The Use of Soya Protein Isolates in Preparation of Some Low Fat Dairy Products

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Received: 10/7/2006

Abstract: *Soya Protein Isolates (SPI) (92%) protein was used at different levels to substitute the non fat dry milk in low fat yoghurt and ice cream manufacture. Addition of SPI improved the viscosity and other rheological properties of the resultant yoghurt, enhanced the buffering capacity of yoghurt in low and neutral conditions and reduced the curd syneresis rate. However, in ice cream manufacture, SPI enhanced the rheological properties and overrun. SPI treatments revealed less scores for flavour and higher scores for body and texture for the resultant yoghurt and ice cream. The foregoing results indicate that SPI could be successfully used at level up to 3.13% for the production of good quality yoghurt and up to 4.75% for producing ice cream acceptable taste and texture.*

Key words: *Soya dairy products, Soya protein isolates, Soya yoghurt, Soya ice cream, rheological properties.*

INTRODUCTION

Soya dairy products are still relatively unknown in Middle East while it has gained steadily in popularity in the USA since its introduction a few years. The same trend will spread to Europe since consumers are becoming increasingly interested in alternatives to traditional foodstuffs and particularly in products which improved the health profile (Moller, 1991). Most soya dairy products produced so far has been made from tofu, even through this associated with two major problems. One is an unsatisfactory taste and the other is the heavy investment in equipment for converting whole soybean into tofu. Therefore, many manufacturers have been looking for alternative methods. They have now got a new possibility as much as improvement has taken place in the soya processing industry in recent years. It is now possible with the help of soya protein concentrate to produce soya dairy products with a neutral taste (Tanteeratarm *et al.*, 1993).Soya protein products are generally divided into three categories:

1- Soya flour (minimum 50% protein in dry matter).
2- Soya concentrates (minimum 70% protein in dry matter).
3- Soya isolates (minimum 90% protein in dry matter).

It is exactly in this respect that soya dairy products offer a number of advantages over conventional dairy products. Soya products contain no cholesterol and studies show that soya protein lowers given levels of cholesterol. Another aspect is allergy to milk, consumers who are allergic to milk protein or who are lactose intolerant will welcome these products (Synder and Kwon 1987) .As already mentioned dairy –like products based on soya protein are frequently associated with an unacceptable taste but as it happens in other industries, the soya protein industry has made some significant product improvement and the type of soya protein which has demonstrated the best performance in this test. *i.e.* soluble soya protein concentrate, belongs to a recently developed group of soya products with a neutral taste. It is evident that soya protein contains all the essential amino acids, even in balanced quantities and that it has a nutritive value equal to that of meat, milk and egg protein.

Overtime, many researchers have studied and developed many dairy products enriched with soy milk or soya extract of publishing work

(Hammad *et al.*, (1985); Buono *et al.*, (1990); Moller (1991); El- Safty *et al.*, (1992); El-Gazzar and Hafez (1992); Ankenman and Morr (1996);
El-Sayed *et al.*, (1998); Ammar *et al.*,(2000); Gomaa *et al.*, (2000a,b).

Therefore the aim of this study was to evaluate the possibility of making a functional low fat yoghurt and ice cream with a number of health benefits from cow's milk fortified with different levels of soya protein isolate and to investigate the effect of replacing rate of non-fat dry milk with soya protein isolate on the chemical, rheological and organoleptic properties of yoghurt and ice cream.

MATERIALS AND METHOD

1-Yoghurt production:

Yoghurt was produced according to the formulations in (Table 1), cow's milk was obtained from herds of Faculty of Agriculture, Suez Canal University and standardized to about 2.1% fat and 9% SNF and soya protein isolate (92 % protein, Armor proteins Saint-Brice en Cogles, France) was used in partially or complete replacement skim milk powder (Holand) used in manufacture of control yogurt (2% fat and 13% SNF).

The milks were then pasteurized 72 °C/5 min and cooled to 40 °C .One gram of direct set frozen yoghurt starter (*S. thermophilus* + *L. delbrueckii* subsp. *bulgaricus*) (obtained from CHR-Hansen's, Denmark) was incubated for 1h in 1L of sterilized skim milk at 40°C .Prepared culture was inoculated at the ratio of 50 ml per 1L of yoghurt milk. The milks were than incubated at 43°C until clotting (≈ 3h). Yoghurt were stored at about 5°C

Table (1): Composition of low fat yoghurt milks containing different levels of soya protein isolate (gm/100gm).

