

## A REVISION OF CUSCUTACEAE FAMILY IN IRAN

E. Jafari, M. Assadi, G. A. Ghanbarian

Received 2016. 01. 25; accepted for publication 2016. 04. 27

Jafari, E., Assadi, M., Ghanbarian · G. A. 2016. 06. 30: A revision of Cuscutaceae family in Iran. - *Iran. J. Botany* 22(1): 23-29. Tehran.

Cuscutaceae family is reviewed based on the literature and available herbarium materials. This is a monotypic family and includes a single genus, three subgenera and eighteen species in Iran, among them *Cuscuta haussknechtii* Engelm, is the only endemic species in Iran. This genus has been studied for the ongoing project of the Flora of Iran. The study was based on fresh materials from field as well as herbarium specimens. All specimens existed in the herbaria of Research Institute of Forests and Rangelands (TARI), herbarium of Iranian Research Institute of Plant Protection (IRAN), Ferdowsi University of Mashad (FUMH), Research Center of Agricultural and Natural Resources of Fars Province were revised. A synopsis and identification key is provided to the eighteen species. Diversity centers and distribution of taxa in Iran are presented. Also the checklist of accepted species, synonyms, typical characters of the taxa are given. In this research new localities and new host plants are added to species and a new variety *C. lehmanniana* var. *lehmanniana* is introduced as a new record to Iran.

Efat Jafari (correspondence <jafari. efat@yahoo. com>) Research Center for Agriculture and Natural Resources of Fars Province P. O. Box 71555-617, Shiraz, Iran. -Mostafa Assadi, Research Institute of Forest and Rangelands, , Agricultural Research, Education and Extension Organization (AREEO), P. O. Box 13185-116, Tehran, Iran- Gholam Abbas Ghanbarian, Dept. of Natural Resources and Environment, Faculty of Agriculture, Shiraz University, Shiraz, Iran.

**Key words:** *Cuscuta*; taxonomy; species; hosts; Iran

بازنگری تیره *Cuscutaceae* در ایران

عفت جعفری، مربی پژوهش، عضو هیئت علمی مرکز تحقیقات کشاورزی و منابع طبیعی فارس  
مصطفی اسدی، استاد پژوهش، مؤسسه تحقیقات جنگلها و مراتع کشور  
غلام عباس قنبریان، استادیار، دانشگده کشاورزی دانشگاه شیراز

تیره سس (*Cuscutaceae*) بر اساس منابع و نمونه‌های هرباریومی مورد بازنگری قرار گرفته است. این خانواده شامل یک جنس، سه زیرجنس و هجده گونه در سطح ایران است. به طور کلی اهداف این پژوهش شامل: شناسایی گونه‌ها، ارائه کلیدهای مربوطه بر اساس ویژگی‌ها و صفات مهم، تهیه نقشه پراکنش و نهایتاً نگارش فلورفارسی برای این خانواده است. به این منظور پس از بررسی منابع و مطالعات کتابخانه‌ای و تعیین محل پراکنش گونه‌های مختلف، مطالعات بر اساس جمع‌آوری نمونه‌های کمبود از مناطق رویشی و بررسی نمونه‌های هرباریومی موجود در هرباریوم مؤسسه تحقیقات جنگل‌ها و مراتع کشور (TARI)، مؤسسه تحقیقات گیاهپزشکی کشور (IRAN)، هرباریوم پژوهشگده علوم گیاهی دانشگاه فردوسی (FUMH) و هرباریوم‌های مختلف سایر مراکز آموزشی و پژوهشی صورت گرفت. نتایج حاصل از این بررسی به صورت کلیدهای شناسایی و شرح هجده تاکسون پذیرفته شده و مشخص شدن دقیق مراکز تنوع و پراکنش گونه‌های این جنس در ایران و ترتیب گونه‌ها به همراه اسامی مترادف و نمونه‌های دیده شده ارایه می‌گردد. در این تحقیق نویسندگان رویشگاه‌ها و میزبان‌های جدیدی برای این جنس از ایران معرفی کرده‌اند.

