"DEVELOPMENT OF PROTEIN ENRICHED PANCAKE MIX"

PROJECT WORK

SUBMITTED TO DEPARTMENT OF PG STUDIES IN FOOD SCIENCE AND NUTRITION,

BESANT WOMEN'S COLLEGE, MANGALORE

IN THE PARTIAL FULFILMENT OF REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN FOOD SCIENCE AND NUTRITION

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CERTIFICATE

This is to certify that the project work entitled ***"DEVELOPMENT OF PROTEIN ENRICHED PANCAKE MIX"*** is an authentic record of independent research work done by ***Miss. FATHIMATH AFEEA(Reg.no:193041963)*** under my supervision during the period of ***JULY 2021 to OCTOBER 2021***, submitted to Mangalore university for the partial fulfillment for the award of the degree of ***Master Of Science In Food Science*** and the present work has not been previously formed the basis for the award of degree, diploma, fellowship, associateship or other titles.

PLACE: VITLA, BANTWAL

DATE: 30 October 2021

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CERTIFICATE

This is to certify that the project work entitled **"DEVELOPMENT OF PROTEIN ENRICHED PANCAKE MIX "**, submitted to the **Department of PG Studies in Food Science and Nutrition, by Miss. FATHIMATH AFEEFA (Reg.no:193041963)** towards the partial fulfillment of the degree of **Master Of Science In Food Science And Nutrition**, is a faithful record of original work carried out by her in the academic year ***2020-2021.***

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DECLARATION

I, **FATHIMATH AFEEFA ,** hereby declare that project work entitled **"DEVELOPMENT OF PROTEIN *ENRICHED PANCAKE MIX "*** is a bonafide record of research work done by me under the supervision of **Mrs. ROOPA RAO K., Assistant professor , Department of PG Studies In Food Science and Nutrition, Besant Women's College, Mangalore.**

The information depicted in the current report is the result of my own work, except where the reference is made. The information provided in the report is authentic as per my knowledge.

The results embodied in the project work have not been submitted to any other university or institution for the award of any degree, diploma, associateship, fellowship or similar titles.

Place: VITLA, BANTWAL

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ABSTRACT

Protein energy malnutrition (PEM) is a fairly common world wide in both children and adults. With an ageing population, dietary approaches to promote health and independence later in life are needed. In part, this can be achieved by maintaining muscle mass and strength as people age. dietary recommendations for protein intake may be insufficient to achieve this goal and that individuals might benefit by increasing their intake and frequency of consumption of high-quality protein.

Pancake is a breakfast dish which is liked by all age group. Protein rich pancake product provide adequate amount of protein and also contain fibre which provide bulk to the diet.

Developed pancake is a healthy choice that can be incorporated into the diet to prevent protein deficiency.

CHAPTER 1:
INTRODUCTION

1.0.Introduction:

A healthy eating habits, despite of age involves consumption of high quality protein meals throughout the day. Adequate consumption of dietary protein is important for maintaining health status, growth and development functions throughout the life. They also support physical activity, weight loss and prevention risk of disease. Food protein quality is traditionally dependent on its amino acids content, protein contains 20 different amino acids are linked by peptide bonds. Amino acids helps in providing nitrogen, hydrocarbon skeletons and sulphur and impossible to replace by any other nutrients (such as lipids and carbohydrates) because nitrogen and sulphur are not synthesised in the body. Amino acids are the precursors which is, most important for the synthesis of proteins, peptides and low molecular weigh substances(nitric oxide, RNA and DNA) with extensive physiological importance.

The protein under nutrition leads to anaemia, stunting growth, edema, physical weakness, vascular dysfunction and impaired immunity.

The pancake mixer play a major role in market and they have great demand because of variety of product and their convenience in preparation. Pancake is weight based products are consumed globally by all the age groups.

Here the main aim of the project is to prepare a pancake mixer which is nutritious. The ingredients are horse gram powder, wheat flour and jaggery powder.

Horse-gram powder:

Horse gram(Macrotyloma uniflorum) Is rich source of protein. It also contains calcium and iron. Simple processing such as roasting soaking of or scrum were used to reduce anti nutritional factor. in the processing method, the horse gram was roasted for 10 minutes cool down and then powdered. Where the anti nutritional factors such as tan in san fights reduced on processing, nutrition such as protein calcium iron and phosphorus did not change when compared to that contained in raw horse gram. Horse gram occupies an important place in human nutrition. Besides nutritional importance, it has been linked to reduce the risk of various diseases due to the presence of non negative bio active substances. The a recent review attributed with

recent scientific knowledge towards the possibility of exploring the horse gram, as a source of food and nutraceutical compound.

