

THE USE OF DATE SYRUP CONCENTRATE (DIBIS) IN ICE CREAM PROCESSING

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(Received: Apr. 18 , 2010)

ABSTRACT: *Sucrose used in the control ice cream mix was replaced in ratios (25, 50, 75 and 100%) with date syrup concentrate (dibis). The effect of this replacement on the chemical composition (Total solids, protein, fat, ash, carbohydrates and pH) and physical properties (specific gravity, weight per gallon, freezing point and viscosity) of ice cream mixes, as well as the overrun, melting resistance and sensory evaluation of resultant ice cream were investigated.*

The addition of dibis had negligible effect on fat and protein content. Ice cream mixes containing dibis had a lower total solids %, carbohydrates % and pH than the control. Addition of dibis had a higher ash % than the control. Slight differences were found between specific gravity and weight per gallon compared with control ice cream mix and mixes containing dibis. Replacement of sucrose with dibis increased the viscosity of Ice cream mixes. The freezing point of ice cream mixes decreased with the increase in the added dibis. The overrun and melting resistance of the ice cream increased with the increase in the added dibis. Ice cream containing the dibis at the ratios of 25, 50 and 75% were rated acceptable by panelists and got higher scores for organoleptic properties specially ice cream containing 50% dibis.

It is recommended that, dibis can be used to replace up to 50% of sucrose to give ice cream of good quality and better nutritive value.

Key word: *Ice cream, Dibis (date syrup concentrate), Replacement of sucrose*

INTRODUCTION

Milk and milk products are considered as favourable vehicle for incorporation these health components. Ice cream has its considerable importance in the consumption pattern for dairy products. (Gafour *et al.*, 2007).

Many kinds of sweeteners namely, sucrose, many types of corn sweeteners, maple syrup, honey, converted sugar, fructose, and malt syrup are used in ice cream mixes (Stogo, 2001). Sucrose is the most popular sweeteners used in ice cream making. Besides its sweetening and flavouring effects, sucrose act as a bulking agent helps to control freezing point and crystal size, flavour carrier, texturizer, and stabilizer (Nielsen, 1973; Smith and Bradley, 1983). Several studies suggested the use of other sweeteners in

the manufacture of frozen desserts, such as, corn syrup, glucose syrup, polydextrose, fructose, and high fructose corn syrup (Torres and Thomas, 1981; Conforti, 1994; Hartel 1996; Mostafa *et al.*, 2002).

Date syrup concentrate (dibis), strained date juice is derived from date paste (Barreveld, 1993). It can be used as a sugar substitute without adverse effects in many food industries such as, fruit juice, beverages cake and biscuits, (Assous, 1999 and Khalil, *et al.*, 2002). On the other hand, dibis is a good source of many important elements such as K, Na, Ca, Mg, Fe and Zn (Khalil, *et al.*, 2002). The use of date syrup as a sweetening and flavoring ingredient in ice cream making , was studied by Hamed *et al.*, (1983). Acceptable product was obtained by replacing 50% of the sugar with date syrup. In a preliminary study, Mikki *et al.*, (1983) added 10% date pulp in the production of date ice cream. Shukr and Muhsin, (1984), indicated that substitution of no more than 40% of sucrose in ice cream mix with date dibis produced acceptable product. Salama (2004), the sugar used in the ice cream mix was replaced partially (20, 40 and 60%) with date syrup concentrate (dibis).

The objective of this study was to evaluate the replacement of sucrose used in making ice cream with date syrup concentrate (dibis) partially or completely on some chemical, physical and sensory properties of the product.

MATERIALS AND METHODS

Materials:

Fresh buffaloe's milk(15.6% TS, 5.4% fat , 4.6% lactose, 4.3% protein and 1.01% ash) and fresh cream (58.3% TS and 53.9% fat) was obtained from Food Tech. Res. Inst., Agric. Res. Center, Giza, Egypt. Skim milk powder (Ecoval N. V., Paris, France). Food grade gelatine was obtained from Arabic Laboratory Equipment Company, Egypt. Sugar and chocolate powder were obtained from the local markets.

Dibis (73.5% TS, 69.5% carbohydrates, 1.86% ash, 1.1% protein and 4.9 pH) was prepared from Siwi date pulp according to the method of Khalil *et al.*, (2002).

Preparation of different ice cream mixes:

Ice cream mixes were prepared according to (Arbuckle, 1986). The mix consisted of 8% milk fat, 11.2% milk solids not fat (MSNF) 15 % sugar, 0.5% gelatin and chocolate powder 3% the above mix, was used a control. Four treatments were carried out in which date syrup concentrate (Dibis) was used to replace 25, 50, 75 and 100% of sucrose in ice cream mixes. The mixes were heated to 80 °C for 30 min, cooled and aged at 5°C for 4 hrs, then freezed in hard ice cream machine (Taylor, Model,103, Italy). The product was packaged in 100 ml cups and stored at -18°C. The experiment was triplicated.

