EVALUATION OF BALADY BREAD MADE WITH SOUR DOUGH COMPARED TO THAT MADE BY BAKERY YEAST

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Abstract

This study was designed to evaluate balady bread made with sour dough, produced by using (water or milk) chemically, physically and organoleptically in comparison with the balady bread made by bakery yeast. Results of sensory evaluation suggested the superiority of balady bread made with (20%) sour dough produced by using water or milk and fermented for one day. The results indicated that using sour dough in bread-making increased the total titerable acidity which in turn reduced bacterial counts. On the other hand, bread made with (20%) sour dough produced by using milk had the longest shelf life at 25ºC. Also using sour dough delayed staling of the produced bread. The results indicated that bread made with sour dough is a rather good source of vitamins. The results may recommend the use of sour dough (20%), fermented for 2days in balady bread making.

INTRODUCTION

Using sourdough is an art rather than a science. The rules are simple, but the results are quite useful. Sourdough in bakery was traditionally used for its leavening effect (CO2 production) and its aromatic impact on bread (organic acids and volatile compounds). Sourdough bread, relies on the natural, and wild yeasts of the air. These yeasts are cultivated in a starter, in order to achieve enough potency to leaven a loaf of bread. Because wild yeasts differs from region to region, no two sourdough starters will produce the same taste. San Fransisco is famous with the regional wild yeasts which make its sourdough unique, while the yeasts of the Nile region are the ancestors of the cultivated yeast we use today.

Several studies on sourdough fermentation and its microbiology have shown that, besides organic acids and CO2, other types of compounds are produced (Fig. 1). Indeed, bacteriocins (Corsetti *et al.*, 2004), antifungal compounds or exo-polysaccharides are released during the fermentation. The sourdough process depends on numerous factors including, composition of microflora, fermentation and enzymatic activities and flour characteristics. These factors do not act separately but in an interactive way, added to the complexity of the system. In alcoholic fermentation, various yeast strains produce carbon dioxide and ethanol in anaerobic conditions. As typical sourdough often consists of both yeast and lactic acid bacteria, the interaction of yeasts and lactobacilli is important for the metabolic activity of sourdough. Optimum temperatures for the growth of lactobacilli are 30-40ºC depending on strain and for yeasts 25-27ºC. In general, a higher temperature, a higher water content of sourdough and the utilization of whole-meal flour enhances the production of acids in wheat sourdoughs (Lorenz and Brummer 2003).

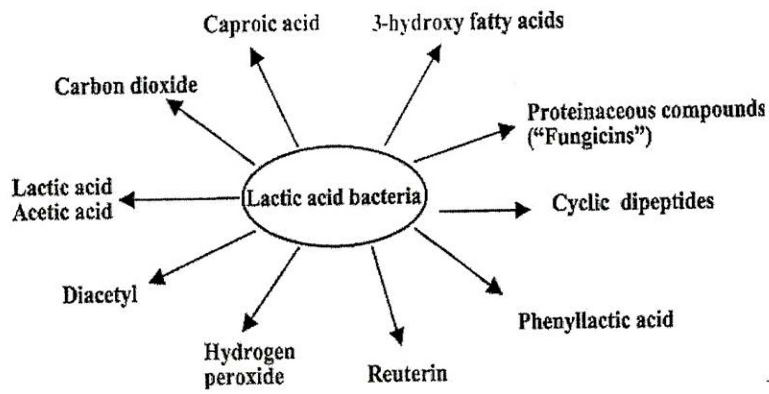

Fig.1. Summary of current knowledge of the main antifungal compounds produced by different lactic acid bacteria LAB " Schnürer and Magnusson. 2005"

The proteolytic enzymes present in the sourdough system degrade various cereal proteins. This proteolysis produces free amino acids, which may act as flavour precursors. The amino acid concentrations was increased as a result of the bacterial fermentation, whereas yeast fermentation decrease the concentration of free amino acids (Thiele *et al.* 2002).

The influence of sourdough on fiber content (both soluble and insoluble) and quality is important from both nutritional and technological points of view. The fermentation of barley and oat fiber concentrates (rich in β-glucan) with LAB has been reported to decrease the content of insoluble fiber (IF) in barley and oats.

Fermentation and baking are the main sources of flavor of bread. Fermentation of sugars by yeasts during the bread-making process leads to a large number of volatile compounds that are supposed to be responsible for the distinctive characteristics associated with bread flavour. Furthermore, increased acidity enhanced overall taste intensity (Lilja *et al.* 1993).

