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Effect of Semi-Densed Polyethylene Storage on Organoleptic and Chemical Characteristics of Flours from Soaked, Malted and their Blend of Millet Grains (*Pennesitum glacum*)

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Abstract: The study was focused on common and avialable packagible polythylene bags (SDPE) which could be reached by home makers and process marketers to elucidate its effects on flour from soaked, malted and blended flours from millet grains through its chemical and organoleptic quality characteristic. Pearl millet have high lipase activity hence short shelf life. The storage study was for 90 days and it was discovered that storage using common semi-densed polyethylene packages decreased significantly flour organoleptic qualities like aroma, overral acceptability and flavour on malted flour which were not accepteded by panalist except for colour for all the flours. Flour storage in Semi Densed (SDPE) Polyethylene bags increased the chemical activity of the flour hence lipase activity significantly having increase in pH (6.7-5.8), TTA (0.5-0.8), TBA (0.1-0.8) with the control dovtailling at 90 days of storage. There was significant rise in moisture content (5.6-6.7) between the storage period using (SDPE) bages which does not support maximum shelf life stability but could assist home makers, market-processors and small scale producer of millet flour for considerable period of time compared to days and week of their stay during usage in food processing and culinary approaches.

Key words: Storage, semi-densed polyethylene package, malted flour, soaked flour, organoleptic, chemical

INTRODUCTION

Pearmillet (*Pennisetum glacum*) is a native cereal in Africa and also in some Asian countries. Millet is processed in many ways involving dehulling and then milling into products like flours, grits and dehulled whole grains which are used to prepare staple food like cooked whole grians, thick and thin soups and porridges. By means of processing approach millet anti-nutritional factor such as tannin which affects bioavialability of essential nutrients are reduced (Rostango, 1972). Acccording to Nkama and Gbenyi (2001), steeping, malting, roasting can achieve anti-nutritional factors reduction.

Millet flour product have various application in food and in homes (Poongodi and Jemima, 2009; Rao *et al*., 2004). The flour product are used for soup porridge in benue state called Enyiokwolla and are readly enjoyed (Ocheme and Chinma, 2008). Due to it grain neutricauetical functionalities, its sugar had been reported to reduce diabetes. Millet flour for thin or thick soup porridge production have been observed not to stay long after processing even at home due to it millet flour tendency to turn rancid (FAO, 1995; Yadav *et al*., 2012). The various phytochemicals causing redox activity might have surfaced during processing this might also be responsible for it limited application at home and for culinary purposes thereby limiting its application on other food systems. Millet flour availability in a convienent form will reduce the labour involved in the production of its products and also ensure it availability of the flour products.

Storage in (SDPE) bages is a common packaging material which is very affordable with undefined head space, however reported to prolonge shelf stay of food products (Yadav *et al*., 2012). Packaging with (SDPE) bages are more favourable to rhombus, wood clay pot and underground (Vogel and Graham, 1979). The temperature variaton on flour products from millet grain could result in either hydrolytic or oxidative rancidity, trigering free-radical reaction, distabilizing flour quality and shelf stay. The semi-densed polythylene package under sealed condition could prevent free radical build up hence prolonging it stay beside microbial proliferations. This study tends to produce flour from soaked, malted and

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their blend ratios and extending them using sensorial and chemical via packaging in (SDPE) at room temperature to acertain the much stabilty and deviation from its supposed flour sensorial and chemical properties.

MATERIALS AND METHODS

Peamillet (*Pennesitum glacum*) was purchased from Federal College of Education, Agricultural Depatment Farm. The 400 g of the millet grains were used for the soaking and malting. The 150 g of the grain were soaked and also 150 g portions were also malted. The flour from each soaked and malted portions were blended finally at 60% and then thoroughly mixed befor packaging in SDPE and sealing using electric sealer. The package flour in the bages were kept on shelves at ambient temperature of 37±1°C for 90 days were flours were drawn for periodically for chemical and organoleptic evaluations.

Figure 1 showed how the millet grains were processed. The control flour that is the (untreated flour), soaked flour, malted flour and blends.

