

Formulation, Standardization, Nutrient Analysis and Sensory Evaluation of Green Gram Flour (*Vigna radiata* L.) incorporated in Madhuraseva

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Abstract - Green gram is that the major pulse crop of the state with a complete coverage of 799680 square measure that is concerning forty per cent of the full pulse cultivating space of the state. The aim of the study is to formulate and standardise a new product using value addition of green gram flour incorporated in Madhuraseva. **Objectives:** The study was carried out with the objectives, to formulate and standardize the green gram flour incorporated Madhuraseva, to analyze the nutrient content of green gram flour incorporated Madhuraseva, to evaluate the shelf-life study of the green gram flour incorporated Madhuraseva and to calculate the cost of green gram flour incorporated Madhuraseva. **Methodology:** Green gram flour incorporated into Madhuraseva in four different variations 25%, 50%, 75% and 100%. **Results:** From the sensory analysis the product B (50%) was selected as the best product. The nutrient analysis showed that the sample B contains a good source of calcium 135.92mg and phosphorus 32.2mg when compared to that of the standard which had only 133mg of calcium and 30.4mg of phosphorus respectively. The selected best product was stored for 15 days and every 5th day sensory attribute and microbial analysis were carried out to find the storage stability for both standard and selected variation for the accessibility. The best product and standard was stored in airtight container and zip lock cover for the shelf life study for a period of 15 days. The microbial study was also carried out for 15 days and results showed no microbial growth in the sample and it is safe for consumption. The cost of the formulated product is lower than the standard. **Conclusion:** It was concluded that the green gram flour incorporated Madhuraseva with 50% of the green gram flour was accepted with high in calcium and phosphorus content.

Index Terms - Green gram flour, Madhuraseva, airtight container and zip lock cover.

1. INTRODUCTION

Phaseolus aureus or *Vigna radiata* (*Vigna radiata* L.) is that the third most vital short season grain legumes within the standard farming system of tropical and temperate regions. It is mature on a range of soil and atmospheric condition, because it is tolerant to drought and could be a smart supply of macromolecules and minerals and its protein quality is analogous to or higher than alternative legumes (T.K. Samant, 2014). *Phaseolus aureus* is the third necessary pulse crop of Asian country mature in nearly eight per cent of the full pulse space of the country (Tushar Ranjan Mohanty et al., 2014). Mung bean provides vital amounts of proteins, carbohydrates and a spread of micronutrients in diets. Mung bean macromolecule and carbohydrates are simply light and build less flatulence than proteins derived from alternative legumes (Ramakrishnan.M et al., 2013). All the pulses are renowned to supply flatulence with an exception of *Phaseolus aureus*. This property makes *Phaseolus aureus* (green gram) complementary to health (Dr. Kavya N, 2014). *Vigna radiata* beans contain a number of minerals. Potassium is needed for the right functioning of internal organ muscles, whereas metallic element relaxes the arteries and veins leading to an enlarged flow of blood, oxygen, and nutrients throughout the body. Calcium is important for teeth and bone health, whereas iron is crucial for the formation of haemoprotein, and plays a vital role within the varied metabolic processes. Zinc aids within the growth and repair of tissues, boosts the system, and plays a vital role in spermatozoan survival. Additionally to those, copper and selenium

also are gift in trace amounts (Madav.A (2010). *Vigna radiata* beans don't seem to be solely low in fat however also are cholesterol-free. Therefore they are recommended for people who want to lose weight. Sprouted beans have lower fat content compared to whole bean preparations. Therefore, salads prepared from sprouted beans are generally preferred over the whole bean ones, as far as weight loss is concerned (Mesallam, 2014). Sprouted green gram was higher in inhibitor capability over moth beans and chick peas, therefore the sprouted seeds of *Phaseolus aureus* were found to be a lot of effective in total inhibitor capability. Sprouting increases the health benefits by increasing its free radical scavenging abilities which otherwise if reduced causes oxidative stress leading to provide base for many diseases (Sanjay, 2016). Hence this study was taken up with the following objectives: 1) To formulate and standardize the green gram flour incorporated in flavoured Madhuraseva. 2) To evaluate the shelf life of the green gram flour incorporated in flavoured Madhuraseva.3) To analyze the nutrient content of green gram flour incorporated in flavoured Madhuraseva.4)To calculate the cost of green gram flour incorporated in flavoured Madhuraseva.5)To popularize the prepared new product among the population.

