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## TUNISIAN DEGLET NOOR DATES RIPENING, PROCESSING AND STORAGE

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### **Abstract**

Production of dates in Tunisia amounts to 80.000 tons per year mainly produced at the Tozeur and Kebili governorates. Dates are harvested when their color turn to dark , the flesh is soft and the soluble solids content is double the moisture content. Dates are homogeneously packed with 3-10% deviating from the standards. The individual fruit weight is 6-7g depending on the variety. The carbohydrate content of dates ranges between 64 to 74% while protein, cellulose, fats and minerals account to about 2% each. Dates can be stored at 0° C or for one year while at 27° C storage may last only one month. Further research should be continued on the maturity indices, the storage conditions and the drying technology.

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### **INTRODUCTION**

As far back as 4000 B.C., dates were already appreciated and commercially cultivated in southern Irak. In the Old World, North Africa is one of the important regions where dates are grown. In Tunisia, dates occupy a good place and contribute to a large extent to the regional development. The date palm trees in Tunisia are about 3.5 millions concentrated around the oasis of Tozeur, Kebili and Tamerza, classified as traditional regions (with more than 150 varieties) or as modern when they specialize in the Deglet Noor variety. While the majority of varieties are produced in either small or fair amounts, only four are well established and exported as dessert dates varieties; Deglet Noor, Kenta, Aligh and Kuwat. The Deglet Noor variety was cultivated in the 12th century in El Harirare, in Algeria and was introduced to the Tozeur oasis, in Tunisia in the 16th century. This variety presents half of the Tunisian palm trees with more than 60% of total fruit production (Table 1 and 2).

**Table 1.** World Dates Production (Tons)

|         | Deglet Noor | Other varieties | Common dates | Total     |
|---------|-------------|-----------------|--------------|-----------|
| World   | 170.000     | 50.000          | 3.280.000    | 3.500.000 |
| Tunisia | 50.000      | 15.000          | 15.000       | 80.000    |

**Table 2.** Tunisian Regional Dates Production (tons)

| Governorate | Deglet  | Noor    | Other   | Varieties | Total   |         |
|-------------|---------|---------|---------|-----------|---------|---------|
|             | 1993-94 | 1994-95 | 1993-94 | 1994-95   | 1993-94 | 1994-95 |
| Tozeur      | 18.500  | 17.500  | 11.500  | 101.700   | 30.000  | 28.000  |
| Kebili      | 32.500  | 25.500  | 15.000  | 12.000    | 47.250  | 37.500  |
| Gafsa       | 1.350   | 170     | 950     | 850       | 2.300   | 2.550   |
| Gabes       | -       | -       | 6.000   | 6.500     | 6.500   | 6.000   |
| Total       | 52.350  | 43.170  | 33.450  | 121.050   | 86.050  | 74.050  |

**GRADING OF DATES**

Dates for export are graded as follows:

- Deglet Noor Dates
- Aligh Dates
- Common Dates

For direct consumption: This kind of dates is either offered directly after picking or after processing. It must be ripe, healthy, whole soft textured, clean, fleshy, without malformations and parasites. The sugar content should be at least twice the moisture content. They are graded as follows (FAO, 1987):

Deglet Noor Dates "Extra": The content of the package must be homogenous, with less than 3% of fruits not corresponding to quality and weight specifications. Each fruit has a minimum of weight of 7 grams.

Deglet Noor Dates "Standard": The content of the package must be homogenous, with less than 6% of fruits not corresponding to quality and weight specifications. Each fruit has a minimum of weight of 6 grams.

Deglet Noor Dates "FAQ" (Fair Average Quality): The content of the package must have less than 10% of fruits not corresponding to quality and weight specifications. Each fruit has a minimum of weight of 6 grams. In addition to those specification, 3% in weight should be branched.

Dates coming directly from palm trees without any treatment are graded according to their appearance, quality and weight. They are classified as "Ungraded" or "Dry". Ungraded dates are collected from healthy trees without parasites or serious damage or any trances of fermentation. The package may contain a maximum of 15% "dry" dates. Dry dates have to reach full physiological development, with dry flesh, a skin adhering, crinkled and weighing a minimum of 5 gram each.

