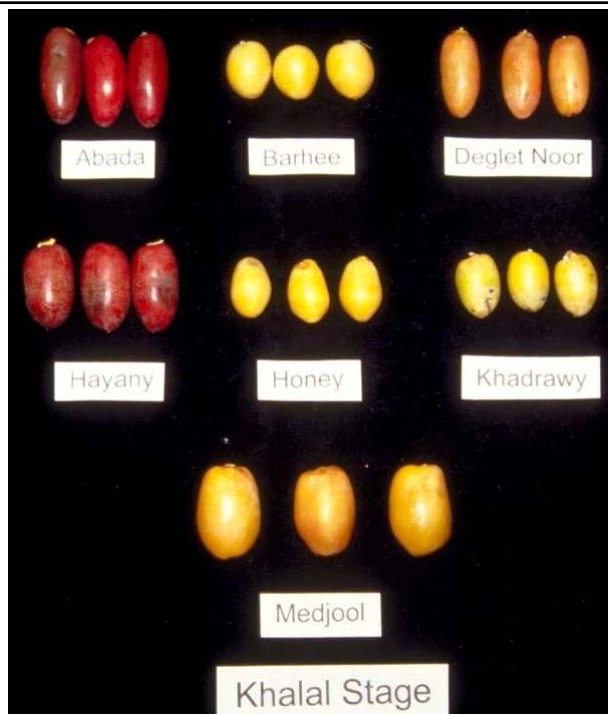


Harvesting and Postharvest Handling of Dates

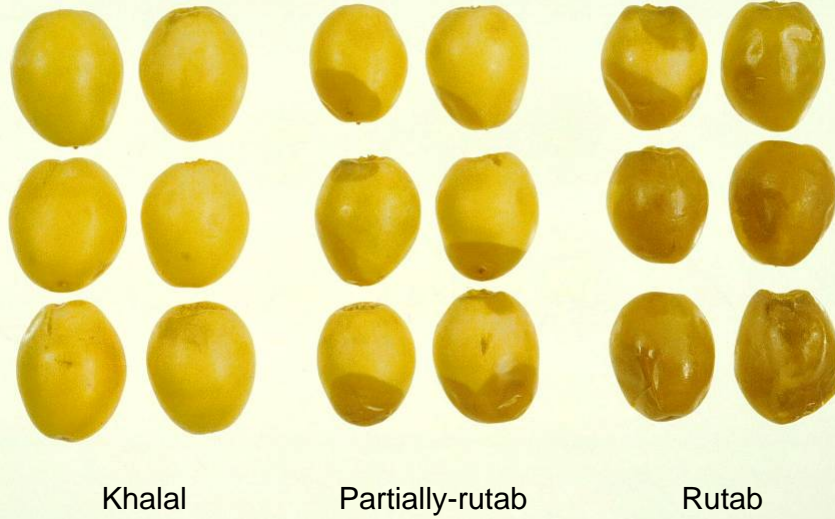


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17 June, 2010

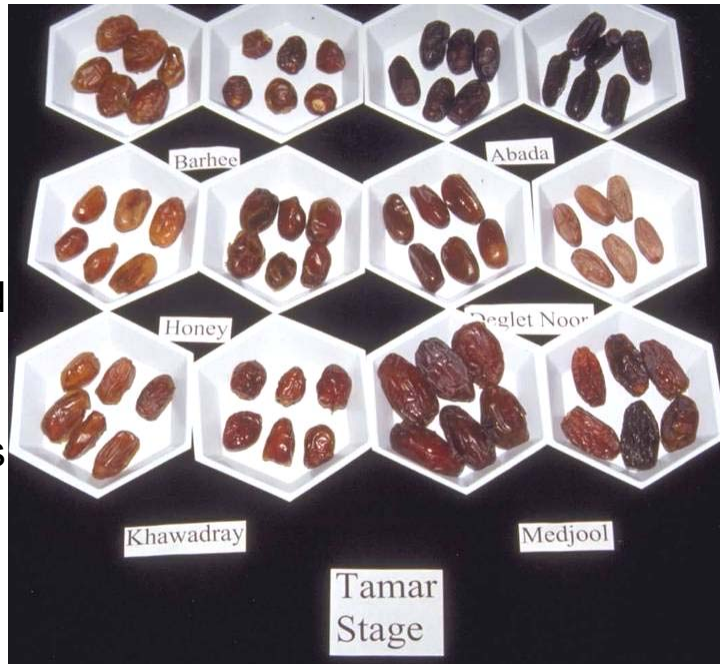
Genotypic differences in color of khalal stage dates



