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# PHYSICOCHEMICAL AND SENSORY PROPERTIES OF ICE CREAM MADE FROM CAMEL MILK AND FORTIFIED WITH DATES PRODUCTS

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## ABSTRACT

The chemical composition, pH values and Titratable acidity and sensory properties of ice cream made from camel milk fortified with different kinds of dates were investigated. It was noted that there is increase in the ash content, protein content / dry matter, percentage of the Titratable acidity and low values of the pH in samples with added dates compared to the control sample of ice cream. Samples fortified with dates Debs 5% and control sample recorded the best degrees in taste, color, appearance, and overall acceptability during storage periods, and did not score any significant change in the properties of melting during storage, except when adding date paste AL- khalas of 10% and 10% Debs.

The control sample and sample with added dates molasses 5% recorded the highest general acceptance than the other treatments, Meanwhile their storage for 60 day did n′t have any effect on their acceptability. Ice cream made from camel milk either with or without addition of dates was acceptable, acclaimed by the arbitrators and didn't score any defects.

**KEYWORDS:** Camel Milk, Dates, Ice Cream, Physiochemical, Organoleptic Properties

## INTRODUCTION

Ice Cream is one of the most popular products all over the world because it is usually accompanied by the feeling of fun and joy, and as a result, its production and consumption continues to increase. It exploits part of the milk production in many countries for its use in the frozen products industry (Elahi*et al*., 2002). There is an increase in recent years in the rates of ice cream dairy consumption, which led to the production of 240 different kinds of ice cream products (Mengzi *et al*., 2011). The nutritional value of ice cream varies depending on the composition; as each of the milk components is present in the ice cream in a concentrated manner (Goff *et al*., 1989), in addition to many other food ingredients.

Camel milk plays an important role in human nutrition in the tropics and desert states. As it contains the essential nutrients found in cow's milk (El-Agamy*et al.*, 1998, Karue, 1998), and it is recommended as milk substitute for children with cow's milk allergy (Metwalli and Al-Saleh, 2009). Camel milk has a similar protein, low lactose, and fat content and saturated fatty acids and cholesterol compared to cow's milk. In addition, it contains a greater amount of vitamin C, ash, sodium, potassium, phosphorus, zinc, iron and manganese than cow's milk (Karray*et al*., 2005, Konuspayeva *et al*., 2008, Hashim*et al*., 2009). It can be also consumed by some special groups, such as those who suffer from lactose intolerance (Cardoso *et al*., 2010).

Camel milk has high content of vitamins (A, $B_2$, C and E), as well as a high proportion of insulin, without having

its sensitivity characteristics, (Knoess, 1982a). This type of milk was believed to actually have some medicinal properties, as it contains other compounds such as lactoferrin, Immunoglobulin and lysozyme, which were reported to have an important role in the formation of a low percentage of β-Casein with law ratio of β-lactoglobuline which showed association with the impact of anti-allergic (El-Agamy*et al*., 1996, Konuspayeva*et al*., 2007).

The idea of ice cream production from camel milk is not new, but what makes it acceptable in this study is its use with some local date products; which increases the antioxidant capacity for camel milk, and significantly increases phenolic components in camel milk, and also reduces the high activity of serum enzymes and the concentration of urea, and increases the activity of an enzyme (glutathione-S-transferase) in a poisoned rat. And this combined beneficial effect of mixing camel's milk with date's calls for its use as a high nutritional and health value sweetener (Al-Humaid*et al*., 2010). Especially that it is already available local product, where Saudi Arabia is considered to be the highest country in the world in cultivation, production, consumption and exportation of dates. The Saudi Ministry of Agriculture statistics showed that the dates self-sufficiency ratio in Saudi Arabia in 2010 reached (108%), with a production of the Kingdom of dates around one million tons per year from about 23 million trees, which represents about (13.9%) higher than the proportion of production in the world (USDA, 2011).

The date fruits from the natural food products that are characterized by high nutritional value; they contain sugars, proteins, fiber, vitamins and minerals. This study is going to use those products; given the need to add different flavors to the ice cream, mostly imported and lacks nutrients complementary components of milk, thus there is a need to bridge the nutritional side with products with suitable flavors, national-free products than any other add-ons, high nutritional value and has important religious and national dimensions.

Therefore, this study aims to produce ice cream from camel milk and to fortify it with different dates and with different ratios (cutting dates, paste dates and dates molasses) as a local flavored and nutritionally supported product and to study the Physio-chemical and organoleptic properties of the products.

## MATERIALS AND METHODS

### Materials

The ingredients of ice cream mix included are pasteurized camel's milk obtained from "Farm College of Agriculture and Veterinary Medicine," Qassim University, and homogenized pasteurized cow cream", fat 30%, from the sale of food Buradiah centers, Qassim region, while skim milk powder, granulated can sugar, glucose, gelatin, vanilla and emulsifiers (Egg yolk) were obtained from the local markets in Buridah, Qassim. Also, dates "Al - khalas and sokary both full dates, dates paste" date's molasses obtained from Naded Dates Factory Buradiah, Qassim region.

