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RESEARCH ARTICLE

Autecological studies on *Citrullus colocynthis* species in Saudi Arabia

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Abstract

Many plant species may be used for the production of herbal preparations containing phytochemicals with significant anti-oxidant and anti-inflammatory capacities and health benefits. *Citrullus Colocynthis* spp is among the most known for the medical plants. The aim of our approach was to study the morphological and taxonomical parameters for Citrullus *Colocynthis* in the Saudi Arabia. This result of this study affords a chemotaxonomic significance for *Citrullus Colocynthis* species collected from various catchment areas in Saudi Arabia on the basis of the evidences from morphometric and phytochemical studies. From this study we have concluded that geographical distribution of the species occurs in the Saudi Arabia.

Introduction

Ecologist have long been interested in large-scale gradients of the effect of the environmental factors which lead to growth variation and adaptation. The comparative study of plants are important to understand the species behavior at its habitat especially in arid and semi-arid regions. It has been known from the literature that species commonly show morphological differences when living under different environmental conditions. For example, *Achillea lanulosa* plants living over the Sierra Nevada range in the USA, grow tall and robust at 3000 ft. and it progressively reduce their size until they reach 11000 ft altitude (Clausen 1948 and Al-Zahrani 2006). *Citrullus Colocynthis L* (Schrad) is a medicinal plant species of *Cucurbitaceae* family found in Africa and Asia (Ramzi 2013). Fruits of the plant contain bitter glycoside and those are used as drug for several purposes. Compounds in the fruits have anti-inflammatory properties due to presence of alkaloids and flavonoids so those are used to treat pain and rheumatoid arthritis (Marzouk 2012). Meanwhile, aqueous and methanolic extracts of the plant demonstrated high anti-microbial activity against some bacteria and fungi. Several studies have also shown anti-cancer and apoptosis properties of seeds as well as their role to decrease blood sugar (Tanin-Spitz 2007).

Citrullus Colocynthis L is a common annual wild plant, procumbent herb with simple tendrils. Flowers are in small with yellow color and the fruit is very bitter, there are several medicinal uses of this plants. It grows fast in the Sandy soils and widespread in different parts of Saudi Arabia (Al-Zahrani 2006). Alwadi and Ambulate (1996) did not found any obvious morphological differences of *Calotropis procera* plants grow into two different altitude ranges. The aim of the present investigation was to study the morphological and taxonomical parameters for *Citrullus Colocynthis* species in Saudi Arabia and also to evaluate the variations in the concentrations and distributions of some secondary metabolites and also to determine the antioxidant and free radical scavenging activity.

Materials and methods

Plants were collected from samples of different herbariums. These herbariums are from King Saud University (KSU), King Abdul-Aziz University (KAU), King Abdul – Aziz city for science and technology (KACST), National

Commission for Wild Life Conservation and Development (NCWCD) and Ministry of Water (RIY) or collected from different localities of Saudi Arabia.

Study of morphological characters:

Description of morphological and floral characters, the measurements of the whole plant, the measurement of leaf area and the measurement of sepals (calyx) and petals (corolla).

Study of stomata and trichomes on leaf surface (micro morphology):

Leaves are collected from plant samples of different herbariums.

Dried adult leaves are cut into a fragment of 1cm in the middle of the lamina and put into a test tube which contains 10% of nitric acid (HNO3). The test tube was placed in a water bath at 100^0 C for 5-10 minutes. After cooling the fragment was then transferred into a Petri dish filled with distilled water. Both halves of the cuticular membrane were gently brushed to clean them from any remaining pieces of the mesophyll tissue. The fragment was then placed into a watch glass filled with 5% acetic acid for 30 min. To bleach. The fragment was washed with distilled water and transferred into 50% alcohol for 2min.: alcin blue for 5 min.: alcoholic series (50%, 70%, 80%, 90% and 100%) for 2 min. in each series and finally in 1:1 solution of absolute alcohol and Histo clear for 2 min. and then in Histo clear for 3sec. After the dehydration, the fragment was transferred onto a slide greased with Histo clear and mounted with Canada balsam. The leaves stomata sculpturing and trichomes were studied with Light Microscope Olympus (CX41RF), and photographed with camera mounted on light microscope (V-TV063XC).

Four species were scanned using Scanning Electron Microscope (SEM). Young leaves (first fully expanded leaf from the tip) and old leaves (third or fourth fully expanded leaf from the tip) were collected from each plant. Plant specimens for SEM using procedures described by McWhorter (2007). Squares of leaves (with approx.1mm thickness of underlying tissues) were excised from the plant, using a razor blade, avoiding the midrib areas so as to give a relatively consistent surface. Leaf segments of approximately $20mm^2$ were fixed for 12 h in 4% glutaraldehyde and rinsed three times with distilled water before dehydration in a graded ethanol series. Samples were dried in a critical point drier and were mounted on aluminum stubs using two-sided adhesive carbon tape. The samples were then coated with a thin layer of gold. Scanning Electron Microscope Jeol JSM (6060) LV. Electron images were recorded using a digital image processor.