### INTRODUCTION

The genus *Cuscuta* L. belongs to *Cuscutaceae* family is a cosmopolitan. The taxon includes about 170

species in both hemispheres. According to Flora Iranica (Yunker & Rechinger 1964) there are 17 species in different regions of Iran. It is an annual plant known by

several common names, such as dodder; strangle weed, angel's hair, and golden thread (Yuncker, 1965). Seedlings consist only of stem tissue and have no leaves or roots. Stems filiform to moderately robust, twining, white, yellow or red, adhering to hosts by haustoria. It is incapable of producing its own food and hence is completely dependent upon its host plants for survival (Agrios, 1988, Tanase *et al.* 2012). Flowers small, 4-5-merous, sessile or shortly pedicellate. Calyx and corolla tubular to campanulate, whitish or variously coloured. Stamens inserted in throat or very shortly produced beyond it; scales mostly present, equaling stamens in number, attached to corolla below filament attachment, simple or bifid, usually fimbriate, dentate or fimbriate-ciliate. Styles 2 or united into 1, distinct to obsolete; stigma (s) capitate or linear-elongate. Capsule membranous, irregularly or regularly circumscissile near base or indehiscent. Seeds small. 4 or fewer. Embryo filiform, coiled, lacking cotyledons (Plttmann 1978)

*Cuscuta* is one of the commonly used herbal constituents in functional foods and medicinal tonics to nourish the different body parts. It is often added as nutrient in porridge and alcoholic beverages to improve quality of food (Anjum *et al.* 2013). It is also used to prevent abortion as well as aging in clinical treatment. Previous studies have indicated that it possesses anticancer and immune stimulatory activities (Ozenda 1965). It has been often utilized in folk medicine; and several components of medicinal value have been found within it (Nemli 1987, Nisa *et al.* 1985, Watt 1972).

The aim of this study is to give an identification key to the species of Iran, new hosts of the species, list of accepted species and synonymies and distribution of the species in Iran.

## MATERIALS AND METHODS

All specimens existed in different herbaria of Iran: TARI, IRAN, FUMH and Herbarium of Research Center of Agricultural and Natural Resources of Fars province, were revised. Stereomicroscopy was used for observation of morphological and micro morphological characters. Different Floras and references were used for the identification of the taxa (Boisser 1875, Yunker 1932, Koroleva 1934, Parsa 1949, Meshcheriakov 1954, Terekhova 1964, Yuncker 1965, Kutateladze 1967, Feinbrun 1972, Feinbrun 1978, Jafri 1978, Plttmann 1978, Iranshahr 1983, Rajput 1988, Iranshahr 1999).

## RESULTS

The genus *Cuscuta* is represented in Iran by

eighteen species includes three subgenera and five Sections. The specific differences between them are based on the stems, flowers and fruits.

### Checklist of *Cuscuta* L. species in Iran

Subgen . 1. ***Grammica*** (Loureiro) Engelm.

Sec. *Cleistogrammica* Engelm.

1. *C. australis* R. Br., Prodr. FL. Nov, Holl. 1:491(1810).

Typical characters: Corolla lobes ovate, obtuse or sub-acute, erect to patent.

This species with 2 varieties was reported from Gilan and Khorasan Provinces by Yunker & Reching (1964). However, despite the visited sites, any plant with these characteristics was not found.

2. *C. campestris* Yunck., Mem. Torrey Club 18: 138 (1932).

Typical characters: Corolla lobes triangular, acute, often inflexed. Stigma capitate. Capsule indehiscent.

Distribution in Iran: N, NW, W, C, NE.

**New hosts:** *Cichorium intybus* L., *Cousinia* Cass., *Scariola orientalis* (Boiss.) Sojak., *Polygonum dumosum* Boiss., *Reseda lutea* L., *Solanum nigra* L., *Tamarix* L., *Dendrostellera lessertii* (Wikstr. )Van Tigeh).

Sect. *Eugrammica* Yuncker

3. *C. chinensis* Lam., Encycl. Meth. Bot. 2: 229(1786)

Typical characters: Corolla lobes triangular, acute, often inflexed. Stigma capitate. Capsule dehiscent.