Utilization of sourdough in wheat flour baking has been reported both to decrease and increase, or to have no impact, on shelf-life of wheat bread, influence being dependent on fermentation conditions and the process utilized (Kulp 2003). Improved shelf-life is related in some cases to delayed starch retrogradation even though the actual firmness of sourdough breads after storage is higher in comparison to the control bread.

Rope spoilage is the most important spoilage of bread after mouldiness. It is usually caused by *Bacillus* sp.,. Both *B. subtilis* and *B. licheniformis* cause a potential risk to foodborn illness (Kramer and Gilbert 1989). Lactic acid bacteria produce antimicrobial compounds (bacteriocins) such as nisin, which have the potential to inhibit germination and the growth of *Bacillus* species.

Lactobacilli are required to maintain a healthy GI tract and are not usually considered to be pathogens in the healthyhost except when associated with dental caries. They are considered protective organisms and are thought to inhibit the growth of pathogenic organisms via the production of lactic acid and other metabolites. As typical flora in the GI (*gastrointestinal*) and urogenital tracts, lactobacilli have been shown to prevent pathogenic bacteria from causing infection. These bacteria exhibit several properties that make them useful for preventing infectious disease One such property is the production of low-molecular-weight antimicrobials, also known as bacteriocins

Species *Lactobacillus sanfranciscensis, Lactobacillus plantarum, Lactobacillus pontis, Lactobacillus rossiae* are recognized as key organisms in sourdoughs (Corsetti et al., 2005).

MATERIALS AND METHODS

MATERIALS

1. Wheat flour: Wheat flour (82 % extraction) was obtained from South Cairo Mills Co., Cairo, Egypt.
2. Fresh bakery yeast was purchased from starch and yeast company, Alexandria, Egypt.
3. Active dry yeast (Fermipan) was obtained from – Gist- Brocades Company , Holland.

METHODS

***Preparation of sour dough**

Sour dough were prepared in one stage method five hundred grams of wheat flour (82 % extraction) were mixed with 350 ml milk or water in a mixer to prepare dough that was fermented at 24-48-72 hr at 28 ^{O}C (stage 1) . Acidification was enhanced by repeated additions of flour and water.

***Balady bread preparation**

Sour dough was used at levels of 10 and 20% and fresh bakery yeast 1% of the wheat flour (82 % extraction) to prepare samples of balady bread. Balady bread as a control was prepared using wheat flour (82% extraction) and fresh bakery yeast, The formula was 1000 g flour (82%), 30 g fresh yeast, 10 g salt and 730 g water. The ingredients were mechanically mixed for 12 min. Each dough was left to rest for 10 min then divided into pieces (each of 160 g). Dough pieces were placed on wooden board covered with wheat bran and kept for 40 min for fermentation at room temperature. Dough pieces were flattened to loaves of 20 cm. diameter and 0.5 cm thickness manually (final proofing). The flattened loaves were then baked at 450 – 500 ^{o}C for 1.0-1.5 min and bread loaves were allowed to cool on a wooden rack for 30 min. at room temperature before evaluation, then packed in polypropylene bags according to Faridi and Rubenthaler(1984). Physical and organoleptical properties of balady bread made with sour dough was compared with that made with Fresh Yeast. Also balady bread (control group) was made with neither of experimental doughs.

***Sensory evaluation of bakery products**

The prepared bakery products (balady bread) were organoleptically evaluated for its external characteristics, internal characteristics according to the methods of Faridi and Rubenthaler(1983) and Gelinas *et al.*(1995). Sensory characteristics were tested by ten trained panelists from the staff of the Food Technology Research Institute, Agricultural Research Center, Giza, Egypt.

