UTILIZATION OF PLANT SOURCES TO PRODUCE SHERBET

Sofie, Y. EL-Dairy, Neamah, R. Attalla and Eman, F. Mohamed

Animal Production Research Institute, Ministry of Agriculture, Dokki, Giza

SUMMARY

Different types of sherbets were manufactured using milk different by-products; permeate, sweet whey and butter milk with the application of slome fruit juices (mango, mandarin and tomato strawberry). Analysis of the mix and resultant sherbets showed that using butter milk increased the specific gravity, weight per/kg. and total solids, while it decreased pH values, overrun and melting resistant, followed by using sweet whey and permeate respectively compared with control. Using mango, mandarin and tomato strawberry improved the nutritional values of sherbets. Protein was between (4.91- 9.03g/100ml), calcium (69.6-183 /ml), potassium (211-367 ml/100ml), phosphorus(42.8 – 127.4ml/100ml), iron (1.13 – 2.56ml/100ml), Zinc (1.03 – 2 . 12ml/100 ml) and energy (129.69 - 174.76K cal/100g). Fortified sherbets with mango had the highest score followed by tomato strawberry and lastly was mandarin in all treatments.

Keywords: Sherbets, permeate– sweet whey- butter milk- mango, mandarin- tomato strawberry

INTRODUCTION

Permeate, sweet whey and buttermilk are the most common by- products of dairy industry resulted during production of ultrafiltrated cheese, kareish cheese and butter respectively. The economic and environmental cost for handling these by-products are of an increasing concern for the dairy industry beside the loss of valuable milk nutrients (Ab-Elsalam *et al.*, 2003). The actual of by-products being produced in Egypt are almost four folds of registered quantities. It means that these by products are available in enough quantities and can be utilized as raw materials for some other industries. Recent dietetic recommendations tend to increase the consumption of fruits and vegetables either fresh or by its incorporation in the diet. They are a major source of dietary fibers, minerals and vitamins. In addition, they contribute proteins, fat and carbohydrates.

Most people turned to consume sherbet as a refreshing intake with moderate energy level .Sherbets is a frozen confectionery made from water , milk fat (1-2%), milk total solids (2-5%), much lower overrun (25-45%), higher sugar content(25-35%).

MATERIAL AND METHODS

- Nido whole milk
- Sucrose from local super market.

- Buffalo's permeate sweet whey and butter milk were obtained from. the Unit of Dairy Industry , Dairy Technology Department ,Animal Production Research Institute, Agriculture Research Center, Giza..
- Glucose, Sigma- chemical- Company.
- Apple Pectin.

Fresh juice mango, mandarin and strawberry tomato prepared by using electric blender after removing seeds.

Sherbet mix

Each 750 of different mixes were prepared as mentioned in Arbuckle (1986) to contain in the final product (sherbet) 25% sugar, 0.3% pectin, 25% Fruit juice mix, 5% milk solids, 1.3% milk fat. to give 750 mg. using water, milk permeate, sweet whey and butter milk water as control, treatment (1), treatment (2), and treatment (3) respectively. Three control mixes from for the three treatments were prepared individually, heated to 85°C, cooled and aged to 4°C for 24^h, then frozen in an ice cream freezing machine (Lind & Polar's 1605, Italy). During freezing, 250g of the prepared fruit juices were added individually to each 750g mix to give 25% fruit in the resultant sherbet solution. Citric acid was added to make titratable acidity of the sherbet up to 0.35% as lactic acid (Arbukle, 1988). Different sherbet treatments were packed in 100 ml cups and hardened at -18C° in a freezing cabinet according to Rothwell (1976).

Method of analysis

The different sherbet mixes were analyzed for pH using pH meter digital Ionizer model (501 Italy), specific gravity according to Winton (1958), weigh per kilo gram according to Burke (1947), viscosity using Hoppler viscometer type BH2 No 644312 (Bhanumurthi *et al.*, 1972), melting resistance and overrun (Arbuckte, 1986), Organoloptic scoring (Rothwell.1960), protein and ash (O.A.C). fat and total solids (Ling 1963). Minerals: Calcium was determined according to Foulker & Neites (1982). Phosphorus was determined according to El-Merzabani *et al.* (1977). Potassium was determined according Sunder Man (1958). Zinc was determined by colorimetric method according to Honsher and Zak (1985).

