

## A TAXONOMIC REVISION OF THE GENUS TRIFOLIUM L. SECT. FRAGIFERA KOCH (FABACEAE) IN IRAN

M. Haerinasab & M. R. Rahiminejad

Received 11.08.2011. Accepted for publication 10.03 2012.

Haerinasab, M. & Rahiminejad, M. R. 2012 06 30: A taxonomic revision of the genus *Trifolium* L. sect. *Fragifera* Koch (*Fabaceae*) in Iran. –*Iran. J. Bot.* 18 (1): 22-30. Tehran.

We reviewed the taxonomic status of the Iranian material of *Trifolium* sect. *Fragifera* (*Vesicaria*). A critical study of 156 accessions collected specifically for this study and additional 160 herbarium specimens led to the discovery of one new variety, *T. tumens* Steven ex M. Bieb. var. *caespitosum* Haerinasab and reporting two new records, *T. tomentosum* L. var. *chthonocephalum* Bornm. and *T. clusii* Godr. & Gren. var. *gossypinum* Zohary. In addition, six synonymies are made: *T. fragiferum* L. var. *pulchellum* Lange as a synonym of *T. fragiferum*, *T. tumens* var. *talyschense* (Khalilov) Zoh. as a synonym of *T. tumens* var. *tumens*, *T. physodes* Stev. ex M. B. var. *psilocalyx* Boiss. as a synonym of *T. physodes*, *T. resupinatum* L. var. *microcephalum* Zoh. as a synonym of *T. resupinatum* var. *resupinatum*, *T. bullatum* Boiss. & Hausskn. ex Boiss. var. *macrosphaerum* Zoh. as a synonym of *T. bullatum* and *T. tomentosum* L. var. *curvisepalum* (Täckh.) Thieb. as a synonym of *T. tomentosum* var. *tomentosum*. Furthermore, we made some nomenclatural corrections for the Iranian material of the genus *Trifolium* sect. *Fragifera*. A taxonomic key to the *Trifolium* taxa sect. *Fragifera* was constructed and presented here.

Maryam Haerinasab (correspondence, [m.haerinasab@gmail.com](mailto:m.haerinasab@gmail.com)) and Mohammad Reza Rahiminejad, Department of biology, University of Isfahan, Isfahan, Iran.

Keywords. *Trifolium*, *Fragifera*, *Fabaceae*, taxonomy, revision, Iran.

بازنگری تاکسونومی بخش *Fragifera* (*Vesicaria*) از جنس *Trifolium* از تیره بقولات در ایران

مریم حائری نسب، دانشجوی دکتری گروه زیست‌شناسی دانشگاه اصفهان.

محمد رضا رحیمی نژاد، استاد گروه زیست‌شناسی دانشگاه اصفهان.

در این پژوهش، بخش *Fragifera* Koch (*Vesicaria* Crantz) از جنس *Trifolium* L. در ایران مورد بازنگری تاکسونومی قرار گرفته است. مطالعه ۱۵۶ نمونه جمعیتی جمع‌آوری شده جهت این پژوهش و ۱۶۰ نمونه هرباریومی دیگر منجر به کشف یک واریته جدید، *T. tomentosum* var. *chthonocephalum* Bornm. و دو گزارش جدید برای فلور ایران، *T. tumens* Steven ex M. Bieb. var. *caespitosum* Haerinasab و *T. clusii* Godr. & Gren. var. *gossypinum* Zoh. گردید. همچنین شش مترادف سازی به شرح ذیل ایجاد شد: *T. fragiferum* L. var. *pulchellum* Lange به عنوان مترادف *T. fragiferum* L. var. *pulchellum* Lange، *T. tumens* var. *talyschense* (Khalilov) Zoh. مترادف *T. tumens* var. *tumens*، *T. physodes* Stev. ex M. B. var. *psilocalyx* Boiss. مترادف *T. physodes*، *T. resupinatum* L. var. *microcephalum* Zoh. مترادف *T. resupinatum* var. *resupinatum*، *T. bullatum* Boiss. & Hausskn. ex Boiss. var. *macrosphaerum* Zoh. مترادف *T. bullatum* و *T. tomentosum* L. var. *curvisepalum* (Täckh.) Thieb. مترادف *T. tomentosum* var. *tomentosum*، *T. tomentosum* var. *tomentosum* مترادف *T. tomentosum* var. *tomentosum* قرار داده شدند. علاوه بر این، برخی اصلاحات نام‌گذاری در مورد این بخش و تاکسون‌های موجود در آن اعمال گردید. یک کلید شناسایی برای همه تاکسون‌های متعلق به این بخش در ایران تهیه و در اینجا ارائه می‌گردد.

### INTRODUCTION

Crantz (1769) established the monotypic sect. *Vesicaria* (*T. fragiferum* L.), a name that was first mentioned by Linnaeus (1753) to designate a group of

three *Trifolium* species possessing an asymmetrical vesicular fruiting calyx (*T. fragiferum*, *T. resupinatum* L. and *T. tomentosum* L.) and one species with symmetrical fruiting calyx (*T. spumosum* L.). Seringe

(1825) introduced sect. *Vesicastrum* having ten species including the above group of the three Linnaean's. Koch (1835) in his account for the *Florae Germanicae et Helvaticae* included the three above mentioned species in sect. *Fragifera*. Zohary and Heller (1984) recognized sect. *Vesicaria* as the most "natural group" of the genus *Trifolium* based on its unique and distinctive matured asymmetrical vesicular 2-lipped calyx including the three mentioned species. Zohary (1972) and Zohary and Heller (1984) took this section specific calyx features as evidence in favor of the monophyly of sect. *Vesicaria*. Zohary (1970) in his account for the genus *Trifolium* in Flora of Turkey recognized sect. *Fragifera*, while Zohary and Heller (1970) included the same species in sect. *Vesicaria*. In his account for the Flora Iranica area, Heller (1984) recognized seven species and fifteen varieties in sect. *Vesicaria*, from which fourteen occur in Iran. As the literature review show the boundaries of sect. *Fragifera* were the matter of controversy both taxonomically and nomenclaturally (Crantz 1769, Seringe 1825, Presl 1831, Koch 1836, Godron 1848, Hossain 1961, Ponert 1973, Zohary and Heller 1970 & 1984).

