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EFFECT OF SOME NUTRITIONAL ADDITIVES ON YOGHURT PROPERTIES

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ABSTRACT

The objective of this work was to study the effect of different dietary fibers on the rheologyical , physicochemical and sensory properties of yoghurts fortified with these fibers . Ground wheat germs , flour oat's ,fibers of top of sugar can and ground barely addition were used and added at 0.5, 1.0,1.5 and 2.0% (w/w) to yoghurt milk. Yoghurt samples prepared with nutritional additives or traditional were compared. Results show the changes in the chemical and sensory properties of Yoghurt from different treatments were followed during storage at refrigerator (4-5°C) for 15 days. As the percentage of food additives increased the coagulation time decrease. Total solid ,ash on dry matter, soluble nitrogen ,non protein nitrogen on total nitrogen and total volatile fatty acid increased in all treatments but fat on dry matter values decrease compare with control cow's yoghurt. Titratable acidity values of various yoghurt treatments gradually increased during storage period 15 days. pH value was of opposite behavior of titratable acidity for all treatments of yoghurt made from buffaloe's and cow's milk .It could be observed from the organoleptic scoring that both oat and barley treatments were the best additives for improving the body characteristics of cow's yoghurt to be compare with that made from buffalo's milk one.

INTRODUCTION

Many years ago several types of fermented milk in the Middle East area were known .They were originally made by the natural microflora of milk by the time people gained the experience how to prolong the shelf life of their fermented products by concentrating the total solids of product by draining off the whey like Yoghurt , Labneh , Kariesh cheese and Laban El-zeer or by drying in hot place after mixing with some grains like in Kishk. As they are easily digested ,Tatochenko,(1972) mentioned that cultured milk , rather than fresh , is the preferred weaning food for infants. It is also found by many investigators that cultured milk contains high amounts of vitamins , especially B group. Fermentation of milk was used as a means of preserving a highly perishable product and to produce new flavors for an old food staple. In the early years of milk fermentation, milk was simply allowed to be fermented by its normal microbiota, but the actual process was not completely understood. Cultures could be maintained by inoculating fresh milk with fermented milk. (Kerr and McHale 2001) . Today, lactic acid-producing microorganisms are added to milk to decrease the pH of the milk and produce many different fermented milk products such as Yoghurt or Zabady which is a dairy product produced by bacterial fermentation of milk. The bacteria used to make Yoghurt are known as Yoghurt culture" *Lactobacillus delbrueckii subsp.*

bulgaricus and Sterptococcus thermophilus bacteria. Since fermented milk is a main dairy product consumed by most of Egyptian people , no fibers are included in such product , it is of good use to try adding some milled grains to raise the yield and the nutritive value of Yoghurt such as wheat germ , oat ,fiber of top of sugar can and barley.Wheat germ is a concentrated source of several essential nutrients including vitamin E, folate (folic acid) , phosphours, thiamin ,Zinc and magnesium. It is a good source of fiber .Wheat germ can be added to protein shakes, casseroles, muffins, pancakes, cereals, yoghurt smoothies, cookies, and other goods. The common oat (Avena sativa) is a species of cereal grain grown for its seed, which is known by the same name (usually in the plural, unlike other grains). While oats are suitable for human consumption as oatmeal and rolled oats. Oats have numerous uses in food; most commonly, they are rolled or crushed into oatmeal or ground into fine oat flour. Sugar cane belongs to the grass family (Poaceae), an economically important seed plant family that includes maize, wheat, rice, and sorghum and many forage crops. The main product of sugarcane is sucrose, which accumulates in the stalk internodes. Also barley is a major cereal grain , a member of the grass family .It is an important feed grain in many areas of the world not typically suited for maize production, especially in northern climates - for example, northern and eastern Europe.

The main aim of this work was to evaluate the effects of addition of different levels of ground wheat germs , flour oat, fibers of top of sugar can and ground barley on properties and nutritive value of Yoghurt.