Organoleptic analysis: The senory evaluation of the flour were carried out by panalist of twenty semi trained judges drawn from the staffs at federal college of education kontagora for different sensorial analysis. A nine point hedonic scale of like extremely to dislike extremely were used. The values were subjected to ANOVA, according to Steel and Torrie (1981) and the significant difference determined at T = 0.05.

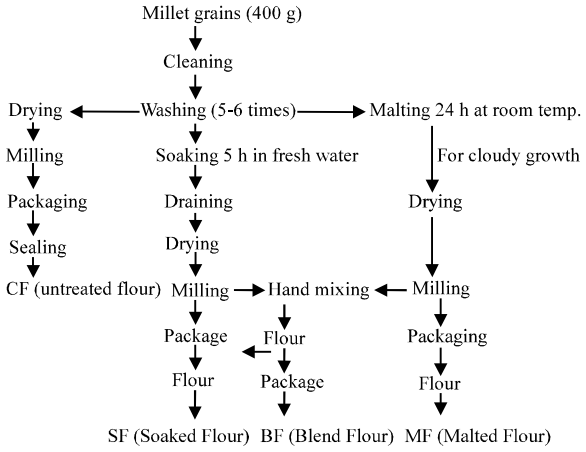

Fig. 1: Effects of SDPE storage packaging of millet flour on chemical charactristics of soaked, malted and blends of millet flours

Chemical analysis: The pH determination was by Vasconcelos *et al.* (1990). Total titratible acidity was by Pearson (1976). Thiobabituric acid TBA was by Pearson (1976).

Storage stability: Sample of 50 g were packed in SLDPE bages and then stored at ambient condition (37±2°C) at (45-50% RH) for the storage study. The sample were drawn and evaluated for change in aroma, taste, colour, pH, TTA, TBA and moisture content.

RESULTS AND DISCUSSION

In Table 1 effect of SDPE storage bages on organoleptic quality of soaked, malted and blends of millet grain flours in days.

Table 1 showed results on organoleptic analysis of stored flour for 90 days in a semi densed polyethylene bags of soaked, malted and blended milled grain flours. Panelist preferred the soaked, malted and the blend flour for their overral accceptability as the storage periods increased. The controlled flour competed favourably with the 30 and 60 days storage duration in SDPE bage storage but not significant at 90 days.

This was observed for soaked flour, the blended flour showed less preference by panelist at 60 and 90 days, respectively of stored studies. The malted flour were not accepted for 0 and 90 days, respectively. There were no significant difference in the aroma of the flour which followed suit for taste rating. The preference for aroma in soaked and malted flour maybe due to primary fermentaton that might have taken place during soaking and malting, respectively. The characteristic colour, aroma and taste from the control flour sample followed similar trend. Panelist accepted the malted flour for aroma and taste. The organoleptic scores indicated that panelist acceptance of the prepared flour decreased as storage

Table 1: Effect of SDPE storage bages on organoleptic quality of soaked, malted and blends of millet grain flours in days

	0 days				30 days				60 days				90 days			
Samples	Colour	Aroma	Taste	Overral accept[ab]	Colour	Aroma	Taste	Overral accept[ab]	Colour	Aroma	Taste	Overral accept[ab]	Colour	Aroma	Taste	Overral accept[ab]
CF	7.1[a]	7.3[a]	6.8[a]	7.2[a]	7.7[a]	7.5[a]	6.4[b]	6.7[a]	7.8[a]	7.3[a]	6.2[a]	7.1[a]	6.7[a]	7.5[a]	6.1[a]	6.8[a]
SF	7.3[a]	6.9[b]	6.9[a]	7.1[a]	6.5[b]	6.7[b]	6.3[c]	6.7[a]	6.5[b]	6.5[b]	6.2[b]	6.7[b]	6.3[b]	6.6[b]	6.0[a]	6.3[b]
MF	5.9[c]	6.2[c]	6.3[c]	5.9[c]	6.2[c]	6.6[c]	6.7[a]	6.7[a]	6.4[b]	6.5[b]	6.5[a]	6.7[b]	5.4[c]	6.5[b]	5.8[b]	6.4[b]
BF	6.6[b]	6.7[b]	6.6[b]	6.6[b]	5.3[d]	6.7[b]	6.4[b]	6.4[b]	5.3[c]	6.5[b]	6.2[b]	6.3[c]	5.0[c]	6.5[b]	5.9[b]	6.0[c]