Wheat flour:

Wheat floor is the most important food which contributes more calories, protein and carbohydrates to the diet. It is also considered as a good source of minerals, B-group vitamins and dietary fibre. It is low in fat and cholesterol. Wheat is highly controversial because it contains a protein called gluten, which can trigger a harmful immune response in predisposed individuals. People who are intolerant to gluten need to eliminate weight from their diet . Wheat flour improve digestion and help prevent colon cancer.

Jaggery powder:

Jaggery powder Containing less than 3 mm particle size is used to give a v good flavour to pancake. The jaggery has a longer shelf life for upto two years. Jag contains more nutrients than sugar because Sugar contains only empty calories whereas jaggery contains iron, magnesium, potassium and manganese also contains small amount of B vitamins and minerals, including calcium, zinc, phosphorus and copper. Health benefits include improve digestive health, anaemia prevention liver detoxification and improved immune function.

CHAPTER 2

Review of literature

2.1. Protein intake pattern

Sumathi Swaminathan *et al.*, (2012) stated that 60% of Indian diet of protein is derived from cereals. From the last 25 years the National Nutrition Monitoring Board (NNMB) took several surveys of protein intake and diet in urban and rural areas and also in slum area. The survey shows that in Indian population the protein intake that is mainly from cereals is about 1gm/kg/day form slum, tribal and sedentary rural area. According to protein digestibility corrected amino acid score (PDCAAS) in particular rural area the intake of protein is less . The one third of the rural population appear to have inadequate quality of their protein intake which is at risk of not meeting their daily requirements.

Sylvie Rousset *et al.*, (2003) studied that sufficient level of protein required to maximise the gradual body protein loss is noticed throughout aging. Age, sex and life conditions that may modify protein intake and distribution. But the accurate amounts, also their daily distribution that affects the protein utilisation and N retention which are not known in both young and elderly individuals. Protein intake and protein distribution over daily meals is different for both young and elderly individuals. For men the average protein intake was lower in the older age group whereas opposite trend was seen in women. The protein intake distribution was different between two age groups that is for lunch 56.5% of daily protein was eaten by the elderly and only 47% by the younger subjects. So the protein intake pattern differs between sexes and age groups.

Sumedha Minocha *et al.*, (2017) analysed that the protein requirement associated to its equality or digestibility to meet human essential amino acid requirements. In India they consume cereal based food which has low quality protein leads to risk of quality protein deficiency. From the study the percentage of the population at risk of quality protein deficiency that vary between 4% and 26% among different age groups and between the urban or rural sector . To reduce these risk requires greater intake of high quality protein such as

pulses, and that food subsidy policies move beyond cereals and become more quality conscious .

2.2Nutritional Composition

SS Kadam *et al.*, (1985) studied that the horse gram are grown mostly under dry land agriculture . Like other legumes horse grams are deficient in methionine and tryptophan. Horse gram is rich source of iron and molybdenum whereas it has higher trypsin inhibitor and hem-agglutinin activities and polyphenols. The germination, dehusking, roasting and cooking are shown to produce beneficial effect on nutritional quality.

M Marimuthu *et al.*, (2013) evaluated the flour functionality and nutrient composition of horse gram seeds were examined of their flour characteristics. The main aim is quantifying physiochemical and functional properties which may serve as a guide to utilise its benefits for human and animal nutrition . In this study they may provide a guide line for the use of horse gram seed flour are good functional food for nutrition, food formulation and utilization.

Yadahally N Sreerama *et al.*, (2008) investigated that the use of horse gram and its flour is limited in legume composite flours and products due to the presence of anti nutritional components, poor functional and expansion properties of horse gram make easier its use as ingredient in food processing. New popped or expanded horse gram come from xylanase-mediated depolymerisation of cell wall polysaccharides of horse gram. This popped horse gram is resulted in increased length (5.3-6.8mm) and higher yield of expanded grain(63-98%) . The xylanase treated and expanded horse gram flour had higher water (204.3g/100g) and oil absorption capacities (98.4g/100g) than unprocessed flour which had 135.8g/100g and 74.6g/100g respectively at ambient conditions. This study shows that flour functionality and nutritional value of horse gram can be improved by processing it into new product that can be used as an ingredient in food processing

Iron was 8.71 -9.16 mg %(DMB)

Aishwarya V. Patil *et al.*, (2019) stated that horse gram is a potential grain legume which has excellent nutritional quality. Seven released varieties and five breeding lines of horse gram were acquired from All India Coordinated Research project dry land project Vijaypur. The horse gram were evaluated for crude protein, in vitro protein digestibility, antioxidant

activity and polyphenol content . There was no significant difference among the varieties was observed.