RESULTS AND DISCUSSION

Chemical composition

Data presented in Table (1) shows that the contents of total solids, protein, Fat, ash and minerals in butter milk were higher as compared with those of whey and permeate (Kramsof *et al.*, 1986).

On the other hand; the pH values, total solids, carbohydrate, potassium and zinc were higher in mango as compared with those of mandarin and tomato strawberry sherbets, while protein, phosphorous and iron were higher in tomato strawberry as compared with those of mango and mandarin. Fruits and vegetables are a vital source of essential minerals, vitamins and dietary Fibers. They are well recognized to supply fair amounts of carbohydrates, proteins and energy (Kadam and Solunkhe, 1995).

Table 1. Chemical composition of raw materials used in sherbets mixes (100ml)

	Parameters	Permeate	whey	Butter milk	Mango	Mandarin	Strawberry Tomato
	Total solids/g	5.8	6.42	9.00	19.5	12.03	12.8
	Protein/g	0.15	0.9	3.05	0.34	0.44	1.1
	Carbohydrate/g	4.9	4.9	4.5	17.2	12.53	6.8
	Fat/g	0.01	0.3	0.5	0.41	0.18	0.16
	Ash/g	0.5	0.61	0.7	0.43	0.32	1.1
	pH value	6.6	6.4	5.9	4.75	4.17	3.93
Meniral/mg/ 100ml	Calcium	38.5	51.5	108.0	165.0	37.4	8.0
	Potassium	126.0	142.0	150.0	180.0	131.0	243.0
	Phosphorous	38.0	40.1	68..35	22.5	15.55	48.3
	Iron	0.05	0.072	0.1	0.42	0.39	1.51
	Zinc	0.09	0.1	0.58	053	0.51	0.12

Table (2) showed some increase in specific gravity and weight /kg in all treatments as compared to the control, especially when using butter milk with tomato strawberry.

Table 2. Some physiochemical properties of sherbets mixes based on permeate, sweet whey and butter milk

Treatments	pH value	Specific gravity g/cm^3	Weight (Kg)	Viscosity Cps Fresh	Viscosity Cps After 24^{hrs}
		Mango			
C	6.67	1.015	4.410	8.89	10.95
1	6.65	1.021	4.436	13.08	14.17
2	6.53	1.029	4.471	14.08	15.17
3	6.08	1.064	4.623	55.97	98.09
		Mandarin			
C	6.67	1.015	4.410	8.89	15.95
1	6.63	1.024	4.449	15.22	16.31
2	6.47	1.051	4.567	18.12	19.19
3	6.01	10.79	4.688	41.77	43.86
		Tomato strawberry			
C	6.67	1.015	4.410	8.89	10.95
1	6.63	1.029	4.471	17.34	18.42
2	6.47	1.059	4.603	20.14	21.20
3	6.04	1.082	4.703	45.84	46.89

Table (2) also revealed that the viscosity increased when using permeate, whey and butter milk respectively. Highest value was reached by using butter milk with mango. This can be attributed to the increase in acidity as reported by Mustafa *et al.*, (2001). Addition of permeate, sweet why and butter milk to different mixes increased viscosity compared with the control. The highest viscosity were in butter milk sherbets mixes due to the pH values and chemical compositions of butter milk (Sofie *et al.*, 1994).

Mix properties:

Table (2) indicates the properties of the control mix and 1, 2, 3, mixes before adding fruits into the freezing machine. It could be observed that the pH values were the highest in all mixes mixed with water, while it were the lowest in all mixes with butter milk. It is due to the decreased pH values in butter milk. (Shadia *et al.*, 1994).

