

Sensory Evaluation of Germinated Groundnuts to Little Millets Powder Laddu

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ABSTRACT: Global interest is growing in the development of new food products with excellent nutritional quality and utility. Groundnuts are good source of protein and germination improves its nutritional composition. The anti-oxidants and low-calories of little millets benefit in the maintenance of balanced nourishment and ideal weight. The study used germinated groundnuts and little millets in various proportion to evaluate their sensory scores using 9-point hedonic scale. Germination is a low-cost, effective processing technique that has the ability to improve nutritional content, minimize antinutritional components and provide beneficial properties for a range of food applications. The laddu consisting of 2:1 germinated groundnut to little millets powder with 5.0g milk powder being constant scored highly among all the formulations. The sensory scores for appearance, color, flavor, taste, texture, aroma, sweetness and overall acceptability of the best accepted laddu are 8.33 ± 0.15 , 8.46 ± 0.13 , 8.60 ± 0.13 , 8.66 ± 0.12 , 8.40 ± 0.16 , 8.60 ± 0.13 , 9.00 ± 0.00 and 8.80 ± 0.10 respectively. Developing appropriate proportions of germinated groundnuts and germinated little millets were challenging. This study provides new functional ingredients for the developing foods using germinated grains to promote wellbeing and novel food product suitable for underweight persons to improve their nutritional status.

Keywords: Germination, groundnuts, little millets, sensory evaluation and value added laddu.

INTRODUCTION

Groundnuts (*Arachis hypogaea* L.) commonly called peanuts are an important food legume of tropical and subtropical areas and ranked 13th among the economic crops of the world. It can be grown in different agro-climatic regions between latitudes 40°S and 40°N where rainfall during the growing season exceeds 500 mm. Though it is being cultivated in about 24.0 million hectares, on large scale it is mainly grown in India, China, USA, Senegal, Indonesia, Nigeria, Brazil and Argentina. In India, groundnut is grown in about 8.0 million hectares producing 10.3 MT and is the most important oilseeds crop of the country. Although India ranks first in area of groundnuts, its productivity is much less than USA, China and many other countries (Singh, 1999).

One of the significant annual oilseed crops and a strong source of protein is groundnuts. Its important characteristics include taste and flavor, fatty acid and amino acid profiles along with its oil and protein concentration. The quantity and relative proportion of fatty acids in groundnut oil varies depending on variety and area. Although eight primary fatty acids account for 98% of the fatty acids in groundnuts, twelve more fatty acids were identified (Asibuo *et al.*, 2008).

One affordable and efficient processing method is germination that enhances nutritional composition and has useful qualities for a variety of food applications. Therefore, germinated grains are new sources of

functional ingredients in health promoting foods (Chiemela *et al.*, 2021).

Groundnuts take about 3 – 5 days for germination and emergence from the soil at 30°C. The radical emerges within 24 hours or earlier for vigorous Spanish types and within 6 to 48 hours in Virginia types. The primary root system is tap-rooted but many lateral roots also appear about 3 days after germination. Roots are concentrated in the 5 – 35 cm zone below the soil surface, but penetrate the profile to depth of 135° cm. Groundnut roots do not have typical root hairs, but rather tufts of hair, which are produced in the root axis (Prasad *et al.*, 2010).

Groundnuts are good source of protein and germination improves its nutritional profile. The use of K – 1812 groundnut variety in this study was because it is resistant to Spodoptera and tikka leaf spot there by increasing the yield by 18 – 20%. The seeds have oil content of around 50%.

Millet contains vitamins E and B, as well as minerals like calcium, phosphorus, magnesium, manganese, potassium, and iron. Millets plentiful nutrients have shown to reduce the risk of many life style diseases like cancer, obesity and diabetes, cardiovascular diseases, gastrointestinal disorders, migraines and asthma. Millets help to regulate hyperglycemia due to their low carbohydrates and high dietary fibre making them a perfect food for the ever growing diabetic population. These millets as a possible supply of critical nutrients play a crucial role in the modern diet particularly in

impoverished and emerging countries where climate vagaries can influence the dietary patterns (Gowda *et al.*, 2022).

