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Research Article

Notes on Taxonomic Situation of *Calenduleae Tribe* in Iran

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Abstract

The *Calenduleae* tribe belongs to *Asteraceae* family, with ca 12 genera and 120 species are distributed in the Mediterranean, Irano-Turanian and Saharo- Arabian regions of world. According to flora Iranica *Calendula* L. and *Dipterocome* Fisch. & C. A. Mey. are 2 genera of *Calenduleae* in different regions of Iran. *Calendula* species generally grows in a variety of sites such as mountains, dry stony slopes in foothills, field edges, margins of gardens and road sides, also *Dipterocome* species generally grows in dry and saline areas and sandy deserts. It distributes in north west, centre and north east of Iran and also in Caucasus, Afghanistan, Iraq, Asia (central part), Africa and Syria. In this research based on the literature, available herbarium materials and field observation, this tribe has been revised. A revision of this tribe in Iran including: key, literature, synonymes and locality lists is presented; meanwhile a list of genera with the total number of the species for each genus recognized in Iran is added.

Keywords: *Calendula, Dipterocome*, Iran, taxonomic, notes.
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Introduction

Iran in terms of topography, climate, vegetation and geographical features is one of the most important and unique countries in the Middle East. According to a recent study (Mozaffarian 2007), the flora of Iran includes 8000 species belonging to 1450 genera and 150 families. These families include 124 dicotyledons, 22 monocoty-ledons and 4 gymnosperms.

The genus *Dipterocome* was firstly described by Fischer and (Meyer 1835) from Persia, Azerbeijan. Then it was described as Jaubertia by (Spach 1849); the same genus was treated by (Boissier 1849) in his Diagnoses plantarum orientalium novarum as new species *Koelpinia sessilis*. (Boissier 1875) in Flora Orientalis retreated *Koelpinia sessilis* equivalent to *Dipterocome pusilla*. (Rechinger 1989) in Flora Iranica gives the distribution of this genus as Syria, Armenia, Iraq, Persia and Afghanistan. (Post 1933) in Flora of Syria, Palestine and Sinai gave the distribution of this genus.

The genus *Calendula* includes about fifteen species in the Mediterranean, Irano-Turanian and Saharo- Arabian regions. According to flora the Iranica (Rechinger 1989) there are six species of *Calendula* in different regions of Iran and among them *Calendula aurantiaca* is only endemic.

The term calends refers to the plant's tendency to bloom in accordance with the calendar every month in some regions, or during the new moon. It is one of the easiest

plants to grow and one that provides great joy, bringing sunshine to the heart and mind.

In Europe, the leaves are considered resolvent and diaphoretic while the flowers are used as a stimulant, antispasmodic and emmenagogue (Lt. Colonel Kirtikar and Major Basu 1993). In England, the decoction of the flowers was used as a posset drink for the treatment of measles and smallpox, and the fresh juice as a remedy for jaundice, costiveness (constipation) and suppression of menstrual flow (Khare 2004). In India, the florets are used in ointments for treating wounds, herpes, ulcers, frostbite, skin damage, scars and blood purification. The leaves, in infusion, are used for treating varicose veins externally (Khare 2004; Lt. Colonel Kirtikar and Major Basu 1993). *Calendula* was used in German folk medicine as a remedy for wounds and glandular problems. Used historically as 'poor man's saffron,' calendula adds both color and flavor to some foods, typically rice and chowders. It was prevalent in European marketplaces during the Middle Ages and was a common soup-starter.

Over thirty chemical components have been identified in *Calendula*. These constituents include the flavonol glycosides isoquercitrin, narcissin, neohesperidoside, terpenoids, lupeol, longispinogenin, sterols, volatile oils, arvoside A, carotenoid pigments, calendulin, and polysaccharides. The plant contains a number of pentacylic alcohols including faradol, brein, arnidiol, and caldenduladiol. Rutin, quercitin, and isorhamnetin are among the flavonoids in the plant. *Calendula* has been shown to be an effective bacteriostatic, anti-inflammatory, antipyretic, antifungal, and vulnerary herb. Clinical trials have shown that *Calendula* increases cell proliferation and encourages the granulation process of wound healing. (Bradley 2006; Hoffmann 2003).

