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# Effect of Total or Partial Substitution of Cacao and Sucrose by Date Powders Variety *H'lowa* on the Some Quality of Dairy Creamed Dessert

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## ABSTRACT

Fruits of date palm (*Phoenix dactylifera* L.) are consumed throughout the world and are a vital component of the diet in most Arabian countries. Consumers are increasingly searching for innovations of the food industry whenever they are able to make their own food choices. The dessert market is growing rapidly with many new products and concepts. The paper is included in this research direction by studying some effect of substitution of cacao and sugars by date powders variety *H'lowa* on the quality of dairy creamed dessert. In order to obtain the date powders, four varieties of dates *H'amira*, *H'loua*, *Tefezouine* and *Timjouhart*were dried at 90°C during 2h. Date powders variety *H'lowa* was selected according to these good quality for replacement of cacao or sugars. The total or partial replacement of the cacao causes stability of pH, slight decrease of acidity and solid content, decrease of ash, crud proteins content and increases the reducing sugars level. Total or partial replacement of sucrose causes a decrease of the solid content, pH, reducing sugars, stability of acidity and ash and increase the proteins content. Microbiological analyzes indicate an increase of the number of total plat count, yeasts and moulds with the use of the date powders. Complete substitution of cacao by the date powders (17g) improves the texture and odor of dairy dessert and the partial replacement of sucrose by date powders (55 g) improve color and taste.
**KEYWORDS:** date powders, dairy creamed dessert, quality.

## 1. INTRODUCTION

The date palm *Phoenix dactylifera* L. belonging to the Arecaceae family represents an important economical and ecological culture for many countries [1]. It is a dioecious, monocot plant that has been cultivated across the Middle East and North Africa for over 5000 years [2, 3]. Date palm cultivars are divided to three main types according to their fruit moisture content as soft, semi-dry and dry cultivars [4]. Dates contain a high percentage of sugars reaching 88% in some varieties [5] and mineral salts [6] but low in fat and virtually free from cholesterol and sodium. There is an important genetic biodiversity of the date palm in the Maghreb region (Algeria, Tunisia and Morocco) with more than 1000 varieties [7]. Algeria is a date producer country with an annual production of more than 500 000 t. The most significant part of this quantity constitutes common dates (all other varieties from *Deglet-Nour*). The production of common dates in Algeria reached 244577 t [8]. The dates destined to the local consumption and to the export has morphological, microbiological and physicochemical characteristics well-defined. However, the surplus of the production of many known varieties poses a marketing problem for the farmers. They are generally designated for cattle feeds which is likely to weaken the phoenicicole system [9]. Common dates are known as low value varieties [10] which cannot be directly supplied in the market due to hygienic and economic problems. Utilization of such surplus by date processing companies into more value added derivatives and also by being used for production of new food products is very important in increasing the income of the sector.

Today's dairy processors have ability to convert raw milk to different new products, in order to improve efficiencies of traditional products and to introduce new products for expanding the dairy product market [11]. The dairy desserts are highly popular particularly because of their wide variety of texture. There are numerous types of dairy desserts which are mainly formulated with milk, cream and butter, thickeners (e.g. starch and hydrocolloids), sucrose, colourants and flavouring agents. The particular characteristics of some ingredients, like fat content of milk, type of starch, and/or type and concentration of hydrocolloids, and their crossed interactions, will be reflected in notable differences in their rheological and sensory properties [12]. They then consist of milk to over 80% and 8 to 12% of sugar [13]; starch and carrageenan, are added up respectively 2-4% and 0.1-0.3%

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[14]. Dairy desserts are good sources of energy and calcium and hence can promote bone health, reduce the risk of chronic diseases and improve overall health [15]. The objective of this work is to characterise and study the effect of total or partial replacement of cacao and sucrose by date powders variety *H'lowa* in the quality of dairy creamed dessert.

## 2. MATERIAL AND METHODS

**2.1. Vegetable material and preparation of date powders:** The dates used in current experiments were varieties half soft, known as *H'amira*, *H'loua*, *Tefezouine* and *Timjouhart* badly exploited, cultivated in the area of Adrar (South of Algeria) and harvested in the month of October 2014. For the preparation of the date powders, theses fruits have been washed in order to eliminate sand and dust, and then cut into the small particles (1-3 cm). Dates are dried at 80-90°C and the drying process was continued until the pulp moisture content did not decrease significantly with increasing drying time and/or the colour change is not visible to the naked eye (Figure 1). The moisture content thus obtained was considered as equilibrium moisture content [16, 17].


Figure 1: All varieties (fruit entire and powders)of dates: *H'amira, H'loua, Tefezouine and Timjouhart*.

