



Diversity of *Citrullus colocynthis* (L.) Schrad. (Cucurbitaceae) in the United Arab Emirates

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ABSTRACT

Germplasm of *Citrullus colocynthis* in the United Arab Emirates was studied to find variation in it. Twenty five different accessions of the species were collected from various regions of the country. Eight morphological characteristics including fruit length, fruit diameter, number of seeds fruit⁻¹, seed length, seed width, seed thickness, 100 seeds weight and seed weight fruit⁻¹ were measured to ascertain diversity in it. The results show that a high level of heterogeneity exists within the *C. colocynthis* germplasm in the country.

Key Words: accessions, *Citrullus colocynthis*, diversity, fruit, germplasm, seed, United Arab Emirates.

INTRODUCTION

Citrullus colocynthis (L.) Schrad. which belongs to the gourd (Cucurbitaceae) family is native to North Africa, southern Europe, the Middle East and South Asia. Mostly it is found in the sandy soils with high temperatures and low rainfall. In the United Arab Emirates (UAE), where it is called handhal, is common and widespread in its eastern, northern and central regions (Jongbloed, 2003).

C. colocynthis has many medicinal benefits against different ailments including diabetes type II (Huseini et al., 2009) and breast cancer (Grossman et al., 2007). It possesses anti-inflammatory (Marzouk et al., 2010) and anti-bacterial (Rasool and Jahanbakhsh, 2011) compounds that may help to fight the related diseases. Its antioxidant quality (Kumar et al., 2008) makes it a health food, while its mosquito larvicidal trait (Rahuman and Venkatesan, 2008) can assist to control malaria. It can also be used for the treatment of infertility (Chaturvedi et al., 2003).

The plant can be cultivated to produce low cost bio-fuel as it has the potential to yield high oilseed production (Giwa et al., 2010), while growing on marginal lands. About 6,500 kg ha⁻¹ seed yield is possible with little effort (Duke, 1978). Since its seed

has high oil contents of up to 53% (Milovanović and Pićurić-Jovanović, 2005), it may produce more than 3,000 kg ha⁻¹ of oil which is comparable to major oilseed crops. Apart from bio-fuel, its oil can also be used as food like conventional vegetable oils.

MATERIAL AND METHODS

A botanical exploration was carried out during 2013-14 to study *Citrullus colocynthis* in the UAE. During the expedition, fruits of about 25 accessions of the species were collected from different regions of the country (Fig. 1). For one accession, fruits were gathered from 5-20 plants growing on a single location. Majority of the accessions were collected from desert where they grow nicely with little available moisture. The geographic coordinates of the collecting sites were located using a Garmin GPS 72H. The recorded data was downloaded and processed with the program ArcGIS Explorer prepared by Esri®.

The data on morphological characteristics were based on 10 fruits and seeds, randomly selected from each of the 25 accessions. Morphological traits measured on fruits were fruit length, fruit diameter, number of seeds fruit⁻¹ and weight of seeds fruit⁻¹. The characteristics measured on seeds were seed length, seed width, seed thickness and 100 seed

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weight. The data were analyzed using standard statistical methods to determine the significant differences among the 25 *C. colocynthis* accessions for the 8 morphological characteristics.

RESULTS AND DISCUSSION

Citrullus colocynthis (L.) Schrad. Linnaea 12:414. 1838 (Figs. 2 & 3)

Synonyms: *Cucumis colocynthis* L.; *Colocynthis vulgaris* Schrad.

Prostrate vine with annual stems and perennial rootstocks. Stems angular and rough. Tendrils simple, mostly un-branched. Leaves alternate, ovate-cordate or triangular-cordate, rough on both surfaces, on 3 cm long stalk, 3-7-lobed, 5-10 cm long, central lobe occasionally ovate, sinuses open. Flowers solitary, yellow, monoecious, peduncled, axillary, corollas 5-lobed; ovary hairy. Fruit a pepo, more or less globular, slightly depressed, somewhat elliptical

fissures, young green and white variegated at maturity yellow; leathery rind; pulp light, spongy, breakable, off white to yellow, extremely bitter. Seeds ovoid, compressed, smooth, light yellow to dark brown, borne on parietal placenta.

Flowering November to June, fruiting December to July.

The results show (Table 1) that a large variation exists among the *C. colocynthis* germplasm for its fruit and seed traits in the UAE. The accession RMS 231 has the longest fruit (70.1 mm), while RMS 257 (48.7 mm) has the shortest and the difference between the two is more than 27%. Similarly the same two accessions have the largest (74.6 mm) and the smallest (52.3 mm) diameter for their fruits with the variation of around 30%. RMS 257 fruit contains the least amount of seeds (169) among the 25 accessions, while RMS 258 has maximum number of seeds (561) that shows a big difference of 70% between the two.