While observing and revising the plant collection of Iran, It was an opportunity to accomplish the identification of non- identified existing specimens in herbaria and to arrange a new key to the species of *Calenduleae* for flora of Iran.

Materials and methods

All specimens existed in different herbaria of Iran: TARI, IRAN, FUMH, Herbarium of Research Center of Agricultural and Natural Resources of Fars, were revised. Stereomicroscopy was used for observation morphological and micromorphological characters in parts of capitula and achenes. The aim of this paper is to revise the taxonomy of the *Caleduleae* tribe in Iran, to present an identification key to the known taxa to Iran, and to give the sequence of the species.

Results

The *Calenduleae* tribe is represented in Iran by 10 species grouped into 2 genera: *Calendula* and *Dipterocome*. The generic differences between them are based on the leaves and achenes. In this paper the checklists of accepted genera and species have been prepared and new localities added to these genera locating a new record of *Calendula* (Jafar and Joharchi 2009) for Iran. *Calendula* species generally grow in a variety of sites such as mountains, dry stony slopes in foothills, at the edges of fields, the margins of gardens and road sides. The genus is distributed in most part of Iran. It is also found in Tunisia, Egypt, Algeria, Libya, Palestine, Pakistan, Iraq, Turkmenistan, Europe, Asia (south western part), northern Africa, Turkey, Morocco and Spain. The *Dipterocome* species generally grows in dry and saline areas and sandy deserts. It is found in the north west, centre and north east of Iran and also in the Caucasus, Afghanistan, Iraq, Asia (central part), Africa and Syria.

Checklist of *Calendula* L. species

1. *C. officinalis* L., Sp. Pl. 921 (1753).

Type: Described from Europe

Typical characters: Annual plants, cultivated everywhere as one of the most popular ornamental plants.

2. *C. aurantiaca* Kotschy ex Boiss., Pl. Persiae austral. ed. Hohenacker no. 295 (11. 1845).

Syn: *C. sinuata* Boiss. & Gaill., Diagn. Pl. Or, Nov. Ser 2.6: 109 (1859); *C. sinuata* var. *aurantiaca* Boiss. F1. Or. 3: 416 (1875).

Type: Described from Iran (Shiraz).

Some studied specimens: Khorasan: 7 km

from Mashhad to Neyshabure, Emamzadeh Hashem road, in river, Zokaee 1089 (FUMH).

Typical characters: Perennial wetland plant (Fig. 1)

Distribution in Iran: C, NE.

Figure 1. a b. *Calendula aurantiaca*

and Aboohamzeh, 38674 (TARI).- Fars: Fasa, 55 km Jahrom road, 1100 m, Foroughi, 1116TARI.- Busher: versus Borazjan, 43 km near Busher, Ab-e- Tavil, Termeh and Moussavi, 7690-IRAN; Ahram, chah-e- Talkh, Iranshahr and Terme 7710-IRAN.- Khorasan: NW Tabas, Pirhajat, 1045 m, Ayatollahi and Joharchi 10721 (FUMH).

Typical characters: Annual plant, disk florets concolorous, (yellow-orange), beaked achenes absent, fruiting head containing a few achenes nearly smooth at beak and broadly 3-winged. (Fig. 2)

Distribution in Iran: W, C, E, S.

4. *C. arvensis* L., Sp. Pl. ed. 2: 1303 (1762-63).

Type: Described from Europe

Some studied specimens: Golestan: Kalale towards Morave tappe, 35 km before Morave Tappe, 550 m, Javadi and Ghanbari 31760-IRAN; Kalale towards Morave tappe, Gogjeh, 250 m, Javadi and Ghanbari 31765-IRAN; Kalale towards Morave tappe, Ghareh-ghouvakh, 400-600 m, Mussavi and Tehrani 7707-IRAN.- Mazandaran: Kelard, Haraz road, 430 m, Foroughi 4354 (TARI); Kelard, Haraz road, 460m, Foroughi 1382 (TARI).- Fars:

3. *C. tripterocarpa* Rupr, Bull. Phys.-Math. Acad. St. Petersb. 14: 231 (1856).

Type: Described from Iraq.