Scores are based on 9 point hedonic scale. Means in the same column not followed by the same superscript are not significantly different at T = 0.05

days increases. The controlled flour sample had a panelist ranged value of 7.7 and gradually reduced for all characteristics synergistically to 5.2, 5.0 and 5.4. The taste were observed to be bitter and colour darker as the flour continue to age which might be due to residual tannin breaking down or been used up. The cause may be due to undefined head space in the SDPE packaging, uncertain phytochemicals of the processing millet grains.

Figure 1 above having Fig. 2-5 showed the chemical properties of flours graphically. The pH values of the controled flour soaked, malted and their blends are shown on the graphs. pH and indication of microbial proliferation and load were high with increased storage period in SDPE. The flours for all samples tends to acidic conditions. The soaked, malted and the blends flour tends to show some build up of pH at 60 days of storage study befor dovtailling. This might be due to matreial equilibration. According to Semwal *et al.* (1999) malting results in bacterial build up, contamination and osmotic diarrhea due to starch hydrolysis into simple sugars.

Figure 3 showed also titratible acidity of periodic storage flour in semi densed polyethylene bags. The graph indicated that the TTA increased with storage days indicating increasing rancidity with storage days in SDPE packages. This confers that this package allow permeation of solutes or ions in or out of the material flour. This was not observed in the controle flour that tends to began to reduce after 60 days of staorgae due to secondary metabolite buiding up (Thiam, 1977). Ths might be the reason to why malting and soaking which induced partial breakdown of storage component like protein and vitamins leaching was not observable in the control flour (Semwal *et al*., 1999). The increase in TTA with storage peiod was also obseved by Chaudhary and Kapoor (1984). The TBA values depicts fat content or residual fat in the flour are shown in Fig. 4. The result revealed that thiabaubetoric acid increased with storgae periods. This might be due to hydrolytic changes associated with the action of lipolytic enzyme (Thiam, 1977). The controlled flour showed increased TBA values up to 60 days before dovtailling. A dissimilar trend were observed for malted and soaked flour which showed gradual rise in fat content. The blends of flour showed a very maximum amylaptic activity due to blends of soaked and malted flour. These TBA phenomenon of the flours were in agreement with the values reported by Yadav *et al.* (2012) on 30 days storage period of pearl millet in microwave oven treatment.

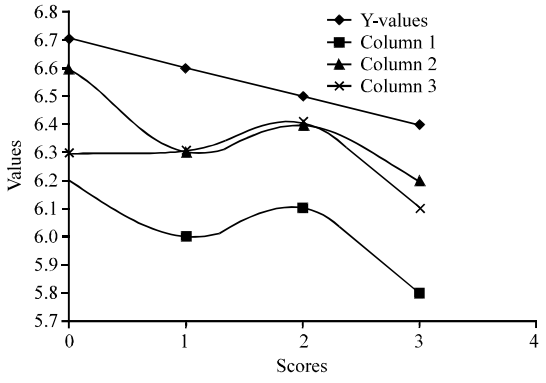

Fig. 2: Graph of pH% of soaked, malted and blends of millet flour in SDPE bage; Y-values = Control Flour (CF); Column 1 = Soaked Flour (SF); Column 2 = Malted Flour (MF); Column 3 = Blended Flour (BF)

