TECHNICAL BRIEF: Characteristics of 18 date palm varieties

Findings from twenty-two years of research in the UAE
Introduction

Date palm (*Phoenix dactylifera* L.) is a critical part of social and economic life on the Arabian Peninsula, but as climate change advances and water becomes more scarce, new approaches are needed to ensure the crop can contribute to livelihoods, nutrition, and culture into the future.

In this context, the International Center for Biosaline Agriculture (ICBA) has been conducting experiments in the United Arab Emirates (UAE) since 2001 to identify date palm varieties that are tolerant of biotic and abiotic stresses such as salinity, water scarcity, and pests and diseases. In a plantation covering almost three hectares, the researchers have gathered a comprehensive collection of datasets on 18 date palm varieties (Figure 1) from the UAE, Saudi Arabia, and Iraq.

This document summarizes findings about each of the varieties, including yield potential, salinity tolerance, nutritional values, and more. It also contains a summary table comparing salinity tolerance of the tested varieties.

Figure 1: The five stages of growth and development of date palm fruit.

*The variation in the number of days (±) is due to a varietal effect, ranging from very early to mid and late-maturity varieties.
*High salinity levels can cause a delay in the ripening of fruits by a couple of days.
FARAD (also known as FARD commercially)

This commercial variety has an oval and elongated shape, with a pinkish-yellow color on the tree. In the besser (unripe) stage, it has a bitter taste and contains fibers and pigments, and at the tamer (ripe) stage it has a dark brown color. The flesh is sweet and pungent with a medium-thick texture, and white pulp with low fiber and pigments. The seeds are small and the fruit is of medium weight. This is a semi-dry variety and is best eaten when it reaches the tamer stage.

Origin: UAE
Approximative yield potential (kg/tree): 70-90
Maturity: Mid to late
Salinity tolerance: 50% yield reduction at 9 deciSiemens per meter (dS.m\(^{-1}\)) determined by the electrical conductivity of the water (ECw)
Distribution in UAE: Widespread

LULU

This commercial variety is bright yellow on the tree, and has an oval inverted shape. Its color in the rutab (soft) stage is amber, and in the tamer stage is brown. It has thick, less-fibrous flesh and a sweet, soft flavor. The seed is small and the fruit is of medium weight. It is best eaten at the rutab or tamer stages.

Origin: UAE
Approximative yield potential (kg/tree): 70-90
Maturity: Late
Salinity tolerance: 50% yield reduction at 12 dS.m\(^{-1}\) ECw
Distribution in UAE: Widespread

Jabri

The fruit has a spherical shape and yellowish-white color. It tastes sweet when it’s in the besser stage, and its fibers are clear. The rutab has a golden yellow color, while the tamer has a light brown color.

Origin: UAE
Approximative yield potential (kg/tree): 40-60
Maturity: Very early
Salinity tolerance: 50% yield reduction at 9 dS.m\(^{-1}\) ECw
Distribution in UAE: Widespread

Naghal

The fruit is an elongated oval shape with a slight curve and has a yellow-orange color. The rutab has a light brown hue, while the tamer is darker brown. Eaten at rutab and tamer stages.

Origin: UAE
Approximative yield potential (kg/tree): 40-60
Maturity: Very early
Salinity tolerance: 50% yield reduction at 9 dS.m\(^{-1}\) ECw
Distribution in UAE: Widespread
**Khisab**

The color of the fruit on the tree is light red, and its shape is oval inverted. The fruit at rutab is reddish-brown, and at tamer is dark brown. The besser is sweet with an astringent taste, and the fibers and pigments are medium. It is often consumed at the rutab stage.

*Origin:* UAE  
*Approximative yield potential (kg/tree):* 80-120  
*Maturity:* Mid to late  
*Salinity tolerance:* 50% yield reduction at 12 dS.m⁻¹ ECw  
*Distribution in UAE:* Widespread

**Barhi**

The fruit is a thick oval shape with a light yellow color. The rutab has a light brown color while the tamer has a waxy light brown color. The fruit tastes sweet when it reaches the besser stage and can be eaten at the besser, rutab, and tamer stages.

