ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Effect Of Milk Fortified with Iron On Physico-Chemical Properties Of Matsun.

Amir Nasir Rostami Najafabadi*.

Armenian National Agrarian University, Faculty of Food Technologies, Milk and Dairy Product Technology Department

ABSTRACT

Food fortification is probably the most significant technics for enhancement of the vitamins and minerals value as well as quantity inside of food. The objectives of this study is to investigate the effect of fortification matsun with some iron salt at different rates on matsun physical and chemical properties in order receive the rate of fortification which should be used. Cow milk (3.2% of fat) was obtained from private farms of Abovyan region (Armenia). The milk was divided in to 4 portions. The first portion was not fortified with iron and regarded as a control. The remaining 3 portions were fortified with iron respectively at a level of 20 mg. 40 and 60 mg iron/ kg milk. Matsun samples were chemically examined when fresh and after 3, 5 and 7 days of refrigerating at 5˚C. The obtained data were subjected to analysis of variance. Results: Fe- enriched yoghurt dry matter changes over time but time has no significant effects on Fe-enriched yoghurt with different dry matter content, acidity and fat. Time has no significant effects on moisture. Time has no significant effects on protein content but different enrichment percentage has significant effects on protein content, moisture content and Acidity.

Keywords: milk, iron salt, fortification, matsun

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Milk is considered pretty much as good way to obtain proteins fat, carbohydrates in addition to vitamins, calcium as well as phosphorus .however it may be usually poor source to obtain trace elements. Iron deficiency is considered to become the the most frequent worldwide nutritional deficiency. Women and certainly young children really are mostly at risk. It really explained that in fact adverse effects include lower grows rate as well as impaired cognitive results in kids in addition to weak pregnancy outcome as well as lower working potential in to adults [1]. Overall the highly recommended daily intakes related to dietary iron with regards to usual infants really are 1mg/kg as well as for children. Men and women adolescents require 10, 12 and 15 mg every day, respectively [2].

Yoghurt has gained significant potential customer acceptance. It can be an excellent way to obtain calcium and protein however as is in fact typical of every dairy items, consists of minimal iron. For this reason, dairy products usually are logical vehicles for iron fortification basically because they have remarkable nutritive values, reach target population and are generally greatly consumed. The overall quality of iron-fortification dairy items will depend on the iron resource utilized, rates of iron as well as characteristics of dairy products made use of for iron fortification

Fortification by using iron is in fact precisely more difficult compared to various other vitamins and minerals due to the fact that iron reacts chemically lots of food elements. Thus, the most suitable iron compound to have food fortification really should be one which supplies extremely bioavailability iron also in the mean time period doesn't have influence on nutrient content or sometimes sensory properties of a given food and really should be stable at the time of food processing in addition to of low cost. Several research have already been performed on iron fortification of yoghurt [3-8]. It can be well known that often tow most significant off-flavours might be associated with fortified dairy products: oxidized flavour as a result of catalysis of lipid oxidation by iron and metallic flavour contributed by iron salts [9]. No more oxidative rancidity were recognized in fresh bio-yoghurt as well as throughout storage samples [10, 6] whereas, Mehanna et al. [4] concluded fresh yoghurt fortified with iron from different resource seem to be affected simply by iron concentration. In this way, it was actually indicated the fact that the sensory quality of iron-fortified dairy foods has been proven to be affected by the type of iron used, the quantity of iron added and the properties of dairy products being fortified [11-13]. The goals and objectives of the research would be to investigate the effect of fortification matsun with some iron salt at several rates on matsun physical and chemical properties in order obtain the rate of fortification which should be used.

MATERIAL AND METHOD

Matsun (It is very similar to yogurt and it is made from cow's milk (mostly), goat's milk, sheep's milk, buffalo milk, or a mix of them and a culture from previous productions.) is in fact one of the most common dairy products eaten in Armenia it is a popular fermented milk product and is actually one of the drinks they have actually frequently daily. It can be beneficial to obtain health wellness and slaking thirst perfectly. Moreover. it is a traditional drink on the table at Armenian shorvotide as well as normally served with rice pudding “katnov”. An extra type of this powerful drink Kamatse matsun is similar matsun but aged for around a week, and after that filtered through a piece of cloth (normally a special linen bag is used). Kamats matsun, free from excessive water is in fact thicker by consistence and tender by taste utilizing a sight sour taste. The Armenian just not only drink matsun and kamats as any other tormented milk product, but in addition consider using them within their cuisine to make a salad dressing and cook cold soups. Matsun already has useful properties of for those who seriously and certainly professionally associated with sports: low calorie content (about 55 calories per 100g). The product is in fact rich in simply digestible protein. Contributing to a rapid growth in muscle mass. And also for people with problems with sleeping during the night. In order to sleep in a short time overcame recommended just before bedtime drink a little fresh matsun. This good habit can certainly help calm the nervous system. Son at night it will be easier to fall asleep.

