International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2019): 7.583

Chemical Analysis of Composite Flour Using Locally Available Coarse Grains

Dr. Rosy Kumari

Assistant Professor, P.G Department of Home Science, Patna Women's College, Patna-800001, India
Email: *angelrosy1991[at]gmail.com*

Abstract: ***The present study was investigated that the combination of Whole wheat flour, Ragi flour, Green gram flour, Soya flour and roasted groundnut contains high amount of energy, protein with essential amino acids composition along with vitamins and minerals content, will enhance the nutrients value. The objective of the present study is to prepare composite flour with the incorporation of coarse grains and analyze the nutritional composition of the prepared composite flour. The composite flour was prepared with the mixing of five ingredients using soaked Whole wheat flour (WF) and other soaked flour namely; Ragi flour (RF). Green gram flour (GGF), Soy flour (SF) and Roasted groundnut (RG) to analyzed for the nutritional composition by using the standard procedures. The nutrition composition like energy, protein, fat, calcium and phosphorous were found high in the composite flour.***

Keywords: Composite flour, Coarse grain, Chemical analysis

1. Introduction

Food based approaches are recognized as an essential part of an urgently needed more comprehensive strategy for improving nutrition by increasing the availability and consumption to combat iron and other micronutrient deficiencies. The combination of whole wheat flour, Ragi flour, Green gram flour, Soya flour and Roasted groundnut contains high amount of energy, protein with essential amino acids composition along with vitamins and minerals content, will enhance the nutrients value of homemade products which would be considered beneficial for malnourished population. Composite flour refers to the mixture of different concentrations of non-wheat flours from cereals, legumes, roots and tubers with wheat flour or can be a mixture of flours other than wheat flour **(Okpala *et al.*, 2011).** Composite flours are recently manufactured not only to improve the desired functional properties of end product based on them but also to improve nutritional composition **(Ubbor *et al.*, 2014).** Cereal substitution to wheat is an economical step. The deficiencies of wheat flour and its nutrients can be overcome by other cereal substitution. Cereals and coarse grains play an important role in composite food preparation due to their cheapest sources of food energy contributing a high percentage of calories (>56%) and proteins (50%) in Indian diet **(Mahajan and Chattopadhyay, 2000).** All current dietary guidelines have cereal food as largest component of recommended daily as they are good source of vitamins and a number of minerals, notably iron, zinc, magnesium and potassium.

Supplementary food should contain a staple food as the main ingredient (i.e., preferable a cereal), a protein supplement from a plant or animal food source (e.g. beans, groundnut, milk, meat, chicken, fish, eggs, etc), a vitamin and mineral supplement (e.g. a vegetable or a fruit), an energy supplement to increase the energy density of the mix (e.g. fat, oil or sugar etc). When these four ingredients are used together in suitable proportions, they form a complete meal (**Igah, 2008**). Food availability data from the FAO **(FAO, 2011)** showed that adverse shifts in dietary composition are taking place at a much more rapid pace than are beneficial changes. Many of them have been driven by dietary globalization that has on the one hand increased dietary diversification, and on the other hand increased consumption of fats and refined carbohydrates. Traditional Asian diets are cereal-based but, with a growing middle class, changes are taking place in the structure and patterns of diets.

Many of these traditional indigenous foods are generally regarded as safe in the countries where they have been consumed for a long time, yet little, if any, formal scientific information is available on their composition and safety. This is an area of attention and should be researched in the near future. The emerging health benefits and documentation of indigenous food in Asia as to the need for strategic community based interventions that would help to improve food security, nutrition and health of the vast population. There is need to demonstrate and quantify the benefits of the diversity of the indigenous and underutilized food for livelihoods and to ensure that such information gathered is put to use widely to increase their well being. The more effective use of such diversity can also serve to be a more sustainable and environmentally friendly solution to the problems of food production.

2. Materials and Methods

The present study entitled "**Chemical analysis of composite flour using locally available coarse grains**" was conducted by using the following methodology based on the nature of problems and objectives. It has been discussed in the following sub-heads.

