

# Date

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**Scientific Name and Introduction:** *Phoenix dactylifera* L., the date palm, has been a staple food for the population of the Middle East and North Africa for thousands of years. Date fruit is a drupe with a single seed or pit. The fruit is oblong in shape, 2.5 to 7.5 cm long, thick or thin flesh, astringent when premature and become sweet when ripe, skin of specific color at ripening stage and a hard pit inside grooved down one side. Dates are a high-energy food. Fruit are rich in carbohydrate and other nutrients.

**Quality Characteristics and Criteria:** A high quality for fresh dates is attributed to adequate size and color, small pit, thick flesh, free from dirt, sand and leaves particles, birds, insects and rodents damages, fungi and molds infestation, sugar crystals formation and free from any other apparent alterations (Dowson, 1982). The skin of dates should be smooth, with little or no shriveling, golden-brown, amber, green or black color depending on varieties. The texture may be soft and syrupy, or firm or dry texture depending on the cultivar.

**Horticultural Maturity Indices:** Fruit growth follows a sigmoidal curve, and it is usually divided to five stages of development known by their Arabic terms: “hababouk,” “kimri,” “khalal,” “rutab,” and “tamr.” Most of the dates are harvested in the “tamr” stage, when the fruit has about 60 to 80% sugar content depending on location and cultivars. At this stage, fruits can be harvested soft, semi-dry or dry depending on destination and use. Some varieties with low tannins but rich in sugar can be harvested at the “khalal” stage, i.e., “balah” in North African countries and “bisr” in Oman, for other varieties, dates harvested before full maturity must be ripened artificially. Very immature dates may not be properly ripened artificially and consequently will be of poor quality.

**Grades, Sizes and Packaging:** Quality grades for dates are based on uniformity of color and size and absence of defects or damages by discoloration of the flesh, rupture of the skin, deformity of the fruit, puffiness of the skin, scars, sunburn, insect damage, decay, black scald, fermentation, improper ripening, mechanical damage, dirt or any other foreign material. These criteria are the basis for Codex and US Grades A, B, C, standard and substandard applied for whole, pitted or dry dates. In general the total sugars for different grades are usually the same when expressed as a percentage of dry weight, but the higher grades usually contain higher amount of sugar per date. ‘Medjool’ dates in the USA are classified into three size categories: Jumbo for < 10 dates per lb (0.45 kg), Mixed for 10 to 15 dates per lb and Conventional for > 15 dates per lb. Some dates are marketed in 15 lb (6.8 kg) flats of fiberboard or wood, others in 5 or 10 lb (2.3 or 4.5 kg) cartons. Large reinforced cartons are used for packing of dry dates, especially for export. Consumer packages are widely used and are made of a number of sizes and shapes, including bags of transparent film, or trays over wrapped with films. Round fiberboard cans with metal tops and bottoms containing 500 to 1000 g (1.1 to 2.2 lb) are also used. Rigid transparent plastic containers with a capacity of 200 to 300 g (0.44 to 0.66 lb) are commonly used. Small consumer packages are also used such as bags containing about 50 to 60 g (about 2 oz).

**Optimum Storage Conditions:** Pathological and physiological deterioration increases with increasing moisture content and storage temperature. Relatively small differences in moisture content may have an important effect on the keeping quality of ‘Deglet Noor’ fruit. At 24 °C (75.2 °C), ‘Deglet Noor’ dates show darkening of the skin 4-times faster when they have 24% versus 20% moisture content (Rygg, 1975). At 0 °C (32 °F), dates can be stored in good conditions up to 1 year, but some varieties may develop sugar

spots or crystals. Fully mature soft and firm ‘Deglet Noor’ dates can be kept for more than a year when stored at -17.5 °C (0 °F) but will not stand more than 1 mo at 27 °C (80 °F), 3 mo at 15 °C (59 °F) or 8 mo at 5 °C (41 °F) (Rygg, 1956). Partially dried dates can be held for a year at 0°C (32 °F) or lower, or for a few weeks at ambient temperature. Dry dates can be held at 20 °C (68 °F) for years without significant quality losses. Optimum RH is 70 to 75%.

**Chilling Sensitivity:** Ripe dates at “rutab” or “tamr” stages (see “Horticultural Maturity Stages), commonly handled in the world market, are not sensitive to chilling and freezing temperatures. However, freezing temperatures can injure dates at early stages of “kimri” and “khalal.”

**Ethylene Production and Sensitivity:** At 20 °C (68 °F) dates produce < 0.1  $\mu\text{L kg}^{-1} \text{h}^{-1}$  ethylene at the “khalal” stage, and none at the “rutab” and “tamr” stages (see “Horticultural Maturity Stages). Ripe dates are not sensitive to ethylene exposure.

