J. Agric. Sci. Mansoura Univ., 30 (5): 2639 - 2650, 2005

SOME PHYSICAL, RHEOLOGICAL AND SENSORY PROPERTIES OF ICE MILK CONTAINING ROLLED OATS

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ABSTRACT

Reduced fat and fat free rolled oats ice milk were prepared from mixes that were subjected to replacing fat at ratios of zero, 20, 40, 60, 80 and 100% with rolled oats. Ice milk (58 - 65% overrun) was produced using conventional techniques. One of the three batches which were made was fortified with adding pieces of sliced date (3g / 100g) before hardening the resultant ice milk. The effect of rolled oats replacements on the specific gravity, weight per gallon, freezing point, apparent viscosity and some rheological parameters (at different aging time) were evaluated. Also, the calorific reduction and the sensory evaluation of rolled oats ice milk from different formulas and with added pieces of sliced date were assessed.

Increasing the proportion of rolled oats replacement increased the specific gravity and weight per gallon of the mixes comparing with control . Freezing point gradually decreased as the amount of rolled oats increased. Mixes apparent viscosity increased by increasing rolled oats ratios and with increasing aging time. Rheological parameters ; plastic viscosity, yield stress and consistency index had the same trend except for the flow behavior index (n) which decreased with increased rolled oats ratio and with aging time. Products made with replacement of fat at 80% and 100% rolled oats melted more slowly and were judged to have slight creamy flavour and formed a gel matrix compared with other treatments while the overrun increased in a parallel to the replacing ratio of fat with rolled oats.Calorific value (Kcal /100g) and caloric reduction percentage decreased as the amount of rolled oats increased. Sensory evaluation revealed that ice milk containing rolled oats at levels 4% and 5% were given the lowest scores compared to the other treatments as it acquired a slight unacceptable flavour which exhibit a cereal flavour and slight graininess texture. Study indicates that date pieces were more effective in masking and improving rolled oats ice milk cereal flavour. It is recommended that replacing fat content with rolled oats up to 3% and 4% (with adding pieces of sliced date) give ice milk of good quality while retaining fat - like mouthfeel , better nutritive value and healthy product.

Keywords : low calorie ice milk, rolled oats ice milk, functional ice milk, rolled oats.

INTRODUCTION

In recent years the market for low, light and natural products has shown considerable growth in most developed countries. Nutritional properties and, in particular, calorie content are often key issues in the product development process. High fat intake is associated with increased risk for obesity and some types of cancer, saturated fat intake is associated with high blood cholesterol and coronary heart disease (USDHHS, 1988 and AHA,1996). Some foods or food ingredients may help to reduce the risk of certain diseases if they are eaten regularly as part of a generally healthful diet. Such foods are often referred to as "functional foods". Functional foods may be whole, fortified, enriched or enhanced foods, having the beneficial effect on health and consumed as part of a varied diet (ADA,1999). New approach is to apply dietary fiber products as a functional foods. Foods made from whole oats, such as rolled oats, oat bran, oat flour and oatrim, can help to lower

blood cholesterol levels and therefore reduce the risk of heart disease if consumed regularly in sufficient amounts, recommended amount 3g/day (Food Labeling, 1996 and FDA, 1997).

Oats are cereal grains whose origin can be traced back to about 2000 BC in the middle east, particularly the areas surrounding the Mediterranean sea. Some of the first evidence of oats were found in Egypt and parts of Switzerland (Paula, 1996). Rolled oats compositions were 68.2% carbohydrate, 7.4% total lipid, 14.2% protein, 1.2% crude fiber and ash 1.9% (Bernice K. Watt and Annabel L. Merrill, 1975).

Oats are a source of carbohydrates (desirable complex carbohydrates) to provide calories for energy needs and which have been linked to reduced risk of colon, breast and prostrate cancer (Paula, 1996 and Can Oat Milling, 1998). Oats have greater potential value to provide protein (contain an excellent balance of amino acid), specially for vegetarians. Oats also contain essential vitamins, particularly thiamin, folic acid, biotin and pantothenic acid, minerals (manganese, magnesium, selenium and iron, as well as calcium, zinc and copper), and fatty acids (high in unsaturated fatty acids especially linoleic acid) and have been recognized as an important source of dietary fiber (Webester, 1986; Marshall & Sorrells, 1992 and Clydesdale, 1994). The dietary fiber in oatmeal and oat bran contains a mixture of soluble and insoluble fiber fractions.