2.1 Experiment Site

The present investigation was carried out in the Nutritional Research Laboratory of the Department of Food Nutrition and Public Health, Ethelind College of Home Science, (SHUATS) Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad U.P.

2.2 Procurement of Raw Materials

Raw materials like *Ragi flour*, *whole wheat flour*, Soya flour, *Moong dal flour* and groundnut flour obtained from local market of Allahabad for the development of the various food products.

2.3 Preparation of Flour

a) Preparation of Wheat flour and *Ragi* flour:- Wheat grains and *Ragi* were thoroughly cleaned to remove dirt, dust, insect excreta/ feathers and admixture of other food grains and dried directly in the sun for 3-4 days till the material was completely dried having 6-8% moisture content. The clean graded materials were ground in the electric grinder to make fine flour and sieved by 80-100 mesh sieves. The flour samples obtained were kept in airtight container before use.

b) Preparation of soya flour: -Soy grains were thoroughly cleaned to remove the dust and other foreign materials. The clean grains were soaked in water for 4-6 hours and then autoclaved for 5 minutes in a pressure cooker. They were removed and dried directly in the sun for 3-4 days till the material was completely dried having 6-8% moisture content. Soy was then ground to make fine flour and sieved through 80 – 100 mesh sieves. The flour samples obtained were kept in airtight container before use.

c) Preparation of *green gram* dal flour: -Green gram dal was thoroughly cleaned to remove the dust and other foreign materials. The clean dal was soaked in water for 4-6 hours. They were removed and dried directly in the sun for 3-4 days till the material was completely dried having 6-8% moisture content. Green gram dal was then ground to make fine flour and sieved through 80 – 100 mesh sieves. The flour samples obtained were kept in airtight container before use.

d) Preparation of groundnut flour: - Groundnuts were thoroughly cleaned to remove, dust, insect excreta/ feathers and admixture of other food grains. They were removed and roasted for till the groundnut become brown. The clean graded materials were ground in the electric grinder to make fine flour. The flour samples obtained were kept in airtight container before use.