Ripening of Barhi Dates from Khalal to Rutab



Genotypic differences in color and size of tamar stage dates





Tamar Stage of Development of Deglet Noor Dates

Date Harvesting in California-1

Photos by David Karp



Date Harvesting in California-2



Date Harvesting in California-3



Date Harvesting in California-4

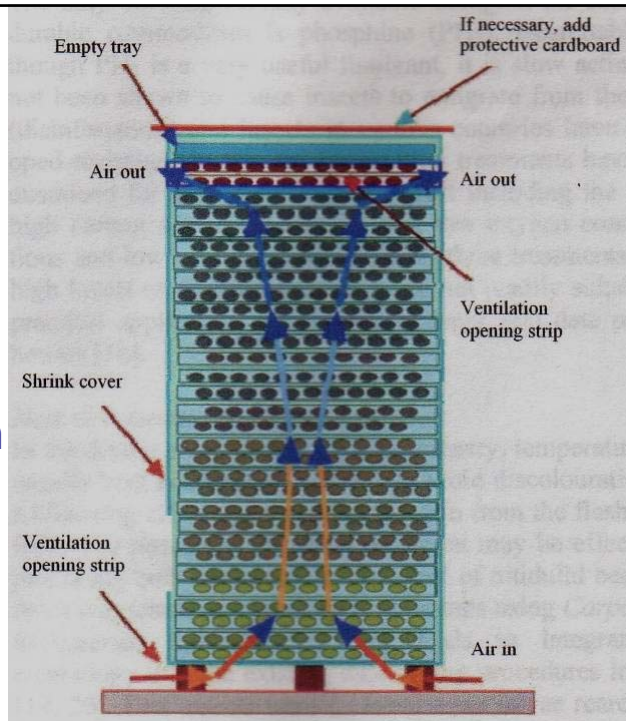


Sun Drying of Dates



Photos by David Karp

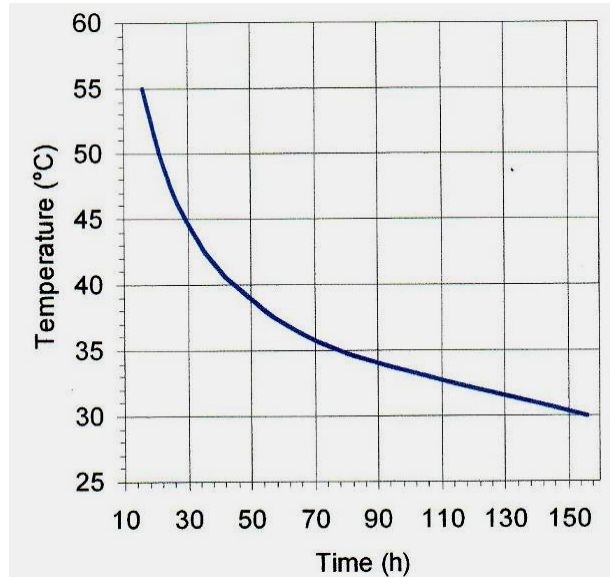
Sun drying of Medjool dates in a pallet wrapped with shrink wrap with ventilation at the top and bottom



Time needed for sun drying of Medjool dates in 2 m high pallets covered by a shrink film with ventilation strips at top and bottom



Time necessary for ripening of mature Mejdool dates at various temperatures



Stored Products Insects cause Qualitative and Quantitative Losses



- *Navel orangeworm*
- *Indian meal moth*
- *Dried fruit beetles*
- *Saw tooth grain beetle*
- *Merchant grain beetle*
- *Raisin moth*
- *Fruit fly*