2.3Germination

RS Pal *et al.,* (2016) investigated the change in antioxidant activity, chemical composition and mineral content of horse gram after dehulling and germination. When compared to the raw and germinated horse gram the dehulled samples contain higher protein content. After dehulling (29.31%) and germination (98.37%) the total soluble sugars (TSS) content increase whereas the total lipid increases(10.98%) after dehulling and decreases after germination . The phytic acid, tannin, and oxalic acid are decreased after dehulling and germination. Here they studied that the bulk density(11.85%) and oil absorption capacity (18.92%) of flours significantly increased after germination. After germination combined with dehulling increase the nutritive value of horse gram and reducing anti nutrients.

Atinder Ghumman *et al.,* (2016) studied the effect of germination on protein profiling, functional and pasting properties of lentil and horse gram lines. The random coils and alpha helix proportion of beta sheets was lowest whereas proportion of the beta sheets and beta turns are highest . Germination of horse gram does not affect trypsin inhibitor. Amylose content decreased during germination. Uncooked starch shows the increase in proportion of small granules and decrease in proportion of large granules.

Vanshika Handa *et al.,* (2017) optimised the soaking and germination conditions of horse gram to decrease the anti nutritional factors as well as maintaining the nutritional properties of horse gram. Under different illumination condition that is light and dark the horse gram is soaked for 6, 12 and 18hr followed by germination for 0,24 and 48hr . Then this soaked and germinated are dried at 55 degree Celsius in laboratory. The physiochemical and functional characteristics are affected by both soaking and germination where the germination which is done in dark and light conditions effect the ascorbic content, total protein, total phenols , antioxidant activity and tanin content . In this study it was found that the germinated sample in the presence light decreases anti nutritional factors and there was increase in ascorbic acid and total protein content.

2.4. Health benefit

Saroj Kumar Prasad *et al.*, (2015) studied that horse gram is grown in wide range of adverse climatic conditions which is an under-utilised crop. It plays an important role in human nutrition and has rich source of protein , minerals and vitamins. Bioactive substances such as phenolic acid , phytic acid, fibre, proteinase inhibitors have notable metabolic or physiological effects . Horse gram is recognised by traditional medicine as they are the potential therapeutic agent to treat kidney stones , urinary diseases piles common cold , fever etc.

A Bhartiya *et al.*, (2015) discussed the horse gram (Mycrotyloma uniflorum) belongs to family Fabaceae are among under-utilised legumes which is lesser known neglected legume that are cultivated in Asian and African countries. Horse gram has best therapeutic properties and are used to cure kidney stones, asthma, bronchitis, piles , heart disease , urinary discharge etc. other than this it also have anti diabetic , anti ulcer activity and also help in dietary management of obese people due to the presence of beneficial bioactive compounds.

2.5.Prevelance of malnutrition

Dechelen Tshering Bhutia(2014) discussed that in India Protein Energy Malnutrition is a major health problem in India. This affect is mainly seen in children which leads to permanent impairment in later life. Underweight, stunted growth are the symptoms of PEM. The widespread of stunting among under five is 48% and wasting is 19.8% and the underweight is 42.5% is highest in the world. This PEM is also seen in children who is suffering from poverty where they cannot meet their dietary nutritional requirements .

Aditya Vedantam *et al.*, (2009) estimated the frequency of malnutrition among elderly in rural people of south India. Nutritional status was evaluated using the Mini Nutritional Assessment (MNA) questionnaire which had an eighteen- item nutritional screening instrument used in elderly. Here as examined by the MNA, 14% of the 227 subjects were malnourished and 49% are at risk. The majority are living with their children with low income .In south India more than 60% subjects the low MNA scores shows the lower intake of protein and require more attention.

Bobby Joseph *et al.,* (2002) identified the prevelance of malnutrition in the rural areas of Karnataka among 256 children who attended anganawadis. The children from 1-5years are from villages located at the outskirts of Bangalore city. The children with wasting , stunting and wasting and stunting was 31.2%, 9.4% and 29.2% respectively. To detect acute malnutrition they used reference weight and calculated using Weech's formula. The study showed that mid-upper arm circumference (MUAC) should be used carefully because they are not susceptible to detect all the malnutrition cases, although the MUAC for height can be used because they are more susceptible. For the calculation of stunting Weech's formula can be used, however the sensitivity is not very high.

