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New record of vascular plant for the flora of Saudi Arabia: *Celtis toka* (Forssk.) Hepper and Wood, Cannabaceae

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Article Info

Abstract

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A new species of *Celtis toka* (Family Cannabaceae) from Faifa, Saudi Arabia is described and illustrated. Morphological descriptions with a distribution map and photograph of the species were provided. *Celtis toka* is only recorded from West and Middle of the Sahel region and East Tropical Africa to Yemen in Arabian Peninsula. This record conceded as the second locations for the Arabian Peninsula.

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Introduction

Sixty to eighty plant species mainly trees were covered by one of the important genera *Celtis* L. and distributed widely in southern and northern hemispheres (Manchester et al., 2002; Shu, 2003), southern Europe (More and White, 2003), Africa (El-Alfy et al., 2011; von Maydell, 1990), Asia, southern, northern and central America (Manchester et al., 2002), some part of tropical Africa (Hedberg and Edwards, 1989), China

(Shu, 2003) and Arabian Peninsula (Wood, 1997; Al-Khulaidi, 2013). The genus exists from the zone of Miocene of Europe, Rusinga Island, Kenya and Paleocene of North America and eastern Asia (Manchester et al., 2002) and preserved in the above fossil record.

Only one species of *Celtis* (*C. africana*) has been registered in the Saudi Arabia flora which was listed as an indigenous species in African regions and Southwest

Asia (Hedberg and Edwards, 1989). *C. africana* is one of the species from African *Celtis* (Stefan et al., 2018; Hedberg and Edwards, 1989) that indigenous to Saudi Arabia and Yemen (Al-Khulaidi, 2013; Wood, 1997; Collenette, 1999). *C. africana* generally listed as a rare species in Saudi flora scattered near villages, valley banks and bottom of the rocky slope (Collenette, 1999; Al-Khulaidi et al., 2016; Al-Khulaidi et al., 2018). The native range of *Celtis toka* is reported in West Tropical Africa and spread to the Arabian Peninsula. The differences in the *Celtis* species, *C. africana* and *C. toka*, reported were observed only in leaf's margin and style type (Hedberg and Edwards, 1989; Wood, 1997). More recently, Al-Khulaidi (2019) reported that the *C. toka* was located between 400 and 800m in the river bed and adjacent to Wadis of Tihama foothills and the central escarpment of Yemen.

The purpose of the study is because the flora of Saudi Arabia and the Arabian Peninsula has not yet been comprehensively studied. There are so many diverse and unknown plant species that existed in the flora of Saudi Arabia near the Al-Baha regions. Though there are few preliminary flora books made by different investigators (Migahid, 1996; Collenette, 1999; Chaudhary, 2000; Mandeville, 1990; Miller and Cope, 1996), still the flora of Saudi Arabia is not fully documented. The local botanist in their plan for working on the flora through search, the species has not been included in the previous floral documents, so the *C. toka* is one of them reported by us as new record.

Observation and taxonomic description

Several botanical explorations were made in the Asir region, Saudi Arabia in different seasons during 2016-2019 to investigate the status of the flora and collecting the rare plant species. A new plant species (*C. toka*) that has not been recorded in the Flora of Saudi Arabia (Migahid, 1996; Collenette, 1999; Chaudhary, 2000; Miller and Cope, 1996) was discovered and described 1st time. The identification and description of collected plant samples have been carried out with the help of relevant flora described from Ethiopia (Hedberg and Edwards, 1989), Arabian Peninsula and Socotra (Miller and Cope, 1996), Yemen Flora (Wood, 1997), and Somalia (Thulin, 2009). Further, a herbarium specimen was developed and deposited at the Department of Biology, Balhurashi, Albaha University, Saudi Arabia. Photographs of collected plant species were submitted for further investigations (Fig. 1).

Taxonomy

Hepper and Wood reported the *Celtis toka* (Forssk.) with the given name with original publication details by Kew Bull. 38(1): 86 (1983) (Fig. 2).

Synonyms: *Ficus toka* Forssk. Fl. Aegypt. -Arab. 219. (1775). *Celtis integrifolia* Lam., Encycl. [Lamarck et al.] 4(1): 140 (1797).

Locality: Fayfa, Saudi Arabia, between 635 and 925 m, on rocky slope adjacent to Wadis and Valley bottom, September 2020 (Table 2), Voucher specimens, ALFAYFI, 9-2020.

Diagnosis: *Celtis toka* is a deciduous monoecious tree with an elongate crown and smooth light grey, with cavities bark. Linear stipulate leaves, flowers without petals. It is similar to *C. africana*, but was differentiated according to the leaf's margin and style type.

