

STUDIES ON BREAD PRESERVATION FOR SUMMER SEASON

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Various permissible food preservatives were tried to extend the shelf-life of bread. Sorbic acid in combination with calcium acetate showed remarkable increase in shelf-life of the bread. The mixture of these two salts when added to flour at the rate of 0.2 and 0.3%, increased the life of bread to five and seven days respectively. The preservatives had nominal effect on bread volume. The quality characteristics of preserved bread were similar to fresh bread.

Key words: Bread, Preservation, Summer.

Introduction

There are numerous cottage scale bakeries and a few large scale imported bread plants in big cities producing bread for consumers. Spoilage of bread through mold and bacterial growth is a common experience and becomes serious during the rainy season due to high humidity and temperature by which considerable volume of bread production goes waste within 30 hrs. This accounts for considerable loss of both the material and man-power, and calls for proper attention for its prevention/reduction.

A number of chemicals are reported in the literature which inhibit mold growth [1-6]. The work presented here-in deals with the application of various preservatives either alone or in combination, to extend the shelf-life of bread under hot and humid conditions.

Experimental

Flour, yeast, cooking salt, sugar and vegetable ghee were purchased from the market for this study.

The chemical composition with respect to protein, fat, crude fibre, ash and nitrogen free extract (by difference) of the flour was estimated according to AACC methods [7]. The physical characteristics of the flour with respect to water absorption, dough development time, mixing tolerance and dough softening units were recorded by using Brabender farinograph (Brabender Farinograph, OHG, Disbury, Germany). The gluten quality of the flour in terms of resistance, extensibility and product figure were recorded by using Simon extensometer (Research Extensometer, Henry Simon Ltd., England). The results of analysis are presented in Table. 1. These results are an average of three estimations.

Bread preparation and storage conditions. Bread was prepared according to the method reported by N. Khan [8]. The preservatives were added to flour at the rate of 0.2 and 0.3% on flour weight basis. Acetic acid and propionic acid were mixed in the water measured for dough making. The breads were cooled to room temperature and sliced with a

bread slicer machine (Hobart, Chas. West wood Johannesburg) and packed in polyethylene pouches. These were stored at $38 \pm 1^\circ$ under relative humidity (R.H.) of 75-85% to study the shelf-life. It is worth mentioning that all the concentration of preservatives tried to extend the shelf-life of bread are non-toxic to humans.

TABLE 1. CHEMICAL AND PHYSICAL* COMPOSITION* OF WHEAT FLOUR

Chemical Composition	
Constituents	Percent
1. Moisture	13.50
2. Protein	10.85
3. Fat	0.62
4. Crude fibre	0.33
5. Ash	0.50
6. Nitrogen-free-Extract (N.F.E)	74.20
Physical Characteristics	
1. Water absorption	64.0
2. Dough development time	3.5
3. Mixing tolerance (in min.)	4.5
4. Dough softening units (F.U.)	80.0
5. Resistance (E.U.)	540.0
6. Extensibility (cm)	11.5
7. Relation figure	4.69
8. Product figure	6.210

*An average of three estimations

Bread Quality Evaluation

(i) **Mold growth observation.** The mold growth on crust and crumb of bread slices during storage was examined visually. The flavour/taste were evaluated organoleptically. The results of study of control and preservative treated breads were expressed in terms of shelf-life of breads in hrs. when these were free from any signs of mold growth and any noticeable change in flavour/taste. The results are presented in Table 2.

(ii) **Moisture estimation.** The weight of each bread after packing in polyethylene pouch was recorded and its weight

TABLE 2. EFFECT OF PRESERVATIVES ON THE *SHELF-LIFE OF BREAD

Preservatives added	Shelf-life of bread (in hrs.)		
	Treatment		
	Control	0.2%	0.3%
1. Calcium acetate	30	48	48
2. Calcium propionate	30	48	48
3. Sorbic acid	30	48	72
4. Sodium benzoate	30	30	48
5. Sodium metabisulphite	30	30	48
6. Calcium acetate and calcium propionate (1:1)	30	48	72
7. Propionic acid	30	30	48
8. Acetic acid	30	30	48
9. Sorbic acid and calcium acetate (1:1)	30	120	168

*An average of three experiments

was checked after every 24 hrs. for Calculating loss in moisture. This practice was continued till mold growth appeared on the bread. The total storage period of control and preservative treated breads was counted in hrs. when there was no mold growth occurred. The loss in weight of each bread during this safe storage period was expressed in terms of percent loss in moisture. The results are presented in Table 3. Each Fig. is an average of three estimations.

(iii) *Bread volume estimation.* The volume of control and preservative treated breads was estimated according to seed displacement method [10]. The results are presented in Table. 4. Each result is an average of three readings.

Results and Discussion

According to the results presented in Table 1, the wheat flour was of medium strength [9] and produced bread of reasonably good quality.

TABLE 3. PERCENT *MOISTURE LOSS IN BREAD PRESERVED WITH CHEMICALS

Preservatives	Concentration of preservation (%)	Shelf-life of bread (in Hrs.)	Moisture loss (%)
1. Control	—	30	0.85
2. Calcium acetate	0.2	48	1.20
3. Calcium propionate	0.3	48	1.20
4. Sodium benzoate	0.3	48	1.20
5. Sodium metabisulphite	0.3	48	1.20
6. Propionic acid	0.2	48	1.20
7. Acetic acid	0.3	48	1.20
8. Sorbic acid	0.3	72	1.60
9. Calcium acetate and calcium Propionate (1:1)	0.3	72	1.60
10. Calcium acetate and sorbic acid (1:1)	0.3	168	4.00

*An average of three estimations.

TABLE 4. EFFECT OF PRESERVATIVES ON BREAD* VOLUME (IN MILS)

S. No.	Preservative	Preservation Concentration		
		Contrl	0.2	0.3
1.	Calcium acetate	425	415	410
2.	Calcium Propionate	425	420	415
3.	Sorbic acid	425	415	405
4.	Sodium metabisulphite	425	410	405
5.	Calcium acetate + calcium propionate	425	415	410
6.	Propionic acid	425	420	415
7.	Acetic acid	425	415	410
8.	Sodium benzoate	425	420	415
9.	Sorbic acid + Calcium acetate	425	415	405

*average of three breads

The results presented in Table 2 revealed that all preservatives, either alone or in combination, enhanced the shelf-life of the bread considerably as compared to the control sample which developed mold after 30 hrs. of storage. Propionic acid, acetic acid and sorbic acid in concentration of 0.3% extended the bread life to 72 hrs. Sorbic acid and calcium acetate (1:1) in concentration of 0.2 and 0.3% proved most effective by increasing the shelf-life of bread to 120 hrs. and 168 hrs. respectively.

Table 3 relates to percentage of loss in moisture content of bread during its shelf-life. In general there was little loss in moisture content during the acceptability period of the bread. There was only a loss of 4.0% in weight of bread preserved for seven days. The softness of each preserved bread was similar to fresh bread.

The results presented in Table 4 showed that the preservatives used in this study either alone or in combination had little effect on the bread volumes. Concentration of 0.2% of different preservatives on the average decreased the bread volume from 1.17 to 3.53% as compared to the control bread. The decrease was slightly higher in the case of 0.3% concentration and it was in the range of 2.35 to 4.72%. These findings were similar to those reported by Mir, N. Islam [3] (Loc. cit.)

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