2.6.Product development

Thirukkumar.S *et al.,* (2014) evaluated that horse gram is the inexpensive sources of protein calcium and iron. Simple processing of horse gram used to reduce the anti nutritional factors that is soaking and roasting. One portion of horse gram was washed and soaked in required amount of water for 12 hours with periodical change of water every four hours. Then horse gram is dried and then powdered. In another method horse gram was roasted on low flame for 10 minutes , cooled and powdered whereas the tannins and phytates are anti nutritional factors which are reduced during processing. The nutrients protein, calcium, iron and phosphorus will not change during processing. In Wheat based chappathi to increase the nutrient content of the product this processed horse gram is added. 10% soaked and dried or 15% roasted horse gram flour is added to chappathi prepared from wheat flour was highly acceptable.

Shashi Jain *et al.,* (2012) studied that the seed of horse gram are of to varieties that is 'AK-21' and 'AK-42' were examined for their physiochemical and nutritional properties using five product such as kasar, laddoo, mathri, biscuits and Khakra. The hydration capacity for both varieties was 0.03g /seed at 6 hr similarly 0.04g/seed at 12,18 and 24 ht. When compared to AK-42 the seed count , seed weight and density is higher in AK-21. After 18hr after soaking in plain water the cooking time of Ak-42 was 50 min whereas cooking time for AK-21 was 60 min. The protein content in AK-21 was 15.10g% and the protein content inAK-42 was 15.32g%(DMB). The fat content of Ak-42 is less when compared to AK-21. The fibre content ranged between 4.57-5.15g% . The amount of energy ranged from 376.12 to 377.21 kcal/100g and the iron was 8.71 -9.16 mg %(DMB)

Homi Joshi *et al.*, (2020) described that horse gram is a cheap source of protein and nutrient rich pulse. Horse gram is most suitable for commercial foods and its flour is used in preparation of food products. Here they aimed at developing functional biscuits by adding horse gram flour to wheat flour and to check the physical property and sensory characteristics of sensory gram flour biscuits. Sensory evaluation shows that product developed by adding 25% horse gram flour to wheat flour had good taste , flavour , texture and overall acceptability. This study proves that horse gram flour can be successfully added to get improved nutritional value.

Masaharu Seguchi(1990) assessed that pancakes baked with wheat flour that is heat treated are decreased in their gumminess and increase in springiness. The temperature dependent Brabendar Amylograph test of this heat treated wheat flour at 120 degree Celsius for 0,1.0,2.0,3.0 and 5.0hr shows that when the time of heat treatment is increased the first viscosity of flour slurries starts at low temperature. The change in property by heat treatment are consistent with properties of chlorinated wheat flour.

2.7.Wheat flour

Saeed Akhtar *et al.*, (2011) studied that government and world organisations focused on deficiencies of iron , zinc and vitamin A . Wheat flour is suitable for micronutrient fortification. This fortification of wheat flour has been accepted as an appropriate strategy to reduce micronutrient deficiencies.

Miki Ozawa *et al.*, (2006) examined that the dry wheat flours divided into water soluble , gluten , prime starch and tailings component by an acetic acid fractionation technique. At each temperature with a gradual increase in the time duration the recovery of the prime starch component decreased whereas tailing component increased the other two components did not change . These dry heated wheat flours gave pancake springiness. The interaction between the tailing component and prime starch component in wheat flour produced by dry heating was highly associated to improvements in the pancake springiness.

Monica whent *et al.*, (2012) studied that from five wheat cultivars the whole wheat flour was estimated for phenolic, carotenoid and tocopherol composition and also anti

inflammatory and anti proliferative activities against HT-29 cells. The total ferulic acid is primarily present in the insoluble bound form that is ranged from 452 to 731 micro gram per gram . Here the carotenoid is Lutein and was ranged from 1.5 to 4 micro gram / gram and alpha tocopherol levels ranged from 12 to 61 micro gram per gram. The research display that whole wheat flour of the five cultivars varied notably and there is possibility that wheat varieties are selected based on possible health benefits.

2.8.Jaggery

J Singh *et al.,* (2013) described that the 65% people of India lives in rural villages. The rural population suffers due to malnutrition as they cannot meet their nutritional requirements. Healthy food should be consumed so that the consumption of the food may prevent diseases . Jaggery, is a product from sugarcane which is rich in important minerals. The magnesium present in jaggery strengthens our nervous system also take care of our blood vessels. The potassium and the low amount of sodium maintain the acid balance in the body cells. Jaggery is also used as medicine for migraine in Ayurvedic field.

Parth Hirpara *et al.,* (2020) explained that jaggery is a medicinal sweet where it contains nutrients like protein vitamin and minerals like iron and copper . Texture of jaggery is hard and has golden yellow colour. Jaggery is also an energy food which can be used for blood purification, regular functioning of live and also keep blood healthy. It improves digestion , boosts energy, relieves constipation, it has anti toxic and anti carcinogenic properties, treatment of bronchial or lung infections and pre menstrual syndrome

2.9.Packaging

Bernhard Saam (1999) studied that a package of stand up pouches in which a rectilinear container holds the pouch inside with closed top portion , they are arranged between adjacent base portion of the pouches occupying minimum space . The container can be opened by separating the portions the line of weakening is broken.