Little millet (*Panicum sumatrense*) is a minor millet with various health benefits due to the presence of bio-active nutraceuticals like phenolic compounds, tocopherols, carotenoids and low glycemic index. It is a good source of phosphorus and the inclusion of fibre aids in fat loss. The anti-oxidant and low-calorie content of little millets help in the maintenance of a healthy diet and weight (Indirani and Devasena 2021).

MATERIAL AND METHODS

This research was carried out in the Post Graduate & Research Centre, PJTSAU, Rajendranagar, Hyderabad.

Procedure of laddu: Different proportions of laddu were prepared with germinated groundnut and little millet powders. K – 1812 groundnut variety is collected from Krishi Vigyan Kendra, PJTSAU, Wyra, Khammam.

Table 1: Proportions of composite flour.

Sr. No.	Sample name	Germinated groundnut powder (g)	Germinated little millet powder (g)	Milk powder (g)
1.	Control	95.00	-	5.00
2.	GLL 1	-	95.00	5.00
3.	GLL 2	47.50	47.50	5.00
4.	GLL 3	63.50	31.50	5.00
5.	GLL 4	31.50	63.50	5.00

The groundnuts and little millets were soaked for 12 hours, sprouted for 24 hours at ambient temperature and sun dried. The groundnuts were roasted and powdered whereas dried little millets were powdered. Germinated groundnuts and little millet powders were weighed as per various proportions to prepare the composite flour as given in Table 1.

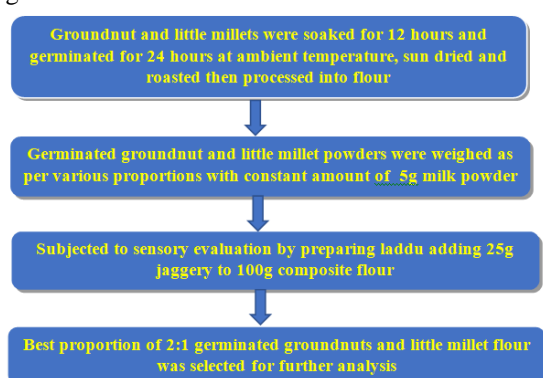


Fig. 1. Flow chart for preparation of value added laddu.

5.0g of milk powder was commonly added to the prepared composite flour of 95.0g. For every 100.0g of the above prepared composite flour was added with 25.0 g of jaggery and pinch of cardamom powder to enhance the taste. The laddu was prepared by using ghee was greased to grease the palm and the mixture was molded into laddu. Each laddu prepared weighed about 25.0g.

Sensory evaluation: Twenty semi-trained panelists assisted in the sensory evaluation using 9-point hedonic scale (Meilgard *et al.*, 1999). The panelists evaluated the coded sample and scored them for appearance, color, flavor, taste, texture, aroma, sweetness and overall acceptability. The panelists sipped water in between tastings of the various formulations of laddu to clearly understand the sensory properties.

RESULTS AND DISCUSSION

The panelists assessed the germinated groundnut little millets laddu organoleptically. The appearance, colour, flavour, taste, texture, aroma, sweetness and overall acceptability of each formulation may affect the laddu's sensory scores. The highest sensory scores as shown in Table 1 were taken into consideration for choosing the best approved laddu.

Considering the sensory outcomes of all laddu formulations, the laddu that was made of 63.50g of germinated groundnut and 31.50g of germinated little millets for 100g product had the highest sensory qualities.

