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The Impact of Malting on Nutritional Composition of Foxtail Millet, Wheat and Chickpea

Laxmi G[1]*, Chaturvedi N[2] and Richa S[1]

[1]Research Scholar, Department of Foods & Nutrition, Ethelind School of Home Science, SHIATS, Allahabad, India
[2]Department of Food Science & Nutrition, Banasthali Vidyapeeth, Rajasthan, India

Abstract

Coarse grains are rich sources of nutrients and food processing of coarse grain have been developed over the countries are adopted to make the final product more attractive and increase its nutritional value.

Objective: The objective of the study was to analyzed impact of malting on macro and micronutrients composition of foxtail millets, wheat and chickpea to increase their palatability.

Methods: Foxtail millet, wheat and chickpea undergo malting process in which 12 h. Steeping and 48 h Germination had been performed. Processed foxtail millet, wheat and chickpea were converted into flour and this flour was mixed in different proportions (40:30:30). The proximate analysis of single and mixed flour was done by standard procedure mentioned by AOAC 2005.

Results: Results showed that composite flour were enriched with malted (foxtail millet, chickpea and wheat flour), grains were rich in protein and carbohydrate. The maximum value of carbohydrate and protein found increased in foxtail millet flour had highest i.e (58.64%, 11.16%) respectively. Moisture was maximum increased in malted wheat flour (12.29%). crude fiber, vitamin C, and iron were found to be increased in mixed flour (13.04, 70%, 26.82%), when compared with unprocessed FMF, CPF, and WF.

Conclusion: The results suggest that malting, as a processing technique; can be used to effectively enhance the nutritional/organoleptic status of foxtail millet, wheat, and chickpea.

Keywords: Organoleptic; Wheat; Chickpea; Amino-acid; Fortification; Foxtail millet

Introduction

Several methods have been generally adopted to improve the nutritional and organoleptic qualities of cereal-based foods. These include: genetic modification, amino-acid fortification, supplementation or complementation with protein-rich sources and processing techniques which include malting, milling and fermentation [1-3]. Others are steaming, pressure-cooking, flaking, puffing or micronization of the cereal starch which increase its digestibility [4]. Taylor and Robbins [5] identified malting as the most inexpensive traditional processing technique for the elimination of the nutritional impediments of sorghum-based foods. Malting is a biotechnological technique which involves the controlled germination of a cereal grain which aims at activating enzyme systems that catalyze the hydrolysis of polymerized reserved food materials, notably, proteins, starches and cell-wall substances, thus, extracting fermentable materials [6,7]. 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. Foxtail millet (*Setaria etalica*) is cheaper and nutritional comparable or even superior of major cereals, especially with respect to protective nutrient. The nutritive value of foxtail millet is quite composing to rich. It is twice richer in protein, four times richer in mineral and fat and thrice richer in calcium as compared to rice [7]. Chickpea (*cicer arietinum*) is the most important pulse crop in India from production and consumption in India. Chickpea in seed contain 29% Protein, 59% Carbohydrate 3% Fiber 5% oil and 4% ash chickpea protein is rich in lysine and argenic but most deficient in sulfur containing amino acid methionine and cysteine. Chickpea is also a good source Ca, P, Mg, Fe and K [1]. Wheat (*Triticum aestivum*) is one of the most important stable foods for majority of population around the world. They are source of carbohydrate and supply of calories and other nutrients to the consume which serves as the life sustaining crop for more than 1000 million population of India. Coarse grains are rich sources of nutrients and food processing of coarse grain have been developed over the countries are adopted to make the final product more attractive and increase its nutritional value. The combination of millet, cereal and legume will enhance the nutrients value of grains which would be considered beneficial for malnourished population. Nutritional composition of millet, wheat and chickpea will make a great scope to meet the nutritional requirement of vegetarian and poor people of our country.

Material and Methods

Raw materials

Foxtail millet, wheat, and chickpea were purchased from local commercial suppliers, consisted of processing of millet, pulse and cereal which are basically foxtail millet, Chickpea and Wheat.

***Corresponding author:** Laxmi G, Research Scholar, Department of Foods & Nutrition, Ethelind School of Home Science, SHIATS, Allahabad, India, Tel: 05322684281; E-mail: laxmi_gautam93@yahoo.com