*Origin:* Iraq  
*Approximative yield potential (kg/tree):* 80-100  
*Maturity:* Very late  
*Salinity tolerance:* 50% yield reduction at 10 dS.m⁻¹ ECw  
*Distribution in UAE:* Widespread

**Khalas**

The fruit starts off bright yellow, but as it ripens, it turns deep amber to reddish brown and eventually light brown. Besser fruits are known for their sweet taste and low fiber and pigment content. The flesh is melting, tender, translucent, and has thick white flesh with a slight yellow tint. It is free from fiber and pigments, giving it a smooth texture. The flavor is rich and delicious, making it an excellent choice to eat at both the rutab and tamer stages. Khalas is a popular cultivar in Gulf countries.

*Origin:* UAE  
*Approximative yield potential (kg/tree):* 40-60  
*Maturity:* Mid  
*Salinity tolerance:* 50% yield reduction at 8 dS.m⁻¹ ECw  
*Distribution in UAE:* Widespread

**Khnizi**

This commercial variety is dark pink with an inverted oval shape. The besser fruit is sweet and does not contain any fiber or pigments. The rutab is dark brown, while the tamer is blackish brown. The seeds are small and brown, and the fruit is of medium weight. It is typically consumed at the rutab and tamer stages.

*Origin:* UAE  
*Approximative yield potential (kg/tree):* 60-70  
*Maturity:* Mid to late  
*Salinity tolerance:* 50% yield reduction at 8 dS.m⁻¹ ECw  
*Distribution in UAE:* Widespread
**Shahlah**

This variety is pinkish-yellow, oval, and elongated. The Besser stage is known for its sweet taste, low fiber content, and lack of pigments. The rutab stage is brown and the tamer stage is reddish-brown. The seed is medium-sized and the fruit is usually of average weight. It is best to eat at the tamer stage.

**Origin:** UAE  
**Approximative yield potential (kg/tree):** 60-80  
**Maturity:** Mid  
**Salinity tolerance:** 50% yield reduction at 10 dS.m\(^{-1}\) ECw  
**Distribution in UAE:** In some areas

**Abu-Maan**

This widely-known commercial variety is yellow, short, and heart-shaped. It’s sweet and contains low levels of fiber and pigments at the Besser stage. The fruit’s rutab stage is amber, while the tamer is dark brown. It has small, brown seeds and is typically quite large, with an average weight; it’s best eaten at the rutab and tamer stages.

**Origin:** UAE  
**Approximative yield potential (kg/tree):** 50-70  
**Maturity:** Mid to late  
**Salinity tolerance:** 50% yield reduction at 9 dS.m\(^{-1}\) ECw  
**Distribution in UAE:** In some areas

**Am-Al-Hamam**

This variety is oval, elongated, and pinkish-yellow. It is bitter and has fibers and pigments at the Besser stage. The rutab has a dark brown color, while the tamer has a brown hue. The fruit has a medium weight and is a semi-dry variety. It is best to eat at the tamer stage.

**Origin:** Kingdom of Saudi Arabia (KSA)  
**Approximative yield potential (kg/tree):** 60-80  
**Maturity:** Mid  
**Salinity tolerance:** 50% yield reduction at 9 dS.m\(^{-1}\) ECw  
**Distribution in UAE:** In some areas

**Rothan**

The fruit is light yellow and a thick oval shape. The rutab is light brown, while the tamer is brown. At the besser stage, the fruit has a sweet taste. It is recommended to eat it during the rutab and tamer stages.

**Origin:** UAE  
**Approximative yield potential (kg/tree):** 60-70  
**Maturity:** Mid  
**Salinity tolerance:** 50% yield reduction at 9 dS.m\(^{-1}\) ECw  
**Distribution in UAE:** Very limited
Sukkari

Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 50-70
Maturity: Mid
Salinity tolerance: 50% yield reduction at 10 dS.m⁻¹ ECw
Distribution in UAE: Very limited

The fruit is yellow; the besser stage is sweet and doesn’t contain any fiber or pigments. The rutab is golden-brown with small seeds. The fruit is medium weight and has patches of lighter color, with a small-to-medium sized cone shape and a firm exterior. It is known for being sweeter than other types of dates, and has chewy flesh. It’s best to eat it during the rutab and tamer stages.

