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Sensory flavor profiles and aromatic volatiles of six Emirati date palm fruits at three ripening stages

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Date Palm Trees in UAE

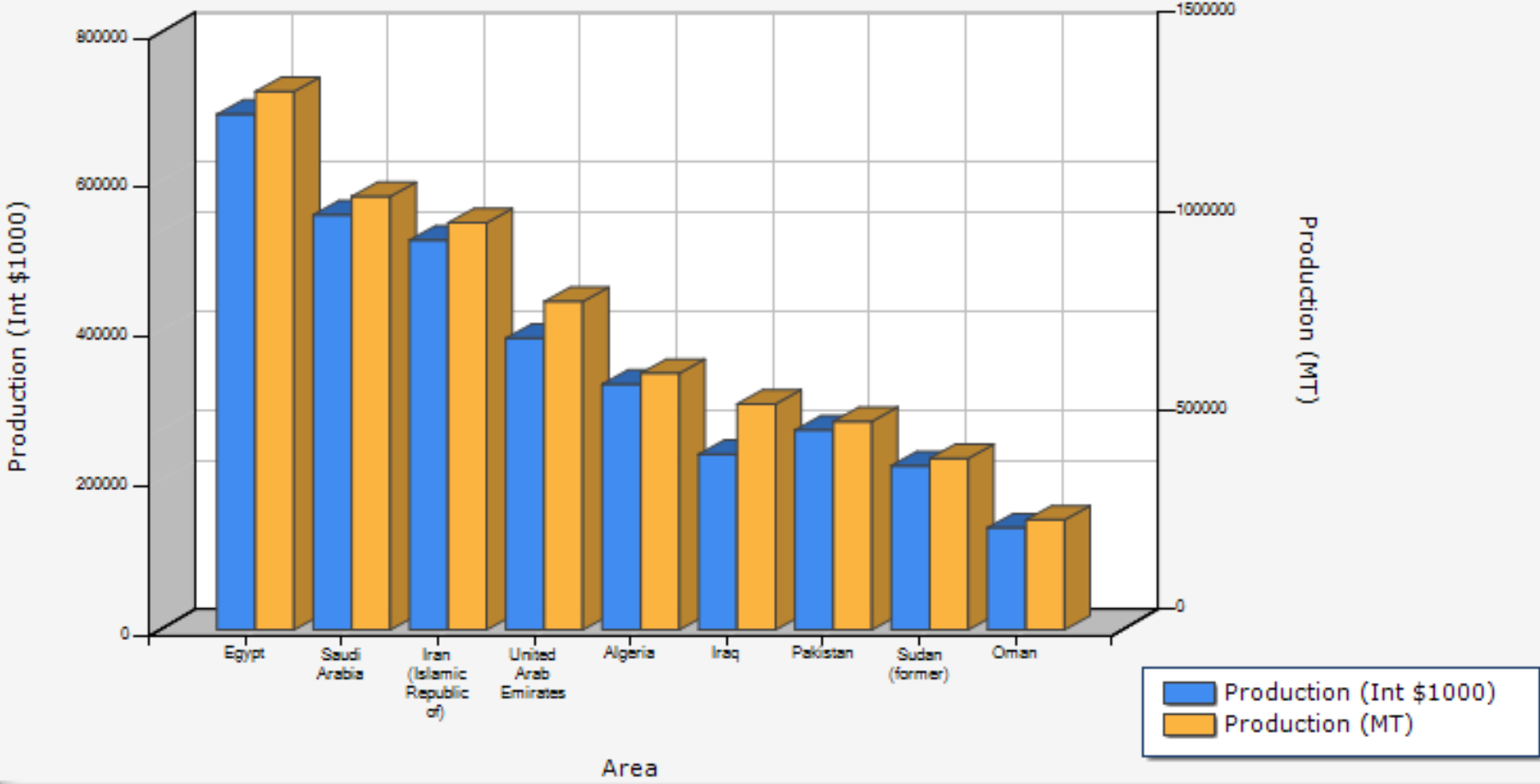
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Date Production - FAO Statistics



Top production - Dates - 2010



Ripening stages of Dates

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© **Bisr/Khalal**



Rutab



Tamr



Dates' Characteristics

- © Excellent source for simple sugars
- © Good source for dietary fiber, minerals, vitamins
- © Functional properties
 - © Antioxidants and polyphenols
- © Health benefits