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Methods of analysis:

Total solids, protein, fat, ash and carbohydrates were determined according to AOAC (2000). pH was measured using pH meter HANNA 213 Italy. The specific gravity, weight per gallon, overrun and melting resistance of ice cream were determined according to Arbuckle(1986), freezing point (FAO, Laboratory manual, 1977). The viscosity was determined using a viscometer L model DV-111, Rheotest, German.

Sensory evaluation:

The organoleptic properties of resultant ice cream were assessed by 12 panelists from the staff members of Dairy Tech. Dept., Food Tech. Research Institute, Agric. Res. Center, Giza, Egypt, according to score sheet described by Salem and Mowafy (2001).

Statistical analysis:

The results were analyzed statistical according to SAS System Users Guide (SAS Institute Inc., U.S.A. 1994).

RESULTS AND DISCUSSION

Composition and properties of ice cream mixes:

The chemical composition and some properties of ice cream mixes containing different levels of dibis are presented in Table (1). The addition of dibis had negligible effect on fat and protein content, of the ice cream mixes. Ice cream mixes containing dibis had lower total solids %, carbohydrates % and pH than the control, and these decrease were proportionally to the ratio of replacement. Ash % increased as percentage of added dibis increased. This may be due to the effect of higher minerals content in dibis.

Slight differences were found between specific gravity of control ice cream mix and mixes containing dibis. It could noticed that weight per gallon of all mixes was closely related to their specific gravity.

It could be observed from Table (1) that the replacement of sucrose in ice cream mixes with dibis, resulted in an increase in viscosity. This increase was proportional to the replacement ratio. These results are in agreement with those of Salama (2004).

The freezing point of ice cream mixes decreased by increasing the amount of added dibis. These results were in agreement with those of Hamad *et al.*, (1983). This can be attributed to the low molecular weight of glucose and fructose in dibis which decrease the freezing point more than sucrose (Salama 2004).

Table (1): Chemical composition and properties of ice milk mixes containing different levels of dibis .

Properties	Control	Dibis at the ratios of %				L.S.D.
		25	50	75	100	
Total solid %	38.58 ^{ab}	38.58 ^{ab}	37.96 ^{bc}	37.87 ^c	36.85 ^d	1.0345
Fat %	8.6	8.7	8.4	8.7	8.5	n.s
Protein %	8.96 ^a	8.56 ^b	8.54 ^{bc}	8.42 ^c	8.21 ^{cd}	0.4342
Carbohydrate %	20.36 ^a	20.14 ^{ab}	19.78 ^b	19.21 ^{bc}	18.75 ^c	1.1325
Ash %	1.06 ^d	1.12 ^c	1.21 ^{cb}	1.42 ^{ab}	1.56 ^a	0.8348
pH	6.42 ^a	6.21 ^{ab}	5.87 ^{bc}	5.74 ^{cd}	5.61 ^d	0.6321
Specific gravity(kg)	1.0584 ^c	1.0672 ^{bc}	1.0691 ^b	1.0712 ^{ab}	1.0741 ^a	0.2541
Weight/ gallon(kg)	8.954 ^c	8.964 ^{bc}	8.991 ^b	8.994 ^{ab}	9.021 ^a	0.3142
Viscosity (CP)	2.74 ^d	3.14 ^c	3.25 ^{bc}	3.47 ^{ab}	3.62 ^a	0.9421
Freezing point °C	-2.4 ^a	-2.6 ^b	-2.7 ^{bc}	-2.8 ^c	-3.1 ^d	0.5325

- Different letters in the same row (a,b,c,....) means that multi comparisons are different from each other, letter a is highest mean followed by b,c,.... Etc.

- Significant at 0.05 level

- Means with the same letter are not significantly different

Properties of resultant ice cream:

Table (2) illustrates the physical properties of ice cream as affected by addition of dibis. The specific gravity and weight per gallon of ice cream decreased with the increase of sucrose replacement with dibis.

The overrun of the ice cream increased by replacing sucrose with dibis. These results are in agreement with Hamad *et al.*, (1983), they reported that the addition of strained date paste increased the percent of overrun up to 85% for 50% substitution of sugar.

The addition of dibis increased the melting resistance product (Table 2). Dibis decreased losses in initial weight of ice cream (5 gram at zero time) from 96.3% for control to 80.1, 87.1, 80.4 and 79.6% at 90 min for 25, 50, 75 and 100% substitution respectively. These results are in agreement with those of Salama (2004), who reported that the addition of dibis date paste increased the melting resistance.

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Table (2): Properties of ice milk containing different levels of dibis .