### Calculations of the Composition and Prepare of the Ice Cream Samples

Attends mixture of ice cream according to (Fayed *et al.*, 1999) 8% fat, 11% solids solid non-fat, (12 %) sugar, (4%) glucose syrup, (0.50%) (Gelatin) and emulsifier (egg yolk).To install a mixture of ice cream was calculated sugar in all kinds of dates (Table 1), and to calculate the amount added is subtracted the amount of sugar from the quantity to be added in each of sucrose, monosaccharide's, and calculates the quantity of each of milk, cream, milk powder, the stabilizer and the emulsion (Table 2)**.**

**Table 1: Chemical Composition of Types of Dates and Their Products Added to a Mixture of Ice Cream**

| Ingredients% | Sokary Dates | Sokary Dates Paste | Al-khalas Dates | Al-khalas Paste | Dates Molasses |
|---|---|---|---|---|---|
| **Total fat** | 0.12 | 0.20 | 0.10 | 0.10 | 0.23 |
| **Raw protein** | 2.67 | 2.40 | 1.67 | 1.72 | 1.16 |
| **Moisture** | 15.14 | 15.27 | 11.38 | 15 | 19.36 |
| **Ash** | 1.84 | 1.80 | 1.59 | 1.48 | 1.86 |
| **Raw fiber** | 3.13 | 2.92 | 2.38 | 2.53 | None |
| **Total carbohydrates** | 77.1 | 77.14 | 82.80 | 79.20 | 77.39 |
| **Energy** | 320 | 321 | 339 | 325 | 316.27 |
| **Fructose** | 14.23 | 26.89 | 35.14 | 32.50 | 27.95 |
| **Glucose** | 15.83 | 27.60 | 37.25 | 34.41 | 35.16 |
| **Sucrose** | 33.70 | 7.91 | none | none | None |
| **Sugar maltose** | None | none | none | none | None |
| **Lactose** | None | none | none | none | None |
| **The total sugar** | 63.76 | 62.40 | 72.39 | 66.91 | 63.11 |

According to AOAC, 2007

Carbohydrates and energy account mathematically.

Raw materials (cream, milk, glucose) mixed in the manufacturing vat with heating in a water bath, then the dry material was gradually added with continuous stirring and increasing the temperature, but the emulsion "egg yolk" was added after the mixture was cooled, the heating was kept to the point (75° c) for (15 minutes) to ensure the completion of the process of pasteurization of the mixture. (When date paste and molasses dates were used, they were added at the end of the heating stage to ensure their spread in the mixture (5%), (10%) for each type, but when using dates pieces, they were added after cooling and aging and with rates (5%), (10%) for each type.

Then, the mixture was put in the cooling machine and whipped in ICE30BCE type, Cuisinart company even fail completely blended, automatically controlled to stop whipping upon the arrival of the ice cream to the point of whipping required, this process leads to partial freeze rapid mixture, air integration in the mixture or the so-called overrun, (Fayed *et al.*, 1999). Filling process were done manually in plastic cups lid capacity (150 ml). After filling, ice cream containers were stored at (-18◦c) for (24 hours) prior to the sensory evaluation and studying the physicochemical, organoleptic properties. Samples were taken from each treatment (three samples) after (1, 30 and 60) days of freezing and storage. The dry materials were mixed together (sucrose, powdered milk, and the installer "gelatin"), liquid

**Methods**

Protein% for ice cream: by "Kjeldahl" (nitrogen × 6.38), according to (AOAC, 2007). Ash for ice cream: according to (Ling, 1963). The Titratable Acidity% of ice cream: according to (Ling, 1963). Carbohydrate% of ice cream: according to (AOAC, 2007).The pH values for soft ice cream: by pH meter device model (Jenway 3310) according to the method described in the (AOAC, 2007).

**Table 2: Composition of Ice Cream Mixes**

| Ingredients | Control sample | Sokary pieces 5% | Sokary Pieces10% | Al-khalas pieces 5% | Al-khalas pieces 10% | Sokary Paste 5% | Sokary Paste 10% | Al-khalas Paste 5% | Al-khalas Paste 10% | Dates molasses 5% | Dates molasses 10% |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **milk fat3%** | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 |
| **Cream 34%** | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| **Skim milk powder** | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Sucrose-table sugar** | 0.6 | 0.5 | 0.4 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| **honey syrup Glucose** | 0.2 | 0.2 | 0.1 | 0.1 | 0.06 | 0.1 | 0.01 | 0.1 | 0.03 | 0.1 | 0.03 |
| **Stabilizer-gelatin** | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 | 0.0175 |
| **Emulsion-fresh eggs yolks** | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 | 0.0075 |
| **dates** | None | 0.25 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 |
| **Total (Kg)** | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

### Sensory Evaluation of Samples of Ice Cream

It was estimated after (1, 30 and 60 days) from freezing, so that samples were coded letters at random. samples of all treatments were judged by (10 judges) from Nutrition and Food Science department at the Faculty of designs and home economics, and (10 judges) from the Department of Food Science and Human Nutrition at the Faculty of Agriculture and Veterinary Medicine, where they enrolled their grades according to the method of Kaul and Mathur, (1982).Contained sensory evaluation on the five qualities of the product divided on (100 degrees), which are: Flavor (40 degrees), Body &Textures (30 degrees), Melting properties (10 degrees), color (10 degrees), and general appearance (10 degrees). The temperature used during the evaluation samples were (-10◦c).

