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ICBA
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TECHNICAL BRIEF:

Characteristics of 18 date palm varieties

Findings from twenty-two years of research in the UAE

Citation

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Introduction

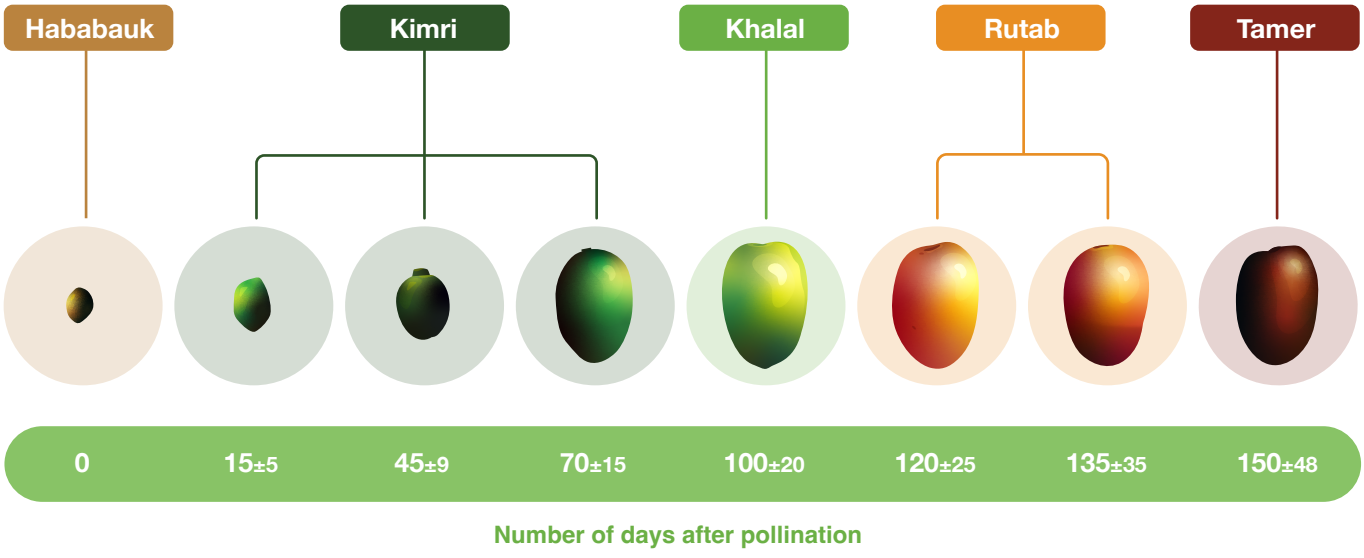
Date palm (*Phoenix dactylifera* L.) is a critical part of social and economic life on the Arabian Peninsula, but as climate change advances and water becomes more scarce, new approaches are needed to ensure the crop can contribute to livelihoods, nutrition, and culture into the future.

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.

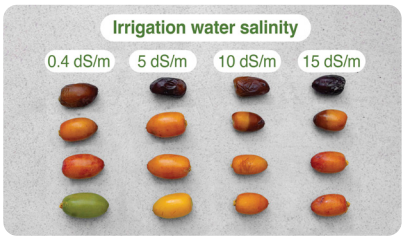
This document summarizes findings about each of the varieties, including yield potential, salinity tolerance, nutritional values, and more. It also contains a summary table comparing salinity tolerance of the tested varieties.

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) فرض

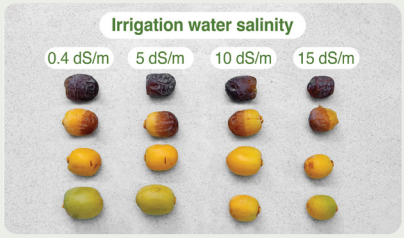


Origin: UAE
Approximative yield potential (kg/tree): 70-90
Maturity: Mid to late
Salinity tolerance: 50% yield reduction at 9 deciSiemens per meter ($dS.m^{-1}$) determined by the electrical conductivity of the water (ECw)
Distribution in UAE: Widespread

Farad dates at various stages of ripening under different salinity levels (left); fruit on trees (right)

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.