This study aimed to evaluate and review the Iranian material of sect. *Fragifera* (*Vesicaria*) both in taxonomical and nomenclatural point of view. In this research a synopsis key of the distinct taxa with a short explanation and the short diagnosis for the new taxa are provided and given.

## MATERIALS STUDIED

We studied 156 accessions from the distributional range of sect. *Fragifera* collected all around Iran. All the vouchers and type specimens are deposited in the herbarium of the University of Isfahan (abbreviated as HUI in this paper). Furthermore, we examined 160 herbarium sheets from HUI, TARI (Research Institute of Forests and Rangelands), IRAN (Iranian Research Institute of Plant Protection Herbarium), Central Herbarium of the Science & Research branch of Islamic Azad University (IAUH) and some digital herbarium such as E (Royal Botanic Garden Edinburgh), C (Museum Botanicum Hauniense, University of Copenhagen) and BM (British Natural History Museum).

## RESULTS AND DISCUSSION

Based on the observations of the present study the following characters are of taxonomic values: plant habit and taxonomic characters including: height; length of petioles and peduncles; presence/absence of involucre of inflorescence; shape of inflorescence; length of pedicels; type and density of indumentum of

the calyx; length and shape of the upper calyx teeth; presence/absence of hairs on the peduncles, pedicels and ovaries.

Based on our observations and literature review, this study resulted in one new variety, two new records, six new synonymies and some nomenclatural corrections for the Iranian material of the genus *Trifolium* sect. *Fragifera*.

## Description of Sect. *Fragifera* Koch

Annual or perennial plants. Heads pedunculate or sessile, the fruiting ones globular or ovoid or stellate. Flowers many, sessile or pedicellate, bracteolate, sometimes lower bracts forming an involucre. Calyx 2-lipped; upper lip 2-toothed; tube growing in fruit into an inflated, vesicular, netted-nerved body with teeth becoming setaceous; lower lip 3-toothed, unchanged in fruit; throat of fruiting calyx narrowed or closed. Corolla resupinate or not, marcescent or deciduous; standard free or more or less connate with the other petals. Ovary elliptical or ovate with straight or geniculate style. Pod 1-2-seeded, enclosed in the scarious or membranous, inflated, hairy or glabrous calyx tube that mostly functions as a dispersal unit.

## Treatments

Based on the results of this study we concluded that *Trifolium* sect. *Fragifera* occurs in Iran with a total of seven *Trifolium* species and eight varieties; a diagnostic key to these taxa is constructed and presented below; numeric letters in the brackets underneath the names in this key are corresponding to the localities shown in Fig. 1.

## Identification Key to the species of *Trifolium* sect. *Fragifera* in Iran

1. Perennials with creeping or caespitose stems. Petals not resupinate 2
1. Annuals. Petals resupinate 4
2. Heads distinctly involucre by relatively larger bracts of lower flowers **1. T. fragiferum** (A2, B2, B3, C2)
2. Heads not at all involucre 3
3. Flowering heads 1-2 cm. Lower calyx teeth dentate. Capitula loose, hemispherical to globose. Leaflets obovate with cuneate base **2. T. tumens**
  - a. Plant caespitose. Leaves mainly at base of stem. Stem leaves, if present, sub sessile, minute; leaflets 5 mm broad or less var. **caespitosum** (B2, B3)
  - b. Plant not caespitose. Leaves all along the stem, petiolate; leaflets about 1 cm or more broad var. **tumens** (A2, B2, B3, B4)

