

## Effect of the Bunches Bagging on the Qualitative Characteristics of Dates

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**Abstract.** Given the national and international importance of the Deglet Nour variety, its protection against anomalies is critical. The selection of agricultural protection techniques is based on their availability, ease of application, and low cost. Bagging in bunches is one example. In this study, we will demonstrate the utility of this technique as a means of date quality protection and improvement when compared to a control. The findings show that bunch bagging allows dates to mature earlier and increases their weight and dimensions. The increase in water content in bagged dates reduces their acidity and consistency, while increasing the content of reduced sugars as sucrose and total sugars degrade.

**Keywords.** Bagging, Deglet Nour, Characteristics, Biskra.

### 1. Introduction

In Algeria and Tunisia, Deglet Nour variety is very sensitive to climate change; dates become dry during hot seasons characterized by lower humidity and hot winds [1]. If bad weather coincides with the Khalal stage, production losses are significant [2]. However, date palms growing in hot arid regions are facing environmental stresses which limit tree productivity and negatively affect fruit quality especially weight and size [3,4]. Fruit weight and size are critical quality parameters that affect dates marketing because larger size is generally preferred over small ones [5, 6].

Bunch bagging can be used as a primary source of protection from various biotic factors like fungus, high humidity, rain, bird and insects. Beside this, it may also amplify the microenvironment during fruit development that will alternately lead to enhanced quality of the fruit [7].

Algerian farmers have stated that date bunch bagging is only used to protect dates, particularly the Deglet Nour variety, from the effects of autumn rains and bird attacks. Nonetheless, the researchers state that using different bagging materials improves date production quality [8-12]. Bagging has been reported to be effective in protecting against date rot (Fading disorder) [2]

The aim of our study is to confirm the effectiveness of this simple agricultural technique on several physiological, morphological and biochemical properties of dates, in order to stimulate the generalization of its use in the rest of the dry areas in Algeria.

## 2. Material and Methods

### 2.1. Experimental Site

The experiment was carried out on a farm in Borjd Ben Azzouz (44 kilometers from the capital of Biskra "Ziban" in Algeria's south-east). Plantations of the Deglet Nour cultivar can be found in this biotope. Eight homogeneous plants are chosen (of the same age, vigour, and health conditions). The device is made up of two blocks, one for control palms (T0) and the other for bunch bagging (T1). After cleaning of palm tree (size leaflets, leaf bases size, cleaning of palm date fibers....) and fixing bunches. Bunches were bagged with yellow polyethylene bags during August, when these dates coincide with the Bser stage (Photo 1).



**Photo 1.** Date bunches bagging practice.

### 2.2. Qualitative Analyzes

Mature dates were randomly selected from several bunches, at various heights and orientations, and stored at 4°C until the various analyses and measurements were performed (Table 1.)

**Table 1.** Analyzes and measures applied.

Analyze/measure	Protocol	Equation
Maturation rate	[13]	$\% \text{ of maturation} = \frac{\text{Number of matured fruits}}{\text{Total number of fruits}} * 100$
Dimensions (length and width)	coulisse foot (HOLEX. O-100M, Digital calibrer).	/
Whole weight	precision analytical balance ( $\pm 0,001$ )	/
Water content	[14]	$H\% = \frac{\text{fresh mass before drying} - \text{mass after drying}}{\text{Mass of the test sample}}$
pH	[15]	$C.E (\mu S/cm) = \text{measured C.E} \times \text{correction factor according to temperature}$
Electrical conductivity	[16]	
ashes	[16]	$\text{Organic matter}\% = \frac{\text{fresh mass before drying} - \text{mass after drying}}{\text{Mass of the test sample}}$ $\text{Ash} = 100 - \text{Organic Matter}$
Total sugars	[17] [18]	/
Reducing sugars	[19]	$RS = \frac{5 \times \text{the number of ml of 5\% glucose solution, used}}{\text{the number of ml of filtrate used, for the decolorization of}}$

Sucrose	/	Fehling's liquor) x the dilution factor.
Date consistency	[20]	Sucrose % = (total sugars % - reducing sugars %) x 0.95
(r index)	[21]	r = sugar content / water content

Results obtained will be compared to the standards established by the Algerian Ministry of Agriculture in the interministerial decree of November 17, 1992 (JO n°31/1992) [9]; thus, the qualitative evaluation criteria for dates were reported by [22, 23] on Egyptian and Iraqi cultivars (Table 2.).