***Staling rate of balady bread:**

After baking, the bread was cooled to room temperature, then packed in polyethylene bags and stored at room temperature (24°C). Alkaline water retention capacity (AWRC) as an indicator of staling was determined at zero, 24, 48 and 72 hrs according to Kitterman and Rubenthaler (1971) as follows: the bread was cut into small pieces, dried under vacuum at 50°C, then ground to pass through 60 mesh stainless steel sieve. Five grams of the ground bread were placed into dry plastic centrifuge tube then 25 ml of NaOH CO3 solution (8.4 gm sodium bicarbonate dissolved in one liter distilled water) were added and the tube was stoppered and shaked until wet. Then left for 20 minutes with shaking each 5 minutes. The contents were centrifuged at 2500 rpm for 15 minutes and the supernatant was decanted while the precipitate was left for 10 minutes at 45 angles (to get rid of free water). The experiment was duplicated and average gain of the 2 runs multiplied by 20 to give alkaline water retention capacity in percent (AWRC %) and rate of AWRC decrease (%) (RD %).

$$(RD\ \%) = \frac{AWRC\ (0\ time) - AWRC\ (n\ time)}{AWRC\ (0\ time)}$$

Where n = time of storage

***Determination of Total Titratable Acidity (T.T.A) and pH in balady bread**

Total Titratable Acidity (T.T.A) and pH were determined in balady bread according to Gelinas *et al.* (1995). Fifteen grams of bread crumb (from the center of the loaf) was shaken for 30 min. in 100ml of water,pH was measured in this suspension. T.T.A was determined in the same suspension by titration with NaOH 0.1 N to pH 6.6. T.T.A was expressed as mequ. Mol. Of lactic acid per gram, calculated as volume NaOH (ml) × Normality.

*** Determination of vitamins (B) content of balady bread:**

The vitamins contents of balady bread were determined according to Batifoulier *et. al.*, (2005).

***Storageability of balady bread**

Balady bread loaves were packaged in polypropylene bags and stored at room temperature as samples observed visually till mold occurred. Appearance of mold was used as a shelf life indicator.

***Total bacterial count:**

Standard plate count agar media as recommended by AOAC (1990) was used for the determination of the total microbiological count. A known volume of the diluted samples of dough(0.1 ml) was added to Petri-plate dish contained standard plate count agar media, and incubated at 35°C for 48 h. the total bacterial count was recorded as colony count per gram sample.

RESULTS AND DISCUSSION

1- Sensory evaluation of the produced balady bread made of wheat flour (82% ex.) with different levels of Sour dough and commercial bakery yeast

Sensory evaluation is important criterion in evaluating bread quality and bread acceptability. The studied sensory properties included general appearance, roundness, crust color, separation of the two layers of bread loaf, distribution of crumb, texture, taste and odor.

Table 1. Sensory characteristics of balady bread produced from different Sour dough and commercial bakery yeast.

Sour dough			Sensory characteristics						
Sour dough processing	Fermentation time of S.D (Day)	**Addition level %	Crust color (10)	Two layer formation (10)	Crumb color (10)	Crumb uniformity (10)	Odor (30)	Taste (30)	Overall acceptability (100)
With water	1	10%	8.5^{b}	8.6a^{bc}	8.5^{bc}	9.0^{bc}	25.5^{e}	25.5^{cd}	85.6^{de}
		20%	9.0a^{b}	9.0a^{bc}	9. 0^{b}	9.5^{ab}	28.0^{b}	28.5^{ab}	93.0^{bc}
	2	10%	9.0a^{b}	9.1^{abc}	8.5^{bc}	8.5^{cd}	27.0^{cd}	27.0^{bc}	89.1^{cd}
		20%	10.0^{a}	10.0^{a}	10.0^{a}	9.0^{bc}	29.0^{ab}	30.0^{a}	99.0^{a}
	3	10%	9.0a^{b}	9.0^{abc}	8. 0^{c}	8.0^{d}	22.0^{f}	21.0^{f}	77.0^{fg}
		20%	8.0^{b}	8.7^{abc}	7. 0^{e}	7.0^{e}	18.0^{g}	16.0^{h}	64.7^{h}
With milk	1	10%	9.0^{ab}	8.2^{bc}	9. 0^{b}	9.2^{b}	26.6^{de}	26.0^{c}	88.0^{cd}
		20%	10.0^{a}	9.0^{abc}	10.0^{a}	9.5^{ab}	28.0^{bc}	27.0^{bc}	93.5^{bc}
	2	10%	10.0^{a}	9.5^{ab}	10.0^{a}	9.5^{ab}	28.0^{bc}	28.0^{b}	95.0^{ab}
		20%	10.0^{a}	10.0^{a}	10.0^{a}	10.0^{a}	30.0^{a}	30.0^{a}	100.0^{a}
	3	10%	9.5^{a}	9.0a^{bc}	9.0^{b}	10.0^{a}	27.0^{cd}	27.0^{bc}	96.5^{ab}
		20%	9.0^{ab}	8.0^{c}	8.6^{bc}	9.0^{bc}	23.0^{f}	24.0^{d}	81.5^{ef}
Dry		1%	6.5^{c}	10.0^{a}	8.2^{bc}	9.0^{bc}	22.0^{f}	20.0^{g}	75.7^{g}
Fresh yeast		3%	6.5^{c}	10.0^{a}	8.0^{c}	9.0^{bc}	19.0^{g}	23.0^{e}	75.5^{g}
L.S.D			1.06	1.47	0.91	0.78	1.23	1.76	5.31