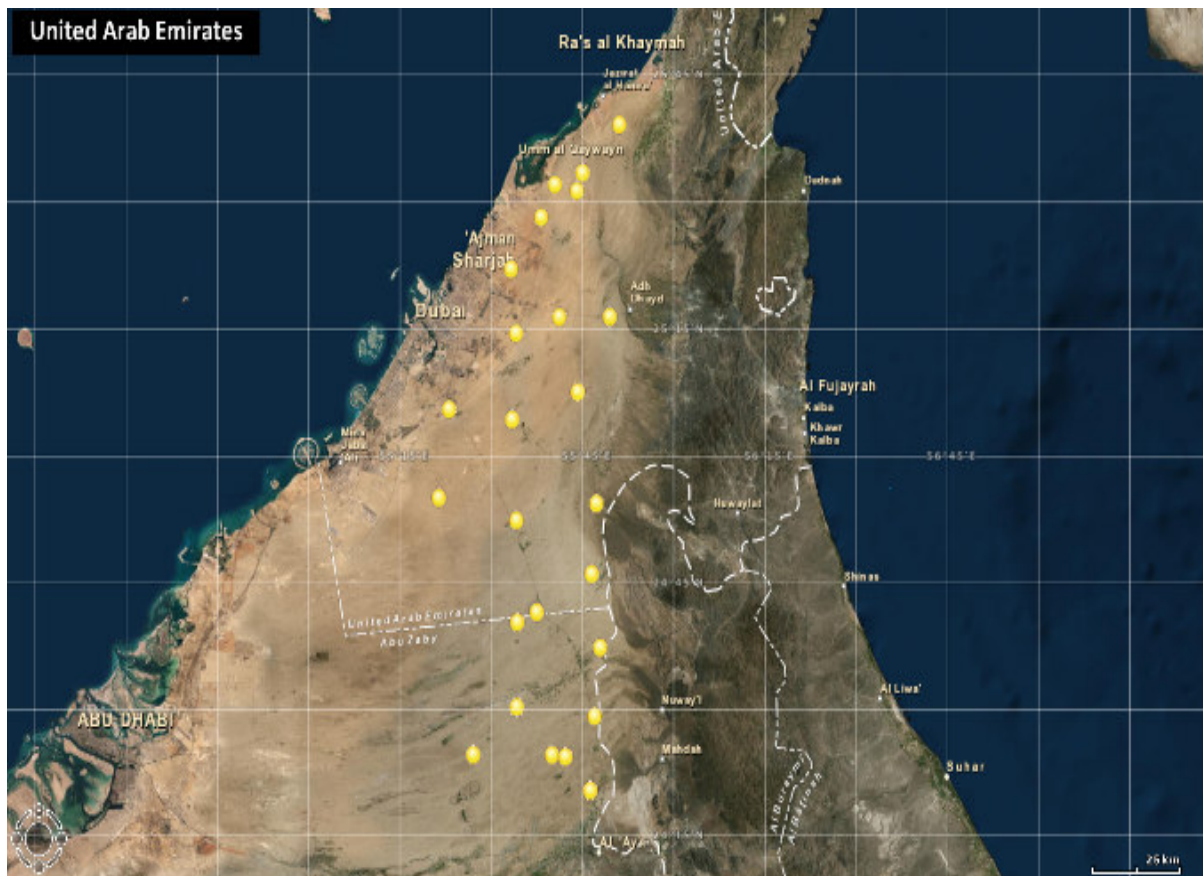


Fig. 1. Collection sites of *Citrullus colocynthis* in the UAE



Fig. 2. *Citrullus colocynthis* vine growing in desert.



Fig. 3. Fruit of *Citrullus colocynthis*.

Table 1. Morphological traits of 25 *Citrullus colocynthis* accessions of the UAE