Some studied specimens: Kohkiloyeh va Boirahmad: near Dehdasht, 500 m, Assadi

Figure 2. *Calendula tripterocarpa*

10 km to Firouzabad on the road from Shiraz, 1500-2100 m, Assadi and Sardabi 41395 (TARI); 15 km from Firouzabad to Ghir, 1500-2100 m, Assadi and Sardabi 41478 (TARI).- Khuzestan: NE of Dezful, Sardasht to Bolhasan, 600 m, Jamzad and Morid 79200 (TARI).- Khorasan: NW of Bojnord, Emam darreh, 1000 m, Joharchii and Zangooei 33 (FUMH).

Typical characters: When present, small annual plant, fruiting head with or without

beaked achenes.

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

5. *C. karakalensis* Vass., Fl .USSR. vol. 26: 895 (1961).

Type: Described from Kara-Kala.

Studied specimens: Khorasan: NW of Bojnord, 4 km Shishkhan to Khorramdeh, 548 m, Memariani and Zangooei 38827 (FUMH).

Typical characters: Florets yellow. External achenes sickle- shaped, 10-15 mm long, along dorsum with longitudinal groups of prickles- bristles, formed by two lateral bristly-toothed wings; on ventral side achenes winged and irregularly toothed; middle achenes boat-shaped (with membranous wings convoluted inside), with fine teeth- prickles along dorsum, half as large as the external achenes; internal achenes ring- shaped, wingless, prickly- toothed along dorsum. (Figs. 3, 4)

Distribution in Iran: NE.

6. *C. persica* C.A. Mey.,Verz. Pfl. Cauc. 72 (1831).

Type: Described from Baku.

Some studied specimens: Golestan: Moraveh Tappeh, 300 m, Hewer 3625 (TARI); 22 km to moraveh Tappeh, on the road from Inche Boroon (CG3), 180 m, Assadi and Maasoumi 55433 (TARI); Gonbade- Kavus, Sharif 7700- IRAN.- Mazandaran: Rout Amol, Esfandiari7706 – IRAN; Chalous towards Marzanabad, 17 km Chalous, 300-400 m, Termeh and Matine 7686- IRAN.- Gilan: Roud Lar, Barkhordari 7672-IRAN.- Azarbaygan: Arasbaran protected area, Ghaghalu, 660 m, Assadi and Vosughi 24551 (TARI); Arasbaran protected area between Asheghlou and Kalaseh, 400m, Hamzeh and Asri 81380 (TARI).- Lorestan: Khoranabad, Tange malavi, 1700 m, Foroughi 3025 (TARI).- Kohkiluyeh: Tol cheghah towards Basht, 10 km to Basht, 900-1000m, Moussavi, Delghandi and Fatehi 7688-Iran.- Fars: Shiraz, 1500 m. Esfandiari 7705-IRAN; Shiraz toward Jahrom, 85 km Shiraz, 1300-1450 m, Delghandi and Daneshpajooh 7696- Iran; Farashband, Mirzayan 7702- IRAN; Firozabad, Ahram, Kashkouli 7683-IRAN; Kazeron, Chenarshahijan, 920m, Foroughi 4229 (TARI); 34 km from Nurabad to Dogonbadan (WP1), 700 m, Assadi and Aboohamzeh 38308 (TARI); Kazeron, Chenarshahijan, 920 m, Foroughi 4229 (TARI); 34 km from Nurabad to Dogonbadan (WP1), 700 m, Assadi and Aboohamzeh 38464 (TARI).- Hormozgan: 17 km from Kahgum to Darab, 750 m, Mozaffarian 52236 (TARI); 40 km from Hajiabad to Sirjan,