MATERIALS AND METHODS

Fresh morning buffaloe's milk which was used in this study having 16.63% T.S , 6.2% fat , 4.12 % protein , 0.94% ash , 0.17% acidity and pH 6.65 was obtained from private farm in Dakahlia Governerat .While fresh cow'milk was obtained from El-Serw Animal Production Research Station, having 12.01% T.S, 3.8% Fat, 2.74% protein, 0.89% ash , 0.16% acidity and pH 6.66. The yoghurt starter culture used was obtained from Ch. Hansen's Laboratories , Denmark . Lypholized starter culture of Streptococcus saliverus subsp. thermophilus and lactobacillus delbrukii subsp. bulgaricus were separately activated by culturing in 15% sterilized reconstituted skim milk. Wheat germ was obtained from Banha, mill company , Egypt. having 12.7% moisture , 21.68% protein , 10.8% fat , 1.88% crude fiber , 3.51% ash and 64.11% carbohydrates. Oats was obtained from Sun Oil L.T.D. England having 341kcal/per 100g oats , 57.0g carbohydrates and 7.0g fat . Whole top of can powder (not cleaning) having 8.49% moisture , 4.07% ash , 3.1% protein , 0.6% fat and 41.22% fibers.Barley was obtained from El-Tisseer company of Egypt .157g barley having 193 calories , 3.5g protein, 0.7g fat , 0 cholesterol, 44g carbohydrate, 6g total dietary fiber, 17mg ca, 2mg iron , 35mg magnesium, 85mg phosphorus, 146mg potassium, 5mg sodium, 1.2mg zinc, 0.16mg copper , 0.4mg manganese, 13.4mcg selenium , 0.13mg thiamine, 1.09 riboflavin , 3.23mg niacin , 0.21mg pantothenic acid , 25mg

folate , 11 IU Vit A, 0.01mg Vit E , 1.25mcgVit K , melatonin hormone and Beta-glucon .

Yoghurt manufacture:

Buffalo's or cow's milk were heated at 90°C/5 min, Buffalo milk was left without additive to be control .A portion of cow milk were divided into 17 equal portions . For all treatments 0.5,1.0,1.5 and 2% were separately added at 90°C . well stirred, then the milk was strained. 2% Yoghurt starter *Streptococcus salivarius* subsp. *Thermophillus and Lactobacillus delbruckii subsp. Bulgaricus* was added to each portion of milk at 42°C

Each milk was distributed into 100 mL in plastic cups, the cups incubated at 42°C until a firm curd was formed. The resultant yoghurt was stored in a refrigerator (4-5°C) for 15 days.

Rheological tests:

Coagulation time, taken as a measure of the starter stability was observed by the visual method used by Berridge (1952) and Davies and White (1958).

Curd tension is determined by using the method of Chandrasekhara *et al.*, (1957)

Rate of yoghurt curd syneresis at room temperature (25-30°C) was 40 measured as given by Mehanna and Mehanna (1989)

Chemical analysis

Moisture content , fat content , titratable acidity , total nitrogen, soluble nitrogen , non protein nitrogen were estimated according to the methods describing by ling (1963).

pH values were measured using laboratory pH meter with glass electrodes (HANNA Digital) Instruments pH meter Hi , 8014 Italy .

The total volatile fatty acids of samples were determined as given by kosikowski (1978).

Yoghurt scoring

The Yoghurt samples were scored for organoleptic properties according to Nelson and Trout (1965) . 50 points were giving for flavour, 35 points for body and texture and 15 points for appearance.

RESULTS AND DISCUSSION

Table (1) shows the chemical composition of buffaloe's and cow's milk. The buffaloe's milk had higher percentage of T.S , fat , fat/TS , protein , P/TS and ash as compared with cow's milk.

