

# Contribution to the valorization of the "Mech - Degla" date flour incorporated in artisanal couscous

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## Abstract :

The main objective of this work concerns the possibility of developing dry dates variety 'Mech Degla' in order to substantially improve the nutritional quality, technological and culinary craft couscous. To this end, the incorporation of the flour of dates at various rates (0%, 25% and 50%) in the craft couscous was studied.

The results helped make interesting conclusions. Indeed, incorporation of dates flour showed an increase of the ash content (from 0.91 to 1.29%), protein (from 12.04 to 13.10%), of fatty acid (from 0.032 to 0.042 H<sub>2</sub>SO<sub>4</sub> / 100g MS) and carbohydrates (60% excess).

**Keywords :** Couscous, flour dates, Mech Degla, incorporation, quality.

## 1. Introduction

Dates rise in recent years, an increasing interest in growing as more well among consumers than among nutritionists. They are used in addition to the development of high energy food or dietary value as : jams, baby food, cookies, ... etc . [1]

In addition, grains have always featured prominently in the diet of Algerian [2]. Durum wheat is then imposed by its high especially in rural areas whose traditional dish is the most consumed couscous consumption. This is a complete feed consisting of proteins, fiber, carbohydrates, vitamins and phosphorus and low in fat and sodium. The manufacture is couscous craft by means of a rolling phase followed by a pre-baking with steam and then a drying phase. Indeed, the incorporation of flour date in couscous, well accepted by the consumer, appears interesting nutritionally.

This work investigates the incorporation date in handmade couscous. For this purpose, flour dates of low market value " Mech Degla " was incorporated at different rates (0 %, 25% and 50%), with the aim of improving the nutritional value of couscous.

## 2. Materials and Methods

For the development of artisanal couscous enriched flour dates "Mech-Degla," we chose two levels of incorporation of the flour (25% and 50%) for 75% and 50% semolina. A witness free couscous meal dates (0%) is necessary for the comparative study.

### **2.1. Steps for preparing flour dates**

- Sorting and cleaning by hand;
- Manual for coring with a knife provided;
- Cut dates into small cubes using household scissors;
- Drying or dehydration of dates in an oven at 160 ° C for 1 hour to obtain a relative humidity of 5 to 6%;
- Crushing and Screening sieve 0.20 mm.

### **2.2. Stages of development of artisanal couscous enriched flour dates**

Following the traditional process, couscous is made with an average meal. It undergoes a mixing that is wetting the hominy with salt water to power the drive while adding semolina fine until agglomeration. This will obtain the grain will be sieved and homogenized. Couscous obtained after sieving will undergo a pre-cooking with steam for 10 minutes and then drying in air.

### **2.3. Physical and physico-chemical characterization**

The craft couscous enriched flour dates was tested tasting by a jury of 20 people chosen at random.

The particle size was determined by using sieves; while the fatty acid according to NF.ISO.7305 standard.

Deliquescence, which determines the state of disintegration of raw or cooked couscous, was determined according to the method Guezlane and Abecassis (1991) [3].

The baking test is to determine the rate of solidification of couscous in the preparation, by firing a definite vintage couscous (dry) and track changes reported on the weight after each preparation step quantity.

The behavior of the starch in water results in two changes in particular the solubility and the swelling , as determined by the method of Anderson *et al.* (1969) [4].

### **2.4. Nutritional characterization**

The water content and ash were determined according to the NA / 1133 standards / 1990 and NF.11.28.1985 respectively.

The protein content was determined using the Kjeldahl method (NF V-03-050). NF EN ISO 734-1, 2000 was used for the determination of the lipid content and the method of Navarre (1974) for the carbohydrates.

### **2.5. Microbiological characteristics**

The enumeration of sulfite-reducing Clostridium and moulds were carried out according to ISO 66 and 49 OJ No. 35/1998, respectively standards.

### 3. Results

#### 3.1. Physical and physicochemical characteristics

Generally, couscous enriched flour dates has a color different from that of the durum wheat. Staining is particularly pronounced as the incorporation rate is higher, in particular couscous 25% and 50% incorporation rate.

After cooking, the grains of couscous 25% and 50% will stick together and form small aggregates. The volume of these grains is smaller contribution by volume of grain couscous control (0 %) are large. Indeed, the higher the rate of incorporation increases the couscous grains are smaller and stick them.

The median particle size of 25 samples couscous and 50 % of the rate of incorporation is to 1000 $\mu\text{m}$  couscous and 850 $\mu\text{m}$  % 0 for samples 25 % and 50 %.