Chapter 3
Materials and Methodology

The main aim of the study is to develop a nutritious protein rich pancakes. They were developed in different variations. The Horse-gram were analysed for their protein, fibre and moisture content. Sensory evaluation was done and finally they were checked for their shelf life.

3.0. Materials and Methodology

3.1. Materials:

3.1.1. Raw ingredients:

The raw ingredients were bought from the local market in mangalore.

Table 1: Raw ingredients are used in the pancake mixture

Ingredients	Amount(in grams)
Horse-gram	45
Wheat flour	35
Jaggery	20

3.1.2. Equipment and glassware:

Equipment: Weighing balance (Essae-Teraoka Pvt. Ltd), Hot air oven (B.D. instrumentation, Ambala Cantt), muffle furnace (Rotek instruments, Kerala), 2375 Double beam spectrophotometer, water bath (Labotech instruments, B.D. instrumentation, Ambala Cantt).

Glassware: Beakers, Test tubes, Conical flasks, Glass rod, Burette, Standard flask, measuring cylinder, Watch glass, Petri dish, Pipettes, Micropipettes, Conical flask.

3.1.3. Reagents and chemicals used: All reagents and chemicals used in the experiments were of AR grade procured from Fisher Scientific, Mumbai; Medilise, Kerala; Emplura, Mumbai.

- Bovine serum albumi
- alkaline copper sulphate
- 0.1N sodium hydroxide solution
- 1% sodium potassium tartarate
- 2% sodium carbonate
- Folin Ciocalteau Reagent

3.2. METHODOLOGY:

3.2.1. Adulteration test:

Table 2: Adulteration test of raw ingredients

Ingredient	Test	Adulterant
Horse-gram	Take 2-3 grams of horse-gram sample and place them in petridish then they are examined usually	Extraneous matter (dust, stone, insect and hair)
Jaggery	To 1 gram of melted sample few drops of concentrated hydrochloric acid were added. Mixed well.	Chalk powder

3.2.2. Standardisation of processing method.

a) Roasting:

Horse-gram was roasted in a pan for 10 minutes in low flame, cooled and subjected to milling.

b) Jaggery:

20gram of solid jaggery were ground to fine powder using mechanical grinder.

3.2.3. Variations of the product:

Table 3: Different variations of the ingredients

Variation 1	Variation 2
Horse-gram- 35gram	Horse-gram- 45gram
Wheat flour- 45gram	Wheat flour- 35gram
Jaggery- 20	Jaggery- 20

3.2.4. Determination of protein by Lowry's method:

Powdered sample of one gram was mixed with 4ml of potassium phosphate buffer(pH is 7.4) and the sample was centrifuged at 500rpm for 15 minutes. 1ml of supernatant was used for protein estimation. The standard sample was prepared using bovine serum albumin of 200μg/ml concentration with aliquots of 0.2-1.0ml which were made upto 1.0ml with distilled water. 5 ml of alkaline copper sulphate solution was added and the test tubes were allowed to stand for 10minutes, later 0.5ml of Folin-Ciocalteau Reagent(FCR) was added and all the test tubes were incubated in dark for 30minutes. The absorbance was read at 660nm using spectrophotometer.

3.2.4. Preparation of Pancake Mixer

Step1:Powdering of Horse-gram:
Roast the horse-gram and powder it.

Step2: Horse-gram was added to wheat

Step 3 : Addition of jaggery powder.

Step 4: Mixing

The amount of raw ingredients used in the product was depicted in the table 1.

3.2.5. Sensory evaluation using preference test:

The sample containing high amount of protein by Lowry's method was subjected to the preference test with random sampling using the sample size of 50.

3.3. PROXIMATE ANALYSIS:

Estimation of moisture and fibre of the product. The methods described by AOAC 2000.

3.3.1. Estimation of moisture content by hot air oven method:

In a sterile glass petriplate 5g of pancake mixer was taken whose weight was noted earlier. The sample were dried in hot air oven at 125°C for 4 hours . Then the samples were cooled in the desiccator for 30 minutes and the weight was noted that is (m1). The sample were again placed in the oven for another 1 hour at 125°C. The samples were cooled for 30 minutes in the desiccator and the weight was taken that is (m2). The average of the both weight were taken and was substituted in the formula to obtain the % of moisture.