Table (1): Physicochemical composition of buffalo and cow milk (Average of 3 replicates):

Composition / Type of milk	Acidity	pH	TS	Fat	Fat/TS	Protein	P/TS	Ash
Buffalo	0.17	6.65	16.63	6.2	37.28	4.12	24.77	0.94
Cow	0.16	6.66	12.01	3.8	31.16	2.74	22.81	0.89

Coagulation of different milk was done through starter fermentation. Effect of adding different percentage of wheat germs, oats , barley and

fibers of top of sugar can on coagulation time (CT), curd tension and curd syneresis values of different treatments were illustrated in Table (2).

It is clear that CT was the shortest (120 sec.) for buffaloe's milk as compared with cow's milk (140 sec.) while curd tension is higher .It is due to the higher total solids and casein found in buffaloe's milk as well the micelles of casein are stronger than cow milk casein.

Table (2): Some Rheological properties of different Yoghurt milks

Treatments	Percentage	CT (sec.)	Curd tension(gm)	Syneresis ml. of whey
Buffalo	Control	120	37.22	28.50
cow		140	25.90	33.78
Wheat germ	0.5%	150	25.40	30.90
	1.0%	147	25.50	30.20
	1.5%	144	25.50	28.50
	2.0%	140	25.53	26.60
Oat	0.5%	138	26.20	35.32
	1.0%	136	26.80	34.66
	1.5%	135	26.81	33.76
	2.0%	132	26.90	32.90
Top of sugar can	0.5%	135	24.90	31.77
	1.0%	133	24.93	31.65
	1.5%	132	24.98	31.32
	2.0%	130	25.10	30.28
Barley	0.5%	133	38.42	29.81
	1.0%	130	38.50	28.63
	1.5%	128	38.53	27.50
	2.0%	126	38.60	26.73

As the percentage of wheat germ increased , the CT paralleley decreased this may be owing to the increase in T.S (Table 4). No marked effect was observed in the curd tension of cow milk enriched with wheat germ flour. On the other hand syneresis was decreased as the portion of wheat germ flour increased. This may be due to the gelation effect of the flour of wheat germs. When oats flour was added to cow milk the CT is slightly increase having seconds 140,138, 136,135 and 132 for control ,0.5, 1.0 , 1.5 and 2% oat flour respectively , also the increase in curd tension was very slight. On the other hand the addition of oat flour increased the syneresis from 33.78 (control) to 35.32(0.5%) the increase of oat flour ratio decrease the syneresis values to reach 23.90 ml for 2% oat flour treatment. The addition of fiber of Top of sugar can decreased the CT as compared with control (140 sec.).The increase of fiber sugar can slightly decreased the CT being 135.133,132 and 130 seconds for 0.5,1.0,1.5 and 2.0% fiber of top of sugar can respectively. It seems that fibers of top of sugar can had no effect on syneresis .The addition of barley flour decreased the CT from 140 sec (control) to (133sec) for 0.5% barley . As the ratio of barley increased the CT decreased , as well very slight increase was observed for curd tension , values ranged between 38.42 to 38.60gm . On the other hand syneresis decreased from 29.81 for 0.5% barley to 26.73ml for 2.0% barley .These results agreement with Brennan and Tudorica (2008) who reported that used

barley beta-glucan, partially hydrolysed guar gum and inulin in the processing of low-fat yoghurts reduced product syneresis and improved the texture and rheological properties of the low-fat-based products so that their quality characteristics were similar to yoghurt made with full-fat milk.
Table (3) shows that the time of coagulation was the shortest (150 min.) for buffaloe's milk as compares with cow's milk (183 min.) also the coagulation was very firm .

