J. Food and Dairy Sci., Mansoura Univ., Vol. 6 (4): -, 2015

QUALITY IMPROVEMENT OF YOGHURT DRINK BY USING SOME MODERN APPLICATIONS :

1- Utilization of Sweet Whey and Some Dried Milk Products in Manufacture of Yoghurt Drink

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ABSTRACT

Yoghurt drink was made using cow's milk yoghurt (control) or yoghurt fortified with skim milk powder (SMP) or milk protein concentrate (MPC) or whey protein concentrate (WPC).The fortification ratios were 0.5%, 1.0%, 1.5% and 2.0% from above materials respectively. The prepared yoghurt mixes were heated to 85°C/20 min, then cooled to 42°C to be ready for inoculation with 2% yoghurt starter and incubation at 40°C until setting. Resultant yoghurt was mixed with15% (w/w) sweet whey well in the blender for homogenization, then cooled in refrigerator at 5+ 2°C and stored for 12 days. The addition powders had a significant effect on pH and acidity of different yoghurt drink samples .Increasing of milk powders increased T.S, via protein content .The viscosity values were increased as the percentage of additives increased which decreased wheying off since the lowest wheying off was noticed in MPC samples followed by SMP and last for WPC treated samples. Organoleptically, all fresh samples had the best score and accepted for 3 and 6 days of storage

INTRODUCTION

Sweet whey or unsalty whey is the liquid remaining after milk has been curdled and strained. It is a by-product during the making of rennet types of hard cheese like Ras or Cheddar and Swiss cheese or after precipitation of casein and has several commercial uses. It contain several biological and nutritional components such as riboflavin, α lacta albumin, β lactoglobuline. The amino acid composition of whey protein is advantageous in the preventation of the cardiovascular diseases and whey protein is considered as carcinogens (Roman *et al*. , 2011) . Some of the oligosaccharides and probiotics in whey is a considered also as an important source of calcium and numerous B-Vitamins (Diaz *et al*. ,2004, Homonnay and Koncz, 2005 and Roman *et al.* , 2011)

Using some additives as milk protein concentrate, skim milk powder and whey protein concentrate in the processing of yoghurt drink has proven to be useful from different aspects, as their benefits due to nutrional value, functional properties and health attributes. (Marshall and Harper, 1987; Salem *et al*, 1987 ; AbdRabo *et al,* 1988 ; El-Neshawy *et al,* 1988 ; Nakazawa *et al*, 1991; Koyolczuk and Maheut 1991 and Shammet *et al* 1992)

Many researchers studied the effect of using dried milk in manufacture of dairy fermented milks especially on rheological properties .They found that an improving of firm, curd tension ,curd syneresis as well sensoric properties in the final products (Abd El-salam et al. 1991; Guinee et al. 1995; Dave and Shah, 1998; El-Sheikh, 2001; Bhuller et al. 2002; Badran, 2004; Moussa,

2004; Sakr, 2004 and Akalin et al. 2012)

The present study is mainly concerned with improving the quality and keeping quality of yoghurt drink via preventing wheying off and increasing viscosity of the product by using sweet whey and dried milk products Milk protein concentrate (MPC), skim milk powder (SMP) and whey protein concentrate (WPC) were used in this respect.

MATERIALS AND METHODS

Materials:

Milk: Cow's milk was obtained from the herd of Animal Production Research Station (APRS), Al- Gemmaiza , having 11.70% TS , 3.0 % fat and 2.8 % protein. Sweet whey: It was obtained after manufacturing of Ras Cheese ,Dairy Technology Department, APRS, Al-Gemmaiza. Its average chemical composition was total solids (5.36 %) , fat (0.50 %) , protein (0.80 %) with acidity (0.10 %). Skim milk powder: (SMP) imported from Germany, having 4 % Moisture, 34% protein as mini., 1.25% fat as max. and 96 % total solids. Milk protein concentrate: (MPC) imported from New Zealand, having 69.80% protein, 17.20% lactose, 7.20%minerals, 4.40% moisture and 1.40% milk fat. Whey protein concentrate (WPC) from Turkey, having 1.5% fat, 11% protein, 4% moisture and 75% lactose. Lactic culture: *Stretpococcus theremophillus* and *Lactobacillus delbrueckii ssp. bulgaricus* DVS, MA016, 20M. Texel, France

Methods:

Yoghurt Drink Processing: Yoghurt was manufactured as described by Tamime & Robinson, 1985, and used for making yoghurt drink (YD) by dilution with sweet whey at 15% level.

Method of analysis: Titratable acidity of milk, sweet whey and YD It was determined as given by ling (1963). The results were recorded as percentage of Lactic acid. Total solids and Fat contents, were determined according to the methods described by AOAC (1994) for milk, sweet whey and YD. Total protein (TP) It was calculated after determination of total nitrogen content by means of micro- kheldahle as given by Ling, (1963) as follows: Total protein (%) = TN (%) X 6.38. Soluble nitrogen (SN) It was estimated according to ling (1963). Total volatile fatty acid (TVFA)It was determined by a direct distillation method according to Kosikowski (1978).The results were expressed as ml. 0.1 N NaoH/100g sample (YD). Wheying off: The amount of whey separated from YD samples was measured after keeping the YD bottles settled for the storage time in the refrigerator. The separated upper layer of whey was collected by means of syringe. The amount of collected whey was measured using a graduated cylinder (Hatem, 1996). Viscosity: It was determined by using a digital Brookfield Viscometer (ModelLVDV-E, Brookfield Engineering Laboratories, Inc. USA according to Atherton and Newlander(2000). Organoleptic properties evaluation: this was done by 10 specialists from Al-Gemmaiza APRS, Dairy technology department. The samples were donated to the judgers for giving their opinions according to scoring card according to Farag*, et al*., (2007).

Statistical analysis: Analysis of variance and Duncan□s test as well as average and standard error (SE) were carried out using computer program (SPSS) 1999.

RESULTS AND DISCUSSION

Titratable acidity: Figure (1) shows that, values of acidity in yoghurt drink (YD) markedly increased in the treated samples as compared with the control during progressing of storage period. For 12 days old YD, no significant differences were detected between the control and other treatments. These results are in accordance with those reported by Kebary and Hussein (1999) and Badran (2004).

Fig. (1) Impact of using sweet whey and some dried milk products on acidity (%) of fresh and stored yoghurt drink.

Total solids content (TS): Total solids of the different drinks are shown in Fig. (2), for all treatments as percentage of additive increased lead to increasing of Total Solids (TS) in the final product was increased. It is observed little increase in the TS samples during the storage period owing to the evaporation of water on the inner surface of the container. Similar trend was obtained by Atwa et al. (2008) who reported that the (TS) content of yoghurt slightly increased during the storage period.

Fig. (2): Impact of using sweet whey and some dried milk products on TS (%) of fresh and stored yoghurt drink

Fat Content: Fig. (3) shows the variations of fat content which decreased by increasing of additives levels in fresh and stored samples. As the storage period progressed, the fat content slightly decreased for all treated samples. These results are in accordance with those obtained by Hanafy (1995) who made yoghurt drink with skim milk and observed that fat content decreased in the final product during the storage.

Fig (3): Impact of using sweet whey and some dried milk products on fat content of fresh and stored yoghurt drink

Total protein content (TP): The total protein content is illustrated in Fig. (4). It increased as a result of adding SMP, MPC or WPC. MPC treatment samples had the highest values of TP while the control recorded a minimum content then WPC - treated samples. For all treatments as the storage period progressed, a little increase in TP content was observed. These results are in agreement with Mehanna and Mehanna (1989) and Badran (2004), who showed that TP content of yoghurt significantly, decrease by decreasing fortification of cow's milk with non-fat dry milk.

Fig. (4): Impact of using sweet whey and some dried milk products on TP content of fresh and stored yoghurt drink

Soluble Nitrogen content (SN): values of (SN) are illustrated in Fig. (5). Results showed non-significant differences between the control and the other treated samples at fresh and stored states. The comparison between fresh and 12 days old samples showed significant increase in SN values for all treated samples. Similar results were reported by Shenana et al. (2007). However, SN values gradually increased during the storage period for all yoghurt drink samples until the end of storage.

Fig. (5) : Impact of using sweet whey and some dried milk products on SN content of fresh and stored yoghurt drink

Total volatile fatty acids content (TVFA): Fig. (6) reveals TVFA found in YD from different treatments. For all treatments, as the storage period progressed lead to increase TVFA values. Slight increase was detected for some treatments as the concentration increase TVFA values ranged between 8.00 and 9.00 ml. 0.1 N NaOH/100 ml yoghurt drink for fresh samples, after 12 days values ranged between 10.00 and 12.33 0.1 N NaOH/100ml. The percentages of increase were 25, 33.33, 33.33 and 36.66 for control, 2% SMP, 2% MPC and 2% WPC treatments respectively. General treand of this property was similar as obtained by Shenana et al (2007).

Wheying off values: Fig. (7) shows the amount of whey separated. Using dried milk products additives caused a significantly decrease of wheying off values. It is clear in WPC treatment then MPC and SMP treated samples respectively. During storage period, all treated samples had increment of whey exuded until the end of storage. A better results were recorded in treatment of 0.5% WPC with a lower amount of wheying off. These results are accordance with Hatem (1996). Similar results were also obtained by El-Wahsh (2013) who showed that the use of WP instead of SMP significantly decreased the scores given for wheying off.

Fig. (6) : Impact of using sweet whey and some dried milk products on TVFA (0.1 N NaOH/100g) of fresh and stored yoghurt drink

Fig. (7): Impact of using sweet whey and some dried milk products on whey-off (ml) of fresh and stored yoghurt drink

Viscosity values: The viscosity values of different treatment are illustrated in Fig. (8). For all treatments as the percentage of additive increased, the viscosity values also increased. The average was between 154.7 cp in the control and 283.5 cp in 2.0% MPC. Cp for fresh YD samples. After 12 days of storage, the viscosity values of all treatments decreased. The rate of decrease was noticed with decreasing of additives in all dried milk products samples. These results are in accordance with those obtained by Hanafy (1995) who showed that, the dilution with skim milk caused a gradual decrease in viscosity values in YD samples.

Fig. (8): Impact of using sweet whey and some dried milk products on viscosity of fresh and stored yoghurt drink

Organoleptic properties: Table (1) reveals the score values of fresh and stored YD samples. In fresh case, 0.5% MPC and 0.5% WPC treated samples had a superior scores than the other treatments. On the contrary 2.0% SMP samples had the lowest score. Generally, the score values were decreased with increasing dried milk additives. The samples gained a lowest with advancing of storage period score than the fresh for all treatments. These decrease was recorded in all samples until the end of storage which remarkable in increasing percentages of dried milk additives. These results are in accordance with those reported by Hanafy (1995).

Table(1): Effect of using sweet whey and some dried milk products on the organoleptic properties of fresh and stored Yoghurt drink

Treatments	Storage period	Flavour (45)	Body & Texture (35)	Acidity (10)	Appearance (10)	Total (100)
Control	Fresh	42.50	31.50	8.75	9.00	91.75
	3 days	41.75	30.50	8.00	8.75	89.00
	6 days	41.00	29.75	7.50	8.00	86.25
	9 days	39.50	29.50	7.25	7.25	83.50
	12 days	37.00	28.50	6.50	6.50	78.50
SMP 0.5%	Fresh	42.75	32.75	9.00	9.00	93.50
	3 days	42.25	31.75	8.25	8.50	90.75
	6 days	41.25	30.75	8.00	8.25	88.25
	9 days	41.00	29.50	7.50	7.25	85.25
	12 days	38.75	27.75	7.25	6.50	80.25
SMP 1.0%	Fresh	44.25	34.00	9.50	9.75	97.50
	3 days	43.50	33.00	9.25	9.50	95.25
	6 days	42.50	32.00	8.75	9.25	92.50
	9 days	41.25	31.00	8.50	8.25	89.00
	12 days	39.50	29.75	8.25	8.00	85.50
SMP 1.5%	Fresh	42.50	31.25	8.75	8.50	91.00
	3 days	41.50	30.75	7.50	8.25	88.00
	6 days	40.75	29.50	7.25	7.50	85.00
	9 days	39.25	29.00	6.75	7.25	82.25
	12 days	37.25	27.25	6.50	6.50	77.50

Table(1): Continue

Treatments	Storage period	Flavour (45)	Body & Texture (35)	Acidity (10)	Appearance (10)	Total (100)
SMP 2.0%	Fresh	41.25	31.00	7.75	8.50	88.50
	3 days	40.25	30.50	7.25	7.50	85.50
	6 days	39.75	29.50	7.25	7.00	83.50
	9 days	38.00	27.75	7.00	6.75	79.50
	12 days	35.75	26.00	6.25	6.00	74.00
MPC 0.5%	Fresh	44.75	34.25	9.25	9.75	98.00
	3 days	44.00	33.25	9.25	9.50	96.00
	6 days	42.75	32.50	8.50	9.00	92.75
	9 days	41.75	31.50	8.25	8.50	90.00
	12 days	40.75	30.25	7.75	8.25	87.00
MPC 1.0%	Fresh	43.00	34.00	9.00	9.00	95.00
	3 days	42.00	33.00	9.00	8.50	92.50
	6 days	40.75	30.50	8.25	8.00	87.50
	9 days	40.75	30.00	7.00	7.75	85.50
	12 days	39.00	28.50	6.50	7.25	81.25
MPC 1.5%	Fresh	43.00	30.75	8.50	8.75	91.00
	3 days	42.00	30.25	8.25	8.00	88.50
	6 days	41.50	29.50	7.50	7.50	86.00
	9 days	39.50	29.25	7.25	7.00	83.00
	12 days	37.00	27.75	6.25	6.75	77.75
MPC 2.0%	Fresh	42.25	31.00	7.75	8.50	89.50
	3 days	41.25	29.75	7.50	7.75	86.25
	6 days	40.25	29.00	7.00	7.00	83.25
	9 days	39.00	28.00	6.50	6.50	80.00
	12 days	36.25	25.75	6.00	6.00	74.00
WPC 0.5 %	Fresh	43.25	33.75	9.75	9.75	96.50
	3 days	42.75	32.25	9.25	9.25	93.50
	6 days	41.75	31.75	8.25	9.00	90.75
	9 days	41.25	31.25	8.25	8.75	89.50
	12 days	39.75	29.75	7.50	8.00	85.00
WPC 1.0%	Fresh	43.00	33.25	9.00	9.50	94.75
	3 days	42.25	32.25	8.50	9.00	92.00
	6 days	40.75	30.50	8.25	8.75	88.25
	9 days	40.00	29.50	7.25	8.50	85.25
	12 days	39.50	27.75	7.25	8.00	82.50
WPC 1.5%	Fresh	42.50	32.00	8.50	9.00	92.00
	3 days	41.00	30.75	8.00	8.50	88.25
	6 days	40.50	30.00	7.50	8.25	86.25
	9 days	38.00	28.50	7.00	7.50	81.00
	12 days	37.25	28.00	6.50	7.25	79.00
WPC 2.0%	Fresh	41.50	30.50	8.25	8.75	89.00
	3 days	40.50	29.00	7.25	8.25	85.00
	6 days	39.75	28.25	7.25	8.25	83.50
	9 days	36.50	27.00	6.75	7.00	77.25
	12 days	35.00	26.25	6.25	6.75	74.25

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J. Food and Dairy Sci., Mansoura Univ., Vol. 6 (4), April , 2015

تحسين جودة مشروب اليوغورت باستخدام بعض التطبيقات الحديثة
١- استخدام الشرش الحلو ومنتجات الألبان المجففة فى صناعة مشروب اليوجورت

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اهتم البحث باستخدام الشرش الحلو الناتج من صناعة الجبن الراس بنسبة ١٥% فى تصنيع مشروب يوجورت من مشروب يوجورت مصنع باستخدام اللبن البقرى وبعض المنتجات اللبنية المجففة مثل (اللبن الفرز المجفف – مركز بروتين اللبن – مركز بروتين الشرش) بنسب ٠.٥ ، ١.٠ ، ١.٥ ، ٢.٠% من هذه المنتجات فى محاولة لتحسين جودة مشروب اليوجورت الناتج حيث تم تحليل مشروب اليوجورت فى بداية وخلال فترة التخزين فى الثلاجة لمدة ١٢ يوماً ، ويمكن توضيح نتائج الدراسة فيما يلى:

أدت هذه الإضافات إلى زيادة قيم الحموضة حيث زادت القيم فى عينات معاملات مركز بروتين الشرش. كما حدث زيادة فى قيم الجوامد الصلبة الكلية وكذا قيم البروتين وخاصة فى تلك العينات المصنعة باستخدام مركز بروتين اللبن تلاها عينات معاملات اللبن الفرز المجفف ثم عينات معاملات مركز بروتين الشرش ، كما حدث زيادة فى قيم الأحماض الدهنية الطيارة بالمقارنة بعينات الكنترول ، حدث زيادة فى قيم اللزوجة بزيادة نسب الإضافات من المنتجات اللبنية المجففة وخاصة فى العينات المصنعة باستخدام مركز بروتين اللبن ، كما أظهرت هذه العينات أقل معدل فى طرد الشرش تلاها معاملات مركز بروتين الشرش ثم اللبن الفرز المجفف ، كما أدت الإضافات المختلفة إلى تحسين الخواص الحسية لمشروب اليوغورت وكانت العينات الطازجة أفضل وظلت العينات مقبولة حتى ٦ أيام ثم قلت درجات التحكيم حتى نهاية فترة التخزين.