Shagra

Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 50-60
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 dS.m⁻¹ ECw
Distribution in UAE: Very limited

The fruit has a reddish-blonde color and an oval to heart-shaped appearance. The besser is known for its sweet taste and lack of fiber and pigments. The rutab fruit transitions from a deep amber to reddish-brown color to a lighter brown as it ripens, eventually turning blackish-brown in the tamer stage. It has small brown seeds and a medium-weight fruit, and is best enjoyed in the rutab and tamer stages of ripeness.

Ajwa-Tul-Madinah

Origin: Medina, Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 60-70
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 dS.m⁻¹ ECw
Distribution in UAE: Very limited

Ajwa dates are small and dark with longitudinal spot-lines. They are soft to the touch and have a fine texture with white wrinkles. The variety is of special interest to Muslims as it has been mentioned in Prophetic medicine.

Makhtoumi

Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 40-60
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 dS.m⁻¹ ECw
Distribution in UAE: In some regions

The fruit has a reddish-blonde color and an oval to heart-shaped appearance. The besser is known for its sweet taste and lack of fiber and pigments. The rutab fruit transitions from a deep amber to reddish-brown color to a lighter brown as it ripens, eventually turning blackish-brown in the tamer stage. It has small brown seeds and a medium-weight fruit, and is best enjoyed in the rutab and tamer stages of ripeness.
**Nabtat-Saif**

The fruit is yellow and spherical. The bessar is sweet, with fiber and pigment content. The rutab is brown, the tamer is brown, and the seed is small. The average weight of the fruit is medium.

**Origin:** Kingdom of Saudi Arabia (KSA)  
**Maturity:** Mid  
**Distribution in UAE:** Non-existent

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**Nabtat-Sultan**

This variety has a yellow-orange, spherical fruit. It has a sweet taste with low fiber and pigment content. The rutab and tamer stages are brown, with small seeds, and the fruit is generally large in size. It’s best consumed during the rutab and tamer stages.

**Origin:** Medina, Kingdom of Saudi Arabia (KSA)  
**Approximate yield potential (kg/tree):** 35-60  
**Maturity:** Mid  
**Salinity tolerance:** 50% yield reduction at 8 dS.m$^{-1}$ ECw  
**Distribution in UAE:** In some regions

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### Table 2: Nutritional values of tested varieties