Table (3):Effect of additives on the coagulation time of different Yoghurt treatments

Treatments	Percentage	Time of coagulation(min.)	Remarks
Buffalo	Control	150	Very firm coagulation
cow		183	Less firm
Wheat germ	0.5%	180	Less gelatinous texture
	1.0%	178	More gelatinous texture
	1.5%	176	Very gelatinous texture
	2.0%	174	Highly gelatinous texture
Oat	0.5%	176	Firm and the colour tends to white
	1.0%	170	Firm and the colour tends to white
	1.5%	164	Firm and the colour tends to white
	2.0%	160	Firm and the colour tends to light white
Top of sugar can	0.5%	174	Sticky – light yellow
	1.0%	172	Sticky – yellow
	1.5%	171	Sticky – intensive yellow
	2.0%	170	Sticky – dark yellow
Barley	0.5%	169	Firm- normal colour of cow yoghurt
	1.0%	163	More firm
	1.5%	160	Very firm
	2.0%	159	Highly firm

The addition of different flours and fibers markedly decreased the acid coagulation time of the resultant yoghurt as compared with cow control treatment. It seems that used additives had no inhibition effect on the starter activity .Sharma, Ekta (2011) reported that the addition of fiber to milk did not affect the fermentation time for the different supplemented yogurts to reach pH 4.6, thus there were no differences in the gelation time of the fortified yogurts by arabinogalactan. The decrease of time acid coagulation is may be due to the gelation effect of such flours and fibers. Barley flour had the shortest coagulation time (169 mintes) and the highest (180 min.) for flour of wheat germ .Firminess is important character for evaluation the firmented milk , lakely barley treatments gave very firm coagulation besides the accepted flavour. Top of sugar can fibers gave less texture and the colour changed to yellow .

Data of TS ,ash in dry matter and fat/DM through 15 days storage are given in Table (4).

As, it is expected , buffaloe's milk Yoghurt had higher percentage of T.S and ash /DM than those of yoghurt made from cow's milk .Although all additives were added at the same ratio , total solids of different yoghurt were not similar. The very marked observation is as the fiber increased in the additive, the TS was higher ,Top of sugar and barley flour had the highest

fiber and also had the highest TS and ash/DM. As a general, TS and ash/DM contents of all yoghurt treatments increased as storage period progressed. This may be attributed to moisture evaporation during yoghurt storage. These results are in disagreement with Vaini and Horman(1973) who showed that the decrease in total solids of yoghurt within storage might be largely due to the fermentation of lactose with the production of lactic acid, acetaldehyde and acetone. Barley treatments had the highest TS and ash/DM as compare with cow's treatments. TS contents of barley treatments during storage periods zero, 7, 15 days were 16.29 , 16.43 and 16.56 % respectively, followed by top of sugar can treatments which increased the TS of resultant Yoghurts and also increased during storage period, followed by oats treatments and recently wheat germ treatments. These result agreement with Fernandez-Garcia, Estrella (1998) who reported that addition of oat fiber and natural alternative sweeteners in the manufacture of plain Yogurt increasing total solids. All treatments increased whenever increase the addition percentage, for example wheat germ treatments 0.5, 1.0 , 1.5 and 2.0% had TS 14.00, 14.25,15.00 and 16.01 respectively .Wheat germ , oat , fibers of top of sugar can and barley treatments had ash higher than cow's treatment. The difference in ash content may be due to insoluble solids and fiber content which may contribute in increasing the ash content . Ghadge , *et al*. (2008) reported similar results when studied the effect of the fortification of various proportion of either apple fruit pulp or honey on the physico-chemical and sensory properties of buffalo milk yoghurt.
Buffaloe's milk Yoghurt contained higher fat than cow's milk Yoghurt. Eid , *et al.* (2009) reported similar results.