### Statistical Analysis

In accordance with the system of statistical analysis, (SAS, 1996) and LSD test, Mann Whitney test for two independent samples test and one way ANOVA.

## RESULTS AND DISCUSSIONS

### Chemical Composition and Physicochemical Properties

Chemical composition and physicochemical properties for camel milk differs than for cow's milk (Yagil, 1982) and (Abu-Lehia, 1987); therefore, products made from camel milk is expected to be different from those made from cow's milk.

Table (3) shows the average of some chemical composition and some physicochemical properties of ice cream for various treatments. Table (3) and figure (1) also show the average percentage of (protein / dry matter), which found that all added treatments pass sokary dates either cut or paste showed ratios (protein /dry matter) were significantly higher than

control sample, while adding cutting pass Al-khalas5% or Al-khalas paste 5% showed less significant treatments in the ratio (protein / dry matter) from the rest of the treatments, both control sample or other treatments, perhaps due to the high protein content in the pass sokary dates than Al-khalas as is shown from the table (1).

**Table 3: Average Chemical Composition and Physicochemical Properties of Ice Cream Samples for Different Treatments**

| Treatments | Protein % | Protein / Dry Matter % | Carbohydrate % | Carbohydrate /Dry Matter % | Fat /Dry Matter% | Ash % | Ash /Dry Matter % | Titratable Acidity % | pH |
|---|---|---|---|---|---|---|---|---|---|
| **Control sample** | 4.58 ± 0.03$^{def}$ | 11.39 ± 0.19$^{cd}$ | 24.54 ± 0.24$^{e}$ | 60.75 ± 0.85$^{d}$ | 19.89 ± 0.1$^{c}$ | 0.95 ± 0.01$^{a}$ | 2.35 ± 0.05$^{a}$ | 0.14 ± 0.00$^{a}$ | 6.57 ± 0.10$^{e}$ |
| **Sokary Pieces10 %** | 4.66 ± 0.11$^{f}$ | 12.19 ± 0.15$^{f}$ | 25 ± 0.25$^{g}$ | 65.42 ± 0.42$^{h}$ | 20.67 ± 0.16$^{g}$ | 1.08 ± 0.02$^{e}$ | 2.82 ± 0.04$^{f}$ | 0.2 ± 0.01$^{de}$ | 6.45 ± 0.05$^{bc}$ |
| **Sokary pieces 5%** | 4.52 ± 0.08$^{d}$ | 11.36 ± 0.2$^{c}$ | 24.71 ± 0.09$^{f}$ | 61.81 ± 0.51$^{e}$ | 19.75 ± 0.11$^{b}$ | 1.02 ± 0.02$^{d}$ | 2.55 ± 0.05$^{c}$ | 0.19 ± 0.01$^{cd}$ | 6.48 ± 0.08$^{cd}$ |
| **Al-khalas pieces 10%** | 4.54 ± 0.06$^{d}$ | 11.53 ± 0.23$^{cd}$ | 27.08 ± 0.08$^{i}$ | 68.8 ± 0.60$^{j}$ | 20.07 ± 0.11$^{d}$ | 1.08 ± 0.02$^{e}$ | 2.74 ± 0.04$^{e}$ | 0.2 ± 0.02$^{de}$ | 6.46 ± 0.01$^{bc}$ |
| **Al-khalas pieces 5%** | 4.43 ± 0.07$^{c}$ | 10.31 ± 0.2536$^{a}$ | 26.43 ± 0.12$^{h}$ | 66.40 ± 0.40$^{i}$ | 19.60 ± 0.10$^{a}$ | 1.00 ± 0.01$^{c}$ | 2.54 ± 0.04$^{bc}$ | 0.18 ± 0.02$^{cd}$ | 6.55 ± 0.05$^{de}$ |
| **Sokary Paste 10%** | 4.64 ± 0.12$^{ef}$ | 11.95 ± 0.30$^{e}$ | 24.03 ± 0.17$^{d}$ | 63.27 ± 0.27$^{g}$ | 20.54 ± 0.10$^{f}$ | 1.07 ± 0.02$^{e}$ | 2.82 ± 0.02$^{f}$ | 0.25 ± 0.07$^{f}$ | 6.39 ± 0.12$^{ab}$ |
| **Sokary Paste 5%** | 4.57 ± 0.07$^{de}$ | 11.93 ± 0.27$^{e}$ | 22.56 ± 0.10$^{c}$ | 58.84 ± 0.24$^{c}$ | 20.86 ± 0.12$^{h}$ | 1.02 ± 0.02$^{d}$ | 2.66 ± 0.03$^{d}$ | 0.19 ± 0.012$^{cd}$ | 6.40 ± 0.01$^{ab}$ |
| **Al-khalas Paste 10%** | 4.37 ± 0.13$^{c}$ | 11.37 ± 0.37$^{c}$ | 24.02 ± 0.02$^{d}$ | 62.51 ± 0.41$^{f}$ | 20.30 ± 0.11$^{e}$ | 1.01 ± 0.01$^{cd}$ | 2.63 ± 0.03$^{d}$ | 0.20 ± 0.01$^{de}$ | 6.40 ± 0.10$^{ab}$ |
| **Al-khalas Paste 5%** | 4.26 ± 0.06$^{b}$ | 10.89 ± 0.29$^{b}$ | 22.39 ± 0.11$^{b}$ | 57.23 ± 0.23$^{b}$ | 19.93 ± 0.10$^{c}$ | 0.98 ± 0.01$^{b}$ | 2.50 ± 0.05$^{b}$ | 0.15 ± 0.01$^{ab}$ | 6.51 ± 0.11$^{cde}$ |
| **Dates molasses 10%** | 4.00 ± 0.10$^{a}$ | 11.31 ± 0.11$^{c}$ | 22.3 ± 0.10$^{b}$ | 63.06 ± 0.60$^{g}$ | 22.34 ± 0.14$^{i}$ | 1.02 ± 0.01$^{d}$ | 2.88 ± 0.06$^{g}$ | 0.22 ± 0.01$^{e}$ | 6.36 ± 0.08$^{a}$ |
| **Dates molasses 5%** | 4.21 ± 0.11$^{b}$ | 11.61 ± 0.21$^{d}$ | 20.13 ± 0.12$^{a}$ | 55.46 ± 0.20$^{a}$ | 22.3 ± 0.18$^{i}$ | 1.02 ± 0.01$^{d}$ | 2.81 ± 0.05$^{f}$ | 0.17 ± 0.02$^{bc}$ | 6.50 ± 0.10$^{cde}$ |