**2.2. Biochemical analysis:** Samples were analyzed chemically according to the official methods of analysis described by the Association of Official Analytical Chemist [18]. Yield of date powder (or date flesh) in % is the ratio of the mass of powder(or date flesh) obtained /mass of fruit entire. For determination of the optical density, 50 mL of diluted sample was centrifuged at 2300rpm for20 minutes. 25 mL of the supernatant was mixed with 25 mL of 95% ethanol and then filtered. The optical density is measured by a spectrophotometer at 420 nm [19]. The pH was measured by using a digital pH meter and titratable acidity was determined by manual titration of suitable quantity (10 g) with standardized 0.1 N NaOH using phenolphthalein as indicator. The volume of NaOH required to neutralize the date was recorded and used to calculate the content of titratable acids. The moisture content was determined by measuring the mass of the sample before and after water is removed by evaporation at 105°C for 24 h (until constant mass was achieved). Total nitrogen of date and proteins content were determined by the method of Kjeldahl digestion and distillation apparatus [18, 20]. Total and reducing sugars were determined colorimetrically at 480 nm by Dubois method [21]. Standards were prepared with glucose solutions at different concentrations. The ash content was determined according to the AOAC official method 972.15 by incineration five gram of date at a temperature of 600°C during 3 h [22]and the mineral salts was determined according to the methods advocated by Hamon *et al.*, [20] and AOAC,[22].

**2.3. Microbiological analysis:** The microbiological quality was determined by enumeration of total plate count (TPC) in the TGEA (Triptone Extrat Glucose Agar) after incubation for 72 h at 30°C. All colonies were counted on those plates containing 30-300 colonies and multiplied by dilution factor. Arithmetic average was counted as total plate count per gram [23]. Faecal streptococci were counted in Roche presumptive medium contains sodium azohydrate and Litsky confirmation medium contains sodium azohydrate and purple ethyl. Search sulfite-reducing Clostridium can be done by counting the sporulated forms which develop in media VF containing sodium sulphite and iron alum after 48h at 37°C [24]. The total and fecal coliforms were counted, respectively desoxycholate lactose agar and violet red bile lactose agar (VRBL) after 24 to 48 h at 37 for total coliforms and at and 44°C for faecal coliforms, *Staphylococcus aureus* on Giolitti Cantonii and Chapman agar after 24 to 48 h at 37°C, mean *Salmonella* in *Salmonella* agar and incubated for 24 to 48 h at 37°C, after enrichment in Selenite-F Broth (SFB) medium for 24 to 48 h at 37°C. The yeasts and moulds on potato dextrose agar (PDA) supplemented with

oxytetracycline after 5 days at 25°C [25]. All colonies were counted on the plates containing less than 50 colonies and multiplied by dilution factor. Arithmetic average was counted as total plate count per gram.

**2.4. Rheological analysis of the date powder:** The date powder is known by its wealth of sugars and its low content of proteins. The aptitude of the date to undergo a complementary thermal drying for obtaining powders was already underlined [17, 26]. Then, the comprehension of the behavior of the powder is imperative to lead a final product with best physical quality [27]. Accordingly, we try to formulate food containing powders date. A dehydrated product adsorbs a large amount of water compared to a fresh product. 10g of different powders are exposed to air for 2 hours, then weighed again the product. The power of hydration in % is calculated by the following formula: [the mass of the test after exposure to fresh air in (g) - the mass of the sample before exposure to air in (g)/ the mass of the sample before exposure to air in (g)] * 100. The temperature has an effect on the stability of dehydrated products and manifested by the agglomeration, browning and blackening. Dates powders are exposed to different temperatures and check their quality.

**2.5. Sensory evaluation [28]:** All the samples were evaluated for sensory characteristics (taste, color, odor and texture) by 14 panelists (students and technicians from University of Mascara, Algeria); using a point scale (7: good, 5: acceptable, 3: poor, 1: bad).

**2.6. Preparation of Dairy creamed dessert:** In view of the rheological, biochemical and microbiological properties of date powders, the highest color, taste and texture scores, it is possible to use the date powders variety (*H'lowa*) in many food preparations (dairy dessert). Five samples of dairy dessert were prepared from Giplait of Mascara (Algeria), with different concentrations of date powders (*H'lowa*), sugars and cacao. Control dairy dessert was made with 1L Pasteurized milk, 135g sugar, 4g Gelling agent, 17g cacao and 4g Starch. All types of dairy creamed dessert (control, A: total replacement of cacao by 17g date powders, B: Partial 50% substitution of cacao: 8.5g cacao and 8.5g date powders, C: partial substitution of sucrose: 80g sucrose and 55g of date powders, D: total substitution of sucrose by 135g of date powders,) were stored at 4°C. All samples (produced in triplicate) were subjected to the following manufacturing steps: 1Lofpasteurized milk heated to 45°Cwas added by cacao, sugars, starch and gelling agent. The mixture under goes homogenization and pasteurization at 103°C for 15 min, followed by conditioning in pots and storage at 4°C. Dairy Creamed Dessert samples were withdrawn on a weekly basis for 2 wk to inquire the quality during storage at 4°C. The samples were taken out and left at room temperature prior to analyses. The samples were then homogenized to obtain a uniform mixture for further analysis. At different storage intervals (1, 7 and 15 days), the samples were measured for biochemical, microbiological and sensory properties. The total fat of the samples was determined, by Gerber [29]. The Formal titration method was used to estimate the total protein content of dairy creamed dessert [30].