<table>
<thead>
<tr>
<th>Nutritional values</th>
<th>Boron (mg/kg)</th>
<th>Calcium (mg/kg)</th>
<th>Copper (mg/kg)</th>
<th>Iron (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FARAD</td>
<td>11.23 ±6.62</td>
<td>736.45 ±218.20</td>
<td>1.07 ±0.94</td>
<td>7.50 ±1.08</td>
</tr>
<tr>
<td>LULU</td>
<td>11.55 ±3.12</td>
<td>711.32 ±199.09</td>
<td>0.97 ±0.61</td>
<td>6.90 ±2.01</td>
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<tr>
<td>JABRI</td>
<td>9.83 ±2.28</td>
<td>679.48 ±163.58</td>
<td>2.00 ±1.00</td>
<td>7.97 ±0.43</td>
</tr>
<tr>
<td>NAGHAL</td>
<td>12.84 ±3.22</td>
<td>745.57 ±162.43</td>
<td>3.28 ±1.17</td>
<td>10.17 ±2.61</td>
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<tr>
<td>KHSAB</td>
<td>11.48 ±2.09</td>
<td>704.55 ±114.16</td>
<td>2.10 ±1.15</td>
<td>6.17 ±3.11</td>
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<tr>
<td>BARHI</td>
<td>11.50 ±3.02</td>
<td>692.34 ±139.36</td>
<td>2.85 ±1.23</td>
<td>9.25 ±1.40</td>
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<tr>
<td>KHALAS</td>
<td>11.97 ±3.19</td>
<td>753.11 ±135.34</td>
<td>3.13 ±1.56</td>
<td>10.56 ±3.56</td>
</tr>
<tr>
<td>KHINIZI</td>
<td>10.22 ±3.21</td>
<td>571.95 ±140.64</td>
<td>2.04 ±1.44</td>
<td>9.60 ±2.65</td>
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<tr>
<td>SHAHINA</td>
<td>9.37 ±2.39</td>
<td>645.34 ±176.23</td>
<td>2.12 ±1.32</td>
<td>7.65 ±0.43</td>
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<td>ABU-MAAN</td>
<td>6.32 ±2.06</td>
<td>595.34 ±114.75</td>
<td>1.24 ±0.72</td>
<td>4.71 ±2.89</td>
</tr>
<tr>
<td>AM-AL-HAMAM</td>
<td>9.11 ±2.34</td>
<td>611.97 ±201.34</td>
<td>2.09 ±1.99</td>
<td>6.91 ±0.55</td>
</tr>
<tr>
<td>ROTHAN</td>
<td>10.55 ±2.62</td>
<td>620.15 ±221.21</td>
<td>3.59 ±0.93</td>
<td>7.14 ±2.33</td>
</tr>
<tr>
<td>SUKKARI</td>
<td>10.88 ±2.39</td>
<td>581.47 ±130.79</td>
<td>3.06 ±0.84</td>
<td>9.09 ±2.99</td>
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<tr>
<td>SHAGRA</td>
<td>9.89 ±4.12</td>
<td>662.20 ±146.89</td>
<td>2.47 ±1.10</td>
<td>7.08 ±2.01</td>
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<tr>
<td>AJWA-TUL-MADINAH</td>
<td>12.08 ±2.19</td>
<td>766.00 ±164.27</td>
<td>2.66 ±1.47</td>
<td>10.08 ±3.23</td>
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<tr>
<td>MAKHTOUMI</td>
<td>11.71 ±3.13</td>
<td>675.06 ±90.27</td>
<td>2.71 ±1.31</td>
<td>8.31 ±2.96</td>
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<tr>
<td>NABTAT-SAIF</td>
<td>9.07 ±2.23</td>
<td>734.64 ±137.47</td>
<td>1.88 ±0.34</td>
<td>4.92 ±2.43</td>
</tr>
<tr>
<td>NABTAT SULTAN</td>
<td></td>
<td></td>
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</table>
### Table 1: Comparative salinity tolerance of tested varieties

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Varieties (ranked numerically based on yield during the first eight years of production)</th>
<th>Varieties (ranked numerically based on quality (minerals))</th>
</tr>
</thead>
</table>
| TOLERANT | 1. LULU, BARHI  
2. KHISAB, SUKKAR, JABRI, SHAHLAH  
average salinity level at 50% yield reduction is 10 to 12 dS m$^{-1}$ ECw (8400 ppm) | AJWAT ALMADINAH, NAGHAL, BARHI, SHAGRI, ABU MAAN, JABRI, SUKKARI AND ROTHAN |
| MODERATELY SENSITIVE | FARAD, UM AL-HAMAM, NAGHAL, ABU-MAAN, ROTHAN  
average salinity level at 50% yield reduction is 9 dS m$^{-1}$ ECw (6300 ppm) | LULU, SUKKAR, KHNIZI, NABTAT SAIF, KHALAS, MAKTOUMI AND |
| SENSITIVE | SHAGRI, KHNIZI, NABTAT SAIF, AJWAT AL-MADINAH, KHALAS, MAKTOUMI  
average salinity level at 50% yield reduction is 8 dS m$^{-1}$ ECw (5600 ppm) | |