Physicochemical Properties of the resultant sherbets

Table (3) outlines the physical properties of sherbets as affected by the addition of fruit juices. The addition of mango, mandarin, tomato strawberry had slightly affected the specific gravity and weight per kg. These results are in agreement with Salem (2003) and Gofour *et al*, (2007). Data of the same Table, show that sherbet made with sweet whey and tomato strawberry had the highest overrun value while using mango with butter milk led to lowest overrun, this is obviously related to the raw material of different fruits and milk by products (EL-Dairy, 1984). Regarding the rate of melting after 0.5,1 and 1.5 hours , Tomato strawberry sherbets melt faster then mandarin and mango sherbets. Also, it was clear that the melting rate decreased by using butter milk, control, permeate and sweet whey respectively.

Table 3. Some physiochemical properties of sherbets based on permeate, sweet whey and butter milk

Treatment	Specific gravityg/cm^3	Weight/Kg	Overrun	Melting %		
				30	60	90min
			Mango			
C	0.760	3.302	42.83	1.0	7.14	14.9
1	0.799	3.472	44.34	1.4	9.85	15.26
2	0.882	3.832	49.64	0.0	10.83	16.06
3	0.980	4.258	37.00	0.0	3.07	9.37
			Mandarin			
C	0.760	3.302	43.48	4.85	44.96	76.0
1	0.765	3.324	46.74	5.06	49.98	91.11
2	0.770	3.356	50.72	7.9	57.54	95.00
3	0.910	3.954	39.80	1.60	2.28	31.00
			Tomato strawberry			
C	0.760	3.302	46.83	15.03	52.73	80.40
1	0.771	3.350	48.00	16.80	62.22	96.10
2	0.779	3.385	53.37	18.56	68.8	98.00
3	0.928	4.032	42.00	8.28	26.73	30.41

From Table (4) it can be observed that mango sherbets had the highest total solids followed by tomato strawberry and lastly mandarin sherbets. Also, it can be noticed that total solids increased by using permeate whey and butter milk respectively. It was also noticed that using butter milk in sherbets gave the highest values of protein especially when mixed with tomato strawberry ,this could be due to the highest protein content in butter milk and tomato strawberry. Data indicated that using mango had the highest values of fat followed by mandarin and lastly tomato Strawberry (Kadam and Salunkhe, 1995).

Table 4. Chemical composition of sherbets based on permeates, sweet whey and butter Milk

Treat.	Total solid	Protein g/100ml	Fat g/100ml	Mineral mg/100ml					Energy Kcol/ 100ml
				Calcium	Phosphorous	Potassium	Iron	Zinc	
				Mango					
C	32.22	4.91	2.20	69.6	49.7	211.0	1.81	1.45	134.56
1	35.25	5.20	2.33	105.2	63.3	297.0	1.20	1.67	147.84
2	35.44	4.71	2.82	126.0	68.4	320.0	1.52	1.96	159.38
3	35.81	8.32	3.42	183.0	95.2	337.0	1.6	2.12	174.76
				Mandarin					
C	32.22	5.11	1.24	85.3	42.8	148.0	1.13	1.38	129.96
1	33.10	5.61	1.33	96.6	47.7	214.0	1.35	1.56	132.81
2	34.11	6.39	1.52	117.0	78.7	249.0	1.54	1.84	137.64
3	34.31	8.69	2.92	158.0	107.6	282.0	1.69	2.04	144.24
				Tomato strawberry					
C	32.22	5.71	1.07	58.1	67.0	263.0	2.04	1.03	126.76
1	35.00	5.83	1.11	67.0	65.6	339.0	2.12	1.15	140.03
2	35.22	6.63	1.41	89.0	99.3	358.0	2.38	1.29	140.33
3	35.47	9.03	2.53	127.0	127.4	367.0	2.56	1.63	144.69

