Journal of Food Science and Technology (Iran)

Homepage:www.fsct.modares.ir

Scientific Research

Effect ofturnip, pumpkin and bakery yeast on microbial flora and texture of doineh

Bahrami, S. [1], Davati, N. [2*], Noshirvani, N. [3]

1. MSc Student, Department of Food Science and Technology, Faculty of Food Industry, Bu-Ali Sina University, Hamedan, Iran.
2. Assistant professor, Department of Food Science and Technology, Faculty of Food Industry, Bu-Ali Sina University, Hamedan, Iran.
3. Assistant professor, Department of Food Science and Technology, Faculty of Technical and Natural Resources of Tuyserkan, Bu-Ali Sina University, Hamedan, Iran.

ARTICLE INFO

Article History:

Received 2022/ 01/ 27
Accepted 2023/ 03/ 08

Keywords:

Doineh,
Turnip,
Pumpkin,
Bakery yeast.

DOI: 10.22034/FSCT.19.133.197
DOR: 20.1001.1.20088787.1401.19.133.17.2

*Corresponding Author E-Mail:
n.davati@basu.ac.ir

ABSTRACT

Recently, the production of fermented products has received significant attention due to health benefits. Doineh is a cereal- dairy based fermented product that is often traditionally prepared in the western regions of Iran. The aim of this study was to investigate the effect of adding 8% turnip, 8% pumpkin as a nutritious supplement and different amounts of bakery yeast 0, 0.5 and 1% to achieve an optimal formulation with a good texture and low microbial flora during 9 days fermentation.The results showed that the treatments of turnip, pumpkin and bakery yeast improved the texture and reduced microbial flora of doineh. The viscosity ofdoineh samples containing bakery yeast increased and in contrast, the growth of pathogenic bacteria and pH significantly ($p<0.05$) decreased compared to the control. While, water and oil adsorption showed no significant difference ($p<0.05$) in the samples. Based on the results, formulations containing 1% bakery yeast and 8% Turnipare suggested because of better texture and better control of microbial spoilage.

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

1. Introduction

Currently, with the progress of human societies, the industrial production of food containing additives and chemical preservatives is increasing, which leads to digestive diseases and cancer, while the industrial production of fermented products with beneficial properties and high nutritional value is very low. Today, many countries are interested in producing fermented foods in semi-prepared or powder forms that can be suitable for consumption in hospitals, schools and homes. Recently, the design and production of cereal-based probiotic products has received significant attention due to its natural health-enhancing value and the creation of diversity in the production and consumption of this category of food. (Buttermilk and yogurt) will be compensated. Davina, like Tarkhina, is known as a dairy-cereal fermented product, with the difference that in some places, very thick, pre-fermented buttermilk is used in the preparation of Davina. These products are sold in some countries of the world, including Iran, Iraq, It is consumed in Turkey, Masro in several other countries with different names, and it is usually used as a raw material in the preparation of traditional soup in Iran, especially in the western regions. The nutritional value, qualitative and organoleptic characteristics of Davina depend on various factors, including raw materials, microbial quality, and fermentation conditions. has it. Due to low humidity and low pH, Davina, like Tarkhina, is considered an unsuitable environment for the growth of spoilage-producing microorganisms, and therefore has a long shelf life [1]. Due to the similarity of the production process of Duina with Tarkhina, it can be expected to have relatively high nutritional value like Tarkhina. The research conducted by Ibanoglou et al. (1995) and Biljisil et al. (2006) showed that tarragon is a good source of organic acids, minerals, free amino acids, vitamins, ascorbic acid and folic acid [2, 3]. In the study by Arbas et al. (2006) which was conducted on a product similar to tarrakhina called tarrhana; The beneficial and probiotic properties of this food such as lowering cholesterol, regulating blood glucose levels in diabetics and reducing the risk of cancer in consumers have been mentioned [4]. Fermented foods are considered one of the best diets due to maintaining quality characteristics in different environmental conditions, improving food safety, increasing the bioavailability of proteins and minerals, increasing vitamins and reducing anti-nutritional factors and antimicrobial activity. Therefore, with the industrial production of dairy-cereal fermented products such as Davina, while diversifying the diet, its beneficial properties can be used to improve the health of consumers. The purpose of this study is to investigate the addition of turnips, pumpkin and different amounts of sour dough to achieve a formulation of dough with a suitable texture and low pathogenic microbial flora to be proposed in the industry.

2- Materials and methods

2-1- Preparation of Davinah

After washing, wheat semolina was cooked for one hour at a temperature of 80 degrees Celsius. The cooked bulgurs were placed in a cabinet equipped with two mesh trays under a temperature of 70 degrees Celsius until completely dry. After drying, wheat semolina was ground by an industrial mill. To prepare the base dough, the formulation of wheat semolina 24/5, buttermilk 70/2 and salt 5/3 was used. The raw materials were weighed and based on the type of treatment, the required amounts of baker's yeast (at three levels of 0%, 0.5% and 1%) and nutritional supplements (at three levels of no supplementation, 8% pumpkin and 8% turnips) were also It was weighed and added to the formula. First, wheat semolina was mixed with buttermilk and then grated turnip or pumpkin, baker's yeast and salt were added. The mixture was kneaded well by hand for 5 minutes to form a dough. The samples were placed on a sieve for 1 minute to remove excess water. Then it was distributed in sterile glass containers and after covering their lids, they were kept at a temperature of 20 degrees Celsius for 9 days. Also, in order to investigate the effects of fermentation time in 4 levels including days 0, 3, 6, 9, 4 repetitions of each treatment were prepared in a total of 36 samples.