*Properties with the same letter not differed significantly

**1% fresh yeast was added to all samples of bread made with sour dough

The data shown in table (1) indicate that the studied sensory properties were significantly ($p>0.05$) superior for bread made with (20%) addition of sour dough made either with milk or water and fermented for one day. At this condition, overall acceptability of bread reached 100%. Also it is clear that the above mentioned sensory criteria was significant ($p>0.05$) at the minimum for bread made with dry or fresh yeast. Furthermore, increased acidity enhanced overall taste intensity (Lilja *et al.* 1993).

2-Total bacterial count of balady bread dough and Storage period of balady bread produced from different Sour dough and commercial bakery yeast:-

From data listed in table (2) it is clear that increasing fermentation time of sour dough made with water, steadily increased the total bacterial counts. While, increasing fermentation time of sour dough made with milk from 1 to 3 days unexpectedly led to parallel decrease in total counts, this may be due to the fluctuating activity in lactic acid bacteria. Bread made with sour dough, made with milk had the highest (T.T.A.) which decreased, then increased slightly with increasing the fermentation time of sour dough from 1 to 3 days. This is due to fluctuation in the activity of lactic acid producing bacteria with progressing fermentation time, this is obvious from the lactic acid % formed during the fermentation process.. Bread made with dry yeast (1%) had the highest total microbial counts followed by bread made with fresh yeast (3%).

Table 2. Total bacterial count of balady bread dough and Storage period of balady bread produced from different Sour dough and commercial bakery yeast.

Sour dough			Total bacterial count	Storage period of balady bread (days) at 25° C							
Sour dough process	Fermentation time (Day)	*Addition level %		1	2	3	4	5	6	7	8
With water	1	20%	$12x10^6$	-	-	-	-	-	+	++	+++
	2	20%	$27x10^6$	-	-	-	-	-	+	+	++
	3	20%	$41x10^6$	-	-	-	-	-	+	++	++
With milk	1	20%	$49x10^6$	-	-	-	-	-	-	-	+
	2	20%	$15x10^5$	-	-	-	-	-	-	-	+
	3	20%	$8x10^5$	-	-	-	-	-	-	-	+
Dry		1%	$88x10^6$	-	-	+	++	+++	++++	====	====
Fresh		3%	$58x10^6$	-	-	+	++	+++	++++	====	====

*1% fresh yeast was added to all samples of bread made with sour dough

As a consequence of these results bread made with sour dough made with milk had the longest shelf-life at 25° C, followed by that made with sour dough made with water, while, the shortest storage period was for bread made with either dry or fresh yeast

However, lactic acid bacteria with a capability to produce bacteriocins have not been very effective in sourdough breads, and the inhibitory effect of sourdough has been reported to be mainly due to the production of acids. It is noteworthy that the effective acidity level of enhanced microbial shelf-life does not meet the acidity criteria for a good flavor of wheat sourdough bread (Rosenquist and Hansen 1998).

<u>3-Chemical composition of balady bread (BB) made from wheat flour (82% extraction rate) with different levels of Sour dough and commercial bakery yeast</u>

Chemical composition of balady bread (BB) made from wheat flour (82% extraction rate) and supplemented with addition of different levels of sour dough (10.

and 20%) are shown in Table (3). From the result shown in the table it is clear that, the addition of sour dough to wheat flour 82% extraction rate had no effect on the chemical composition of resulting balady bread

Table 3. Chemical Composition of wheat flour (82% extraction), and balady bread produced from different Sour dough and commercial bakery yeast.