Table (4):Effect of some additives on TS, Ash and Ash/DM of Yoghurt during the storage period

Treatments	Percentage	TS			Ash/DM			Fat/DM		
		Storage periods (days)								
		0	7	15	0	7	15	0	7	15
Buffalo	Control	18.91	19.03	19.16	4.810	5.171	5.450	38.870	38.880	38.930
Cow		13.00	13.15	13.31	4.770	5.033	5.375	32.310	33.460	34.560
Wheat germ	0.5%	14.00	14.16	14.31	6.460	6.765	7.150	30.057	30.861	30.887
	1.0%	14.25	14.45	14.60	7.700	8.030	8.290	30.070	30.934	30.938
	1.5%	15.00	15.15	15.29	8.870	9.260	9.517	30.100	30.990	31.033
	2.0%	16.10	16.23	16.38	9.140	9.470	9.766	30.155	31.072	31.136
Oat	0.5%	14.10	14.26	14.39	6.520	6.872	7.304	30.070	30.990	32.100
	1.0%	14.70	14.87	14.90	7.820	8.040	8.300	30.075	31.000	32.148
	1.5%	15.15	15.30	15.44	9.040	9.350	9.560	30.079	31.026	32.150
	2.0%	16.11	16.26	16.38	9.370	9.656	9.910	30.081	31.027	32.356
Top of sugar can	0.5%	15.95	16.12	16.22	6.520	6.930	7.306	30.596	31.450	32.121
	1.0%	16.43	16.56	16.67	7.827	8.040	8.310	31.100	31.497	32.130
	1.5%	17.18	17.20	17.32	9.040	9.355	9.567	31.298	31.800	32.275
	2.0%	17.66	17.78	17.92	9.400	9.674	9.927	31.314	31.900	32.366
Barley	0.5%	16.29	16.43	16.56	6.570	6.940	7.307	31.000	31.830	32.186
	1.0%	16.72	16.86	16.98	7.830	8.050	8.400	31.220	32.000	32.197
	1.5%	17.19	17.34	17.51	9.070	9.400	9.572	31.410	32.240	32.55
	2.0%	17.70	17.85	18.03	9.490	9.720	9.956	31.548	32.258	32.723

The addition of flours and fibers decreased the fat/DM content of the yoghurt . By the end of storage fat/DM values of 2.0% additives were 34.560,

31.136,32.356, 32.366and 32.723 for control , wheat germ, oats , top of sugar can and barley respectively.

Data of total protein, WSN/TN,NPN/TN and TVFA of fresh yoghurt and during storage period were tabulated in Table (5). The above values of control yoghurt, and all treatments made from different milk markedly increased during storage period 15 days.

In spite of TP content of buffaloe's milk yoghurt was higher than that of cow's milk yoghurt, but WSN/TN of the later were higher than those of the former at the zero time and during storage period. Also, the rates of development of WSN/TN were higher in cow's milk yoghurt comparing with buffaloe's milk yoghurt which agreed with Eid , *et al.* (2009).

Addition of food additives such as wheat germ , oat , top of sugar can and barley on whole cow milk with different rates to made yoghurts increased the T.P these results agreements with Gogo , *et al.* (2012) who found that addition of egg white to milk yoghurt increased the total protein .

Barley yoghurts treatments had the highest total protein but wheat germ yoghurt treatments had the lower TP.

From the same table it is clear that cow milk yoghurt had higher SN/TN than buffalo milk yoghurt. It is well known that the hydrolysis of casein of cow milk is higher and quicker than those of buffalo milk casein. Increasing food additives concentration increased the WSN/TN , compared with control sample or yoghurt with low additives concentration (0.5%) these result agreement with Foda ,*et al.* (2007) which shows that increasing turmeric concentrations increased the WSN/TN (%) compared with control sample or yoghurt with low turmeric concentration (0.1%). Also, during cold storage the WSN/TN ratios significantly changed. This may suggest that turmeric powder had no inhibitory effect on proteolytic organisms. The proteinase activity of L. bulgaricus hydrolyses the casein to yield polypeptides and broken down by the peptidases of S. thermopilus with liberation of amino acids (Tamime and Robinson, 1985).