2.METHODOLOGY

2.1. Selection of ingredient: Whole green gram was selected as an ingredient since legumes serves as a “poor man’s meat”. It is purchased from the local market. The green gram seeds were cleaned for wholesomeness after discarding broken hull seeds and shriveled seeds

2.2. Preparation of green gram flour: Whole Green gram was cleaned, dry roasted and grounded to a powder. The grinding was done using pestle and mortar. It was grounded to a fine powder and kept in air tight container till analysis was completed.

2.3. Selection of product: Madhuraseva was selected as the product.

2.4. Formulation and Standardization: Standardization was done by incorporating the green gram flour in specific proportion. The selected green gram flour was incorporated by substituting bengal gram flour in the standard recipe with the proportion of 25%, 50%, 75% and 100% in Madhuraseva. In the product formulation four variations along with standard was taken for the

sensory evaluation. Table 1 indicates the level of incorporation of green gram flour with bengal gram flour in selected product.

Table 1

Green gram flour incorporated in different variations

Variations	Bengal gram flour	Green gram flour
Standard	100g	-
Sample A	75g	25g
Sample B	50g	50g
Sample C	25g	75g
Sample D	-	100g

2.5. Sensory Evaluation: The standardized products were evaluated for its sensory attributes using a score card with point scale. The criteria included in the score card were appearance, colour, flavour, texture, and taste. Sensory analysis was conducted in a clean, undisturbed environment at 11.00am and 3.00pm. Score card was used to evaluate. The evaluation was done by 30 semi trained panel members of staff and students from Department of Foods and Nutrition in Rathnavel Subramaniam College of Arts and Science.

2.6. Selection of best product incorporation: Sensory quality is a combination of different senses of perception coming in to play choosing and eating a food. The overall quality of the product depends on the nutrition and sensory quality assessed by human sense organs. The most acceptable proportion was selected through appearance, colour, flavour, texture, and taste. After sensory evaluation from the different variations Sample B was selected as the best product.

2.7. Nutrient analysis: Calcium intake should be high, especially at young ages, so that the children naturally grow up with strong teeth. It helps in the easy movement of nutrients across cell membranes. Calcium strengthens the backbone and ensures the right shape to the body and prevents many skeletal complaints like arthritis and osteoporosis. Phosphorus is a vital part of the growth process, as well as the maintenance of bones and teeth. It works in association with calcium to create strong bones, which can withstand the normal wear and tear of human life. Green gram is rich in calcium and phosphorus. These two nutrients were analysed in the standard and formulated products by using standard procedure.

2.8. Shelf life Study: Shelf life study was done to find the longevity of the products so that the consumers could consume it for maximum number of days. Shelf life of any food product depends on moisture content,

preparation method, preservatives added and packing material used. To determine the time a product can be expected to keep without appreciable change in quality, safety or character.

2.9. Packaging Material: The product was packed in two different packaging materials like airtight container and zip lock cover. The selected products were stored in both packaging materials in room temperature and noticed for 15 days to find out its better shelf life. The storage stability of the products will depends on the preparation method, the ingredients used and the moisture content. The stored products were analyzed for their sensory attributes by the same panel members on 1st, 5th, 10th and 15th days.

2.10. Microbial Analysis: Microbial analysis was conducted to check the growth of mold, fungus, and to find the total bacterial count at room temperature. One sample was selected as best product among four variations and along with standard the selected samples were subjected to microbial analysis. The microbial test was carried out on 1st, 5th, 10th and 15th day respectively to assess the microbial count.