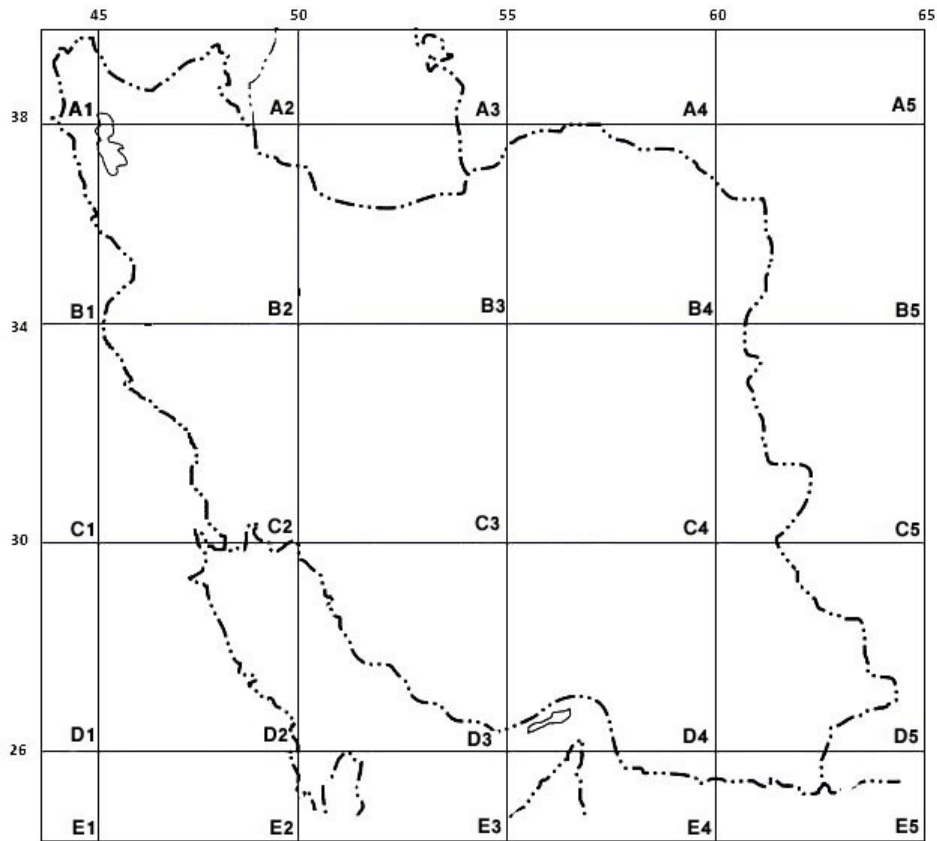


Fig. 1. Map shows the distributional range of *Trifolium* sect. *Fragifera* in Iran. Letters and numbers on the map are associated to the distributional features of the taxa mentioned in the key.

3. Flowering heads (1.5-) 2-2.5 cm. Lower calyx teeth subulate. Capitula dense, globose to ovoid. Leaflets elliptical to obovate-cuneate  
**3. T. physodes**  
 (B1, B2)

4. Fruiting heads star-shaped; fruiting calyx ellipsoidal or pyriform, with open throat and erect or divergent teeth. Flowers usually fragrant  
**4. T. resupinatum**

a. Stems hollow, up to 80 cm long or more and up to 5 mm thick. Flowering heads dense. Leaflets up to 3 cm long  
 var. **majus**  
 (B3, C2, C3)

b. Stems mostly solid, 20-40 (-60) cm long, thinner than above. Flowering heads loose. Leaflets 1-1.5 (-2) cm long  
 var. **resupinatum**  
 (B2, B3, C2, C3, D3)

4. Fruiting heads not star-shaped; fruiting calyx not as above 5

5. Fruiting heads all borne on fairly long peduncles. Leaflets obovate, not truncate or retuse. Upper calyx teeth long and well developed in fruit  
**7. T. clusii**

a. Fruiting heads smoothly globular, densely covered with white wool that entirely conceals nervation of

fruiting calyces and teeth not protruding from surface of head  
 var. **gossypinum**  
 (C2, C3)

b. Fruiting heads with protruding calyx tips; fruiting calyces hairy or glabrous with visible nervation. Peduncules 0 to about 1 cm  
 var. **kahircicum**  
 (C2, D3)

5. Fruiting heads sessile or pedunculate. Leaflets truncate or retuse. Upper calyx teeth shorter than above  
 6

6. Inflorescences 3-5 mm, few-flowered. Fruiting heads never cottony, usually glabrous or glabrescent. Lower calyx teeth 1-2 mm, triangular; the upper two very short or reduced to minute callosities  
**6. T. bullatum**  
 (B2, C2, C3)

6. Inflorescences 5-7 mm, many-flowered. Fruiting calyx generally hairy or cottony. Lower calyx teeth 2-3 mm, usually lanceolate or linear; the upper two conspicuous, recurved or divaricate  
**5. T. tomentosum**  
 a. Stems extremely abbreviated. Fruiting heads all crowded together at base of plant and overtopped by long petioled leaves  
 var. **chthonocephalum**

(C3)

b. Stems well-developed. Fruiting heads along or at top of stems and branches. var. **tomentosum** (B2, C2, C3)

**1. *Trifolium fragiferum* L., Sp. Pl. 772 (1753).**

Syn.: *T. bonanni* J. & C. Presl, Del. Prag. 51 (1822). *T. congestum* Link, Linnaea 9: 584 (1835). *T. neglectum* Fisch., C. A. Mey. & Avé-Lall., Suppl. ad Ind. Sem. Hort. Petrop. 21 (1843). *T. fragiferum* var. *pulchellum* Lange, Meddel. Nat. Floren. 2, Aart. 7: 170 (1865) **syn. nov.**

Heller recognized two varieties for this species in Iran: var. *fragiferum* and var. *pulchellum* (1984). The position of var. *pulchellum* is not clear. Although the extreme forms of the two varieties are quite distinct; however, presence of a wide range of intermediate variants between them obscures the taxonomic identifications in this species. Hossain (1961) believed that var. *pulchellum* represents but depauperate habitat forms growing in much-trodden or over-grazed areas.

Creeping plant, rooting at the nodes, up to c. 40 cm. Leaflets shortly cuneate-obovate to oblong, 6-20 × 4-12 mm; petioles long, up to 8 cm. Peduncles slender, longer than the subtending leaves, up to 10 or more. Inflorescences very compact, axillary; flowering heads 8-15 mm across. Flowers shortly pedicellate, bracteate, the bracts of the lower flowers irregularly fused and involucriform below the head.