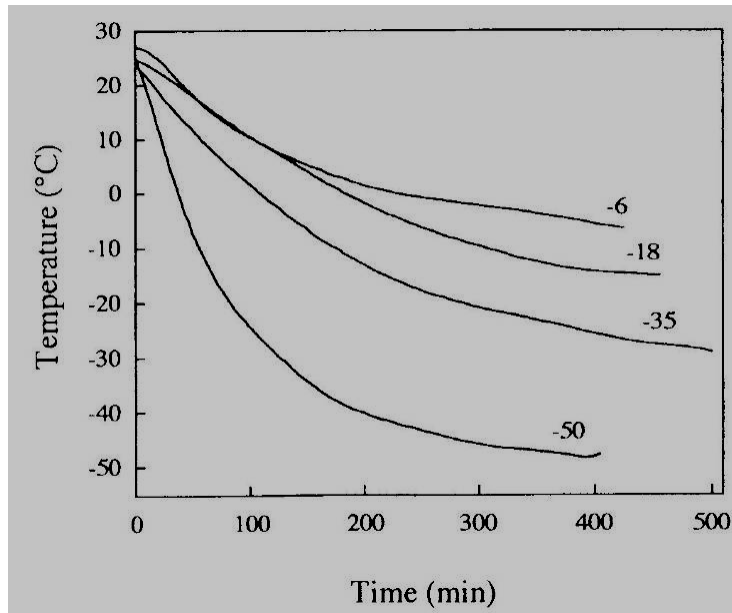
Insect Control Procedures for Dates

- *Fumigation (methyl bromide or phosphine)*
- *Irradiation at 750 Gy*
- *Freezing at -18 °C for longer than 2 days*
- *Use of heat treatments (50-55 °C)*
- *Exposure to 100% carbon dioxide for longer than 2 days*
- *Storage at temperatures below 5 °C reduces insect activity*
- *Storage in 0.5% oxygen (balance nitrogen) atmosphere reduces insect activity*

Experimental Insect Control Treatments

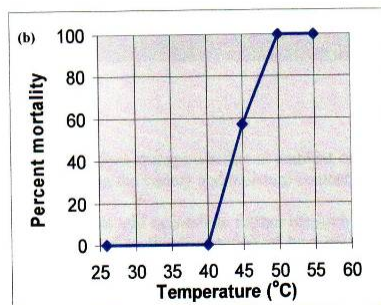
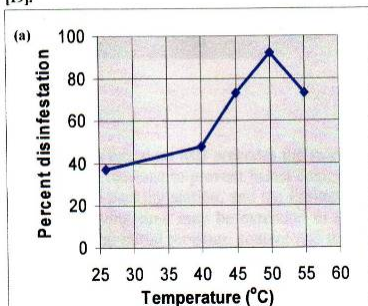
- Fumigation with ethyl formate, carbonyl sulfide, methyl iodide, or sulfuryl fluoride**
- Insecticidal atmospheres (below 0.5% O₂ and/or 40-60% CO₂)**
- Heat treatments (radiofrequency)**
- Ultraviolet radiation**
- Vacuum treatments**

Cooling Rates to Freeze Dates



Effect of temperature on insect disinfestation

Figure 6. (a) Percent disinfestation of *C. hemipterus* larvae from artificial feeding sites at various temperatures for 2 h of exposure after the test temperature was reached. (b) Percent mortality of *C. hemipterus* larvae exposed to various temperatures for 2 h after the test temperature was reached [19].



Preparation of Dates for Market-1

- Initial sorting to remove defective dates and foreign materials.
- Cleaning to remove dust, dirt, and other foreign materials using air pressure and water followed by air drying to remove surface moisture. Damp towels may be used in cleaning the dates.
- Sorting by quality and size into grades.



Sorting dates by quality

CODEX Standard for Dates-1

2.5 Size Classification (Optional)

Dates may be designated as to size names in accordance with the following charts:

(a) Unpitted dates

Size	No. of dates in 500 g
Small	More than 100
Medium	80 to 100
Large	less than 80

(b) Pitted dates

Size	No. of dates in 500 g
Small	More than 110
Medium	90 to 110
Large	less than 90