Properties	Control	Dibis at the ratios of %				L.S.D.
		25	50	75	100	
Overrun%	52.67 ^d	53.87 ^c	55.21 ^b	56.71 ^b	58.93 ^a	1.4563
Specific gravity(kg)	0.685 ^a	0.662 ^{ab}	0.641 ^b	0.593 ^c	0.593 ^{cd}	0.7425
Weight/ gallon(kg)	3.63 ^a	3.54 ^{ab}	3.32 ^b	3.16 ^c	2.96 ^{cd}	0.7271
melting resistance loss % after						
30 min	15.5 ^a	13.2 ^b	11.8 ^c	10.8 ^{cd}	10.2 ^d	11341
60 min	69.4 ^a	61.4 ^b	57.4 ^c	51.6 ^d	49.2 ^e	2.135
90 min	96.3 ^a	90.1 ^b	87.6 ^c	80.4 ^d	79.6 ^d	1.9452

- Different letters in the same row (a,b,c,....) means that multi comparisons are different from each other, letter a is highest mean followed by b,c,.... Etc. Significant at 0.05 level
- Means with the same letter are not significantly different

Organoleptic properties:

Presented organoleptic properties scores of the resultant ice cream are listed in Table (3). Ice cream containing the dibis at the ratios of 25, 50 and 75% were rated acceptable by panelists and got the high scores for organoleptic attributes specially ice cream containing 50% dibis. The dibis imparted an acceptable creamy colour, sweet flavour and smooth body & texture. These results are in agreement with those of Hamed *et al.*, (1983).

The foregoing results indicated the possibility of using dibis in the ice cream making in partial replacement sucrose up to 50% without determined the physical and organoleptic properties of the product.

Table (3): The organleptic properties of ice cream containing different levels of dibis

Treatments	Flavour 50	Body & texture 30	Melting properties (10)	Colour 10	Total (100)
control	46 ^b	27 ^c	8 ^b	10	91 ^{bc}
Dibis at the ratios of %	25	47 ^{ab}	28 ^b	8 ^b	93 ^{ab}
	50	48 ^a	28 ^b	9 ^a	95 ^a
	75	45 ^{bc}	29 ^a	9 ^a	92 ^b
	100	39 ^d	29 ^a	9 ^a	86 ^d
L.S.D.	1.1813	0.63224	0.2431	n.s	1.2345

- Different letters in the same column (a,b,c,....) means that multi comparisons are different from each other, letter a is highest mean followed by b,c,.... Etc. Significant at 0.05 level
- Means with the same letter are not significantly different

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استخدام مركز شراب البلح (الدبس) فى صناعة الايس كريم

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الملخص العربي

استهدفت الدراسة استبدال السكرز الذي يستخدم فى تحلية مخاليط المثلجات اللبنية ببعض المحليات الطبيعية مثل شراب البلح المركز (الدبس) واثر ذلك على الخواص الكيميائية والفيزيائية والحسية لكل من مخاليط الايس كريم والنتاج النهائي. تم تصنيع خمسة معاملات من مخلوط الايس كريم أربعة مخاليط استبدل فيها السكرز بشراب البلح بمعدلات ٢٥ ، ٥٠ ، ٧٥ ، ١٠٠% بالإضافة إلى الكنترول. ولقد تم تقدير الجوامد الكلية والدهن والبروتين والكربوهيدرات ورقم الـpH والرماد والزوجة والوزن النوعى والوزن بالجالون ونقطة التجمد والمقاومة للانصهار والريع ولقد اختلفت النتائج باختلاف تركيز المادة المضافة.

وقد اوضحت الدراسة ان إضافة شراب البلح (الدبس) وزيادة معدلاتها فى مخاليط الايس كريم لم يكن لة تأثير على نسب كلا من الدهن والبروتين ولكن حدث انخفاض فى نسبة كل من الكربوهيدرات والجواد الكلية ورقم الـpH بزيادة إضافة الدبس الى مخلوط الايس كريم، وارتفعت قيم الرماد بزيادة نسب احلال شراب البلح فى المخلوط.

ولقد اوضحت النتائج ان إحلال الدبس للسكرز فى مخاليط الايس كريم يؤدى الى تحسين خواص مخلوط الايس كريم من حيث اللزوجة ونقطة التجمد، وكانت الاختلافات طفيفة عن الكنترول من حيث الوزن النوعى والوزن بالجالون. كما اوضحت النتائج أيضا ان احلال الدبس للسكرز ادى الى زيادة نسبة الريع والمقاومة للانصهار، ومن ناحية الخواص الحسية فان إحلال الدبس للسكرز حقق قبول كبير لدى المحكمين عند استخدامة حتى نسبة ٧٥% ولكن كانت نسبة استبدال ٥٠% للسكرز افضل معاملة نظرا لاعطائها طعم حلو مقبول الى جانب قوام وتركيب ناعم مرغوب لدى المستهلك.

لذلك يوصى باستخدام الدبس فى مخاليط الايس كريم حتى نسبة ٥٠% لما لها من تاثير جيد على الخواص الريولوجية والحسية إلى جانب ارتفاع قيمة الغذائية.