We note that there is not much difference between the diameters of the particles couscous samples analyzed. This is explained by the median particle size implemented that same rolling diameter and made by the same person. We also note that the flour of dates has no influence on the size of the samples couscous because of their finesse.

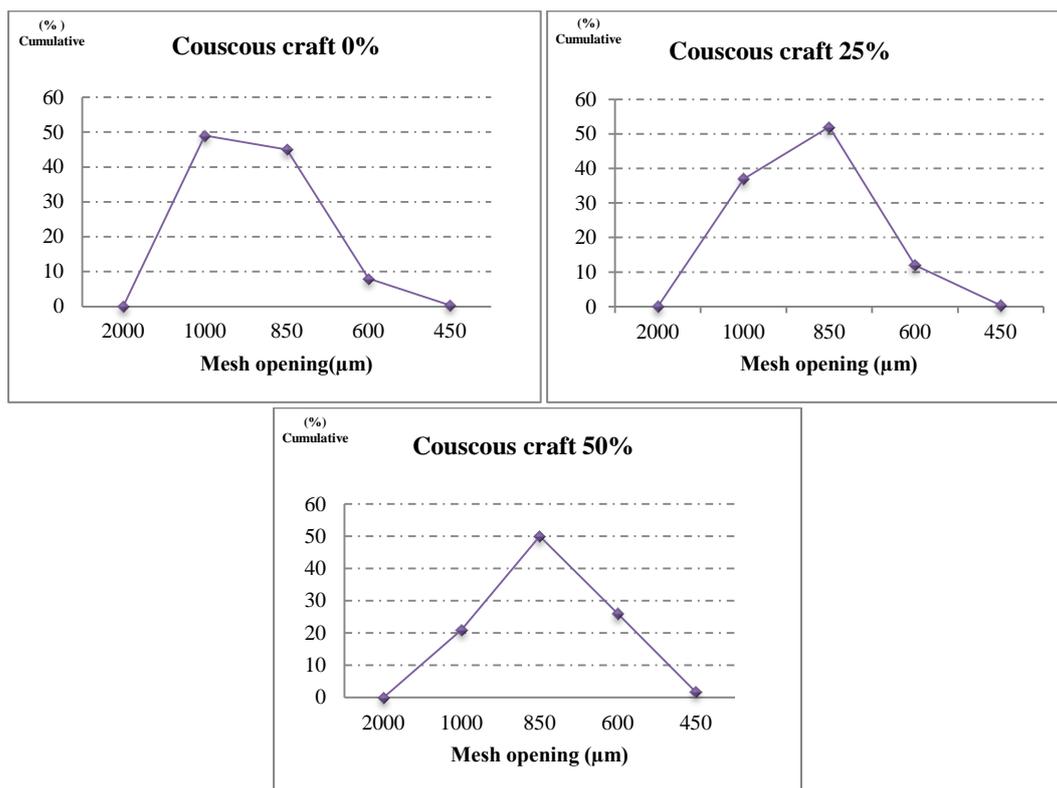
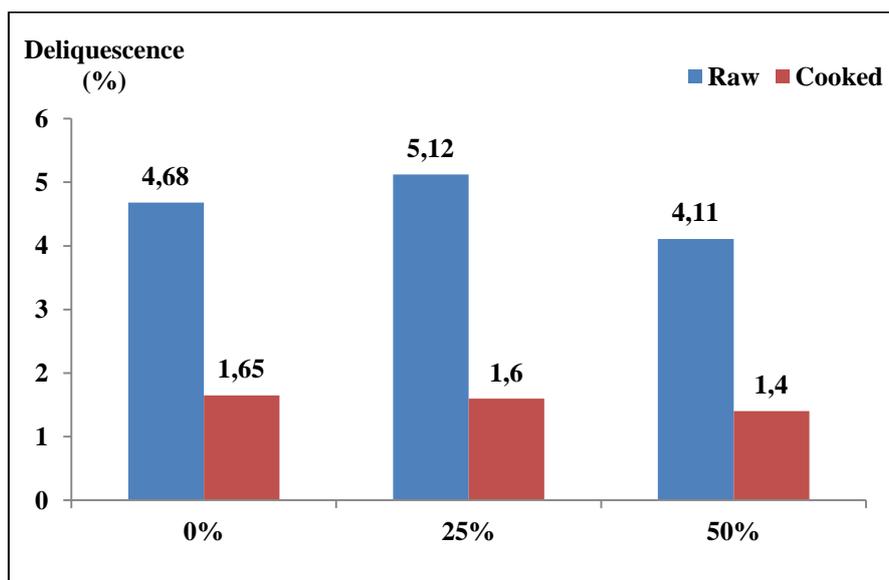


Figure 1. Granulometric curve samples at different rates couscous craft incorporating flour dates (0%, 25% and 50%).