Oats are particularly high in beta glucans, a soluble fiber which has proven effective in lowering serum cholesterol (TurnBull & Leeds, 1987; Ripsin *et al.*, 1992; Food Labeling, 1996; Pomersoys, 2001; Danielle *et al.*, 2003 and Bruce Thomson, 2004). Soluble fibers have also been shown to slow the increase in blood glucose that normally follow as meal, which can be important in the management of type II diabetes (Ray Sahelian, 2003 and Hallfrisch *et al*, 2003). Soluble fiber is used to give products a fat- like texture, such as whipped oat dessert, similar to ice- cream. Oats are also used in salad dressing, sauce thickeners, ice-cream coatings and stabilizers, baby foods, beverages, baked goods and snack foods.(Kacher, 1991; AG Innovation News, 2003). Oats flour can be used as a preservative for ice cream and other dairy products (contain antioxidant vitamin E) Doug Eborn, (2001).

Insoluble fiber are known as effective laxation aids and may play a role in preventation of gastrointestinal disorders and are effective in diluting carcinogens in the gastrointestinal tract that relates to their protective role in colon cancer (AG Innovation News, 2003).

There has been an interest for use the date as a component in food preparations like sweets, confectionery, baking products, institutional feeding and health foods. Dates are rich in sugar as it contain 78% carbohydrates on dry basis, an excellent source of vitamin A, B_1, B_2 and niacin, a good source of potassium, calcium, iron and dietary fiber (2-6%) but low in protein and fat (Barreveld, 1993). Therefore fresh dates are often found in combination with milk (fresh and sour) and milk products, such as yoghurt, curd, butter and cheese. Dates are also stewed in fresh milk or thoroughly mixed with milk powder (Shaarawy, 1989). Dates add extra flavour to a product called Tamreyya (Shaarawy, 1989) and frequently used in home made pastry.More

recent development work has been done on the use of dates in desserts, like-ice cream and puddings. Date juice were used at different levels as sweetening and flavouring agent in water ice and ice cream (Shukr and Muhsin, 1984). Egyptian production represents about 18% of the total production of date in the world (FAO,2002). Siwi date variety is the important semi dry date in Egypt, represents about 13.2% of the total production (Malr, 2001).

The objective of this study was to investigate the possibilities of utilizing rolled oats which is characterized by its high nutritional value and healthy foods as a fat replacer in the manufacture of ice milk to replace fat partially or completely and investigate its effect on the physical, rheological and sensory properties of the product. Also the resultant ice milk were fortified with pieces of sliced date for its nutritional value and for improving the sensory properties.

MATERIALS AND METHODS

Ingredients:

Whole milk powder (Nido full cream spray dried milk) packed in Egypt by Nestle Egypt S.A.E. Skim milk powder (Grade A- low heat - spray process-pasteurized) manufactured by Westfarm Foods, U.S.A.. Gelatin powder from Adwic (El Nasr Pharmaceutical chemicals). Sugar was purchased from local market. Rolled oats, quick-cooking (Lassie Oats) manufactured by C.Hahne Mills-Bad Oeynhausen-Germany under trademark license of Royal Lassie Mills Ltd. Wormerveer /Holland. Its composition 14.5% protein, 63.5% carbohydrate, 7% fat per 100g, 2% ash and 2% crude fiber. Rolled oats were grounded in a grinder before using. Date fruit (Agwa New Karama-whole siwi; semi dry variety at Tamr stage) Zahraa El-Salaam Factory, El-Salam city. Date fruit was analyzed for moisture content, total sugar, crude fiber, protein and ash (A.O.A.C.,1990). The composition of date fruit on dry weight basis was as follow: total sugar(78%), protein (3.3%), ash (2.1%), crude fiber (2.37%) and moisture content (20.43%).