### CHARACTERISTICS OF 18 DATE PALM VARIETIES

<table>
<thead>
<tr>
<th>Potassium</th>
<th>Magnesium</th>
<th>Manganese</th>
<th>Sodium</th>
<th>Phosphorus</th>
<th>Zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td>7426.46 ±1214.7</td>
<td>593.33 ±179.85</td>
<td>4.11 ±1.78</td>
<td>340.04 ±107.18</td>
<td>611.60 ±96.66</td>
<td>593.33 ±179.85</td>
</tr>
<tr>
<td>6312.34 ±890.56</td>
<td>516.23 ±113.93</td>
<td>4.63 ±1.19</td>
<td>413.13 ±93.31</td>
<td>835.27 ±99.39</td>
<td>4.63 ±0.39</td>
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<tr>
<td>8187.88 ±991.2</td>
<td>587.77 ±66.91</td>
<td>3.34 ±0.87</td>
<td>245.44 ±42.56</td>
<td>801.63 ±151.29</td>
<td>4.77 ±0.31</td>
</tr>
<tr>
<td>8049.67 ±247.30</td>
<td>709.16 ±124.26</td>
<td>5.07 ±1.27</td>
<td>429.98 ±169.45</td>
<td>784.51 ±131.33</td>
<td>5.14 ±0.48</td>
</tr>
<tr>
<td>7106.56 ±859.6</td>
<td>632.70 ±146.38</td>
<td>3.69 ±1.23</td>
<td>427.47 ±169.45</td>
<td>694.27 ±146.64</td>
<td>4.85 ±0.45</td>
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<tr>
<td>7545.97 ±966.20</td>
<td>686.89 ±110.67</td>
<td>4.31 ±1.35</td>
<td>407.81 ±73.49</td>
<td>765.41 ±110.13</td>
<td>4.98 ±0.42</td>
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<tr>
<td>7995.56 ±935.75</td>
<td>755.75 ±56.59</td>
<td>3.31 ±1.19</td>
<td>280.91 ±231.56</td>
<td>797.56 ±99.09</td>
<td>4.95 ±0.59</td>
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<tr>
<td>7470.83 ±689.52</td>
<td>547.40 ±93.34</td>
<td>3.50 ±1.39</td>
<td>296.17 ±122.06</td>
<td>706.56 ±125.49</td>
<td>4.83 ±0.39</td>
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<tr>
<td>7992.11 ±961.35</td>
<td>567.77 ±67.35</td>
<td>3.15 ±0.78</td>
<td>241.91 ±39.34</td>
<td>765.76 ±199.11</td>
<td>4.56 ±0.76</td>
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<tr>
<td>6306.95 ±1116.2</td>
<td>496.55 ±65.09</td>
<td>2.39 ±1.03</td>
<td>311.13 ±82.50</td>
<td>744.15 ±133.03</td>
<td>4.96 ±0.34</td>
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<td>6150.33 ±1231.6</td>
<td>613.43 ±56.31</td>
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<td>7591.55 ±907.08</td>
<td>580.71 ±82.31</td>
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<td>7064.43 ±1456.1</td>
<td>635.54 ±104.72</td>
<td>4.54 ±1.55</td>
<td>207.29 ±57.08</td>
<td>847.53 ±110.22</td>
<td>4.73 ±0.25</td>
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<tr>
<td>7756.75 ±854.80</td>
<td>625.65 ±62.47</td>
<td>3.50 ±1.29</td>
<td>345.00 ±92.18</td>
<td>712.42 ±131.47</td>
<td>5.15 ±0.37</td>
</tr>
<tr>
<td>8293.69 ±1072.52</td>
<td>674.63 ±70.31</td>
<td>3.67 ±1.08</td>
<td>330.91 ±115.92</td>
<td>836.65 ±107.07</td>
<td>5.02 ±0.37</td>
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<td>7052.90 ±885.27</td>
<td>617.55 ±109.06</td>
<td>3.78 ±1.59</td>
<td>352.56 ±118.44</td>
<td>725.36 ±127.75</td>
<td>4.90 ±0.30</td>
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<td>7131.74 ±1011.4</td>
<td>717.26 ±84.26</td>
<td>2.88 ±1.12</td>
<td>362.83 ±107.62</td>
<td>852.03 ±84.75</td>
<td>5.03 ±0.41</td>
</tr>
</tbody>
</table>

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**Salinity effect:** Value increase: 🍄 Value decrease: 🍊 No significant variation: 🍊 Variation (increase – decrease): 🍊
ICBA is an international not-for-profit applied agricultural research center with a unique focus on marginal environments where an estimated 1.7 billion people live. It identifies, tests and introduces resource-efficient, climate-smart crops and technologies that are best suited to different regions affected by salinity, water scarcity and drought, among other factors. Through its work, ICBA helps to create jobs, and improve livelihoods, food security and nutrition for some of the poorest rural communities around the world.

To know how much water date palms need, please explore: