

# The Evaluation of the ability of lactic sourdough and Hydroxy Propyl Methyl Cellulose gum to improve the nutritional and sensory characteristics of bread made of barely flour

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**ABSTRACT:** Using high-fiber resources (barely flour) in bread formula is often associated with some problems about the dough and quality of the bread. Adding the fiber leads to the reduction of the volume, hardness and the darkness of the bread and sometimes the taste of it would be changed. Negative effects of fiber in bread structure are born out of the reduction of the Gluten and the increase of the bran grain. In this research, the lactic sourdough (spontaneous) as a natural preservative in four levels of 0, 10, 20 and 30 percent and the fermentation time of 75 minutes and Hydroxy Propyl Methyl Cellulose gum in three levels of 0, 1.5 and 3 percent are used and their influences on the sensory characteristics of the bread which is made of barely flour is studied. The sensory characteristics (flavor, color, texture and overall acceptance) and the bread staling are determined by the panelists. The results shows that the increase of the concentration of this gum and lactic sourdough would improve the sensory and staling characteristics of the barely flour bread. The concentration of gum leads to the reduction of the hardness and the resinous status of the bread indicates the increase of the sensory quality of the bread. Hence, Hydroxy Propyl Methyl Cellulose gum can be used as an appropriate additive for improving bread quality. Also, the increasing use of lactic sourdough, due to reduction of the pH, leads to the improvement of the color, flavor and rheological features of the barely flour dough and bread.

**Keywords:** sourdough, rheological features, Farinograph, barely bread, HPMC.

## INTRODUCTION

Using high-fiber resources (barely flour) in bread formula is often associated with some problems about the dough and quality of the bread. Adding the fiber leads to the reduction of the volume, hardness and the darkness of the bread and sometimes the taste of it would be changed. Negative effects of fiber in bread structure are born out of the reduction of the Gluten and the increase of the bran grain. It seems that the flat breads are more appropriate to mix with high-level of fiber without any changes in their qualities. On the other hand, the Protein in barely bread is higher than the one in wheat bread which improve the nutritional value of the produced bread as well as enhancement of the texture quality of the them. The purpose of adding and use of Hydrocolloids is to enhance the quality of the bread and retain its freshness during the stored period (Koochaki, 2011). Also, European Commission (EC) stated that the sourdough is a kind of complex microbial ecosystem which is mainly produced by the lactic acid bacteria and sourdoughs. Microorganisms in the sourdough have a role in producing high quality bread. The activity of these microorganisms which is the reason of pH reduction leads to the improvement of flavor, rheological features of the barely dough and bread and the increase of the maintenance. One of the important features which impact on the bread acceptance is staling. Due to the existence of lactic bacteria in producing some polysaccharides, such as

Dextran, Xanthan, Glucan, Fructan and Levan in the extracellular, using of soured dough with lactic bacteria causes the water absorption increases which results in the prevention of the transition of the bread moisture into the crust and delaying the staling of the bread (Crowli , 2002). Transferring of the aromatic substances and moisture from the interior parts to the crust leads to the loss of the bread's flavor. On the other hand, it loses its leathery crust, tenderness and crunchiness and the compressibility of the bread would be reduced (Rybota and Bile, 2007). One of the methods of staling measurement is the sensory method. The consumers' demands should be considered for sensory evaluation. People or graduated individuals who are called panelist could be considered in poll for the assessment. The main device for consumers to evaluate the bread staling is to touch the bread. Volt presented such method scientifically. After some researches, he came to this conclusion that if hand pressure is under the controlled condition, it will be a device for assessment (Nasehi, 1995). Experts, based on their purposes, divide sensory tests into two groups of consumer-oriented and product-oriented. In first group test, preference, acceptability and interest rate in product are evaluated by untrained consumers. While in second group of test, the differences between products and their features, and difference test, ranking of a feature's intensity, rating of a feature's severity and descriptive analysis are determined. Didier training assessment group is usually used to run these tests. Appraisers would classify a set of staling factors, such as appearance, taste, firmness and flavor and rate them from 5 to 1. If total points are 100, it will consider satisfactory (Vence ). Based on this, the impact of lactic sourdough and HPMC gum on enhancement of nutritional and sensory characteristics of barely bread would be studied in this research.

## MATERIALS AND METHODS

### ***Barely Flour Samples and Chemical Properties***

The barely bread is provided from Sahar bread Co. Physical and chemical features of the mentioned flour, such as moisture, fat, ash and protein were studied according to Standard 2337, Fiber was studied according to the source through AACC method, Phytic Acid studied based on the method of Fridi and colleagues, 1983, Thompson and co-workers, 1982 and AACC, 1984, pH was studied according to Iran standard number 37, the particles were measured according to proposed method by the producer of the device, acidity was studied by the Iran standard method with number of 103 and the rheological experiments were done through approved method of AACC with the number of 21-54.

### ***Preparation and fermentation of lactic sourdough samples (spontaneous)***

Lactic sourdough was produced from barely flour through spontaneous method. This means that, 600 cc of neutralized distilled water is mixed with 400 gr of barely flour and is placed 24 hours in 32°C to get ready (Najafi, 2011).

### ***Providing final dough***

To prepare the dough, first of all, sourdough suspension with the weight of 3% of barely flour which was boiled in warm water (neutral water) with sugar was solved separately in 10 minutes in order to activate the sourdough cells. This combination was added to barely flour and mixed some minutes. Finally, salt which was already solved in water was added to the dough (if salt adds first to mixed water and sourdough, it will prevent sourdough from optimal activity). The required water was determined according to the desired empirical evaluation in order to molding. After preparing the dough and doing final fermentation (75 minutes), the obtained sourdough was gone for baking (Haghparsat , 2005).

