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Bread Made from Wheat Flour and White Sesame Flour in Presences of Natural Improver

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Abstract: Addition of white sesame flour to wheat flour with different incorporation levels (5, 10.15%) in bread blend led to significant increase in nutritive value but with inferior quality with respect to crumb, crust color and bread volume. Proximate analysis of the wheat and white sesame flour were carried out. The rheological prosperities of the blends of wheat flour and white sesame flour were determined using a farinograph. To alleviate these inferior effects, natural improvers were used. Rheological test revealed, increase in water absorption value, dough development time and dough stability for all dough prepared from white sesame-wheat flour blend in presence of the two types of improvers. Characteristics of bread prepared from white sesame-wheat flour blend using the two improvers, revealed better result as for crumb color, crust color, aroma, texture and taste as compared to control bread, with a noticeable increase in bread volume.

Key words: Bread making, wheat flour, sesame flour, improvers

INTRODUCTION

Bread is a basic food for people in Sudan, as it provides approximately 30% of the total daily requirement of calories and protein. Maintaining and enhancing bread quality and supply is therefore essential to the well being of the population, especially children in developing countries, where protein malnutrition is overwhelming in some parts.

Wheat protein is deficient in some of essential amino acids such as lysine, threonine and valine. Bread made from wheat is enriched with combination of food sources to balance this deficiency. In this respect whole seeds oil with their high content of protein, phosphorus, iron, magnesium, vitamin E and niacin were incorporated in some bread recipes.

Sudan is rich with many seed oil, one of which is white and red sesame seed with annual production of 287000 ton (2007). Sesame seed is considered a good dietary source of protein with a good balance of amino acids and chemical score of 62% and net protein utilization of 54%.

Addition of white sesame flour to wheat flour with different incorporation (5, 10.15%) in bread blend led to significant increase in nutritive value but with inferior quality with respect to bread characteristics (Ali, 2006). Improvers have been used for more than 100 years to full development of the bread flour properties and to balance the natural differences in baking behavior.

Improvers are focused on improving dough machinability, like pentosan, other on bread volume and crumb texture such as different emulsifiers, like sodium Stearoyl-1-lactylate and monoacylglycerols, hydrocolloids and enzymes.

The aim of this study is to alleviate the inferior effects, on dough properties and bread quality, caused by addition of white sesame flour to the bread blend.

MATERIALS AND METHODS

Preparation of flour

Wheat flour: The wheat flour (extraction rate 72%) was obtained from Seen Flour Mills, Preparation of sesame flour was according to the method described by Alopo (2001).

Preparation of improvers: Two types of improvers; improver (1) Consist of hemicelluloses, fungal alpha amylase, A.A, lipase gluco-oxidase). Improver (2) Consist of tartaric acid, hemicellulase, fungal alpha, A.A, lipase gluco- oxidase.

Proximate analysis: The moisture, ash, oil, protein and fiber content of wheat flour, white sesame flour were determined according to the method described in AOAC (1990).

Rheological testing: Rheological properties of the flour blends containing bread improvers were studied for their farinograph characteristic following the method described in ICC Standard (1972).

Bread baking: The bread was prepared according to Badi *et al.* (1978) method.

Bread evaluation: External and internal characteristics of bread were evaluated according to the ranking method described by (Ihekoronye and Ngoddy, 1985).

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Statistical Package for Social Science (SPSS). Means (±SD) were tested using one factor analysis of variance and then separated using Duncan' s Multiple Range TEST (Mead, 1983).

RESULTS AND DISCUSSION

The chemical composition of commercial wheat flour (72%) extraction rate and white sesame flour were determined as shown in Table 1. For white wheat flour the moisture content was 13.2%, protein 11.93%, crude fibre 0.35% ash content 0.50%, oil content 1.35% and total carbohydrates 72.7%. As for white sesame flour, moisture content was 5% protein 55.2%, crude fibre 4.0%, ash content 7.41%, oil content 1.4% and total carbohydrate 26.9%. These results supported those of Ali, 2006.

Table 1: Chemical composition of wheat flour (72% ext. Rt.), white sesame seed and white sesame flour

	Samples (flour)	
Parameter (%)	Wheat	White sesame
Moisture content	13.20±0.10^{a}	5.00±1.00^{b}
Ash content	0.50±0.10^{c}	7.41±0.01^{a}
Protein content	11.93±0.06^{b}	55.2±0.01^{c}
Oil content	1.35±0.01^{b}	1.40±0.10^{c}
Crude fiber	0.35±0.01^{c}	4.00±0.10^{b}
Carbohydrate*	72.70±0.10^{a}	26.99±0.06^{b}

*by difference. Mean values ± SD bearing different superscript letters within rows are significantly different (P≤0.05)

Rheological result revealed increase in water absorption value, dough development time and dough stability for all dough prepared from white sesame flour-wheat flour blend with increase in white sesame flour proportion (Table 2) in presence of two types of improve.