Cow milk (3.2% of fat) was in fact obtained from private farms of Abovyan region. Lactic acid bacteria inside of matsun are lactobacillus debrueckili subsp. Bulgaricus and Streptococcus thermophilus, and it is mad from cow. Goat or sheep milk Matsun is basically a mesophilic culture, which suggest that it cultures at room temperature. With care, this starter may be used as well as definitely to be able achieve accurate and complete distribution of fortified salt. Preparing of 1000 mg/kg of iron salt was prepared by dissolving this salt

in distilled water. Then the real concentration of iron salt was determined using GOST 269228-86. Ferrous sulphate was obtained from Scharlau Company (Spain).

Total solids content were determined based on GOST 3626- 90 and fat to GOST 5867-90 .The pH values have been determined by Jenway pH meter (Jenway limited. England). Moisture contend was determined at 105 ºC (GOST 3626- 90) Titrable acidity and pH value were determined according to the methods GOST 36 24- 92

Total and soluble nitrogen contents were really determined in accordance with GOST 23327- 98. Fat content was measured according to GOST 5867-90. Yogurt making Procedure: Fresh cow milk was standardized to 85'C for 10 min. The milk was divided in to 4 portions. The first portion was not fortified with iron and regarded as a control. The remaining 3 portions were fortified with iron respectively at a level of 20 mg. 40 and 60 mg iron/ kg milk. The milk was cooled to 42˚C. Inoculated with matsun culture and titled in to 500 ml plastic cups. Covered and incubated at 42˚C until a firm curd was formed. Matsun samples were chemically examined when fresh and after 3,5 and 7 days of refrigerating at 5˚C.Data in Tables 1-3 how the effect of iron salt fortification on total solids, total protein, acidity, yogurt moisture, ash content and fat content of yogurt during storage respectively.

Table. 1. Effect of iron Salt Fortification on Total Solids (%) and Acidity of Matsun during Storage

		Ferrous sulphate. Mg/kg					Ferrous sulphate. Mg/kg		
Storage period days	Control	20	40	60	Storage period days	Control	20	40	60
Fresh	13,10	13.33	13.35	13.37	Fresh	132	134	140	156
3	13,12	13.35	13.37	13.38	3	150	153	158	162
5	13,14	13.37	13.38	13.38	5	152	158	162	166
7	13.17	13.38	13.39	13.39	7	158	169	168	171

Table. 2. Effect of iron Fortification on Yogurt Moisture (%) and on Fat Content(%) during Storage

	Ferrous sulphate. Mg/kg			Ferrous sulphate. Mg/kg					
Storage period days	Control	20	40	60	Storage period days	Control	20	40	60
Fresh	85.0	85.0	85.0	85.0	Fresh	3.1	3.1	3.1	3.0
3	85.1	85.1	85.0	85.1	3	3.0	3.1	3.0	3.0
5	85.1	85.1	85.1	85.1	5	3.0	3.0	3.9	3.9
7	85.2	85.2	85.2	85.2	7	3.9	3.8	3.8	3.8

Table. 3. Effect of iron Salt Fortification of Matsun on Total Protein (%) and on the Ash Content(%) during Dtorage

		Ferrous sulphate. Mg/kg					Ferrous sulphate. Mg/kg		
Storage period days	Control	20	40	60	Storage period days	Control	20	40	60
Fresh	3.10	3.11	3.12	3.12	Fresh	0.610	0.611	0.700	0.708
3	3.12	3.13	3.14	3.15	3	0.612	0.613	0.702	0.710
5	3.15	3.16	3.17	3.18	5	0.612	0.615	0.704	0.712
1	3.17	3.17	3.18	3.19	7	0.614	0.617	0.706	0.716

Statistical Analysis: The obtained data were subjected to analysis of variance (ANOVA) according to Snedecor and Cochran [14].