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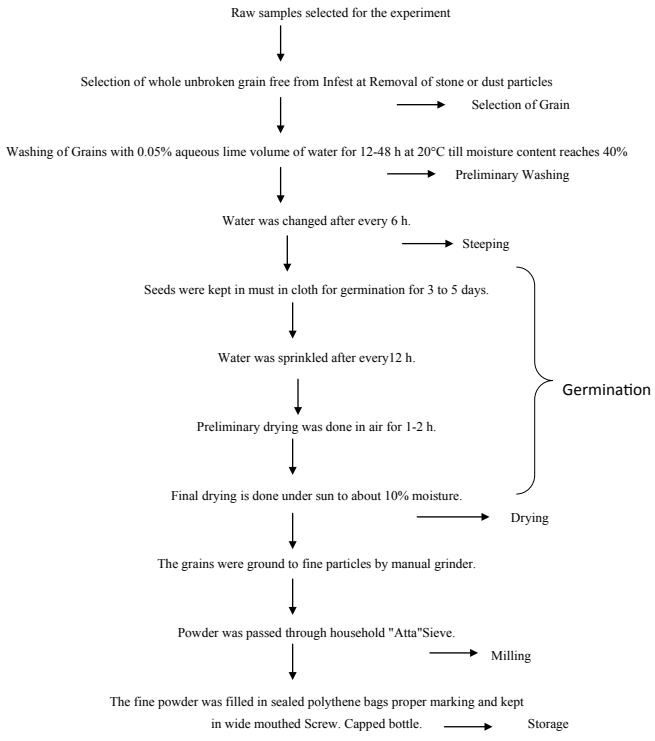
Proximate Composition	Foxtail millet		Chickpea		Wheat		Mixed flour	
	Un processed	Malted	Un processed	Malted	Un processed	Malted	Un processed	Malted
Moisture (g/100 g)	11.2	12.0 (7.14)	9.8	10.2 (4.08)	12.2	13.7 (12.29)	11.06	11.91 (7.68)
Protein (g/100 g)	12.5	19.83 -58.64	17.1	18.5 (8.18)	12.1	12.2 (14.87)	13.9	16.71 (20.21)
Fat (g/100 g)	4.3	3.2 (25.58)	5.3	4.1 (22.64)	1.7	1 (41.17)	3.7	2.7 (27.02)
Crude Fibre	8	8.2 (2.5)	3.9	4 (2.56)	1.9	2 (5.26)	4.6	5.2 (13.04)
Ash (g/100 g)	3.3	2.6 (21.21)	3	2.2 (26.66)	2.7	1.7 (37.03)	3	2.2 (26.66)
Carbohydrate (g/100 g)	60.9	67.7 (11.16)	60.9	63.3 (3.94)	69.4	70.1 (1.00)	63.7	68.2 (7.02)
Iron (mg/100 g)	2.8	3.05 (11.16)	4.6	5.4 (17.39)	4.9	4.65 (5.1)	4.1	5.2 (26.82)
Calcium (mg/100 g)	31	17 (45.16)	202	124 (38.61)	48	26 (45.83)	93.6	53.5 (42.84)
Phosphorus (mg/100 g)	290	149 (48.62)	312	176 (43.58)	355	212 (40.28)	319	182 (42.62)
(mg/100g)		-48.62		-43.58		-40.28		-42.62
Vitamin C (mg/100 g)	0	4.1 (0)	3	7.1 (136.6)	0	6.2	3	5.1 (0.410)

Table 1: Effect of malting (12 h steeping and 48 h Germination) on nutritive value of Foxtail millet, Chickpea, wheat and mixed flour.

Processing and preparation of samples

Foxtail millet, wheat, and chickpea undergo for malting process in which 12 h steeping & 48 h. Germination has been performed. All these processed millet; pulse and cereal are converted into flour. This flour was mixed in different proportions (40:30:30). The proximate analysis of single and mixed flour was done by standard procedure mentioned by AOAC 2005.

Processing of foxtail millet, chickpea & wheat procedure of malting process



Analysis proximate composition

Analysis of proximate composition of developed individual and mixed flour was done. The parameter analyzed were as follows, moisture Protein, Fat, Ash, Fiber, CHO, Energy, iron, calcium, and iron. Moisture, content was determined using the Sharma, crude protein by the, Modified Biuret method, crude fibre, crude fat, carbohydrate and ash using the Sharma, Ascorbic Acid was determined using the Titration Method, Iron Content using the Wong's Method, Calcium Content [8] (Titremetric Method).

Result and Discussion

Proximate composition

The proximate composition of the samples increased above the values of the control with increasing steeping and germination periods. The results indicated that as a data indicates that moisture content was found to be increased in the all the test samples. They were increased by 7.14%, 4.08%, 12.29% and 7.68% maximum increased was seen in malted foxtail millet flour (7.14) & mixed flour (7.68) and followed by malted wheat (12.29) and chickpea (4.08), It was found that the protein content of test sample were increased i.e. 58.64%, 8.18%, 14.87% and 20.21% respectively. Result revealed that test sample foxtail millet showed highest increased percentage value of protein content i.e. 58.64%. The fat content was reduced due to malting as shown in figure 4.3 since fat provides Twice as much energy as carbohydrates, the reduction, in Fat content observed during germination a reduction in the energy value implies of all test similar result was obtained by the, after malting it was seen that ash content was decreased 21, 26.66, 37.03 and 26.66% in malted test samples. The maximum reduction was seen in malted WF (37.03) followed by FM (21.21), CP (26.66) and MF (26.66). the crude fibre content in unprocessed FMF, CPF, WF and MF and all malted test samples were 8.0, 8.2 g/100 g 3.9, 4.0 g/100 g, 1.9 g, 2.0 g/100 g, 4.6, 5.2 g/100 g respectively. The fibre content was slightly increased in all malted samples. Carbohydrate content in the entire test samples (FMF, CPF, WF and MF) where 67.7 g, 63.3 g, 70.1 g, 68.2 g/100 g respectively. The result showed that the carbohydrate content was increased with in steeping and germination period. As crude fibre consist mainly of cellulose lignin and hemicelluloses acc. to the Fiknier and Hamid the increased crude fibre might be attributed for building the dry mater during the growth and development of plant during germination. It was observed that there was increased Iron content maximum increased was seen in malted mixed flour (MF) (26.82) and Chickpea flour (CPF) 5.4% followed by wheat flour (WF), foxtail flour. After malting calcium content was reduced 17,124,26 and 53.5 g/100 g respectively. Result indicated that there was maximum reduction in all test samples (38.61 to 45.83). Data represents that vitamin C content in unprocessed FMF and WF were absence 0 and CPF was 3 mg/100 g respectively. After malting vitamin C content was increased in are malted samples 4.1,7.1,6.2 and 5.10 g/100 g respectively (Table 1).

Conclusion

The results obtained from this study confirmed that malting as a

processing technique can be used to effectively enhance the nutritional/organoleptic status of foxtail millet, wheat, and chickpea.

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