## 3.RESULTS AND DISCUSSION

**3.1. Biochemical analysis of date flesh and date powders:** According to the results clearly presented in table 1, there is a difference between the yield of each flesh cultivar and powders. The variety *Tafezouine* has the best yield (93.32 ± 0.4) followed by *H'mira* (88.70 ± 0.2), then *Timjouhart* (86.30 ± 0.3) and *H'loua* (71.22 ± 0.1). For the yield of date powders, the ranking is as following the *H'loua*, *H'mira*, *Timjouhart* and *Tafezouine*. The variation in yield between the dates flesh and powders is due to their difference in water content. Optical density is a parameter that judges the polymerization reactions and browning that generated products may give a darker color to the product and evaluates the nutritional quality. The colour is an important quality attribute of date flesh and powders. It is essential for food processor to minimize the colour losses during processing and storage [31]. The lowest optical density is obtained with the variety *H'loua* because it has low water content and thus a low drying time compared to *H'mira*. The pH of the flesh dates range from5.61 ± 0.01 to5.90 ± 0.02, the results obtained concord with those of Belguedj [32] and Abekhti *et al.*[33]. For determination of titrable acidity, our results concord with results obtained by Belguedj [32] except for that of *H'mira* that shows higher values maybe due to the microbiological activity just before drying, because the acidity of providing order of3.2g/kg, but according to our results, there is an acidityof about4.16 ± 0.2g/ kg.In this study, the moisture varies from one variety to another, generally dry and semi soft varieties have lower moisture compared to soft varieties. Ranked down as moisture respectively *Tafezouine*, *H'mira*, *Timjouhart*, *H'loua*. After drying, the driest date powder is one of the varieties *H'loua*. The high moisture content facilitates spoilage of dates and low moisture content will lead to dry dates not acceptable to consumers. Ours results are agreement from the observations of Barreveld [34] who reported that moisture content in date fruits at different stages of development were about 50-60% for sweet khalal, fleshes varied between 9.73 and 17.52 g/100 g, being lowest in Um-sellah and highest in Shahal. Toutain [35] considered dates as soft, if they present water content more than 30%, dry if this rate is less than 10% and half soft if the rate is between 10 and 30%. This nomenclature permits us to classify theses varieties of

date as half soft. The moisture content of date flesh of various varieties is not agreement with results (64.34%) obtained by Omowunmi and Ayoade [36]and agreement with results (10.57%) obtained by Abekhti *et al.* [33]. The moisture content of date powders obtained by El-Sharnouby *et al.* [37] was 11.0% and the moisture of date flesh obtained by Salim-ur-Rehman *et al.* [38] is 17.7%. The ash content is generally the minerals that are present in all food products and an index to the nutritive value [39]. Dates are a good source of certain minerals (potassium and calcium), this explains considerable ash content in dates. The ash content obtained in this work was for all varieties vary 1.82 ± 0.02 to 2.05 ± 0.03 for flesh date and 2.13 ± 0.02 to 2.57 ± 0.03 for date powders. Ash in dates powders are higher than those given by flesh dates because the water evaporation. The difference between flesh date and powder date is 0.3% for *H'mira, H'loua* and 0.5% for *Timjouhart* and *Tafezouine*. This variation is due to the deference between the moisture percentages of these varieties and date powders. Ash content of date powder obtained by El-Sharnouby *et al.* [37]was 2.6%. For determination of reducing and total sugars, the results of flesh fruits (edible part) are similar to those given by Belguidj [32]. The carbohydrate content of date flesh of various varieties is agreement with results (65%) obtained by Omowunmi and Ayoade [36].