CODEX Standard for Dates-2

3.2.2 Definition of Defects

- (a) **Blemishes** - Scars, discoloration, sunburn, dark spots, blacknose or similar abnormalities in surface appearance affecting an aggregate area greater than that of a circle 7 mm in diameter.
- (b) **Damaged** - (Unpitted dates only) - dates affected by mashing and/or tearing of the flesh exposing the pit or to such an extent that it significantly detracts from the visual appearance of the date.
- (c) **Unripe Dates** - Dates which may be light in weight, light in colour, have shrivelled or little flesh or a decidedly rubbery texture.
- (d) **Unpollinated Dates** - Dates not pollinated as evidenced by thin flesh, immature characteristics and no pit in unpitted dates.
- (e) **Dirt** - Dates having embedded organic or inorganic material similar to dirt or sand in character and affecting an aggregate area greater than that of a circle 3 mm in diameter.

CODEX Standard for Dates-3

- (f) **Insects and mites** - Dates damaged by insects or mites or contaminated by **damage and contamination** the presence of dead insects or mites, fragments of insects or mites or their excreta.
- (g) **Scouring** - Breakdown of the sugars into alcohol and acetic acid by yeasts and bacteria.
- (h) **Mould** - Presence of mould filaments visible to the naked eye.
- (i) **Decay** - Dates that are in a state of decomposition and very objectionable in appearance.

3.2.3 Allowance for Defects

The maximum allowances for the defects defined in 3.2.2 shall be:

- A total of 7% by count of dates with defect (a)
- A total of 6% by count of dates with defects (b), (c) and (d)
- A total of 6% by count of dates with defects (e) and (f)
- A total of 1% by count of dates with defects (g), (h) and (i)

CODEX Standard for Dates-4

4. FOOD ADDITIVES

Maximum Level

- 4.1 Glycerol) In accordance with GMP (see also Section 3.1.1)
- 4.2 Sorbitol)

5. HYGIENE

5.1 It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene (CAC/RCP 1-1969, Rev. 2 (1985) Codex Alimentarius Volume 1), and other Codes of Practice recommended by the Codex Alimentarius Commission which are relevant to this product.

5.2 To the extent possible in Good Manufacturing Practice, the product shall be free from objectionable matter.

5.3 When tested by appropriate methods of sampling and examination, the product:

- shall be free from microorganisms in amounts which may represent a hazard to health;
- shall be free from parasites which may represent a hazard to health; and
- shall not contain any substance originating from microorganisms in amounts which may represent a hazard to health.

Preparation of Dates for Market-2

- Surface coating with wax or other materials to reduce stickiness and improve appearance (gloss).
- In some cases, the dates are pitted and may be stuffed with nuts. Other products include date pieces that are used in cereals and other foods and macerated dates that are used in backed products.

Preparation of Dates for Market-3

- Packaging to protect the dates from physical damage and moisture absorption if moisture-proof packaging material is used. Use of insect-proof packaging is highly recommended to prevent reinfestation of the dates with insects during their subsequent storage and handling step

Trends in Consumer Packages

- More products are packaged in resealable bags or clamshell plastic containers.
- Greater use of packages made from recyclable materials.
- Increased use of modified atmosphere packaging (MAP).
- Consumer packages can help in reducing product contamination during handling, but can slow down cooling rate.



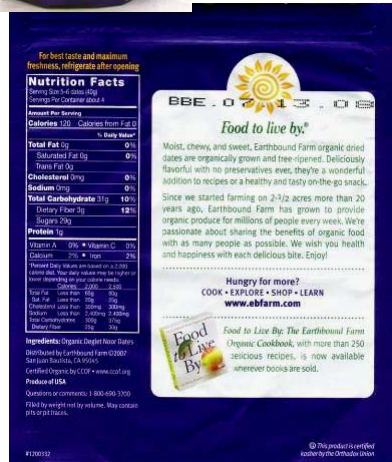
Plastic package for dates


Package of organic, pitted dates

Front



Back





OUR FINEST MEDJOOl GIFT PACKS
(4-1/2 lbs. pictured)

Known for their exceptional flavor and size. Our world famous Medjool Dates are unequalled in quality. Only the best are selected for these popular beautifully packaged gifts.

04-05A — 1-1/2 lbs. net wt. — \$17.50
 04-05B — 3 lbs. net wt. — \$32.00
 04-05C — 4-1/2 lbs. net wt. — \$45.25

PORTRAIT OF BEAUTY

Our finest Medjool Dates—the gift of royalty—hand packed in a beautiful Tiffany-style canister. Great for gift giving year-round.