Total volatile fatty acids (TVFA) are taken as a measure of the degree of fat hydrolysis during storage. TVFA values of yoghurt at zero time and during storage period were also tabulated in Table (5) . As storage time increased, TVFA contents significantly increased in all yoghurt treatments. These increase may be due to small degree of lipolysis and also may be due to oxidative deamination and decarboxylation of amino acids, which convert the amino acids into its corresponding volatile fatty acids (Tamime and Robinson, 1999).TVFA of yoghurt manufactured from cow's milk was slightly higher than those of yoghurt made from buffaloe's milk.

Data of acidity and pH values of different treatments were tabulated in table (6). Titratable acidity values of various yoghurt treatments gradually increased during storage period 15 days. pH value was of opposite behavior of titratable acidity for all treatments of yoghurt made from buffaloe's and cow's milk during storage time, whereas, it was gradually decreased. Osman and Ismail (2004) stated that titratable acidity % and pH value significantly increased and decreased respectively during refrigerated storage of the bio-yoghurt.

Table (5):Effect of some additives on total protein, soluble protein ,non protein nitrogen and total volatile fatty acid of Yoghurt during the storage period

Treatments		Storage Period	TP%	WSN/TN%	NPN/TN%	TVFA%
Buffalo		0	5.040	13.420	4.300	6.0
		7	5.070	15.340	5.160	6.5
		15	5.110	16.850	5.870	6.7
Cow		0	4.400	18.110	6.377	6.7
		7	4.410	20.980	7.960	7.1
		15	4.450	22.060	9.170	7.7
Wheat germ	0.5%	0	4.421	20.780	6.926	6.8
		7	4.498	22.550	8.369	7.4
		15	4.555	24.510	9.524	7.7
	1.0%	0	4.542	20.930	7.022	7.1
		7	4.613	22.680	8.437	7.8
		15	4.664	24.620	9.576	8.1
	1.5%	0	4.785	21.070	7.067	7.4
		7	4.836	22.820	8.443	7.8
		15	4.970	24.260	9.243	8.3
	2.0%	0	5.230	21.220	7.073	7.9
		7	5.276	22.730	8.222	8.3
		15	5.321	23.620	9.352	8.8
Oat		0	4.440	20.830	7.040	6.9
	0.5%	7	4.504	23.370	8.498	7.3
		15	4.562	24.610	9.650	7.8
	1.0%	0	4.651	20.990	7.130	7.2
		7	4.683	23.433	8.583	7.9
		15	4.702	24.690	8.684	8.3
	1.5%	0	4.887	21.150	7.180	7.5
		7	4.932	23.545	8.670	7.5
		15	4.970	24.775	8.857	8.4
	2.0%	0	5.244	21.290	7.299	7.9
		7	5.289	23.640	8.685	8.4
		15	5.327	24.790	9.581	8.9
Top of sugar can		0	5.085	20.953	7.152	7.3
	0.5%	7	5.142	23.449	8.561	7.7
		15	5.174	24.661	9.741	8.2
	1.0%	0	5.346	21.002	7.160	7.7
		7	5.385	23.460	8.649	7.9
		15	5.423	24.706	9.765	8.4
	1.5%	0	5.595	21.208	7.298	8.0
		7	5.602	23.576	8.656	8.2
		15	5.640	24.887	9.842	8.5
	2.0%	0	5.799	21.342	7.371	8.3
		7	5.838	24.481	8.743	8.4
		15	5.876	25.624	9.881	9.0
Barley		0	5.295	20.964	7.229	7.5
	0.5%	7	5.334	23.564	8.612	7.9
		15	5.391	24.734	9.822	8.4
	1.0%	0	5.436	21.127	7.277	7.8
		7	5.487	23.605	8.721	8.0
		15	5.525	24.827	9.815	8.5
	1.5%	0	5.704	21.365	7.382	8.2
		7	5.755	23.614	8.758	8.4
		15	5.812	24.925	9.879	8.7
	2.0%	0	5.927	21.421	7.427	8.4
		7	5.978	24.546	8.751	8.5
		15	6.035	25.687	9.936	9.0

Table (6): Effect of some additives on Acidity and pH in different Yoghurt treatments