Moisture (%) was calculated by the formula:

$$\frac{\text{(weight of petridish+sample prior drying)(g) - (weight of petridish+ sample prior drying)(g)}}{\text{Weight of the food sample(g)}} \text{ X100}$$

3.3.2. Estimation of fibre:

In a 500 ml beaker, 2g of food sample (pancake mixer) was taken to that add 200ml of 0.255N of sulphuric acid solution and boil for 30 minutes. Then it was filtered using a muslin cloth and washed with 200ml of boiling water, till all the acid was washed off. The content were filtered in a filter paper washed with water and were dried for 2 minutes in hot air oven for 250°C and the dried sample was scraped off to the weighed crucible and was dried again for 100°C for 4 hours, it was cooled and weighed. The content were placed in the preheated muffle furnace at 600°C for 30 minutes, cooled and weighed .

The crude fibre content was calculated by using formula;

$$\frac{\text{Weight of the crucible before ashing - Weight of the crucible after ashing}}{\text{Weight of the food sample(g)}}$$

3.4. Shelf-life study of the product:

Sensory evaluation of the pancake mixer was done by using 9 point hedonic scale rating on the overall acceptability for 2month period with 4sessions of analysis on the 15^{th} day , 30^{th} day, 45^{th} day and 60^{th} day.

CHAPTER 4

RESULT AND DISCUSSION :

Lowry's method was used to estimate the protein content of two different variations of Protein rich pancake mixer.

Pancake mixer with high protein content was selected as final product. The final product then checked for the presence of adulterant, moisture content, fibre content and shelf life.

4.0. Results and discussion

4.1. Adulteration test:

Table 4: Adulteration test of raw ingredients

Ingredient	**Adulterant Tested**	**Observation**	**Inference**
Horse-gram	Extraneous matter (Dust, stone, insect, hair)	No extraneous matters were observed.	Horse-gram was not adulterated.
Jaggery	Chalk powder	No effervescence was observed.	Jaggery was not adulterated.

All the ingredients used in the preparation of pancake mixer was free from adulterant.

4.2. Standardisation – Processing method:

Table 5: Processing method:

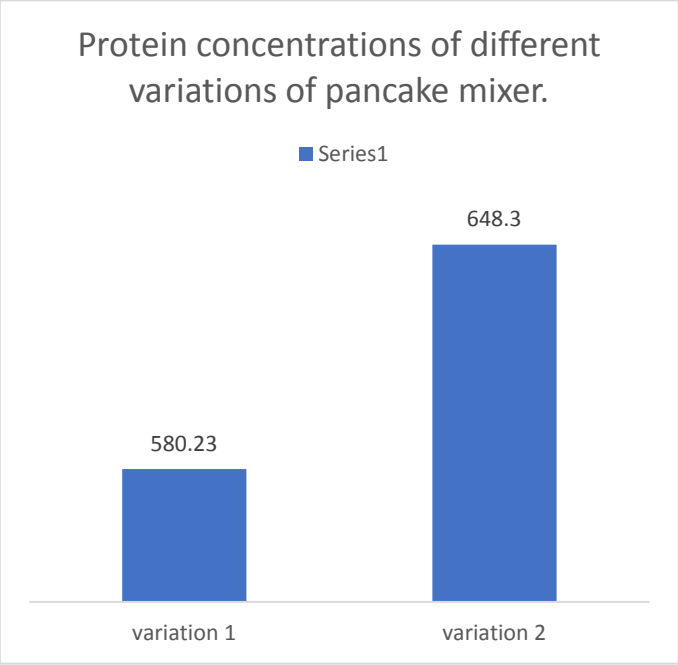
Processing method	**Observation**	**Inference**
Roasting of horse-gram	• Horse-gram that were subjected to dry roasting had acceptable colour, odour and appearance. • Horse-gram that were not subjected to dry roasting had unacceptable colour, odour and appearance.	Roasted horse-gram were incorporated in the pancake mixer preparation.

4.3. Protein estimation of pancake mixer by Lowry's method.

Table 6: protein content of different variations of pancake mixer

Variation	Compositions (total 100g of pancake mixer)	Protein concentration per gram of sample(µg/ml)
Variation 1	• Horse-gram=35g • Wheat flour =45g • Jaggery =20g	580.23
Variation 2	• Horse-gram =45g • Wheat flour=35g • Jaggery =20g	648.3

Figure 1. protein content of different variations of pancake mixer



From **Figure 1,** variation 2 has highest protein content when compared with variation 1.