2-2- Viscosity

To measure the viscosity, the modified method of Taraki et al. (2013) was used [5]. 10 grams of Davina was mixed with 100 milliliters of distilled

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

water and placed on a magnetic heater for 10 minutes. After 15 minutes of baking time, the resulting mixture was vigorously mixed for 40 seconds. The viscosity of each sample was measured by a viscometer (Brookfield DV2T, USA) using a ULA spindle at a speed of 60 rpm at a temperature of 30 and 60 degrees Celsius. Two readings were done for each sample, and each reading was read after 30 seconds. The results were read in terms of centipoise (Cp), which is the percentage of dynamic viscosity.

2-3- The ability to absorb water and oil

10 grams of Duina samples were mixed with 50 ml of sterile distilled water to check water absorption and with 50 ml of vegetable oil to check oil absorption separately and then vortexed for 15 minutes and subsequently centrifuged at g4000 for 20 minutes. Water absorption (WAC) was reported as grams of water and oil absorption (OAC) as grams of oil absorbed per gram of tissue [6].

2-4-pH

According to the method of Ilbanoglou et al. (1995), 5 grams of the sample was mixed with 100 ml of distilled water for 3 minutes using a laboratory mixer, and the solution was filtered through Whatman No. 30 filter paper. Then the pH of the solution was measured using a digital pH meter (Metrohem 827, Switzerland) [2].

5-2- Microbial tests

The trend of microorganism flora changes in samples containing different amounts of baker's yeast, type of nutritional supplement, was investigated in comparison with the control sample during fermentation including days zero, three, six and nine. After homogenizing the samples under sterile conditions, 1 gram of the sample was added to 9 ml of sterile Ringer's solution. The resulting mixture was vortexed for one minute and used as the initial dilution^{1-}10 was considered. subsequent dilutions ($^{2-}$10 to me^{7-}10) Sterile Ringer's solution was also prepared from this initial dilution.To count the total microbial population, use the standard plate counting method using the culture mediumPlate Count Agar (PCA)Counting coliforms from Violet Red Bile Agar (VRBA) culture medium, counting fungi from culture mediumPotato Dextrose Agar (PDA)AndBacteria count*Staphylococcus aureus* Mannitol Salt Agar (MSA) culture medium was used. direction Investigation of fungi, the environment of the deadthe relevant at a temperature of 25 degrees Celsius and other environment, the inoculated dead animals were kept in a greenhouse (Persian Teb, Iran) at a temperature of 37 degrees Celsius [7].

6-2- Statistical method

The effects of fermentation time (in 4 levels 0, 3, 6, 9 days), supplementation in 3 levels (no supplementation, 8% pumpkin, 8% turnip) and baker's yeast (in 3 levels 0, 0.5% and 1%) on the properties of the product. Data analysis was done based on factorial statistical method and completely random statistical design and in two repetitions. Data variance analysis was done with SPSS software. In case of significance, comparison of means was investigated based on Tukey's test at 5% probability level. All tests were performed in 3 repetitions.

3. Results and Discussion

3-1- The effect of nutritional supplement and baker's yeast on the viscosity of Doina during fermentation

Rheological measurements are analytical tools that can provide basic information about the structure and interactions of components within the material [8]. Viscosity is one of the main parameters for semi-liquid foods that affects the sensory quality of the product. The effects of temperature, fermentation time and additives (turnip, pumpkin, and baker's yeast) on the viscosity of Davina are shown in Table 1. According to the results of this research, each of the investigated treatments affects the viscosity of the dough. The addition of nutrient supplement increased the viscosity compared to the control sample. The effect of adding pumpkin was more than the effect of adding turnip; These changes may be due to the water holding capacity in the pulp of plant raw materials. In the research of Taraki andcolleagues (2013) with the purpose of investigation The effect of cherry pomace on the physicochemical, functional and sensory properties of tarhana was determined, adding cherry pomace increased the viscosity [5].Investigating the effect of adding baker's yeast on the viscosity of the dough on the first day of fermentation showed that increasing the

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

concentration of baker's yeast alone had no effect on the viscosity. While the simultaneous application of nutritional supplement and baker's yeast during fermentation had an effect on viscosity. The comparison of the viscosity content of Davina in different concentrations of baker's yeast during fermentation showed that the lowest viscosity was related to the control sample on the first day and the highest amount was related to the sample containing 8% pumpkin and 1% baker's yeast on the ninth day of fermentation. Selik et al. in 2005, by investigating the effect of adding baker's yeast on the functional and qualitative properties of terhana, showed that adding baker's yeast to terhana causes a slight increase in viscosity [9]. Investigating the effect of fermentation time at each temperature of 30 and 60 degrees Celsius showed that the viscosity increased with the increase of fermentation time. AtThe length of the fermentation process, viscosity due to structural changes in proteins and carbohydrates, interactions between substances and alsoThe increase of electrostatic and hydrophobic intermolecular interactions increases due to the exposure of amino acid side chains [8, 10]. AlsoIt may be because most of the wheat starch granules are completely swollen and physically interact with other materials and increase the viscosity [11].In our study, the viscosity of all samples decreased with increasing temperature. Heat may break the entanglement and molecular bonds and stabilize the molecular structure and lead to a decrease in viscosity. With the increase in temperature, the instability of protein-protein and protein-water interactions occurs, which leads to a decrease in viscosity [6]. In 1999, Ibanoglu et al. investigated the effect of soup temperature, the size of tarhana powder particles before cooking and the type of wheat flour used in the formulation with different shear speeds on tarhana soup viscosity. They announced that increasing the temperature of Terhana soup decreased the viscosity. Measurements at different temperatures showed that Terhana soup shows a pseudo-plastic behavior similar to wheat porridge [8].