Mean values in the same column within each parameter bearing the same superscript do not differ significantly ($P \leq 0.05$).

Table (3) shows also average percentages (carbohydrate / dry matter) in ice cream samples of different treatments, which found that the addition of cutting dates sokary and Al-khalas or date paste sokary and Al-khalas, as well as molasses were significantly higher than control sample, especially when add the proportion (10% ).

Also, table (3) shows high significantly (fat / dry matter) percentages when add dates molasses at any ratios (5 or

10%) than the rest of the treatments and the control sample, and it also showed a high percentage (fat / dry matter) when add pieces of dates sokary (10%) and paste dates sokary (5 or 10%).

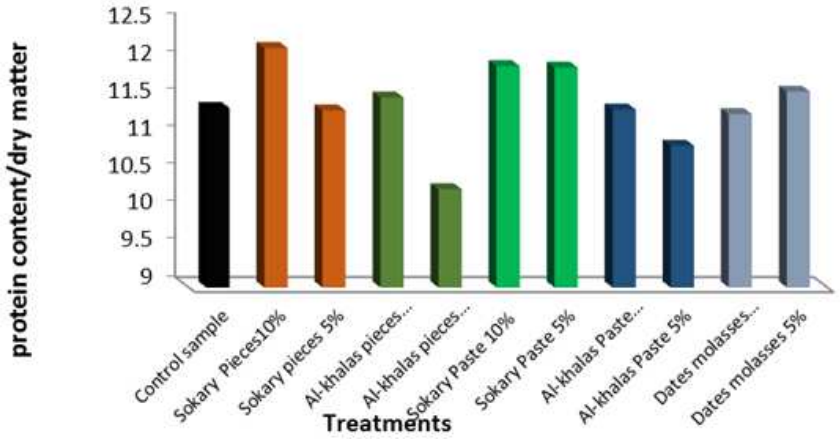


**Figure 1: Protein Content / Dry Matter in Ice Cream samples for different Treatments**

The ash ratios in ice cream samples, as seen from table (3) that all treatments showed proportions of high significant in the (ash / dry matter) compared to the control sample, perhaps due to the high salt ratios in date Added especially dates sokary, and it turned out more when add the proportion (10%) either cutting or dates s paste sokary, pieces or paste Al-khalas dates, as well as add molasses both (10 or 5%).

When estimating the proportion of Titratable acidity% in the ice cream, results showed that all the added dates treatments of any kind and in any ratios were significantly higher than the control sample also appeared in the figure of (2).