Distribution in Iran: N, NW, C, SE.

**New hosts:** *Artemisia annua* L., *Lactuca serriola* L., *Beta vulgaris* L., *Alhagi mannifera* Desf., *Medicago sativa* L., *Trigonella* L., *Plantago lanceolata* L., *Phyla nodiflora* (L. ) Greene.

Subgen II . ***Monogyna*** (Engelm.) Yunck.

Sect. *Monogyna* Engelm

4. *C. monogyna* Vahl., Symb. Bot. 2: 32 (1791).

Typical characters: Stem thick. Mainly on trees and shrubs rarely on herbaceous hosts. Scale inside the petal almost reaching anther. Style 1 (united).

Distribution in Iran: N, NW, W, C, NE.

**New hosts:** *Echinophora cinerea* (Boiss.) Hedge & Lamond., *Ferulago angulata* (Schlecht.) Boiss., *Convolvulus* L., *Amygdalus scoparia* Spach., *Malus domestica* Borkh., *Citrus* L., *Ulmus* L.

5. *C. lehmanniana* Bunge in A. Lehm., Mem. Sav. Etrang. Petersh. 7: 396 (1851).

- var. *lehmanniana*

Typical characters: Stem thick. Mainly on trees and shrubs rarely on herbaceous hosts. Style1 (united).

Scale inside the petal not reaching anthers (fig. 1.).



Fig. 1. *Cuscuta lehmanniana* Bunge var. *lehmanniana*.

Distribution in Iran: NE.

**New hosts:** *Alhagi mannifera* Desf. ), *Agrimonia eupatoria* L.

### Subgenus III *Cuscuta*

Sect. *Epistigma* Engelm.,

6. *C. haussknechtii* Yunck. Mem. Torrey Club. 18:269(1932).

Typical characters: Calyx truncate at margin of tube, calyx lobes very short, stigmas elongate.

Distribution in Iran: W, C.

**New hosts:** *Salvia multicaulis* Vahl., *Stachys* L., *Alhagi mannifera* Desf., *Onobrychis cornuta* (L.) Desv.

7. *C. kotschyana* Boiss. Diagn. Pl. Or. Nov. 1, 7: 29(1846)

Typical characters: Corolla lobes triangular, acute and elongate. Ovary spherical.

- var. *kotschyana*

Typical characters: Corolla lobes more elongate and sharper than above. Ovary conical.

Distribution in Iran: NW, W, C, NE, E, SE.

**New hosts:** *Scandix aucheri* Boiss., *Achillea* L., *Jurinella* Jaub & Spach., *Arenaria persica* Boiss., *Juniperus excelsa* M. B. ), *Andrachne telephoides* L., *Euphorbia* L., *Oxytropis* DC. ), *Atraphaxis* L.

- var. *caudata* Bornm. & Schwarz.

Typical characters: Calyx with distinct lobes, Calyx lobes triangular.

Distribution in Iran: N, NW, W, C, NE.

8. *C. pedicellata* Ledeb., Fl. Alt. 1: 293(1824).

Typical characters: Flowers small, 2-3 mm long, not papillate, usually 4- merous, clustered in umbelliform cymes.

Distribution in Iran: N, NW, W, C, NE, S, SE.

**New hosts:** *Pycnocycla* Lindl., *Sambucus ebulus* L., *Convolvulus* L., *Vicia erivilia* (L.) Willd., *Galium* L., *Scrophularia* L.

### Sect. *cuscuta*

9. *C. babylonica* Auch. ex Choisy, Mem. Soc. Phys. Geneve 9:270 (1841).

- var. *babylonica*

Typical characters: Corolla lobes ovate- triangular, equaling or shorter than tube, flowers smooth or sparsely papillate.

Distribution in Iran: NW, W, C, NE.

**New hosts:** *Satureja bachtiarica* Bunge., *Prosopis juliflora* (Swartz) DC. ), *Meristotropis xanthioides* Vassilez.

- var. *elegans* Engelm.