Table 1 Viscosity (Cp)changes of doineh affected by different formulations during fermentation

Day 9	Day 6	Day 3	Day 1	Formulation	Temperature
13.23	12.08	11.12	10.45	P	60^{O}C
27.15	25.67	17.34	12.92		30^{O}C
15.27	13.13	13.33	12.14	P.T	60 ^{O}C
36.24	34.9	34.88	25.06		30 ^{O}C
17.97	16.41	15.89	14.83	P.Sq	60 ^{O}C
56.35	53.12	41.92	35.60		30 ^{O}C
13.42	12.74	11.27	10.61	PS1	60 ^{O}C
27.38	25.64	18.02	13.18		30 ^{O}C
18.67	17.22	15.23	12.17	P.S1.T	60 ^{O}C
48.72	45.23	35.07	21.24		30 ^{O}C
19.33	17.61	16.03	15.20	P.S1.Sq	60 ^{O}C
58.02	54.18	42.93	36.20		30 ^{O}C
15.53	14.34	11.64	10.71	P.S2	60 ^{O}C
29.62	27.19	18.77	13.25		30 ^{O}C
21.45	18.11	17.31	12.25	P.S2.T	60 ^{O}C
61.76	57.64	47.16	21.42		30 ^{O}C
21.86	18.74	17.52	15.36	P.S2.Sq	60 ^{O}C
63.09	58.02	45.08	36.78		30 ^{O}C

P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

In Hasan Vegdallah's research (2018), the apparent viscosity of Terhana soup samples prepared using different sources of cereals and dairy products was determined at different rotation speeds of 20, 50, 80 and 100 revolutions per minute at a temperature of 70 degrees Celsius. The decrease in apparent viscosity with increasing shear rate showed that Terhana soup behaves like a non-Newtonian fluid [12]. Acidity changes with viscosity changes at levels greater than mm^2**/s** 10 or Cp 10 is inversely proportional [13]. But in our study, with the decrease in pH (increase in acidity) in the samples containing pumpkin and turnip, the amount of viscosity also

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

increased, which can be due to the thick texture resulting from the formulation of Doina with these components.

Since food viscosity is often inversely related to moisture content. Therefore, in terms of microbial activity, viscous foods have a longer shelf life due to the reduction of available water [14]. In our study, Doina sample with 1% yeast containing pumpkin and turnip respectively have the highest viscosity.

3-2- Doina's ability to absorb water and oil

According to the results of analysis of variance, the use of different amounts of baker's yeast and nutritional supplement did not show any significant effect on the absorption of water and oil in the dough during the fermentation time at the 95% probability level.

3-3- The effect of nutritional supplement and baker's yeast on the pH of Doina during fermentation

According to the results of analysis of variance, the effect of using different amounts of baker's yeast and nutritional supplement on the pH of the dough during the fermentation time was significant at the 95% probability level. Also, the interaction effect of formulation and fermentation time on the pH of Davina ($p<0.05$) was also significant. As can be seen in Figure 1, with increasing fermentation time, the pH level decreased in all treatments.The effect of nutrient supplement and baker's yeast on the pH of the dough on the first day of fermentation in different formulations was almost the same and there was no significant difference ($p<0.05$). After three days of fermentation, no significant difference was observed between the control sample and formulations with 8% nutritional supplement alone, but the concentrations of 0.5% and 1% baker's yeast with the control sample had a significant difference at the 95% probability level. On the 6th and 9th day of fermentation, there was a significant difference between the control sample and the other samples; so that the lowest pH inDavina contains 1% baker's yeast and 8% pumpkinon the ninth day of fermentation and thenDavina contains 1% baker's yeast and 8% turnipsFermentation was observed on the ninth day and the highest amount was observed in the control sample on the first day.In Terhana, as a product similar to Doina, these changes in pH value have been attributed to the increase of digestible substrates in the dough as a result of the increase in amylolytic activity, which leads to a decrease in pH during the fermentation period [15].

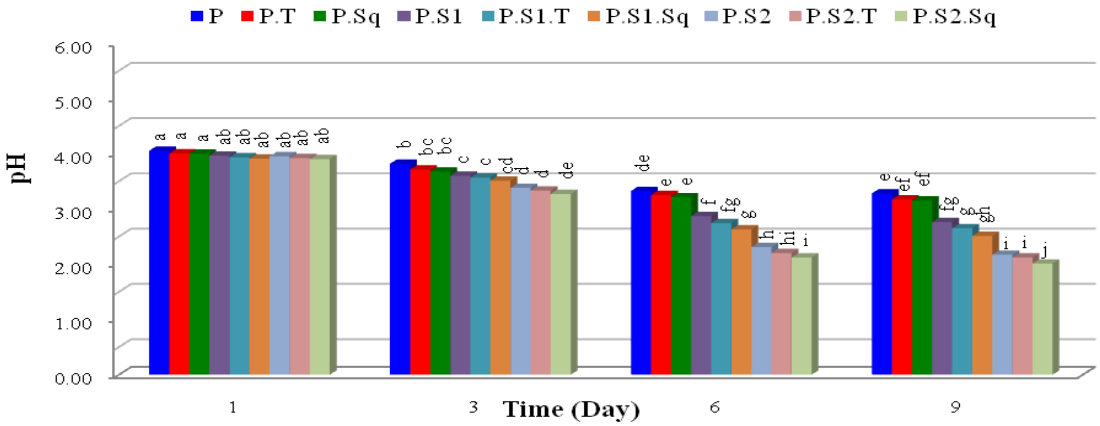

Fig 1 Effect of bakery yeast, turnip, and pumpkin on pH of doineh during fermentation. Different letters indicate statistically significant differences at ($p < 0.05$).

P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

Kivanch and Fando (2017) found the main reason for the decrease in dough pH to be the production of organic acids by baker's yeast and lactic acid bacteria during fermentation, which is by converting glucose to ethanol (via pyruvate) and producing acetaldehyde, carbon dioxide, lactic acid, acetic acid and Carbonyl compounds decrease pH and increase acidity during

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

fermentation [16]. According to the results of variance analysis, it was observed that adding baker's yeast decreased the pH of Doina more strongly. This was expected because, in addition to the basic microbial flora, as mentioned above, the bacteria in baker's yeast can use carbohydrates for their metabolism and cause more organic acids (acetic acid, lactic acid, and pantothenic acid) to be produced, which results It is the further reduction of pH [17]. The results of this study were consistent with the results of Sangan and Karapinar (2012) and Soyukuk et al. (2020) [18, 19].