*Selected specimens seen.* **Azerbaijan:** 20 km to Shabestar from Tasouj, 1367 m, 03/08/2009, Herinasab HUI17831; Ahar to Meshkinshahr, Naghareh-kub village, 1250 m, 26/07/2009, Herinasab HUI17830. - **Gilan:** Zibakenar road, Kolachai 2 street, Tessieh village, 0 m, 12/06/2010, Herinasab HUI17848. - **Mazandaran:** Chalus road, Do-ab to Kojur, 597 m, 18/07/2010, Herinasab HUI17837; Bahmanir to Ghaemshahr, 0 m, 17/07/2010, Herinasab HUI17833; Juibar to Sari, Tirkola, 11 m, 17/07/2010, Herinasab HUI17829; M. Alamut, 1240-2500 m, Termeh 28419-IRAN (14650-E). - **Golestan:** 20 km east of Gorgan, Alang village, 0 m, 19/08/2009, Herinasab HUI17835. - **Tehran:** Arjmand, 2108 m, 21/07/2010, Herinasab HUI17836 - **Kurdistan:** 30 km south of Divandarre, 1700 m, 01/08/2009, Herinasab HUI17849. - **Lurestan:** Shulabad, 1929 m, 22/07/2009, Haerinasab HUI17847; 35 km South of Aleshtar, 1284 m, 23/07/2009, Haerinasab HUI17834; Khoramabad, Kaka-Reza village to Cheghelvandi, 1618 m, 23/07/2009, Haerinasab HUI17823; Dorud, 1488 m, 23/07/2009, Herinasab HUI17842; Azna to Aligudarz, 1889 m, 23/07/2009, Herinasab HUI17845. - **Hamadan:** Aq

Bolagh-e Aqdaq, 90 km N Hamadan, Rioux & Golv. AB-277-TARI. -**Bakht:** Kuh Rang, 2380 m, Pabot 28412-IRAN (12495-E).

*Digital selected specimens seen.* E00342207 (Jardine 739), E00342208 (Furse 3228), E00342219 (Lectotype of *T. neglectum*) (<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>).

**2. *Trifolium tumens* Steven ex M. Bieb. Fl. Taur.-Cauc. 2: 217 (1808).**

As a general conclusion, we accept two varieties in this species for the flora of Iran, which include one new variety.

**var. *tumens***

Syn.: *T. tumens* Steven ex M. Bieb. var. *majus* Boiss., 137 (1872); *T. fragiferum* L. subsp. *tumens* (Steven ex M. Bieb.) Gib. & Belli, Mem. Accad. Sci. Torino ser. 2, 41: 34 (1890). *T. talyschense* Khalilov, Not. Syst. Inst. Bot. Acad. Sci. URSS 12: 118 (1950). *T. tumens* var. *talyschense* (Khalilov) Zoh., Israel J. Bot. 19: 322 (1970), **syn. nov.**

Plants with many stems, slightly woody at base or not. Stems slender, leafy all along. Heads 1-2 cm across. Peduncles mostly axillary, hairy at tip. Pedicels hairy. Flowers pink, 6-10 mm long. Fruiting heads hemispherical to globular; fruiting calyx hairy all over. Pod hairy above. Seeds 1-2, up to 1.2 mm long.

*Selected specimens seen.* **Azerbaijan:** Namin, Fandoghlu forest, 1490 m, 04/08/2009, Haerinasab HUI17875; Asalem to Khalkhal, 1971 m, 14/06/2010, Haerinasab HUI17878. - **Gilan:** 19 km to Rasht from Ghazvin, Kocha village, 61 m, 10/06/2010, Haerinasab HUI17861; 17 km south of Rasht, Jovkalbandan village, 79 m, 10/06/2010, Haerinasab HUI17865; Asalem, Esfandiari, 28603-IRAN (6452-E); Astara to Ardebil, Gardeneh-ye Heyran, 629 m, 15/06/2010, Haerinasab HUI1787; Gardeneh-ye Heyran inter Astara et Ardabil, 300-400 m, Termeh & Matin 28585-IRAN (36779-E); Inter Asalem et Khalkhal, 1000-1500 m, Termeh & Matin 28421-IRAN (36776-E). - **Mazandaran:** Chalus road, pol-e Zangule, 2200 m, 18/07/2010, Haerinasab HUI17868. - **Mazandaran:** Chalus road, Tunel-e Kandovan, 18/07/2020, Haerinasab HUI17854. - **Tehran:** Firuzkuh to Polur, 2600 m, 21/07/2010, Haerinasab HUI17876; Firuzkuh to Polur, after Lasem, 2359 m, 21/07/2010, Haerinasab HUI17874; Firuzkuh to Polur, after Arjmand, 2450 m, 21/07/2010, Haerinasab HUI17867; Gaduk before Firuzkuh, 2185 m, 21/08/2009, Haerinasab HUI17869. *Digital selected specimens seen.* E00342288 (Lectotype of *T. tumens*), E00342558 (Furse 1078), E00342275 (Rechinger 52480)