Table 2 presents data from the statistical analysis of the sensory evaluation results. In terms of appearance when compared to the control, highest score was observed 8.33 in GLL3 whereas GLL1 had the lowest score *i.e.*, 7.13. The color was scored highest *i.e.*, 8.46 in GLL3 whereas the lowest score was found 7.33 in GLL1 and also in control. The mean scores for flavor ranged from GLL3 (8.60) to GLL1 (6.80). Taste scores were higher for GLL3 (8.66) and lowest for GLL4 (6.40). Texture score was high in GLL3 *i.e.*, 8.40 and low in GLL2 *i.e.*, 6.40. The aroma was scored highest *i.e.*, 8.60 in GL3 whereas the lowest score was found 6.53 in GLL2. Regarding the sweetness attribute, the mean sensory scores was high in GLL3 (9.00) and low in GLL1 (7.33).

In terms of overall acceptability, the highest score was observed 8.80 in GLL3 whereas the lowest score was found 6.53 in GLL4. From the results of sensory evaluation GLL3 laddu was selected for further analysis. Anuradha and Laxmi (2017) reported that germinated laddu made with 50% ragi, 30% soyabean, 15% groundnuts and 5% blackgram had given highest mean sensory scores for the attributes such as appearance, texture, taste, flavor and overall acceptability.

Table 2: Sensory scores of germinated groundnut and little millet laddu.

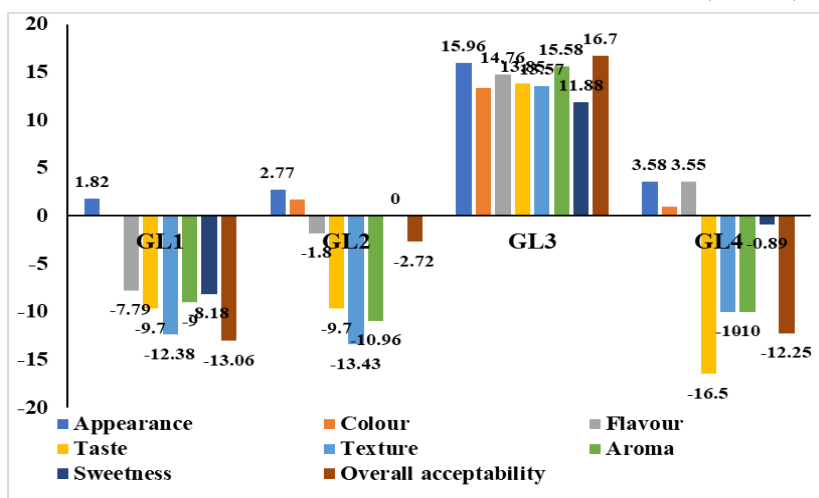
Sample	Appearance	Colour	Flavour	Taste	Texture / Mouthfeel	Aroma	Sweetness	Overall acceptability
Control	7.00 ^a ± 0.19	7.33 ^a ± 0.18	7.33 ^b ± 0.18	7.46 ^c ± 0.13	7.26 ^b ± 0.18	7.26 ^b ± 0.18	7.93 ^b ± 0.06	7.53 ^b ± 0.21
GLL 1	7.13 ^a ± 0.16	7.33 ^a ± 0.15	6.80 ^a ± 0.14	6.80 ^b ± 0.14	6.46 ^a ± 0.13	6.66 ^a ± 0.18	7.33 ^a ± 0.15	6.66 ^a ± 0.15
GLL 2	7.20 ^a ± 0.17	7.46 ^a ± 0.16	7.20 ^{ab} ± 0.10	6.80 ^b ± 0.20	6.40 ^a ± 0.16	6.53 ^a ± 0.25	7.93 ^b ± 0.06	7.33 ^b ± 0.18
GLL 3	8.33 ^b ± 0.15	8.46 ^b ± 0.13	8.60 ^c ± 0.13	8.66 ^d ± 0.12	8.40 ^c ± 0.16	8.60 ^c ± 0.13	9.00 ^c ± 0.00	8.80 ^c ± 0.10
GLL 4	7.26 ^a ± 0.20	7.40 ^a ± 0.19	7.60 ^b ± 0.16	6.40 ^a ± 0.13	6.60 ^a ± 0.19	6.93 ^{ab} ± 0.18	7.86 ^b ± 0.09	6.53 ^a ± 0.16
Mean	7.38	7.60	7.50	7.22	7.02	7.20	8.01	7.37
SE	0.09	0.08	0.09	0.11	0.11	0.12	0.07	0.11
CV%	8.44	7.57	7.50	6.05	7.68	9.63	4.45	8.45
CD	0.45	0.42	0.41	0.32	0.39	0.50	0.26	0.45