Table 1: Biochemical and microbiological analysis of date flesh (DF) and date powder (DP).

| | ***Timjouhart*** | ***Tafezouine*** | ***H'loua*** | ***H'mira*** |
|---|---|---|---|---|
| **Yield %** | DF. 86.30 ± 0.3<br>DP. 44.15 ± 0.2 | DF. 93.32 ± 0.4<br>DP. 40.74 ± 0.2 | DF. 71.22 ± 0.1<br>DP. 56.01 ± 0.3 | DF. 88.70 ± 0.2<br>DP. 47.78 ± 0.3 |
| **O D at 420 nm** | DF. 0.47 ± 0.01<br>DP. 1.35 ± 0.01 | DF. 0.50 ± 0.02<br>DP. 1.33 ± 0.01 | DF. 0.31 ± 0.01<br>DP. 0.66 ± 0.02 | DF. 0.49 ± 0.02<br>DP. 1.41 ± 0.02 |
| **pH** | DF. 5.73 ± 0.03<br>DP. 5.03 ± 0.03 | DF. 5.65 ± 0.04<br>DP. 5.29 ± 0.03 | DF. 5.90 ± 0.02<br>DP. 5.49 ± 0.03 | DF. 5.61 ± 0.01<br>DP. 5.31 ± 0.01 |
| **Acidity titrable g/Kg** | DF. 3.6 ± 0.2<br>DP. 3.5 ± 0.1 | DF. 3.7 ± 0.3<br>DP. 2.04 ± 0.3 | DF. 2.38 ± 0.1<br>DP. 4.1 ± 0.1 | DF. 2.52 ± 0.1<br>DP. 4.16 ± 0.2 |
| **Moisture %** | DF. 16.11 ± 0.3<br>DP. 4.26 ± 0.3 | DF. 28.31 ± 0.4<br>DP. 5.23 ± 0.5 | DF. 13.4 ± 0.2<br>DP. 4.04 ± 0.3 | DF. 19.70 ± 0.2<br>DP. 4.63 ± 0.2 |
| **Ash %** | DF. 2.05 ± 0.03<br>DP. 2.57 ± 0.03 | DF. 2.04 ± 0.03<br>DP. 2.55 ± 0.03 | DF. 1.9 ± 0.03<br>DP. 2.23 ± 0.03 | DF. 1.82 ± 0.02<br>DP. 2.13 ± 0.02 |
| **Reducing sugars %** | DF. 41.20 ± 0.3<br>DP. 68.7 ± 0.2 | DF. 45.2 ± 0.3<br>DP. 47.11 ± 0.4 | DF. 46.23 ± 0.3<br>DP. 62.8 ± 0.1 | DF. 58.1 ± 0.1<br>DP. 77.50 ± 0.2 |
| **Total sugars %** | DF. 62.7 ± 0.4<br>DP. 71.6 ± 0.4 | DF. 54.4 ± 0.3<br>DP. 61.9 ± 0.3 | DF. 84.11 ± 0.4<br>DP. 85.70 ± 0.2 | DF. 62.1 ± 0.2<br>DP. 63.4 ± 0.4 |
| **Sugars/water** | DF. 3.89<br>DP. 16.80 | DF. 1.92<br>DP. 11.83 | DF. 6.27<br>DP. 21.21 | DF. 3.15<br>DP. 13.69 |
| **Proteins %** | DF. 0.77 ± 0.03<br>DP. 0.01 ± 0.02 | DF. 0.53 ± 0.04<br>DP. 0.22 ± 0.02 | DF. 0.48 ± 0.03<br>DP. 0.27 ± 0.1 | DF. 0.65 ± 0.02<br>DP. 0.37 ± 0.02 |
| **Total Plate Count UFC/g** | DF. 6000<br>DP. 0 | DF. 7000<br>DP. 10 | DF. 8000<br>DP. 14 | DF. 400<br>DP. 0 |
| **Yeasts and moulds UFC/g** | DF. 2000<br>DP. 60 | DF. 300<br>DP. 40 | DF. 3500<br>DP. 20 | DF. 300<br>DP. 0 |

Vales represent Mean ± sd ; n=3

Amoros *et al*. [40] found that the total sugar concentration in Caqui 24 and Caqui 22 date fruits ranged from 424 to 542 g kg 1. Mikki [41] reported that Saudi date varieties contain about 70% reducing sugars with an almost equal quantity of glucose and fructose. In date powders, the values of total and reducing sugars are very high for *Timjouhart*, *H'loua* and *H'mira* and slightly higher for *Tafezouine*. The total sugar content give the ranking; *H'loua*, *Timjouhart H'mira* and *Tafezouine*. The reducing sugars content for all varieties date powders obtained is not agreement with results (50g.$L^{-1}$) obtained by Shahravy *et al.* [42] and results (60± 0,4%) for date powders observed by Benahmed *et al.*[16]. The report Sugars/Water gives an idea of the osmotic pressure, the absorption capacity of power, energetic and nutritional value and the water activity (Aw) which influences the bacteria charge. The classification of powders report is as follows: *H'loua*, *Timjouhart*, *H'mira* and *Tafezouine*. According to Maatallah [43], protein levels are of the order of 2%, but according to our results, these quantities vary between 0.01 ± 0.02% and 0.77 ± 0.03%. Protein content of date powder obtained by El-Sharnouby*et al.*[37]was 2.1%. Al-Hooti *et al*. [44] reported that dates were not considered as a good source of protein. Borchani *et al*. [45] analysed eleven Tunisian cultivars of date for protein and found the highest protein content of 2.85 g/100 g dry matter. The crude protein of date flesh obtained by Salim-ur-Rehman *et al.* [38] is 3.5%.

