www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2021; 10(8): 1045-1047

www.thepharmajournal.com
Received: 12-06-2021
Accepted: 23-07-2021

Aishwarya V Patil
Ph.D., Scholar, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India

Pushpa Bharati
Professor, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India

Corresponding Author:
Aishwarya V Patil
Ph.D., Scholar, Department of Food Science and Nutrition, College of Community Science, University of Agricultural Sciences, Dharwad, Karnataka, India

Partitioning of Kodo millet for the development of low and high fiber flour

Aishwarya V Patil and Pushpa Bharati

Abstract
Millets have substantive potential in broadening the genetic diversity in the food basket and ensuring improved food and nutrition security. Millets are nutritionally richer than cereals and are good source of energy, protein and minerals. As malnutrition is witnessed among vulnerable groups of developing countries, it is important to frame strategies to combat this burning issue through novel technologies and dietary diversification. Hence, the present study was undertaken with the objective to partition the Kodo millet for the development of low and high fiber flour. The Kodo millet flour was partitioned using three methods *viz,* traditional method, through sieving and partitioning by grinding. The partitioned flours were analyzed for proximate composition. The recovery rate of fine and coarse Kodo millet was about 40-50% in milling and grinding and 60-65% of recovery in traditional method. There was significant difference ($p \leq 0.01$) in proximate components like moisture, fat, crude protein and carbohydrate. The protein content of fine v/s coarse flours of traditional method, sieving and grinding was 8.01 v/s 6.19 g/100g, 7.11 v/s 5.18 g/100g and 7.72 v/s 6.02 g/100g respectively. The fat content ranged from 1.51-3.52 g/100g. The coarse flour had higher fiber content than fine flour. The crude fiber content of coarse flours of traditional method, sieving and grinding was 4.37, 5.87 and 6.01 g/100g respectively. The partitioned Kodo millet flours *ie.,* low fiber and high fiber flour can be further used for the development of health foods for vulnerable groups and Non communicable diseases.

Keywords: Kodo millet, malnutrition, partitioning

1. Introduction

Millet is a generic term used for small sized grains that form heterogeneous group and referred along with maize and sorghum as 'coarse cereals'. Their agricultural importance arises from their hardiness, tolerance to extreme weather and could be grown with low inputs in low rainfall areas (Jaybhaye *et al.*, 2014) [5]. Millets are considered as crop of food security because of their sustainability in adverse agro-climatic conditions. These crops have substantive potential in broadening the genetic diversity in the food basket and ensuring improved food and nutrition security (Ushakumari *et al.*, 2004) [8]. The important millets cultivated largely in the Asian and African countries. The major and mostly used millets are pearl millet, finger millet, foxtail millet and little millet. Whereas kodo millet, proso millet, barnyard millet and brown top millet are considered as underutilized minor millets (Jaybhaye *et al.*, 2014) [5].

Kodo millet is one among the oldest traditional underutilized crop. It is grown in India, Pakistan, Philippines, Vietnam, Indonesia, Thailand and West Africa. It is majorly grown in deccan plateau of India such as Karnataka, Gujarat, parts of Tamil Nadu; some regions of Maharashtra, Odisha, West Bengal, Rajasthan, Uttar Pradesh and Himalayas and consumed as healthy and energy food in rural parts of India. The nutritional potential of kodo millet in terms of protein (11%), fat (4.2%) and fiber (14.3%) is superior to the commonly used cereals like wheat and rice.

Malnutrition during early life leads to permanent stunting in growth and there may also be irreversible consequence from micronutrient deficiencies that affect brain development and other functional outcomes. During the first two years of life, malnutrition has a profound effect on child development particularly during the first phase of complementary feeding (6-12 months) (Lombor *et al.*, 2009) [6]. When breast milk is no longer enough to meet the nutritional needs of the infant, supplementary foods should be added to the diet of the child (WHO, 2001). Millet is relatively rich in some mineral elements particularly calcium, phosphorus, magnesium and iron. It is also a rich source of B-vitamins particularly thiamine. Malting of pearl millet and finger millet reduced protein content, but improved protein efficiency ratio (PER), bioavailability of all minerals and had pronounced effect in lowering anti-nutrients.