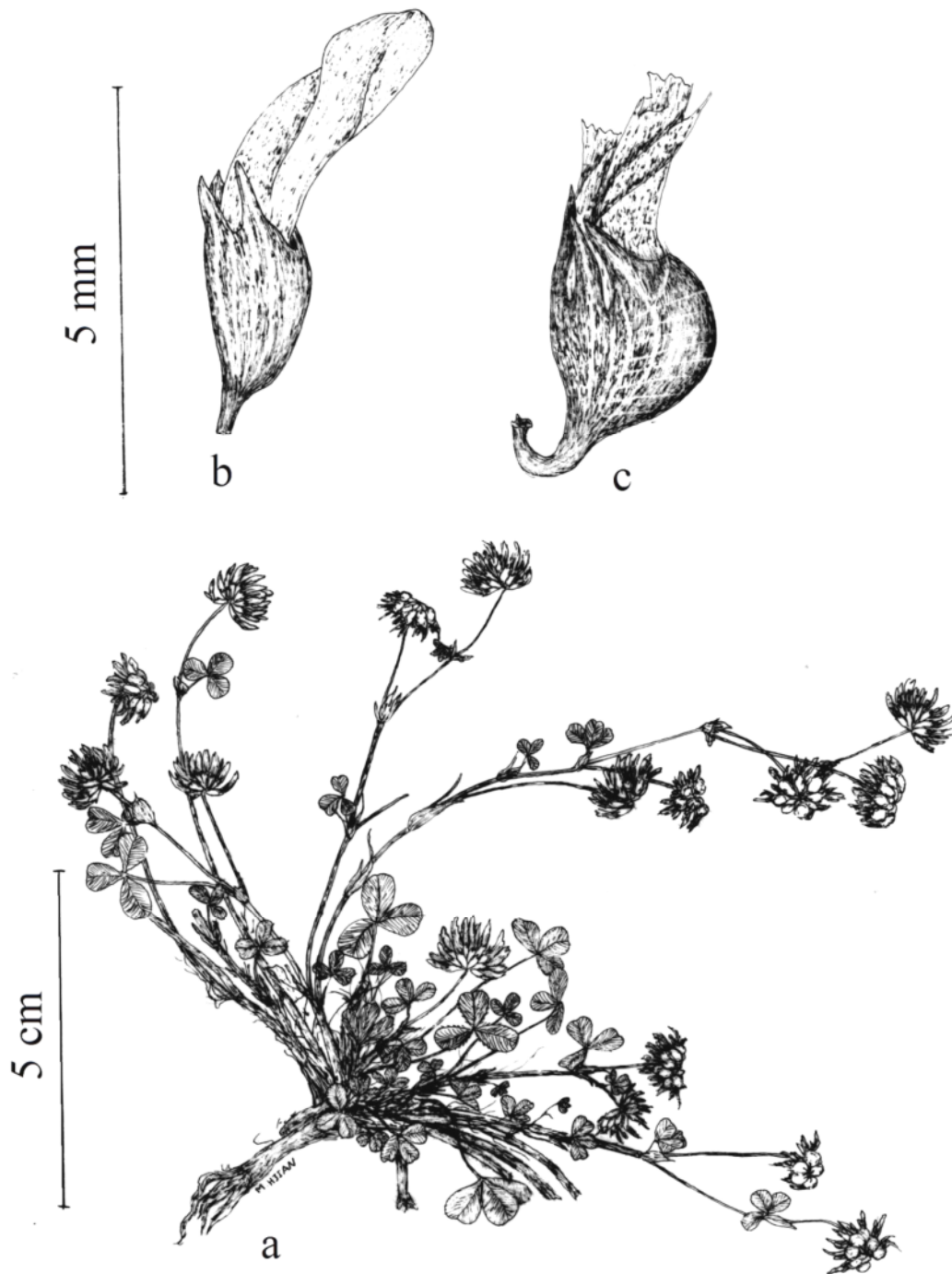


Fig. 2. *Trifolium tumens* var. *ceasitosum*. (a) Plant in flower and fruit, (b) flowering calyx, (c) fruiting calyx.

(<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>).

**var. caespitosum** Haerinasab, **var. nov.** (Fig. 2).

Typus: **Mazandaran:** Noshahr, Kojur to Ruyan, Kadir village, 1590 m, 19/07/2010, Haerinasab HUI17850 (holotypus herbarium of Isfahan University). - Paratypes: **Gilan:** Asalem to Khalkhal, 1590 m, 05/08/2009, Haerinasab HUI17853. -**Mazandaran:** Chalus road towards Kojur, 1750 m, 18/07/2010, Haerinasab HUI17852; Kojur to Ruyan, Galugah to Dibaj, 1985 m, 20/07/2010, Haerinasab HUI17851.

Planta valde caespitosa. Caules numerosi, ad basin densi, secundum caulem sparsissime foliati. Folia caulina fere omnia subsessilia; foliola minuta, obovato-cuneata, 0.5-0.8(-1) × 0.3-0.4(-0.5) cm. Capitula hemispherica. Pedunculi longi, teretes. Tubus calycis dorso sparse villosus, inferne glaber. Legumen supra pilosum, monospermum. Semen brunneum, 2 mm longum.

**3. T. physodes** Stev. ex M. B., Fl. Taur.-Cauc. 2: 217 (1808).

Syn: *T. physodes* var. *psilocalyx* Boiss., Fl. Or. 2: 136 (1872), **syn. nov.**

Petioles of lower leaves long, to c. 12 cm; the uppermost leaves subsessile or sessile. Inflorescence dense, globose, (1.5-) 2-2.5 cm in diameter. Calyx c. 20-veined, 8 mm long, ventrally gibbous; surface usually ± densely hairy, otherwise glabrous; teeth subulate-filiform, divergent; the upper two soon deflexed so that all the teeth appear disposed in a single lip.

*Specimen seen.* **Azerbaijan:** Sardasht towards Piranshahr, Pardena, 1500 m, 08/07/2001, Salimpour, 7781 (IAUH).

Digital selected specimen seen. E00342252 (Lectotype of *T. physodes*)

(<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>).

The authors of this study found that Heller determined the specimen 28421-IRAN (36776-E) as *T. physodes* var. *physodes* dated 1978, and reported it as both *T. physodes* var. *psilocalyx* and *T. tumens* var. *talyschense* in his account of Flora Iranica (1984). Interestingly, Heller (1984) reported sample 28585-IRAN (36779-E) as *T. physodes* var. *physodes*, while based on his label, the same sample was determined as *T. tumens* var. *talyschense*. Based on the new synonymy of *T. tumens* var. *talyschense* to *T. tumens* var. *tumens*, we recognized these two specimens as *T. tumens* var. *tumens*.