Sour dough			Moisture %	On dry weight bases			
Sour dough process	Fermentation time (Day)	Addition level %		Protein %	Ash %	Fat %	Total carbohydrate %
With water	1	20%	31.68	13.61	1.88	2.8	81.71
	2	20%	31.08	13.49	1.90	2.83	81.78
	3	20%	30.6	13.4	1.92	2.85	81.83
With milk	1	20%	31.91	13.65	1.91	2.79	81.65
	2	20%	30.8	13.44	1.93	2.84	81.79
	3	20%	29.78	13.24	1.94	2.88	81.94
Dry		1%	29.65	13.22	1.86	2.89	82.03
Fresh		3%	30.4	13.36	1.85	2.85	81.94

*1% fresh yeast was added to all samples of bread made with sour dough

4-Determination of staling bread made from wheat flour (82% extraction rate) and different levels of Sour dough and commercial bakery yeast:

Table (4) shows the alkaline water retention capacity (AWRC) of balady bread made from wheat flour (82% extraction) with different levels of sour dough and commercial bakery yeast at zero, 24, and 48 h of storing after baking. Results indicate that bread made with sour dough produced with milk, which was fermented for 2 or 3 days had the highest alkaline water retention capacity (AWRC) even the (AWRC) was decreased with progressing the shelf life of bread. On the other hand, bread made with dry or fresh yeast had the lowest (AWRC). The data clearly point out that staling of bread could be retarded using the above mentioned conditions.

Table 4. Alkaline water capacity as a parameter of staling of balady bread produced from different Sour dough and commercial bakery yeast.

Sour dough process	Fermentation time (Day)	Addition level %	% Water absorption at zero time	% Water absorption After 24 hr	Ratio of decrease %	% Water absorption After 48 hr	Ratio of decrease %
With water	1	20%	295.77	284.58	3.78	261.96	11.43
	2	20%	305.86	288.12	5.8	265.65	13.15
	3	20%	300.94	286.95	4.64	263.41	12.47
With milk	1	20%	312.9	292.5	6.52	283.7	9.33
	2	20%	360.06	339.97	5.58	319.33	11.31
	3	20%	365.86	341.64	6.6	329.0	9.99
Dry		1%	279.73	255.41	8.69	242.4	13.34
Fresh		3%	283.56	265.19	6.48	253.05	10.75

*1% fresh yeast was added to all samples of bread made with sour dough

Improved shelf-life is related in some cases to delayed starch retrogradation even though the actual firmness of sourdough breads after storage is higher in comparison to the control bread.

5-Total titratable acidity (T.T.A.), pH, lactic acid, acetic acid and lactic acid / acetic acid ratio in balady bread dough :

Data in table (5) reveal a parallel increase in (T.T.A.) with increasing the fermentation time of sour dough, used in production of bread dough from 1 to 3 days. This corresponded to an expected decrease in pH. Bread made with sour dough, made with milk had the highest (T.T.A.) which decreased, then increased slightly with increasing the fermentation time of sour dough from 1 to 3 days. This is due to fluctuation in the activity of lactic acid bacteria with progressing fermentation time, this is obvious from the lactic acid % formed during the fermentation process. The results also, indicate that there was an increase in acetic acid % with increasing the fermentation time of sour dough (made with water) used in bread-making from 1 to 3 days with corresponding decrease in pH, while it fluctuated again in bread made with sour dough made by using milk. Lactic acid formation exceeded that of acetic acid in bread made with sour dough, made with milk in contrary to the other treatments except for bread made with sour dough, made with water and fermented for 1 day.

Table 5. Total titratable acidity (T.T.A.), pH, lactic acid, acetic acid and lactic acid / acetic acid ratio in balady bread dough.

Sour dough			T.T.A	pH	lactic acid %	acetic acid %	lactic acid / acetic acid ratio
Sour dough process	Fermentation time	Addition level %					
With water	1	20%	2.7	5.8	0.11378	0.10085	1.13
	2	20%	4.8	5. 02	0.148695	0.258098	0.58
	3	20%	4.9	5.01	0.1706	0.23056	0.74
With milk	1	20%	6.6	4.1	0.62826	0.4474	1.41
	2	20%	5.9	4.5	0.34179	0.22866	1.49
	3	20%	6.2	4.3	0.51138	0.3754	1.36
Dry		1%	3. 0	5.4	0.17197	0.23884	072
Fresh		3%	3.6	5.2	0.1706	0.29398	0.58

*1% fresh yeast was added to all samples of bread made with sour dough

6-Vitamins contents of balady bread produced from different Sour dough and commercial bakery yeast :

Data in table (6) indicate that there was an increase in thiamin content parallel to increasing the fermentation time of the sour dough (from 1 to 2 days)in the sour bread-dough made with water followed by a decrease in the thiamin content when fermentation time reached 3 days. This may correspond to the state of respiration of the bacteria responsible for fermentation since thiamin participates as carboxylase Co-enzyme (thiamin pyrophosphate) of De-Hydrogenase complex in respiration. Thiamin content of bread made with fermentation time: i.e., it decreased then increased, apparently according to state of respiration of bacteria responsible for fermentation.