Typical characters: Corolla lobes ovate- oblong, longer than tube, flowers densely granular- papillate.

Distribution in Iran: W.

**New hosts:** *Lycopersicum esculentum* Mill., *Peganum harmala* L.

10. *C. europaea* L., Sp. Pl. 124 (1753).

Typical characters: Flowers usually 4- merous, infrequently 5- merous, calyx tubes obtuse.

Distribution in Iran: N, C, SE.

**New host:** *Polygonum* L.

11. *C. epilinum* Weihe., Arch. d. Apothekerver. in nördl. Deutschland 8: 50, 51(1824).

Typical characters: Usually parasite of *Linum*, calyx lobes membranous, shorter than corolla tube.

Distribution in Iran: NW, W.

12. *C. kurdica* Engelm., Trans. Acad. Sci. St. Louis 1:470 (1859)

Typical characters: Flower 2-3 mm long, calyx lobes smooth, corolla lobes often erect.

Distribution in Iran: NW, W, C.

**New hosts:** *Nepeta* L., *Thymus daenensis* Celak., *Astragalus* L., *Acantholimon* Boiss., *Galium* L.

13. *C. palaestina* Boiss., Diagn. Pl. Or. Nov. Ser. 2: 86 (1849).

Typical characters: Flower 1.5 – 2 mm long, calyx lobes smooth, rarely papillate, corolla lobes often inflexed.

Distribution in Iran: N, NW, W, C, S.

**New hosts:** *Ferulago angulata* (Schlecht. ) Boiss., *Scorzonera* L., *Scrophularia* L.

14. *C. epithimum* Murr. in L., Syst. Veget., ed 13, 140 (1774).

-var. *epithimum*

Typical characters: Flowers elongated 2- 3 mm long, apex of calyx and corolla very long and acute, calyx lobes smooth, rarely papillate.

Distribution in Iran: N, NW, W, C, NE, E, S.

**New hosts:** *Centaurea gaubae* (Bornm) Wagenitz., *Cousinia* Cass., *Lacuca* L., *Nikitinia leptoclada* (Bornm. & Sint. Ijijin), *Euphorbia* L., *Ajuga* L., *Perovskia abrotanoids* Karel., *Phlomis aucheri* Boiss., *Ziziphora clinopodioides* Lam., *Astragalus* L., *Acantholimon* Boiss.

-var. *kotschy* (Des Moulins) Engelm.

Typical characters: Flowers shorter than above, apex of calyx and corolla shorter than above, calyx lobes papillate.

Distribution in Iran: N, NW, W, C, NE, E, S.

**New hosts:** *Pistacia atlantica* Desf., *Amygdalus scoparia* Spach.

15. *C. brevistyla* A. C. H. Braun ex A. Rich., Tent. Abyss. 2: 79 (1851).

Typical characters: Stigma and style together smaller than ovary, calyx lobes thickened and fleshy, as long as corolla tube.

Distribution in Iran: N, NW, W, C, NE, S.

**New hosts:** *Artemisia sieberi* Besser., *Centaurea* L., *Cousinia multiloba* DC., *Rhabdosciadium aucheri* Boiss., *Tanacetum polycephalum* Schultz- Bip., *Arenaria persica* Boiss., *Nepeta* L., *Phlomis cancellata* Bunge., *Stachys trinerris* Aitch. & Hemsl., *Thymus* L., *Ziziphora clinopodioides* Lam., *Asphodelus tenuifolius* Cav., *Acantholimon* Boiss., *Pteropyrum aucheri* Jaub. & Spach.

16. *C. balansae* Boiss. & Reut. ex Yunek., Gen. *Cuscuta*, Mem. Bot. Club. 18, 2: 290 (1932) Torr.

Typical characters: Flowers 4- merous, calyx lobes papillate, acute.

Distribution in Iran: NW, W, C, NE, S.

**New hosts:** *Cleome brachycarpa* Vahl ex DC., *Taverniera glabra* Boiss., *Calligonum* L., *Scrophularia* L.

17. *C. planiflora* Ten., Fl. Napolit. 3: 250 (1824. 1829).

