SURVEY EFFECT OF INULIN AND β-GLUCAN ON BARBARI BREAD STALING

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ABSTRACT: In this research, applications of inulin and beta-glucan fibers on potential to retard the staling Iranian Barbari bread, has been studied. Inulin and beta-glucan powders used in the preparation of the samples, respectively 3% and 1.5% (w-w). Tests performed include physicochemical tests relating to quality of flour including moisture, protein, ash, etc. Staling properties of bread, performed by Instron device and Sensory test. The standard AACC 74-09 was modified so that the firmness was measured at 24, 48, and 72 hours after baking bread. Based on the results of the .In total acceptability, the sensory evaluation Instron showed that such a combination treatment containing 3% inulin and 1.5% beta-glucan enhanced the shelf life.

Keywords: Combination sample, Instron, Physicochemical, Retrogradation, Sensory

INTRODUCTION

Traditional breads is the most common products of wheat flour which determine the quality and durability is always emphasized. One of the most common types of traditional breads in Iran, Barbari bread is prepared by traditional process and fluctuations in quality baking flour is the importance various reasons so that waste is converted into bread. Main research question is whether it can be combined either by optimum combination of prebiotic inulin and dietary fiber beta-glucan in Barbari bread to improve its quality, while maintaining the postponement staling of the products?

Essentially, bread staling is a phenomenon brain hardening which is not possible to prevent in normal circumstances, even the best materials and methods to be used in baking bread. After breads baking, staling will be started and be lost texture, flavor, and color. Staling is a very complicated process. Phenomenon in amylopectin, the polymers reorganization in the amorphous region, loss of moisture content, water distribution between amorphous and crystalline regions, as well as the microscopic structure of the brain tissue of bread staling are involved and should be evaluated as fractional.

Barbari bread has a higher specific volume than other types of flat breads, and a thickness of 2.5 cm appears. Iran standard for this type of bread because the bread component separated from the lower surface of the upper shell half- giant is classified, but non- starch polysaccharide compound beta-glucan composed of linear chains of glucose is linkages (1-3) β and (1-4) β. Inulin also a component of dietary fiber, linked (1-2) β and almost all molecules leads to glucose units (Wood, 1977). In connection with prebiotic substances that are indigestible or limited digestible by stimulating the growth or activity of one or a limited number of bacteria in the colon that can improve host health (Tamime, 2005). Prebiotic compounds as a secondary factor for the control of probiotic bacteria in the intestinal flora are considered (Crittenden, 2001). Prebiotic must be able to pass through the large intestine without digestion and absorption in the upper gastrointestinal tract by beneficial bacteria such as Lactobacillus and Bifidobacterium, and
may consume (Thammarutwasik., 2009). What about the fairy antibiotics is important, the stimulatory effect of probiotics is their choice. A group of carbohydrates, dietary fiber are not degraded by human digestive enzymes but are fermented by colon microflora. Positive effect on the pH of the large intestine and fermentation byproducts produced by the physiological effects (Ahlborn., 2005). The term dietary fiber for the first time by researchers called Hipsley (1953) as components of the plant cell wall origin stated. Burkitt (1976), Trowell (1972) and other scholars of dietary fiber in the form of plant residues that are resistant to hydrolysis by human digestive enzymes, and therefore were defined as non-digestible ability of these compounds in the small intestine emphasized. This after numerous researches, scientists found that the relationship between dietary fiber intake and risk of colon cancer (Izydorczyk & Dexter, 2008).

Codex Alimentarius Commission (2006) reported that dietary fibers are carbohydrates with a degree of polymerization of at least 3. U.S. Association of Cereal Chemistry (AACC, 2000) as food and fiber ultra-pragmatic or especially introduced, because their nutritional properties, inhibiting or reducing a wide range of diseases. American Institute of Medicine of the total dietary fiber and fiber-fiber concept to practical application. Most compounds of prebiotic dietary fiber, but unlike the second group, probiotic, prebiotic, they stimulate the growth of microorganisms. Reportedly Codex Alimentarius (2006), based on synthetic oligosaccharides, maltose and galactose are also dietary fiber (Butt., 2001). Bran and whole grain cereals, fruits and vegetables are the main sources of dietary fiber has been suggested that continuous use. The grain structure, bark and buds highest amount of fiber there so refined flour, bran and germ removed because it contains less fiber (Butt., 2001). As two important dietary fiber and beta-glucan and inulin available is crucial for making valid research and a lot has been done on them.

In 2009, Skendi, investigated effect of beta-glucan enriched wheat flour, two different varieties (in two different molecular weight: BG-100 105 × 1 and: BG-200105 × 2.03) 0, 0.2, 0.6, 1, 1.4% on Greek bulk rheological properties and bread properties. Farinograph water absorption, dough and bread moisture content and water activity increased with increasing beta-glucan. Higher molecular weight beta-glucan (BG-200) compared with the other type was more effective. Add beta-glucan formula flour, dough development time, stability, resistance to deformation, stretching dough and bread specific volume increase. In 2010, Filipoovik, studied on sugar beet fiber and inulin addition of HPX, GR 5% for some rheological properties and its effect on the quality of frozen dough bread baguette is looked. The dough temperature -18 °C is frozen for 0, 1, 30 and 60 days was maintained. The results of the different components of the fiber traits in samples and control samples. Most of the fibers were observed after 30 days. Same time these compounds have the greatest impact in terms of volume and quality of the brain, bread, fresh dough (without freezing) were seen. The results showed that inulin HPX well distributed within the network, and possibly gluten, yeast cells from freezing on days 1, 30 and 60 preserves.