3-4- Microbial characteristics of Davina

3-4-1- The effect of nutritional supplement and baker's yeast on the total number of microorganisms during fermentation

Based on variance analysis of data, the changes in the total population of microorganisms in different concentrations of baker's yeast, nutritional supplement during fermentation and their interaction were significant ($p<0.05$) (Figure 2). According to the results of comparing the averages, increasing the concentration of baker's yeast increased the content of the total population of microorganisms on the first day; So that the highest content of the total microorganism population was related to the samples under 1% concentration of baker's yeast and the lowest content of the total microorganism population was related to the control sample on the first day. Addition of nutritional supplement alone and simultaneously with baker's yeast treatment also led to an increase in the total population of microorganisms. The highest content of the total microorganism population was related to the sample containing 8% pumpkin and 1% baker's yeast on the first day. During days 0, 3, 6 and 9 of fermentation, a significant difference was observed between the control sample and the other treatments at the 95% probability level. In general, with increasing fermentation time, the total population of microorganisms in all treatments decreased significantly ($p<0.05$). However, on each day of fermentation, the microbial flora of the samples containing baker's yeast alone and the control sample had a greater decrease in the microbial flora than the samples containing only turnip or pumpkin.

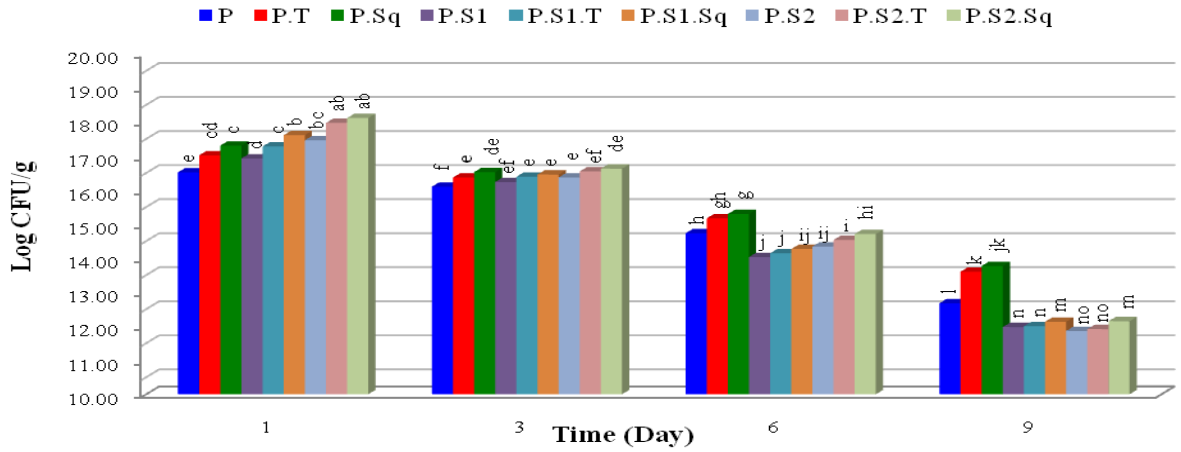

Fig 2 Effect of bakery yeast, turnip, and pumpkin on total microbial count of doineh during fermentation. Different letters indicate statistically significant differences at ($p < 0.05$).

P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

The presence of pumpkin and turnip due to having inherent microbial flora caused an increase in the total population of microorganisms compared to the control sample during fermentation. Similarly, in the research conducted by Veerapatra et al. in 2015 regarding the production of fruit yogurt from gak fruit, adding fruit to yogurt increased the number of microorganisms. According to our study, among the supplements, the effect of pumpkin in

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

increasing the microbial flora was more than other formulation ingredients, which could be due to the microbial contamination that accompanies it from the field to the production of the doina. Also, the trend of reducing the total number of microorganisms in the samples containing baker's yeast was higher than in the samples with 0% baker's yeast. Possible reasons for the decrease in the total population of microorganisms during fermentation, especially in samples containing baker's yeast, can be the increase of antimicrobial metabolites, including organic acids, carbon dioxide, hydrogen peroxide, diacetyl, ethanol, and bacteriocin resulting from lactic fermentation [20]. The results of this research were consistent with the results of Daglioglu et al. (2000)[21].

3-4-2- The effect of nutritional supplement and baker's yeast on the number of coliforms during fermentation

Based on the results of analysis of variance, the effect of using different amounts of baker's yeast and nutritional supplement on the coliform content of Davina during fermentation, as well as the interaction effect of formulation and fermentation time was significant ($p<0.05$). As can be seen in Figure 3, with the increase in the concentration of nutritional supplement, especially pumpkin, the coliform content of Davina increased, which is probably due to the high primary coliform flora of this nutritional supplement. The study of the effect of adding baker's yeast on the coliform content of Dovina showed that by increasing the concentration of baker's yeast alone, the amount of coliform in the samples containing baker's yeast decreased significantly compared to the samples without baker's yeast. Comparison of average data on days 0, 3, 6 and 9 of fermentation showed that with increasing fermentation time, the amount of coliform in all treatments has decreased significantly, so that the highest amount of coliform is related to the sample containing pumpkin on day 0 and the lowest amount It was related to the sample containing only 1% baker's yeast on the 9th day of fermentation.At firstDue to the contamination of the raw materials, the coliform population was high during the fermentation period with activityLactic acid bacteria and yeast*Saccharomyces cerevisiae*The amount of baker's yeast decreased.