- var. *planiflora*

Typical characters: Flowers small, 1.5 – 2 mm long, corolla and calyx lobes longer than tubes, outer surface of calyx smooth.

Distribution in Iran: C, S, SE.

**New hosts:** *Bupleurum* L., *Artemisia scoparia* Waldst. & Kit., *Centaurea intricata* Boiss., *Platycheate glaucescens* (Boiss.) Boiss., *Platycheate mucronifolia* (Boiss.) Boiss., *Senecio vernalis* Waldest. & Kit., *Erysimum oleifolium* J. Gay., *Gymnocarpus decander* Forssk., *Helianthemum lipii* (L.) Pers., *Convolvulus* L., *Andrachne telephoides* L., *Salvia* L., *Ziziphora* L., *Asphodelus tenuifolius* Cav., *Boerhavia elegans* Choisy., *Papaver* L., *Astragalus* L., *Lotononis platycarpus* (DC.) Ecki. & Zeyh., *Medicago polymorpha* L., *Scorpiurus muricatus* L., *Taverniera glabra* Boiss., *Acanthophyllum* Boiss., *Ziziphus spinachristii* (L.) Willd.

-var. *sicula* (Tin. ex Engelm.) Trab.

Typical characters: Flowers large. Calyx lobes ovate-abuts, rounded at apex, corolla and calyx lobes as long as tubes, Outer surface of calyx smooth.

Distribution in Iran: N, NW, W, C.

**New hosts:** *Rhabdosciadium aucheri* Boiss., *Artemisia* L., *Marrubium* L., *Stachys* L., *Thymus* L., *Ziziphora clinopodioides* Lam.

-var. *papillosa* Engelm.

Typical characters: Flowers large. Calyx lobes as long as tube, elongate, acute, acuminate, very turgid at apex, outer surface of calyx papillate.

Distribution in Iran: W.

**New hosts:** *Helianthemum lippii* (L.) Pers.

18. *C. approximata* Babingt., Ann. et Mag. Nat. Hist. 13: 253 (1844).

- var. *approximate*

Typical characters: Calyx and corolla lobes triangular to ovate, acute pointed apex, calyx shining and finely netted with prominent veins when dry. Flowers and inflorescences large.

Distribution in Iran: N, NW, W, C, NE, E, S, SE.

**New hosts:** *Bupleurum* L., *Centaurea* L., *Helichrysum* Mill., *Capparis* L., *Sambucus ebulus* L., *Hypericum scabrum* L., *Ziziphora clinopodioides* Lam., *Asphodelus tenuifolius* Cav., *Daphne mucronata* Royle., *Peganum harmala* L.

-var. *urceolata* (Kuntze) Yunck.

Typical characters: Calyx lobes very turgid at apex, wide of calyx lobes longer than its length, shining and finely netted with prominent veins when dry

Distribution in Iran: N, NW, W, C, NE, E.

**New hosts:** *Achillea* L., *Artemisia* L., *Scariola orientalis* (Boiss.) Sojak., *Hypericum* L., *Perovskia atriplicifolia* Benth., *Phlomis olivieri* Benth.

-var. *shiraziana* (Boiss.) Yunck.

Typical characters: Flowers and inflorescences small. Calyx and corolla lobes ovate, acute, calyx lobes slightly turgid at apex, shining and finely netted with prominent veins when dry.

Distribution in Iran: W, C.

-var. *leucosphaera* Boiss & Heldr. ex Yunk.

Typical characters: Calyx lobes very turgid at apex, apex of calyx and corolla lobes very long, calyx lobes longer than the broad, shining and finely netted with prominent veins when dry.

This species by Yunker & Rechinger (1964) reported from Fars Province. But it was not found in the area.