Millet malt can be used as a cereal base for low dietary bulk and calorie dense weaning foods, supplementary foods, health foods and also amylase rich foods. Traditionally, the millet (finger millet specifically) malt is utilized for infant feeding purpose. Malting helps to increase significantly the nutrient composition, fibre, crude fat, vitamins B, C and their availability, minerals, improve the bioavailability of nutrients, sensory attributes of the grains (Himabindu and Devanna, 2017) [4]. This accounts for the decrease in the prevalence of protein malnutrition among children fed exclusively on millet diet.

Along with nutrition, millets offer health benefits in daily diet and help in the management of disorders like diabetes mellitus, obesity, hyperlipidemia, etc. Millets offer unique advantage for health being rich in micronutrients, particularly minerals and B vitamins as well as nutraceuticals (Jaybhaye *et al.*, 2014) [5]. Hence the present study is undertaken with the objective to partition the Kodo millet for the development of low and high fiber flour.

Methodology

Kodo millet was procured from the local market of Dharwad, Karnataka. The kodo millet was cleaned washed and was further used for analysis in triplicates.

The kodo millet was partitioned in three different methods *viz.*, traditional method, through milling and partitioning by grinding to get fine flour with low fiber and coarse flour with high fiber content.

Traditional method: Hundred grams of kodo millet flour was passed through muslin cloth. The flour was passed through the muslin cloth with constant stirring till a coarse residue remained on the top of muslin cloth and fine flour was collected. Three trials were done. The recovery rate of fine flour and residue remained (above the muslin cloth) was recorded.

Partition through sieving: Hundred grams of kodo millet was taken and was passed through 150 BSS sieve with opening of 105 microns. The flour obtained after sieving was collected as fine flour and remaining flour as coarse flour. The flours obtained were weighed and noted.

Partitioning through grinding: About 100g of kodo millet were soaked overnight in water (1:1 ratio). The water was drained and the grains were washed with water. The soaked grains were ground to obtain the fine paste. The obtained paste was passed through 100 BSS sieve with opening of 150 microns. Fine milk was obtained and the remaining coarse paste was collected in a tray. Both the obtained milk and coarse paste were dried in hot air oven. The dried products (milk and coarse residue) were later converted into powder form. The flour was weighed and noted (Devi and Sangeetha, 2013) [3].

The obtained flours were analysed for recovery rate and proximate analysis

Proximate analysis: The proximate components like moisture, crude fat, crude protein, crude fiber, ash and Carbohydrate were analysed for different Kodo millet flour and partitioned flours (AOAC, 2019) [2].

Statistical analysis: The data was computed for mean, standard deviation and ANOVA using SPSS 16.0.

Results and Discussion

Recovery rate of different partitioned flour is shown in Table 1 and Fig. 1. The recovery of fine flour ranged from 42 - 66.33 per cent and for coarse flour the recovery was 33.66 - 52 per cent. The traditional method had highest recovery for fine flour of 66.33 per cent followed by sieving method (48%) and grinding method (42%). Sieving method had highest recovery of coarse flour *i.e.*, 58 per cent followed by grinding method (48%) and traditional method (33.66%).

Moisture, fat, crude protein, ash, crude fiber and total carbohydrate of partitioned Kodo millet flours is presented in table 5. Moisture, fat, protein, crude fiber and carbohydrate showed significant difference ($p \leq 0.05$) among the partitioned flours.

The moisture content ranged from 10.92 -13.68 g/100 g. Lowest moisture content was observed in CGM and highest was seen in CSM followed by FSM (13.55 g/100 g).The fat content varied from 1.51- 3.52 g/100 g. CSM had lowest fat content *i.e.*, 1.51 g/100 g and highest fat content was observed in KMF (3.52 g/100 g), followed by FGM (2.70 g/100 g) and FSM (2.65 g/100 g). Protein content ranged from 5.18 – 13.80 g/100 g. Highest protein content was observed in KMF (13.80 g/100 g), followed by FTM (8.80 g/100 g) and FGM (7.72 g/100 g) and CSM had lowest protein content. The crude fiber content ranged from 3.70-5.87 g/100 g. FGM showed lowest crude fiber content (3.70 g/100 g) and highest crude fiber content was observed in CSM (5.87 g/100 g) followed by CGM (5.84 g/100 g) and KMF (5.78g/100 g).

