



Investigating the Production of Probiotic Beverages based on Wheat

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ABSTRACT

One of the most important sources of protein, carbohydrates, vitamins, minerals and fiber is human cereals. In addition, they can be used as sources of indigestible carbohydrates, which, along with the strengthening of several beneficial physical effects with water-soluble fiber such as beta-glucan, argininosylan and oligosaccharides, such as galactole and fructo oligosaccharide, and selective growth resistant starch Stimulate lactobacilli and bifidobacteriosis in the large intestine and act as probiotics and propose to enrich the probiotic content. Treatments included concentrations of 5, 10, 15 and 20% of wheat bran extract and bacteria included *L. acidophilus*, *L. casei*, *L. reuteri*, *L. fermentum* or *L. plantarum*. After preparation of probiotic extract and beverage, measurements of physical, chemical and sensory properties were done. The results showed that the addition of wheat bran to beverage could increase physical and chemical properties such as dry matter, brix, bulk density and pH. The addition of wheat bran extract reduced the percentage of moisture and ascorbic acid. However, this wheat bran extract had no significant effect on fat content. The results of sensory analyzes showed that the probiotic Drink Drink that contained wheat bran extract was in a better condition than the control samples in terms of taste and color. However, the control samples showed the highest score in terms of odor, gum, and acceptance in comparison with samples containing barley extract.

Keywords: Probiotic Drink, Barley, Grains, Extract, Brix.

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1. INTRODUCTION

Wheat plays an important role in feeding many people in the world, which is directly linked to various diseases and human health. The nutritional value of wheat increases with fermentation by microorganisms, which is due to increased digestibility. Although wheat has a high nutritional value, it does not contain a number of nutrients, including vitamin A, B12, vitamin C, fatty acids and lysine amino acids (Guthrie, 1989), which can be used in combination with Combine with milk products, meat, nuts or legumes) and fermentation (fermentation by microorganism's increases digestibility). One of Tarhana's wheat flour fermentation products is the mixing of wheat flour, yogurt, yeast and vegetables (such as tomatoes, onions and green peppers), salt and spices (pepper and peppermint). In different countries, milk, soy beans, lentils, peas, corn meal and eggs are added. These products contain acidic bacteria and some probiotic properties, and have been considered as one of the oldest probiotic foods with the availability of protein, vitamins and minerals for children and the elderly. (Chelik et al., 2005).

Recent economic and social developments have created many problems for human health. High stress and high levels of human activity have led to diseases such as heart attack, high blood pressure, intestinal disorders and various types of cancers (Kun et al., 2008). One of the effective ways of

preventing or eliminating these diseases is the consumption of probiotic products that has become prevalent in countries such as Europe, the United States and Japan, so that more than 90 probiotic products contain *L. Acidophilus* and *B. Bifidum* is produced throughout the world. In many European countries, in North Africa and Asia, various types of probiotic products, including fermented milk, fresh milk, yogurt, frozen desserts and cheese are being produced and consumed. In the last two or three decades, commercially available probiotic products have been lethal to the market (Mortazavian and Sohrabvandi, 2006; Mohammadi et al., 2012).

Probiotics are mainly added to dairy products such as yogurt (Almeida et al., 2009; Khosravi and Koushki, 2008). However, problems such as intolerance to lactose and the level of cholesterol in dairy products may restrict the consumption of these products by some people (Tantipaibulvut et al., 2008; Krasaekoopt and Kitsawad, 2010). Research has shown that the use of probiotics in fruit and vegetable juice can be a good alternative for a group of people with special needs, such as planters and those with allergic reactions to milk proteins (Marhamatizadeh et al., 2012; Roble et al., 2010).

The group of soft drinks is one of the most important products that have been developed in recent years as new products. The expansion of the market for pragmatic drinks in the future is expected due to the prevalence of life-style diseases such as diabetes and high blood pressure and so on. The use of natural constituents of beverages is more widely accepted (Bhuiyan et al., 2012). Over the past years, demand for fruit and vegetable-based drinks has grown dramatically. Fruits and vegetables play an important role in preserving the health and balance of the diet due to the presence of important micronutrients such

as vitamins and minerals. According to the nutritional status of cereals, this study was conducted to investigate the production of probiotic wheat-based mulch.

2. MATERIAL AND METHODS

Materials

In order to use wheat bran extract in malleable beverage formulation, a wheat bran sample from flour mills was prepared. Branch powder was stored at -18°C until use.

Bran extraction

Extraction of wheat bran by using sub-critical water at 120°C for 15 minutes in autoclave. For this purpose, wheat bran (20% w / v) was poured into the water and the Erlene wheat bran was transferred to Autoclave. After the desired time, in order to separate the bran from the extract, the Erlene content was straightened by a Bukhner hat, and the extract of the wheat bran was stored in the refrigerator.