Treatments / Ingredients	T_0	T_1	T_2	T_3
Standardized cow's milk (2.1% fat, 9% S.N.F).	95.3	95.3	95.3	95.3
Skim milk powder	4.7	3.13	1.57	0.00
SPI	0.00	1.57	3.13	4.7
Substitute ratio	0	33.3	66.66	100

T_0: yoghurt milk containing standardized cow's milk+ skim milk powder(control)
T_1; yoghurt milk containing standardized cow's milk and SPI substituted 33.3% of the skim milk powder
T_2: yoghurt milk containing standardized cow's milk and SPI substituted 66.6% of the skim milk powder
T_3: yoghurt milk containing standardized cow's milk and SPI substituted 100% of the skim milk powder

and evaluated after 1,5,10 and 15 days. The whole experiment was repeated three times.

Methods of analyses:

The fat, protein and dry matter contents and acidity of milk and other ingredients used in yoghurt manufacture were analyzed by standard methods (Marshall, 1992). During storage, yoghurt samples were checked for pH (Jenway pH meter electrode No. 29010, Jenway limited, England).

Buffer capacity:

Buffer capacity of yoghurt was measured according to Martini *et al.* (1985). Buffer capacity lower than the initial pH (4.1 to 2.0) of yoghurt was obtained by titrating diluted yoghurt sample (10g sample diluted with 10.0g of distilled water) with 1 N HCl. Half ml increments of 1 N HCl were added to the sample, mixed thoroughly and pH values were recorded. Similarly, buffer capacity values above the initial pH (4.1 to 8.2)of yoghurt were determined by titrating with 1 N NaOH.

Syneresis:

The susceptibility of yoghurt to syneresis was measured by the following two methods:

A- Drainage method reported by Lorenzen *et al.* (2002) where 30g of set-style yoghurt were put on an analysis sieve, placed on the top of a glass beaker by the help of an ice cream scoop. The weight of drained whey after 2h at 6°C was related to the initial weight of yoghurt and expressed in percent.

B- Centrifugation method: 50g of set-style yoghurt was centrifuged using IEC PR-700 Centrifuge, USA at 2500 X g for 5 min. The weight of supernatant whey was determined and expressed in percent.

Rheological Properties:

To determine the rheological properties (Viscosity, Consistency and flow index), yoghurt samples were stirred for 5 min to achieve visually homogeneous slurry (Lankes *et al.*, 1998) before measurements. The rheological properties were measured using a Brookfield viscometer (Brookfield Engineering Laboratories, Inc., MA. USA), equipped with a SC4-21spindle running at 25 rpm. Measurements were made in the temperature of 24°C in shear rate ranging from 23.3 to 232.5 S^{-1}.

Organoleptic Properties:

Organoleptic assessment of yoghurt samples included flavour (10 points), Body and texture (10 points), and colour and appearance (5 points). The organoleptic attributes were rated using 25-point scale by panelists from the staff of the Dairy Department, Suez Canal University.

2-Ice Cream production:

Materials:

Cow's milk was obtained from herds of Faculty of Agriculture, Suez Canal University and standardized to about 3.0% fat and 9% SNF. Skim milk powder 95% TS was imported from Holland, cane sugar and vanillin were obtained from local market, gelatin solution (10%) was prepared from gelatin powder (ADWIC, El-Nasr Pharmaceutics Chemicals Co. Egypt). Soya protein isolate (SPI 92 % protein) Armor proteins Saint-Brice en Cogles, France.

Preparation of different mixes:

The ice cream mixes were prepared according to Arbuckle (1986). The mixes consisted of 2% fat, 15% SNF, 15% sugar, 0.5% gelatin and 0.03 % vanilla. The mixes were prepared using the formulation in (Table 2) and processed as shown in Figure (1).