Experimental procedures:

1-**Preparation of different mixes**:

The mix of control formula was standardized to give about 5% fat, 12.5% milk solids not fat, 15% sugar and 0.5% gelatin. Table (1) shows the selected compositions of oat ice milk mix formulas and indicated that fat was replaced by rolled oats at levels zero, 20, 40, 60, 80 and 100%.

Table (1): Selected composition of oats ice milk mix formulas.

Composition	Formula No.					
	%					
	Control	I	II	III	IV	V
Fat	5	4	3	2	1	0
Solids not fat	12.5	12.5	12.5	12.5	12.5	12.5
Sugar	15	15	15	15	15	15
Stabilizer	0.5	0.5	0.5	0.5	0.5	0.5
Rolled oats	0	1	2	3	4	5
Total solids	33	33	33	33	33	33
Sliced date	3	3	3	3	3	3

2- **Preparation of Rolled oats ice milk:**

Table (2) shows the formulas for different ingredients for making rolled oats ice milk. Ingredients were mixed together, heated at 70°C for30 min., cooled to 4°C and aged at that temperature overnight prior to freezing. The mixtures (2Kg mix for each treatment) were frozen in an ice cream freezing machine (Taylor-mate Model 156, Italy). The resultant ice milk was packaged in cups (100 ml), and put in deep freezer at -18°Cfor hardening according to Rothwell (1976). Each experiment was made in three replicates. One of replicate was fortified with pieces of sliced date before hardening.

Method of analysis:

The ice milk mix was analyzed for total solids, fat, and titratable acidity according to the official method A.O.A.C. (1990), pH using digital pH meter, Jenway pH meter, Jenway Limited, England), Specific gravity (Winton, 1958), weight per gallon (Burke, 1947), freezing point (FAO Laboratory Manual, 1977), viscosity and rheological parameters were carried out using a Brookfield Digital Rheometer model DV-III+ (Brookfield Engineering Laboratories,Inc., MA , USA), equipped with a SC_4-21 spindle. Apparent viscosity was measured at 100 rpm. Measurments were made at temperature of 5°C in shear rate ranging from 23.3 to 232.5 S^{-1}. All rheological properties were performed in duplicates. Caloric value was calculated as follow: carbohydrate and protein 4Kcal /gm., fat 9Kcal /gm.. (Marshall and Arbuckle, 1996).

The resultant ice milk were analyzed for overrun (Marshall and Arbuckle, 1996), melting resistant (Bhannumurthi *et al.*, 1972), specific gravity (Winton, 1958) and weight per gallon (Burke, 1947). Rolled oats ice milk as well as treatment fortified with pieces of sliced date were assessed for sensory evaluation, caloric value and caloric reduction. The sensory evaluation for resultant ice milk were carried out by 15 panelists from the Dairy Dept. Staff, for flavour (45 points), body &texture (30 points), and colour (5 points).

Table (2): Formulations of oats ice milk mixes.

Ingredients	Formula No. g/kg					
	Control	I	II	III	IV	V
Sugar	150	150	150	150	150	150
Gelatin	5	5	5	5	5	5
Whole milk powder	180	143	107	71	36	-
Skim milk powder	-	25	50	75	100	125
Rolled oats	-	10	20	30	40	50
Water	665	667	668	669	669	670

RESULTS AND DISCUSSION

Mix Properties:

Table (3) showed that the titratable acidity (T.A.) of prepared mixes ranged from 0.22 to 0.28. Ice milk mixes containing 5% rolled oats had a higher T.A. than the control and other mixes. Acidity increased slightly as

percentage of rolled oats increased. The same trend were found between specific gravity of control ice milk and mixes containing rolled oats, which was proportional to the rate of substitution. It could be noticed that weight per gallon of all mixes were closely related to their specific gravity of the corresponding mixes. On the other hand, pH values were slightly decreased as the percentage of substitution increased.

Table (3): Effect of rolled oats as a fat replacer on some physical properties of reduced fat and fat free oats ice milk mixes (mean of 3 replicates).