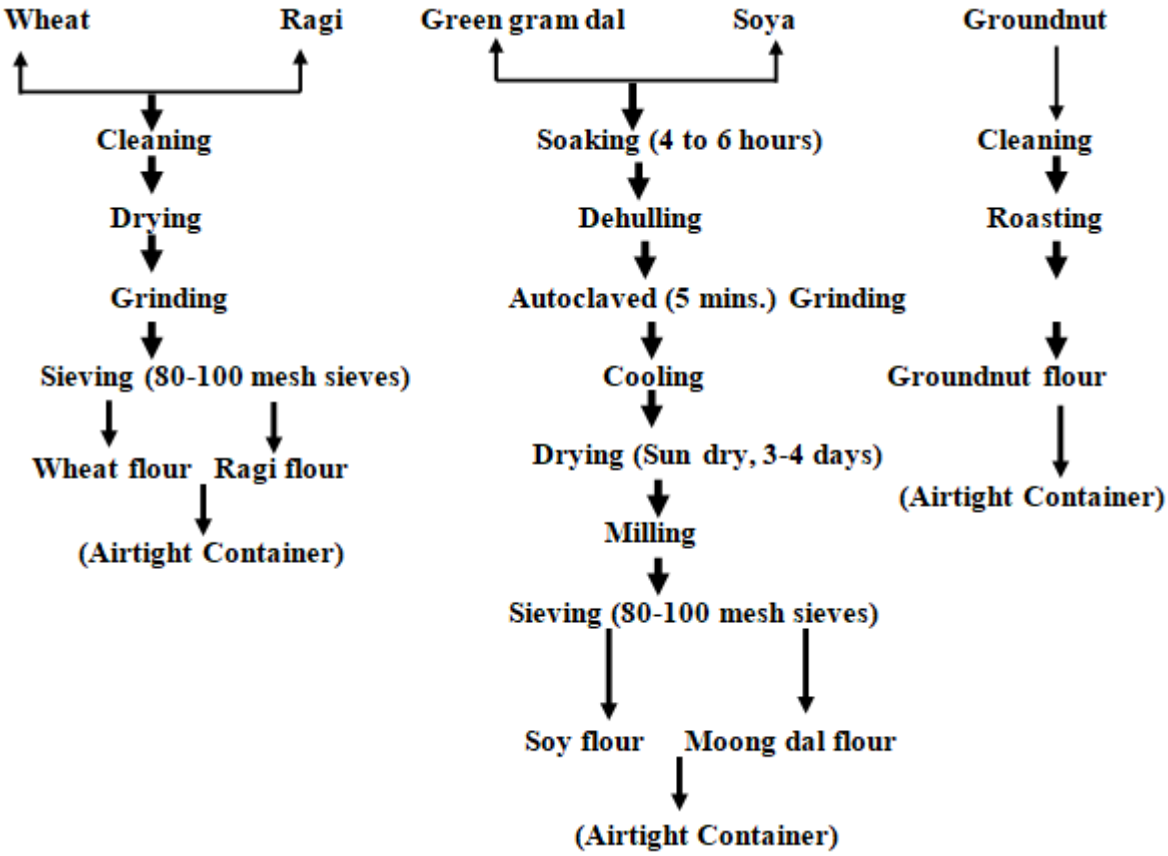

Figure 1.1: Flow Diagram of Processing Steps of Raw Material
Source: Srivastava and Kumar (2007)

2.4 Chemical analysis and Their Antioxidant Activity of the Identified Prepared Composite Flour:

1) Estimation of Nutritional composition of the developed food products

- Total moisture was determined as per procedure given by AOAC (2007).
- Total ash was determined as per procedure given by AOAC (2007).
- Total protein was determined as per procedure given by AOAC (2007).
- Total fiber was determined as per procedure given by AOAC (2007).
- Total fat was determined as per procedure given by AOAC (2007).

- Calcium was determined as per procedure given by AOAC (2007).
- Iron was determined as per procedure given by AOAC (2007).
- Phosphorous was determined as per procedure given by AOAC (2007).
- Beta Carotene was determined as per procedure given by Rangana (2001).
- CHO = 100- (%moisture+ %fat + %ash +% protein)
- Energy – The calorific value of the food sample can be calculated by the following formula-
  Energy (kcal) = (%CHO X 4) + (% fat X 9) + (% protein X 4)
- Total calories and carbohydrate content of various food stuffs was calculated by difference and calculation method "Nutritive Value of Indian Foods" by (Indian Council of Medical Research, 2010).

Figure 1.2: Nutritional Analysis of composite flour

3. Results and Discussion

The findings of the present study entitled "**Chemical analysis of composite flour using locally available coarse grains**" are discussed in this chapter. The results of the present research are in accordance with the objectives, derived through the use of required methodology, the data collected and tabulated under the present study and standard tools have been presented with appropriate illustration in this chapter. Following are the main heads under which the results have been presented and discussed.

Chemical analysis of composite flour of the identified prepared composite flour

Table 1.4: Mean nutrient composition of the composite flour (Per 100g)

Composite Flour	T_0	T_1	T_2	T_3
Moisture **%**	5.69 ± 0.21	6.24 ± 0.03	7.24 ± 0.03	8.27 ± 0.32
Total Ash **(g)**	2.28 ± 0.04	2.61± 0.04	2.87 ± 0.00	2.96 ± 0.00
Energy **(kcal)**	341 ± 0.72	347 ± 0.06	351 ± 0.03	356 ± 0.05
Protein **(g)**	11.8 ± 0.28	20.20 ± 0.03	21.32 ± 0.13	22.12 ± 0.04
Fat **(g)**	1.57 ± 0.02	9.54 ± 0.38	10.73 ± 0.47	11.34 ± 0.39
Crude fiber **(g)**	1.8 ± 0.04	2.86 ± 0.07	3.65 ±0.07	4.25 ± 0.12
Carbohydrate **(g)**	69.37 ± 0.02	48.38 ± 0.01	46.73 ± 0.03	46.12 ± 0.009
Iron **(mg)**	4.76 ± 0.02	7.62 ± 0.22	9.92 ± 0.06	10.93 ± 0.06
Phosphorous **(mg)**	352.68 ± 0.06	358.70 ± 0.13	365.62 ± 0.16	368.76 ± 0.19
Calcium **(mg)**	47.12 ± 0.05	52.22 ± 0.20	55.34 ± 0.15	58.36 ± 0.06
ß-carotene **(µg)**	49 ± 0.01	56± 0.06	59 ± 0.02	64 ± 0.04