**Ripening stages**

The Iraqi nomenclature has been employed to denote the ripening stages of dates:

Kimri (BLAH): In this stage, dates have grown a little and are clear and green. Rygg (1946) has examined his stage and divided it into two different phases. The first phase is characterized by a rapid increase in weight and volume, high acidity, high moisture content, slight increase in total reducing sugars. The second phase is associated with generally reduced total sugar accumulation, acidity and a high moisture content.

Kalaal (BSIR): This stage is characterized by changing the color of the skin from green to yellow or chrome, by a continued decrease in rate of gain of weight, reducing sugars, acidity, moisture content and by a rapid increase in sucrose content.

Routab: The change in the Routab stage is associated with the turning of the color from yellow to brown. Dates become translucent and soft, it is the start of ripening.

Tamar: In this stage, dates are dark and soft and they have lost enough water to make the ratio of sugar to water high enough to prevent fermentation. Dowson (1962) stated that dates in the Tamar stage can be stored for a year at room temperature if they are tightly pressed.

### COMPOSITION OF DATES

In the Tamar stage, dates contain two thirds of sugar, a quarter of water and the remaining is cellulose, pectins, ash etc. (Table 3).

**Table 3.** Composition of dates of three Tunisian varieties (Ben Cheikh, 1986)

| Composition         | Deglet Noor | Kenta | Khouat / Aligh |
|---------------------|-------------|-------|----------------|
| Water content (%)   | 26.4        | 17    | 19.6           |
| Total solids (%)    | 73.6        | 83    | 20.4           |
| Proteins (N x 6.25) | 2.06        | 2.24  | 2.81           |
| Cellulose (%)       | 2.94        | 2.5   | 2.41           |
| Fats (%)            | 2.06        | 2     | 0.80           |
| Total Sugars (%)    | 64.47       | 74.45 | 72.11          |
| Minerals (%)        | 2.06        | 1.82  | 2.25           |
| Calcium (%)         | 0.01        | 0.009 | 0.011          |
| Phosphor (%)        | 0.023       | 0.04  | 0.016          |
| Magnesium (ppm)     | 32.89       | 32.28 | 35.9           |
| Iron (ppm)          | 3.68        | 3.73  | 4.02           |
| Copper (ppm)        | 3.31        | 4.15  | 3.61           |
| Zinc (ppm)          | 2.57        | 3.73  | 2.81           |

Dates are classified either according to their sugar content, the sucrose (more than 60% of total sugars) or the reducing sugar (80% glucose and fructose) types, or according to their water content, soft (or wet), semi-dry and dry (Table 4).

Soft dates, such as Barhi and Khastaawi reduce type and content of sugars to approximately 30% of water. They pass through the Rutab stage and remain soft when they reach the Tamar stage.

Semi-dry dates contain 20% to 30% of water. They are classified as reducing sugar, they pass through the Rutab stage and finish with a dry Tamar stage.

Dry dates contain less than 20% of water, such as Badraiya or Dalat Beidha. These are mostly sucrose dates which do not pass through a rutab stage.