LULU لولو

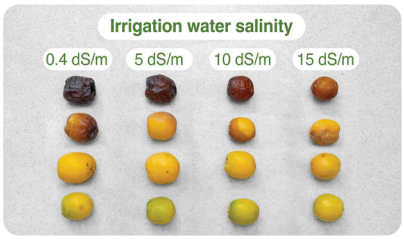


Origin: UAE
Approximative yield potential (kg/tree): 70-90
Maturity: Late
Salinity tolerance: 50% yield reduction at 12 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Lulu dates at various stages of ripening (left); fruit on trees (right)

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.

Jabri جبري

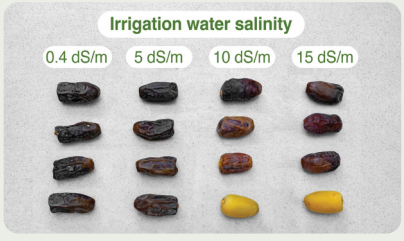


Origin: UAE
Approximative yield potential (kg/tree): 40-60
Maturity: Late
Salinity tolerance: 50% yield reduction at 10 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Jabri dates at various stages of ripening (left); fruit on trees (right)

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.

Naghal نغال

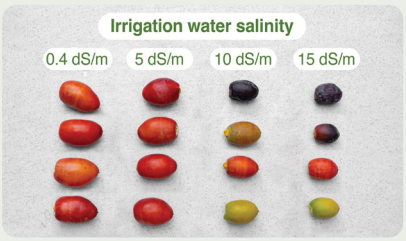


Origin: UAE
Approximative yield potential (kg/tree): 40-60
Maturity: Very early
Salinity tolerance: 50% yield reduction at 9 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Naghal dates at various stages of ripening (left); fruit on trees (right)

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.

Khisab خصاب

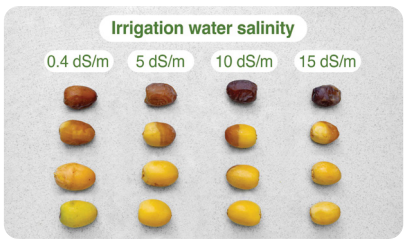


Origin: UAE
Approximative yield potential (kg/tree): 80-120
Maturity: Very late
Salinity tolerance: 50% yield reduction at 10 $dS.m^{-1}$ ECw
Distribution in UAE: In many regions

Khisab dates at various stages of ripening (left); fruit on trees (right)

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.

Barhi برحي

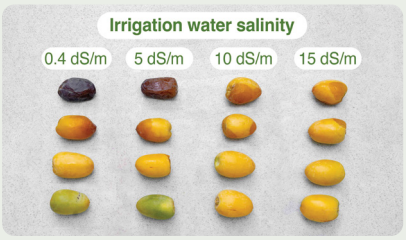


Origin: Iraq
Approximative yield potential (kg/tree): 80-100
Maturity: Mid to late
Salinity tolerance: 50% yield reduction at 12 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Barhi dates at various stages of ripening (left); fruit on trees (right)

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.

Khalas خلاص

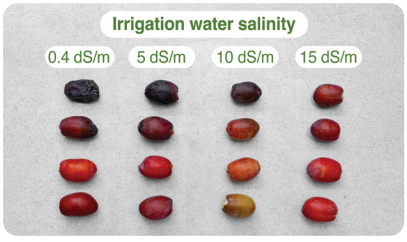


Origin: UAE
Approximative yield potential (kg/tree): 40-60
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Khalas dates at various stages of ripening (left); fruit on trees (right)

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.

Khnizi خنيزي

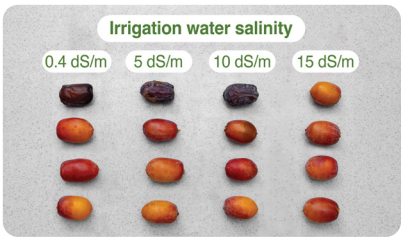


Origin: UAE
Approximative yield potential (kg/tree): 60-70
Maturity: Mid to late
Salinity tolerance: 50% yield reduction at 8 $dS.m^{-1}$ ECw
Distribution in UAE: Widespread

Khnizi dates at various stages of ripening (left); fruit on trees (right)

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.