Dates' Products

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Date syrup



Date fruit residue



Date paste

OBJECTIVES

- ◎ To investigate the effect of date variety and ripening stage on:
 - ◎ Sensory flavor profile
 - ◎ Aromatic volatiles
 - ◎ Emirati date fruit
 - ◎ Barhi, Khalas, Ayashi, Nabtat Seif, Sakary M, and Sakary S
 - ◎ At three ripening stages
 - ◎ Bistr, rutab and tamr

MATERIALS

© Date fruits – Local Farm at Al Showeeb, UAE.



METHODS

© **Moisture content**

- © Vacuum oven at 70 °C to constant weight.

© **Sugar content**

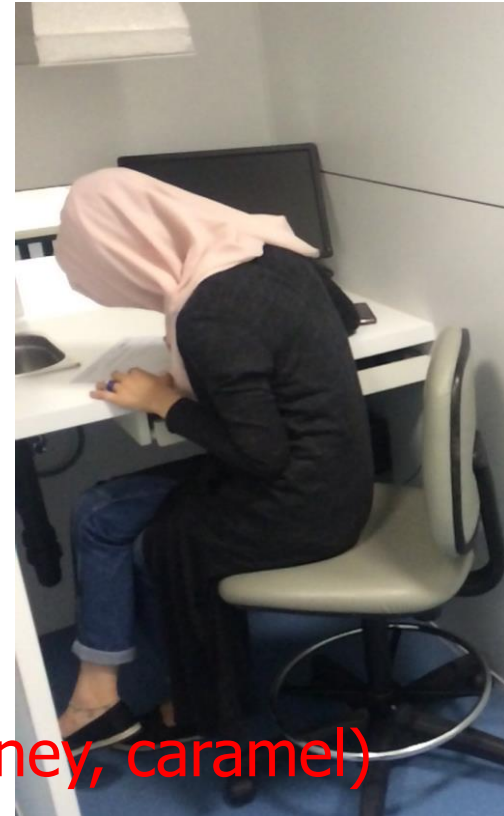
- © High Performance Liquid Chromatography (HPLC)

© **Aromatic Volatiles**

- © 3800 GC equipped with a 4000 Mass Selective Detector

Sensory flavor profile

- © 12 Trained panelists
- © Quantitative Descriptive Analysis
- © 15 cm unstructured line
- © 18 descriptive attributes
 - © Aromas (jujube, date, raisin, syrup, honey, caramel)
 - © Basic tastes (sweetness and bitterness)
 - © Flavors (jujube, date, raisin, syrup, honey, caramel)



Statistical analysis

- © SPSS
- © Analysis of variance (ANOVA)
- © Tukey's test ($p < 0.05$)

RESULTS AND DISCUSSION

Moisture content of six Emirati date varieties at three different ripening stages

Variety	Moisture content*		
	Bisr	Rutab	Tamr
Ayashi	61.6±2.8a	34.6±1.8b	24.5±1.0c
Nabtat Saif	62.6±2.2a	35.0±0.7b	23.6±0.1c
Sakary M	62.0±2.3a	30.1±0.0a	21.3±0.7b
Sakary S	62.6±1.3a	34.0±1.3b	21.5±1.2b
Barhi	61.4±2.5a	32.1±2.3ab	19.3±0.3a
Khalas	64.6±0.4a	33.2±0.9ab	23.2±0.1bc

* Means within the same ripening stage with different subscript letters are significantly different at $p \leq 0.05$ (n = 3)

Sugar content of six Emirati date varieties at bisr ripening stage

Variety	Bisr		
	Glucose	Fructose	Sucrose
Ayashi	11.7bc	13.2bc	03.4b
Nabtat Saif	10.4b	11.4b	00.0a
Sakary M	11.7bc	13.6c	04.9b
Sakary S	02.3a	02.5a	23.4c
Barhi	13.5c	14.6c	00.0a
Khalas	10.7b	12.5bc	04.1b

* Means within the same ripening stage with different subscript letters are significantly different at $p \leq 0.05$ (n =3)