**Table 2.** The criteria adopted in evaluating the studied dates.

Standards set by the Algerian Ministry of Agriculture	Qualitative evaluation criteria for dates
no abnormality and undamaged.	Fruit Length:
a weight of the date, greater than or equal to 6 grams.	Long (greater than 4 cm): Good character.
a weight of the pulp, greater than or equal to 5 grams.	Medium (3.5 - 4 cm): Acceptable.
a length greater than or equal to 3.5 centimeters.	Reduced (less than 3.5 cm): Bad character.
a diameter greater than or equal to 1.5 centimeters.	Fruit Weight:
a pH greater than or equal to 5.4.	High (greater than 8 g): Good character.
humidity, between 10 – 30%.	Medium (6 - 8 g): Acceptable.
a sugar content, greater than or equal to 65% of the dry weight.	Weak (less than 5 g): Bad character.
	Fruit Diameter:
	High (greater than 1.8 cm): Good character.
	Medium (1.5 – 1.8 cm): Acceptable.
	Very low (less than 1.5): Bad character

### 2.3. Statistical Analyzes

The data is statistically interpreted using the IPM SPSS statistics 22 software. An analysis of variance is performed on all data in order to test the variability of the means of the qualitative measures of variable (T0 and T1). The fixed significance level (alfa) for all analyses is 5%. We used a one-way controlled ANOVA (T0/T1).

## 3. Results and discussions

### 3.1. Influence on the Rate of Maturation and the Morphological Characteristics of Dates

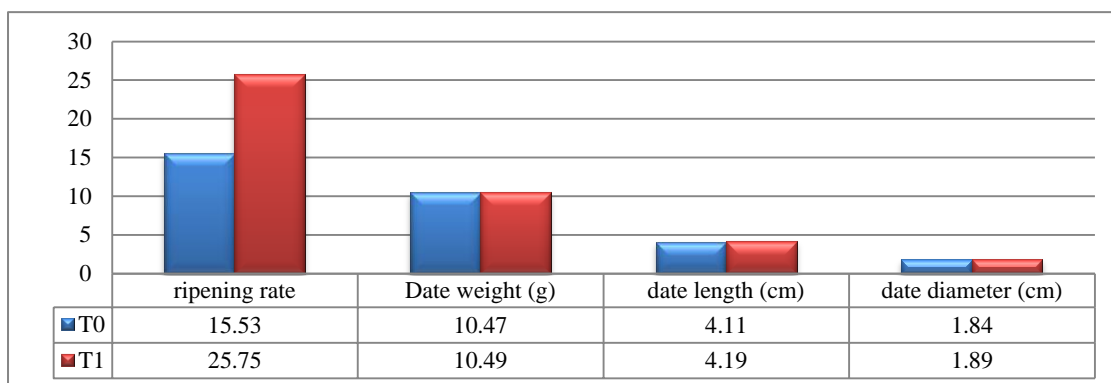
When compared to the control, bagging of bunches increases dates ripening rate by 15.53 % and 25.75 % respectively. This effect was also observed on the date's weight, length, and diameter, which were 10.49 g, 4.19 cm, and 1.89 cm respectively (Fig. 1). These findings are consistent with those of [8, 9] in the Deglet Nour variet, [11] in the Succary and Khalas varieties, [24] on khastawi and Zahdi, [25] in mango.

This effect on date maturation can be explained by an increase in temperature inside the bagged diet, which creates a microclimate favoring early date maturation [26].

The concentration of Ethylene gas increases during date maturation to stimulate respiration and cellular metabolism, resulting in date maturation [27], so the concentration of this gas can increase as a result of bagging.

Accumulated heat might induce higher respiration rates and the CO<sub>2</sub> accumulation within bags might lead to more acetaldehyde production and removal of astringency, hence induce an advance of fruit ripening [28, 29].

According to [30], the increase in the weight of dates, and thus their dimensions, is due to an increase in the water content, or total soluble solids (TSS) of the fruit.