Properties	Formula No.					
	Control	I	II	III	IV	V
Specific gravity (gm /cm^3)	1.1170	1.1285	1.1377	1.1426	1.1525	1.1566
Weight / gallon (Kg)	5.076	5.129	5.170	5.193	5.238	5.256
Acidity (%)	0.22	.026	0.27	0.27	0.28	0.28
pH value	6.46	6.43	6.41	6.39	6.38	6.35
Freezing point (°C)	-2.3	-2.3	-2.4	-2.4	-2.5	-2.5
Caloric value (Kcal / 100g	153	147.2	141.7	136	131.2	125.7
Caloric reduction (%)	0	3.82	7.41	10.95	14.25	17.83

I, II, III, IV and V different mixes containing 1, 2, 3, 4 and 5 % rolled oats respectively.

The freezing point of the mix was gradually deceased with the increase in the added rolled oats.. These present results are in line with the finding of Ohmes *et al.*, (1998) they stated that , when fat is removed from ice cream and is replaced with non fat milk solids or other dissolved substances the freezing point is lowered.

Apparent viscosity of ice milk mixes and other rheological properties increased substantially by replacing fat with rolled oats either when fresh or after aging compared to the control. There was positive correlation between viscosity and the rate of replacement Fig (1). A pronounced increase in viscosity was observed for the treatments up to 60% and 80% rolled oats, viscosity increased up to 49.0 and 59.5 mPa.S. respectively after aging for two hours compared to control 52.0 mPa.S. after six hours of aging time. The interactions of soluble fibers containing rolled oats and liquid components of the ice milk can explain increased viscosity in treatments with rolled oats. This could be attributed to the high water holding capacity of rolled oats. Kacher (1991) found that oat amylodextrin containing soluble fiber formed a gel when combined with water at 25% oatrim and 75% water that has a fat like mouthfeel and texture, creamiest texture, referred to a viscosity. The result given in Table (8) showed that the rheologocal parameters; plastic viscosity, yield stress and consistency index increased as the rate of replacement with rolled oats increased and also with aging time among treatments. While flow behavior index (n) decreased. These results were in agreement with El- Nagar and Kuri (2001) who demonstrated that the addition of inulin (a mainly soluble fiber) increased viscosity and alters the texture of yog- ice mixes and furthermore inulin highly hygroscopes, bind water and form a gel like network, in addition to other components would modify the rheology of the mix.

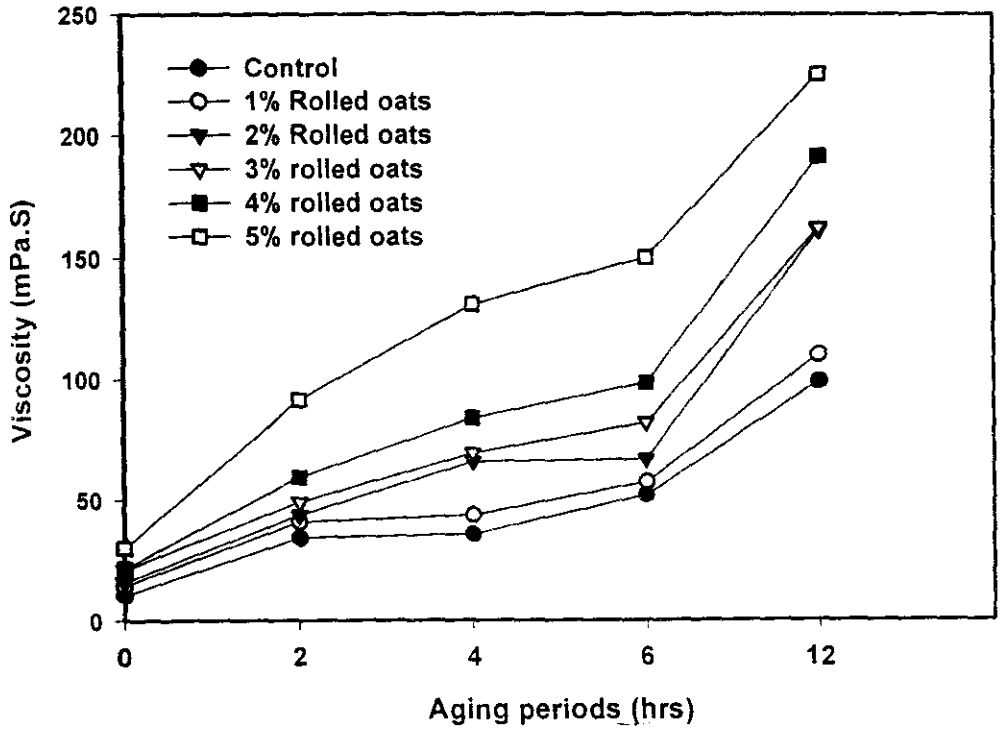

Fig (1). Effect of adding rolled oats association with aging period on the viscosity of reduced fat and fat free oats ice milk

