E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2025; SP-8(1): 173-176
Received: 20-11-2024
Accepted: 22-12-2024

P Shanthikumar
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

R Sushma Devi
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

R Preetham
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

J Sai Prasad
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

K Sandhya
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

Corresponding Author:
R Sushma Devi
College of Food Science and Technology, Professor Jayashankar Telangana Agricultural University (PJTAU), Rudrur, Nizamabad, Telangana, India

Development of different products using defatted groundnut cake flour

P Shanthikumar, R Sushma Devi, R Preetham, J Sai Prasad and K Sandhya

DOI: https://doi.org/10.33545/2618060X.2025.v8.i1Sc.2356

Abstract
Groundnut is an important cash crop for domestic markets as well as for foreign trade in several developing and developed countries. Peanut is an important crop grown worldwide. Commercially it is used mainly for oil production but apart from oil, the by-products of peanut contains many other functional compounds like proteins, fibers, polyphenols, antioxidants, vitamins and minerals which can be added as a functional ingredient into many processed foods. Recently it has also revealed that peanuts are excellent source of compounds like resveratrol, phenolic acids, flavonoids and phytosterols that block the absorption of cholesterol from diet. It is also a good source of Co-enzyme Q 10 and contains all the 20 amino acids with highest amount of arginine. Further defatted groundnut cake (DGC) used in preparation of different value added products such laddoo, chutney powder etc., Different formulation of laddoo product were evaluated for their appearance, texture, taste, flavour and overall acceptability through sensory evaluation. The most acceptable formulation of laddoo product was S3(50:50) with highest sensory score. Among DGC chutney powder formulations, the most acceptable product was S4 (100:0). Because 100% of the defatted groundnut cake flour was added to the mixture. Flavour, appearance, taste, texture were the major properties accepted by panelists. The processing methods like roasting and boiling have shown increase in the concentration of these bioactive compounds. These bioactive compounds have been recognized for having disease preventive properties and are thought to promote longevity. These products will be suggested for commercial production with good nutritional properties and which can be maintain the good health of human.

Keywords: Defatted groundnut cake flour (DGCF) laddoo and chutney powder

Introduction
Peanuts are one of the major oilseed crops in the world with a high nutritional profile especially in terms of protein because of which it is being used in many diets to meet appropriate protein levels in the body. They are a good source of protein (21- 36.4%), carbohydrates (18%) and fats (36-54%). As malnutrition is one of the major challenges the world faces today, various intervention programmes are struggling hard to find an appropriate solution to this. Peanut and its by products are now gaining their position to improve deficient diets. Peanut flour is a by-product of peanut oil extraction commonly is known as partially defatted peanut cake flour (DPF). (T Bindhya Dhanesh *et al*., 2018) [2].

Fast foods are quick, reasonably priced, and readily available alternatives to the traditional or home cooked foods. Being convenient and economical for a busy lifestyle, fast foods are typically high in calories, fat, saturated fat, sugar, and salt. Today, fast food industry is getting adapted to Indian food requirements and is growing well in India. It is gaining acceptance primarily from Indian youth and younger generations and is becoming an important part of life. Bakery products are very popular among the population, it is necessary to ascertain their nutritional status which probably has not been attempted systematically until now. (Kripa Seth *et al*., 2018) [9]. Peanut is an important crop grown in the world wide, originating in South American, the peanut spreads beyond the Mediterranean, such as China, Africa, Indian, Japan and United States of America. Most peanuts grown in the world are used for oil production, peanut butter, confections, roasted peanuts and snack products, extenders in meat product

formulations, soups and desserts. The substantial amounts of by-products are generated in the process of peanut harvest and peanut oil extraction, which are potential pollutants. However, only a few in these by-products is used as animal feed, and treated as a fertilizer.

Groundnut cake is a by-product obtained after extraction of oil. The cake contains 45–60% protein, 22–30% carbohydrate, 3.8–7.5% crude fibre and 4–6% minerals. The groundnut production in India was 9.4 mt and in Andhra Pradesh 0.74 mt. Andhra Pradesh is one of the major producers of groundnut contributing about 15% of the total production and more than 80% of the produce is utilized for oil extraction. (Chitra Purohit *et al.*, 2011) [7].

One way to bridge the `food gap` leading to protein energy malnutrition which is the most widespread nutritional disorder among children in the developing countries is to introduce lowcost weaning foods produced from locally available raw material. As the importance of energy in preventing malnutrition is now well recognized, there is need for nutritionally balanced, energy dense and easily digestible weaning foods based on simple technologies (Akeem Raji 2020) [8].

Peanuts or groundnuts as they are known in some parts of the world are the edible seeds of a legume. India is second largest producer of peanuts in world, with total production of approximately 7.131 million metric tons per year (USDA, PS&D database (1996–2000).