Treatments	Percentage	Acidity(as lactic acid)			pH value		
		Storage periods (days)					
		0	7	15	0	7	15
Buffalo	Control	0.780	0.880	0.950	4.66	4.64	4.60
Cow		0.960	1.040	1.110	4.28	4.23	4.22
Wheat germ	0.5%	0.970	1.050	1.120	4.27	4.21	4.2
	1.0%	0.992	1.075	1.160	4.25	4.17	4.16
	1.5%	1.014	1.100	1.200	4.24	4.16	4.14
	2.0%	1.060	1.150	1.250	4.22	4.15	4.12
Oat	0.5%	0.980	1.070	1.130	4.26	4.20	4.00
	1.0%	1.080	1.100	1.170	4.20	4.16	4.15
	1.5%	1.130	1.150	1.200	4.16	4.15	4.14
	2.0%	1.210	1.230	1.260	4.13	4.13	4.11
Top of sugar can	0.5%	1.130	1.200	1.270	4.16	4.14	4.10
	1.0%	1.210	1.300	1.350	4.13	3.98	3.94
	1.5%	1.260	1.340	1.390	4.11	3.95	3.92
	2.0%	1.300	1.370	1.420	3.99	3.93	3.90
Barley	0.5%	1.140	1.220	1.280	4.15	4.12	4.00
	1.0%	1.230	1.310	1.370	4.13	3.97	3.93
	1.5%	1.270	1.360	1.400	4.10	3.94	3.91
	2.0%	1.320	1.380	1.440	3.95	3.92	3.90

This may be due to fermentation of lactose, which produces the lactic and acetic acids during fermentation and storage period. Wheat germ treatments had the lower acidity as compare with each treatments followed by oat treatments. These result agree with Qureshi, *et al* ,(2012) who reported that the oat fiber yoghurt sample had a higher acidity as compare with control. The increased in acidity of yoghurt was mainly due to the oat fibers during storage which lactose is broken down to lactic acid. Top of sugar can 0.5% concentration were 1.13,1.20 and 1.27 within 0,7 and 15day. Yoghurt stabilized with 2% barley had higher acidity (1.32%) than residual treatments. By the end of storage time at 2.0% concentration , pH values were 4.12 , 4.11 , 3.90 and 3.90 for wheat germ , oat, top of sugar can and barley.

Results of the organoleptic scoring (Table 7) indicated that sensory evaluation scores of a different treatments of yoghurt shows some decrease with the advance of storage period. Also, yoghurt prepared from buffaloe's milk of different treatments had higher score point than that of cow's milk. The total score was 96 and 87 points for control buffaloe's and cow's milk yoghurt at zero time respectively these result agree with Eid , *et al* (2009). The increase of flours and fibers ratio decreased the scoring points. Wheat germ led to less scoring points for the produced yoghurt as compared with control due to less flavour scoring points. Oat treatments improved the body characteristics of the products and give the higher score than cow control treatment. Scoring points for oats treatments (0.5%) were 88,83 and 62 for fresh.10 and 15 day respectively. Fernandez *et al.*, (1998) reported that oat increased the apparent viscosity of yoghurt, while Ahmed *et al.*, (2010) mentioned that water binding capacity of B-glucan products increased than control products.