The carbohydrate content ranged from 26.59 – 37.72 g/100 g. The highest carbohydrate content was observed in KMF (37.72 g/100 g), followed by FSM (28.97 g/100 g) and FGM (28.53 g/100 g). Lowest carbohydrate content was seen in CGM (26.59 g/100 g). There was no significant difference in ash among the partitioned flour. The ash content varied from 1.14 – 1.95 g/100 g. FGM showed highest ash content (1.95 g/100 g), followed by CTM (1.80 g/100 g) and CSM and CGM (1.70 g/100 g) and FTM showed lowest ash content *i.e.*, 1.14 g/100 g. The fat, crude fiber and energy of kodo millet were on par with the results reported by Jaybhaye *et. al*. (2014) [5]. Processing enhances the edible quality of the millet grain and improves the nutritional value and reduces the antinutritional factors. It can be observed that the partitioned fine flour obtained by all the three methods were nutritionally superior to coarse flours except crude fiber being more in coarse flour.

This may be due to the sieving or milling methods which increase the nutrient content and potential health benefits as these processing methods decrease the antinutritional factors (Ahmed *et al.*, 2013) [1]. This also indicates that most of the nutrients expect fiber are present in the endosperm while ash is probably equally distributed throughout the grain. Suma and Urooj (2011) [7] reported low antinutrient that improved bio-accessibility making it nutritionally superior in pearl millet due to partial separation of bran fraction and semi refined flour.

Table 1: Recovery rate of partitioned kodo millet flour

Partitioned flours	Fine flour	Coarse flour	Wastage
Traditional method	66.33%	33.66%	-
Sieving method	48%	52%	-
Grinding method	42%	48%	10%