Phenology: Flowering and fruiting seasons in between April to October.

Conservation status: *C. toka* is so far known only from its type locality. Only 62 mature individuals were seen, Area of Occupancy (AOO) was calculated as less than three square kilometers and the Extent of Occurrence (EOO) was 15 square kilometers. As per the IUCN red list of genus for the categories and criteria (IUCN 2019), *C. toka* was categorized as critically endangered (CR). Further vegetation surveys and investigation on occupies and the number of individuals of this species in similar habitats is required to fully conservation assessment status.

Etymology: This species described by Pehr Forsskål for the first time from its native locality and the species name (*toka*) was derived from the local Yemeni name 'tuqa' (Provençal, 1742).

Celtis first comprised in the Ulmaceae family but later separate family Celtidaceae. The genetic variability and morphological features finally gave the supporting evidence for the separation of Ulmaceae and Celtidaceae (Zavada and Kim, 1996). *The APG III System* (Angiosperm Phylogeny Group, 2009) placed *Celtis* in Cannabaceae, while there seems to be strong molecular phylogenetic support for placing *Celtis* in Cannabaceae by different investigators

(Sytsma et al., 2002; Zhang et al., 2018). Mapping of DNA of 11 genera of Ulmaceae has placed *Celtis* in

Celtidaceae and suggested that Cannabaceae might be classified within Celtidaceae (Susan et al., 1998).