Adding permeate, whey and butter milk to fruits we accompanied by high level of calcium, potassium and phosphorous as reported by (Hanaa *et al.*, 2007) and Abd-El Salam *et al*, (2007). The calcium content in mango sherbets with diary by products had the highest value (183 mg/100ml). the calcium content in mango was higher than that in other fruits being 165.0,37.4,8.0 mg/100ml for mango, mandarin and, tomato strawberry respectively. Studies indicate that calcium is the most abundant mineral in the body and 99% is found in the Skelton. A basic function of calcium is therefore to provide a strong framework for supporting and protecting delicate organs jointed to allow movement and malleable to allow growth. The addition of by-products to fruits improves the bioavailability of calcium (Kansal, 2002). Phosphorus is the second most abundant minerals in the body and about 80%is found in bones and teeth. Phosphorus is further involved in the control of appetite, in a manor not yet fully understood in the efficiency of food utilization (Ternouth, 1990). Phosphorus is arguably the meat potent of all the mineral elements. From the obtained results in Table (4) It was noticed that phosphorus content of sherbets varied between 42.8:127.4mg/100ml, the highest value was recorded with tomato strawberry sherbet with butter milk. On the other hand, potassium is the major intracellular ion in tissues. Many enzymes have specific requirements for potassium and element influences many intracellular resections involving phosphate with effect on enzyme activities and muscle contraction (Using 1960; Thompson, 1972). From the same Table we can observe that mango sherbet with butter milk gained the highest value of potassium. (307 mg/100ml).

Table (4) also shows that tomato strawberry with all by-products had the highest values of iron; Increasing iron content could be attributed to the higher content on raw materials of fruits themselves. The high iron content of these fruits can improve the iron content of sherbets with milk by-products which were considered as poor sources of Fe (Abd-EL-Salam, 2000). Approximately 60% of body iron is present as hemoglobin. On the other hand mango sherbets with milk by-products had the highest content of zinc. The most important functional property of zinc stand out for gene expression and appetite (Cousins, 1997). A number of trace elements (zinc, Fe) and other nutrients are strongly related to adequate immunize response this nutrients act together or separately to form an active immunize response. From Table (4) it could be observed that there is a slightly different in energy between tomato strawberry and mandarin sherbets. While mango sherbets had the highest energy, it is due to the higher content of carbohydrate of mango juice.

Sensory evaluation of different sherbets is recorded in Table (5). Generally it could be observed that mango sherbets with butter milk and tomato strawberry sherbets with butter milk flavors as well as their body and texture were more accepted by panel-tasting members than mandarin. Regarding sherbets with butter milk, flavor and body and texture was somehow heavy due to us higher total .solid and melting properties.

Table 5. Sensory evaluation of sherbets based permeate, sweet whey and butter Milk

Treatment	Flavor 50	Body & texture 40	Melting quality 10	Total (100)
		Mango		
C	43	37	7	87
1	46	39	8	93
2	47	39	8	94
3	49	40	9	98
		Mandarin		
C	38	36	6	80
1	44	38	8	90
2	45	38	8	91
3	46	39	9	94
		Tomato strawberry		
C	40	36	6	82
1	45	38	8	91
2	46	38	8	92
3	48	39	9	96

CONCLUSION

In conclusion, production of sherbets can be successfully made by using milk by-products (permeate, sweet whey and butter milk) fortified with mango, mandarin and tomato strawberry. These additives would rather exhibit more nutritional values and health benefits.

REFRENCES

Abd EL-Salam, M.H., 2000. Nutritive value on milk and milk products (in Arabic). General Book Organization, Cairo, Egypt.

Arbuckle, W.S., 1986. Ice cream. 4th ed. AVI Publishing company Inc. West port, Connecticut, USA.pp.26-259.

Bhanumurthi, J.L., K.S. Trhon., Y.R. Srinvasan and O. Samlik, 1972. Viscosity changes in sweetened condensed full cream buffalo milk during storage, Indian. J. Dairy Sci., 25:

Burke, A.D., 1947. Practical ice cream making Co. Milwaukee, Wisconsin U.S.A.

EL-Dairy, S.Y.T., 1984. Technological studies on flavored ice milk Ph. D. Ain Shams University Cairo.

El-Merzabani. M.M., A.A. EL-Aaer, and N.L. ZakHari, 1977. Phosphorus colorimetric method. J. clinic. Chem. Clinic. Biochem. 15:517-518.

Foulker, W.R. and S. Meites, 1982. Selected methods for the small clinical laboratory Washington, d. c. b 125.