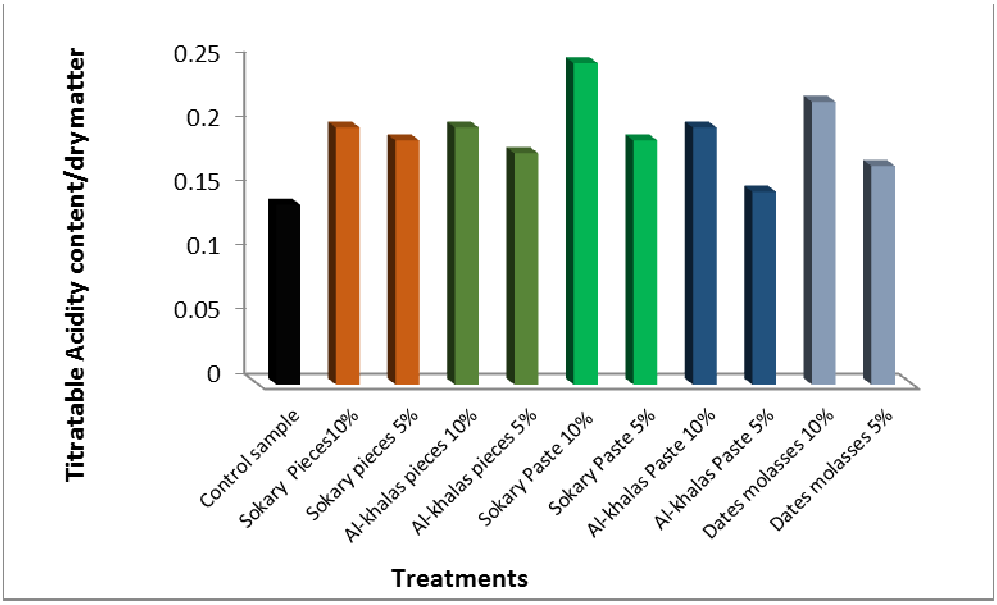


**Figure 2: Titratable Acidity% of Ice Cream Samples for Different Treatments**

Also it showed that the addition of the proportion (10%) of the sokary date paste or Al-khalas or (10%) of the pieces dates sokary or Al-khalas or (10%) of molasses led to a significant rise of titratable acidity, perhaps due to the fermentation or helping the fermentation adding dates on mixtures of ice cream.

The same direction as shown by measuring the pH values of the figure (3) that all treatments showed low pH

values of the control sample, especially when adding (10%) of the sokary paste or Al-khalas or (10%) dates molasses. While when pieces of Al-khalas and pieces of sokary were added, despite the decline in the pH values of the control sample, but it was higher than the treatments of (10%) paste or molasses as well.

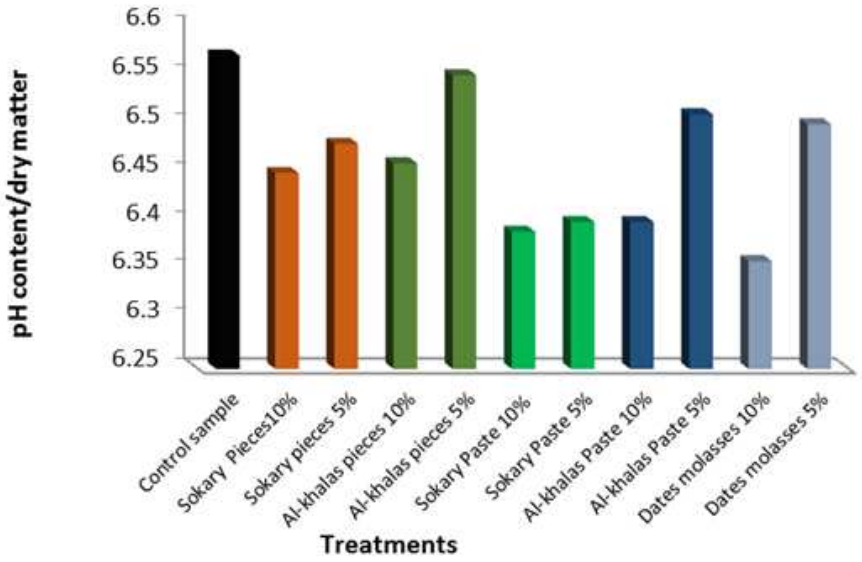


**Figure 3: pH Values of Ice Cream Samples for Different Treatments**

It has been found (Khalil and Blassy,2011) that the addition of fiber pulp Balah naturalized as a substitute for fat led to increased acidity, and the increase was commensurate with the addition ratios of the core rate Balah, and also led to a decline of pH; this is due to the low pH values of the core-Balah added.

**Organoleptic Properties**

Table (4) shows the average arbitration sensory samples of different parameter values for ice cream during storage periods up (60 days), which show the flavor, texture, composition and properties of the melting, color and general appearance values.

The results showed that there is a significant difference among all treatments between that of the control after the first day in taste values; where different to add dates to a mixture of all treatments of different types and different ratios, recorded additions dates molasses (5%) higher values, followed by the control sample, there were no significant differences at the level of (0.05) for each of the treatments as well cut off dates sokary type (10%) and (5%), cut passing Al-khalas (5%), and paste pass sokary (10%), and paste pass Al-khalas (5%) (10%), and dates molasses (10%), acceptance of the taste of the convergence of these samples have been observed. And generally we did not record significant differences in taste between each treatment after storage for two months; that is, the storage did not affect the taste of all treatments, while there were significant differences in taste samples cut sokary (10%) and sample dates molasses (5%), and then a month later, a simple change did not happen to it after that (60 days of storage).The flavor is one of the most important factors that affect the viability of the Ice cream products (Abdullah *et al.*, 2003).