Peanut, (*Arachis hypogaea*) technically considered as pea and belongs to the family (Fabaceae) of bean/legume. Although a legume; it is generally included amongst the oilseeds due to its high oil content. Peanuts are rich in protein, oil and fibre. Apart from oil, peanuts are widely used for production of peanut butter, confections, roasted peanuts, snack products, extenders in meat product formulation, soups and desserts.

Groundnut kernels are consumed directly as raw, roasted or boiled kernels or oil extracted from the kernel is used as culinary oil. Oil pressings, seeds, and the haulms of groundnut are used as animal feed while the oilcakes are used as industrial raw material and fertilizer. These multiple uses of groundnut plant make it an excellent cash crop for domestic markets as well as for foreign trade in several developing and developed countries. Cultivated groundnut originated from South America. Its cultivation is mostly confined to the tropical, subtropical, and warm temperate (zones) countries between 40o N and 40o S latitude. It is currently grown on 25.2 million hectares worldwide with a total production of 35.9 million metric tons, with developing countries in Asia (66%) and Africa (25%) as the major producers. In 2009, China, India and the United States were the three largest producers of groundnut.

Proper nutrition is very important for good human health which is related to the consumption pattern and nutritional value of the diet. Food provides energy for daily activity and maintains body functions. Daily consumption of protein is less than two thirds and fat are less than one third of the level in diet in the developing countries. Malnutrition is a chronic problem in children as well as adults in developing countries. Formulation of nutritionally balanced food for the vulnerable group is one of the ways to eradicate malnutrition of the growing population. (Brintha *et al.*, 2014) [3].

The purpose of the present investigation was to determine protein, oil, fatty acid, carbohydrate, protein solubility, amino acid, antinutritional factor sand nutritive value of the *Arachis hypogaea* species. Further preparation of value added product of defatted groundnut cake flour (DGCF) and nutritional profiling of those products can be done.

Materials and Methods

Preparation of defatted groundnut cake (DGC) in laboratory oil expeller (LOE) Sound and cleaned groundnut kernels were obtained from local supermarket and were heated in oven at 98°C for 8min and deskinned manually by rubbing between hands. The kernels were subjected to electrically operated oil expeller having a capacity of 4 -6 kg/hr to extract oil and obtain defatted groundnut cake (DGC).

Products with DGC obtained from laboratory oil expeller (LOE) was selected for value addition into the food products namely laddoo, chutney powder, fryums, biscuits, noodles and extruded snacks at different levels of incorporation.

Chutney powder had the ingredients, roasted and powdered chana dhal 100 g, red chillies 10 g, coriander seeds powder 12 g, cumin seeds powder 8 g, curry leaf powder 10 g, amchur powder 12 g, turmeric powder 1 g, garlic powder 2 g, salt 10 g. DGCF chutney powder was prepared by blending roasted chana dhal and DGCF in the proportions of 0:100. 100:0, 25:75 and 50:50.

Chana dhal, DGCF, coriander seeds, cumin seeds were roasted without oil. Whole red chillies, curry leaves were roasted in little oil. All the above ingredients were powdered, mixed uniformly with turmeric powder and salt.

Laddoo had the ingredients, coconut powder 100 g, 0water 25 ml. DGCF laddoo was prepared by blending coconut powder and DGCF in the ratios of 100:0, 50:50, 25:75 and 0:100. Jaggery was heated with water till it dissolved. Coconut powder and roasted DGCF were added and mixed well. MP and cardamom powder were added, cooled for 2 min and pressed by hand to obtain round laddoos.

Sensory evaluation of the DGCF products: The different DGCF products were evaluated sensorily to find the maximum acceptable level of incorporations by a panel of 10 semi-trained judges using 5- point Hedonic scale. The products were evaluated for their appearance, texture, taste, flavour and overall acceptability.

Physico-chemical analysis of the prepared DGCF products

Estimation of Moisture: Moisture was done by oven drying method. In oven drying method, the sample was heated under specified conditions, and the loss of weight was used to calculate the moisture content of the sample. Weigh the empty Petri dish. Take 5 g of the sample and place in weighed empty Petri dish. Note the weight (Petri dish + sample) (w1). Pre heat the oven to 100°C. After place the sample in the oven at 105ºC± 2°C for 3 to 4 hours. Take the sample from the hot air oven and place it in desiccators for some time. Weigh the sample (dried sample + Petri dish) (W2). Calculate the moisture percentage by the following formula.

$$\% \text{ Moisture} = \frac{W_2 - W_3}{w2 - w1} \text{ X } 10$$

Estimation of Ash

The finely ground sample of 5g was weighed in pre-weighed silica crucible and ignited till smokeless. Then it was transferred to muffle furnace and heated at 550°C for 4 hours for complete oxidation of organic matter and resultant ash content was calculated

$$\text{Ash content} = \frac{W3 - W2}{W1} \text{ x } 100$$

Estimation of Protein content by kjeldahl method: The protein content was estimated by Kjeldahl method.