Sugar content of six Emirati date varieties at rutab ripening stage

Variety	Rutab		
	Glucose	Fructose	Sucrose
Ayashi	25.3d	24.7b	00.0a
Nabtat Saif	25.0d	25.5b	00.0a
Sakary M	17.5b	19.9b	01.7a
Sakary S	03.8a	04.4a	54.4c
Barhi	21.5c	22.2b	12.5b
Khalas	23.9cd	25.9b	03.9a

* Means within the same ripening stage with different subscript letters are significantly different at $p \leq 0.05$ (n = 3)

Sugar content of six Emirati date varieties at tamr ripening stage



Variety	Tamr		
	Glucose	Fructose	Sucrose
Ayashi	38.0b	35.4b	00.0a
Nabtat Saif	36.8b	33.6b	00.0a
Sakary M	37.6b	36.6b	00.0a
Sakary S	19.9a	20.0a	20.8b
Barhi	42.4b	42.6b	00.0a
Khalas	38.2b	37.9b	00.0a

* Means within the same ripening stage with different subscript letters are significantly different at $p \leq 0.05$ (n = 3)

Sweetness and bitterness of six Emirati date varieties at three different repining stages **UAEU**

Variety	Bisr		Rutab		Tamr	
	Sweetness	Bitterness	Sweetness	Bitterness	Sweetness	Bitterness
Ayasa	2.8±2.4a	4.1±3.4a	5.5±3.2ab	3.4±3.6b	7.3±2.2a	2.2±3.4a
Nabtat Saif	2.5±2.9a	4.6±3.7a	5.2±2.9ab	3.1±2.1ab	7.2±2.6a	2.1±2.9a
Sakary M	3.8±2.1a	4.6±3.9a	5.1±2.2ab	2.3±1.9ab	5.9±2.6a	1.9±3.1a
Sakary S	3.6±2.1a	3.7±2.7a	4.5±2.6a	2.8±1.8ab	7.2±2.4a	2.2±3.1a
Barhi	4.4±3.5a	4.2±3.8a	6.7±2.6b	1.6±1.7a	6.4±2.4a	2.6±3.7a
Khalas	3.2±2.9a	4.8±3.9a	4.1±2.6a	3.1±2.6ab	6.5±2.3a	2.4±3.6a

15 cm unstructured line scale

Aroma profiles of six Emirati date varieties at bisr repining stages



Variety	Date	Raisin	Syrup	Honey	Caramel
Ayasa	4.4±2.5ab	2.7±3.2a	2.8±2.2a	2.4±2.4a	2.7±2.2a
Nabtat Saif	3.9±2.3ab	3.3±2.9a	2.1±2.1a	2.3±2.2a	1.7±1.8a
Sakary M	3.1±1.8a	1.8±2.4a	2.7±1.1a	1.8±2.1a	2.0±1.7a
Sakary S	3.7±2.1ab	2.7±2.1a	2.4±1.7a	2.6±2.8a	2.3±1.7a
Barhi	4.1±2.6ab	2.6±2.9a	2.4±1.8a	2.3±2.1a	2.5±2.6a
Khalas	5.1±2.1b	2.4±2.4a	2.6±1.8a	2.6±2.6a	1.8±1.6a

15 cm unstructured line scale

Aroma profiles of six Emirati date varieties at rutab repining stages



Variety	Date	Raisin	Syrup	Honey	Caramel
Ayasa	3.7±2.5a	ND	2.7±1.5a	3.3±3.9a	1.4±2.9a
Nabtat Saif	3.9±2.7a	ND	3.5±2.1ab	2.6±3.0a	1.4±2.8a
Sakary M	4.5±2.8a	ND	3.1±1.4ab	1.9±1.6a	2.1±2.4a
Sakary S	3.9±2.0a	ND	2.3±1.1a	1.1±1.1a	1.3±2.5a
Barhi	5.1±2.8a	ND	3.7±1.7ab	2.2±1.7a	0.9±1.7a
Khalas	4.5±1.7a	ND	4.1±2.4b	1.8±1.8a	0.8±2.1a