The texture of the ice cream has a direct relationship with composition, and this depends on the size, number and arrangement of air cells, ice crystals, lactose crystals and fat concentrations. The soft texture is an evidence of the homogeneity of small ice crystals and air cells and the lack of crystals. And Snow textures were observed when the air cells are large or many, there are other drawbacks to the strength of the show in the ice cream, such as: (sticky, or

fragmentation, or coagulation, or water, and so on), generally due to a lack of equations mixtures (Webb *et al.*, 1974 ), the results also showed in a table (5) that there is a significant difference between the control sample and among all treatments after one day of storage in terms of textures and body, and also the control sample recorded the highest degree of judging, followed by a sample where dates molasses were added by (5%).

No significant differences between each of the samples added cutting pass sokary (10%) and paste pass sokary (5%) and paste Al-khalas passes (5%), while no significant differences were shown among all of the qualities of body and textures added cutting pass sokary (5%) and cutting pass Al-khalas (5%) and paste Al-khalas (10%) at the beginning of storage.

During storage periods body and texture of ice cream samples does not show significant changes, except for samples fortified with cutting pass sokary (10%) and paste sokary (10%) and dates molasses (10%); we can say: The storage effect for two months did not significantly affect the more samples and treatments in terms of body and texture. The texture is one of the important properties of ice cream, and the most defective texture is coarse or harsh which is due to the large size of ice crystals, which are mainly caused by thermal shock (Lindamood*et al*., 1989).

Marshall and Arbuckle, (1996) stated that the increase of sugar in ice cream caused the mainstay finely; because it reduces the freezing point, and increasing amounts of non-frozen cause increased viscosity and detract free water ratio. Scored (Abdullah *et al*., 2003) that the hard solids in ice cream plays an important role in the quality of ice cream if these lead to clotting textures, while low ratios lead to the formation of ice crystals and coarse texture. Sugar plays an important role in lowering the freezing point of the ice cream mixture; therefore delaying solids freeze solid in the freezer (Potter and Hotchkiss, 1995). Icy texture notes when many big pneumatic cells consist (Abdullah *et al*., 2003) and (Stampanoni*et al*., 1996) explained that an increase in solid dairy solids levels of non-fat reduced sensation of cold in the ice cream, the higher the fat content least, although it not recommended, due to its effect on ice cream flavor (Ohmes*et al*., 1998), and (Bodyfelt*et al*., 1988) noted that the texture of the ice cream which has low a fat and total solids recorded mainstay harder for samples with high fat and total solids content, and attributed this to that it leads to high levels of snow and therefore less of milk fat amorphous levels, which is a component of the softer snow.

Akoh, (1998) said that the apparent viscosity in the molten state in part is an important factor; it affects how the sense of a sample of ice cream when tasted. Goff, (1997) found that it can control the physical properties of the ice cream mixture by the development of manufacturing, which can change the texture and the physical appearance of the ice cream. Numerous proteins and sugars are also considered important in the ice cream ingredients, which are engaged in the properties of texture and composition of the ice cream (Vega and Goff, 2005).

The table (4) shows also average judging the sensory properties of the melted of ice cream samples for different values of treatments during storage periods of time (60 days). It was observed from the results that there were no significant differences between the various treatments and control sample in melting properties at the storage beginning, except samples in which paste pass Al-khalas (10%) were added, and recorded the highest melting values when dates molasses (5%) were added, then paste pass sokary (10%) and (5%). We did not record any significant change during the storage period (60 days) of any treatments for melting properties, but only great for samples where paste pass sokary (10%) and dates molasses (10%) degree were added.