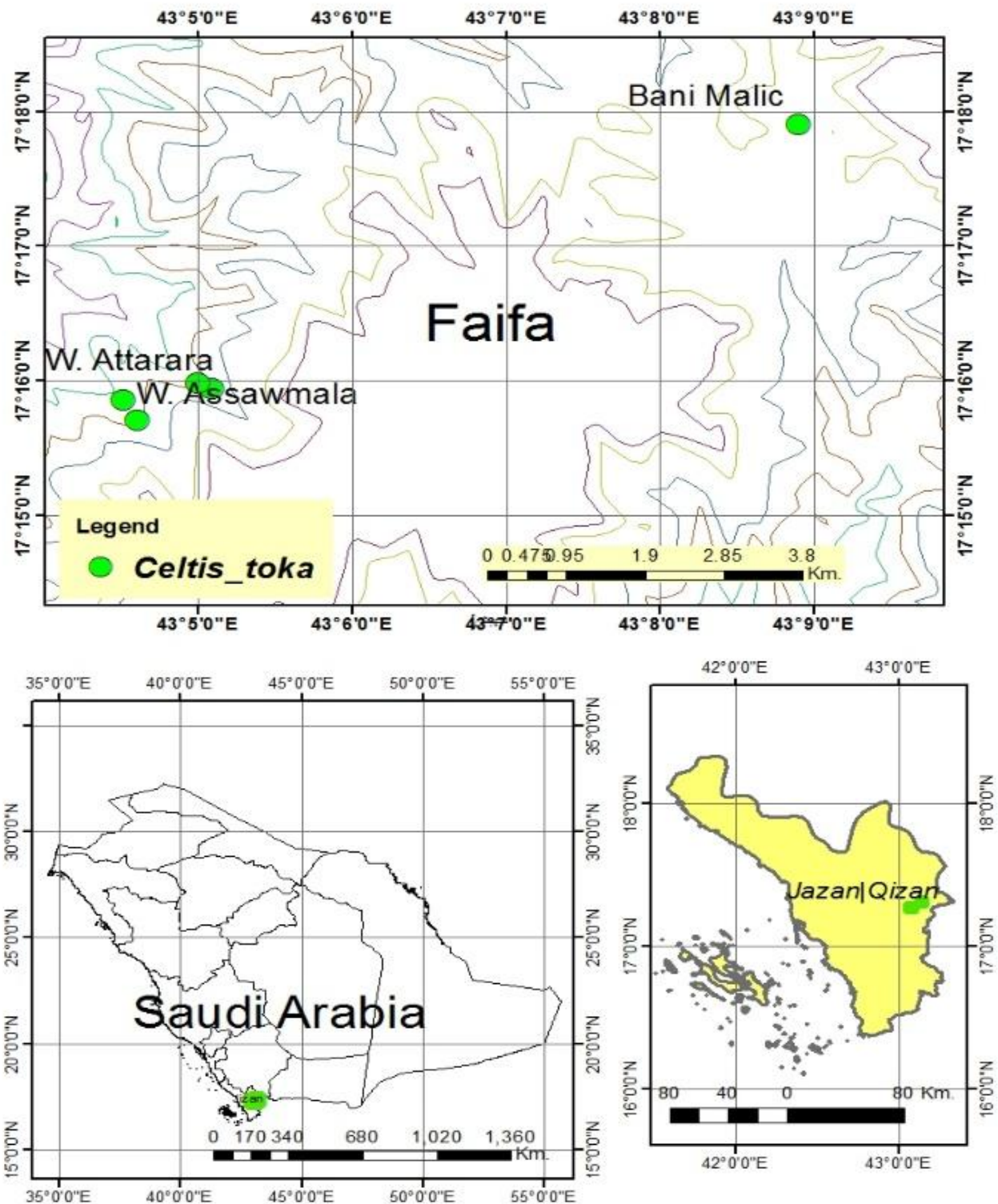


Fig. 1: Distribution of *Celtis toka* in Faifa, Asir region, Saudi Arabia.

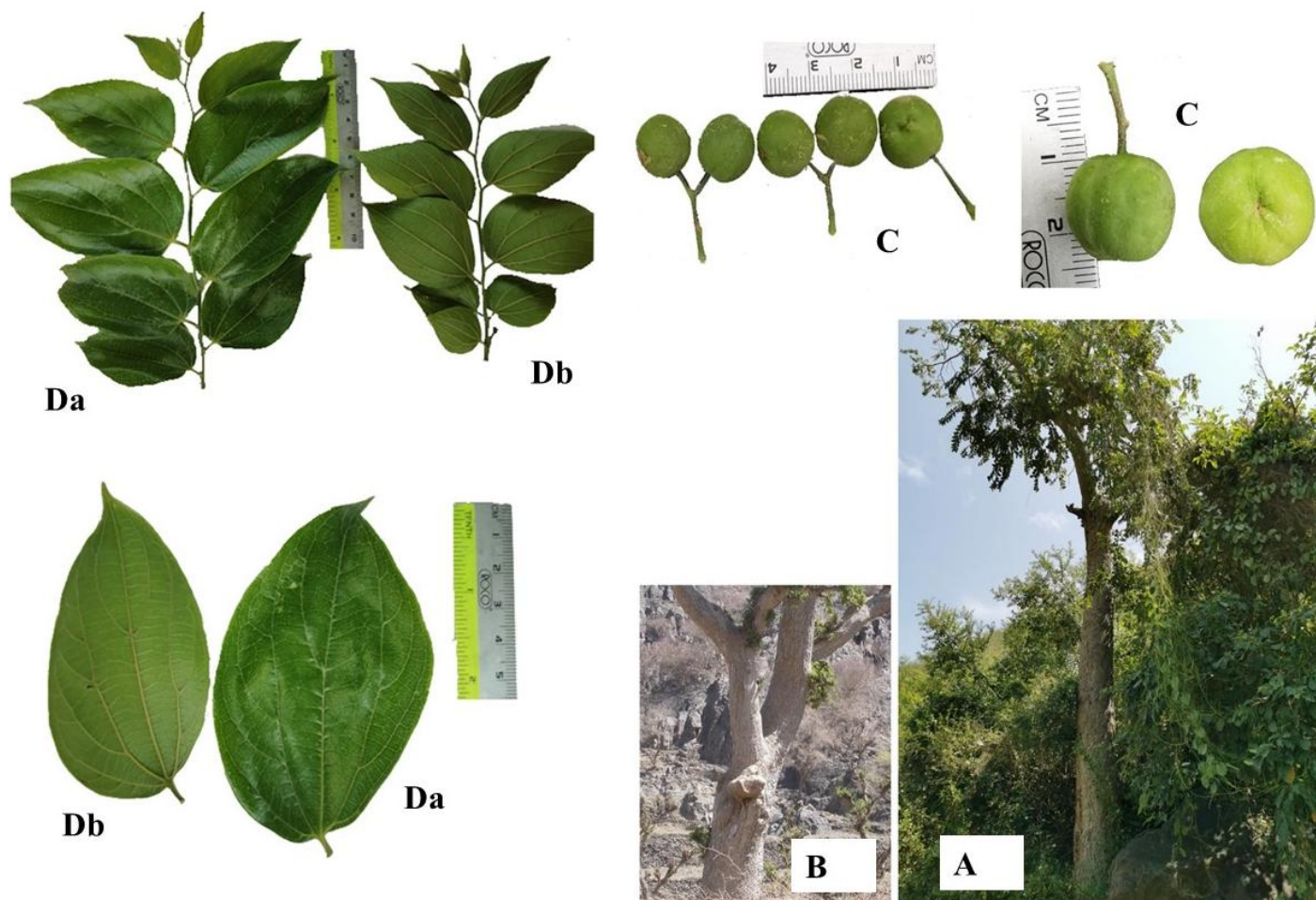


Fig. 2: The plant sample *Celtis toka*. A: Plant habit; B: bark; C: Fruits; D: Leaves (Da; upper surface Db; lower surface).