**Respiration:** Respiration rates of dates is very low, < 5  $\text{mg CO}_2 \text{kg}^{-1} \text{h}^{-1}$  at 20 °C (68 °F) at the “khalal” stage, and < 2  $\text{mg kg}^{-1} \text{h}^{-1}$  at the “rutab” and “tamr” stages. It increases as the moisture content of the fruit increases. Cured ‘Deglet Noor’ dates, with 20 to 22% moisture, produced 0.4  $\text{mg CO}_2 \text{kg}^{-1} \text{h}^{-1}$  at 24 °C and 2  $\text{mg of CO}_2 \text{kg}^{-1} \text{h}^{-1}$  when the moisture content increased to 27% (Rygg, 1975).

**Physiological Disorders:** Darkening is a major problem in dates. It’s rate varies with cultivar, temperature, moisture content, and it is affected by several treatments. It can be reduced by storage in low temperature, low moisture content, or in an inert gas. Temperatures above 60 °C (140 °F) cause a reddish color and increase the astringency and off flavors in ‘Deglet Noor.’

Blacknose or sugartip is a severe checking of the skin in some cultivars (especially in ‘Deglet Noor’), it is induced by high RH just before the beginning of the “khalal” stage and is characterized by darkening, shriveling, and hardening of the flesh at the tip of the fruit (Rygg, 1975). Black scald is characterized by a blackening of the flesh and sunken area with a definite line of demarcation at the tip or on sides of the fruit.

Puffiness or sunken separation is caused by high temperature and/or high RH before the beginning of ripening, and may increase during curing and affects only soft cultivars.

Sugar spotting is characterized by light-colored spots under the skin and is restricted to the invert sugar dates. Almost all dry cultivars, and several of the semi-dry cultivars, contain large amounts of sucrose and are less sensitive to sugar spotting. Sugar spotting decreases as the temperature decreases and when the moisture falls below 22%. Sugar spots affect appearance and texture, they can be removed by warming, but can reappear if unfavorable conditions prevail (Rygg, 1975). Freezing of dates at a higher temperature range results in the rupture of various cellular compartments and the appearance of bright yellow-brown spots of crystallized solutes (Shomer et al., 1998). Intercellular membranes and cell walls can be kept intact even after 10 mo when fruits are frozen at a lower temperature range.

**Postharvest Pathology:** The most common pathological deterioration of dates includes fermentation by yeast (most important) and molding by fungi. Steam-hydrated dates are more resistant to attack by microorganisms than natural or nonhydrated dates because of the partial sterilization of steam dehydrated fruit. Fungi include *Aspergellus* sp., *Alternaria* sp, *Stemphylium botryosum*, *Cladosporium* sp., *Macrosporium* sp., *Citromyces ramosus*, *Phomopsis diopspyri*, *Penicilium*, etc. These fungi may cause significant losses before or just after harvest during rainy or high RH periods and can attack fruits at the “khalal” (see “Horticultural Maturity Stages) or “rutab” stages (Djerbi, 1996). However, most of these fungi, except *Catenularia fuliginia* Saito, will not grow on dried dates.

**Insect Pests:** *Oligonychus afrasiaticus* Mc Gregor and *O. pratensis* Banks are mites known as “Bou Faroua” disease. They affect dates at the “hababouk” stage (see “Horticultural Maturity Stages) and larva develop around the fruit with a white filament netting which in turn causes fruits to drop prematurely. The

same consequences are caused by *Coccotrypes dactyliperda*, which leads to fruit-drop at the immature green stage. *Parlatoria blanchardii* scale attacks also the fruit while they are still green. Date or carob moth *Ectomyelois ceratoniae* Zeller, is another Lepidoptera widely present in different producing areas of dates and causes important postharvest losses on stored dates. Several other insects such as *Batrachedra amydraula* Meyr, date stone beetle (*Coccotrypes dactyliperda* F.), *Carpophilus hemipterius*, *Carpophilus multilatus*, *Urophorus humeralis*, and *Heptoncus luteolus* can cause serious damages for dates on the bunch or after harvest. Other pests include *Vespa orientalis*, *Cadra figulilella* and *Arenipes sabella* and Mushroom mite (*Tyrophagus lintaeri* Osborn), which can infest stored dates.

**Quarantine Issues:** Fumigation by methyl bromide (for now) or phosphine, ionizing radiation, the use of low and/or high temperatures, and MA treatments are registered to be used for insect control in dates.

**Special Considerations:** Dates may require postharvest ripening if picked early. Soft and semi-dry cultivars need to be dehydrated to eliminate excess RH if they will not be consumed immediately. Hydration is used to soften the texture of hard-type cultivars.

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