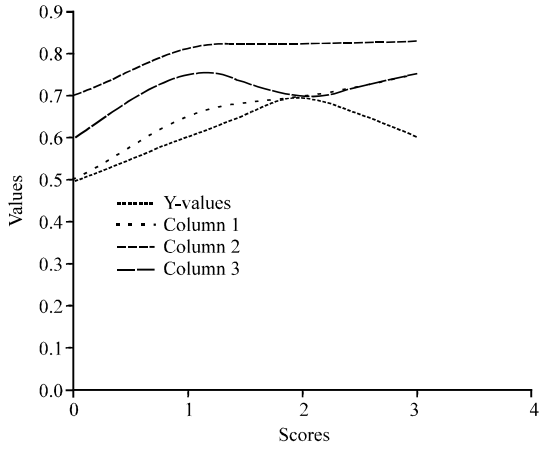

Fig. 3: Graph of TTA% of soaked, malted and blends of millet flour in SDPE bages; Y-values = Control Flour (CF); Column 1 = Soaked Flour (SF); Column 2 = Malted Flour (MF); Column 3 = Blended Flour (BF)

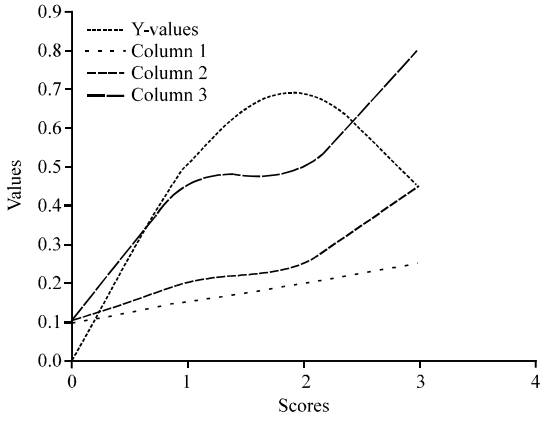

Fig. 4: Graph of TBA m/kg of soaked, malted and blends of millet flour in SDPE bages; Y-values = Control Flour (CF); Column 1 = Soaked Flour (SF); Column 2 = Malted Flour (MF); Column 3 = Blended Flour (BF)

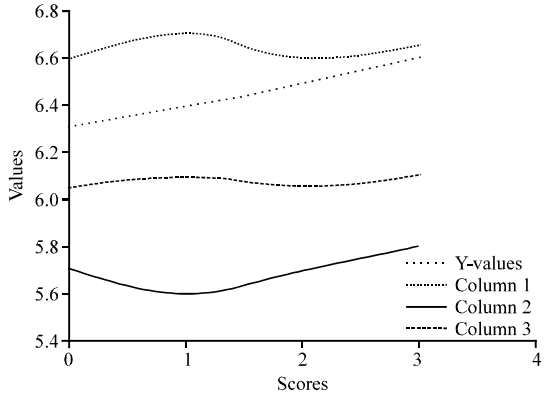

Fig. 5: Graph of moistur content percentage of soaked, malted and blends of millet flour in SDPE bages; Y-values = Control Flour (CF); Column 1 = Soaked Flour (SF); Column 2 = Malted Flour (MF); Column 3 = Blended Flour (BF)

Figure 5 showed a fairly constant trends as days of storage increased, depicting low material permeability at this storage temperature. The undefined head space might be the cause of the high TBA and TTA resulting in fairely unstable shelf stay but considerable better for home users and culinary practices. The controlled flour moisture values increase may be due to unmodified properties of the starch unlike flours from soaked, malted and the blends.

CONCLUSION

Semi-density polyethylene bag storage of soaked, malted and blends flour result in significant reduction in pH, TTA and TBA. The pH observed value could help in contorl of microbial load in the flour, however the TTA and TBA showed increased values with storge periods, revealing that SDPE cannot disrupt lipase activity, saokng, malting and blends flour could only be used for upto 1-2 months of keep before detoriation sets in. Soaked, malted and blends flour were significantly accepted for aroma and taste. These studies would be beneficial to researcher, miller, process-marketers as well as in culinary practice and endevourer as it would help store flour usage for considerable long days without significant change in overal chemical and organoleptic quality. It would encourage millet flour utilization and frontier to future application in food processing and technology.

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