**4. T. resupinatum** L., Sp. Pl. 771 (1753).

**var. resupinatum**

Syn.: *T. bicornis* Forssk., Fl. Aegypt.-Arab. 139 (1775). *T. formosum* Curt. ex DC., Prodr. 2: 200 (1825) non d'Urv. (1822). *T. resupinatum* L. var. *robustum* Rouy et var. *gracile* Rouy, Fl. Fr. 5: 92, 93 (1899). *T. resupinatum* var. *microcephalum* Zoh., Israel J. Bot. 19: 324 (1970); Zoh., Fl. Pal. 2: 456 (1972), **syn. nov.** Stems erect or ascending, glabrous or glabrescent, mostly solid, rarely fistulose. Leaflets 4-20 mm long. Flowers fragrant. Fruiting heads 8-20 mm, not very dense, hairy or glabrous.

*Selected specimens seen.* **Golestan:** Aliabad, in the entrance of Kabudval street, 164 m, 28/05/2009, Haerinasab HUI17897; Aliabad to Azad-shahr, in the entrance of Zarrin-gol road, 200 m, 28/05/2009, Haerinasab HUI17905. -**Gilan:** 17 km south of Rasht, Jovkalandan village, 79 m, 10/06/2010, Haerinasab HUI17901; Saravan, 69 m, 10/06/2010, Haerinasab HUI17904; Bandar-e Anzali, 0 m, 13/06/2010, Haerinasab HUI17902; Rezvanshahr, 43 m, 14/06/2010, Haerinasab HUI17894; 17 km to Rasht, 40 m, Termeh & Moussavi 28398-IRAN (16455-E). -**Mazandaran:** Zirab to Firuzkuh, 330 m, 31/05/2009, Haerinasab HUI17892. -**Fars:** Nurabad to Kazerun, Tang-e Chugan, 834 m, 16/04/2010, Haerinasab HUI17898. -**Khuzestan:** 5km after Shush towards Andimeshk, 110 m, 14/05/2009, Haerinasab HUI17895; 23 km to Shush from Alvan, 15/05/2009, Haerinasab HUI17900; Choghzanbil, 73 m, 15/05/2009, Haerinasab HUI17896; Bagh-malek to Ramhormoz, 496 m, 15/04/2010, Haerinasab HUI17899; 20 km after Andimeshk towards Shush, 94 m, 14/05/2009, Haerinasab HUI HUI17893; Bagh-malek, 845 m, 16/05/2009, Haerinasab HUI17891.

*Digital selected specimen seen.* E00342320 (Furse 1894).

(<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>), C10003201 (Holotype of *T. bicornis*) (<http://plants.jstor.org>).

**var. majus** Boiss., Fl. Or. 2: 137 (1872).

Syn.: *T. suaveolens* Willd., Hort Berol. 108 (1816). *T. resupinatum* L. var. *suaveolens* (Willd.) Dinsm. in Post, Fl. Syria Pal. Sin. Ed. 2, 1: 345 (1932).

Plants up to 80 (-100) cm. Stems mostly erect, up to 5 mm thick, often transversely wrinkled or ringed, branching above. Leaflets 3-5 cm long. Heads 1 cm or more across, very compact, less stellate than in var. *resupinatum*. Fruiting heads very dense.

*Selected specimens seen.* **Golestan:** Aliabad to Azad-shahr, in the entrance of Zarrin-gol road, 200 m, 28/05/2009, Haerinasab HUI 17887. -**Lurestan:** South of Pol-Dokhtar, between Tang-e Fanni and Valiy-e Asr



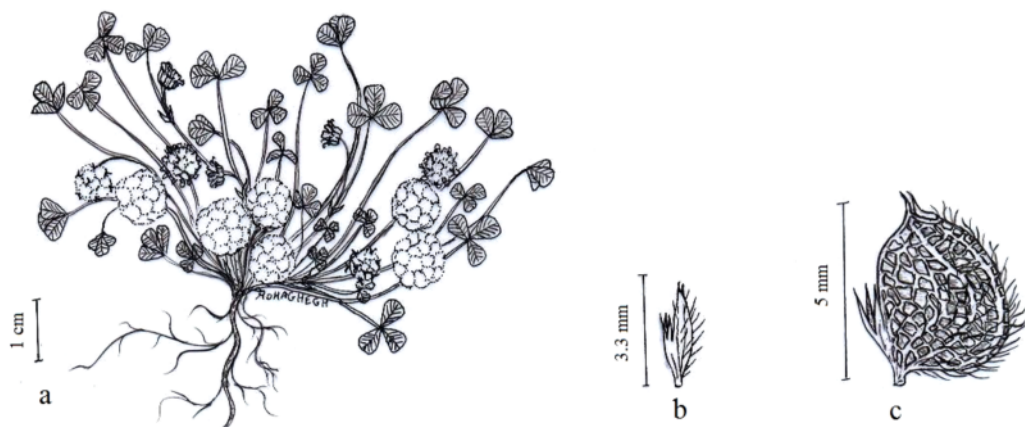


Fig. 3. *Trifolium tomentosum* var. *chthonocephalum*. (a) Plant in flower and fruit, (b) flowering calyx. (c) fruiting calyx.

village, 879 m, 14/05/2009, Haerinasab HUI17886; Azna to Aligudarz, 1889 m, 23/07/2009, Haerinasab HUI17890. - **Khuzestan**: 5 km from Izeh to Dehdez, 828 m, 17/05/2009, Haerinasab HUI17903; 5 km from Dezful to Shush, 110 m, 15/04/2010, Haerinasab HUI17888; 90 km to Ahvaz from Dezful, 63m, 15/04/2010, Haerinasab HUI17885; Behbahan, 311 m, 16/04/2010, Haerinasab HUI17889; Izeh, near Talab-e Shat, 845 m, 15/04/2010, Haerinasab HUI17884; Bagh-malek to Ramhormoz, after Rud-e Zard, 424 m, 15/04/2010, Haerinasab HUI17883.