±= S.E

The table 4.6.1 present the information regarding the mean nutrient composition of developed composite flour (per 100 gm) which shows that the moisture content was highest in treatment (T_3) i.e. 8.27 percent and least was found in treatment (T_0) i.e. 5.69. **Banu *et al.*, (2012)** reported that moisture content of 11.3 percent to 11 percent for different composite mixes prepared with whole grains.

Ash content of the prepared composite flour increased with substitution of different flours varied from 2.28g to 2.96g/100g. Composite flour prepared with whole wheat flour, finger millet flour, green gram flour, soy flour and groundnut flour in the ratio of (35:5:15:25:10) had the highest ash content 2.96g/100g, while the lowest value was observed in 100 percent whole wheat flour 2.28g/100g. The increased amount noted in the ash content of the composite flour may be attributed to the higher mineral content of coarse grains. Coarse grains have been reported to be good sources of ash. The ash content 2.18 to 4.23 g/100g of the composite flour reported in this study is similar to the ash content (2.9 percent) of composite flour produced from maize-soy flour by **Edema *et al.*, (2005).**

Energy content varied from 341 kcal to 356 kcal. The maximum energy values were observed in treatment T_3 followed by T_2 and T_1.The lowest value was observed in T_0 (340 kcal) and highest in T_3 (356 kcal). **Păucean and Man (2013),** reported that **t**he incorporation of maize flour at a level of up to 40 percent and defatted maize germ flour at a level of up to 15 percent produces bread without any

negative effects in quality attributes and reasonable acceptance, offering a promising, nutritious and healthy alternative to consumers.

The protein content of the prepared composite flour was found between 11.8g to 22.12g/100g. Protein content of the sample was found highest in treatment T_3 (22.12g) and lowest in T_0 (11.8g) followed by T_2 and T_1ie. 21.32g/100g and 20.20g/100g respectively. Similar studies were reported by **Dogore *et al* ., (2013)** who stated that the composite flour was prepared by Yam, Soybean and Cassava in (60, 30,10 percent) and found crude protein content of the range between 15.21 per cent to13.83 percent. Quantity and quality of protein in the flour are critical aspects that are used to achieve the desired texture of instant noodles and they vary among the type and quality of the final products to be made. Protein content of flour generally ranges from 7 percent to 9.5 percent for high quality instant noodles and about 11.5 percent to 12 percent for cup instant noodles.

Fat content varied from 1.57 to 11.34g/100g with the lowest in T_0 (1.57g) and highest in T_3 (11.34g).Similar results were founded by **Bolarinwa *et al.*, (2015).** Results of present study are supported by the results of **(Amir *et al.*, 2014)** also reported that sorghum soy composite flour contain (3.6 percent) of fat. The fat content (2.08-3.92g/100g) of the composite flour obtained in this study is in line with the fat content (4.-6.2 percent) of rice and soy flour blends.

The highest amount of crude fiber was in T_3 (4.25g) and lowest in T_0 (1.8g). The fiber content of the composite flour varied from 1.8g/100g to 4.25g/100g. Treatment 'T_3' had the highest crude fiber i.e. 4.25g/100g, while the lowest fiber 1.8g/100g was recorded for 100 percent whole wheat flour T_0. This may be due to the high amount of fibre content in the mix flour. The fiber content 4.25-1.8g/100g obtained in this study is in line with the fiber content (3.3-5.7 percent) of wheat and soy composite flour reported by **Ndife *et al.*, (2014).** However, lower fibre content (1.2-1.72 percent) was reported for rice and soybean flour blends.