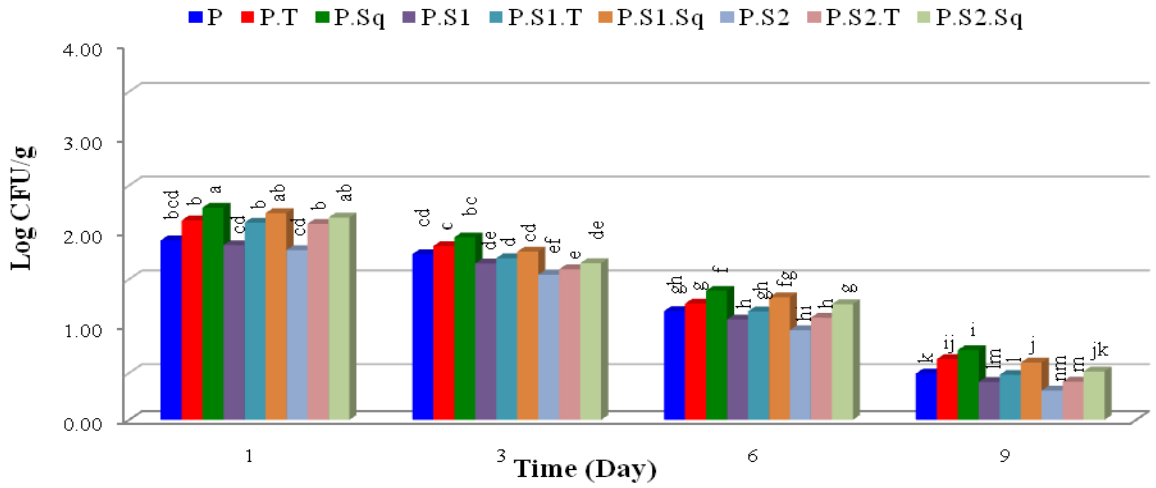

Fig 3 Effect of bakery yeast, turnip, and pumpkin on coliform count during doineh fermentation. Different letters indicate statistically significant differences at ($p < 0.05$).

P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

The reduction of coliform growth can be mostly due to the presence of antimicrobial compounds resulting from the lactic activity of samples containing baker's yeast.As mentioned earlier, lactic acid bacteria contain several natural antimicrobial substances, including organic acids (lactic acid, acetic acid, formic acid, phenyllactic acid, and caproic acid), carbon dioxide, hydrogen

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

peroxide, diacetyl, ethanol, bacteriocin, rotrin, and They produce roticycline, which prevents the growth of pathogenic bacteria and spoilage agents, including coliforms. Most of the researches carried out regarding the antimicrobial properties of lactic isolates of traditional fermented products have indicated their prominent role in preventing the activity of pathogenic microorganisms and spoilage agents. For example, Sarani et al. (2018) studied the antimicrobial effects of the predominant lactic isolates in tarrhine and their bacteriocin-like compounds and confirmed its antimicrobial effect [22].Bacteriocins inhibit the synthesis of cell wall by binding to lipids and lead to cell death by forming pores in the membrane [23].

3-4-3- Effect of nutritional supplement and baker's yeast on number*Staphylococcus aureus*Duina during fermentation

Based on the results of analysis of variance of the effect of baker's yeast, nutritional supplement during fermentation time and also the interaction effect of formulation and fermentation time on the number*Staphylococcus aureus* The difference was significant ($p<0.05$). As seen in Figure 4, with increasing fermentation time, the amount*Staphylococcus aureus*In the samples containing baker's yeast and nutritional supplement and the control sample, it has decreased significantly. Addition of nutrient supplement on the first day of fermentation increases the population*Staphylococcus aureus* It became a dream. So that on the first day, the largest population*Staphylococcus aureus* Related to the samples containing 8% pumpkin and the lowest population*Staphylococcus aureus* It was related to the sample containing 1% baker's yeast alone on the ninth day. Investigating the effect of adding baker's yeast on the population*Staphylococcus aureus*Devina showed that with increasing the concentration of baker's yeast,amount*Staphylococcus aureus* mostlyIn samples containing baker's yeast alone, compared to other samples, it significantly decreased during fermentationIt has been found that according to what was mentioned before, due to the production of antimicrobial compounds caused by lactic activity against*Staphylococcus aureus* In the samples containing baker's yeast, as well as the primary contamination of nutritional supplements, especially pumpkin, to this bacterium. Also, in the research of Nasrullahzadeh et al. (2019), the results of investigating the inhibitory effect of lactic acid bacteria isolates on growth*Listeria monocytogenes* And*Staphylococcus aureus* showed that all isolates were able to prevent the growth of these two pathogens [23]. The results of Saeedi et al.'s (2020) research on the effect of yeast*Saccharomyces cerevisiae* on biofilm formation*Staphylococcus aureus* It showed that both supernatant extracts and yeast lysate were able to form biofilms of two strains sensitive and resistant to methicillin in all concentrations.*Staphylococcus aureus* significantly reduce [24]. Comparison of average data during fermentation showed that with increasing fermentation time, the amount*Staphylococcus aureus* It has been significantly reduced in all treatments; The increase of organic acids and antimicrobial metabolites that are formed during fermentation lowers the pH and as a result, the environment becomes unsuitable for the growth of pathogenic microorganisms and the cause of spoilage [5]. Also, the samples containing turnips had a lower population of staphylococci than pumpkin, which could be due to the presence of antimicrobial compounds in the turnip root. Mohammadi Thani et al. (2017) in a study of the chemical compounds and antimicrobial properties of the essential oil obtained from Shirazi turnip root by GC/MS method including caveicol with the highest percentage (31.32%), trans-anthole (58.19%), linalool (15 determined alpha-pinene (9.28%), alpha-thujone (6.59%) and beta-pinene (3.34%) and the antimicrobial activity of Shirazi turnip essential oil against*Staphylococcus aureus*، *Bacillus cereus*، *Salmonella Typhimurium* And*Ashershiakli* proved [25].