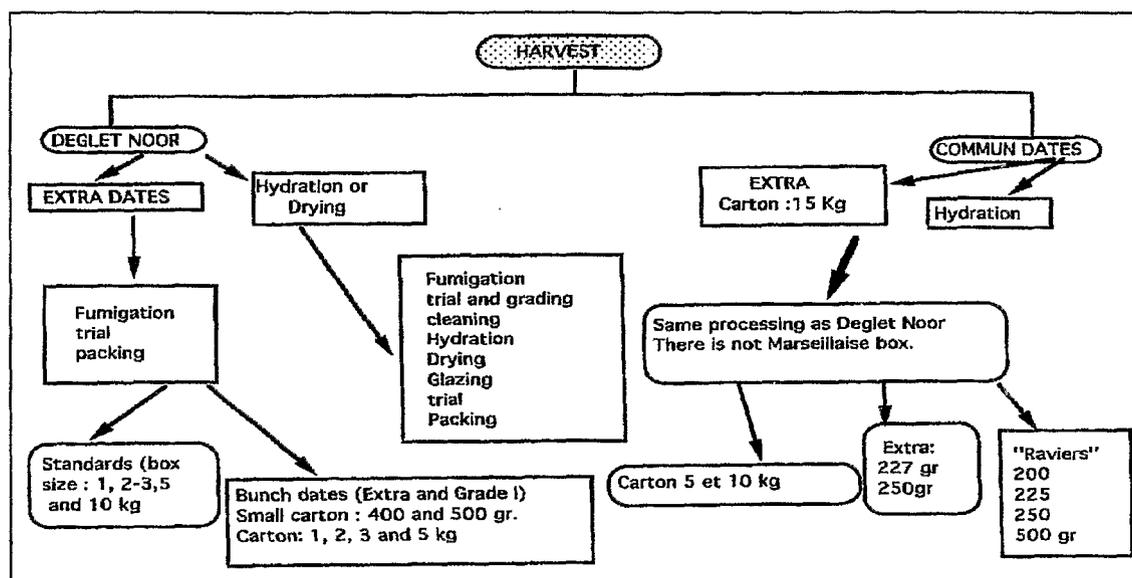
**Table 4.** Sugar and water content of Tunisian date varieties (G.I.D., 1982)

| Variety                       | Water content (%) | Sucrose (% total solids) | Reducing sugars (% total solids) |
|-------------------------------|-------------------|--------------------------|----------------------------------|
| Soft Deglet Noor <sup>1</sup> | 28 - 30           | 37                       | 39                               |
| Semi-dry <sup>2</sup>         | 25                | -                        | -                                |
| Dry                           | 15                | -                        | -                                |
| Aligh full maturity           | 26 - 28           | 5                        | 70                               |
| Akhout Aligh                  | 23 - 25           | 5                        | 70                               |
| Kenta, Kentichi, Hora         | 18                | 59                       | 17                               |

Dates are collected from Kebili (1) or Jerid (2)

**DATE PROCESSING**

Dates are subject to two major types of deterioration, one by fermentation and molding and the other by physiological disorders including darkening and aroma and flavor loss. Both deteriorations increase with the increase of water content. 23% is the recommended water content. Rygg (1971) pointed out that dehydrated dates may be stored at room temperature for a long period of time. The same author (1977) indicated that temperature of storage and water content of dates are the major factors which affect the shelf life of dates. Therefore, if dates do not have the recommended water content, artificial hydration or drying should be used. At 25° C, Deglet Noor dates with 20% moisture retain their color four times as long as those with 24% moisture (Rygg, 1957). Deglet Noor dates stored in pallet boxes should be packed with no more than 22° moisture (Rygg, 1967).



**Figure 1:** Summary of the major processing and packaging operations undergone by Tunisian dates (Tunisian Oeuf fruit company)

Dates are not subject to low-temperature freezing injury, therefore temperatures below 0° C are not harmful. Deglet Noor can be stored for a year at 0° C, longer at -18° C, about 8 months at 5° C, 3 months at 15° C, and 1 month at 27° C (Rygg, 1956). At near 0° C, Deglet Noor dates develop sugar spots and darken in a few months. Sugar spots impair the appearance and the texture but are not harmful, it is interesting to study the removal of these disorders by warming.

Figure 1 summarizes the different operations undergone by Tunisian dates before shipment.

## IMPROVED PROCESSING AND STORAGE OF DATES

During the season 1994-95, the different processing and treatment steps used for Deglet Noor dates before export have been studied. This preliminary study showed a few points requiring further investigation in order to improve the storage shelf life of dates. The major points are:

- 1- Determination of the optimum harvesting date for dates to be stored at low temperature.
- 2- Re-investigation of the storage conditions of the major Tunisian varieties.
- 3- Determination of the optimum storage temperature in relation to water content of dates to be used for short, medium and long-term storage periods.
- 4- Study of the hydration and drying parameters for dates to be stored at low temperatures and the effects of these treatments on the quality of dates.
- 5- Study of the use of antioxidants such as ascorbic acid and a mean of inhibition for enzymatic browning of dates during storage.
- 6- Study of the removal of sugar spotting disorders by warming

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