15 cm unstructured line scale

Aroma profiles of six Emirati date varieties at tamr repining stages



Variety	Date	Raisin	Syrup	Honey	Caramel
Ayasa	5.0±2.1a	2.3±2.5a	3.0±2.4a	2.8±2.8a	1.3±1.8a
Nabtat Saif	5.2±2.2a	1.1±1.7a	2.2±1.5a	2.2±2.1a	1.2±1.7a
Sakary M	5.0±2.6a	2.2±2.3a	2.2±1.1a	2.5±3.1a	1.2±2.5a
Sakary S	4.3±1.9a	1.6±2.9a	2.2±1.7a	2.1±2.5a	1.3±2.6a
Barhi	4.9±2.4a	2.7±2.7a	3.4±2.4a	2.8±2.4a	2.4±2.1a
Khalas	5.4±2.3a	2.2±2.7a	3.1±1.8a	2.3±2.0a	1.5±2.5a

15 cm unstructured line scale

Flavor profiles of six Emirati date varieties at bisr repining stages

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Variety	Jujube	Date	Raisin	Syrup	Honey	Caramel
Ayasa	2.1±2.7a	4.6±2.6a	2.3±2.8a	3.5±2.8a	3.1±3.1a	2.9±2.5ab
Nabtat Saif	2.1±2.5a	3.3±2.3a	2.6±2.5a	2.9±2.7a	2.5±2.9a	1.5±1.5a
Sakary M	3.6±3.5a	3.8±2.1a	2.2±3.2a	3.5±2.4a	2.8±2.2a	2.0±2.3ab
Sakary S	4.4±2.9a	4.1±2.2a	3.2±3.5a	2.3±1.7a	2.1±1.1a	1.6±1.4ab
Barhi	4.5±3.1a	3.1±2.9a	2.6±3.1a	3.3±3.2a	3.6±3.9a	3.1±3.4b
Khalas	3.2±2.8a	3.8±2.8a	2.1±2.3a	2.4±1.8a	3.2±2.7a	1.7±1.8ab

15 cm unstructured line scale

Flavor profiles of six Emirati date varieties at rutab repining stages

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Variety	Jujube	Date	Raisin	Syrup	Honey	Caramel
Ayasa	0.7±2.4a	5.2±2.9a	1.9±1.6a	3.2±1.6a	2.8±2.3a	2.6±3.4a
Nabtat Saif	1.4±3.7a	5.8±3.3a	2.0±2.2a	3.1±2.8a	2.7±2.3a	2.1±2.8a
Sakary M	1.2±3.1a	5.1±2.7a	2.4±2.7a	3.5±2.3a	2.8±1.9a	2.2±2.5a
Sakary S	0.8±2.2a	4.6±2.5a	2.2±3.3a	2.5±2.6a	2.3±2.0a	1.1±2.1a
Barhi	1.0±3.2a	5.7±2.9a	2.3±2.8a	2.1±1.4a	4.2±6.9a	2.7±2.8a
Khalas	0.8±2.2a	5.3±2.8a	2.0±2.1a	3.5±2.7a	4.3±3.3a	2.4±3.3a