As it is seen from Table (3), the calculated caloric value of low calorie rolled oats ice milk ranged from 125.7 to 153 Kcal./100g. The caloric value decreased as the amount of rolled oats increased. The caloric value of ice milk prepared by 5% rolled oats was 125.7 Kcal /100g, being 17.83% less in the caloric reduction of the control ice milk. This due to the low energy resulted from rolled oats (4 Kcal./g) corresponding to 9 Kcal./g for lipid. The same trend was observed for treatments with adding pieces of sliced date Table (6) in which caloric value decreased to 133.72 Kcal /100g, being 16.94% less in the caloric reduction of the control ice milk. Barreveld (1993) stated that a date of 20% moisture content will provide about 3.000 Kcal /Kg date flesh, for the greatest part derived from its sugar content.

Ice Milk Properties:

The properties of the resultant ice milk from different treatments were illustrated in Table (4). The specific gravity and weight per gallon were slightly higher for ice milk treatments comparing with control. Thus the effect of using rolled oats as a fat replacer was neutralized by the increase in overrun. The level of rolled oats in mixes affected the overrun values. The overrun increased as substitution of fat increased gradually up to 100% rolled oats compared with control ice milk. This increment in the overrun which was observed by increasing the replacement ratios of fat with rolled oats especially at 80% and 100% rolled oats might be due to the better functional properties (whipping and foam ability). It was clearly indicated that as the specific gravity and weight per gallon decreased, the overrun increased. Mahran *et al.*, (1984) stated that the specific gravity of ice milk is inversely proportional to changes occurring in the overrun.

As it is seen in Table (4), the increase of melting resistance of ice milk was proportional to the amount of rolled oats used. This increment could be attributed to the high water hydration capacity of rolled oats which attracts water and turns to gel (Paula, 1996 and IFT, 1998). The control ice milk showed lower melting resistance than the rest of ice milk treatments made with replacement of fat. It was found that the melting resistance was related to viscosity and freezing point of the mix. Theese results are in accordance with those of Arbuckle (1986); Salem *et al.*, (2003) and Salama &. Azzam (2003). Moreover, El- Nagar and Kuri (2001) stated that increased additions of inulin (a mainly soluble fiber) to yog-ice mixes formed gel networks which reduced melting rates. Furthermore, inulin has the ability to reduce the freedom of water molecule movement resulting in a more difficult to melt yog-ice. From Table (4) it was observed that the addition of rolled oats up to 4% and 5% increased the melting resistance, the high viscosity could be responsible for this product melted slowly. Therefore results for viscosity and melting characteristics, indicated that rolled oats act as a stabilizer due to its capacity for binding water.

Table (4): Effect of rolled oats as a fat replacer on some properties of reduced and fat free oats ice milk(mean of 3 replicates).

Properties	Formula No.					
	Control	I	II	III	IV	V
Specific gravity (g / cm^3)	0.699	0.703	0.703	0.702	0.699	0.701
Weight / gallon (Kg)	3.176	3.195	3.195	3.190	3.176	3.186
Overrun (%)	59.72	60.36	61.76	62.65	64.78	64.92
Melting resistance, weight loss % after						
15 min.	22.12	18.08	15.32	15.19	11.2	6.83
30 min.	48.36	42.90	36.70	35.1	33.84	31.32
45 min.	86.43	80.86	69.46	68.68	66.74	58.19
60 min.	95.80	98.89	98.21	97.60	89.90	89.41

i, ii, iii, IV and V different mixes containing 1, 2, 3, 4 and 5 % rolled oats respectively.

