Effect of Freezing Storage on the Quality of Pita Bread.

Preparation by: Ola Anbis & Afnan Al-Naser.
Supervised by: D. Samer Mudalal.
Agenda:-

- Aim of the study.
- Method.
- Results and Discussions.
Objective:

In this study, we evaluated effect freezing storage on the quality traits for the pita bread (color, Texture, microbiological safety and consumer acceptance of bread).
Introduction:

- Freezing of bread is today's common practice in the bread Preservation in Palestine.

- The benefit of freezing process:-
  - extreme prolongation of bread shelf-life.
  - reduced bread waste.
  - related economical losses.
  - gave consumers fresh bread at any time of the day.

- Disadvantages.
Study design

Materials and equipments:

- A total of 20 loaves of pita bread were purchased from the Huso bakery in Tulkarm.
- Instruments: chromameter, texture analyzer, autoclave, Incubator.
- Questionnaire.
Study design

Procedures:

- Bread selected:
  - loaves: 20
  - color: 3
  - TPA: 3
  - Microbiology: 4
  - sensory: 10
Physical characteristics:

Crust color was measured using a chromameter which was calibrated using a white reference tile: lightness($L^*$), redness($a^*$), yellowness($b^*$).
Textural properties:

Two slices were taken from each loaf for evaluations. The textural profile analysis (TPA) equipped with a load cell of 50 kN, each bread slice was compressed twice by 30% of the initial sample height.
Springiness = $D_2/D_1$
Gumminess = Hardness * (Area2 / Area1)
Chewiness = Gumminess * springiness.
Microbiological properties:

15 g Bread + 135 ml PW

10^2

9 ml PW

10^1

1 ml

PDA

PCA

37C 2day

PDA

PCA

25C 3-5day
The sensory evaluation of breads was conducted by ten assessors of students & employees. A 10-point hedonic rating scale was used, for 6 properties including (crust color, crust characteristic, crumb color, grain & texture, flavor & test, chewing).

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**Sensory characteristics**
Study design

Statistical Analysis:

- The results were statistically evaluated by using the ANOVA option of the GLM procedure present in SAS software (Minitab). The main effects of freeze storage on the quality traits of Pita bread (sensory, texture, color L*a*b*, and microbiological analysis) were evaluated.
- Means were separated using Tukey’s honestly test of the GLM procedure (Minitab).
Results & Discussions
• Color index:

\[ (L^*) \]

P-value(0.394) > 0.05

Means that do not share a letter are significantly different.

Tukey Simultaneous 95% CIs
Differences of Means for \( L^* \)

If an interval does not contain zero, the corresponding means are significantly different.

Interval Plot of \( L^* \) vs time
95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

<table>
<thead>
<tr>
<th>time</th>
<th>N</th>
<th>Mean</th>
<th>Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>66.18</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>63.09</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>57.21</td>
<td>A</td>
</tr>
</tbody>
</table>
(a*)

P-value(0.987) > 0.05

Interval Plot of a* vs time
95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

Tukey Simultaneous 95% CIs
Differences of Means for a*

If an interval does not contain zero, the corresponding means are significantly different.

<table>
<thead>
<tr>
<th>time</th>
<th>N</th>
<th>Mean</th>
<th>Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>13.38</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>13.27</td>
<td>A</td>
</tr>
<tr>
<td>0</td>
<td>9</td>
<td>13.13</td>
<td>A</td>
</tr>
</tbody>
</table>
(b*)

P-value(0.900) > 0.05

The pooled standard deviation is used to calculate the intervals.

<table>
<thead>
<tr>
<th>time</th>
<th>N</th>
<th>Mean</th>
<th>Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>34.736</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>9</td>
<td>34.881</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>35.162</td>
<td>A</td>
</tr>
</tbody>
</table>
**Hardness:**

P-value (0.011 < 0.05)

The pooled standard deviation is used to calculate the intervals.

**Tukey Simultaneous 95% CIs**

Differences of Means for Hardness Cycle 1

Time N Mean Grouping

- 2 6 3881 A
- 1 6 2190 A B
- 0 6 1166 B

If an interval does not contain zero, the corresponding means are significantly different.
• Springiness:

\[ P-value \; (0.03 < 0.05) \]

Interval Plot of Springiness: vs Time

95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

Tukey Simultaneous 95% CIs
Differences of Means for Springiness:

Time N Mean Grouping
2 6 32.48 A
0 6 21.81 A B
1 6 8.87 B
• **Gumminess:**

P-value (0.136 > 0.05)

Interval Plot of Gumminess: vs Time

95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

Tukey Simultaneous 95% CIs

Differences of Means for Gumminess:

If an interval does not contain zero, the corresponding means are significantly different.