Methods of analyses:

The total solids, fat, acidity were determined according to (AOAC, 1990), pH by using digital pH meter. The specific gravity of the mix was determined using the method described by Winton (1958), weight per gallon according to (Burke, 1947). Freezing point (FAO, 1977). The viscosity, consistency and flow index of the mix were carried out as described by Petersen *et al.*, (2000) using a Brookfield viscometer (Brookfied Engineering Laboratories. Inc., MA, USA), equipped with a SC 4-21 spingle running at 25 rpm. Measurements were made at temperature of 5°C in shear rate ranging from 9.3 to 93.

Melting down percent and overrun were determined according to Arbuckle (1986). The sensory evaluations were assessed by the staff of the Dairy Department., Suez Canal University using the following scale for flavour, (50 points), body and texture (40 points) and appearance (10 points)

Table (2): Composition of low fat ice cream mixes containing different level of Soya protein isolates (g/100g mix)

Treatments / Ingredients	T_0	T_1	T_2	T_3
Sugars	15	15	15	15
Gelatin solution	5	5	5	5
Standardized milk	68	68	68	68
Skim milk powder	9.5	7.1	4.75	2.4
(SPI)	0.00	2.4	4.75	7.1
water	2.5	2.5	2.5	2.5
Substitute ratio	0	25	50	75

T_0: low fat ice cream mix containing 0.00% (SPI)
T_1: low fat ice cream mix containing 2.4% (SPI)
T_2: low fat ice cream mix containing 4.75% (SPI)
T_3: low fat ice cream mix containing 7.1%(SPI)

Figure (1): Processing steps for production of low fat ice cream containing different levels of SPI.

Mixing milk ingredients
↓
Heat treatment (72 °C /5min.)
↓
Cooling 4-5 C
↓
Ageing at (4-5 C / 24 hour)
↓
Freezing(60-74% overrun)
↓
Filling
↓
Hardening and Storage at (-18°C)

RESULTS AND DISCUSSION

1-Yoghurt

Acidity and pH:

Data presents in (Table 3) indicate that yoghurt made with addition SPI has relatively high titratable acidity values than control treatment. The acidity value was increased as the level of SPI was increased. This may be due to the effect of protein content on the acidity of the product. Abou-Donia *et al.* (1980) evaluated the quality of yoghurt fortification with soy extract. They concluded that the level of acidity increased gradually as the level of soy extract increased.

The acidity of all yoghurt gradually increased along the cold storage to reach the maximum values at the end period. The initial pH values after one day ranges from 4.4- 4.5 in all yoghurt samples.

In the fifth day of storage the pH did not change and in the tenth day dropped slightly to 4.2-4.3. Hence, the pH of the yoghurt remained almost stable (≈4.0) during the fifteen days of storage which could be attributed to high buffering capacity of yoghurt. These results are in accordance with those of Kaiasapathy and Supriadi (1996).

Buffering Capacity:

All yoghurt samples showed high buffer capacity in acidic conditions (Table 4). The 1N HCl titrant needed to decrease pH from 4.1 to 2.0 was higher than the 1NaOH titrant needed to increase pH from 4.1 to 8.2.

Similar observation was reported by Kaiasapathy and Supriadi(1996) for yoghurt fortified by whey protein.

Curd syneresis:

The syneresis values of low fat yoghurt containing different level of SPI (Table 5) measured by either the drainage or centrifugation methods showed a gradual decrease with increasing the a mount of SPI added to yoghurt milk.

Table (3): Acidity% and pH values of low fat yoghurt containing different level of SPI during cold storage.

Storage Periods \ Treatments	T_0	T_1	T_2	T_3
		Acidity%		
1 day	0.80	0.83	0.86	0.91
5 days	0.85	0.86	0.88	0.91
10 days	0.94	0.90	0.92	0.95
15 days	1.10	1.10	1.15	1.20
		pH		
1 day	4.5	4.4	4.4	4.4
5 days	4.5	4.4	4.4	4.4
10 days	4.3	4.2	4.2	4.2
15 days	4.1	4.0	4.0	4.0

Table (4): Buffering capacity of low fat yoghurt containing different level of SPI in acidic and alkaline conditions during cold storage.