15 cm unstructured line scale

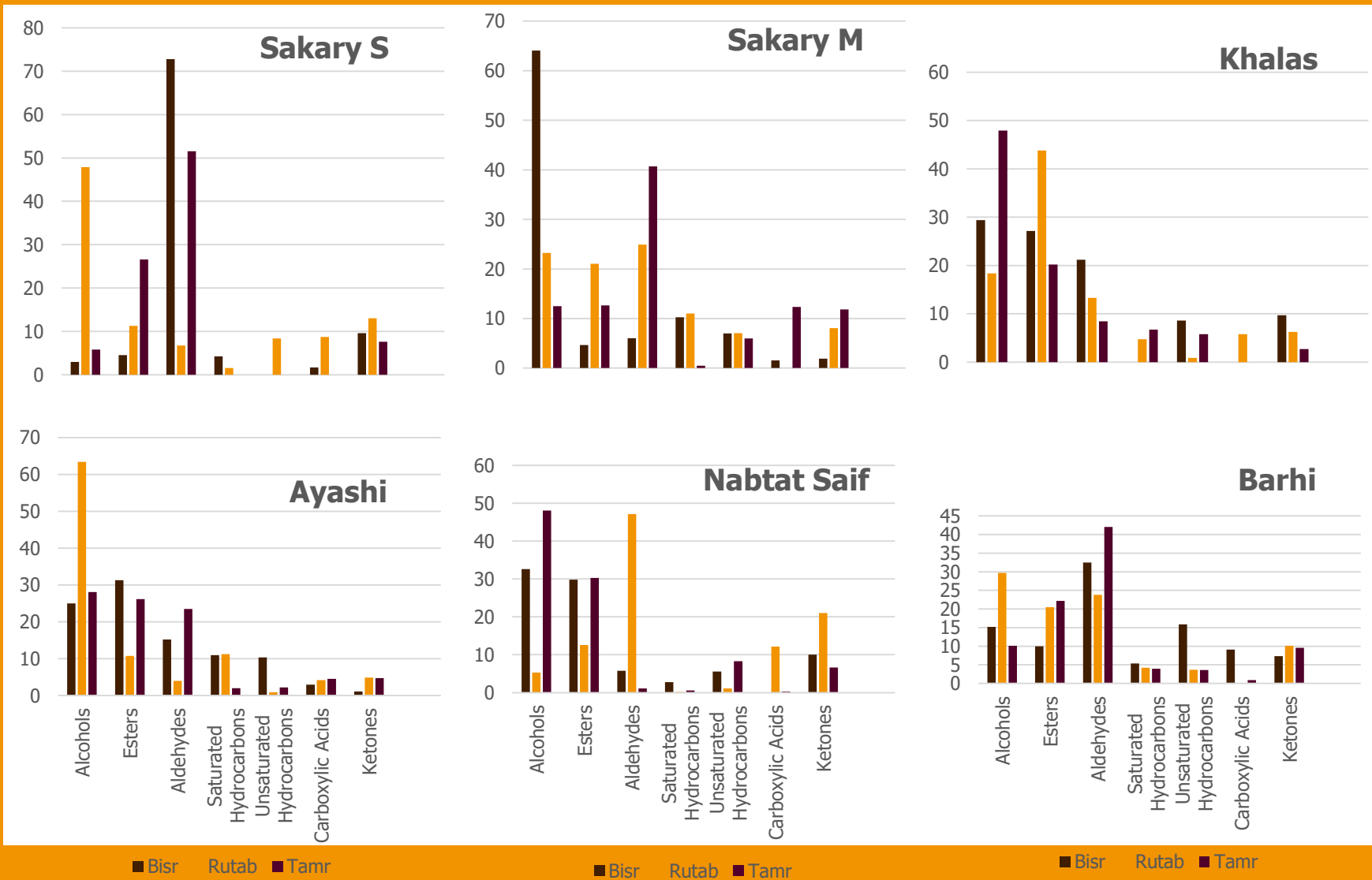
Flavor profiles of six Emirati date varieties at tamr repining stages

UAEU

Variety	Jujube	Date	Raisin	Syrup	Honey	Caramel
Ayasa	0.8±1.6a	5.5±2.3a	2.8±2.4a	3.8±2.2a	3.6±2.0a	2.1±1.5a
Nabtat Saif	0.8±1.6a	5.1±2.9a	1.9±1.8a	3.0±2.3a	3.0±2.7a	1.5±1.8a
Sakary M	1.1±2.7a	5.6±2.7a	2.0±1.9a	2.6±1.9a	2.5±2.1a	1.8±1.4a
Sakary S	0.7±1.6a	4.0±2.1a	2.5±2.7a	3.1±1.7a	2.8±1.6a	2.2±1.9a
Barhi	0.9±1.1a	5.8±2.7a	3.1±3.2a	3.8±3.1a	3.1±2.1a	1.8±1.3a
Khalas	0.8±1.3a	5.5±2.6a	4.2±7.9a	2.9±1.9a	2.7±1.5a	1.8±1.5a

15 cm unstructured line scale

Evolution of volatile compounds in Emirati date varieties



CONCLUSIONS

- © The first comprehensive study on flavor profiles & aromatic volatiles of Emirati date fruits varieties.
- © All the tested date varieties had similar sensory flavor profiles at the same ripening stage.
- © 164 volatile compounds were identified mainly alcohols, esters, aldehydes and ketones.
- © The evolution of the aromatic compounds differed depending on date variety and ripening stage.

Acknowledgement



- © **Financial support - Research Affairs, UAEU**
- © **Mr. Ahmed Saif Al Falasi - Al Showeeb, UAE**
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- © **Panelists**



Thank you