4.4. Sensory evaluation by preference test:

Pancake made from two different pancake mixer were used for preference test. During pancake preparation milk, baking soda , baking powder, cardamom powder were added to improve the sensory quality of pancake . The sample size was 75, it was observed that out of 50 people 17of them liked variation 1 pancake mixer whereas 33of them preferred variation 2

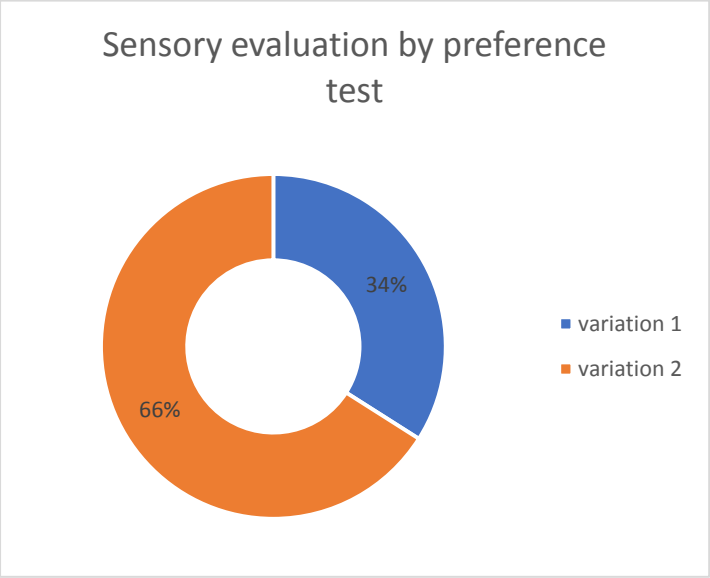


Figure 2 Sensory evaluation by Preference test.

Figure 2 shows that the result Result of the preference test indicating that variation 2 was most preferred for their sensory characteristics like appearance, flavour colour and odour . So variation 2 was selected as final product.

4.5. Valuation of final product:

Sensory evaluation was done by preference test showed that variation 2 was liked by most of the participants and Lowry's method show that the protein content of variation 2 pancake mixer was high and can be used by all the age groups.

4.6. Proximate analysis

The proximate analysis (moisture, fibre and protein content) of protein rich pancake mixer per 100 gms are given in **Table 7** and **Figure 5**

Table 7: Proximate analysis of protein rich pancake mixer

Particulars	**Composition (100grams)**
Moisture content	1.832g
Crude fibre	3.363g
Total protein	648.3mcg

- Total moisture content show the amount of water present in the protein rich was
- Crude fibre content is the non digestible component that provides bulk to the diet. The crude fibre content of protein rich pancake mixer was found to be
- The total protein content of pancake mixer was found to be a protein rich product.

4.7. Shelf life of protein rich pancake mixer:

Sensory characteristics of the pancake mixer were observed in 4 different sessions.

1st day – sensory characteristics of pancake mixer that is colour, odour, flavour and appearance was examined.

15th day - The sensory characteristics of pancake mixer was same and acceptable.

30th day - There was no change in the sensory characteristics and it was acceptable.

45th day - There was no change in the sensory characteristics and it was acceptable.

60th day - there was a Noticeable change in the flavour, colour, odour and appearance was observed

From this study , it is acknowledged that the shelf life of the protein rich pancake mixer was 60 days.

CHAPTER 5

SUMMARY AND CONCLUSION

This section gives deep understanding of This study. The product developed was rich in protein . The shelf life of the product upto 2 month.

5.1. SUMMARY

- The adulteration test asserted the raw ingredients used for the preparation of protein rich pancake mixer Was free from contamination.
- Horse gram was subjected to roasting which is cost effective and improve the nutritional properties and tastes.
- Two different variations was done to get the combination of the product.
- Various proportions were considered to finalise the perfect sample to get perfect pancake.
- Approximate analysis and shelf life study was done.
- Most of the participants prefer the pancake mixer of horse gram 45g, wheat flour 35g and jaggery 20g.
- The pancake mixer was then observed for their shelf life and it was remained til 2 months.

5.2. CONCLUSION:

Protein is very important to be included in the diet for all age groups. The pancake mixer is a rich source of nutrients due to the presence of horse gram and wheat flour, which are locally available and affordable. This pancake mixture is a good source of energy, protein and carbohydrates. The shelf life of the product was shown to be for 2 months. consuming adequate dietary protein is critical for maintaining optimal health, growth development which is provided by this protein rich pancake mixer.

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APPENDIX

APPENDIX 1

Preparation of Reagents:

1) Estimation of protein by Lowry's method:

- standard protein solution

  20 mg of bovine serum albumin was weighed and transferred to a 100 ml standard flask. It was made up to mark with distilled water. The concentration of the standard protein was 200mcg/ml.

- Alkaline copper sulphate solution

  The alkaline copper sulphate was prepared by mixing 50ml of solutionA and 1ml of freshly prepared solution B.

