carry the mandatory details of the food products. That helps to attract the people and create a interest about the food products. The labeling is unique for the each and every product that creates the identity of the particular food product. The labeling of the food product should gather some information like figure VI

- NAME OF THE PRODUCT
- INGREDIENTS
- DATE OF MANUFACTURE
- EXPIRY DATE
- BAR CODE
- NUTRITIONAL VALUE
- MANUFACTURE DETAILS
- CONTACT DETAILS

- WEB SITE
- MAIL
- STORAGE

The total cost calculation of product includes raw material cost, processing cost 30% electric cost and other expensive. Cost of banana flower powder, black rice, wheat flour, yeast, sugar, brown sugar, butter, guava, and salt is calculated based on cost of raw materials that it would be economically suitable for all theselection of the society.

figure VI

RESULT:

The banana flower powder and black rice powder incorporated wheat bread is analyzed by overall mean acceptability to select the formulated product from four variations.

OVERALL MEAN ACCEPTABILITY:

table II

SNO	ATTRIBUTES	STANDARD (MEAN±S.D)	VARIATION I (MEAN±S.D)	VARIATION II (MEAN±S.D)	VARIATION III (MEAN±S.D)	VARIATION IV (MEAN±S.D)
1	APPEARANCE	7.56±1.060	6.78±1.313	7.12±0.958	7.8±0.948	8.24±0.793
2	TEXTURE	7.68±1.067	7.44±1.182	7.52±0.960	7.9±0.864	8.1±1.073
3	TASTE	7.7±0.957	6.98±1.151	6.98±1.078	7.9±0.994	8.12±0.848
4	FLAVOUR	7.4±1.042	7.12±1.062	7.02±1.078	7.78±0.953	8.16±1.094
5	OVER ALL ACCEPTABILITY	7.56±0.912	7.2±0.968	7.02±0.936	7.88±1.062	8.2±0.947

The variation IV is selected when compared to the other three variations. So the variation IV is selected for the further study. This is graphically represented in the figure VII

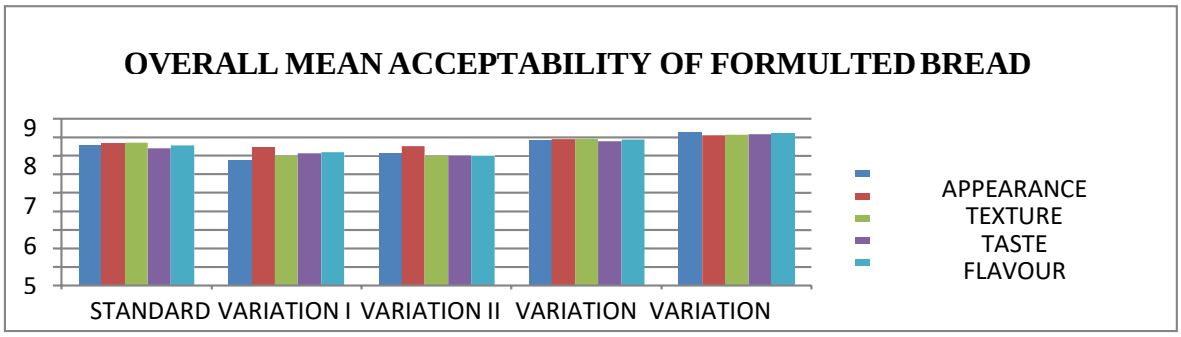

figure VII

YIELD CALCULATION

table III

SNO	NAME OF INGREDIENTS	AMOUNT OF INGREDIENTS USED	YIELD PERCENTAGE
1)	Wheat flour	55	128%
2)	Banana flower powder	10	
3)	Black rice powder	5	
4)	Brown Sugar	10	
5)	Yeast	3	
6)	Guava	10	
7)	Salt	2	
8)	BUTTER	5	

The yield percentage of the formulation of banana flower powder and black rice powder incorporated wheat bread was calculated to be 128 percentage.