Plant description

Length of the Tree up to 20 m, the trunk is smooth light gray bark, usually with few cavities; young twigs glabrous or covered with short soft hair. Leaves, alternate, petiolate, simple, ovate to elliptic $4 \times 9 \times 3-5$ cm, petioles 3-5 mm, dark green to light green, often with 3 veined ranging up to the upper part of the blade, apex acuminate with round, cordate to nearly oblique base, margins entire, scabrid on both surfaces with white hairs usually on the main veins and lateral veins, pedicels up to 6 mm long; flowers yellow-green, in axillary cymes, male flowers originated below with clusters while the terminal female and hermaphrodite flowers are found on the upper cymes. Sepals (5) 3 mm long with pubescent ovary, branched styles (2-3) up to 5 mm long. Fruit single or in pairs, stalk up to 10mm, sub-globose, with a small yellow-green niche at the apex 15 mm long (Table1).

Distribution and habitat

The plant is found on the river woodland between 630 and 750 m asl dominated by *Senegalia asak* (= *Acacia asak*), with associated of *Ficus cordata* and others. The landscape is Mountains with agricultural terraces cut by fertile valleys and drainage lines (Table 2). Distribution of *Celtis toka* in part of Faifa, Asir region, Saudi Arabia has been assessed.

The plant is of Sudano-Sahelian zone (Hedberg, and Edwards,1989; Polhill, 1966), which located between the Atlantic ocean and the Red sea with an annual rainfall, 200 to 600 mm in the Sahara desert region and 600 to 1000 mm in Sudanian zone (Karlson, 2015).

The plant is mainly found beside the streams and Wadis and can survive drier areas such as the Sahel with a mean annual rainfall of 500 – 700 mm, generally, the

plant prefers and grows well in river forests, where the underground water is available. It is used as a medicinal plant and the fiber can be obtained from its bark (von Maydell, 1990).

The plant is seen and herbarium samples were collected from Faifa, Asir in a narrow geographical area, between Wadi Assawmala and Bani Malik (between 630 and 750 m), making it is very rare and threatened.

Table 1. Morphological features of *Celtis toka*.

Characters	Description
Habit	Tree, approx. 20 m tall
Bark and stem	Smooth light gray, usually with few cavities; young twigs glabrous or covered with short soft hair.
Leaves	Alternate, petiolate, simple, ovate to elliptic 4 × 9 cm × 3-5 cm, petioles 3-5 mm, dark green to light green, often with 3 veined emerge into the upper part of the blade, apex acuminate with round, cordate to nearly oblique base, margins entire, scabrid on both surfaces with white hairs usually on the main veins and lateral veins, pedicels up to 6 mm long.
Flowers	Yellow-green, in axillary cymes, male flowers below with numerous clustered, terminal female and hermaphrodite flowers located on the upper cymes. Sepals (5), 3 mm long, pubescent ovary, branched styles (2-3) 5 mm long.
Fruit	Single or in pairs, stalk up to 10mm, sub-globose, with small niche at the apex, up to 15 mm long, yellow-green.

Table 2. Explored plant distribution in Al-Fayfa, Asir region, Saudi Arabia.

Latitude	Longitude	Altitude	Description
17.26566	43.08488	720	Rocky slope above Wadi and facing West, Wadi Attarara, Fayfa, Saudi Arabia.
17.26637	43.08335	675	Rocky slope facing west to Wadi Attarara, Fayfa, Saudi Arabia
17.26428	43.07528	635	Rocky slope facing NW to Wadi Assawmala, Fayfa, Saudi Arabia.
17.26174	43.07668	686	Valley bottom facing NW to Wadi Assawmala, Fayfa, Saudi Arabia.
17.29836	43.14832	925	Bani Malik, Fayfa, Saudi Arabia.

Conclusions

The presence of *Celtis toka* is a new record, and it is recorded only from West and Middle of the Sahel region and East Tropical Africa to Yemen in Arabian Peninsula. More fieldwork is needed in the Asir region to search for this plant, record its number of individuals, monitor its growth, and then evaluate it. This needs action for preservation by collecting seeds and then propagating them in the areas in which it is found or in similar environments throughout the Asir region.

Conflict of interest statement

Authors declare that they have no conflict of interest.

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