Table (5) represents the sensory evaluation of final product. The results obtained revealed that the reduction of fat up to 3% (about 60% of fat replacement) with rolled oats slightly improved the body & texture, further increase of rolled oats to 80% and 100% instead of fat gained the same score point as the control but with improving the melting resistance. Paula (1996) stated that fiber ingredients improving texture, appearance, moisture control and shelf life in products. Controlled water absorption, creates altered or finer-sized particles for better mouthfeel. Fibers also, control the water migration in frozen products that is promoted by freezing and thawing cycles. Increased rolled oats up to 80% and 100% replacement of fat, the scoring of flavour, appearance and colour were decreased slightly. This due to the negative effect of high level of rolled oats on the taste and colour of final products. At level 4% (about 80% of fat) and 5% rolled oats (about 100% of fat) acquired a slight unacceptable flavour which exhibit a cereal flavour and slight graininess texture. It can be concluded that replacing fat with rolled oats up to 60% had creamiest texture, soft body and rich flavour quite similar to control. Adding pieces of sliced date were more effective in masking and improving rolled oats ice milk cereal flavour, as shown in Table (7).

Table (5): Sensory evaluation of reduced fat and fat free rolled oats ice milk (Mean of 3 replicates).

Properties	Formula No.					
	Control	I	II	III	IV	V
Flavour (45)	44	45	45	44	40	40
Body & texture (30)	28	29	29	29	28	28
Colour & appearance (5)	5	5	5	5	4	4
Total (80)	77	79	79	78	72	72

I, II, II, IV and V different mixes containing 1, 2, 3, 4 and 5 % rolled oats respectively.

Table (6): Effect of adding pieces of sliced date on the caloric value and caloric reduction of reduced fat and fat free rolled oats ice milk.

Properties	Formula No.					
	Control	I	II	III	IV	V
Caloric value Kcal /100g	161	155.16	149.66	144.24	139.19	133.72
Caloric reduction (%)	0	3.62	7.04	10.41	13.54	16.94

I, II, II, IV and V different mixes containing 1, 2, 3, 4 and 5 % rolled oats respectively.

Table (7): Effect of adding pieces of sliced dates on the sensory evaluation of reduced fat and fat free rolled oats ice milk.

Properties	Formula No.					
	Control	I	II	III	IV	V
Flavour (45)	44	45	45	45	44	44
Body & texture (30)	28	29	29	29	29	29
Colour & appearance (5)	5	5	5	5	5	4
Total (80)	77	79	79	79	78	77

I, II, II, IV and V different mixes containing 1, 2, 3, 4 and 5 % rolled oats respectively.

The foregoing results indicated that the importance of using rolled oats (high soluble and insoluble fiber content) in ice milk making as a fat replacer not only for improving various characteristics and physical properties, but also for healthy reasons. Also, it could be recommended to reduce the aging time as the oats act as stabilizer.

Table (8): Rheological parameters of reduced fat and fat free mixes of rolled oats ice milk during different aging time at 5°C.

Formula No.	Aging time (hrs)	Plastic viscosity (mPa.S)	Yield stress (N/m^2)	Consistency index ($mPa.S^n$)	Flow index
Control	0	12.0	0.01	1.13	1.01
	2	30.0	0.51	6.07	0.88
	4	33.4	0.58	7.84	0.86
	6	40.6	1.14	15.2	0.77
	12	102.3	6.30	104.6	0.61
I	0	15.7	0.03	1.40	1.02
	2	29.6	0.70	6.93	0.88
	4	50.6	1.40	19.5	0.77
	6	50.7	1.48	20.2	0.76
	12	104.3	7.08	105.8	0.70
II	0	17.2	0.03	1.8	0.99
	2	37.1	0.77	10.4	0.82
	4	50.6	1.40	19.5	0.77
	6	50.7	1.48	20.2	0.76
	12	104.6	8.17	105.3	0.69
III	0	22.3	0.04	2.1	1.01
	2	42.2	0.83	11.6	0.82
	4	54.2	1.48	20.6	0.77
	6	60.8	1.86	26.3	0.75
	12	125.4	10.26	108.0	0.67
IV	0	22.4	0.04	2.12	1.01
	2	48.2	1.10	15.4	0.80
	4	68.25	1.96	26.55	0.77
	6	82.6	2.46	33.8	0.77
	12	127.6	13.56	111.2	0.68
V	0	31.9	0.04	3.1	1.00
	2	69.0	2.24	30.8	0.74
	4	86.4	3.86	59.6	0.67
	6	99.1	4.40	68.2	0.67
	12	134.7	24.25	115.7	0.63