Table 2: Rheological properties of bread samples

Quality dough	W.A (%)	D.D.T (Min)	D.S. (fu)	F.Q. No.
5%				
S1	66.3	10.3	6	144
S2	60.6	1.2	101	22
S3	61.0	1.7	84	29
10				
S1	67.76	7.3	18	125
S2	61.2	1.6	91	27
S3	61.6	2.0	84	100
15				
S1	68.4	6.0	65	76
S2	62.0	6.7	79	83
S3	61.7	2.0	72	100

Key:
S1 = Dough of bread without improver
S2 = Dough of bread with improver (1)
S3 = Dough of bread with improver (2)
W.A. = Water absorption
D.D.T. = Dough development time
D.S. = Degree of softening
F.Q. No. = Farinograph quality no (mm)

The increase in water absorption value with increase of white sesame flour proportion is attributed to the water absorbing characteristics of fibrous material (Halim and Lorenz, 1985) and to the fact that improvers are known for their improved rate of hydration and water absorption (Stampfli and Nersten, 1995; Kohajdova *et al*., 2009).

The increase in dough development time and dough stability could be due to the fact that with increase in white sesame flour proportion in the presences of improvers which have the tendency to form crystalline-liquid phase which associate with gliadin in addition to hydrogen bonding with starch and glutamine which is capable of promoting aggregation of glutens protein in dough resulting in strong protein net work allowing good gas retention and resistance of the dough to collapse (Ribotta, 2004).

Characteristic of bread prepared from white sesame-wheat flour blend using the two improvers (Table 3) showed better results for crumb color, crust color, aroma, texture and taste as compared to bread without improvers. The addition of improvers minimized the deleterious effect of white sesame flour on bread volume which is in agreement with the findings of Shogren *et al*., 1981. The presences of hemicelluloses and tartaric acid resulted in the increase of bread volume. The alpha amylase delays the gelatinization of the starch during baking giving more over-spring and increase in bread volume (ref: Dough and bread conditioners). The lipoxygenase bleach flour pigment as producing better crumb color for bread with white sesame flour.

Table 3: Specific volume of bread

Dough of bread (%)	Specific volume (cm^3/gm)
5	
S1	3.090±0.03^{b}
S2	4.58±0.00^{a}
S3	5.05±0.02^{b}
10	
S1	3.010±0.03^{c}
S2	3.88±0.00^{c}
S3	4.84±0.02^{c}
15	
S1	0.810±0.03^{d}2
S2	3. 410±0.02^{c}
S3	4. 44±0.05^{a}

Mean values ± SD bearing different superscript letters within rows are significantly different (P ≤ 0.05)

Key:
S1 = Bread without improver
S2 = Bread with improver (1)
S3 = Bread with improver (2)

When comparing the effects the two improvers on the bread characteristics such as, crust, crumb color, texture aroma, overall appearance and specific volume improver (2) was superior, up to 10% replacement white sesame flour. Expect for the taste, at incorporation levels of white sesame at 5 and 10% there was no significant

Table 4: Sensory evaluation and baking quality of bread samples

Quality bread (%)	Crust color	Crumb color	Texture	Taste	Aroma	Overall appearance	Specific volume
5							
S1	3.00^{e}	2.80^{e}	2.50^{f}	3.00^{a}	2.60^{d}	2.70^{de}	3.09^{d}
S2	3.20^{d}	3.00^{d}	3.20^{d}	3.19^{c}	3.00^{c}	3.00^{ab}	4.16^{f}
S3	3.34^{c}	3.42^{c}	3.60^{c}	3.30^{c}	2.79^{e}	3.49^{abc}	5.05^{b}
10							
S1	2.20^{h}	2.30^{g}	2.50^{f}	2.50^{e}	2.00^{h}	2.30^{ef}	3.01^{k}
S2	2.40^{g}	2.54^{f}	2.80^{e}	2.61^{e}	2.20^{g}	2.40^{ef}	3.88^{g}
S3	2.62^{f}	2.62^{f}	2.90^{e}	2.63^{e}	2.35^{f}	2.44^{ef}	4.84^{c}
15							
S1	1.50^{i}	1.20^{i}	1.30^{i}	1.10^{a}	1.90^{h}	1.30^{g}	2.81^{i}
S2	1.90^{i}	1.70^{i}	2.00^{g}	1.30^{f}	1.92^{h}	1.90^{f}	3.41^{i}
S3	1.94^{j}	1.96^{h}	1.80^{h}	1.40^{f}	1.97^{h}	1.98^{f}	4.44^{e}

Mean values±SD bearing different superscript letters within rows are significantly different ($P \leq 0.05$)

Key: S1 = Bread without improver, S2 = Bread with improver (1), S3 = Bread with improver (2)

difference between the bread prepared with improver (1) or (2). This is attributed to the fact that improvers have neutral taste and aroma permitting free flavor release of recipe comments which in our case the sesame which is known to be strong (Kohajdova *et al*., 2009).

At incorporation level of 15% of white sesame flour, there was no significant difference in term of crust color, taste, aroma and general appearance between the bread made from improver (1) or (2).

Conclusion: The initial reason for considering the use of white sesame flour in bread making was to improve the nutritional quality of bread which is considered basic food for the people in Sudan especially children.

The presences of white sesame flour causes deleterious effects on the physical properties of the dough (development time, water absorption) and the bread characteristics such as crumb and crust color, texture and bread volume (Ali, 2006).

Since the sensorial appeal of the finished product is the most important for the consumer, these deleterious effects were counteracted by the addition of improvers containing emulsifier and enzymes. Large enhancements were seen in bread specific volume and sensory rating when improvers were added. As for the organoleptic acceptability, although sesame has strong taste and aroma it is accepted as people in Sudan are acquainted with sesame taste.

Data from this study provides a base for sesame flour-wheat flour blend and quality evaluation in food industry.

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