Preparation of probiotics for cultivation

For this study, bacteria *L. acidophilus*, *L. casei*, *L. reuteri*, *L. fermentum* or *L. plantarum* was used. First, four diagonal regions were cultured in a plate containing MRS-Agar to obtain a microbial colony. At 37°C in a CO_2 -containing jar, for lactobacillus species, monoclonal cultures were cultivated and then heated and stained with gram-positive bacilli.

Cultivating species

First, 5 Erlene medium, each containing 100 cc of MRS-Broth medium, was prepared. Each bacterium was inserted into each eagle, next to the flame, and placed inside the incubator for 24 hours to grow the bacteria. After 24 hours of initial inoculation and ensuring their growth, by observation with naked eye, bacterial sedimentation in the culture medium was used to confirm the purity of the culture by staining and observing the lamella using a light microscope. Then, under sterile conditions, 10 mL of MRS -Broth medium was transferred to Sterilized Falcone by sterile pipette and rotated for 35 minutes at 3500 g centrifuge for each strain. Then, the supernatant was separated and placed on the sediment (bacterial agent) sterilized ringer solution in order to prepare the inoculum. Then, with a spectrophotometer, a small amount of opacity was introduced into the spectrophotometer separately, and after placing the tuberculosis inside the apparatus, the absorbance of the wavelength (623 nm, which is commonly used for bacteria), for each species the bacteria were measured and recorded.

Inoculation of studied species to drink

For this purpose, under the laminar hood and along the flame in a completely sterile condition, a number of 20 uterine butter (in terms of the number of tested strains and the time periods of evaluation of the indices (which had been sterilized before), then the wheat bran extract Each of Uriine's Battles has been added. In the next step, inoculum from each of the strains was inoculated into each of the erynins of the beetles containing the malt drink with a ratio of 7%. The Urinene batteries were then stored at 5°C glacial temperature.

Physical and Chemical Properties of Different Drink Production Treatments

PH measurement

With the pH meter, according to the National Iranian Standard, No. 1373, 4404 (ISIRI 4404, 1998).

Brix Measurement

The brix count of the specimens was measured by an ophthalmic refractometer.

Measuring dry material

Measurement of dry matter was carried out using Oven according to Iran's National Standard No. 2685.

Humidity measurement

The oven was used to measure moisture, so that the sample was first heated on a steam bath (Ben-Marie) and dried after evaporation of the sample in oven at 103°C . Then, the moisture content was measured (ISIRI 2705, 2010).

Fat measurements

Measurement of fat percentage of extracted extracts from wheat bran after moisture was measured using Soxhlet apparatus and using Hexane-solvent.

Sensory evaluation

This assessment will be done with a five-point Hedonic test with the help of 10 trained evaluators with a qualitative 5-point rating (5 very good, 4 good, 3 moderate, 4 bad, 5 very bad). So, from the point of view of 5 sensory features (color, smell, taste, consistency, and general acceptance) will be analyzed (Fisher & Phillips, 2006).

Statistical design

To estimate the effects of independent variables of bran (X1) and probiotic extract (X2) on dependent variables (including pH, brix, moisture content, dry matter, ascorbic acid, fat, specific gravity, color, odor, taste, consistency and overall acceptance), the method the central composite design (CCD) response area was used (Table 1). A total of 20 experiments were carried out according to the central composite design. The statistical analysis of the samples was done using the response surface method and Design Expert software.

Table 1: Different treatment levels using the central compound design method

Factor	$-\alpha$	-1	0	+1	$+\alpha$
Bacteria	A	C	F	R	P
Bran extract (%)	2.92	5	10	15	17.07

Statistical analysis

Statistical analysis of data in a completely randomized design will be done using SPSS version 20 software. Comparison of means with each other will be done by using Duncan's test at a significant level of 95%.

3. RESULTS

Using this statistical method, a quadratic equation was obtained for each response. Table 2 shows the regression coefficients of the models for different responses and other characteristics of the proposed model. By replacing the independent variables in the equation, we can predict the value of each response or dependent variables. The results showed that the tested variables (amounts of wheat extract and whey extract) had a significant effect on the responses or parameters. By increasing whey and wheat bran extracts, the amounts of brix, moisture, dry matter, fat, specific gravity, color, odor, taste, consistency and total admission reduced but increased pH.