Results and Discussion

Citrullus colocynthis L. Schrad., Linnaea12:414 was classified in (1838); Rech., FI. Lowland Iraq 584(1964); Tacky. Stud. FI. Egypt .ed.2.374 (1974). Duration and Habitat: scabrous annual, perennial prostrate herb, branches with long angular procumbing, the plant is grey–green, densely papillae, consistent with the earlier studies (Daoud and Shaby 1985 & Shaby 2000). Stem: prostate or climbing stem, the length of the branch is up to 80 cm long, consistent with the prior studies (Daoud and Shah 1985) represented in Table 1. Leaves: leaves are petiolated and simple tendrils with long branches, triangular-ovate, with rolled margin and obtuse apex, alternate, leaf-blade 3-10 x 2-5 cm, deeply 5-7–lobed pinnate - cleft narrow segments with rounded sinuses, with prominent midrib and veins, petiole 1-3 cm, they are scarbid on both surfaces, as stated by Daoud (1985), Shaby *et al* (1985), Migahid (1996) and Boulos (2000) represented in Table 2.

Inflorescences and Flowers : flowers unisexual , solitary, axillary, it has male and female yellow flowers about 1 cm across growing on the same plant, male flowers: on pedicels 1-2 cm; receptacle-tube 1.5-2.5 mm, broadly obconical, calyx- yellow connate at the base lobes 2-4 mm, sepals laneeolate, petals 1 x 0.5 cm , lanceolate, hypanthium green, broadly obeonic the stamens are ligulats 5, the filaments free, the anthers slightly coherent, female flowers: on pedicels 1-4.5 cm receptacle-tube campanulate, short, 5-lobed, corolla deeply 5-partite 3-4 mm, the segments ovate-oblong, obtuse and adnate to the ovary, as stated by Batanouny (1981), Daoud (1985) and Boulos (2000) represented in Table 3.

In conclusion our results suggest that geographical distribution of the species occurs in the Saudi Arabia. Hence it is concluded that the detail taxonomic studies are the basic tools by which they were not only differentiate the various species, but also can place them at their proper positions.

Table 1: Shows duration, habitat and morphological characters for stem of the studied C*itrullus Colocynthis* species in Saudi Arabia

Species characters	Duration	Habitat	Stem	
			Orientation	defince

	Perennial	Annual	Shrublet	Shrup	Herb	Climb	Erect	Prostrate	Twining	Woody	Pubescent	Canescent	Tomentose	Glabrous
Citrullus colocynthis	+	+	+	-	-	-	+	-	-	-	-	-	-	+

Table 2: Shows morphological characters for leafs of the studied *Citrullus Colocynthis* species in Saudi Arabia.

Characters Species	Blade										Arrangement		Leaf surface			Attachment	
	Apex shape		Shape					Margin									
	Obtus	acute	Triangar - ovate	Oblong - linear	elliptical	spathulate	Linear-lanceolate	rolled	entire	crenate	atternate	opposite	Scarbid hairy	tomentose	glabrous	petiolte	**sissile**
Citrullus colocynthis	+	-	+	-	-	-	-	+	-	-	+	-	+	-	-	+	**-**

Table 3: Shows floral characters of the studied *Citrullus Colocynthis* species in Saudi Arabia.

Characters species	Inflorescence							Flower		Calyx				Corolla			
	Type					Flower attachment				Shape				Colour			
	Axillary	Solitary	Terminal	corymbose	racemose	pedicellate	sissile	unisexul	Bisexual	Lanculate	Campanulate	Oblong-ovate	Deeply lobed	Yellow	White	blue	pink
Citrullus colocynthis	+	+	-	-	-	+	-	+	-								
♂ flower										+	-	-	-	+	-	-	-
♀ flower										+	-	-	-	+	-	-	-



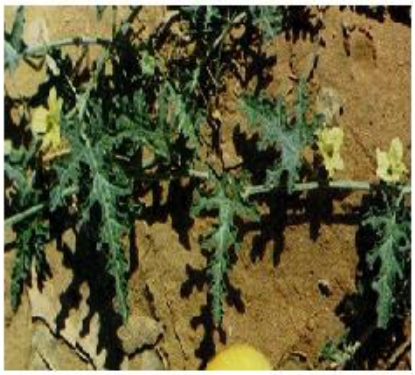

Fig. 1: *Citrullus colocynthis* in Saudi Arabia (Source Migahid, 1996).

Fig. 2: *Citrullus colocynthis* in Saudi Arabia (Source Migahid, 1996).

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