Time N Mean Grouping:

2 6 3382 A
1 6 3343 A
0 6 1056 A
**Chewiness:**

P-value (0.025 < 0.05)

The pooled standard deviation is used to calculate the intervals.

Tukey Simultaneous 95% CIs
Differences of Means for Chewiness:

Time N Mean Grouping
2 6 1197 A
0 6 226.6 B
1 6 223.5 B

If an interval does not contain zero, the corresponding means are significantly different.
Microbiology:

- Microbiological standards

<table>
<thead>
<tr>
<th>Test</th>
<th>Maximum acceptable level</th>
</tr>
</thead>
<tbody>
<tr>
<td>APC</td>
<td>$&lt;10^5$ (cfu/g)</td>
</tr>
<tr>
<td>Yeast</td>
<td>$&lt;10^3$ (cfu/g)</td>
</tr>
<tr>
<td>Mould</td>
<td>$&lt;10^3$ (cfu/g)</td>
</tr>
</tbody>
</table>
Sensory test:

- **Crust Color**: P-value (0.088 > 0.05)

The interval plot of crust color vs time (month) shows the mean crust color with 95% CI. The pooled standard deviation is used to calculate the intervals. The Tukey simultaneous 95% CIs indicate differences in means for crust color. If an interval does not contain zero, the corresponding means are significantly different.

**Interval Plot of Crust color vs Time (month)**

95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

**Tukey Simultaneous 95% CIs**

Differences of Means for Crust color

<table>
<thead>
<tr>
<th>Time (month)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>5.400</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>4.800</td>
<td>A</td>
</tr>
<tr>
<td>0</td>
<td>10</td>
<td>4.100</td>
<td>A</td>
</tr>
</tbody>
</table>
Crust Characteristics:

P-value (0.618 > 0.05)

Interval Plot of Crust Characteristics vs Time (month)
95% CI for the Mean

Tukey Simultaneous 95% CIs
Differences of Means for Crust Characteristics

The pooled standard deviation is used to calculate the intervals.

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<th>Mean</th>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>5.100</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>4.700</td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>4.500</td>
<td>A</td>
</tr>
</tbody>
</table>

If an interval does not contain zero, the corresponding means are significantly different.
Crumb color:

P-value (1.00 > 0.05)

Interval Plot of crumb color vs Time (month)
95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

Tukey Simultaneous 95% CIs
Differences of Means for crumb color

Time (month) | N | Mean | Grouping |
---|---|---|---|
0 | 10 | 4.900 | A |
1 | 10 | 4.900 | A |
2 | 10 | 4.900 | A |

If an interval does not contain zero, the corresponding means are significantly different.
Texture & grain:

P-value (0.585 > 0.05)

The pooled standard deviation is used to calculate the intervals.
Flavor & Taste:

P-value ($0.025 < 0.05$)

![Interval Plot of Flavor & taste vs Time (month)](image)

95% CI for the Mean

The pooled standard deviation is used to calculate the intervals.

![Tukey Simultaneous 95% CIs](image)

Differences of Means for Flavor & taste

If an interval does not contain zero, the corresponding means are significantly different.

![Time (month) N Mean Grouping](image)

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<th>Mean</th>
<th>Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>1.900</td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>2.000</td>
<td>A, B</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>4.100</td>
<td>A</td>
</tr>
</tbody>
</table>

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For the Month:

- The flavor and taste values are plotted against time (in months).
- The interval plot shows the confidence intervals for the mean over time.
- The P-value is less than 0.05, indicating a significant difference.
- Tukey's simultaneous 95% CIs are calculated to assess differences between means at different time points.
**Chewing:**

P-value (0.221 > 0.05)

The pooled standard deviation is used to calculate the intervals.

<table>
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</tr>
<tr>
<td>0</td>
<td>10</td>
<td>3.600</td>
<td>A</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>3.500</td>
<td>A</td>
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</table>
The results of our study showed that the consumption of frozen bread during two months of freezing is safe and acceptable to the consumer.