02-01A — 1-1/4 lbs. net wt. — \$18.50
 02-01B — 2 lbs. net wt. — \$29.75
 02-01C — 3 lbs. net wt. — \$44.25

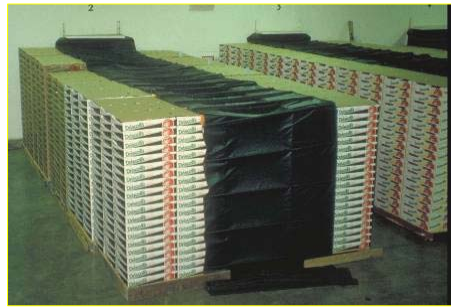
ORDER TOLL FREE
800-827-8017
 oasisdategardens.com



Examples of gift packages available by mail, telephone, or web-based order

Preparation of Dates for Market-4

Forced-air cooling to below 10C (preferably to 0C) before transportation or storage under the same temperatures and 65-75% relative humidity.

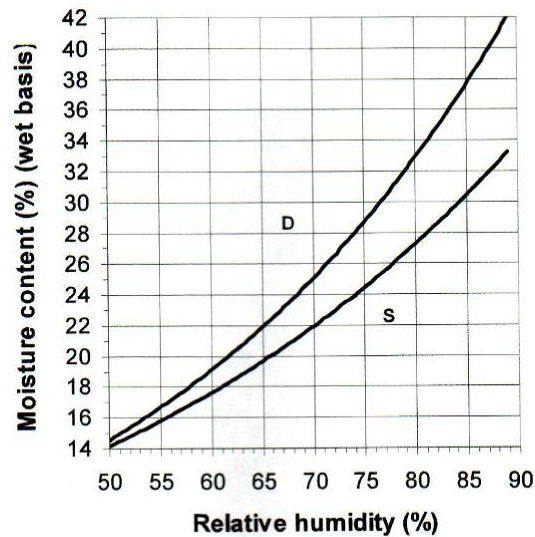


**Loading dates into refrigerated trucks
for transport to market**

Storage Factors

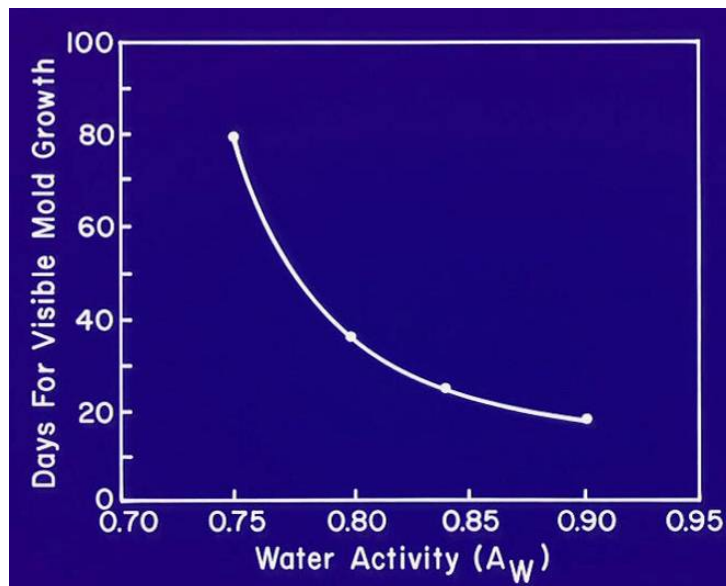
- ***Moisture content of the dates***
- ***Relative humidity of storage***
- ***Storage temperature***
- ***Oxygen concentration***
- ***Effective insect control***