Shahlah شهلة

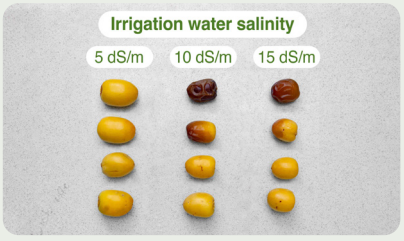


Origin: UAE
Approximative yield potential (kg/tree): 60-80
Maturity: Mid
Salinity tolerance: 50% yield reduction at 10 $dS.m^{-1}$ ECw
Distribution in UAE: In some areas

Shahlah dates at various stages of ripening (left); fruit on trees (right)

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.

Abu-Maan ابو معان

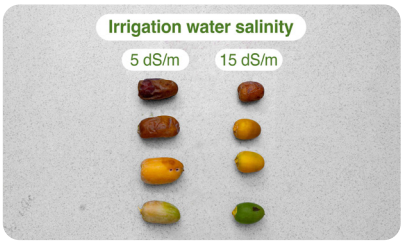


Origin: UAE
Approximative yield potential (kg/tree): 50-70
Maturity: Mid to late
Salinity tolerance: 50% yield reduction at 9 $dS.m^{-1}$ ECw
Distribution in UAE: In some areas

Abu-Maan dates at various stages of ripening (left); fruit on trees (right)

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.

Am-Al-Hamam ام الحمام



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

Am-Al-Hamaam dates at various stages of ripening (left); fruit on trees (bottom)

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.

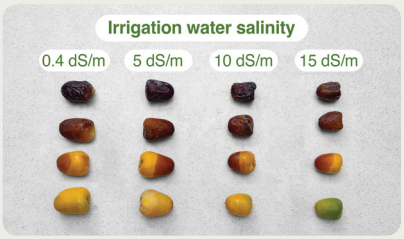
Rothan روثانة

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

Rothan dates at various stages of ripening (left); fruit on trees (right)

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.

Sukkari سكري

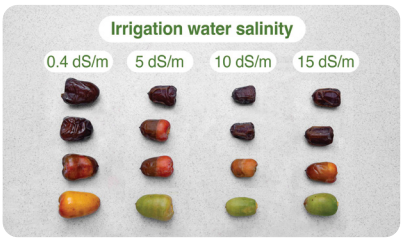


Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 50-70
Maturity: Mid
Salinity tolerance: 50% yield reduction at 10 $dS.m^{-1}$ ECw
Distribution in UAE: Very limited

Sukkari dates at various stages of ripening (left); fruit on trees (right)

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 شقرى

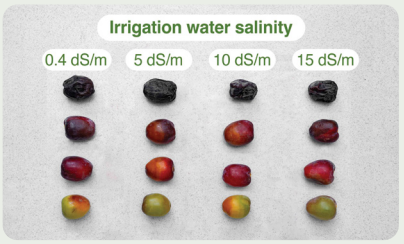


Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 50-60
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 $dS.m^{-1}$ ECw
Distribution in UAE: Very limited

Shagra dates at various stages of ripening (left);harvesting fruit from trees (right)

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 f ruit,and is best enjoyed in the rutab and tamer stages of ripeness.

Ajwa-Tul-Madinah عجوة المدينة

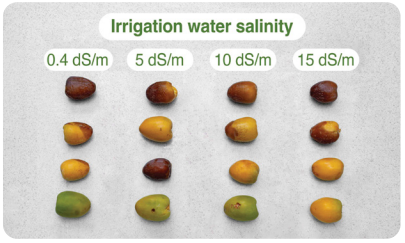


Origin: Medina, Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 60-70
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 $dS.m^{-1}$ ECw
Distribution in UAE: Very limited

Ajwa-Tul-Madinah dates at various stages of ripening (left); on trees (right)

Ajwah 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 مكتومي

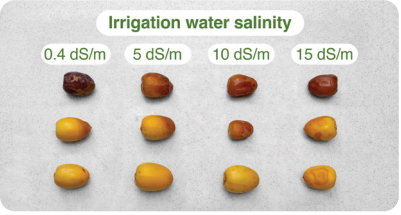


Origin: Kingdom of Saudi Arabia (KSA)
Approximative yield potential (kg/tree): 40-60
Maturity: Mid
Salinity tolerance: 50% yield reduction at 8 $dS.m^{-1}$ ECw
Distribution in UAE: In some regions

Makhtoumi dates at various stages of ripening (left); harvesting fruit from trees (right)

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 نبتة سيف



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

Nabtat-Saif dates at various stages of ripening (left); on trees (right)

The fruit is yellow and spherical. The besser 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.