**Figure 1.** Results of physiological and morphological characteristics of dates.

### 3.2. Influence on the Biochemical and Physicochemical Properties of Data

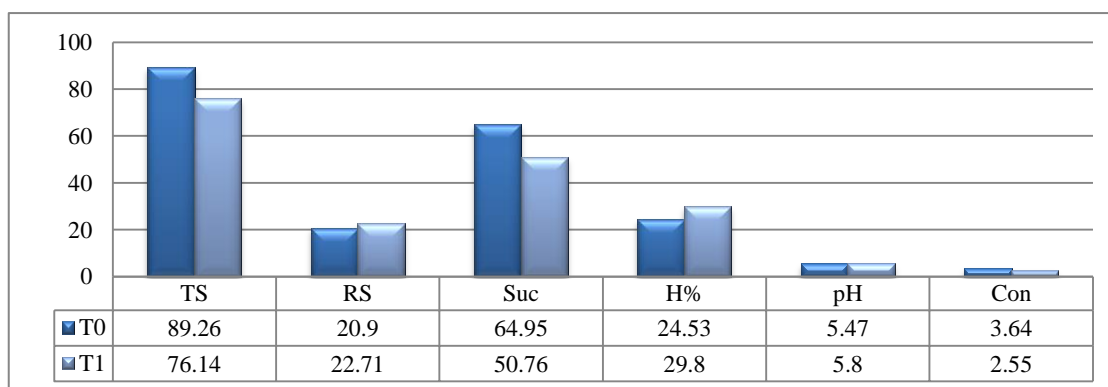
Dates bunches bagging have a high water content of 29.8 % compared to 24.53 % in the control, which is a highly significant difference ( $p= 0.000$ ). Bagging also reduces the loss of water by fruits as a result of excess moisture under the polyethylene [31]. pH of fruit decreases as it becomes richer in water and sugars (Dowson and Aten, 1963), as seen in dates (T1) with a pH of 5.8 and dates (T0) with a pH of 5.47 (Fig. 2). According to [9], bunches bagging reduces the acidity of dates.

Dates from control palms contain more total sugars and sucrose than bagged dates, and the opposite is true for reduced sugars. [8] confirmed these findings, observing a total sugar content of 71.88 % in control dates and 62% in bagged dates (Fig. 2).

According to [11], the ST and SR contents of the Khalas variety are 57.62 and 35.50 % in the control and 56.94 and 38.92 % in dates from bagged bunches.

According to [33], increasing the water content of dates promotes the inversion of sucrose into reducing sugars. The increase in reducing sugar content following sucrose inversion explains the decrease in sucrose content in bagged dates. [34] reports that bagging Deglet-Nour bunches with polyethylene results dates with a high content of reducing sugars (fructose and glucose) when compared to dates from control bunches. A statistically significant difference of  $p= 0.000$  was found between T0 and T1 for each measurement pH, TS, RS, and Suc.

According to Munier (1973) [21], normal dates have a  $r$  equal to 2, while dry dates have a  $r$  greater than this standard. Soft dates are distinguished by those that are weaker. When we compare this value to the obtained results, we see that the dates (T1) have a relatively low  $r$  (Fig. 2). It is caused by low total sugar content to a high water content ratio. Dates become semi-soft ( $r$  3.5) after being bunches bagged. Dates from control bunches have a  $r$  value greater than 3.5, indicating that they are dry dates.



**Figure 2.** Results of biochemical characteristics of dates.

### 3.3. Date Quality Classification According to Ministry of Agriculture Standards

Table 3 shows a summary of the results of the evaluation of the impact of bagging on the quality of dates produced at our experimental site, according to national standards and the criteria reported by [21,22].

**Table 3.** Qualitative evaluation of our dates produced.

	Date weight	Date length	Date diameter	Moisture %	Total sugars	pH
Control Dates	Good character	Good character	Good character	Good character	Good character	Acceptable
Bagging dates	Good character	Good character	Good character	Good character	Good character	Good character

In general, the dates from the control palms or those subjected to cleaning and bagging has a good commercial appearance and is acceptable to the consumer.

One of the most important roles of bagging is to protect dates from climatic anomalies, particularly autumn rains. During sampling, we discovered some unbagged bunches that had been damaged by the rains. These rains were recorded at the end of August, causing a change in the dates due to browning or rotting (Photo 2).



**Photo 2.** Effect of rain on dates (A-Date rot, B- Browning of dates , C- Dates of bagged bunches).

### Conclusion

Our research demonstrated that bunch bagging has an effect on the properties of dates. This technique allows you to accelerate the maturation of dates as the temperature rises due to the greenhouse effect of polyethylene. The microclimate created by the bag reduces water loss by the fruits as a result of excess humidity under the polyethylene, resulting in dates with high water content. As a result, the weight of the dates and thus their dimensions increase, their pH decreases, they become richer in redness sugars due to sucrose inversion, and they become less consistent.

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