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"Nutritional Composition, Antioxidant Activity, Microbiological Analysis And Storage Stability Of *Luffa Acutangula* Peel"

B.FEMILA PARVEEN[1], JP.JAYASRI[2]

POST GRADUATE STUDENT[1], ASSISTANT PROFESSOR[2]

DEPARTMENT OF NUTRITION AND DIETETICS

JAMAL MOHAMED COLLEGE (AUTONOMOUS), TIRUCHIRAPALLI, INDIA

ABSTRACT

The sustainable utilization of agro-industrial by-products has emerged as an effective strategy to enhance nutritional quality while reducing food waste. Ridge gourd *(Luffa acutangula)* peel, which is generally discarded during household and industrial processing represent a valuable source of nutrients and bio active compounds. The present study aimed to evaluate proximate composition, anti-oxidant activity, microbial activity and shelf life stability of ridge gourd *(Luffa acutangula)* peel powder and to develop value- added products incorporating the peel powder. Proximate analysis of 100gm ridge gourd peel powder contain 360 Kcal energy, 1.2gm fat, 66.5gm carbohydrate, 20.7gm protein, 42.0gm fibre, 150mg vitamin C, 2.7gm ash, 8.9gm moisture along with 9.5% of anti-oxidant activity. Microbial assessment showed a low total bacterial count (2×10^1 CFU/g), confirming the microbiological safety. Shelf-life evaluation under ambient storage indicated stability and acceptable microbial quality for up to 90 days.

KEYWORDS: Ridge gourd (*Luffa acutangula)* peel, Dietary fibre, functional food development

1. INTRODUCTION

Ridge gourd *(Luffa acutangula)* belonging to family *Curcubitaceae* is an annual herb traditionally valued for its dietary fibre content found in parts of India, especially along the coastal lines. It is dark green in color and has a tapering end to it. India is considered as a primary center of origin. The plant is widely cultivated in India, Southeast Asia, China, Japan, Egypt and other part of Africa. *Luffa acutangula*, commonly known as ridge gourd or angled loofah. Peerkangai in Tamil Nadu, Turai in Hindi, Zinga in Bengali, Peerkam Kai in Malayalam, Peechinga in Kerela. is a domesticated vegetable of the *Curcubitaceae* originating from India.

Ridge gourd is regarded as a nutrition powerhouse and has a high nutritional value because of its rich and varied nutrient content. The peel of ridge gourds is rich in dietary fibre, protein, vitamin C, and low in calories and fat.

The present study aims is to analyze the proximate composition, microbial activity, shelf-life storage stability of ridge gourd *(Luffa acutangula)* peel powder. The results demonstrate that ridge gourd *(Luffa acutangula)* peel powder holds a promise as a functional ingredient in the development of health promoting food products. These findings also establish a basis for further research to validate its nutritional benefits and expand its applications in functional food formulations.

OBJECTIVES:

- To evaluate the proximate composition and antioxidant activity of *Luffa acutangula* peel powder
- To assess the microbiological quality and storage stability of *Luffa acutangula* peel powder.

2. MATERIALS AND METHODS

2.1 Procurement of ridge gourd *(Luffa acutangula)*

Fresh ridge gourd *(Luffa acutangula)* were procured from a local market in Tiruchirappalli, Tamil Nadu.

2.2 Methods

2.2.1 Standardization of ridge gourd *(Luffa acutangula)* peel powder

Fresh ridge gourd *(Luffa acutangula)* were free form physical defects and microbial spoilage, then thoroughly washed. The outer skin was peeled and cut into medium sized strips. The peels were shade dried for 10 days. The dried peels were powdered, sieved and packed in low density polyethylene (LDPE) pouches for storage.

Figure 1; Procurement and preparation of sample

2.2.2 Nutrient composition of ridge gourd *(Luffa acutangula)* peel powder

Nutritional evaluation is an essential component of food product development, as it determines the macronutrient (proteins, fat, and carbohydrate) and micronutrients (vitamins and minerals) composition of the powder. Sample were properly prepared prior to laboratory investigation. Proximate and nutrient analyses were carried out following AOAC international procedures and antioxidant potential was assessed using the DPPH radical scavenging assay.