Storage Periods \ Treatments	T_0	T_1	T_2	T_3
		In acidic condition (ml 1N HCl)		
1 day	2.0	1.95	2.08	2.00
5 days	2.1	2.00	2.11	2.10
10 days	2.14	2.10	2.18	2.15
15 days	2.20	2.16	2.18	2.13
		In alkaline condition (ml 1N NaOH)		
1 day	1.80	1.77	1.78	1.80
5 days	1.81	1.75	1.81	1.80
10 days	1.87	1.80	1.83	1.84
15 days	1.87	1.84	1.84	1.85

Table (5): Synersis of low fat yoghurt containing different level of SPI during cold storage using drain and centrifuge methods.

Storage Periods \ Treatments	T_0	T_1	T_2	T_3
		Drain method (ml/100 g yoghurt)		
1 day	33	34	28	23
5 days	34	29	28	24
10 days	34	28	27	24
15 days	35	20	18	14
		Centrifuge method (ml/100 g yoghurt)		
1 day	36	38	38	32
5 days	34	36	40	33
10 days	36	38	33	33
15 days	40	30	30	30

Further decreases in syneresis were obtained during the cold storage period. The curd syneresis of all treatments was opposite to those reported for viscosity. These results are in accordance with those of Khader *et al.* (1983) they recommended that defatted soy milk could be used to replace buffalo's milk for the manufacture of zabady, whey syneresis decreased dramatically in the product after 24 hours storage at 5°C.

Rheological parameters of yoghurt samples:

Rheological parameters (viscosity, consistency index, flow behavior index) of yoghurt samples during

Table (6): Rheological characteristics of low fat yoghurt containing different level of SPI during cold storage.

Storage Periods / Treatments	T_0	T_1	T_2	T_3
		Plastic viscosity (m Pa.S)		
1 day	2061	2888	2898	3669
5 days	2488	3384	3404	3740
10 days	2893	3430	3607	4987
15 days	3282	4169	5049	5611
		Consistency index (m Pa .S^n)		
1 day	1074	2225	3244	3299
5 days	1370	2466	3414	4015
10 days	1455	2862	4251	4552
15 days	1778	2868	4692	5563
		Flow index (n)		
1 day	0.45	0.31	0.22	0.03
5 days	0.42	0.31	0.19	0.06
10 days	0.38	0.29	0.18	0.01
15 days	0.31	0.28	0.16	0.00

storage at 5°C are presented in (Table 6) .Differences can be noticed between control and those from SPI treatments.

The viscosity data illustrated that the control had lower viscosity than yoghurt made with SPI. Also, viscosity of yoghurt increased with increasing SPI added. These results suggest that SPI enhance the water binding capacity of the yoghurt coagulum, thereby influencing its viscosity. The same Table shows that consistency index had the same trend of viscosity. Adding SPI to yoghurt milk sharply reduced the flow index, the decrease was proportional to the increase in SPI. The determined flow behaviour index in all yoghurt treatments was low, suggesting pseudo plastic fluids (Abou-El-Nour *et al.*, 2004)

Sensory properties:

Adding SPI to yoghurt milk up to 4.7% had slight effect on the body and texture of the resultant yoghurt However, a clear deficiency in flavour was recorded for the treatment containing more than3.13% SPI (Table 6).

Table (7): Organoleptic characteristics of low fat yoghurt containing different level of SPI.

Storage Periods / Treatments	T_0	T_1	T_2	T_3
		Flavour (10 points)		
1 day	9	8	7	6
5 days	8	7	7	5
10 days	8	7	6	5
15 days	6	6	6	5
		Body and texture (10 points)		
1 day	8	8	9	9
5 days	8	8	9	9
10 days	8	9	9	9
15 days	8	9	9	9
		Colour and appearance (5 points)		
1 day	5	5	5	5
5 days	4	5	5	5
10 days	4	4	4	4
15 days	4	4	4	4
		Total score (25 points)		
1 day	22	22	21	20
5 days	21	21	21	19
10 days	21	20	19	18
15 days	19	19	19	18

Abou-Donia *et al.* (1980) evaluated the quality of zabady made from cow's or buffalo's milk with soy extract (basically protein), they concluded that the organoleptic assessment of these soya yoghurts were in terms of body and texture, appearance, and acidity similar to the control but, the major difference was in flavour.