## KEY TO THE SPECIES

1. Style 1 (united), stem thick, parasites of trees and shrubs 2
- Style 2, stem thin to medium, parasites of dwarf shrubs and herbs 3
- 2- Scale inside the petal not reaching anthers 5. *C. lehmanniana*
- Scale inside the petal almost reaching anthers 4. *C. monogyna*
- 3- Stigma capitate 4
- Stigma elongate 6
- 4- Capsule indehiscent 5
- Capsule dehiscent 3. *C. chinensis*
- 5- Corolla lobes ovate or orbicular, obtuse or sub-acute, often erect to patent 1. *C. australis*

- Corolla lobes triangular, acute, often inflexed  
2. *C. campestris* 7
- 6- Capsule dehiscent irregularly, styles reduced or short and thick 7
- Capsule dehiscent regularly, styles long and thin 9
- 7- Flowers 4 mm long, 5 merous, papillate, sessile or shortly pedicellate 8
- Flower 2- 3 mm long, not papillate, usually 4 merous, pedicellate, clustered in umbelliform cymes  
8. *C. pedicellata*
- 8- Calyx truncate at margin of tube, calyx lobes very short, stigmas elongate 6. *C. haussknechtii*
- Calyx not truncate, with distinct and triangular lobes, stigmas shorter than above 7. *C. kotschyana*
- 9- Flowers 5 merous, pedicellate in umbellate cymes, calyx truncate at margin of tube, with reduced lobes  
9. *C. babylonica*
- Flowers 4- 5 merous, mostly sessile or shortly pedicellate, cymes not as above, calyx with distinct lobes 10
- 10- Flowers usually 4 merous, infrequently 5 merous 11
- Flowers 5 merous, infrequently 4 merous 14
- 11- Calyx lobes obtuse 10. *C. europaea*
- Calyx lobes acute 12
- 12- Calyx lobes papillate, acuminate 16. *C. balansae*
- Calyx lobes smooth, rarely papillate 13
- 13- Corolla lobes often erect, flowers 2-3 mm long 12. *C. kurdica*
- Corolla lobes often inflexed, flowers 1. 5- 2 mm long  
13. *C. palaestina*
- 14- Stigma and style together smaller than ovary 15
- Stigma and style together longer than ovary 16
- 15- Calyx lobes membranous, shorter than corolla tube, usually parasite of *Linum* 11. *C. epilinum*
- Calyx lobes thickened and fleshy, as long as corolla tube 15. *C. brevistyla*
- 16- Calyx golden- yellow, shiny and finely reticulate, calyx lobes turgid at apex 18. *C. approximata*
- Calyx golden- yellow, shiny, not reticulate, calyx lobes not as above 17
- 17- Calyx lobes obtuse, fleshy, longer than calyx tube  
17. *C. planiflora*
- Calyx lobes triangular, acute, membranous, as long as calyx tube 14. *C. epithymum*

## DISCUSSION

Based on Flora Iranica, there are 17 species of *Cuscuta* in Iran ((Yunker & Rechinger 1964). After the draft of Flora Iranica, *Cuscuta* has been studied by Iranshahr. In his study number of *Cuscuta* taxa increasing to 18, among them *C. campestris* Yunk reported as a new record to the flora of Iran. Also a new gathering of *C. haussknechtii* Yunk., previously only known from the type locality, was reported.

(Iranshahr, 1983).

In this work 17 species of *Cuscuta* were studied. *C. australis* R. Br., reported by Yunker & Rechinger (1964) from Gilan and Khorasan Provinces was not found in neither of localities. Nevertheless we included it in the list of species of Iran.

Phytogeographically, the majority of the species of *Cuscuta* are found in Irano-Turanian region, a few species are found in Saharo- Sindian and Euro-Siberian regions. Some species of this genus have a limited distribution in Iran and grow individually or in the small isolated patches. These species are usually very rare or can be endangered, but some species, have widespread distribution in the country.

In this study about 266 plants which serve as hosts for *Cuscuta* were identified, among them 134 new hosts are reported. The results showed that *C. campestris* with 43 hosts, *C. planiflora* with 32 hosts, *C. epithymum* with 28 hosts, *C. approximata* with 27 hosts, *C. brevistyla* with 26 hosts and *C. monogyna* with 23 hosts have the greatest number.

## ACKNOWLEDGEMENT

The authors are grateful to Mr. M. R. Joharchi for his guiding and Mr A. Hatami for identification of many host plants.

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