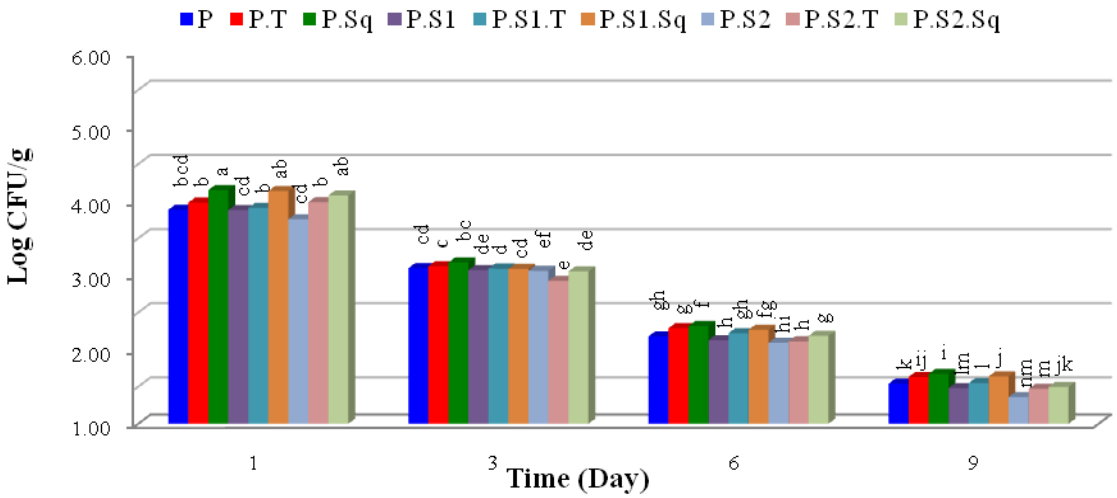

Fig 4 Effect of bakery yeast, turnip, and pumpkin on *S. aureus* count during doineh fermentation. Different letters indicate statistically significant differences at ($p < 0.05$).
P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

3-4-4- The effect of nutritional supplement and baker's yeast on the fungal population of Duina during fermentation

According to the results of analysis of variance, the presence of baker's yeast and nutritional supplement, as well as the interaction of formulation and fermentation time, had a significant effect on the growth of the pods during fermentation ($p<0.05$). According to Figure 5, by increasing the concentration of baker's yeast, the fungal population of Davina, which were all yeasts, increased; So, the highest amount of yeast was related to the samples under the concentration of 1% baker's yeast and the lowest amount of yeast was related to the samples under the concentration of 0% baker's yeast. This is obvious; Because baker's yeast contains a high population of yeast*Saccharomyces cerevisiae* is. The addition of nutritional supplement alone also had a higher amount of yeast than the control sample, which can be related to the inherent and initial contamination of the supplements with yeast. During the fermentation period, the highest amount of yeast related to the sample of 8% pumpkin and 1% baker's yeast was on the first day and the lowest amount of yeast related to the control sample was on the ninth day. During days 0, 3, 6 and 9 of fermentation, a significant difference was observed between the control sample and the other treatments at the 95% probability level. In general, with increasing fermentation time, the amount of yeast decreased significantly in all treatments ($p<0.05$). The pattern of yeast reduction in Doina was consistent with the findings of Arbas et al.'s research (2005), who declared that the content ofYeast and mold in Terhana samples decreased continuously during the fermentation period due to limiting factors such as temperature changes, increased acidity, osmotic pressure, and as a result, decreased water activity [20].. Also, Rasool et al. (2019) work of Hawi baker's yeast*Lactobacillus paracasei* And*Lactobacillus fermentum* investigated the physicochemical properties and durability of Berber bread. The results of this research showed that lactic acid bacteria present in baker's yeast inhibits fungal activity and the growth of spoilage bacteria by producing acetic acid and propionic acid [26]. In confirmation of the results of this research, Polisaz et al. (2008) reported that bread containing baker's yeast contains a high concentration of lactic acid, which has led to their greater resistance to mold and yeast spoilage [27]. Therefore, the reason for the decrease in the yeast population during fermentation in the samples can be attributed to the dominance of lactic flora and the decrease in humidity in the wort.

[DOR: 20.1001.1.20088787.1401.19.133.17.2]
[DOI: 10.22034/FSCT.19.133.197]