Generally it could be concluded that adding of SPI particularly at a concentration of 1.57% enhanced the yogurt quality. Increasing the SPI up to 3.13% was acceptable, regarding both taste and texture.

2-Ice cream:

Physico-chemical properties of low fat ice cream mixes containing different levels of SPI.

As show (Table 8), no change in both acidity and pH was noticed by adding SPI to the mixes. Also, no effect was reported for the specific gravity of ice cream mixes, due to addition of SPI .Weight per gallon of different mixes was closely related to the specific gravity.

The freezing point of the mix was increased as the mount of SPI increased, this mainly due to the composition of SPI, which free from sugar and minerals.

Rheological properties of low fat ice cream mixes containing different levels of SPI.

The viscosity and consistency index of ice cream mixes (Table 9) increased sharply with increasing the level of SPI added. This could be attributed to the considerable increase in water binding capacity of ice cream mixes containing SPI. The flow index has an opposite trend i.e increasing SPI decrease the flow index of the mixes.

Physico- chemical properties of ice cream:

As show in (Table 10) addition of SPI, showed noticeable increase in the overrun of ice cream

Table (8): some physico-chemical properties of low fat ice cream mixes containing different levels of SPI.

Treatment / property	T_0	T_1	T_2	T_3
Specific gravity	1.175	1.175	1.177	1.175
Weight / gallon (kg)	5.340	5.340	5.340	5.340
Acidity%	0.26	0.26	0.27	0.28
pH value	6.46	6.46	6.45	6.45
Freezing point °C	-3.0	-2.90	-2.80	-2.80

Table (9): some rheological parameters of low fat ice cream mixes containing different levels of SPI.

Treatment / Ageing time	T_0	T_1	T_2	T_3
		Plastic viscosity (m Pa. S)		
Zero time	16.7	25.6	38.5	66.2
3 h	112.0	222.6	239.9	291.7
6 h	201.9	261.0	264.2	321.3
24 h	225.2	335.5	413.0	815.2
		Consistency index (m Pa. S^n)		
Zero time	1.95	4.61	7.01	41.5
3 h	112.3	144.1	155	168.2
6 h	308.6	344.8	379.8	441.8
24 h	312.5	371.4	397.7	468.3
		Flow index (n)		
Zero time	0.98	0.91	0.87	0.61
3 h	0.58	0.52	0.50	0.46
6 h	0.55	0.50	0.51	0.48
24 h	0.51	0.51	0.50	0.48

Table (10) some physico-chemical properties of low fat ice cream containing different levels of SPI.

Treatment / property	T_0	T_1	T_2	T_3
Overrun (%)	60	70	74	72
Specific gravity	0.734	0.691	0.675	0.683
Weight / gallon (kg)	3.34	3.14	3.07	3.10
Melt- down				
% after 30 min	20	10	8	8
% after 60 min	55	30	25	22
% after 90 min	100	100	95	95

The increase in overrun of ice cream as a result of adding SPI, could be attributed to the increase in the a mount of incorporated air.The specific gravity and weight per gallon decreased as the overrun increased. Mahran *et al.*, (1984), reported that the specific gravity of ice cream is inversely proportional to changes occurring in the overrun. Melting resistance of ice cream proportionally increased with increasing the level of SPI added (Table 10). This could be attributed to the increase of ice cream viscosity as a result of adding SPI.

Sensory properties

Addition of SPI, to the ice cream mixes, at concentration of 2.4 and 4.75% enhanced the ice cream quality (Table11), more increase of SPI gave a heavy body ice cream with a tendency towards being mealy.

The foregoing results indicate that SPI could be successfully used at level up to 4.75% for the production acceptable quality ice cream.

Table (11): Organoleptic properties of low fat ice cream containing different levels of soy protein isolate.

Treatment / Property		T_0	T_1	T_2	T_3
Flavour	**50**	46	48	43	33
Body & texture	**40**	35	36	38	38
Apperance	**10**	9	9	9	9
Total	**100**	90	93	90	80

REFERENCES

Abou El-Nour, A. M.; El-Kholy, A. M. and Abd El-Salam, M. H. (2004). Rheological properties of cows milk yoghurt treated by transglutaminase (TGASE). Egyptian J. Dairy Sci., 32: 73-86.