**MATERIALS AND METHODS**

**Materials**

Flour used in this study, the percent extraction flour Star Mansourian 82 percent. The study of active dry yeast fariman manufactured; fiber, beta-glucan by Britol China and inulin company Sensus Netherlands were used. Meanwhile, all materials in this experiment were from Germany MERC. In “Table 1” Total number of treatments that is 9 numbers plus the code is written. To perform the experiment in a completely randomized design with three replications was used.

**Methods**

Moisture according to standard AACC 44-15A, flour protein content according to Standard Method AACC 46-10, ash according to Standard Method AACC 08-01 the zeleny test standard AACC 61A-56, is measured. Staling test was performed with Instron device which according to standard AACC 74-09.

To assess staling, after cooling bread loaves were placed in polyethylene bags and kept at room temperature, the hardness of the breads on days 1, 2, 3, and measured the amount of force required to produce a unit Instron (N) is measured to condense pills bread. Pressure test is done with jaw of 10 cm and a load cell 500 N, Top speed 25, sample diameter 10cm, samples compressibility are carried about 25%, and the highest point is read on the curve resulting (Karimi., 2007). Staling measured is done by sensory method according to standard AACC 74-30. Under this method is based on Bectel and Meisxer method in 1953. This group of researchers to examine changes over stale bread being taught according to the following. Then the people were trained, the jury were selected based on their ability to detect extremely stale bread chose. After 24, 48 and 72 hours, the panelist will be asked to criteria contained in the questionnaire, the bread quality (Yarmand, 2009).

**Statistical Analysis**
The average was compared with each other by Duncan method. Analysis of variance (ANOVA) and comparison of averages was done by SPSS 16.0. To compare the Duncan multiple range test at 1% level was used.

<table>
<thead>
<tr>
<th>Code</th>
<th>Details of treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The control sample</td>
</tr>
<tr>
<td>2</td>
<td>Sample containing 3% inulin+ 1.5% beta-glucan</td>
</tr>
</tbody>
</table>

**RESULTS AND DISCUSSION**

**Results**

**Flour quality results**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Moisture (%)</th>
<th>Protein (%)</th>
<th>Ash (%)</th>
<th>Zeleny</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mansobian flour 18%</td>
<td>12.8</td>
<td>10.54</td>
<td>0.809</td>
<td>29</td>
</tr>
<tr>
<td>Star flour standard</td>
<td>14.2 Max</td>
<td>10 Min</td>
<td>0.85</td>
<td>27-35</td>
</tr>
</tbody>
</table>

**Instron results**

Breads mechanical tests is a measure of the bread stiffness or softness. Data from this study indicate which bread hardness will be extended over time and energy levels will be increased. The amount of bread hardness (E-modulus N/mm), after 24h, 48h, and 72h were evaluated by Instron.

The data show that after 24h there is no significant difference were observed between controls and treatments, but in 48h and 72h after baking the control breads become harder than treatments.

**Instron graphs**

**Graph 1:** C after 24h  
**Graph 2:** I_B after 24h
Sensory evaluation of bread staling

The results of these tests show that score (6) are given to the very fresh bread and score (1) are granted to the very stale bread. The mean values indicate that the first day after baking, there is no significant difference between the treatment and control, but the second and third day was seen controls staling were more than treatments.

### Table 4. Results of Instron test

<table>
<thead>
<tr>
<th>Sample</th>
<th>24h after baking</th>
<th>48h after baking</th>
<th>72h after baking</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>4±0.12a</td>
<td>1±0.01b</td>
<td>1±0.04b</td>
</tr>
<tr>
<td>IHBA</td>
<td>4±0.15a</td>
<td>3±0.1a</td>
<td>2.5±0.09a</td>
</tr>
</tbody>
</table>

Discussions

The bread firmness contains beta-glucan after 24 hours decrease to a minimum, but after that become inverse. However, it always will be less than the control. Bread firmness in high levels of beta-glucan maybe related to walls thickening surrounding the gas cells. Bread firmness is a tool to gauge about staling, although it is a very complex process. The high beta-glucan hydration leads to soft tissues. Beta-glucan absorbs water more than starch, this competition may limit starch swelling and solubilisation during cooking and will ultimately lead to a reduction in stiffness. In the other hand, beta-glucan water absorption inhibit amylopectin retrogradation and the total area of gas cells increase, which also helps to bread texture softness. Bread containing beta-glucan is softer than the control.
bread, so this could be the reason of untistaling properties from this material. However, it is more evident in lower quality flours (Skendi, 2009).

Inulin HPX improvement bread loaves volume, also helps to improve the breads texture quality. Even high percentage inulin products show good sensory properties (Filipovic, 2010). White breads enriched with inulin have a good flavor and soft texture, it also can reducing starch available to water absorbent, which prevents against retrogradation and caused of staling postponement (Brasil, 2011).

REFERENCES

Yarmand MS. 2009. Microscopic and Sensory Staling Evaluation of Bread Iranian Consumed. Iranian Journal of Food Science and Technology, 6 (3); 83-93.