ISSN: 0975-8585

Hypothesises:

First hypothesis:

H_0 Hypothesis**:** Fe- enriched yoghurt dry matter doesn't change over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

H_1 Hypothesis: Fe- enriched yoghurt dry matter changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

Table1 : ANOVA
Effect of time on Fe-enriched yoghurt (3 percent)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.170	3	.057	130.349	**.000**
Within Groups	.005	12	.000		
Total	.175	15			

The column with the significance level value should be considered that equals 0.000 here and is smaller than 0.05. This rejects the H_0 Hypothesis therefore the equal-mean hypothesis among categories are rejected. It means that there are significant mean dry matter content in yoghurt over time and time has significant effects on Fe-enriched yoghurt.

Second hypothesis:

H_0 Hypothesis**:** Fe- enriched yoghurt doesn't change with different dry matter content (four groups: control, 20 mg, 40 mg, and 60 mg).

H_1 Hypothesis: Fe- enriched yoghurt changes with different dry matter content (four groups: control, 20 mg, 40 mg, and 60 mg).

ANOVA :**Table2**
Effect of different dry matter content on Fe-enriched yoghurt (3 percent)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.004	3	.001	.102	**.957**
Within Groups	.171	12	.014		
Total	.175	15			

The column with the significance level value should be considered that equals 0.957 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that there is no significant mean dry matter content in yoghurt over time and time has no significant effects on Fe-enriched yoghurt.

Third hypothesis:

H_0 Hypothesis**:** Acidity (pH) doesn't change over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

H_1 Hypothesis: Acidity (pH) changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

ISSN: 0975-8585

Table3 : ANOVA
Effect of time on acidity

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	517.188	3	172.396	1.350	**.305**
Within Groups	1532.750	12	127.729		
Total	2049.937	15			

The column with the significance level value should be considered that equals 0.305 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that mean acidity is not significant over time and time has no significant effects on acidity.

Fourth hypothesis:

H_0 Hypothesis**:** Acidity doesn't change with different dry matter content (four groups: control, 20 mg, 40 mg, and 60 mg).

H_1 Hypothesis: Acidity changes with different dry matter content (four groups: control, 20 mg, 40 mg, and 60 mg).

Table4 : ANOVA
Effect of different enrichment percentage on acidity

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1405.188	3	468.396	8.718	**.002**
Within Groups	644.750	12	53.729		
Total	2049.937	15			

The column with the significance level value should be considered that equals 0.002 here and is smaller than 0.05. This rejects the H_0 Hypothesis therefore the equal-mean hypothesis among categories is rejected. It means that there are significant mean acidity values among others and different enrichment percentage has significant effects on Acidity.

Fifth hypothesis:

H_0 Hypothesis**:** Fat content in yoghurt doesn't change over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

H_1 Hypothesis: Fat content in yoghurt changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

Table5 : ANOVA
Effect of time on fat content in yoghurt

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.113	3	.038	.232	**.873**
Within Groups	1.952	12	.163		
Total	2.065	15			

The column with the significance level value should be considered that equals 0.873 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that mean fat content in yoghurt is not significant over time and time has no significant effects on fat content in yoghurt.

ISSN: 0975-8585

Sixth hypothesis:

H_0 Hypothesis**:** Fat content in yoghurt doesn't change with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

H_1 Hypothesis: Fat content in yoghurt changes with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

Table6 : ANOVA
Effect of different enrichment percentage on Fat content in yoghurt

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.767	3	.256	2.468	**.112**
Within Groups	1.243	12	.104		
Total	2.010	15			

The column with the significance level value should be considered that equals 0.112 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that mean fat content in yoghurt is not significant among different content amounts and different content enrichment percentage has no significant effects on fat content in yoghurt.

Seventh hypothesis:

H_0 Hypothesis**:** Moisture doesn't change over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

H_1 Hypothesis: Moisture changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

Table7 : ANOVA
Effect of time on moisture

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.007	3	.002	.429	**.736**
Within Groups	.070	12	.006		
Total	.077	15			

The column with the significance level value should be considered that equals 0.736 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that mean Moisture is not significant over time and time has no significant effects on moisture.

Eighth hypothesis:

H_0 Hypothesis**:** Moisture content doesn't change with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

H_1 Hypothesis: Moisture content changes with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

Table8 : ANOVA
Effect of different content on moisture

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.088	3	.029	35.000	**.000**
Within Groups	.010	12	.001		
Total	.098	15			

ISSN: 0975-8585

The column with the significance level value should be considered that equals 0.000 here and is smaller than 0.05. This rejects the H_0 Hypothesis therefore the equal-mean hypothesis among categories is rejected. It means that there are significant mean moisture content values among others and different enrichment percentage has significant effects on moisture content.

Ninth hypothesis:

H_0 Hypothesis**:** Protein doesn't change over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

H_1 Hypothesis: Protein changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).