**Table 4: Sensory Evaluation of Samples for Different Treatments of Ice Cream during Storage Periods up to 60 Days**

| Treatments | Flavor (40) | | | Body & Textures (30 ) | | | Melting properties (10) | | | Color (10) | | | Appearance (10) | | | General acceptance (100) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 30 | 60 | 1 | 30 | 60 | 1 | 30 | 60 | 1 | 30 | 60 | 1 | 30 | 60 | 1 | 30 | 60 |
| Control | 38.2 ± 2.7 $^{BC}$ | 36.1± 4.9 | 35.1± 6.2 $^{ABC}$ | 29.4± 0.96 $^{D}$ | 28.2± 2.48 $^{BC}$ | 27.6 ± 3.83 $^{BC}$ | 9.2 ± 0.8 $^{AB}$ | 8.7 ± 1.56 | 9.1 ± 1.59 | 9.6 ± 0.96 $^{C}$ | 9.4 ± 1.07 $^{B}$ | 8.8± 1.61 | 9.5 ± 0.97 $^{D}$ | 8.8± 1.13 | 8.8± 1.31 | 97.3 ± 3.52 $^{D}$ | 90.7 ± 9.22 | 88.4 ± 15.9 $^{AB}$ |
| Sokary Pieces10 % | 34.5± 6.2 $^{ABC}$ | 36.2± 3.9 | 33± 4.8 $^{A}$ | 26.2± 4.80 $^{ab-ABC}$ | 28.4 ± 2.066 $^{b-C}$ | 23.9 ± 4.28 $^{a-A}$ | 8.8 ± 1.5 $^{AB}$ | 8.8 ± 1.13 | 8.3 ± 1.15 | 9.4 ± 0.96 $^{BC}$ | 9.4 ± 0.84 $^{B}$ | 8.8± 1.22 | 9.1 ± 0.73 $^{BCD}$ | 8.9± 0.99 | 8.8± 1.22 | 89.4 ± 13.4 $^{ABCD}$ | 92.7 ± 7.46 | 83.3 ± 11.8 $^{A}$ |
| Sokary pieces 5% | 37± 3.3 $^{ABC}$ | 35.4± 3.2 | 36.6± 3.1 $^{ABC}$ | 26.9± 2.80 $^{ABCD}$ | 28.2 ± 2.09 $^{BC}$ | 27.5 ± 4.03 $^{C}$ | 8.8 ± 0.8 $^{AB}$ | 8.8 ± 1.22 | 8.7 ± 1.41 | 9.1 ± 0.87 $^{ABC}$ | 9.2 ± 1.13 $^{AB}$ | 8.8± 1.47 | 8.6 ± 0.51 $^{ABC}$ | 8.7± 1.15 | 8.7± 1.33 | 92.2 ± 4.26 $^{ABCD}$ | 91.1 ± 9.70 | 90.2 ± 9.55 $^{AB}$ |
| Al-khalas pieces 10% | 33.9± 6.7 $^{A}$ | 34.9± 3.6 | 35.7± 4.6 $^{ABC}$ | 25.4 ± 4.52 $^{A}$ | 27 ± 3.09 $^{ABC}$ | 28.3± 2.26 $^{C}$ | 8.5 ± 1.4 $^{AB}$ | 8.4 ± 1.26 | 9 ± 0.81 | 9 ± 1.05 $^{ABC}$ | 9.1 ± 1.10 $^{AB}$ | 9.2± 0.91 | 8.7± 0.67 $^{ABCD}$ | 8.7± 0.94 | 8.9± 1.59 | 87.3 ± 12.9 $^{AB}$ | 92.1 ± 6.40 | 90.6 ± 8.12 $^{AB}$ |
| Al-khalas pieces 5% | 37.4 ± 3.0 $^{ABC}$ | 35.6± 4.8 | 38.2± 2.1 $^{C}$ | 27.4± 2.83 $^{ABCD}$ | 27.6 ± 2.27 $^{ABC}$ | 27.5± 3.40 $^{BC}$ | 9 ± 0.9 $^{AB}$ | 8.7 ± 1.49 | 9.3 ± 1.05 | 9.4 ± 0.96 $^{BC}$ | 9.2 ± 1.03 $^{AB}$ | 9.2± 1.23 | 9.5± 0.52 $^{D}$ | 8.9± 1.19 | 8.8± 1.22 | 95.2 ± 3.99 $^{BCD}$ | 91.9 ± 7.09 | 85.7 ± 18.8 $^{AB}$ |
| Sokary Paste 10% | 37.9± 1.7 $^{a-ABC}$ | 33.4± 4.2 $^{a}$ | 35.7± 4.5 $^{a-ABC}$ | 28.3± 1.567 $^{b-BCD}$ | 25.2 ± 4.59 $^{ab-AB}$ | 24.9± 3.73 $^{a-AB}$ | 9.3 ± 0.7 $^{b-AB}$ | 7.9 ± 1.44 $^{a}$ | 8.5 ± 1.35 $^{ab}$ | 8.7 ± 0.82 $^{ABC}$ | 8.6 ± 1.17 $^{AB}$ | 8.7± 1.05 | 8.7± 0.82 $^{ABCD}$ | 8.2± 0.91 | 8.7± 1.33 | 95.3 ± 3.77 $^{b-BCD}$ | 88.5 ± 8.11 $^{a}$ | 88.9± 8.7 $^{ab-AB}$ |
| Sokary Paste 5% | 34± 9.0 $^{AB}$ | 36± 3.8 | 38.3± 1.7 $^{C}$ | 26.5± 3.71 $^{ABC}$ | 26.2 ± 3.35 $^{ABC}$ | 27.7± 2.54 $^{BC}$ | 9.3 ± 0.7 $^{AB}$ | 8.4 ± 1.26 | 8.5 ± 1.50 | 8.9 ± 0.87 $^{ABC}$ | 8.8 ± 1.22 $^{AB}$ | 8.5± 1.35 | 9± 0.81 $^{BCD}$ | 8.5± 0.84 | 8.7± 1.70 | 89.1 ± 13.1 $^{ABC}$ | 90.9 ± 6.57 | 91.1± 8.6 $^{AB}$ |
| Al-khalas Paste 10% | 35.9± 3.7 $^{ABC}$ | 33.1± 4.2 | 34.6± 6.1 $^{ABC}$ | 27 ± 1.82 $^{ABCD}$ | 25 ± 4.57 $^{A}$ | 26.3± 3.83 $^{ABC}$ | 8.5 ± 1.6 $^{A}$ | 7.9 ± 1.59 | 8.8 ± 1.03 | 8.2 ± 1.6 $^{A}$ | 8.5 ± 1.50 $^{AB}$ | 8.7± 1.25 | 8.1± 1.52 $^{A}$ | 8.1± 0.99 | 8.7± 1.41 | 90.4 ± 8.72 $^{ABCD}$ | 88.3 ± 9.95 | 88.9 ± 11.0 $^{AB}$ |
| Al-khalas Paste 5% | 35.6± 6.1 $^{ABC}$ | 36.2± 3.4 | 35.5± 4.2 $^{ABC}$ | 26.5 ± 4.64 $^{ABC}$ | 25.6 ± 4.50 $^{ABC}$ | 26.5± 2.01 $^{ABC}$ | 9 ± 0.8 $^{AB}$ | 8.2 ± 1.47 | 8.5 ± 1.64 | 8.6 ± 1.64 $^{AB}$ | 8.8 ± 1.22 $^{AB}$ | 8.5± 1.64 | 8.5± 1.58 $^{AB}$ | 8.5± 0.84 | 9 ± 1.24 | 90.6 ± 13.9 $^{ABCD}$ | 91 ± 9.12 | 87.8 ± 12.7 $^{AB}$ |
| Dates molasses10% | 34.4± 2.1 $^{ABC}$ | 34.2± 7.1 | 37.2± 2.8 $^{BC}$ | 25.6± 2.633 $^{a-AB}$ | 26.8 ± 2.974 $^{ab-ABC}$ | 28.3 ± 1.95 $^{b-C}$ | 8.4 ± 0.8 $^{a-A}$ | 8.6 ± 1.51 $^{ab}$ | 9.4 ± 0.69 $^{b}$ | 8.3 ± 0.67 $^{A}$ | 8.2 ± 1.47 $^{A}$ | 8.9± 1.66 | 8.3± 0.67 $^{AB}$ | 8.7± 1.41 | 9.2± 0.91 | 84.5 ± 5.02 $^{a-A}$ | 89 ± 12.2 $^{ab}$ | 94.2 ± 5.22 $^{b-B}$ |
| Dates molasses5% | 38.4± 1.6 $^{b-C}$ | 32.8± 4.7 $^{a}$ | 34.3± 5.6 $^{a-AB}$ | 28.9± 1.91 $^{CD}$ | 26.5± 2.87 $^{ABC}$ | 26.7± 3.02 $^{ABC}$ | 9.4 ± 0.7 $^{B}$ | 8.3 ± 1.63 | 9.1 ± 1.28 | 9.3 ± 1.33 $^{BC}$ | 8.2 ± 1.47 $^{A}$ | 8.1± 1.28 | 9.4± 1.26 $^{CD}$ | 8.4± 1.57 | 8.4± 1.07 | 95.7 ± 6.09 $^{b-CD}$ | 86.4 ± 11.7 $^{a}$ | 86.8 ± 10.2 $^{ab-AB}$ |