Nabtat Sultan نبتة سلطان

Origin: Medina, Kingdom of Saudi Arabia (KSA)
Approximative 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

Nabtat Sultan dates at various stages of ripening (left); on trees (right)

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.

Table 2: Nutritional values of tested varieties

	Nutritional values					Element (mg/kg)			
	Protein (% by wt.)	Sucrose (g/100g)	Glucose (g/100g)	Fructose (g/100g)	Total Sugars	Boron	Calcium	Copper	Iron
FARAD فرض	2.13	<0.89	34.27	34.73	69.00	11.23 ±5.62	736.45 ±218.20	1.07 ±0.94	7.50 ±1.08
LULU لولو	3.23	<0.89	30.73	33.18	63.91	11.55 ±3.12	711.32 ±199.09	0.97 ±0.61	6.90 ±2.01
JABRI جبري	2.06	<0.89	31.83	32.75	64.58	9.83 ±2.28	679.48 ±163.58	2.00 ±1.00	7.97 ±0.43
NAGHAL نغال	2.88	<0.89	32.72	32.49	65.21	12.84 ±3.22	745.57 ±162.43	3.28 ±1.17	10.17 ±2.61
KHISAB خصاب	2.06	<0.89	36.54	33.53	70.08	11.48 ±2.09	704.55 ±114.16	2.10 ±1.15	6.17 ±3.11
BARHI برحي	2.58	<0.89	34.52	34.26	68.78	11.50 ±3.02	692.34 ±139.36	2.85 ±1.23	9.25 ±1.40
KHALAS خلاص	2.9	<0.89	35.89	31.89	67.78	11.97 ±3.19	753.11 ±135.34	3.13 ±1.56	10.56 ±3.56
KHNIZI خنيزي	2.12	<0.89	31.72	30.59	62.31	10.22 ±3.21	571.95 ±140.64	2.04 ±1.44	9.60 ±2.65
SHAHLAH شهلة	3.02	<0.89	25.58	27.11	52.69	9.37 ±2.39	645.34 ±176.23	2.12 ±1.32	7.65 ±0.43
ABU-MAAN ابو معان	2.43	<0.89	34.46	33.32	67.79	6.32 ±2.06	595.34 ±114.75	1.24 ±0.72	4.71 ±2.89
AM-AL-HAMAM ام الحمام	2.50	<0.89	31.11	31.22	62.33	9.11 ±2.34	611.97 ±201.34	2.09 ±1.99	6.91 ±0.55
ROTHAN روثانة	2.78	<0.89	33.16	33.52	66.68	10.55 ±2.62	620.15 ±221.21	3.59 ±0.93	7.14 ±2.33
SUKKARI سكري	2.79	25.84	21.15	19.00	65.99	10.88 ±2.39	581.47 ±130.79	3.06 ±0.84	9.09 ±2.99
SHAGRA شقرى	2.43	<0.89	34.46	33.32	67.79	9.89 ±4.12	662.20 ±146.89	2.47 ±1.10	7.08 ±2.01
AJWA-TUL-MADINAH عجوة المدينة	3.13	<0.89	33.50	31.65	65.15	12.08 ±2.19	766.00 ±164.27	2.66 ±1.47	10.08 ±3.23
MAKHTOUMI مكتومي	2.43	<0.89	31.93	30.92	62.85	11.71 ±3.13	675.06 ±90.27	2.71 ±1.31	8.31 ±2.96
NABTAT-SAIF نبتة سيف	2.38	<0.89	32.72	32.42	65.14	9.07 ±2.23	734.64 ±137.47	1.88 ±0.34	4.92 ±2.43
NABTAT SULTAN نبتة سلطان	----	----	----	----	----	----------	----------	----------	----------