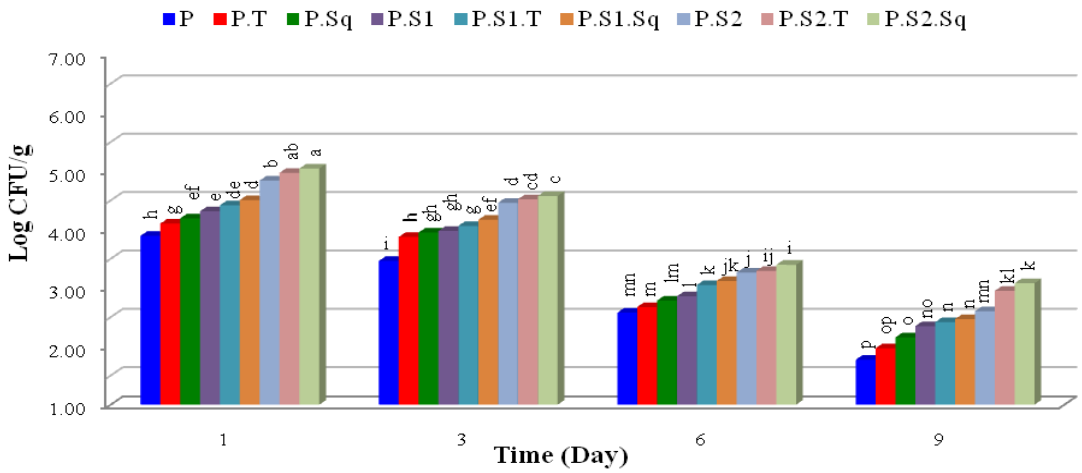

Fig 5 Effect of bakery yeast, turnip, and pumpkin on Fungi (yeast) count during doineh fermentation. Different letters indicate statistically significant differences at ($p < 0.05$).
P: Primary mixture, P.T: Primary mixture + turnip (%8), P.Sq: Primary mixture + pumpkin(%8), P.S1: Primary mixture + sourdough (% 0.5), P.S1.T: Primary mixture + sourdough (%0.5) + turnip (%8), P.S1.Sq: Primary mixture + sourdough (%0.5) + pumpkin(%8), P.S2: Primary mixture + sourdough (%1), P.S2.T: Primary mixture + sourdough (%1) + turnip (%8), P.S2.Sq: Primary mixture + sourdough (%1) + pumpkin(%8).

4- General conclusion

Since the industrial production of fermented products based on dairy-grains such as Doina, due to its high nutritional value and the receipt of useful microbial metabolites during fermentation, with a long natural shelf life, can be a suitable alternative to dairy products and grains containing chemical additives, especially preservatives. Conducting this study was to reach a suitable formulation of Doina containing nutritional supplements, with low microbial flora and suitable texture. The results showed that the sample containing 1% yeast and the sample containing 1% yeast and 8% turnip respectively had the lowest microbial load in terms of pathogenic bacteria. On the other hand, viscosity plays an important role in the industrial process of food, as well as reducing the moisture available to microorganisms. Very high viscosity causes problems such as more energy consumption in the movement and industrial process of food products and, conversely, longer shelf life of the product. In this study, the sample containing 1% yeast and 8% pumpkin had the highest viscosity, and then with a significant difference, the sample containing 1% yeast and 8% turnip had high viscosity. Therefore, the sample containing 1% yeast and 8% turnip is suggested as a nutritious product with low microbial flora, high durability and relatively suitable texture for industrial production.

5- Resources

[1] Tabatabaie Yazdi, A.B., Ghaitaranpou, mortazavi, Isolation and Characterization of Lactic Acid Bacteria from Tarkhineh as a Traditional Product with Medicinal Properties against Pathogenic Microorganisms. Sadra Medical Journal, 2014. 2(3): p. 245-256.

[2] Ibanoglu, Senol, Paul Ainsworth, George Wilson, and George D. Hayes.The effect of fermentation conditions on the nutrients and acceptability of tarhana. Food chemistry, 1995. 53(2): p. 143-147.

[3] Bilgiçli, N., A. Elgün, and S. Türker, Effects of various phytase sources on phytic acid content, mineral extractability and protein digestibility of tarhana. Food chemistry, 2006. 98(2): p. 329-337.

[4] Erbaş, Mustafa, M. Kemal Uslu, M. Ozgun Erbaş, and Muharrem Certel.Effects of fermentation and storage on the organic and fatty acid contents of tarhana, a Turkish fermented cereal food. Journal of Food Composition and Analysis, 2006. 19(4): p. 294-301.

[5] Tarakci, Z., Anil, M., Koca, I. and Islam, A.Effects of adding cherry laurel (Laurocerasus officinalis) on some physicochemical and

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

functional properties and sensorial quality of tarhana. Quality Assurance and Safety of Crops & Foods, 2013. 5(4): p. 347-355.

[6] Hayta, M., M. Alpaslan, and A. Baysar, Effect of drying methods on functional properties of tarhana: A wheat flour-yogurt mixture. Journal of Food Science, 2002. 67(2): p. 740-744.

[7] Pommerville, J.C., Alcamo's laboratory fundamentals of microbiology. 2007: Jones & Bartlett Learning.

[8] İbanoğlu, Ş. and E. İbanoğlu, Rheological properties of cooked tarhana, a cereal-based soup. Food Research International, 1999. 32(1): p. 29-33.

[9] Çelik, İ., Işik, F., Şimşek, Ö. and Gürsoy, O.The effects of the addition of baker's yeast on the functional properties and quality of tarhana, a traditional fermented food. 2005.

[10] Huang, Y.T. and J.E. Kinsella, Functional properties of phosphorylated yeast protein: Solubility, water-holding capacity, and viscosity. Journal of agricultural and food chemistry, 1986. 34(4): p. 670-674.

[11] Gujral, H.S., Sharma, P., Kaur, H. and Singh, J.Physiochemical, pasting, and thermal properties of starch isolated from different barley cultivars. International Journal of Food Properties, 2013. 16(7): p. 1494-1506.

[12] Hassan, M.F. and M.G. Gadallah, Physico-chemical and Sensory Properties of Tarhana Prepared from Different Cereals and Dairy Ingredients. Current Journal of Applied Science and Technology, 2018. 29(3): p. 1-14.

[13] Panovská, Z., A. Váchová, and J. Pokorný, Effect of thickening agents on perceived viscosity and acidity of model beverages. Czech Journal of Food Sciences, 2012. 30(5): p. 442-445.

[14] Maltini, E., D. Torreggiani, E. Venir, and G. Bertolo.Water activity and the preservation of plant foods. Food chemistry, 2003. 82(1): p. 79-86.

[15] Pyler, E. and L. Gorton, Baking science & technology: volume I: fundamentals & ingredients. 2008: Sosland Pub.

[16] Kivanc, M. and E.G. Funda, A functional food: a traditional Tarhana fermentation. Food Science and Technology, 2017. 37: p. 269-274.

[17] S Scazzina, F., Del Rio, D., Pellegrini, N. and Brighenti, F.Sourdough bread: Starch digestibility and postprandial glycemic response. Journal of Cereal Science, 2009. 49(3): p. 419-421.