CONCLUSION

Low fat ice milk with high nutritional value, low caloric value, and good physical and organoleptic properties can be successfully prepared by replacing up to 60% of fat in the mix with rolled oats and up to 80% of fat in rolled oats ice milk treatments which fortified with pieces of sliced date to improving flavour and elevating nutritional value. The obtained products can be considered as functional ice milk varieties. For economic reason, it could

be reducing aging time to produce rolled oats ice milk with good quality, this effect may be due to the gelling properties of rolled oats which improved the consistency of the mix and increased the formation of a viscous gel matrix in short time.

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بعض الخصائص الطبيعية و الريولوجية و الحسية للمثلجات اللبنية المحتوية على الشوفان

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يهدف البحث إلى دراسة إمكانية استخدام الشوفان لما له من أهمية غذائية و صحية (منتج خلى بالألياف) لاستبدال دهن اللبن جزئيا بنسب مختلفة او كليا في صناعة المثلجات اللبنية المنخفضة السعرات، و تاثير استخدام الشوفان كبديل للدهن على بعض الخصائص الطبيعية و الريولوجية و الحسية للمثلوج الناتج . تم استبدال دهن اللبن في مخاليط المثلجات اللبنية بالشوفان بنسب ٢٠،٤٠،٦٠، ٨٠ و ١٠٠% ، بالإضافة إلى معاملة المقارنة (٥% دهن) . كما تم دراسة تدعيم مثلجات الشوفان اللبنية بقطع من البلح لتحسين خواصها الحسية.

أظهرت النتائج ان استخدام نسب مختلفة من الشوفان كبديل للدهن كذ لك زيادة معدل إحلالها محل دهن اللبن له تأثير على خواص مخاليط المثلجات مثل الحموضة، pH ونقطة التجمد ، كما أدت إلى زيادة الوزن النوعي و الوزن للجالون وزيادة اللزوجة و ارتفاع الخصائص الريولوجية بزيادة نسبة الشوفان المضافة لمخاليط المثلجات اللبنية. كما أظهرت النتائج زيادة الربع و المقاومة للانصهار بزيادة نسبة الشوفان المضافة محل دهن اللبن في الناتج النهائى. من حيث الخواص الحسية . أظهرت النتائج أنة يمكن إحلال الشوفان محل ٦٠% من دهن اللبن في المخلوط للحصول على خواص حسية مناسبة من حيث الطعم و القوام والتركيب ، كما انة يمكن رفع نسبة الإحلال إلى ٨٠% من دهن اللبن عند تدعيم المثلوج الناتج بقطع البلح حيث اظهر فاعلية في تحسين طعم و نكهة مثلجات الشوفان اللبنية الناتجة ، أيضا لما للبلح من مقدرة على إخفاء الطعم النشوى (cereal) الناتج من إضافة الشوفان بنسب مرتفعة هذا بالإضافة إلى رفع القيمة الغذائية للمنتج النهائي.

لذلك يوصى باستخدام الشوفان فى مخاليط المثلجات اللبنية لما لة من تأثير جيد على الخواص البيولوجية والحسية الى جانب ارتفاع قيمتة الغذائية والفسيولوجية وينصح الا تزيد نسبة الاستبدال بة عن ٦٠ % من دهن اللبن لانتاج مثلجات لبنية عالية الجودة ومرتفعة القيمة الغذائية ومرتفعة السعرات ومقبولة لدى المستهلك . كذلك يمكن استخدام قطع البلح حيث تضاف على المنتج النهائى بنسبة ٣% وذلك لتحسين الطعم والنكهة والمظهر للمثلوج اللبنى الناتج والعمل على اخفاء نكهة النشا (cereal) الناتجة عن زيادة نسبة الشوفان المضاف وبالتالى امكن رفع نسبة الاستبدال الى ٨٠% من دهن اللبن لاعطاء منتج عالى الجودة الحسية ومنخفض فى الدهن ومرتفع فى القيمة الغذائية.