*Digital selected specimen seen.* E00342348 (Jacobs 6717).

(<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>).

##### 5. *T. tomentosum* L., Sp. Pl.: 771 (1753).

Based on our study we concluded that this species occurs in Iran possessing two varieties among which there is one new record.

##### var. *tomentosum*

Syn.: *T. resupinatum* L. subsp. *tomentosum* (L.) Gib. & Belli, Mem. Accad. Sci. Torino ser. 2, 41: 17(1890). *T. tomentosum* L. var. *pedunculatum* Náb., Publ. Fac. Sci. Univ. Masaryk (Brno) 35: 71 (1923). *T. curvisepalum* V. Täckh., Svensk Bot. Tidskr. 26: 373 (1932). *T. tomentosum* L. var. *curvisepalum* (Täckh.) Thieb., Fl. Lib.-Syr. 2: 28 (1940), **syn. nov.**

Stems well-developed. Fruiting heads smoothly globular, not protruding upper parts of the individual calyces; calyx cottony or pilose to glabrescent. Peduncles, at least the lower ones, conspicuous. Teeth of fruiting calyx spreading and appressed to tube or somewhat recurved.

*Selected specimens seen.* **Fars**: Nurabad to Kazerun, Tang-e Chugan, 834 m, 16/04/2010, Haerinasab

HUI17915. -**Kohgiluyeh-Boirahmad**: 58 km from Gachsaran to Nurabad, 791 m, 16/04/2010, Haerinasab HUI17909; 43 km from Gachsaran to Nurabad, 841 m, 16/04/2010, Haerinasab HUI17914. -**Kermanshah**: Gilan-e Gharb, Sarab, Behboudi 28570-IRAN. -**Khuzestan**: Ghal-e Tol, between Bagh-malek and Izeh, 853 m, 16/05/2009, Haerinasab HUI17916; Ghal-e Tol, after Izeh, 870 m, 15/04/2010, Haerinasab HUI17907; Izeh, near Talab-e Shat, 845 m, 15/04/2010, Haerinasab HUI17906; Molla-sani to Shushtar, 49 km north-east of Ahvaz, 58 m, 15/04/2010, Haerinasab HUI17921.

**var. chthonocephalum** Bornm., Beih. Bot. Centralbl. 31 (2): 204 (1914) (Fig. 3).

This variety present as a new record for flora of Iran. Stemless or very short-stemmed plants. Flowering heads all crowded at the base of plant or its short branches and overtopped by the long-petioled leaves. Fruiting heads wooly, 0.7-1 cm across.

*Selected specimens seen.* **Khuzestan**: 20 km to Izeh from Dehdez, 990 m, 14/04/2010, Haerinasab HUI17911; Izeh, Dehdez road, Pol-e Salou over Karoon river, 750 m, Mozaffarian 53641-TARI. -**Bakhtiari**: Sarkhun to Dehdez, near Sadd-e Karoon 4, 1116 m, 13/04/2010, Haerinasab HUI17908; Sarkhun to Lordegan, after Rafan village, 1444 m, 14/04/2010, Haerinasab HUI17910.

*Digital selected specimen seen.* BM000901147 (Isotype) (<http://plants.jstor.org>).

##### 6. *T. bullatum* Boiss. & Hausskn. ex Boiss. Fl. Or. 2: 138 (1872).

Syn.: *T. bullatum* Boiss. & Hausskn. ex Boiss. var. *glabrescens* Post, Fl. Syr. Pal. Sin. 241 (1883-1896). *T. tomentosum* L. subsp. *bullatum* (Boiss. & Hausskn. ex Boiss.) Oppenh., Bull. Soc. Bot. Fr. 108: 56 (1961). *T.*

*tomentosum* L. var. *bullatum* (Boiss. & Hausskn. ex Boiss.) Hossain, Not. Roy. Bot. Gard. Edinb. 23: 454 (1961). *T. bullatum* var. *macrosphaerum* Zoh., Israel J. Bot. 19: 331 (1970), **syn. nov.**

Calyx tube shining, glarous or thinly hairy, the fruiting calyces appearing separate, not matted together by wooly hairs.

*Selected specimens seen.* **Lurestan:** Khorramabad, Kaka-Reza village, 1569 m, 02/06/2010, Haerinasab HUI17918. **-Kermanshah:** Bisotun, Najiyevan village, 1420 m, 02/06/2010, Haerinasab HUI17920.

*Digital selected specimens seen.* BM000901163 (Lectotype of *T. bullatum*) (<http://plants.jstor.org>), E00342378 (Furse, 1903), E00342364 (Jacob, 6389) (<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>).