Figure 3. *Calendula karakalensis*

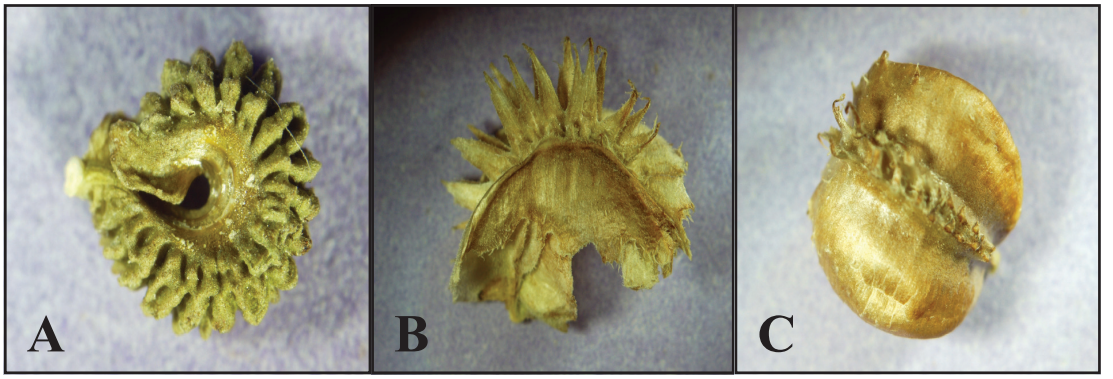

Figure 4. *Calendula karakalensis:* A: external achene, B: middle achene, C: interal achene

Tashkuyeh village, 550 m, Mozaffarian 49516 (TARI).- Bushehr: Kharkau Island, Shirzadian and Karavar 31276- IRAN.- Khouzestan: Hendijan, 20 m, Iranshahr and Terneh 7674-IRAN; Ahvaz towards Khoramshahr, 40 km Ahvaz, Iranshahr and Termeh 7676-IRAN; Ahvaz, Albaji, 40 m, Mozaffarian, 62260 TARI, Shush, 120 m Mozaffarian 58434 (TARI).- Baluchestan: Bazman, 7 km Dalkan road, 980m, Foroughi, 10635 (TARI).- Tehran: Qazvin- Rasht road, 13 km S of Loushan, 700 m, Wendelbo and Maasoumi 19068 (TARI).

Typical characters: Annual plant, all achenes ring- shaped- curved. (Fig. 5)

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

7. *C. sancta* L., Sp. Pl. ed. 2: 1304 (1762-63).

Type: Described from Palestine.

Some studied specimens: Kermanshah: Mehran, Behbudi 7703-IRAN. - Fars: Firozabad, Ghir Karzin, 950 m, Hatami and Khalili 3786; Kazerun road towards Borazjan, 300m, Hatami &Abdollahipanah 11095.- Hormozgan: Bastak, Harang, 250 m, Mozaffarian 49768 (TARI); 25 km from Minab to Senderk, 110 m, Mozaffarian, Rastegar and Banihashemi 38103 (TARI).- Bushehr: 5 km S of Bandar –e Bushehr, 0-10 m, Runemark and Mozaffarian 26950-IRAN.- Khuzestan: Ramhormoz, 40 km Iseh road, 750m, Riazi 9443-IRAN, 10 km from Ahvaz to Susangerd, 20 m Mozaffarian 53435 (TARI); Shushtar, 37 km Masjed Solayman road, 290 m, Foroughi 3132 (TARI).

Typical characters: Annual plant, Plant branched from base, florets bicolor, disk florets (Yellow– maroon), beak smaller than 15 mm. (Fig. 6)

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

8. *C. alata* Rech. f., Fl. Iranica. 164: 104 (1989).

Type: Described from Iraq.

Some studied specimens: Golestan: Center Gorgan to Pahlavi dej, Ghorban abad, Ridel and Ershad 7655-IRAN.-Kermanshah: Ghasre- shirin, Vakilian 7663-IRAN.- Lorestan Khorramabad, 1400 m, Rayhani 25707-IRAN; Pol-e Dokhtar, 110 km from Khorram abad on road to Andimeshk, 1000 m, Wendelbo and Assadi 16606 (TARI).- Kohkiloyeh va Boirahmad: 5 km from Shamsabad to Basht (VP3), 700 m, Assadi and Aboohamzeh 38619 (TARI).- Fars: Farashband, kuh-e Pir, near Konar malek, 800-1300 m, Iranshahr and Termeh 7669- IRAN; Lar, Mojib 7661-IRAN; Shiraz, Bamu park, 1900m, Dehbozorgi 32730-IRAN; 6 km NW of Kazerun, 870m, Runemark and Mozaffarian 26730 (TARI).- Hormozgan: Center Bandar-e Khamir et Bandar-e Lengeh, near Dezhgan, Iranshahr and Termeh 7658-IRAN; Khouzestan, Sabzevari 7664-IRAN.- Bushehr: Center Kangan et Khormuj, 12 km N Abdan, Iranshahr and Termeh 7659-IRAN;