Abou-Donia, S.; M., El-Soda and R., Mashaly. (1980). Enrichment of zabadi with soy extract. J. of Dairy Res. (47):151-153.

Ammar, E.M.A.; M.Sh., Gomaa and M.E.I., Eltibe. (2000). Improving the flavour of certain soy milk-based yoghurts by fermentation with butter starter + yoghurt starter (1.5+1.5%). J. Agric. Sci. Mansoura Univ., 25 (9): 5725-5731.

Ankenman, L.G. and C.V., Morr. (1996). Improved acid, flavour and volatile compound production in high protein and fiber soy milk yoghurt-like product. J. Food Sci., 61 (2):331-336.

AOAC (1990). Official Methods of Analysis. 15th ed. Association of Official Analytical Chemists. Food Composition, Additive, natural Contaminant. Vol. 2. Helrich, k. (Editor). ISBN: 0-935584-42-0.

Arbuckle, W. S. (1986). "Ice Cream". 4th ed The AVI Publishing company, Inc., Westport, Connecticut.

Buono, M.A.; C., Setser; L.E., Erickson and D.Y.C., Fung. (1990). Soy milk yoghurt: sensory evaluation and chemical measurement J. food Sci., 55:528-531.

Burke, A. D. (1947). "Practical Ice Cream Making". The Olsen publishing Co., Milwauke, Wis., USA.

El-Gazzar, H. and Hafez, E.H.. (1992). Physico chemical properties of yoghurt like product from soy milk fortified with skim milk powder. Egypt. J. Food Sci., 20(1):25-36.

El- Safty M.S; El-Bagoury, E.; Metwally, M. and El-Demery, F. (1992). Effect of using powder of soy bean and glucose on some properties of ice cream powder. Egyptian conf. Dairy Sci. and Techn. PP 269-279.

El-Sayed, E.M.; A.A., Hefny; F.A., Saleh and I.A., Abd El-Gawad. (1998). Bifidobacteria as a starter for the manufacture of soy-yoghurt products. Proc. 7th Egyptian Conf. Dairy Sci. & Tech., 269-294.

FAO LAB(1977). Laboratory Mannual. FAO Regional Dairy Development and Training Center for the Near East.

Gomaa, M.Sh.; E.M.A., Ammar and M.I.E., Eltibe. (2000a). Improving the flavour of certain soymilk- based yoghurt by fermentation with butter starter. J. Agric. Sci. Mansoura Univ.;25(9):5733-5740.

Gomaa, M.Sh.; E.M.A., Ammar and M.I.E., Eltibe. (2000b). Preparation of yoghurt from soymilk mixed with buffaloe's milk or skim milk powder. J. Agric. Sci. Mansoura Univ.;25(9):5741-5753.

Hammad, Y. A.; Hamzawi, L. F. ; Zedan, A. N. and Khadar, A. E. (1985). The use of defatted soy flour in ice cream manufacture . Minufiya J. Agic. Res. 10 : 833-841.

Hefny, A.A.; S.Y.T., El-Dairy and SH. E., Abd El-Kader (1995). Production and evaluation of soy based non dairy frozen dessert and its proposed standard specification. Egyptian J. Appl. Sci., 10(9) 588.

Kailasapathy, K.and Supriadi, D. (1996). Effect of whey protein concentrate on the survival of *Lactobacillus acidophilus* in lactose hydrolysed yoghurt during refrigerated storage. Milchwissenschaft 51 (10) 565-569.

Khader, A.E., HAMED, A.I and Abd-El-Hamid,.B.(1983). Compaination of buffalo milk and defatted soya milk in zabady. Munufuia J.,of Agric., Res., 6:217.

Lankes, H., Ozer, H. B. and Robinson, R. K. (1998). The effect of elevated milk solids and incubation temperature on the physical properties of natural yoghurt. Milchwissenschaft, 53: 510.