2.11. Cost Analysis: The cost estimation was done to compare the price of standard product and the formulated product. The cost of the ingredient was calculated according to the availability in the local area.

2.12. Popularisation: Popularization is the direct way of approaching the targeted groups or the public to create awareness and improve the curiosity of them on our product to buy. During popularization the area which we selected and targeted will know about our product, the nutrition part, health benefits all will be included in popularization and the positive point on the product will reach them and insist the public to buy the product and make use of it (Mesallam, 2014). In the popularization, the important and health benefits of the Green gram were educated and the product was popularized among the sample of the product was given to all the participant. School going children was selected as the target group, because they are more prone to bone density problem and digestive problem because of their food habits. The subjects were asked to fill the questions before and after giving nutrition education. It consists of 10 questions which were given to the subjects. This helps to know the importance of popularising a product.

2.13. Statistical Analysis: After seeing the shelf life of the product and proportion of the product is analyzed

in statistical method. Statistics is the study of collection, organization, examination, summarization, manipulation, interpretation and presentation of quantitative data. It deals with all aspects of data including the planning of data collection in terms of the design statistical analysis involves collecting and scrutinizing every data sample in a set of items from which samples can be drawn statistical analysis (Gomez, 2010). The relevant data were collected and acceptability of the product was determined by using mean and standard deviation.

3.RESULTS AND DISCUSSION:

3.1. Comparison of the selected product with the standard: The mean sensory scores for the overall acceptability obtained by the sensory evaluation of standard Madhuraseva and varying proportions of green gram flour incorporated Madhuraseva with the help of score card. It is cleared that among the prepared products, Sample B had the highest mean score in all the criteria when compared to other samples like sample A, C and D. So that we can conclude that Sample B was selected as the best product. Table 2 depicts the comparison of the sensory attributes of the selected green gram flour incorporated Madhuraseva with the standard Madhuraseva.

Table 2

Comparison of mean scores of standard and selected proportion of green gram flour incorporated Madhuraseva

S1 no	Criteria	Standard Product	Selected Product
1	Appearance	4.8	4.6
2	Colour	4.7	4.6
3	Flavour	3.9	4.8
4	Texture	4.5	4.5
5	Taste	4.8	4.6

From the above table it was noted that the selected best product had no big difference in their scores when compared with the standard product.

3.2. Nutrient analysis of green gram flour incorporated Mathuraseva: Calcium and phosphorus are the most abundant minerals in the body. Calcium is an important nutrient used to build strong bones and teeth. Calcium is needed for our heart, muscles, and nerves to function properly and for blood to clot. Phosphorus is needed for healthy bone formation,

improved digestion, regulated excretion, hormonal balance, improved energy extraction, cellular repair, optimized chemical reactions, and proper nutrient utilization. The selected product B contains more amount of calcium (135.9mg) and phosphorus (32.2mg) when compared to the standard product of 133mg of calcium and 30.4mg of phosphorus respectively. Thus it was concluded that the selected product B is high in calcium and phosphorus content.

Table 3

Nutrient analysis of the standard product and selected product

Nutrient	Standard	Sample B
Calcium (mg)	133	135.9
Phosphorus (mg)	30.4	32.2

From the above table it was clear that after the incorporation of green gram flour to the sample product B there is a remarkable change in nutrients like calcium and phosphorous when compared to the standard.

3.3. Shelf life study of green gram flour incorporated Mathuraseva: Shelf life is the recommended maximum time for which products can be stored during which the defined quality of a specified proportion of the goods remain acceptable under expected conditions of distribution, storage and display. The standard and selected products were analyzed for its shelf life period by evaluating their sensory attributes and total microbial load after packing in air tight container and zip lock cover at an interval of 5 days.

3.4. Sensory Analysis of the Standard and Selected green gram flour incorporated Mathuraseva during Storage Study: Sensory Analysis of the Standard and Selected green gram flour incorporated mathuraseva during storage study kept in airtight container and Zip lock cover was given in Table 4.