Note: Control: 95g of germinated groundnut + 0g of germinated little millets with 5g milk powder
 GLL 1: 95g of germinated little millet + 0g of germinated groundnuts with 5g milk powder
 GLL 2: - 47.50g of germinated groundnut + 47.50g of germinated little millets with 5g milk powder
 GLL 3: 63.50g of germinated groundnut + 31.50g of germinated little millets with 5g milk powder
 GLL 4: 31.50g of germinated groundnut + 63.50g of germinated little millets with 5g milk powder

In this study laddu made with 63% germinated groundnut, 31% germinated little millet and 5% milk powder has got highest mean sensory scores. This could be due to difference in ingredients used, soaking time and germination hours.

The Fig. 2 indicated that appearance decreased among the formulations GLL 1 (1.82%), GLL 2 (2.77%) and GLL 4 (3.58%) while the increase was observed in GLL 3 (15.96%) compared to the control of groundnut powder laddu. The color percentage in GLL 1 decrease in GLL 2 (1.74%) and GLL 4 (0.94%) while there was increase in GLL 3 (13.35%) in comparison to the control. The flavor increased in GLL 3 by 14.76% whereas for GLL 1 (7.79%), GLL 2 (1.80%) and GLL 4 (3.55%) decreased.

In terms of taste, it decreased in GLL 1 (9.70%), GLL 2 (9.70%) and GLL 4 (16.50%) while the increase was observed in GLL 3 (13.85%). The texture increased among the formulation GLL 3 (13.57%) while the decrease was observed in GLL 1 (12.38%), GLL 2 (13.43%) and GL4 (10.00%). In case of GLL 1 (9.00%), GLL 2 (10.96%) and GLL 4 (10.00%) when compared to the control aroma was decreased while in GLL 3 (15.58%) it increased. The sweetness was decreased among the formulations GLL 1 (8.18%), GLL 2 (0.00%) and GLL 4 (0.89%) while in GLL 3 (11.88%) sweetness increased. The overall acceptability decreased among the formulations GLL 1 (13.06%), GLL 2 (2.72%) and GLL 4 (12.25%) while the increase was observed in GLL 3 (16.70%).



Note: Control: 95g of germinated groundnut + 0g of germinated little millets with 5g milk powder
 GLL 1: 95g of germinated little millet + 0g of germinated groundnuts with 5g milk powder
 GLL 2: - 47.5g of germinated groundnut + 47.5g of germinated little millets with 5g milk powder
 GLL 3: 63.5g of germinated groundnut + 31.5g of germinated little millets with 5g milk powder
 GLL 4: 31.5g of germinated groundnut + 63.5g of germinated little millets with 5g milk powder

Fig. 2. Percentage change in sensory attributes of developed laddu.

CONCLUSIONS

A combination of 63.50g of germinated groundnut and 31.50g of germinated little millet will be best advised based on all the criteria examined in this study. This is a result of its similar beneficial components, nutritional and sensory features, and health-promoting capabilities, all of which point to the product's potential as a useful one. This study will persuade the food sector to utilize

powdered germinated groundnut and small millet to enhance the nutritional and sensory quality of the products, which may open the door to an improvement in the general nutritional status of the most vulnerable populations.

FUTURE SCOPE

The Kadriri-Lepakshi is said to be drought-resistant and can also withstand inundation. It is resistant to

Spodoptera and tikka leaf spot there by increasing the yield by 18–20%. The value addition of these groundnut variety through germination will assist farmers in generating more income.

Conflict of Interest. None.

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