Moisture content of Medjool dates vs
air relative humidity at 26C



Abbreviations: D, desorption; S, sorption

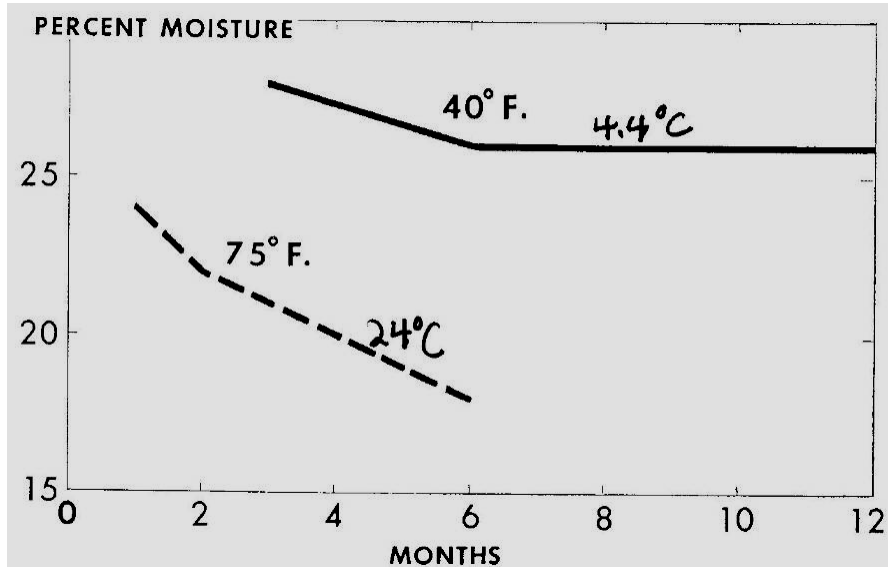
Relationship between water activity and mold growth on dried fruits and nuts



Physical and Physiological Disorders-1

- **Darkening.** Both enzymatic and non-enzymatic browning occur in dates and increase with higher moisture content and higher temperatures. Enzymatic browning can be inhibited at low oxygen concentrations.
- **Souring.** Yeasty fermentation results in souring of dates with moisture content above 25%.

Maximum moisture content that permitted retention of acceptable color in stored Deglet Noor dates



Physical and Physiological Disorders-2

- **Sugar Spotting (sugaring):** Crystallization of sugars below the skin and in the flesh of soft date cultivars. Although it does not influence taste it alters fruit texture and appearance. Incidence and severity of sugar spotting increases with storage temperature and time. Storage at recommended temperatures minimizes this disorder, which occurs mainly in cultivars in which glucose and fructose are the main sugars.

- **Sugaring may be reduced by gentle heating of the affected dates.**



Pathological Disorders

Microbial spoilage can be caused by yeasts (most important), molds and bacteria. Yeast *species of Zygosaccharomyces* are more tolerant of high sugar content than others found in dates. Yeast-infected dates develop an alcoholic odor (become fermented). Acetobacter bacteria may convert the alcohol into acetic acid (vinegar). Fungi (*Aspergillus*, *Alternaria*, and *Penicillium* spp) may grow on high-moisture dates, especially when harvested following rain or high humidity period.

Disease Control Strategies

- Dry the dates to 20% moisture or lower to greatly reduce incidence of molds and yeasts.
- Maintain recommended temperature and relative humidity ranges throughout the handling system.
- Avoid temperature fluctuations to prevent moisture condensation on dates, which may encourage growth of decay - causing microorganisms.
- Use adequate sanitation procedures in the packinghouse and storage rooms.

How to Maintain Quality and Reduce Losses of Dates and Other Dried Products

- **Drying to reduce moisture content (storage potential doubles for every 5% reduction in moisture content)**
- **Insect disinfestation and protection against reinfestation**
- **Storage temperature (storage potential doubles for every 5 C = 9 F reduction in temperature)**
- **Storage relative humidity in equilibrium with moisture content of the product**
- **Proper sanitation to minimize microbial contamination**

Storage Potential of Dates

Semi-Soft Dates (Deglet Noor, Halawy and Zahidi)					
Temperature	70°F (21°C)	60°F (15°C)	40°F (4°C)	32°F (0°C)	0°F (-18°C)
Storage Period	1 month	3 months	8 months	1 year	over 1 year
Relative Humidity	75% or less				

Soft Dates (Medjool, Barhee, Khadrawy, Maktoom, Sayer, and Dayri)		
Temperature	32°F (0°C)	0°C (-18°C)
Storage Period	6 months	More than 6 months
Relative Humidity	75% or less	