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Research article

PHYSIOCHEMICAL QUALITY OF HOME MADE FLOUR FROM DUGGED WELL WATER SOAKED AND MALTED MILLET GRAIN. (PENNESITUM GLACUM)

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Abstract

The study was focused on making millet grain flour using home method approach from soaked and malted millet grain in well water commonly found in rural areas and in the villages to enable home makers have readily available flour enriched with mineral for their diet and for other home application through the evaluation of its physiochemical qualities .There was significant decrease in bulk density (0.56-0.48)w/v ,however there was increase in water absorption capacity (1.31-1.38)g/g,hygroscopicity (65.4-68.28)%and swelling index (4.08-4.66) m/g.The chemical quality showed similar trend significantly .This was also observed in protein content (12.82-15.80),Ash (1.65-1.90) between soaked and malted flour in dugged well water, hence reduction in crude fibre content and carbohydrate .These flour could be used as home neutraceutical and as food supplements.

Keywords: Malted flour, soaked flour, millet grains, quality, physiochemical property, dugged well water, Home use

Introduction

Pear millet (pennisetum glacum) is a staple in Africa and also in some Asian countries like Indian Basavaraj et al (2010) . for millions of people inhabiting the arid areas of the globe. Primarily a good source of human food ,calorie for animal and human as well as a factor in food security measures especially in developing countries FAO (1995) and Deep et al (2012).millet flour are rich in minerals and it caloric content are rich in iron, amino acid calcuim ,phosphorus ,fiber and certain vitamins mathanghi and sudha (2012) .

Millet could be classified into four or five species ,the pearl millet ,italian millet (setona italia) preso millet (panicum milaceum),finger millet (Eleusine coracoza)and Teff (Eragrostus tef).There is an urgent need to develop suitable processing and milling methods for millet into ready to eat products which could be commercialized and utilized for other semi or processed product. The processing of millet grains into product like flour ,grits dehulled grains are in many ways which could be used to produce staple food such as kunu zaki ,porridge ,steamed –cooked product ,couscous,fura and fufu (Nkama and ikwelle1997).These approaches are partially adopted with ready homemade millet flour due to intrinsic and extrinsic factors .Soaking ,toasting ,boiling ,germination and fermentation have been opined by (mukari 1992) for use in pasty gruel .

Dugged well water are not treated and have dense mineral concentration which could affect absorption and desorption as well as desorption of mineral ions having correlational effect on nutrient inhibitors via complexation or decomplexation.Nutrient inhibitors in millet hinders its efficient utilization as a meal. These anti- nutrient factors include phytate and tannins .The toxic chemical moiety are silicon and molybdenum usually from the soil (Oneill 1982) .According to Nkama and Gbenvi (2001),these chemical toxicants and anti-nutritional factors can be removed through processes like steeping ,malting and roasting. This could be aided more by mineral uptake or desorption using well water .The products from its flour are eaten widely especially in developing countries and other parts of the world ,usually made through decortication and milling .Flour millet products had different name by different people but from a common source with its proximate value been examined (Bandura et al 2001).These research work seeks to produce flour from soaked and malted millet using dugged well water and then evaluates its physiochemical properties to ascertain it applicability in other food product base on physiochemical qualities. These could be ease for home user and reduce labour of specified and makes it an available home flour products.

MATERIAL

Pea millet (pennesitum glacum) 1kg, was purchased from federal college of education ,Agriculture departmental farm ,processed into stable flour. The dugged well water were obtained from chemistry department, federal college of education kontagora which was used for the soaking and malting processes. The millet soaked and malted flour were then further conveyed to the department of food science and technology, federal university of Agriculture makurdi for further analysis.