NUTRITIVE VALUE OF FORMULATED BANANA FLOWER POWDER AND BLACK RICE POWDER INCORPORATED WHEATBREAD

table IV

SNO	NUTRIENTS	QUANTITY/ 100g
1.	ENERGY	287.46 Kcal
2.	CARBOHYDRATE	56.11 gm
3.	PROTEIN	5.11 gm
4.	FAT	3.02 gm
5.	FIBER	3.80 gm
6.	CALCIUM	104.0 mg
7.	IRON	6.32 mg
8.	β – CAROTENE	280.0 µgm
9.	ANTIOXIDANT	125µg/g
10.	NIACIN	0.60 gm
11.	VITAMIN E	10.0 µgm

PHYSIOCHEMICAL ANALYSIS OF FORMULATED BANANA FLOWER POWDER AND BLACK RICE POWDER INCORPORATED WHEAT BREAD.

table V

SNO	NUTRIENTS	QUANTITY/100 g
1.	MOISTURE	24.1%
2.	ASH	6.76 g

MICROBIAL CONTENT OF FORMULATED BANANA FLOWER POWDER AND BLACK RICE POWDER INCORPORATEDWHEAT BREAD.

table VI

SNO	PARAMETER	QUANTITY
1.	TOTAL BACTERIAL COUNT	NIL

QUALITY PARAMETER ANALYSIS OF FORMULATION BANANA FLOWER POWDER AND BLACK RICE POWER INCORPORATED WHEAT BREAD.

table VII

PARAMETER	RESULT
Weight (g)	128
Length of the loaf (cm)	19
Breadth of the loaf (cm)	10.8
Volume of loaf (cm^3)	49.9
Specific volume (cm^3/g)	0.389
Bulk densitiy (cm^3/g)	2.565
True density (cm^3/g)	5.210
Porosity (%)	0.50767

SHELF LIFE ANALYSIS OF FORMULATION BANANA FLOWER POWDER AND BLACK RICE POWER INCORPORATEDWHEAT BREAD.

The shelf life of the formulated banana flower powder and black rice powder incorporated wheat bread is estimated. The shelf life of the product is four to five days. After fifth day the mould growth is observed in the bread loaf. The quality of the product is stable for five days only after that it gets spoiled and it is not fit for consumption.

table VIII

PARAMETER	RESULT
SHELF LIFE	4– 5 days

COST CALCULATION FOR FORMULATED BANANA FLOWER POWDER AND BLACK RICE POWDER INCORPORATEDWHEAT BREAD.

table IX

SNO	INGREDIENTS	QUANTITY (g)	PRICE	QUANTITY (g)	PRICE
1	WHEAT FLOUR	1000	55	55	3.025
2	BLACK RICE	1000	350	5	1.75
3	BANANA FLOWER POWDER	1000	200	10	2
4	BROWN SUGAR	1000	80	10	0.8
5	YEAST	1000	1600	3	4.8
6	GUAVA	1000	80	10	0.8
7	SALT	1000	18	2	0.036
8	BUTTER	1000	500	5	2.5
TOTAL		8000	2883	100	15.71

Overhead cost (40%) = 15

Processing and packaging =15 Total

cost = Rs 15.711 + 15 +15

= Rs 45.7

=Rs 45

The total cost of production of the selected formulation of banana flower powder and lack rice powder incorporated wheat bread (variation IV) was estimated to be RS 45/ 100g of bread. When compared to the commercial product it is more nutritious and affordable price to buy this product.

CONCLUSTION:

The banana flower powder and black rice powder incorporated wheat bread is highly nutritious when compared to the other normal breads. It provides the essential nutrients for the body. This bread is enhanced in energy, carbohydrate, protein, fat, fiber, iron, calcium, β- carotene, niacin and vitamin E. It is rich in antioxidants. It is very easy for consuming all the age group of people. It ishighly acceptable for all the income group people also. The overall acceptability of the product is excellent. The shelf life of the product is excellent. It is healthy for consumption and it is naturally safe and environment friendly for consuming and disposing.

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