**3.2.Microbiological analysis of date flesh and date powders:** According to our results (table 1), the total plat count (TPC) is very high and this is logical because the varieties of dates reused properly packed and marketed under the same conditions that are unhygienic and that because bacterial contamination. This increase might be due to increase of moisture in date flesh. The change in TPC for various varieties is in conformity with the findings of Al-Hooti *et al*. [6]. But after drying, the number of bacteria decreases totally, absence in powder of

*Timjouhart* and *H'loua* and very limited number in the other two varieties (10CFU/g for *Tafezouine* and 14CFU/g for *H'mira*). The presence of yeasts and moulds causes an alteration, modification of the nutritional value and the occurrence of undesirable flavor [46]. The number of yeast and moulds is low in the date powders compared to the date flesh. Note the total absence of faecal streptococci, sulphite-reducing *Clostridium*, *Staphylococcus aureus*, coliforms and *Salmonella*. It can be reported the presence of tannins that limit the presence of certain bacteria in dates.

**2.3. Rheological analysis of the date powders:** For the rehydration power, thebestrangeis*Hloua*with4 ± 0.2% followed by *Timjouhart*10 ± 0.2%, *Tafezouine*12 ± 0.3 and*H'mira*15 ± 0.4.There is a very significant effect of temperature on the color and the state of agglomeration of the powders. The descending ranking of the sensitivity is *H'mira*, *Timjouhart*, *Tafezouine* and *H'loua*. This sensitivity can be explained by the variable content of sugar in dates which give stickiness to agglomerates by their crystal form and blackening can be attributed to the caramelization of its sugars (Figure 2).

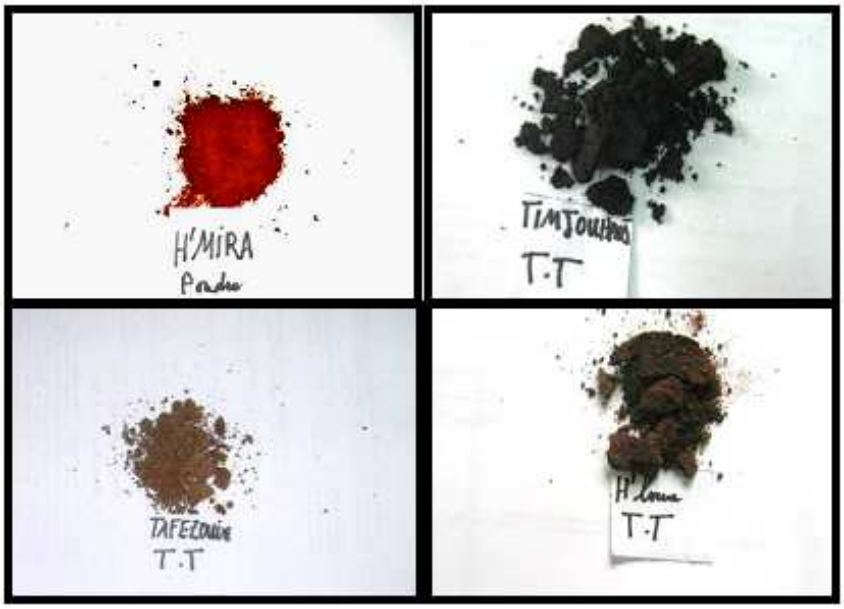


Figure 2: Powders of dates after heat treatment.

**3.4. Results of sensory evaluation of date powders:** Table 2 show the results obtained for the sensory analysis carried out of the assay. The date powder variety *H'lowa* had significantly higher color, taste and texture score followed by *Tefezouine*, then *Timjouhart* and *H'mira*. Date fruits and date powders may be considered as an almost ideal food providing a wide range of essential nutrients and potential health benefits [47].