Table 1: Comparative salinity tolerance of tested varieties

GROUP	**Varieties** (ranked numerically based on yield during the first eight years of production)	**Varieties** (ranked numerically based on quality (minerals)
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, RHOTHAN** average salinity level at 50% yield reduction is 9 dS m^{-1} ECw (6300 ppm)	**LULU, SUKKAR, KHNIZI, NABTAT SAIF, KHALAS, MAKTOUMI AND**
SENSITIVE average salinity level at 50% yield reduction is 8 dS m^{-1} ECw (5600 ppm)	**SHAGRI, KHNIZI, NABTAT SAIF, AJWAT AL-MADINAH, KHALAS, MAKTOUMI** average salinity level at 50% yield reduction is 8 dS m^{-1} ECw (5600 ppm)	

Salinity effect: Value increase: ↗ | Value decrease: ↘ | No significant variation: ⇆ | Variation (increase ~ decrease): ≈

Potassium	Magnesium	Manganese	Sodium	Phosphorous	Zinc
7426.46 ±1241.7 ↗	593.33 ±179.85 ↗	4.11 ±1.78 ≈	340.04 ±107.18 ↗	611.60 ±96.66 ⇆	593.33 ±179.85 ⇆
6312.34 ±890.56 ≈	516.23 ±113.93 ⇆	4.63 ±1.19 ≈	413.13 ±93.31 ↗	835.27 ±99.39 ⇆	4.63 ±0.39 ≈
8187.88 ±991.2 ↗	587.77 ±66.91 ≈	3.34 ±0.87 ↘	245.44 ±42.56 ⇆	801.63 ±151.29 ≈	4.77 ±0.31 ⇆
8049.67 ±947.30 ≈	709.16 ±124.26 ≈	5.07 ±1.27 ≈	429.98 ±169.45 ≈	784.51 ±131.33 ↘	5.14 ±0.48 ⇆
7106.56 ±859.6 ↘	632.70 ±146.38 ≈	3.69 ±1.23 ↘	427.47 ±169.45 ↘	694.27 ±146.64 ↘	4.85 ±0.45 ↘
7545.97 ±966.20 ↗	686.89 ±110.67 ↘	4.31 ±1.35 ↘	407.81 ±73.49 ≈	765.41 ±110.13 ≈	4.98 ±0.42 ↘
7995.56 ±935.75 ↗	755.75 ±56.59 ↗	3.31 ±1.19 ↗	280.91 ±231.56	797.56 ±99.09 ≈	4.95 ±0.59 ↘
7470.83 ±689.52 ≈	547.40 ±93.34 ≈	3.50 ±1.39 ↘	296.17 ±122.06 ↘	706.56 ±125.49 ≈	4.83 ±0.39 ↗
7992.11 ±961.35 ≈	567.77 ±67.35	3.15 ±0.78 ↗	241.91 ±39.34 ⇆	765.76 ±199.11 ⇆	4.56 ±0.76 ⇆
6306.95 ±1116.2 ≈	496.55 ±65.09 ≈	2.39 ±1.03 ≈	311.13 ±82.50 ≈	744.15 ±133.03 ≈	4.96 ±0.34 ≈
6150.33 ±1231.6 ≈	613.43 ±56.31 ≈	3.01 ±0.93 ⇆	311.31 ±31.56	691.56 ±270.33 ≈	4.15 ±0.91 ≈
7591.55 ±907.08 ≈	580.71 ±82.31 ≈	3.71 ±0.94 ≈	230.25 ±122.83 ↗	803.12 ±181.15 ≈	4.89 ±0.32 ⇆
7064.43 ±1456.1 ≈	635.54 ±104.72 ≈	4.54 ±1.55 ≈	207.29 ±57.08 ≈	847.53 ±110.22 ↗	4.73 ±0.25 ⇆
7756.75 ±854.80 ≈	625.65 ±62.47 ≈	3.50 ±1.29 ↗	345.00 ±92.18 ↘	712.42 ±131.47 ≈	5.15 ±0.37 ≈
8293.69 ±1072.52 ≈	674.63 ±70.31 ≈	3.67 ±1.08 ≈	330.91 ±115.92 ≈	836.65 ±107.07 ↗	5.02 ±0.37 ↘
7052.90 ±885.27 ↘	617.55 ±109.06 ≈	3.78 ±1.59 ≈	352.56 ±118.44 ↘	725.36 ±127.75 ≈	4.90 ±0.30 ≈
7131.74 ±1011.4 ≈	717.26 ±84.26 ≈	2.88 ±1.12 ↘	362.83 ±107.62 ≈	852.03 ±84.75 ↗	5.03 ±0.41 ↘
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