Gafour. W. A., E.A.Y. Essawy and A.S. Salem, 2007. Incorporation of material antioxidants into ice cream. Egypt. J. Dairy Sic., 35:117-123.

Hanaa H. Elsayed, Shadia A. Freig and Aida S. Salem, 2007. Preparation and evaluation of new functional beverage. Proc. to the Egypt. Conf. Dairy Sci, &Techn., 211-225.

Kadam, S. S. and Salunkhe, 1995. D. K. Fruits in human nutrition, in handbook of fruit science and technology (D. K. Salunkhe and S. S. Kadan, eds). Marcel Dekker. New York, (1995 P.416).

Kransof, A., K. Poliamskie and K.O.L. Nekteren, 1986. Industries of Dairy by-products. Pub. Lightly and food Industries, Moscow.

Ling, E.R., 1963. Dairy chemistry Vol. II, practical Chapman and Hall, Ltd, London.

Marshall, R.T. and W.S. Arbuckl, 1996. Ice cream, fifth Edition. Chapman and Hall. Int. Thomson pub.

Mostafa, M.B.M., F.A. Abd-Malek and A.I. Okasha, 2001. Utilization of some dairy by-products in the manufactured of reduced cholesterol frozen yoghurt. Proc. 8th Egypt conf. Dairy Sci and Technol., 551.

Rothwell, J., 1960. Recent ice cream research (1954-1959). Dairy Sci.; Abst.22 (10) 484-486.

Rothwell, J., 1976. Ice cream, its present day manufacture and some problem. J. Society of Dairy Tech. 22(3): 161-166.

Salem. A.S., A.M. Abdel-Salam and S. EL-Shibiny, 2003. Preparation and properties of low fat and low sugar functional ice cream varieties. Egypt. J. Dairy Sci, 31:399.

Shadia A. Fikry , Soad. A. Ibrahim and Sofi.Y. EL-Dairy, 1994. Utilization of sweet butter milk and fresh skim milk in ice milk making, Egypt. J. Dairy Sci, 22:39-46.

Sofie, Y. EL Dairy, Soad A. Ibrahim and Shadia A. Fikry, 1994. Substitution of milk solids not fat with Some by products in making Ice milk Agri. Res. Rev.876-882.

Sundermam, F.W., 1985. Potassium turbid. colourimetric method. Am.., J. Clin. Bathol. 29-95.

Winton, A.L., 1958. Analysis of foods: 3rd Printing P.6. Jon Wiley and sons Inc., New York.

إستخدام مصادر نباتية فى إنتاج منتجات لبنية مثل Sherbet ذات قيمة غذائية

صوفى يوسف الديرى، نعمة رائف عطا الله، إيمان فؤاد محمد

معهد بحوث الإنتاج الحيوانى، وزارة الزراعة، الدقى ، الجيزة، مصر

تم إعداد أنواع مختلفة من الشربت بإستخدام كل من راشح تركيز اللبن permeates والشرش الحلو واللبن الخض كمنتجات ثانوية للألبان مع إضافة فواكه طبيعية (مانجو – يوسفى – حرنكش) وأظهرت نتائج التحاليل أن هناك زيادة في الكثافة النوعية والوزن النوعي بالكيلوجرام و نسبة الجوامد الكلية بإستخدام اللبن الخض يليها الشرش الحلو ثم راشح اللبن ، وذلك بالمقارنة بالكنترول ، بينما كان هناك انخفاضا في قيم S+ والريع والمقاومة للأنصهار .

إستخدام المانجو واليوسفي والحرنكش أدى الى تحسين القيمة الغذائية للشربت حيث أدى الى زياده في نسبة الكالسيوم تراوحت بين (69.6 – 183 ملجرام/100مل) والفوسفور (42.8-127.4 ملجرام/100مل) والبوتاسيوم (211- 367 ملجرام/100مل) الحديد (1.13-2.56ملجرام/100مل) الزنك (1.03-2.12ملجرام/100مل) وقد حصل الشربت المضاف له مانجو على أعلى درجات في التحكيم ثم الحرنكش وأخيراً اليوسفي ، وذلك في كل المعاملات .