The sample size of n = 20 and the level of the significance 0.05

The comparison between per class has components of symbols a, b, c.

The comparison between per column has components of symbols A, B, C

In terms of the effect of different treatments on the color of ice cream the results showed that there were significant differences between the treatments and the control sample, the best samples were recorded for the control sample color and then when dates molasses sample (5%) were added. Results showed no significant differences for any of the color of various treatments during storage periods of time (60 days). Also the recorded results in terms of general appearance showed significant differences between the control sample and all the various treatments sampled at the beginning of storage, except for samples fortified with cutting pass Al-khalas (5%), which recorded the highest values in the judging in terms of the overall appearance in addition to the control sample. As well as storage for a period of (60 days) does not show any significant changes in the overall appearance. General admission for each sample of the studied samples is considered the final arbiter of the acceptability of this sample among consumers, thereby encouraging the manufacturer to meet the consumer demand, although the flavor and texture of the product has an important role in the acceptance or rejection of the ultimate consumer of the product after storage.

## CONCLUSIONS

From the obtained results in table (4) there were significant differences between the control sample and the rest of the treatments at the beginning of storage, so in general admission. And the best samples recorded was the control sample, followed by samples where dates molasses (5%) were added, and for storage affects (60 days) was significant on treatments in terms of public acceptance, only samples added paste pass sokary by ( 10%), and samples with added dates

molasses, both (5%), or (10%). And the best samples recorded after a month of storage were samples with cut dates sokary (10%), the samples with added pieces of Al-khalas, followed by (10%) and cut sokary and spare Al-khalas (5%), while the best samples recorded after two months of storage, figure (16) were the samples with added dates molasses (10%), followed by samples with added paste pass sokary (5%). We concluded that the ice cream which was made from camel milk fortified with pass, or genitive pass was the highly popular and acclaimed by the arbitrators, and the general acceptance of all the good treatments values after storage for two months, it did not show any defects, and were lower values at all is (83.3) ± (11.7) of 100 degrees.

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