The project will also be continue until an cut off point appears.
Thank you
Design of a quality index for the objective evaluation of bread quality: Application to wheat breads using selected bake off technology for bread making


Abstract

Bread quality index was established using the instrumental and eating analysis of bread parameters that influence for customers. Two sensory panels of expert and non-expert consumers have been chosen in order to validate the identification and quantification of many products of selected bread produced by different processes with hard baked bread. DPPH-potential radical (OHP) and bread bread profiled (DPPH) were compared to sensory bread characteristics and the significance of bread quality index to know about the quality of bread in the market. These results indicate that the bread quality index could be very useful in the market.

Influence of the freezing condition on the baking performance of French frozen dough

M. Haveret, M. Manka, A. Le Bail

Abstract

Freezing affects the baking performance of bread dough. The volume of the dough during proofing is related to two main factors: the size of the frozen dough and the rate of proofing. A slow freezing rate is usually recommended as a precaution to allow the formation of ice crystals. The purpose of this study was to evaluate the influence of two different freezing rates on the volume of the dough. The results showed that freezing rate strongly influenced the Proofing rate and its location inside the dough. © 2009 Elsevier Science Ltd. All rights reserved.

Effect of frozen storage time on the bread crumb and aging of par-baked bread

Maria Eugenia Bascenias, Cristina M. Rosell

Abstract

The effect of frozen storage time on par-baked bread and the storage of bread after retuning and final baking is described. The moisture content, hardness and hydration ability of the crumb were determined at 3 days, 7 days, 14 days, 28 days, and 56 days of frozen storage in -25 °C. In addition, the effect of frozen storage on the crum microstructure was analyzed by scanning electron microscopy (SEM). The tissue content of both partially and fully baked bread was reduced with the time of frozen storage. The crumb hardness of the par-baked bread varies during different periods of frozen storage was lower, while the rate of fully baked counterpart increased with the time of frozen storage. In both types of bread, the study of crumb microstructures did not show a remarkable change in the tissue of frozen storage.

Effect of Freeze-Thaw Cycles on the Gluten Fibres and Crumb Grain Structures of Breads Made from Frozen Doughs

S. Naito, T. S. Futami, Y. Morikami, N. Ishida, H. Takano, H. Kosumi, and H. Kato

Abstract

The effects of freeze damage on the gluten contents and the gluten content of frozen doughs was determined using scanning electron microscopy (SEM) and magnetic resonance imaging (MRI). Bread and white breads were frozen at -17 °C and stored for 4 weeks. The SEM showed that gluten contents in breads were well retained after freezing, although the maximum diameters of gluten grains were reduced. The SEM showed that gluten contents in breads were well retained after freezing, although the maximum diameters of gluten grains were reduced.

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Quality and microbial stability of partially baked bread during refrigerated storage

Elizabeth Lainer, Fidel Vergara, Maria E. Rincéns

Abstract

Partially baked bread was stored at 1 °C or at 7 °C for 48 days. During this period, the product was evaluated in terms of microorganisms, and sensory and instrumental analyses. After storage, the baked surface of partially baked bread was observed to be thinner and darker in color compared to the control. Physical changes were observed in the partially baked bread stored at 1 °C, but not at 7 °C, where a decrease in firmness and an increase in crumb hardness were observed. At both temperatures, the bread stored at 1 °C showed more growth of mold and bacteria, and the bread stored at 1 °C showed more growth of mold and bacteria, and the bread stored at 1 °C showed more growth of mold and bacteria, and the bread stored at 1 °C showed more growth of mold and bacteria.
Abstract

Bread is a widely popular food product with a caloric density of 487 kcal per 100 g loaf. Approximately 76% of bread consumed in the USA is frozen. Freezing preserves the quality of bread, and frozen bread is popular among consumers. The purpose of this study was to investigate the effects of freezing and storage on the texture and sensory quality of bread. The texture of the frozen bread was significantly different from the non-frozen bread in terms of hardness, springiness, cohesiveness, and chewiness. The sensory quality of the frozen bread was also significantly different from the non-frozen bread in terms of aroma, taste, and texture. The results of this study suggest that freezing and storage can affect the texture and sensory quality of bread. Further research is needed to optimize the freezing and storage conditions to maintain the quality of bread.