Figure 5. *Calendula persica*

Figure 6. *Calendula sancta*

24 km E Khormuj Iranshahr and Termeh 7667-IRAN; Bandar-e Taheri to Gavbandi, Pag 7662-IRAN; Negin Island, Sangari, Ghayurfar and Mofidi 33466-IRAN; 30 km from Bandar-e Bushehr on road to Ameri, 20 m, Runemark and Mozaffarian 26990 (TARI).- Khuzestan: Haftgel to Masjed-Soleyman, 20-30 km Simeyli, 400 m, Iranshahr and Termeh 7656-IRAN.- Kerman: Bashagerd, Sinderk, 190-260m, Iranshahr and Moussavi 7665-IRAN.- Baluchestan: Saravan, Zangian, Sakhohouri 7666-IRAN; Khash, Karevandar, Mirzayan 7668-IRAN.

Typical characters: Annual plant, Fruiting head containing outer achenes, 2- winged with laciniate margine. (Fig. 7)

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

Figure 7. *Calendula alata*

9. *C. palestina* Boiss, Diagn. Pl. Or. Nov. Ser. 1. 10: 83 (1849).

Type: Described from Palestine.

Some studied specimens: Golestan: Kalale, Morave Tappe, 35 km before Morave Tappe, 550 m, Javadi and Ghanbari 31759- IRAN.- Kermanshah: Mehran, Halat, 100 m, Behbudii 7671-IRAN.- Kohkiloyeh va Boirahmad: Dogonbadan near Abrigoon (VP3), 800 m, Assadi and Aboohamzeh 38558 (TARI).

Typical characters: Annual plant, Plant somewhat branched from base, florets yellow, very rarely disk florets maroon. Beak longer than 15-20 mm

Distribution in Iran: N, NW, W.

Key to the accepted species of *Calendula*

1. Head large (up to 4-8 cm wide), cultivated plant ..... 1. *C. officinalis* L.
- Head smaller, plant uncultivated 2
2. Perennial plant .... 2. *C. aurantiaca* Kotschy ex Boiss.
- Annual plant 3
3. Fruiting head without beaked achenes 4
- Fruiting head with beaked achenes 5
4. Achenes homomorphic .... 6. *C. persica* C.A. Mey
- Achenes heteromorphic 7
5. Some outer achenes have short incurved beak ..... 4. *C. arvensis* L.
- Some outer achenes have thick erect beak ... 6
6- Plant somewhat branched from base, florets yellow, very rarely disk florets maroon. Beak longer than 15-20 mm .... 9. *C. palaestina* Boiss.
- Plant branched from base, florets bicolor, disk florets (Yellow– maroon), beak smaller than 15 mm ..... 7. *C.sancta* L.
7. External achenes sickle shape, large, formed by 2 lateral bristly-toothed wings .... 5. *C. karakalensis* Vass.
- External achenes differ from above 8
8. Fruiting head containing a few outer achenes, nearly smooth at back and broadly 3- winged, disk florets concolorous, Yellow ..... 3. *C. tripterocarpa* Rupr.
- Fruiting head containing outer achenes, 2- winged with laciniate margine .... 8. *C. alata* Rech. f

Checklist of *Dipterocome* Fisch. & C. A. Mey. Species

1- *D. pusilla* Fisch. and C. A. Mey., Ind. Sem. Hort. Petrop. 1 (1835) 26.

Type: Described from Iran.

Some studied specimens: Fars: Drab, 800 m, Tayebi 116 - Khorasan: Kashmar, Khalilabad to Kavir-e-namk, (10 km Jafar abad), 800 m, Delghandi, Karavar and Tehrani 9699-IRAN; East of Tobat-e Jam, 890 m, Joharchi and Zangooee 34422 (FUMH);Torbat-e Heydarieh, 860 m, Ayatollahi and Zangooee 14095(FUMH).- Tehran: ca 12 km from

Eivanaky to Garmsar, 1060 m, Mozaffarian 59117 (TARI).

Typical characters: Annual plant, leaves sessile, florets greenish, Achenes star-like, not deciduous, prickly with two hornets above, external hornet as long as the achene (Fig. 8).

Distribution in Iran: NW, C, NE.

Figure 8. *Dipterocome pusilla*

Discussion

Phytogeographically, the majority of the species of *Calenduleae* tribe are found in Irano-Turanian region, a few species are found in Saharo- Sindian and Euro- Siberian regions. Some species of this tribe 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.

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