[18] Sengun, I.Y. and M. Karapinar, Microbiological quality of T arhana, T urkish cereal based fermented food. Quality Assurance and Safety of Crops & Foods, 2012. 4(1): p. 17-25.

[19] Soyuçok, A., Yurt, M.N.Z., Altunbas, O., Ozalp, V.C. and Sudagidan, M.Metagenomic and chemical analysis of Tarhana during traditional fermentation process. Food Bioscience, 2021. 39: p. 100824.

[20] Erbaş, M., M. Certel, and M.K. Uslu, Microbiological and chemical properties of Tarhana during fermentation and storage as wet—sensorial properties of Tarhana soup. LWT-Food Science and Technology, 2005. 38(4): p. 409-416.

[21] Daglioğlu, O., Tarhana as a traditional Turkish fermented cereal food. Its recipe, production and composition. Food/Nahrung, 2000. 44(2): p. 85-88.

[22] Sarani, A., Khomeiri, M., Maghsoudlou, Y., Moayedi, A. and Ebrahimi, M.Molecular identification and evaluation of antimicrobial effects of dominant LAB isolated from Tarkhineh and its bacteriocin-like substances on some foodborne microorganisms. 2019.[23] Nasrollahzadeh, Ahmad, Mndana Mahmoudi, Alireza Sadeghi, and Maryam Ebrahimi. Identification and evaluation of the antimicrobial potential of strains derived from traditional fermented dairy products of iran as a biological preservative against Listeria monocytogenes, Staphylococcus aureus, Salmonella enterica and Escherichia coli. Iranian Journal of Medical Microbiology, 2019. 13(5): p. 392-405.

[24] Saidi, N., Owlia, P., Amin Marashi, S.M. and Saderi, H.The effect of probiotic yeast Saccharomyces cerevisiae on Staphylococcus aureus biofilm formation. Daneshvar Medicine, 2020. 25(5): p. 55-62.

[25] Mohamadi Sani, A., Behnam, K. and Esmaeilpour, M., 2017. Chemical composition and antibacterial activity of the essential oil from Shirazi Turnip root (Brasica rappa L.) in in-vitro conditions. Journal of Food Microbiology, 4(3), pp.31-40.

[26] Sadat Rasool, N., Shahab Lavasani, Estiri, Effect of Sourdough Containing Lactobacillus

paracasei andfermentum on Physicochemical Properties and Shelf life of BarbaryBread. Journal of Innovation in Food Science and Technology, 2019. 11(2): p. 1-14.

[27] Plessas, S., Bekatorou, A., Gallanagh, J., Nigam, P., Koutinas, A.A. and Psarianos.Evolution of aroma volatiles during storage of sourdough breads made by mixed cultures of Kluyveromyces marxianus and Lactobacillus delbrueckii ssp. bulgaricus or Lactobacillus helveticus. Food Chemistry, 2008. 107(2): p. 883-889.

[DOR: 20.1001.1.20088787.1401.19.133.17.2]

[DOI: 10.22034/FSCT.19.133.197]

مجله علوم و صنایع غذایی ایران

سایت مجله: www.fsct.modares.ac.ir

مقاله علمی_پژوهشی

اثر شلغم، کدو حلوایی و مخمر نانوایی بر فلور میکروبی و بافت دوینه

سحر بهرامی[۱]، نفیسه دعوتی[۲*]، نوشین نوشیروانی [۳]

۱- دانشجوی کارشناسی ارشد، گروه علوم و صنایع غذایی، دانشکده صنایع غذایی بهار، دانشگاه بوعلی سینا، همدان، ایران.

۲- استادیار، گروه علوم و صنایع غذایی، دانشکده صنایع غذایی بهار، دانشگاه بوعلی سینا، همدان، ایران.

۳- استادیار، گروه علوم و صنایع غذایی، دانشکده فنی و منابع طبیعی تویسرکان، دانشگاه بوعلی سینا، همدان، ایران.

اطلاعات مقاله

تاریخ های مقاله :

تاریخ دریافت: ۱۴۰۱ /۱۱/۰۷

تاریخ پذیرش: ۱۴۰۱/۱۲/۱۶

کلمات کلیدی:

دوینه،

شلغم،

کدو حلوایی،

مخمر نانوایی.

DOI: 10.22034/FSCT.19.133.197

DOR: 20.1001.1.20088787.1401.19.133.17.2

* مسئول مکاتبات:

n.davati@basu.ac.ir

چکیده

اخیرا تولید محصولات تخمیری به دلیل فواید سلامت بخش آن به طور چشم‌گیری مورد توجه قرار گرفته است. دوینه یک فرآورده تخمیری شیری-غلاته است که غالبا در مناطق غرب ایران به صورت سنتی تهیه می‌شود. هدف از این مطالعه بررسی افزودن ۸٪ شلغم، ۸٪ کدو حلوایی به عنوان مکمل مغذی و مقادیر متفاوت خمیرترش ۰، ۰.۵ و ۱٪ جهت دستیابی به فرمولاسیونی بهینه با بافت مناسب و فلور میکروبی پایین در طی ۹ روز تخمیر بود. نتایج نشان داد که تیمارهای شلغم، کدو حلوایی و مخمر نانوایی باعث بهبود بافت و کاهش فلور میکروبی دوینه شدند. در نمونه‌های دوینه حاوی مکمل مغذی و مخمر نانوایی، ویسکوزیته افزایش یافت و متقابلا رشد باکتری‌های بیماری‌زا و pH کاهش معنی‌داری ($p<0.05$) نسبت به نمونه شاهد در طی زمان تخمیر نشان داد. در حالیکه جذب آب و روغن اختلاف معنی‌داری ($p<0.05$) در نمونه‌ها نشان نداد. براساس نتایج، فرمولاسیون حاوی ۱٪ مخمر نانوایی و ۸٪ شلغم به دلیل بافت بهتر و کنترل بهتر فساد میکروبی پیشنهاد می‌شود.

.