Table9 : ANOVA
Effect of time on protein

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.001	3	.000	.555	**.655**
Within Groups	.010	12	.001		
Total	.012	15			

The column with the significance level value should be considered that equals 0.655 here and is more than 0.05. This supports the H_0 Hypothesis therefore the equal-mean hypothesis among categories is accepted. It means that mean protein content is not significant over time and time has no significant effects on protein content.

Tenth hypothesis:

H_0 Hypothesis**:** Protein content doesn't change with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

H_1 Hypothesis: Protein content changes with different dry matter content enrichment (four groups: control, 20 mg, 40 mg, and 60 mg).

Table10 : ANOVA
Effect of different content enrichment on protein

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.010	3	.003	26.710	**.000**
Within Groups	.002	12	.000		
Total	.012	15			

The column with the significance level value should be considered that equals 0.000 here and is smaller than 0.05. This rejects the H_0 Hypothesis therefore the equal-mean hypothesis among categories is rejected. It means that there are significant mean protein content values among others and different enrichment percentage has significant effects on protein content.

RESULTS

Fe- enriched yoghurt dry matter changes over time (four groups: fresh, after 3 days, after 5 days, after 7 days).time has no significant effects on Fe-enriched yoghurt with different dry matter content. Acidity is not significant over time and time has no significant effects on acidity. There are significant mean acidity values among others and different enrichment percentage has significant effects on Acidity. Fat content in yoghurt is not significant over time and time has no significant effects on fat content in yoghurt. Fat content in yoghurt is not significant among different content amounts and different content enrichment percentage has no significant effects on fat content in yoghurt. Moisture is not significant over time and time has no significant effects on moisture. There are significant mean moisture content values among others and different enrichment percentage has significant effects on moisture content. Protein content is not significant over time

and time has no significant effects on protein content. There are significant mean protein content values among others and different enrichment percentage has significant effects on protein content.

REFERENCES

[1] Walker. A.R. the Remedying of Iron Deficiency. Bromatological J. nutr. 1998. 79(5): 227-235.

[2] Baynes, R.D. and Bothwell, T.H. (1990). Iron Deficiency. Annual Review of Nutrition, 10: 133-140

[3] Hekmat, S. and D.J. McMahon, 1997. Manufacture and quality of iron-fortified yogurt. J. Dairy Sci., 80: 3114-3122.

[4] Mehanna, N.M., T.M. Saleh, A.S. Mehanna and S.M.A. El-Asfory, 2000. Composition and some properties of Zabady made from iron-fortified buffalo's milk. Egypt. J. Dairy Sci., 28: 183-194.

[5] Kim, S.J., J.Ahn, J.S. Seok and H.S. Kwak, 2003. Microencapsulated iron for drink yogurt fortification. Asian-Australasian J. Anim. Sci., 16: 581-587.

[6] Osman, M.M. and M.M Ismail, 2004. Effect of fortification with zinc; iron and ascorbic acid on the chemical; microbiological and organoleptic properties of buffaloe's bio-yoghurt. J. Agric. Sci. Mansoura Univ., 29: 237-251.

[7] Simova, E., G. Ivanov and Z. Simov, 2008. Growth and activity of Bulgarian yogurt starter culture in iron-fortified milk. J. Industrial Microbiology and Biotechnol., 35: 1109-1115.

[8] Azzam, M.A., 2009. Effect of fortification with iron-whey protein complex on quality of yoghurt. Egypt. J. Dairy Sci., 37: 55-63.

[9] Jackson, L.S. and K. Lee, 1992. Fortification of cheese with microencapsulated iron. Cultured Dairy Products J., 56: 1-7.

[10] Abd-Rabou, N.S., M.A. Hofi and H.M. Abbas, 1999. Effect of milk enrichment with different Sources of zinc on the Properties of yoghurt. J. Agric. Sci. Mansoura Univ., 24: 837-845.

[11] Sadler, A.M., D.E. Lacroix and J.A. Alford, 1973. Iron content of Baker's and cottage cheese made from fortified skim milks. J. Dairy Sci., 56: 1267-1270.

[12] Zhang, D. and A.W. Mahoney, 1989. Bioavailability of iron-milk-Protein complexes and fortified Cheddar cheese. J. Dairy Sci., 72: 2845-2855.

[13] Zhang, D. and A.W. Mahoney, 1991. Iron fortification of process Cheddar cheese. J. Dairy Sci., 74: 353-358.

[14] Snedecor, G.W. and W.G. Cochran, 1989.Statistical Methods, Eighth Edition, Iowa State University Press.