  - 0.1N sodium hydroxide solution

  4 grams of sodium hydroxide pellets were weighed in the analytical balance and transferred to a 100ml standard flask using a funnel, it was mixed with distilled water and shaken well till the pallets dissolved completely and was made up to the mark .

  -1%Sodium potassium tartrate solution

  One gram of sodium potassium tartrate crystals were weighed and were transferred to 100ml standard flask. It was made up to the mark by distilled water. It is freshly prepared.

  Solution A: 2% Sodium carbonate solution.

  2 grams of sodium carbonate was wade and was transferred 100ml standard flask. It was made up to the mark with 0.1N sodium hydroxide solution.

  Solution B: 0.5% copper sulphate solution.

  0.5 grams of anhydrous copper sulphate crystals were weighed and transferred into 100ml standard flask it was made up to the mark with 1% sodium potassium titrate solution.

- Folin ciocalteau Reagent (FCR):

Okay 50ml of FCR was Prepared by taking 25ml of FCR in 50ml measuring cylinder and making it up to 25ml by distilled water.

- Potassium phosphate buffer

  3.03 grams of dipotassium hydrogen phosphate crystals and 1.035 grams of potassium di- hydrogen phosphate crystals were weighed separately and were transferred to a 250ml standard flask it was made up to the mark with distilled water.

  The pH was adjusted by dipping the electrode of pH meter in the buffer solution and adjusting the pH with 0.1 sodium hydroxide(If less than 7.4) or with 0.1 hydrochloric acid(If more than 7.4)

2. Fibre estimation by AOAC method:

¬ 0.255N sulphuric acid solution

7ml of concentrated sulphuric acid was measured in a volumetric cylinder and was transferred into 1000ml standard flask using funnel, made up to mark with distilled water.

¬ 0**.313N sodium hydroxide solution**

12.38 Gms of sodium hydroxide pellets were weighed using analytical balance and transferred to a 1000ml standard flask and was added with distilled water until the pellets dissolved. It was made up to mark with distilled water.

APPENDIX-2

SENSORY EVALUATION OF PANCAKE USING 5-POINT HEDONIC SCALE

FORM 1:-

NAME: _____

AGE: _____

Taste each of the following samples and tick how much you like it or dislike it.

Instructions: Rinse your mouth with water and have a piece of cracker before tasting each sample.

	V1	V2
Like lot	_____	_____
Like a little	_____	_____
Neither like nor dislike	_____	_____
Dislike a little	_____	_____
Dislikea lot	_____	_____

SIGNATURE: _____

DATE: _____

Form 2:-

You are receiving a set of samples of pancake. Kindly taste each of from the set and drink water provided before tasting the next sample. Evaluate them by numbering on the basis of attributes given below.

ATTRIBUTES	pancake	
	V1	V2
APPEARANCE		
COLOR		
TEXTURE		
AROMA		
TASTE		
OVERALL ACCEPTABILITY		
(9-Like Extremely,8-Like Very Much,7-Like Moderately,6-Like Slightly,5-Neither Like nor Dislike,4-Dislike Slightly,3-Dislike Moderately,2-Dislike Very Much,1-Dislike Extremely.)		

SIGNATURE: _____

DATE: _____

APPENDIX-3

SHELF LIFE STUDY OF PANCAKE MIX USING 9-POINT HEDONIC SCALE

NAME :_____

AGE :_____

Taste each sample given and rate the characteristics given below on a scale of 1 to 9.

9-Like extremely

8-Like very much

7-Like moderately

6-Like slightly

5-Neither like nor dislike

4-dislike slightly

3- dislike moderately

2- dislike very much

1- dislike extremely

PANCAKE STORED :-

Sensory characteristics	Day 1	Day 15	Day 30	Day 45	Day 60
Appearance					
Colour					
Texture					
Aroma					
Taste					
Overall acceptability					

SIGNATURE: _____

DATE:

DAY 1 _____

DAY 15 _____

DAY 30 _____

DAY 45 _____

DAY 60 _____

APPENDIX 4

Optical density of solution used for calorimetric analysis:

➢ Estimation of protein by Lowry's method

Aliquots of standard	S1	S2	S3	S4	S5	Blank
Volumes of standard protein solution(ml)	0.2	0.4	0.6	0.8	1.0	-
Concentration of standard protein solution(mcg/ml)	40	80	120	160	200	-
Volume of distilled water (ml)	0.8	0.6	0.4	0.2	-	1.0
Volume of copper sulphate (ml)	5	5	5	5	5	5
Volume of Folin-Ciocalteau Reagent(ml)	0.5	0.5	0.5	0.5	0.5	0.5
Optical density of standard solution at 660nm						