In addition, have a different couscous fat acidity in the standards ( $\leq 0.055$  H<sub>2</sub> SO<sub>4</sub>/100MS - NF.ISO.7305) or  $0.032 \pm 0.0007$ ,  $0.0007 \pm 0.035$ ,  $0.041 \pm 0.001$  for H<sub>2</sub>SO<sub>4</sub>/100MS couscous 0%, 25% and 50% respectively of levels of incorporation. This fatty acid slightly increases with increasing incorporation rate flour dates.

On the other hand, spalling varies from 1.40 to 1.65% for all samples couscous cooked state and from 4.11 to 5.12% in the raw state. Indeed, the witness couscous has good cooking quality, non-sticky and little deliquescent with a satisfactory degree of individual grains.



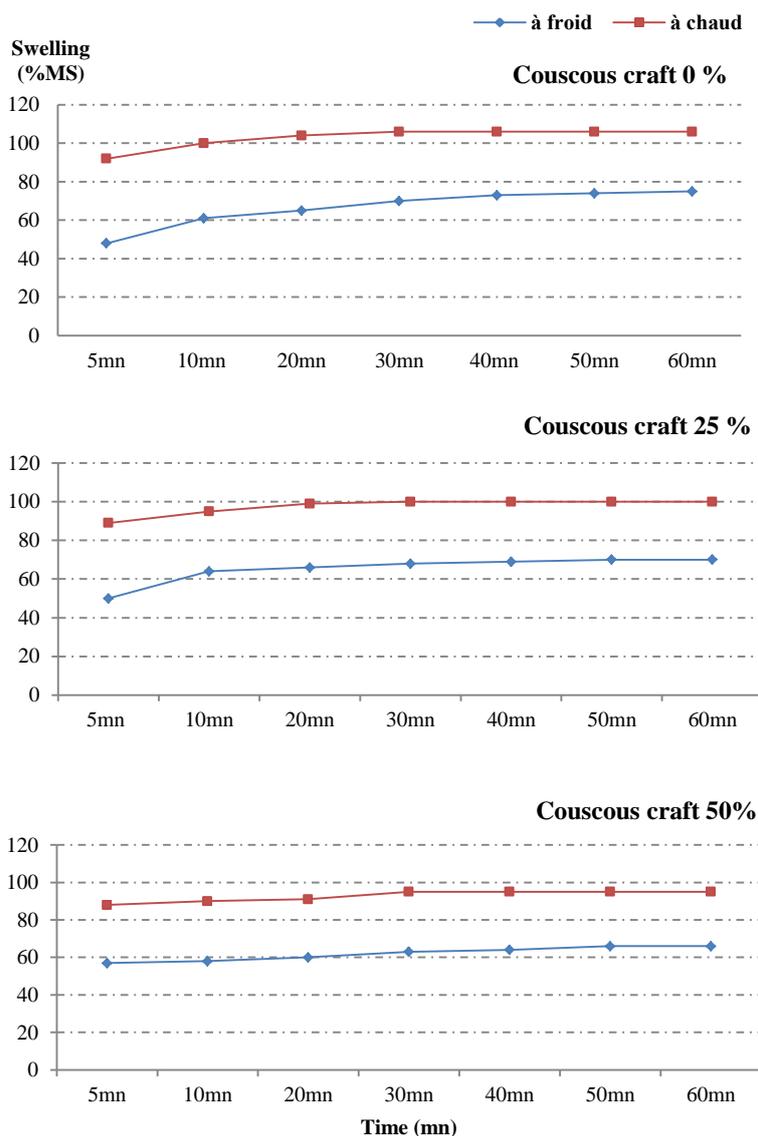
**Figure 2.** Deliquescence of couscous craft in the raw state and cook at different rates of incorporation dates flour (0%, 25% and 50%).

The swelling index (GI), which assesses the degree of starch gelatinization, is  $346.62 \pm 0.48\%$ ,  $355.17 \pm 0.92\%$  and  $365.19 \pm 0.90\%$  couscous % for 0%, 25 % and 50 % respectively of levels of incorporation.

The solubility index (SI), which assesses the degree of disintegration of starch, respectively  $7.38 \pm 0.02\%$ ,  $8.17 \pm 0.02\%$  and  $8.21 \pm 0.11\%$  respectively for couscous 0%, 25% and 50%.

The kinetics of swelling cold (25 °C) is between 48-75 % for the couscous to 0%, between 50-70 % for the couscous to 25% and between 57-66 % for the couscous to 50 % of incorporation flour dates. The witness couscous swells faster, absorbs more water and will swell until 50mn unlike couscous 25% and 50% are saturated after 40 minutes.