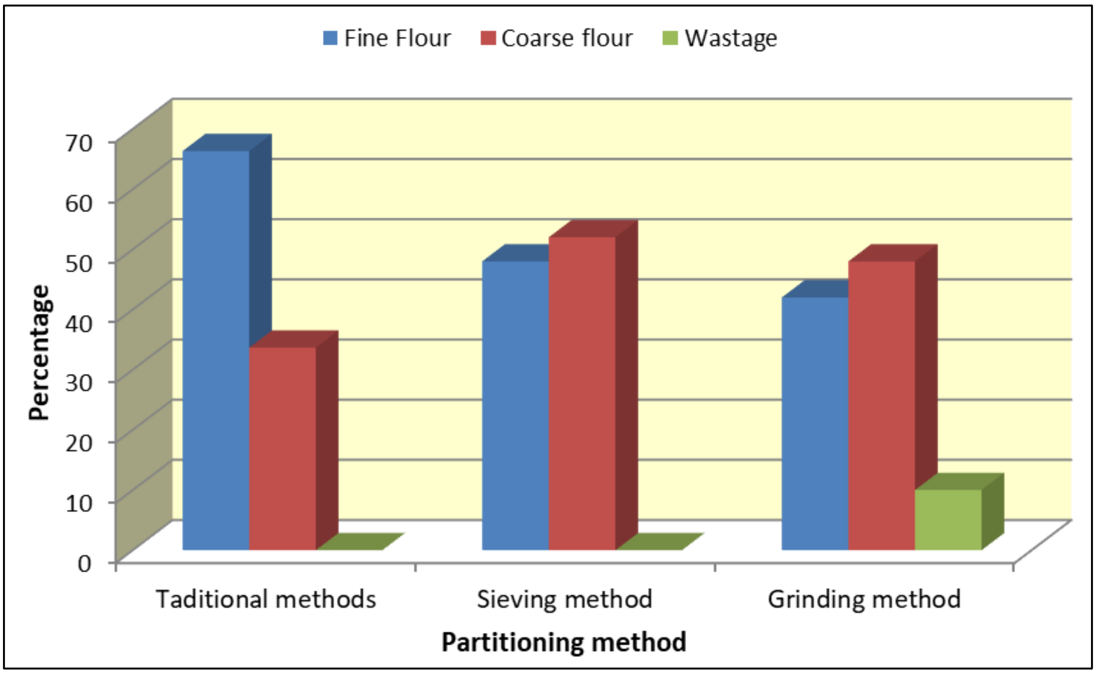

Fig 1: Recovery rate of partitioned flours from different methods

Table 2: Proximate composition of partitioned Kodo millet flour

Flour	Moisture (g/100 g)	Fat (g/100 g)	Protein (g/100 g)	Crude fiber (g/100 g)	Ash (g/100 g)	CHO (g/100 g)	Energy value (Kcal)
KMF	13.38 ± 0.48[a]	3.52 ± 0.16[a]	13.80 ± 1.04[a]	5.78 ± 0.18[a]	1.24 ± 0.34[cd]	37.72 ± 0.95[a]	456
FSM	13.55 ± 0.15[a]	2.65 ± 0.28[b]	7.11 ± 0.20[bc]	4.21 ± 0.17[b]	1.43 ± 0.33[bcd]	28.97 ± 0.34[b]	348
CSM	13.68 ± 0.10[a]	1.51 ± 0.33[d]	5.18 ± 0.31[e]	5.87 ± 0.18[a]	1.70 ± 0.40[abc]	27.95 ± 0.76[bcd]	335
FGM	12.46 ± 0.28[b]	2.70 ± 0.20[b]	7.72 ± 0.57[b]	3.70 ± 0.36[c]	1.95 ± 0.04[a]	28.53 ± 1.15[b]	345
CGM	10.92 ± 0.10[c]	2.11 ± 0.01[c]	6.01 ± 0.22[de]	5.84 ± 0.10[a]	1.70 ± 0.11[abc]	26.59 ± 0.51[d]	319
FTM	12.72 ± 0.50[b]	2.25 ± 0.11[c]	8.08 ± 0.40[b]	4.12 ± 0.32[b]	1.14 ± 0.17[d]	28.33 ± 0.88[bc]	340
CTM	12.57 ± 0.58[b]	2.01 ± 0.15[c]	6.19 ± 0.43[cd]	4.37 ± 0.08[b]	1.80 ± 0.70[ab]	26.94 ± 0.85[cd]	323
Mean	12.75 ± 0.95	2.39 ± 0.62	7.72 ± 2.75	4.84 ± 0.91	1.56 ± 0.35	29.29 ± 3.68	
F value	19.69	28.51	87.09	74.75	4.21	64.86	
S. Em. ±	0.21	0.11	0.30	0.10	0.14	0.47	
C. D. @ 1%	0.96**	0.53**	1.37**	0.49**	NS	2.13**	

Note: Values are mean of three replications, S.Em.: Standard error of mean, C.D.: Critical Difference
KMF: Kodo Millet Flour, FSM: Fine flour from sieving method, CSM: Coarse flour from sieving method, FGM: fine flour from grinding method, CGM: coarse flour from grinding method, FTM: Fine flour from traditional method, CTM: Coarse from traditional method

Conclusions

The Kodo millet was partitioned into two flours i.e., fine and coarse flour. The recovery for fine flour (42 - 66.33%) and coarse flour (33.66 - 52%) was about 50 percent. The fine flours of different methods of partitioning were nutritionally superior than coarse flour except crude fiber. The partitioned Kodo millet flours *i.e.*, low fiber and high fiber flour can be further used for the development of health foods for vulnerable groups and non-communicable diseases.

References

1. Ahmed SN, Zhang Qing, Chen Jing, Shen Qun. Millet Grains: Nutritional Quality, Processing, and Potential Health Benefits, Comprehensive Reviews Food Sci. And Food Safety 2013;12:281-295.
2. AOAC. Association of Official Analytical Chemists, 2019, 21st Ed.
3. Devi MP, Sangeetha N. Extraction and dehydration of millet milk powder for formulation of extruded product, IOSR J. Environmental sci. Toxi. Food tech 2013;7(1):63-70.
4. Himabindu P, Devanna N. Preparation and processing of ancient millets for the production of nutritious malt powder with natural fruit powder. J. Food Dairy Tech 2017;5(2):17-19.
5. Jaybhaye RV, Pardeshi IC, Vengaiah PC, Srivastav PP. Processing and technology for millet based food products: A review., J. Ready to Eat Food. 2014;11(2):32-48.
6. Lombor TT, Umoh EJ, Olakumi E. Proximate composition and organoleptic properties of supplementary food formulated from millet (*Pennisetum psychostachynum*), soybeans (*Glycine max*) and crayfish (*Euastacus* spp). Pak. J. Nutr 2009;8(10):1676-1679.
7. Suma PF, Urooj A. Nutrients, antinutrients & Bioaccessible mineral content (*in vitro*) of pearl millet as influenced by milling. J Food Sci Technol 2011; DOI: 10.1007/s13197-011-0541-7.
8. Ushakumari SR, Rashtogi NK, Malleshi NG. The functional properties of pooped, flaked, extruded and rolled dried foxtail millet (*Setaria italic*), Int. J. Food Sci. Tech 2004;39:907-915.