2.3.3 Microbiological quality of ridge gourd *(Luffa acutangula)* peel powder

Sample were appropriately prepared before conducting laboratory analyses. Microbiological quality was determined using pour plate technique in accordance with IS 5402 2012/ ISO 4833: 2003. The Microbiological evaluation was performed following the DGHS Manual (2005) guidelines.

2.3.4 Shelf-life study of ridge gourd *(Luffa acutangula)* peel powder

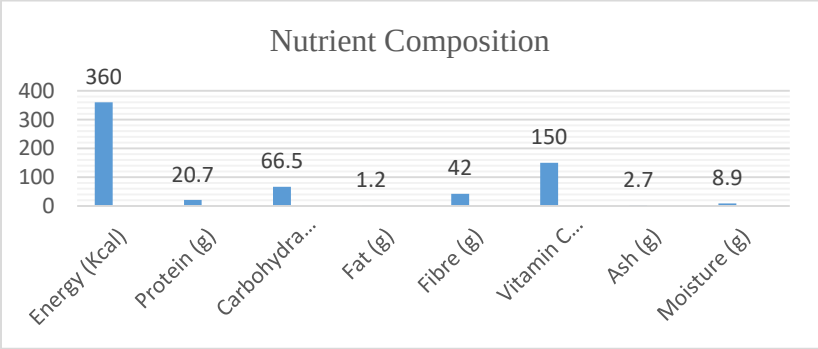
The developed ridge gourd *(Luffa acutangula)* peel powder was packaged in low-density polyethylene (LDPE) pouches and stored at ambient temperature for a period of 90 days. Microbial analysis and stability parameters were monitored at regular intervals (0, 30, 60 and 90) days to evaluate storage stability.

3. RESULTS

3.1 Nutrient composition of Ridge gourd *(Luffa acutangula)* peel powder

The proximate analysis of ridge gourd (*Luffa acutangula*) peel powder showed the following values per 100 g: energy 360 kcal, protein 20.7 g, fat 1.2 g, dietary fibre 42.0 g, vitamin C 150 mg, ash 2.7 g, and moisture 8.9 g. The nutritional profile demonstrates a well-balanced composition with a notably high fibre content. These findings suggest its potential utility as a nutrient-dense ingredient.

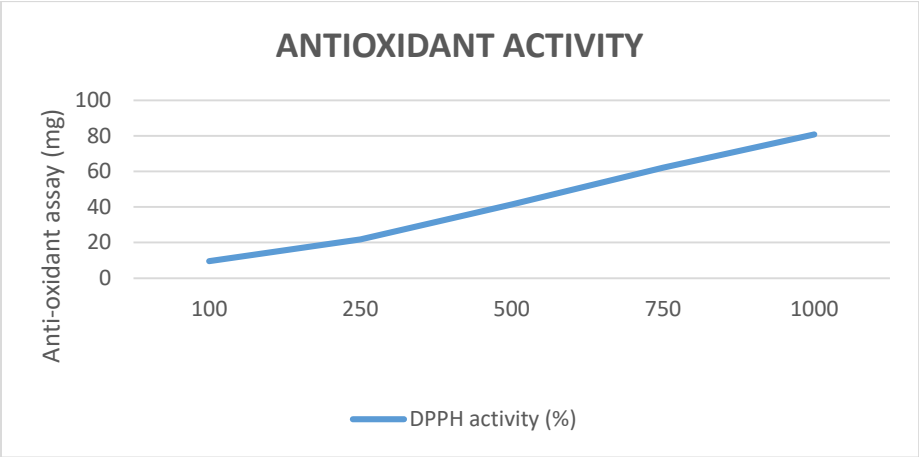
Table 1: Nutrient composition of ridge gourd *(Luffa acutangula)* peel powder



3.1.1 Anti-oxidant activity of ridge gourd *(Luffa acutangula)* peel powder

The antioxidant activity of ridge gourd *(Luffa acutangula)* peel powder showed a concentration dependent increase in inhibition. The percentage inhibition ranged from 9.5% at 100 mg to 80.7% at 1000 mg. The IC_{50} value was determined to be 607 mg, indicating moderate antioxidant potential. The observed activity may be attributed to the presence of bioactive compounds such as phenolics and vitamin C in the peel powder.