The maximum amount of carbohydrates were recorded in T_0 (69.37g) and lowest in T_3 (46.12g). Similar studies were done by **Hameeda *et al*., (2011)**. Carbohydrate content of the prepared composite flour was found to be in the range of 38.15g/100g to 48.75g/100g.

Calcium content of the prepared composite flour was ranged from 47.12 to 58.36 mg/100g. The highest value recorded in T_3 and lowest in T_0.

The phosphorus of the prepared composite flour was varied from352.68 to 368.76 mg/100g. The highest phosphorus content was recorded in T_3 (368.76 mg/100g) and lowest in T_0 (352.68 mg/100g). Similar investigation observed by **Kadam *et al*., (2012), t**he phosphorus content varied from 320 to 378 mg/100g in blended flours. The highest phosphorus content was recorded in T_{13} (378 mg/100g) and lowered in T_0 (320mg/100g).

Their iron of the prepared composite flour ranged from 4.76 to 10.93 mg/100g. The highest amount was recorded in T_3 (10.93 mg/100g) and lowest in T_0 (4.76 mg/100g).

The Beta-carotene content varied from 49 to 64µg/100g. The highest Beta-carotene content was recorded in T_3 (64µg/100g) and lowest in T_0 (49µg/100g). The increase in the nutritive value of flour by supplementation of other composite flour has been reported by many investigators.

According to **Kadam *et al*., (2012),** it can be seen that moisture content varied from 8.41 to 8.89 percent with the lowest T_{13} (8.41 percent) and highest is T_4 (8.89 percent). The protein content in the various blended flours ranged from 11.80 to 15.98. The highest protein value was recorded in T_{13} and lowest in T_0 (11.80 percent). Fat content varied from 1.51 to 3.95percent with the lowest in T_0 (1.51 percent) and highest in T_{13} (3.95 percent).The highest amount o crude fibre was in T_{13} (2.05) and lowest in T_0 (1.22 percent). Ash content varied from 2.03 to 2.70 percent. The lowest value was observed in T_0 (2.03 percent) and highest in T_{13} (2.70). The maximum amount of carbohydrates were recorded in T_0 (74.22 percent) and lowest in T_{13} (65.99 percent). The highest value recorded in T_{13} and lowest in T_0 (50mg/100g). The phosphorus content varied from 320 to 378 mg/100g in blended flours. The highest phosphorus content was recorded in T_{13} (378mg/100g) and lowered in T_0 (320mg/100g). The iron content varied from 5.3 to 12.11 mg/100g. The highest amount was recorded in T_{13} (12.11mg/100g) and lowest in T_0 (5.3mg/100g).

4. Summary and Conclusion

Samples of composite flour was prepared using energy and protein rich foods such as soya, *ragi*, *moong dal*, and *groundnut*. Nutrient composition was analyzed using standard procedures of **AOAC (2007)** results shows that energy was lowest observed in T_0 (341Kcal.) and highest in T_3 (356). The highest protein value was recorded in T_3 (22.12). The highest calcium value recorded in T_3 (58.36). The highest amount of iron was recorded in T_3 (10.93 mg/100g). It is concluded from the present study that the nutritional composition like energy, protein, fat, calcium and phosphorous were found high in the prepared composite flour. It increases almost two and half times then the control.