Table 2. Regression coefficients of the models for different responses and other characteristics

	pH	Brix	Moisture	dry matter	Fat	Special Weight	Color	Smell	Taste	formidability	General acceptance
β_0	4.32	11.12	10.12	14.12	3.96	0.96	1.12	2.31	3.18	4.56	3.56
β_1	0.25	-0.87	-1.10	-2.15	-0.35	-0.12	-0.18	-0.14	-0.23	ns	-0.22
β_2	0.29	-0.54	-0.87	-0.91	-0.23	-0.13	-0.12	-0.21	-0.34	-0.31	-0.31
β_{12}	ns	ns	ns	ns	-0.12	0.20	ns	ns	0.18	0.54	0.35
β_{11}	ns	ns	ns	-0.32	ns	ns	ns	ns	-0.002	0.20	ns
β_{22}	0.024	ns	0.44	0.36	ns	ns	ns	ns	ns	-0.39	0.25
R ²	0.9891	0.9928	0.9806	0.9934	0.9874	0.9925	0.9817	0.9905	0.9881	0.9835	0.9619
Adj-R ²	0.9810	0.9824	0.9710	0.9821	0.9789	0.9804	0.9654	0.9830	0.9759	0.9687	0.9277
Value-F	82.79	43.12	54.21	61.56	89.10	81.54	39.49	51.43	94.95	66.34	34.15
P-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

The study of physical and chemical properties of different treatments of probiotic beetle (Table 3) shows that increasing dry days, dry matter, brix, bulk density and pH increased. However, the increase in the number of days of moisture storage of probiotic beverages decreased. Also, the effect of number of days on the fat content of beverages was not significant, so there was no significant difference in fat content (Table 3).

Investigating the physical and chemical properties of beverage produced by wheat bran extract indicates that the number of days of orange drink storage caused a significant difference in the physical and chemical characteristics of this beverage. The percentage of dry matter increased with increasing number of storage days. Since wheat bran is rich in nutritious compounds, its use in the formulation of beer juice has enriched the beverage.

Table 3: Physical and chemical properties of probiotic beverages

	Control	Days			
		7	14	21	28
pH	3.12e±0.006	3.21d±0.01	3.28c±0.004	3.39b±0.005	3.44a±0.003
Brix	16.76a±0.03	16.70b±0.05	16.68b±0.1	16.63c±0.006	16.58d±0.07
Moisture	14.20c±0.05	14.31b±0.03	14.37b±0.06	14.46a±0.04	14.50a±0.02
dry matter	12.45e±0.02	12.52d±0.006	12.64c±0.04	12.71b±0.03	12.79a±0.04
Fat	0.95a±0.03	0.93a±0.04	0.94a±0.006	0.92a±0.002	0.89a±0.004
Special Weight	1.035d±0.003	1.038dc±0.004	1.039bc±0.006	1.040b±0.007	1.044a±0.006

In order to evaluate the number of storage days on the acceptance of consumers, the sensory characteristics of beverage treatments were evaluated. The results showed that there was a significant difference in the sensory characteristics of beverages among the relevant days. The highest total acceptance score was for the witness sample. Also, the lowest total acceptance rating belonged to the sample of 28 days of

maintenance. In terms of other sensory characteristics, it was found that the control sample was better in terms of odor and consistency, and the samples kept on different days had less privilege. There was no significant difference in the color properties of the days of storage as compared to the control sample (Table 4).

Table 4: Sensory properties of probiotic beverages

	Control	Days			
		7	14	21	28
Color	4.16a±0.05	4.17a±0.01	4.16a±0.02	4.10b±0.05	4.05b±0.05
Smell	4.28a±0.01	4.15b±0.01	4.10b±0.04	4.07b±0.04	4.98c±0.05
Taste	4.45d±0.03	4.57c±0.04	4.64b±0.05	4.67ab±0.06	4.71a±0.03
formidability	4.30a±0.06	4.25b±0.05	4.23b±0.05	4.12c±0.04	4.09c±0.03
General acceptance	4.30a±0.02	4.21b±0.01	4.15c±0.01	4.10d±0.02	4.00a±0.04

Investigating the sensory characteristics of beverage treatment in this study also indicates that increasing the number of storage days affects the sensory characteristics and its acceptability in terms of consumers. Because wheat bran is not widely used in our country, the process of stabilizing it in order to inactivate the lipase enzyme after the milling step is not considered, and this can have a negative effect on the sensory

properties of the extract. Therefore, considering the nutritional characteristics of wheat bran and extracts extracted from it, it is necessary that the process of production and preservation of it in order to use this product in the formulation of foodstuffs should be considered more attention.

4. CONCLUSION

The results of this study showed that by increasing the number of days of storage, changes in its physical and chemical characteristics occur, so that by increasing the number of days of storage, the percentage of dry matter, brix, bulk density and pH will increase. On the other hand, an increase in the number of maintenance days reduces the moisture of probiotic rubbish beverage. Sensory analysis results showed that the control sample was better in terms of odor, consistency and overall acceptance than other samples that were stored. However, the samples were kept in a more favorable position than the control in terms of taste and color.

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