Table (7) : Organoleptic properties of different Yoghurt treatments

Treatments		Storage periods(days)	Color &Appearance(15)	Body & Texture (35)	Flavour (50)	Total (100)
Buffalo	Control	0	14	34	48	96
		7	13	30	44	87
		15	11	26	39	76
Cow		0	12	30	45	87
		7	10	27	42	79
		15	6	23	36	65
Wheat germ	0.5%	0	12	30	41	83
		7	12	29	38	79
		15	10	27	33	70
	1.0%	0	13	30	41	84
		7	13	30	35	78
		15	12	29	28	69
	1.5%	0	13	30	40	83
		7	13	29	34	76
		15	11	27	27	65
	2.0%	0	12	29	41	82
		7	12	29	33	74
		15	10	27	26	63
Oat	0.5%	0	13	32	43	88
		7	11	29	43	83
		15	5	24	33	62
	1.0%	0	12	32	44	88
		7	11	30	43	84
		15	4	25	32	61
	1.5%	0	12	32	43	87
		7	10	30	42	82
		15	3	26	30	59
	2.0%	0	12	32	43	87
		7	10	30	35	75
		15	9	23	27	59
Top of sugar can	0.5%	0	11	30	44	85
		7	10	28	43	81
		15	9	24	38	71
	1.0%	0	11	30	44	85
		7	10	28	42	80
		15	8	25	39	72
	1.5%	0	11	29	44	84
		7	10	27	43	81
		15	9	23	40	72
	2.0%	0	9	28	44	81
		7	8	26	43	77
		15	7	24	41	72
Barley	0.5%	0	13	33	43	89
		7	11	30	42	83
		15	10	29	40	79
	1.0%	0	13	34	42	89
		7	11	30	41	82
		15	10	29	40	79
	1.5%	0	12	34	41	87
		7	10	30	40	80
		15	9	28	40	77
	2.0%	0	12	35	41	88
		7	9	30	40	79
		15	8	28	39	75

Top of sugar can decreased the appearance even for fresh Yoghurt as compared with control treatments. The best treatments which had associated with the highest evaluation were barley treatments having pleasant appearance , strong texture and good flavour than other treatments.

CONCLUSION

In conclusion it could be observed from the organoleptic scoring that both oat and barley treatments were the best additives for improving the body characteristics of cow's yoghurt to be compare with that made from buffalo's milk one. So it could be recommended to use the both additives for improving cow's milk yoghurt.

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تأثير بعض الإضافات الغذائية على خواص الزبادي

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في الآونة الأخيرة اهتم الباحثون بالألياف الغذائية لما لها من أهمية غذائية وصحية كبيرة. لذلك فقد هدفت هذه الدراسة على تدعيم الزبادي بمواد غذائية غنية بالألياف مثل جنين القمح والشوفان والشعير وأيضا أليافا قصب السكر ودراسة تأثيرها على الزبادي من حيث التركيب الكيماوي والخواص الريولوجية والحسية وذلك من خلال إضافتها بنسب مختلفة 5, ، 1 ، 5, 1، 2% لكل إضافة على حدة عند صناعة الزبادي باستخدام لبن جاموسي كنترول ولبن بقرى وبادئ زبادي.

وقد أوضحت الدراسة النتائج التالية:

1- بزيادة نسبة الإضافة للزبادي يقل الوقت اللازم للتجبن.

2- وجدت زيادة في نسبة المواد الصلبة والرماد في المادة الجافة لكل المعاملات بالمقارنة بالزبادي البقرى الكنترول.

3- محتوى الدهن مقسوما على المادة الجافة انخفض في جميع المعاملات بالمقارنة بالزبادي الكنترول وتزداد نسبة الدهن بزيادة النسبة من الإضافة.

4- وجدت زيادة متدرجة في النيتروجين الذائب للزبادي خلال فترة التخزين.
5- تزداد الأحماض الدهنية الطيارة بزيادة نسبة الإضافة.
6- هناك زيادة ملحوظة في حموضة الزبادي خلال فترة التخزين في حين أخذت درجات ال pH اتجاه معاكس للحموضة.
7- سجلت الخصائص الحسية للزبادي قيم عالية لجميع معاملات الإضافة مما يعنى صفات حسية جيدة للزبادي.

ونستنتج من نتائج هذه الدراسة إن إضافة كلا من الشوفان ودقيق الشعير كانت أفضل الإضافات في تحسين خواص الزبادي المصنع من اللبن البقرى ليضاهى في صفاته ذلك المصنع من اللبن الجاموسى.

بتحكيم البحث

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