The kinetics of swelling in hot (100 °C) is between 92-106 % for the couscous to 0 % between 89 to 100 % for the couscous to 25% and between 88-95 % for the couscous to 50 % of incorporation flour dates. The swelling rate of heat is faster for the three samples of couscous with a maximum reached at 10 min (Fig. 3).



**Figure 3.** Swelling cold and hot couscous craft at different levels of incorporation dates flour (0%, 25% and 50%).

We observe a decrease in the swelling capacity and the water absorption of the samples of couscous dates enriched flour (25 % and 50 %) compared with the control hand couscous (0%). The hydration capacity becomes lower with the increase in the incorporation rate of dates flour. In addition, the cooking time is 20 minutes for the 3 types of couscous.

### 3.2. Nutritional characterization

The humidity of the samples at different rates couscous craft incorporating flour dates (0%, 25% and 50%) is respectively 12.16 %, 11.81% and 11.96% according to the standard Algeria (11.5-12.5 %).

The results also show that the couscous enriched to 50% is richer in ash (1.29 %) contributed by the witness couscous (0.91 %) and couscous to 25% (1.15 %).

Moreover, the protein content of different types of couscous complies with standard Algeria (11-15 %). It is respectively 12.04%, 12.85% and 13.10% for an inclusion rate of 0%, 25% and 50%.

The carbohydrate content is 22.3%, 60.20 % and 66.25% respectively for an inclusion rate of 0%, 25% and 50%. This is due to the richness of the meal dates carbohydrates including glucose and fructose.

The lipid content was 0.27%, 0.50% and 0.52% respectively for couscous 0%, 25% and 50%.

### 3.3. Microbiological characteristics

The results of microbiological tests on the three types of couscous (0%, 25% and 50%), reflect a good microbiological quality with total absence of mold and sulphite-reducing Clostridium.

## 4. Discussions

The taste test of couscous cooked state concluded that the acceptability of couscous enriched flour is good dates. Similarly, the color is not likely to influence consumer choice as there is a rich variety in the Algerian market couscous darker (couscous made from barley, couscous oregano, etc ...).

The particle size of couscous and homogeneity are considered among the key parameters that define the quality for the majority of consumers [5].

The fatty acid is an indicator of the state of conservation of the good wheat, semolina and couscous [6].

Spalling increases markedly with decreasing particle size of couscous.

Furthermore, the craft has a larger couscous than industrial couscous sloughing [5].

The low values of the index of solubility in water (4-16 %) are indicative of high-quality products [2].

High values of swelling of couscous are indicative of a high quality product; they are of the order of 280-320 ml of water / 100 g of 25 ° C to couscous and 380-410 ml of water / 100 g at 100 ° C couscous [2].

In addition, the optimum cooking time for couscous is that just necessary for the grains are tender but not sticky or pasty (Derouiche, 2003).

The enrichment of flour for couscous craft of dates has a positive effect on the nutritional quality leading to an increase in energy value compared to witness couscous (0%).

Humidity is a crucial factor in the evolution of biological phenomena [9]. Indeed, humidity > 12.5% exposes the couscous to mold and makes the operation of packaging and storage difficult. The water content depends mainly on the unwinding conditions of the drying operation (Benatallah *et al.*, 2006).

Ash in couscous enriched flour exceeds that of the control couscous (0.8-1.1 %). The ash content of the samples increases with the craft of incorporating the flour dates due to its high mineral levels (2%) [7].

The protein content is an important criterion for assessing the nutritional quality of the finished product. Protein durum plays a fundamental role in the culinary quality of couscous [8].

Indeed, the incorporation of dates as flour from durum wheat has corrected the defects of cereal proteins by providing more balanced amino acids.

Dates are characterized by a high content of reducing sugars and sucrose. The high sugar content of the date pulp gives these fruits a high energy value.

The results obtained show that the lipids in the couscous are difficult to measure the state of traces not exceeding 1.5% [9].

## Conclusions

The main purpose of this work is the study of the incorporation of flour dates "Mech - Degla" in durum wheat for obtaining enriched couscous. Indeed, given the results, the development of a new food product made from flour of dates is possible.

The results of physic-chemical analyzes can be concluded that the samples studied couscous are very valuable quality.

Furthermore, the samples studied show couscous further good microbiological quality.

In addition, the results obtained show that the best rate of incorporation of flour dates in couscous was 50%. It greatly improves the nutritional quality of couscous providing proteins, carbohydrates, minerals and vitamins.

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