Table 2: Sensory evaluation of date powders.

| | Date varieies | Good | Acceptable | Poor | Bad |
|---|---|---|---|---|---|
| **Color** | *Tefezouine* | 50 | 36 | 14 | / |
| | *Timjouhart* | 14 | 50 | 22 | 14 |
| | *H'loua* | 79 | 14 | 7 | / |
| | *H'mira* | 14 | 22 | 43 | 21 |
| **Taste** | *Tefezouine* | 43 | 36 | 21 | / |
| | *Timjouhart* | 21 | 44 | 21 | 14 |
| | *H'loua* | 57 | 36 | 7 | / |
| | *H'mira* | 7 | 14 | 43 | 36 |
| **Texture** | *Tefezouine* | 57 | 29 | 14 | / |
| | *Timjouhart* | 36 | 43 | 21 | / |
| | *H'loua* | 71 | 21 | 8 | / |
| | *H'mira* | 21 | 57 | 22 | / |

**3.5. Results of Dairy Creamed Dessert:** There are no scientific reports on the studied subject but a considerable amount of works on the development of new date based food products has been published. Several studies have been carried out to incorporate dates in production of different food products such as bread [48, 49], biscuit [37], tomato ketchup [50], low caloric cakes [51], chocolate toffee [10], and yogurt [52]. This study was carried out to determine the possibility of using date powders for manufacturing of dairy dessert product.

**3.5.1. Results of raw materials:** The pH of the cacao powder is approximately 6.66±0.1, this value is very close to that of the date powders 5.49 ± 0.1 (table 3). The solid content is of 96.7±0.1% and this agreement with the values proposed by Frénot and Vierling [53]. Date powders has the same value 95.96 ± 0.3% which justify our optics in replacing cacao powders by the date powders without changing the solid content of the dairy cream dessert. Starch has slightly acidic pH 6.23 ± 0.2 and high solid content 96.1 ± 0.2. From these results, we find that the sugar has good physico chemical quality. Fat is the important component of dessert and contribute texture, taste, quality, flavor, and nutritional value in the product. In this sample fat was 13 ± 0.3 $g.L^{-1}$, which was an effective factor on flavor of the final product. The raw material used for the making of dairy creamed dessert has good quality. There is a total absence of *Salmonella* and Staphylococci in all ingredients used and there is a very high presence of faecal coliforms in cacao, starch and milk. The presence of these bacteria in high numbers may be due to the poor microbiological quality of raw materials. The number of total plat count, yeasts and moulds is very high from cacao and starch. These germs have a detrimental effect on the stability of the finished product and may affect the nutrition and market ability of custard and limit its shelf life.

**3.5.2. Biochemical analysis of Dairy Creamed Dessert:** From the results, the total substitution (control and A) or partial replacement 50% (control and B) of the cacao by the date powders causes stability of pH (6.9 ± 0.1), slight decrease of acidity from 3 ± 0.2 to 2 ± 0.1 and solid content (from 30 ± 0.2 to 28.2 ± 0.1), decrease of ash (1 ± 0.1 to 0.84 ± 0.3) and decrease of proteins content (4.9 ± 0.1 to 2.3 ± 0.2). The total substitution of cacao by the date powders increases the reducing sugars from 14.4 ± 0.1 to 16.59 ± 0.1. Total replacement (Control and D) or partial substitution (Control and C) of sucrose by date powders causes a decrease of the solid content (30 ± 0.2 to 22.75 ± 0.3), pH, reducing sugars (14.4 ± 0.1 to 6.79 ± 0.3), stability of acidity and ash and increase the proteins content (4.9 ± 0.1 to 5.4 ± 0.3) during total substitution. During 15 days of storage, slight decrease of all biochemical parameters for all samples was showed (table 4).

Table 3:Biochemical and microbiological analysis of raw materials.

| | Milk | Cacao powders | Starch | Sucrose | Date powders |
|---|---|---|---|---|---|
| **pH** | 6.66±0.1 | 5.61±0.3 | 6.23±0.2 | 7.10±0.2 | 5.49±0.1 |
| **Acidity (°D)** | 16±0.5 | / | / | / | 4.1±0.3 |
| **Solids content (%)** | 9.05±0.1 | 96.7±0.1 | 96.1±0.2 | 99.4±0.2 | 95.96±0.3 |
| **Asch %** | 0.36±0.2 | 6.76±0.2 | 0.1±0.1 | 0.04±0.1 | 2.23±0.1 |
| **Proteins %** | 3.2±0.2 | 17.08±0.1 | 0.3±0.2 | / | 0.27±0.3 |
| **Fat ($g.L^{-1}$)** | 13±0.3 | / | / | / | / |
| **Total Plat Count UFC/g** | $6*10^3$ | $8*10^4$ | $9.1*10^3$ | $10^3$ | 14 |
| **Yeast and moulds UFC/g** | $10^2$ | $3*10^4$ | $8.4*10^3$ | 10 | 20 |
| **Fecal coliforms UFC/g** | $2*10^2$ | $5*10^3$ | $5*10^2$ | Abs | Abs |