Table-4

Mean Sensory Score of Standard and Selected green gram flour incorporated Mathuraseva during storage study

Sl no	Days	Mean Score	
		Standard	Sample B
1	5 th Day	4.8±0.08	4.7±0.06
2	10 th Day	4.8±0.02	4.6±0.02
3	15 th Day	4.7±0.31	4.5±0.35

From the above table, it was clear that the quality of the product kept in airtight container and Zip lock cover was accepted by the panel members till 15th day.

3.5. Microbial analysis of the standard and selected green gram flour incorporated Mathuraseva during storage study: Microbiological testing on food products includes presence/ absence of pathogens, total coliform and aerobic plate counts. It was clear from the below Table 5, there was no microbial growth in both standard and sample during 1st, 5th, 10th and 14th day of storage study but on 15th day of storage, standard product had only bacterial colonies of $\leq 10^4$ Cfugm and there was no bacterial colonies and potential hazardous in sample product. So, from the result we can conclude that the newly formulated product is safe for consumption if it is stored properly.

Table 5

Microbial Load of the Standard Product and Selected Product

Day	Name of the Product	Indicator Test Result (CFU / gram) and Interpretation/Standard Plate Count			
		G	M/S	US	PH
1 st Day	Standard	-	-	-	-
	Sample B	-	-	-	-
5 th Day	Standard	-	-	-	-
	Sample B	-	-	-	-
10 th Day	Standard	-	-	-	-
	Sample B	-	-	-	-
15 th Day	Standard	$\leq 10^4$	-	-	-
	Sample B	-	-	-	-
Remarks	1 st day and 14 th day there was no plate count				
Organism identified	No potentially hazardous microbes were isolated.				

(Good= G; Satisfactory = S; Marginal = M; Unsatisfactory = US; Potentially Hazardous = PH)

3.6. Cost calculation of the standard and selected green gram flour incorporated Mathuraseva: The cost analysis revealed that the cost of 100gm of green gram flour incorporated mathuraseva was Rs.31 whereas the cost of 100gm standard mathuraseva was Rs.32. The cost of the selected product is lower than the standard and it is high in calcium and phosphorus when compared with standard.

Table 6

Cost calculation of the Standard Product and Selected Product

Ingredients	Standard product		Selected product (Sample B)	
	Quantity (gm)	Price (Rs.)	Quantity (gm)	Price (Rs.)
Bengal gram	100	12	50	6
Green gram	-	-	50	5
Sugar	50	6	50	6
Oil	200	14	200	14
Total		32		31

3.7. Popularization of the Selected Green gram flour incorporated in Madhurseva during Storage Study
 Popularization was done for school going children to popularize the importance of green gram flour incorporated in Madhurseva. Awareness was created about the importance of green gram flour for school going children by making them to consume the Madhurseva. The overall feedback was collected by providing a questionnaire to them. It was done for 30 subjects using a questionnaire method. The subjects were asked to fill the questions before and after giving nutrition education. It consists of 15 questions which were given to the subjects. The popularization study shows that there is a significant difference in the response of people before and after popularizing the selected products. Thus it was concluded that the popularisation of green gram flour incorporated product Madhurseva had good impact on the subjects. This helps to know the importance of popularizing a product.

4.CONCLUSION

It was concluded that green gram flour incorporated Mathuraseva with 50% of the green gram flour was accepted in organoleptic studies. The selected product was high in calcium and phosphorus when compared to the standard product. The selected product is acceptable till 15th day without any microbial deterioration and it is stored in zip lock cover hygienically or air tight container properly. The cost of the selected best product was comparably lower than standard and it is a healthy snack for school going children.

5.RECOMMENDATIONS FOR FURTHER STUDY

- Further studies can be carried out by incorporating different flours in other food products.

- Supplementation of green gram flour incorporated study can be carried out for subjects.

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