Table 2: Anti-oxidant activity of ridge gourd *(Luffa acutangula)* peel powder



3.2 Microbiological quality of ridge gourd *(Luffa acutangula)* peel powder

Microbiological analysis was conducted to evaluate the safety of the developed ridge gourd *(Luffa acutangula)* peel powder. The total viable (bacteria) count was determined according to IS 5403 Indian Standard method was found to be 2×10^{1} CFU/g. The low microbial load indicates that the product was processed under hygienic condition and complies with acceptable microbiological limits for dehydrated food products.

Figure 2; Microbiological quality of ridge gourd *(Luffa acutangula)* peel powder

3.3 Shelf-life study of ridge gourd *(Luffa acutangula)* peel powder

The developed ridge gourd *(Luffa acutangula)* peel powder was packaged in Low-density polyethylene (LDPE) pouches and stored at ambient temperature for 90 days to evaluate shelf life. Periodic analysis showed no significant changes in color, flavor or texture throughout the storage period. A slight increase in total viable count was observed; however, the values remained within acceptable microbiological limits. The product retained its sensory quality and safety up to 90 days, indicating that LDPE packaging effectively maintained product stability under ambient conditions.

Day-1 Storage of Ridge gourd peel powder

Day- 90 Storage of Ridge gourd peel powder

Figure 3; storage of Ridge gourd *(Luffa acutangula)* peel powder

4. RESULTS AND DISCUSSION

The proximate composition of ridge gourd *(Luffa acutangula)* peel powder revealed the presence of appreciable amounts of essential nutrients, including energy, protein, carbohydrates, fats, vitamin C, dietary fibre, moisture and ash. The findings indicate that the peel powder is particularly rich in dietary fibre, protein and vitamin C, while remaining low in fat and calories. This nutritional profile suggests its potential as a functional ingredients for promoting digestive health and supporting low-calorie diets.

The antioxidant potential of ridge gourd *(Luffa acutangula)* peel powder was assessed using the DPPH radical scavenging assay. The ethanol extract exhibited notable free radical scavenging activity, with an IC_{50} value of 650 mg, indicating moderate antioxidant capacity. This activity may be attributed to the presence of bioactive compounds such as phenolics and vitamin C, which are known to contribute to oxidative stress reduction. The results highlight the potential of ridge gourd peel as a natural antioxidant source.

Microbiological analysis showed a total microbial (bacteria) count of 2×10^1 CFU/g, which is within acceptable safety limits for food products. The low microbial load confirms that the processing and drying methods employed were effective in maintaining hygienic quality, making the powder safe for human consumption.

The shelf-life study conducted over 90 days demonstrated no significant changes in color, flavor, or texture of the ridge gourd peel powder. This indicates good storage stability and suggests that the product can be safely stored for extended periods without compromising its sensory attributes.

The results emphasize the value of ridge gourd peel powder as a nutrient rich safe, and stable functional food ingredients. Its incorporation into food products not only enhances nutritional quality but also contributes to sustainable food practices by reducing agricultural waste.

5. CONCLUSION

Ridge gourd *(Luffa acutangula)* peel powder was found to be nutritionally rich, particularly in dietary fibre, protein, and vitamin c, while remaining low in fat and calories. It exhibited moderate antioxidant activity and was microbiologically safe for consumption. The product also showed good stability over 90 days without significant sensory changes. Overall, it can be considered a valuable functional ingredients with potential to enhance nutrition and reduce agricultural waste.

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