**7. *T. clusii*** Godr. & Gren. Fl. Fr. 1: 414 (1849).

**var. *kahiricum*** Zoh., Israel J. Bot. 19: 331 (1970).

Fruiting heads with protruding calyx tips; fruiting calyces hairy or glabrous with visible nervation. Peduncles 0 to about 1 cm

*Selected specimens seen.* **Fars:** Boushehr, Bandar-e Gaz, 28399-IRAN (37610-E); prope Kazerun, 1750 m, Riazhi 9176-TARI. **-Khuzestan:** Molla-sani to Shushtar, 49 km north-east of Ahvaz, 58 m, 15/04/2010, Haerinasab HUI17913; 24 km from Behbahan of road to Ramhormoz, 400 m, Runemark & Mozaffarian 30897-TARI.

**var. *gossypinum*** Zoh., Israel J. Bot. 19: 329 (1970) (Fig. 4).

This variety is a new record for flora of Iran.

Peduncles slender, longer than subtending leaves. Fruiting heads spherical, not lobulated. Fruiting calyx densely cottony with the upper teeth hidden in fleece.

*Selected specimens seen.* **Khuzestan:** Izeh to Dehdez, Karoon 3 dam, 953 m, 16/05/2009, Haerinasab HUI17917; Izeh, 43 km E Haft-Gel, Pabot 667-TARI.

**-Kordestan:** Marivan, Zairi 28576-IRAN (37607-E).

**-Bakhtiari:** Sarkhun to Dehdez, 1736 m, 13/04/2010, Haerinasab HUI17912; Katul-ab, 280 km to Ahvaz, 910 m, 31/03/2000, Rahiminejad and Sahebi HUI148233. **-Lurestan:** 60 km west of Khorramabad, 1160 m, 30/04/1966.

## ACKNOWLEDGEMENTS

The authors wish to thank the Office of Graduate Studies of the University of Isfahan for their support. Also we would like to thank Mrs. Mohaghegh and Miss Hajian for their hand drawing.

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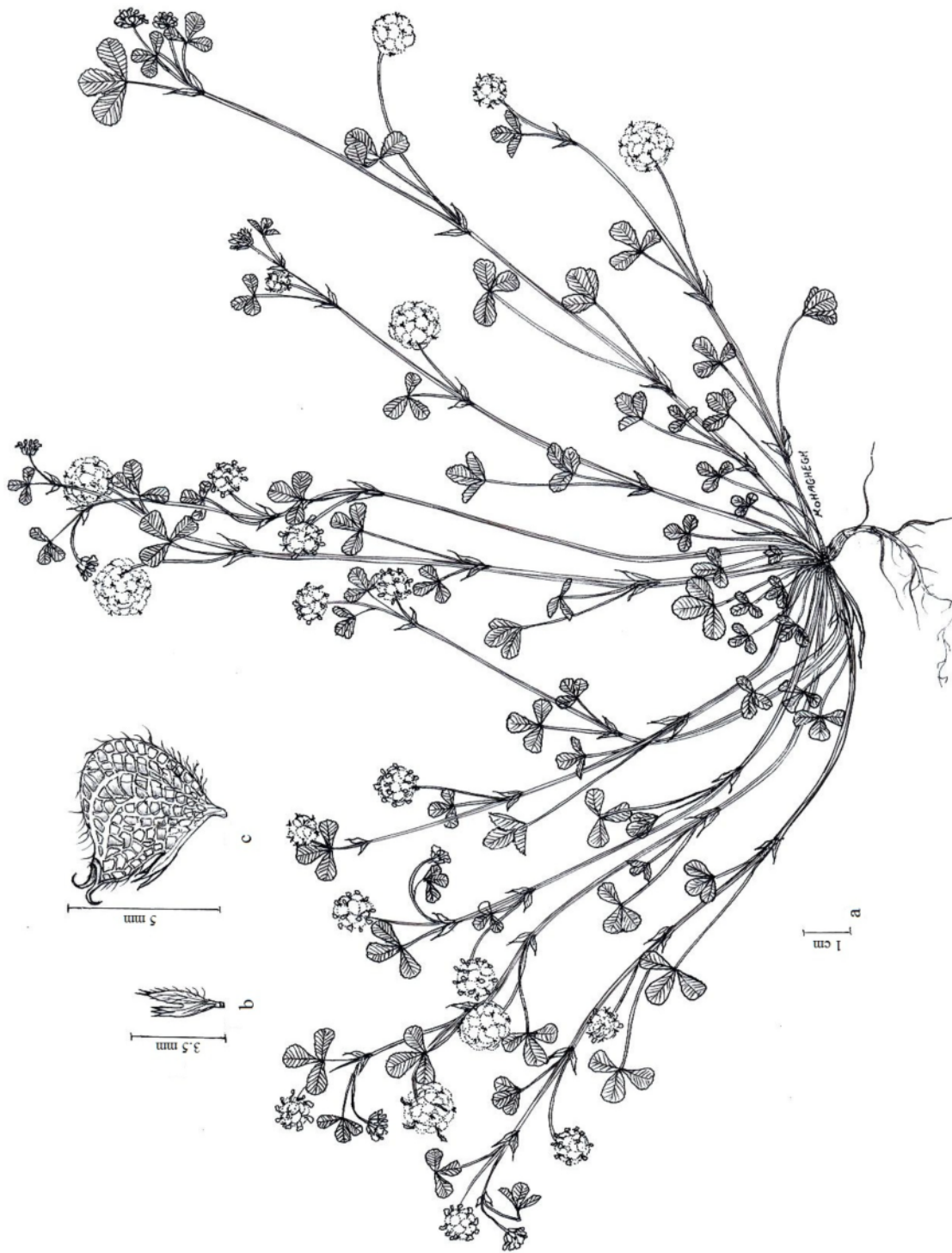


Fig. 4. *Trifolium clusii* var. *gossypinum*. (a) Plant in flower and fruit, (b) flowering calyx, (c) fruiting calyx.