Flavin mononucleotide (FMN) and flavin adenine dinucleotide (FAD)- products of riboflavin and nicotine amide adenine dinucleotide (NAD) and nicotine amide adenine dinucleotide phosphate (NADP) – products of nicotinic acid – all participate in the respiratory chain responsible for energy production in all living organisms their content fluctuates, apparently, according to the need for energy in bacteria responsible for fermentation in our case. Riboflavin and nicotinic acid were high in bread made with sour dough processed with water and fermented for 1day, then their content dropped sharply in the same sour dough fermented for 2 or 3 days. Whereas the content of riboflavin fluctuates with increasing the time of fermentation in bread processed with sour dough made with milk. On the other hand the content of nicotinic acid in the same kind of bread dropped gradually as fermentation time increased from 1 to 3 days.

Pyridoxine is a member of B-complex vitamins that participates in amino acids metabolism (transaminations) as pyridoxal phosphate. Its content fluctuates according to the rate of these processes. The bread content of pyridoxine increased with increasing time of fermentation of sour dough processed with water and fermented from 1 to 2 days, then, it dropped at 3 days of fermentation. In contrary, its content in bread processed with sour dough made with milk decreased with increasing the fermentation time of sour dough from 1 to 2 days, then increased again with increasing the fermentation time to 3 days.

It is clear that bread made with dry or fresh yeast are high in their content of the above mentioned vitamins since yeast is a rich source of vitamin B complex.

The above mentioned data indicate that bread may be a good source of the vitamins listed in this study depending on the condition used in bread making'

Table 6. Vitamins contents of balady bread produced from different Sour dough and commercial bakery yeast.

Sour dough			Thiamin B_1	Riboflavin B_2	Pyridoxine B_6	Nicotinic acid B_5
Sour dough process	Fermentation period (Day)	Addition level %				
With water	1	20%	17.42	5.6504	155.635	221.135
	2	20%	21.15	1.8356	203.091	71.56
	3	20%	15.40	1.6896	117.476	75.631
With milk	1	20%	22.88	3.805	134.357	66.391
	2	20%	18.72	2.229	99.051	54.723
	3	20%	23.60	4.1003	136.0298	40.004
Dry		1%	33.25	12.225	228.044	382.685
Fresh		3%	39.07	10.356	299.9	259.711

*1% fresh yeast was added to all samples of bread made with sour dough

Lactobacilli and other lactic acid-producing cause a drop in pH. This drop in pH then inhibits the growth of putrefactive and pathogenic bacteria. In addition, these organisms also increase the nutritional value of fermented foods. This occurs because lactic acid-producing bacteria cause an increase in the production of essential amino acids and vitamins, along with an increased bioavailability of minerals. The use of sourdough is further advanced by recent indications that it may be an effective tool to improve the sensory and nutritional quality of bread (Arendt, *et al*,, 2005).