Accession ID	Fruit length (mm)	Fruit diameter (mm)	No. of seeds fruit ⁻¹	Seed length (mm)	Seed width (mm)	Seed thickness (mm)	100 seeds weight (g)	Seed weight fruit ⁻¹ (g)
	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE
RMS 215	56.2±2.9	56.6±2.4	300±41.7	5.5±0.12	3.3±0.14	1.66±0.09	1.9±0.08	5.7±0.19
RMS 220	60.1±1.8	61.1±2.1	308±50.5	6.0±0.17	3.5±0.13	1.63±0.10	2.1±0.05	6.5±0.25
RMS 227	57.5±3.0	59.1±2.8	344±55.7	5.6±0.18	3.3±0.12	1.68±0.08	2.0±0.07	6.9±0.35
RMS 231	70.1±2.8	74.6±3.2	487±46.6	7.5±0.10	4.3±0.12	2.01±0.08	4.1±0.12	20.0±0.87
RMS 232	60.7±1.5	61.4±1.6	308±41.4	5.7±0.12	3.4±0.05	1.71±0.08	2.1±0.08	6.5±0.32
RMS 234	62.5±3.4	64.0±3.1	304±41.4	7.7±0.19	4.3±0.15	2.02±0.10	4.2±0.14	12.7±0.88
RMS 236	57.1±3.4	59.2±3.7	235±56.4	7.3±0.14	4.2±0.16	2.12±0.11	3.7±0.10	8.7±0.69
RMS 237	59.6±6.9	56.9±7.6	239±27.9	6.7±0.13	3.9±0.11	1.87±0.06	3.1±0.10	7.4±0.54
RMS 238	65.9±4.2	66.4±3.7	458±50.8	5.8±0.15	3.4±0.11	1.72±0.04	2.2±0.07	10.1±0.58
RMS 239	58.3±2.5	58.4±3.0	384±74.0	5.6±0.14	3.4±0.13	1.68±0.09	2.0±0.05	7.7±0.47
RMS 240	52.8±2.9	55.9±2.4	315±79.7	5.4±0.25	3.2±0.11	1.66±0.05	1.8±0.04	5.7±0.29
RMS 241	53.7±2.3	55.1±1.3	275±55.8	5.8±0.15	3.5±0.12	1.69±0.06	2.0±0.07	5.5±0.33
RMS 244	61.1±2.3	62.4±2.2	236±29.4	5.9±0.30	3.6±0.13	1.73±0.06	2.2±0.08	5.2±0.23
RMS 245	60.1±2.6	62.3±2.3	259±41.8	6.6±0.10	4.1±0.12	1.94±0.13	3.2±0.11	8.3±0.45
RMS 246	55.8±3.5	56.4±4.0	283±56.9	6.7±0.17	3.9±0.10	1.75±0.07	2.6±0.07	7.3±0.52
RMS 247	51.2±3.3	53.8±2.4	240±58.0	5.6±0.21	3.5±0.09	1.70±0.10	2.1±0.08	5.0±0.22
RMS 248	58.9±2.2	60.9±3.1	342±86.1	5.6±0.13	3.4±0.09	1.72±0.05	2.1±0.07	7.2±0.71
RMS 249	57.9±2.6	59.9±1.9	340±47.0	5.5±0.19	3.3±0.11	1.63±0.08	2.1±0.07	7.1±0.56
RMS 250	55.4±5.6	57.3±4.1	327±72.6	5.8±0.17	3.3±0.07	1.64±0.09	2.0±0.05	6.5±0.44
RMS 253	57.1±3.3	59.7±2.7	349±84.8	5.5±0.16	3.3±0.18	1.59±0.09	1.8±0.05	6.3±0.36
RMS 254	57.9±2.7	61.2±2.8	251±44.1	5.7±0.38	3.4±0.20	1.65±0.07	1.9±0.04	4.8±0.40
RMS 255	54.0±2.3	57.7±2.9	290±48.2	5.8±0.19	3.5±0.17	1.69±0.01	2.0±0.08	5.8±0.51
RMS 256	58.0±3.4	58.6±3.0	335±48.4	7.3±0.13	4.3±0.16	1.97±0.06	4.2±0.14	14.1±0.78
RMS 257	48.7±3.2	52.3±4.4	169±41.0	5.7±0.22	3.3±0.14	1.64±0.06	1.9±0.05	3.2±0.18
RMS 258	64.2±2.4	67.0±1.8	561±84.4	5.7±0.26	3.4±0.12	1.66±0.05	2.1±0.06	11.8±0.70
Max-Min	48.7-70.1	52.3-74.6	169-561	5.4-7.7	3.2-4.3	1.63-2.12	1.8-4.2	3.2-20.0

RMS 234 is on the top regarding seed length (7.7 mm) and seed width (4.3 mm). On the contrary, RMS 240 has the smallest (5.4 mm) and the narrowest (3.2 mm) seed and the difference between the two accessions in relation to seed length and width is 30% and 25% respectively. In case of seed thickness, RMS 236 (2.12 mm) has maximum, whereas RMS 220 (1.63 mm) gets the minimum and the difference is more than 23%. For 100 seed weight, RMS 234 (4.2 g) tops the list making it more than 230%

heavier than RMS 240 (1.8 g), which is at the bottom. With regard to seed weight fruit⁻¹ a huge variation is present between the first (RMS 231, 20.0 g) and the last (RMS 257, 3.2 g) of the studied accessions. The difference is more than 6 times making it the most diverse among all the 8 fruit and seed traits measured in this study. The research indicates the presence of immense diversity among the seeds of *C. colocynthis* germplasm in the UAE (Fig. 4).



Fig. 4. Seeds of 25 different accessions of *Citrullus colocynthis* of the UAE.

CONCLUSION

The study indicates the presence of sizable diversity with respect to fruit and seed traits among the *Citrullus colocynthis* accessions collected from different regions of the UAE. The diversity within the wild plant species can be exploited to cultivate it for different purposes. Some of the collected accessions show the potential to be planted as an oilseed crop in the sandy soils with little irrigation. This may help to produce eco-friendly bio-fuel without disrupting the production of major food crops.

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