N g/Kg = (ml of HCL – ml blank) × Normality × 14.01) Weight

Fat estimation: Fat was estimated from crude ether extract of the dry material. The dry sample & plugged with cotton. The thimble is then placed in Soxhlet apparatus and extracted with anhydrous ether for about 16 hrs. The ether extract was filtered into a weighed conical flask. The flask containing the ether extract was washed 4 to 5 times with small quantities of ether in the washings was also transferred. The ether was then removed by evaporation and the flask with the residue dried in an oven at 80 – 100ºC C cooled in desiccators and weighed.

$$\text{Fat content (\%)} = \frac{\text{Weight of ether extract}}{\text{Weight of the sample}} X100$$

Microbial analysis

Microbial population of samples particularly bacterial, fungal was enumerated with standard procedures through serial dilution and plate count was used with slight modifications as most suitable to our laboratory conditions. All media and equipment were sterilized in the autoclave at 121˚C, pressure of 15 psi for 20 minutes. The media used for bacterial count was nutrient agar media and for yeast and mold count was potato dextrose agar. Then, one gram of each sample was aseptically weighted into a 10 ml test tube contain 9 ml distilled water and shake vigorously and it was repeat until nine dilutions.

Standard plate count was estimated by decimal dilution technique followed by the spread plate method for bacteria, yeast. In spread plate method, 15 to 20ml of pre- autoclaved media was poured in a sterilized petri plate and kept under room temperature until the agar became solid. In agar plates 0.1ml of the sample of last three dilutions was dropped and the sample was spread on the agar plate with the help of sterilized glass rod. The plate was then incubated at the 30˚C temperature for 24 hours for bacterial growth and for yeast growth it kept at 28-30°C for 48 hours. Complete pouring of medium in plates and serial dilution and plating were done in aseptic conditions under laminar airflow.

Results and Discussion

The different DGCF products were evaluated sensorily to find the maximum acceptable level of incorporation by a panel of 10 semi-trained judges using 5- point Hedonic scale. The products were evaluated for their appearance, texture, taste, flavour and overall acceptability.

Sensory evaluation of different products

Defatted ground nut cake flour products were evaluated sensorily to find the maximum acceptable level of incorporation by panel of 10 semi- trained using 5-point headonic scale. The products were evaluated for their appearance, texture, taste, flavor and overall acceptability.

Sensory evaluation of laddoo

Table 1: Sensory evaluation of Laddoo

S. No.	Sample with proportions	Flavour	Appearance	Taste	Texture	Overall acceptability
1	S1(0:100)	3.5	3.2	3.4	2.9	3.2
2	S2(25:75)	3.7	3.5	3.3	3.8	3.5
3	S3(50:50)	3.9	3.9	3.9	4.0	3.9
4	S4(100:0)	3.9	4.1	3.4	3.6	3.7

Number of panelist (n=10 panelists).

Maximum sensory scores: 5- excellent, 4-very good, 3- good, 2-fair, 1-poor

The most acceptable formulation of laddoo product was S3(50:50). Because 50% of the defatted groundnut cake flour was added to the mixture. Flavour, appearance, taste, texture these are the major properties are accepted by panelists

Fig 1: DGCF Laddoo

Sensory evaluation of chutney powder

Table 2: Sensory evaluation score of chutney powder

S. No	Sample with proportions	Flavour	Appearance	Taste	Texture	Overall acceptability
1	S1 (0:100)	3.8	4.0	3.8	3.7	3.8
2	S2 (25:75)	3.9	4.0	3.8	3.8	3.8
3	S3 (50:50)	3.7	4.2	3.7	3.8	3.8
4	S4 (100:0)	4.2	4.3	4.0	4.5	4.2

Number of panelists (n=10 panelists)

Maximum sensory scores: 5- excellent, 4-very good, 3- good, 2-fair, 1-poor

The Chutney powder most acceptable product was S4 (100:0). Because 100% of the defatted groundnut cake flour was added to the mixture. Flavour, appearance, taste, texture these are the major properties are accepted by panelists

Nutritional profile of defatted groundnut cake flour products

Table 3.: Nutritional profile of defatted groundnut cake flour products.