References

- **Amir, Akande, K.E., Doma, U.D, Agu, H.O., Adamu, H.M., (2014)**. Major antinutrients found in plant protein sources: their effect on nutrition. *Pakistan Journal of Nutrition* 9(8), 827-832.
- **A.O.A.C (2000).** Official methods of analysis. Association of Official Analytical Chemists International.
- **Banu, Murtaugh, M.A., Jacobs, J.R., Steffen, D.R., Jacob L.M., Marquart L., (2012).** Epidemiological support for the protection of whole grains against diabetes. *Proceedings* of *NutritionSocietyof india* 62,143-149.
- **Bolarinwa, Kamal, G., Nath and Sharan, S. (2015).** Impact of education intervention on nutritional knowledge of iron deficiency anaemia among post adolescent girls. Agriculture research communication center. Department of food science and nutrition. *Asian J. Dairy and Food Res.,* 32 (3): *214-219.*

- **Dogore, Kassahun, A. and Bikes, D. (2013).** Prevalence of Malnutrition and Associated Factors Among Children Aged 6-59 Months at Hidabu Abote District, North Shewa, Oromia Regional State Institute of Public Health, College of Medicine and Health Sciences, University of Gondar, Gondar, Ethiopia. *J Nutr Disorders.*
- **Edema, Neena Joshi and K. G. Vijayalaxmi (2005).** Nutritional Education Tool to Improve Overall Dietary Attitude and Knowledge among Young Women. *Agricultural Technology Information Centre, University of Agricultural Sciences, HebbalCampus, Bangalore 560 024, Karnataka, India.* 2009 *J Hum Ecol*, 25(3): 187-191.
- **FAO (2011).** *Preparation and Use of Food-Based Dietary Guidelines.* World Health Organization, Geneva. 108 pp.
- **Hameeda, Pereira, M.A., Jacobs, D.R., Pins, J.J., Raatz, S.K., Gross, M.D., Slavin, J.L., Seaquist, E.R., (2011).** Effect of whole grains on insulin sensitivity in overweight hyper insulinemic adults. *American Journal of Clinical Nutrition* 7, 848-855.
- **Igah, S.A., *Bayero*, Braun, J.V., Ruel, M., Gulati, A. (2008).** Accelerating progress towards reducing Child Malnutrition in India. A concept for action. Sustainable solutions for ending hunger and poverty, Washington, DC: International Food Policy Research Institute (IFPRI), 1-8., *J. of Pure and Appl Sci*.,1, 20-24.
- **Kadam, M.L., Salve, R.V., Mehrajfatema, Z.M., and More, S.G., (2012).** Development and Evaluation of Composite Flour for Missi roti /chapatti. Dept of Food Chemistry, MGM College of Food Technology, Aurangabad (MS) India Kadam et al., *J Food Process Technol, 3:1*.
- **Mahajan, P.V., and Chattopadhyay, P.K., (2000).** Development of a chemically leavened cereal- legume based instant mix (*Dhokla*). *Journal of Food Science and Technology* 37(5), 459- 464.
- **Ndife, S., Irving, M., Gordon, D., Subramanian, S.V., Smith, G.D., (2014).** Poverty, child undernutrition and morbidity: New evidence from India. Bull World Organ 2005; 83: 210-216.
- **Okpala, Olaniyan, S.A., Adebayo, L.O. and Ademola, A.A., (2011).** Malted Sorghum-Soy Composite Flour: Preparation, Chemical and Physico-Chemical Properties Processing & Technology. *J Food Process Technol*, Volume 6 • Issue 8 • 1000467J.
- **Paucean and Man (2013**). "Nutritional potential bioaccessibility of minerals and functionality of watermelon (Citrullus vulgaris) seeds" *Journal of Food Science and Technology;*44: 1821-1826.
- **Srivastava and Kumar (2007).** Studies on millets: proximate composition, mineral composition, phytate and oxalate content. *Food Chemistry* 39, 99-107.
- **Ubbor (2014).** Department of Home Science, Nutrition and Dietetics, University of Nigeria, Nsukka, Enugu state, Nigeria. 2Natural Sciences unit, School of General Studies, University of Nigeria, Nsukka. Enugu state, Nigeria. Accepted 16 October, 2009.*International Journal of Nutrition and Metabolism*, 1(1) November, 2009 Available online http://www.academicjournals.org/ijnam ©2009 Academic Journals. Full Length Research Paper Nutritional status of preschool children aged 2 - 5 years in Aguata L.G.A of Anambra State, Nigeria.