The percentage of replacement of lactic sourdough and barely flour dough was in four levels of 0, 10, 20 and 30 percent and the percentage of HPMC gum which was added to the formulation was in three levels of 0, 1.5 and 3 percent of flour weight.

### ***Measuring of Phytic Acid of the Barely Flour***

Phytic Acid studied based on the method of Fridi and colleagues, 1983, Thompson and co-workers, 1982 and AACC, 1984

### ***Measuring of Crude Fiber of the Bread***

The AACC method was used for measuring the crude fiber.

**Sensory Evaluation of Produced Breads' Quality**

5-point hedonic scoring method was used for sensory evaluation tests which comprises of such properties like appearance, flavor, texture and overall acceptance. The juries were selected through triangular tests according to the Gasula (1984) method. Also, sensory assessment was used to test stale based on the AACC 38-11.

**Statistical Analysis**

This study was done based on the completely random plan and in three replications. The determination of significant difference between data and ranking them were done respectively through factorial and Duncan test and by use of SAS Version 9.1 software. The correlations between variables and parameters and also between parameters themselves were determined by means of SAS version 9.1 software. The charts were also traced and reported by Microsoft Office Excel 2007.

**RESULTS AND DISCUSSION**

**The chemical combination of used flour**

The chemical combination of used barely flour in this research are shown in Table 1.

Table1. Chemical combination of barely flour

Types of flour features	Complete barely flour	Wheat flour of 82%	Wheat flour of 75%
Humidity	8.7	13.3	15.2
pH	5.56	6.49	6.7
Acidity	6.1	5.4	5.5
Ash	1.72	0.70	0.86
Protein	12.3	9.98	10.3
Fat	2.93	1.47	1.6
Phytic Acid (%)	2.31	5.24	5.56
Crude Fiber (%)	4.91	2.52	2.76
Size of the particles }		Sift 475	0.9 gr
		Sift 180	53.25 gr
		Sift 125	19.22 gr
		Under sift	26.61 gr

**Phytic Acid Content of Produced Breads**

As can be seen in Figure1, the phytic acid would be reduced by the increase of the gum and lactic sourdough, so that the most amount of phytic acid is related to the provided treatment of 0% gum and 0% lactic sourdough (1.89%) and the least amount of phytic acid is about the prepared treatment of 30% gum and 3% lactic sourdough (0.87%). In 2006, Aleck and his colleagues came to this conclusion that sourdough increases the minerals and reduces the phytate and thus improve the bread quality and its nutritional properties. In 2005, Linhard and his co-workers concluded that hydrolysis of phytate is the result of the barely phytase and natural flora phytase enzymes of the sourdough and the reduction of the pH of the environment.

According to the results of the averages' comparisons, there are significant differences between different treatments.

**Fiber Content of the Produced Bread's treatments**

The obtained analysis showed that, if the percentage of sourdough and HPMC gum increases, the amount of produced breads' fiber will decrease. So, the provided treatment of 30% sourdough and 3% gum has the least amount of fiber (3.33%) and the provided treatment of 0% sourdough and 0% gum has the most amount of crude fiber (4.57%).

**The Evaluation of Sensory Features**

As it can be seen from diagrams, the bread which has been produced by 20% lactic sourdoughs and 3% gums has the best appearance. In case of color, the treatment which is produced by 20% lactic sourdough and 3% gums has better color than the other treatments. From this point of view, the produced treatments of 30% lactic sourdough (including 0, 1.5 and 3% gum) have the ability to compete with this kind of treatment. In case of odor, the provided

treatment of 20% lactic sourdough and 3% gum has the best odor, but the treatments of 30% lactic sourdough (with 0 and 3% gum) have also the ability of completeness and replacement with this treatment. But in case of texture, 30% lactic sourdough and 3% gum treatment has the best texture that the produced treatment of 20% lactic sourdough and 3% gum can compete with this treatment. In case of overall acceptance, treatment which is produced by 20% lactic sourdough and 3% gums is the best treatment. Thus, the results of sensory evaluation indicate that, adding 20% lactic sourdough and 3% gum has the suitable impact on bread's quality. About staling, as is seen, the produced treatment of 30% lactic sourdough and 3% gum is the best treatment after 72 hours. Because after this period, it keeps its quality in compare to the other treatments. Kakaee and his co-workers and Ghanbari and Farmani in 2013, studied on HPMC gum and concluded that this gum affects water distribution, increase of Glycosil Amin and finally by impact on the intensity of Maylard reaction which lead to enhancement of color and also due to water absorption in bread texture and preventing it from drying out causes the increase of volume and the softness of bread texture and reduction of its stiffness. The bread's shelf life would be increased and its staling will be postponed due to increase of this gum.

### **Conclusion**

One of the additives used in the food industry to improve the quality of bread and increase its shelf life is Hydrocolloids which is able to improve the starch gelatinization properties and enhance the final product's quality. Sourdough is also affected by the internal and external factors and its microbial population influences the final production's characteristics, such as volume, texture, flavor and nutritional value, and causes the amount of mineral availability to increase and the amount of staling to decrease. Sourdough also leads to improvement of sensory characteristics of bread, reduction of Gluten effects on patients with celiac, development of antimicrobial substance and antifungal effects and enhancement of rheological features of the dough. The results indicates that, by the increase of lactic sourdough due to the reduction of the pH and HPMC gum which is born out of the preventing water loss, the sensory quality of the barely bread would be increased. So that, the highest sensory quality is related to the treatment which is prepared of 20% sourdough and 3% gum and the lowest quality is related to the prepared treatment of the 0% lactic sourdough and 0% gum. The results of sensory tests show that by the increase of HPMC gum and the lactic sourdough, the staling features of the bread would also be improved.

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