Vales represent Mean ± sd ; n=3

Table 4:Biochemical analysis of dairy creamed dessert.

| | Storage time (Day) | Control 17g cacao, 135g sugars | A 17g DP,135g sugars | B 8.5g cacao, 8.5g DP,135g sugars | C 17g cacao, 55g DP, 80g sugars | D 17g cacao, 135g DP |
|---|---|---|---|---|---|---|
| **Solids content (%)** | 1 | 30±0.2 | 28.2±0.1 | 29.35±0.1 | 24.75±0.2 | 22.75± 0.3 |
| | 7 | 28.9±0.3 | 28±0.3 | 28.95±0.3 | 24.50±0.2 | 22.6±0.3 |
| | 15 | 27.5±0.2 | 26.1±0.3 | 27.6±0.1 | 24.35±0.2 | 22.3±0.2 |
| **pH** | 1 | 6.9±0.1 | 6.9±0.3 | 6.89±0.2 | 6.72±0.3 | 6.69±0.2 |
| | 7 | 6.8±0.2 | 6.87±0.1 | 6.84±0.3 | 6.69±0.3 | 6.36±0.2 |
| | 15 | 6.66±0.2 | 6.83±0.1 | 6.61±0.2 | 6.36±0.1 | 6.18±0.2 |
| **Asch %** | 1 | 1±0.1 | 0.82±0.2 | 0.84±0.3 | 0.66±0.1 | 1.03±0.3 |
| | 7 | 0.94±0.1 | 0.81±0.2 | 0.83±0.3 | 0.6±0.1 | 0.9±0.3 |
| | 15 | 0.84±0.2 | 0.7±0.1 | 0.74±0.2 | 0.4±0.1 | 0.24±0.2 |
| **Proteins %** | 1 | 4.9±0.1 | 2.3±0.2 | 4.2±0.2 | 4.9±0.2 | 5.4±0.3 |
| | 7 | 4.8±0.2 | 1.9±0.1 | 4.1±0.2 | 4.1±0.3 | 5.2±0.3 |
| | 15 | 3.2±0.1 | 1.5±0.2 | 2.3±0.3 | 3.2±0.1 | 4.9±0.3 |
| **Titrable acidity (°D)** | 1 | 3±0.2 | 2±0.1 | 2±0.3 | 3±0.2 | 4±0.2 |
| | 7 | 4±0.1 | 3±0.2 | 3±0.3 | 3.5±0.2 | 5±0.1 |
| | 15 | 5±0.2 | 3.75±0.2 | 4±0.3 | 4.25±0.1 | 6±0.1 |
| **Reducing sugars** | 1 | 14.4±0.1 | 16.59± 0.1 | 13.12±0.2 | 13.53±0.1 | 6.79±0.3 |
| | 7 | 14.35±0.2 | 16.22± 0.2 | 12.6±0.1 | 13.5±0.2 | 6.15±0.1 |
| | 15 | 14±0.2 | 16±0.1 | 12.1±0.2 | 11±0.2 | 5±0.2 |

Vales represent Mean ± sd ; n=3

Syneresis is one of the problems during storage of the dairy creamed dessert (DCD). The spoilage of DCD is indicated by the occurrence of syneres is and decrease in pH. The syneres is would become apparent as the storage continued. According to Toba *et al*. [54], the darkened colour of milk is another signal of deterioration and is caused by the oxidation of tryptophan and tyrosine. The spoilage probably leads to the degradation of the nutrients and creates the unfavourable sensory characteristic which results in a shorter shelf life of the DCD. pH of all dairy desserts decrease during the storage time. These results are agreement with values obtained by Reihaneh *et al.* [55]. The substitution of cacao or sugars by date powders decrease solid content and increase moistures. The amount of water released from the samples during the experiment has a negative correlation with water-holding capacity. The water-holding capacity is defined as the ability of a product to retain free water when an external force is applied [56, 57]. Generally, if higher water is separated from the gels under a constant pressure, the lower water-holding capacity of the sample will be obtained.

**3.5.3. Microbiological analysis of Dairy Creamed Dessert:** Microbial analyzes indicate an increase of the number of total plat count, yeasts and moulds with the use of the date powders and during the storage period. The presence of yeasts and moulds in product has a substantial bearing on organoleptic properties and shelf life of the product [58]. According to our results, we note that the total absence of faecal streptococci, sulphite-reducing *Clostridium*, *Staphylococcus aureus*, coliforms and *Salmonella* in all samples analysis (table 5).