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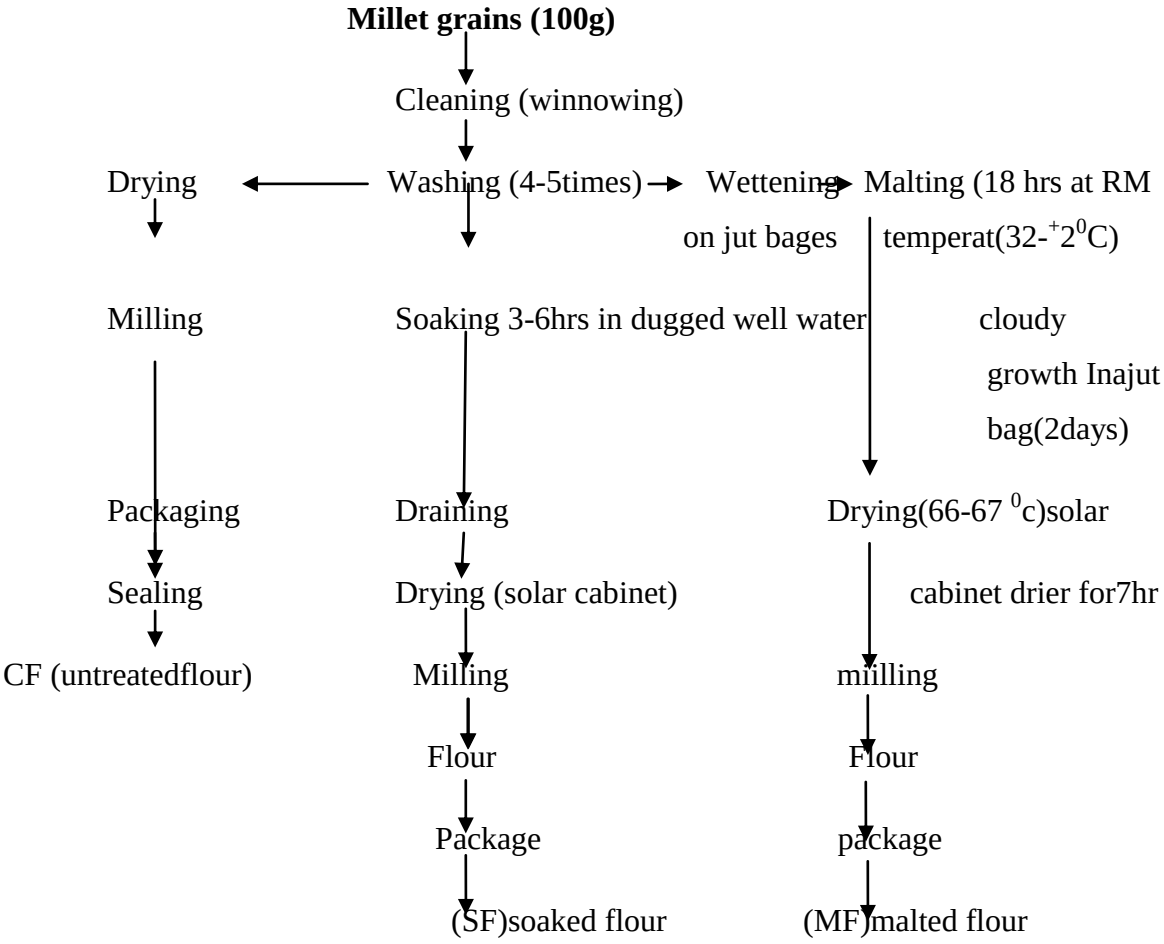
METHOD

The soaking and malting processes were carried out as modified by Nirmala and Marahkrishna (2012). Pearl millet were cleaned, washed for five minutes and then soaked in distilled water for five hours .Excess water were drained and grains tightened in jut bags to drain its water away. Those for malting were isolated from here and then spread on the floor with little sprinkled of dugged well water at 32_+2 ^{oc} ambient temperature for 48 hours ,thereafter dried in shade for a long day hours before drying using solar cabinet drier. The soaked were immediately dried .Similarly with the control which had a straight cleaned washing and then dry processed .All the dried millet grains where attrition milled to obtain respective flour with 40 um sieve size.

Figure 1: Processing of millet grains into different home use flours.



Physiochemical analysis

The chemical analysis were carried out as described by Akpapunam and Markalis (1981) for bulk density determination.Hygroscopicity by Bhatty (1988) ,water absorption capacity by Coffmain and Gaciar (1977),swelling power by Ooraikul and moledina (1981)

Chemical Analysis

The $\mathbf{P^H}$ determination was by (vasconcelos et al 1990).Total titratible acidity was by (pearson 1976).Thiobabituric acid TBA was by (Pearson, 1976)

The proximate analyss were carried out as described by AOAC (2000).

RESULTS

Soaked and malted blends flour on some physiochemical characteristics of millet grains flour (pennisitum glacum)

Table 1: Dugged well water Soaked and Malted physiochemical characteristics of Homemade millet grains flour (pennisetum glacum)

Sample	Bulk density	WAC	hygroscopicity	swelling power	Least Gelation Conc.
CF	$0.57^{+}{}_{0.01}$a	$1.31^{+}{}_{0.01}$a	65.46_+ 1.27a	4.06_+0.07a	8.0_+0.01a
SF	0.57_+ 0.01a	1.30_+0.01b	64.42_+1.39b	3.87_+0.14b	8.0_+0.00a
MF	0.48+_0.01b	1.38_+0.02c	68.25+_1.41d	4.66_+0.14d	16.0_+0.0b
LSD	--	0.001	0.09	--	--

Values are mean of duplicate determinations..Means in the same column not followed by the same superscript are not significantly different at (T=0.05)

Table 2: Chemical characteristics of dugged well water soaked and malted homemade millet grains flour .