Name of the sample		Moisture, %	Protein, %	Fat, %	Ash, %
Laddoo	Control	14.8	14.8	2.9	1.6
	DGCF	7	20.4	2.4	4
Chutney powder	Control	5.4	28.2	6.7	3.4
	DGCF	7	50.1	4.8	4

Protein content of the controlled laddoo product was 14.8% and the protein content of the laddoo was increased when incorporation of defatted groundnut cake flour was about 20.4. The protein content of the controlled chutney powder product was about 5.4% due to incorporation of 7% defatted groundnut cake flour.

Microbial analysis of defatted groundnut cake flour products

Table 4.: Microbial analysis of defatted groundnut cake flour laddoo during storage condition of 1st day and 10th day

S. No	Sample name	Dilution	TBC	TFC
1	Laddoo at 1st day	10-7	5.8 x 10^{-8}	6.1x 10^{-8}
		10-8	3.4 x 10^{-9}	3.9 x 10^{-9}
		10-9	1.3x10^{-10}	1.7 x 10^{-10}
2	Laddoo at 10th day	10-7	9.1 x 10^{-8}	9.8x 10^{-8}
		10-8	7.7 x 10^{-9}	8.6x 10^{-9}
		10-9	5.4x 10^{-10}	6.3 x 10^{-10}

When the microbial analysis carried for both laddoo and chutney powder, at 1st day of laddoo total bacterial and fungal count was normal later at 10th day it was slightly increased. This was observed due to presence of jiggery in the product. The same type result was observed in chutney powder at 1st day total microbial load was normal later it was slightly increased.

Table. 5: Microbial analysis of defatted groundnut cake flour Chutney powder during storage condition of 1st day and 10th day

S. No	Sample name	Dilution	TBC	TFC
1	Chutney powder at 1st day	10-7	4.8 x 10^{-8}	6.3x 10^{-8}
		10-8	2.9x 10^{-9}	3.6x 10^{-9}
		10-9	1.1 x 10^{-10}	1.5x 10^{-10}
2	Chutney powder at 10th day	10-7	8.4 x 10^{-8}	9.7x 10^{-8}
		10-8	6.7x 10^{-9}	7.6 x 10^{-9}
		10-9	4.5 x 10^{-10}	5.3x 10^{-10}

Total the prepared product were stable up to 5 days of storage period later some microbial load may be increased. Further the products suggested to consume within the 10 days of period of preparation.

Fig 2: DGCF Chutney powder

Conclusion

Considering the nutritional importance of defatted groundnut cake (DGC) and its suitability of incorporation into traditional n=10 panelist and convenience products, value addition and popularization of DGC goes a long way in tackling protein energy malnutrition in the country. The study thus signifies the need for adoption of safe processing methods and policies for availability of safe and hygienically prepared DGCF for household and commercial consumption.

References

1. Ancut P, Sonia A. Oil Press-Cakes and Meals Valorization through Circular Economic Approaches: A Review. Appl Sci. 2020;10:7432.
2. Bindhya Dhanesh T, Anita K. Development and Sensory Evaluation of Value-Added Products Incorporating Partially Defatted Peanut Cake Flour and Powdered Greens. Chem Sci Rev Lett. 2018;7(25):25-33.
3. Brintha I, Mahendran T, Seran TH. Nutritional composition and storage stability of groundnut (*Arachis hypogea* L.) seeds cultivated with organic fertilizers. Trop Agric Res Ext. 2014;17(2).
4. Garge P, Kaur Brar J. Development and Organoleptic Evaluation of Nutritious Bars by Using Defatted Peanut Flour, Roasted Soybean Seeds for Gym Trainees. Chem Sci Rev Lett. 2017;6(23):2051-2057.
5. Ibude JA, Chukwuma CC, Uwakwe AA. Evaluation of *Arachis hypogaea* husk Diet in the Growth and Performance of Poultry Birds. Asian J Anim Sci. 2021;15(1):1-9.
6. Musa AK, Kalejalye DM, Ismalla LE, Oyerinde AA. Proximate composition of selected groundnut varieties and their susceptibility to *Trogoderma granarium* Everts attack. J Stored Prod Postharvest Res. 2010;1(2):13-17.
7. Purohit C, Rajalakshmi PS. Quality development of defatted groundnut cake flour. J Food Sci Technol. 2011;48(1):26-35.
8. Sani M, Raji AO, Raji MO. Evaluation of weaning food blends from modified millet and groundnut cake flour. Technoscience J Community Dev Afr. 2020;1(1):33-45.
9. Seth K, Anita K. Nutritional Assessment of Healthy Cakes Developed Using Partially Defatted Peanut Flour. Chem Sci Rev Lett. 2018;7(25):244-249.
10. Vasanthi RP, Nagesh Kumar MV, Rajeev K. Advances in Crop Improvement and Delivery Research for Nutritional Quality and Health Benefits of Groundnut (*Arachis hypogaea* L.). Front Plant Sci. 2020;11:29.