Table 5: Microbial analysis of dairy creamed dessert.

| | Storage time (Day) | Control 17g cacao, 135g sugars | A 17g DP,135g sugars | B 8.5g cacao, 8.5g DP,135g sugars | C 17g cacao, 55g DP, 80g sugars | D (17g cacao, 135g DP) |
|---|---|---|---|---|---|---|
| **Total Plat Count** | 1 | 120 | 180 | 80 | 100 | 220 |
| | 7 | 570 | 700 | 90 | 200 | 2200 |
| | 15 | 590 | 12100 | 1140 | 3000 | 45000 |
| **Yeast and moulds** | 1 | 0 | 71 | 0 | 20 | 54 |
| | 7 | 4 | 600 | 50 | 200 | 1100 |
| | 15 | 500 | 6700 | 440 | 520 | 27000 |

**3.5.4. Sensory evaluation of Dairy Creamed Dessert:** Sensory analysis represents a decisive step during the various stages of food product development. Table 6 show the results obtained for the sensory analysis carried out of the assay. Complete substitution of cacao by the date powders (17g) improves the texture and odor of dairy dessert and the partial replacement of sucrose by date powders (55 g) improve color and taste. Sensory properties of dairy dessert set up is defined by the interactions of milk proteins, starch and carrageenan [12, 13].

Table 6: Sensory evaluation of dairy creamed dessert.

| | Dairy dessert | Good | Acceptable | Poor | Bad |
|---|---|---|---|---|---|
| **Color** | Control (17g cacao, 135g sugars) | 60 | 20 | 20 | / |
| | A (17g DP, 135g sugars) | 25 | 20 | 35 | 20 |
| | B (8.5g cacao, 8.5g DP, 135g sugars) | 55 | 25 | 10 | 10 |
| | C (17g cacao, 55g DP, 80g sugars) | 70 | 15 | 15 | / |
| | D (17g cacao, 135g DP) | 40 | 15 | 25 | 20 |
| **Taste** | Control (17g cacao, 135g sugars) | 65 | 15 | 20 | / |
| | A (17g DP, 135g sugars) | 70 | 15 | 15 | / |
| | B (8.5g cacao, 8.5g DP, 135g sugars) | 30 | 15 | 5 | 50 |
| | C (17g cacao, 55g DP, 80g sugars) | 75 | 20 | 5 | / |
| | D (17g cacao, 135g DP) | 20 | 10 | 10 | 60 |
| **Texture** | Control (17g cacao, 135g sugars) | 65 | 20 | 15 | / |
| | A (17g DP, 135g sugars) | 75 | 15 | 10 | / |
| | B (8.5g cacao, 8.5g DP, 135g sugars) | 40 | 20 | 15 | 25 |
| | C (17g cacao, 55g DP, 80g sugars) | 15 | 25 | 30 | 30 |
| | D (17g cacao, 135g DP) | 30 | 15 | 25 | 30 |
| **Odor** | Control (17g cacao, 135g sugars) | 35 | 20 | 30 | 15 |
| | A (17g DP, 135g sugars) | 70 | 15 | 15 | / |
| | B (8.5g cacao, 8.5g DP, 135g sugars) | 60 | 20 | 20 | / |
| | C (17g cacao, 55g DP, 80g sugars) | 10 | 35 | 25 | 30 |
| | D (17g cacao, 135g DP) | 20 | 30 | 20 | 30 |

## 4. CONCLUSION

Date fruit (*Phoenix dactylifera* L.) is rich in carbohydrates and has a high nutritional value which makes it suitable for being used as an ingredient in confectioneries. The present work is a part of our scientific project about the valorisation of the common dates grown in Algeria. In recent years an important part of food research has been primarily focused on new formulation products. Date powders variety *H'lowa* show good quality and

the highest color, taste and texture scores, it is used in many food preparations (Dairy Creamed Dessert). From the results for dairy creamed dessert, the total substitution or partial replacement of the cacao by the date powders causes stability of pH, slight decrease of acidity and solid content, decrease of ash and crud proteins content. The total substitution of cacao by the date powders increases the reducing sugars. Total or partial replacement of sucrose by date powders causes a decrease of the solid content, pH, reducing sugars, stability of acidity and ash and increase the crud proteins content. During 15 days of storage, slight decrease of all biochemical parameters for all samples was showed. Microbial analyzes indicate an increase of the number of total plat count, yeasts and moulds with the use of the date powders and during the storage period and the total absence of faecal streptococci, sulphite-reducing *Clostridium*, *Staphylococcus aureus*, coliforms and *Salmonella* in all samples analysis. Complete substitution of cacao by the date powders (17g) improves the texture and odor of dairy dessert and the partial replacement of sucrose by date powders (55 g) improve color and taste.

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