Lorenzen, P. Chr., Neve, H., Mautner, A. and Schlimme, E. (2002). Effect of enzymatic crosslinking of milk proteins on functional properties of set-style yoghurt. Int. J.Dairy Tech. 55:152.

Mahran, G. A.; El-Ghandour, M.A.; El-Bagoury, E.H. and Sayed, A.F.(1984). Effect of skim milk powder storage on ice cream quality. Egyptian J. Dairy Sci., 12(2) : 267-273.

Marshall, R.T. (1992). Standard Methods for the Examination of products. 16th Edition. American Public Health Association.

Martini, M.C., Bollweg, G.L., Levitt ,M.D. and Savaiano ,D.A.(1985): Am.J.Clin. Nutr. 45 432-436.Cited from Kailasapathy, K.and Supriadi, D.: Effect of whey protein concentrate on the survival of *Lactobacillus acidophilus* in lactose hydrolysed yoghurt during refrigerated storage. Milchwissenschaft 51 (10) 565-569 (1996).

Moller, J. (1991). Production and evaluation of soy ice cream . conf. Proc. Food Inged. Europe P.154-160.

Petersen, B.L.; Dave, R. I.; McMahon, D.j; Oberg, C.J. and Broadbent, J.R. (2000). Influence of capsular and ropy exopolysaccharide producing *Streptococcus thermophilus* on Mozzarella cheese and cheese whey. J. Dairy Sci. 83:1952.

Synder, H.E, and Kwon, T. W. (1986). Soybean utilization. An avi book pub. By Van Nostrand Reinhold co. New York.

Tanteeratarm, K.; A.I., Nelson and L.S., Wei. (1993). Manufacturing of bland soymilk from soybean: Extrusion and soymilk technology, soy food products and home utilization. International soybean program (INTSOY), Univ. of Illinis, Urbam-Champaign, USA.

Winton, A. L. (1958). "Analysis of foods" .3rd Printing pp. 6, John Wiley and Sons Inc., New York.

استخدام بروتين الصويا المعزول فى صناعة بعض منتجات الالبان المنخفضه الدهن

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قسم الألبان - كلية الزراعة - جامعة قناة السويس – الإسماعيلية – مصر

يوجد عدة أنواع من منتجات الصويا بالاسواق منها دقيق الصويا المنزوع الدهن ويحتوى على حوالى ٥٠٪ بروتين ، وبروتين الصويا المركز وتصل نسبة البروتين به الى أعلى من ٧٠٪ ، وبروتين الصويا المعزول ويحتوى على أكثر من ٩٠٪ بروتين وله طعم مقبول لدى المستهلك . حيث أن منتجات الصويا لا تحتوى كوليسترول وأوضحت الدراسات أن بروتين الصويا فى الغذاء له القدرة على خفض الكوليسترول بجانب أن الاشخاص الذين لديهم حساسية لبروتينات اللبن أو الذين لديهم عدم قدرة على تحمل اللاكتوز سوف يرحبون بهذه المنتجات .

وفى هذه الدراسة تم استخدام بروتين الصويا المعزول ليحل محل اللبن الفرز المجفف بتركيزات مختلفة فى انتاج الزبادى وآيس كريم غنى ببروتين الصويا وبصفات مرغوبة لدى المستهلك وذات قيمة غذائية ووظيفية عالية

وقد وجد أن اضافة بروتين الصويا أدى الى زيادة االحموضة والسعة التنظيمية وتحسنت اللزوجة والصلابة بالزبادى الناتج وانخفض معدل انفصال الشرش وأظهرت التقديرات الحسية أن الزبادى المصنع ببروتين صويا حصل على تقديرات أعلى بالنسبة للقوام ودرجات أقل بالنسبة للنكهة خاصة عند زيادة نسبة الإضافة عن ٣,١٣ جم / ١٠٠ جم لبن .

وإن اضافه بروتين الصويا لمخلوط الايس كريم ادي الى تحسين خواصه الريولوجيه وزياده الريع وأظهرت التقديرات الحسيه أنه يمكن الحصول على ايس كريم مقبول من حيث الطعم والقوام بإضافه بروتين الصويا للمخلوط حتى نسبه ٤,٧٥% والزياده عن ذلك أدى الى طعم غير مقبول.