Sample	PH	TTA	TOTAL SUGAR	PHYTIC ACIDg/100g
CF	6.66+0.01a	0.52+0.01a	1.7+0.00a	0.58+0.04a
SF	6.53+0.08a	0.52+0.00a	1.82+0.00a	0.40+0.00b
MF	6.03-0.21a	0.74+0.10c	1.23_0.00a	0.31+0.04d
LSD	0.003	0.008	--	0.008

Values are mean of duplicate determinations .Means in the same column not followed by the same superscript are not significantly different at (T=0.05)

Table 3: Dugged well water Soaked and Malted flour on some proximate characteristics of homemade millet grains flour

Sample	Fat	Protein	Ash	crude fiber	Carbohydrate
CF	$4.56^{+}_{-0.13}$ a	$12.82^{+}_{0.04}$a	1.65_+ 0.04a	2.29+0.04a	78.57+0.41a
SF	4.19 .01a	12.88-0.06b	1.66+0.04b	2.34+0.07a	78+0.03a
MF	2.99-0.09d	15.84+0.01c	1.90+0.07b	2.40_0.04a	77.56+0.12b
LSD	0.01	0.12	0.10	---	--

Values are mean of duplicate determinations..Means in the same column not followed by the same superscript are not significantly different at (T=0.05)

DISCUSSION

Table one above showed the physiochemical characteristics of the dugged well water soaked and malted flour. The bulk density decreased significantly from 0.57-0.48 in the both flour deviating from the control flour (Cf) indicating low porosity or air spacing in the flours especially in the malted flour. The high content of small sized particle found in malted millet flour is an indication of high bulk density (Okaka and sieh, 1990).This might be due to starch modification during malting of the grains, resulting from enzymatic activity on the ectoderm to endoderm of the kernel grains. This change is an advantage to flour transportation and packaging.

The high water absorption capacity, hygroscopicity experienced by the flours from malted and soaked millet grains maybe due to more hydrophilic site of the carbohydrate moiety in the flours. It may also be due to nutrient being metabolized from the flour .The higher water absorption capacity by the malted millet grains is show piece of more hydrophilic regions and ability to capture water from its environment hence high spoilage tendencies of the flour.

The observed high swelling power observed on malted millet grain flour may be due to fat content of the flour since low molecular fat or dispersed fat decreases emulsification hence limiting swelling (zobel 1984)this attribut increases yield power compared to flour from untreated millet grains flour. The least gelation concentration confers that malting increases the leaching ability of starch moiety from malted millet grain, this may be the reason why it has high gelation concentration compared to the soaked and control flour samples. Other bioactive nutrient may follow, thereby enriching the flour for home usage and consumption with biochemically metabolizable neutraceauticals ions.

Table two showed well water influence of soaking and malting on chemical property of millet grain flour .The PH values of the flour reduced with soaking and malting .This agreed with Briggs ,(1981) and ocheme and chinma ,(2008) on acidity yield and TTA of soaked and malted cereal values. The total sugar content of the flour increased with soaking and malting significantly .The flour from the control sample had the least values while that from malted cereal grains had the highest value. This is expected because of the enzymatic action of either mobilizing maltase .This further agrees that flour from malted millet grains may have better flour compared to the soaked and control samples of flours

Soaking and malting significantly reduced the phyatic acid hence other anti-nutritional factors of the flour Garaic Estapa et al ,(1999)and Hofsten (1978) had reported similar phenomenon on phytase on malted grains leading to increase in phytic acid reduced activity ,releasing positional mineral bonds and making them available to consumers.

Table three showed the nutrient content or the proximate value from dugged well water soaked and malted millet grain flours .The moisture content ,fat ,protein ash, crude fibre and carbohydrate content of the flours obtained from untreated millet grains agreed with values reported by Badau et al (2000),Nkama et al (2001) and ocheme and chinma(2008).The reduction in fat value in the flour from soaked and malted samples maybe due to the action of lipolytic enzyme which would have come up during malting Briggs (1981) ,Akpapunam et al (1998).The increase in protein content value in the flour resulting from soaking and malting maybe due to the fact that other components such as starch, water ,lipids were changing and may have altered the proportion of the amino acid substrate ocheme and chinma (2008) Akpapunam et al (1996).It may also be due to microbial adhesion on the malting substrate or vegetative sprouting. The increase in ash content of the flour maybe due to soaking and malting in well water which had reduced the phytic –phosphorus content and this reduction accompanied by increase in ionizable ions and soluble zinc (Sankara Rao and Deosthale 1983).The slight increase in crude fiber content of the flour is as a result of siftening and pre- fermentation of the grains ,maybe resulting in pectin and polysaccharide breakdown .The low carbohydrate content of the flour was due to synergetic increase or decrease that took place in components like fat ,protein ash crude fibre of the malted grain during processing into flour.

Conclusion

The application of home technique in making flour from dugged well water soaked and malted millet flour grains improved significantly, nutrient content such as protein. Crude fiber and Fat contents were low which is an advantage for low risk factor for overweight patients .Similarly physiochemical attributes like water absorption capacity ,hygroscopicity showed increased trend from soaked to malted flour conferring storage problems ,however an advantage to small scale food processors that might use millet flour as well as when packing and distributing the flour. It was found that these flours are suitable for home use with a good storage conditions and could be incorporated into food as nutrient enricher in pasta,cracker,toast also bread ,chapati and pasty soups.

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