REFERENCES

1. A.O.A.C. 1990. Official Methods of the Association of Official Analytical Chemists 15th Ed. Published by the Association of Official Analytical Chemists. Arlington Virginia. U.S.A.
2. Arendt, E., K.-H. Liukkonen, K. Autio, L. Flander and K. Poutanen. 2005. Potential of sourdough for healthier cereal products. Trends in Food Science and Technology, 16, 104e112.
3. Batifoulier, F., M. A. Verny, C. Besson, C. Demigne, and C. Remesy. 2005. Determination of thiamine and its phosphate esters in rat tissues analyzed as thiochromes on a RP-amide C16 column. J.Chromatography B. (816). 67-72
4. Corsetti, A., L. Settanni and D. Van Sinderen. 2004. Characterization of bacteriocin-like inhibitory substances (BLIS) from sourdough lactic acid bacteria and evaluation of their in vitro and in situ activity. J. Appl. Microbiol. 96, 521–534.
5. Corsetti, A., L. Settanni, D. van Sinderen, G.E. Felis, F. Dellaglio, and Gobbetti, M. Lactobacillus rossii sp. nov., isolated from wheat sourdough, Int. J. Syst. Evol. Microbiol. 55 (2005) 35–40.
6. Faridi, H.A. and G.L. Rubenthaler. 1983. Effect of baking time and temperature on bread quality, starch gelatinization, J. Cereal Chem., 61(2): 151
7. Gelinas, P., J. Audet, Lachance and M. Vachon. 1995. Fermentation dairy ingredients for bread: effects on dough rheology and bread characteristics. Cereal Chem. 72(3) 151-154.
8. Kitterman, S. and G.L. Rubenthaler. 1971. Assessing the quality of early generation wheat selection with the micro AWRC test. Cereal Chem. Today, 16: 313-316.
9. Kramer, J. and R. Gilbert. 1989. Bacillus cereus and other Bacillus sp. In: Doyle, M. P (Ed.). Foodborne bacterial pathogens, Marcel Dekker Inc., New York, pp. 22.70.
10. Kulp, K. 2003. Baker's yeast and sourdough technologies in the production of U.S Bread Products. In: Kulp, K. and Lorenz, K. (eds.). Handbook of dough fermentations. Marcel Dekker Inc., New York, pp. 97.143.
11. Lilja, S., L. Flander and M. Häggman. 1993. Effects of NaCl and acidity on sensory attributes of wheat and rye bread. In: Food Biotechnology – a Nordic Research Programme, Nordic Industrial Fund, p. 3946.

12. Lorenz, K. and J.-M. Brummer. 2003. Preferments and sourdoughs in German breads In: Kulp, K. and Lorenz, K. (eds.). Handbook of dough fermentations. Marcel Dekker Inc., New York, pp. 247–267.
13. Rosenquist, H. and A .Hansen. 1998. The antimicrobial effect of organic acids sourdough and nisin against B. subtilis and B. licheniformis isolated form wheat bread. Journal of Applied Microbiology 85, 621.623.
14. Schnu¨rer. J. and J. Magnusson. 2005. "Antifungal lactic acid bacteria as biopreservatives". Department of Microbiology, Swedish University of Agricultural Science, P.O. Box 7025, SE-750 07 Uppsala, Sweden. Trends in Food Science & Technology 16, 70–78
15. Thiele, C., M.G. Gänzle and R.F. Vogel. 2002. Contribution of sourdough lactobacilli, yeast, and cereal enzymes to the generation of amino acids in dough relevant for bread .avour. Cereal Chem. 79, 45–51.

تقييم الخبز البلدي المصنع باستخدام العجينة الحامضية بالمقارنة بمثيله المصنع باستخدام خميرة الخباز

علاء عزوز ، صائب عبدالمنعم حافظ ، سيد عبد الحميد سليمان

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تم تصميم هذه الدراسة لتقييم الخبز البلدي المصنع بواسطة الخميرة الحامضية المنتجة بواسطة الماء او اللبن وذلك كيميائيا وطبيعيا وحسيا بالمقارنة بذلك المصنع بواسطة خميرة الخباز التجارية . وقد اشارت نتائج الاختبارات الحسية الى افضلية الخبز البلدى المصنع بالخميرة الحامضية بنوعيها (إضافة اللبن والماء) بنسبة اضافة ٢٠% والمخمرة لمدة يوم واحد. وقد اشارت النتائج ايضا الى ان الخبز البلدى المصنع من الخميرة الحامضية تحت نفس الظروف السابقة احتوى على اعلى نسبة حموضة كلية والتى بدورها ادت الى إنخفاض العدد البكتيرى الكلى مما اطال فترة حفظ الخبز الذي تم تخزينه على درجة حرارة ٢٥ درجة مئوية . كما ادت نفس ظروف الانتاج السابقة الى تأخير ظاهرة البيات بالخبز الناتج . وعلى الجانب الاخر اظهرت النتائج ان الخبز المصنع من خميرة الخباز على مستوى عالى من الفيتامينات وبناء على هذة النتائج فإن هذة الدراسة توصى بأستخدام الخبز البلدى المصنع من العجينة الحامضية(بنسبة ٢٠%) والتى سبق تخميرها لمدة يوم او يومين مع أضافة ١% من خميرة الخباز الطازجة لانتاج الخبز البلدى.