

# NOTES ON THE GENUS SCROPHULARIA L. (SCROPHULARIACEAE) IN IRAN

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Attar, F. 2006 12 31: Notes on the genus *Scrophularia* L. in Iran, -*Iran. J. Bot.* 12(2): 136-143. Tehran.

*Scrophularia* L. was revised in Iran. This genus includes 60 perennial, biennial or annual species and subspecies in Iran that 28 taxa of them are endemic of Iran (including new species). In this paper, *S. iranica*, *S. denaensis* and *S. papyracea* are described as new species. These species are compared with the their related taxa. *S. variegata* subsp. *rupestris* is regarded as a synonym of *S. variegata* subsp. *variegata*. Also the key of the species and subspecies and illustrations of the new species are presented.

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Key words. *Scrophularia*, new species, Iran

یادداشت‌هایی بر جنس اسکروفولاریا در ایران

فریده عطار

جنس اسکروفولاریا در ایران مورد بازنگری قرار گرفته است. این جنس در ایران شامل ۶۰ گونه و زیر گونه چند ساله، دو ساله و یکساله بوده که ۲۸ گونه آن انحصاری ایران است (با احتساب گونه های جدید). در این مقاله گونه های *S. iranica*، *S. denaensis* و *S. papyracea* به عنوان گونه های جدیدی از این جنس شرح داده می شوند. این گونه ها با نزدیکترین خویشاوندان خود مورد مقایسه قرار می گیرند. زیر گونه *S. variegata* subsp. *rupestris* با زیر گونه *S. variegata* subsp. *variegata* مترادف قرار می گیرد. همچنین کلید شناسایی گونه ها و تصاویر گونه های جدید نیز ارائه می شوند.

## Introduction

*Scrophularia* L. (Subfam. *Anthirrhinoideae*) was studied for the project of Flora of Iran during four years (Assadi 1989). This genus includes nearly 200 taxa in the world (Mabberley, D.J., 1997) of which 60 of them (including new species) (Table 1) are distributed in Iran. *Scrophularia* L. is one of the large genera of the *Scrophulariaceae*, belongs to the taxonomically most difficult groups. It occurs throughout mountaneous regions (e. g. *S. denaensis*, *S. farinosa* and *S. amplexicaulis*), forests (e. g. *S. vernalis* and *S. megalantha*) riversides (e. g. *S. umbrosa*) and rarely in hot deserts (e. g. *S. deserti*). Some speices such as *S. striata* is recognized as a weed in some region. Most species of Iranian *Scrophularia* are Irano-Turanian elements (*S. frigida*, *S. amplexicaulis*, *S. farinosa*, *S. glauca* and...), rarely

Hyrcanian (*S. vernalis*) and Saharo-Sindian (*S. deserti*).

Also, in this study some interested specimens were found. Among them four species "*S. shulabadensis*, *S. ghahremani*, *S. ispanica* and *S. schiraziana*, *S. khorassanica*, *S. tortuisissima*, *S. crassipedunculata*, *S. alhagioides*" were described as new species (Attar & Hamzeh'ee, 2007; Attar et al. 2006).

Also *Scrophularia rosulata* was reported from Khorassan province.

In this paper *Scrophularia papyracea* and *S. daenaensis* are described as new species from southwest of Iran. Also, *S. mesopotamica* which was collected from Saqqez in Kurdistan province is reported as new record for Iran.

## Morphology

**Habit:** Some species are entirely herbs (e.g. *S. umbrosa*, *S. megalantha*, *S. vernalis*, *S. crenophila*, *S. azerbaijanica* and etc.) . Most species are herb with woody base (*S. variegata*, *S. frigida*, *S. deserti* and etc.) and rarely suffruticose (*S. shulabadensis* and *S. papyracea* and etc.). Also plant can be spinose (only in *S. alhagioides* that is very rare habit in the genus) or tortuse (in *S. tortuosissima*). Height of some taxa of *Scrophularia* exceeds 100 cm in *S. mesopotamica* and some of them up to 20 cm (*S. crassiuscula*).

**Indumentum:** Indument of *Scrophularia* is variable, glabrous such as *S. kurdica*, lanate such as *S. oxysepala*, farinose such as *S. pruinosa*, *S. farinosa*, *S. zuvandica* and *S. frigida* subsp. *haussknechti*, and glandular-hairy such as *S. ghahremani*. The glands are shiny, brown, yellow, black and rarely white, stipitate or sessile. Hairs and glands can be found on stem, leaves, peduncle, pedicel, calyx segments and filament of stamens. Some species are hairy-glandulose on all parts and some species only in some organs.

**Stem:** It can be terete (in *S. xylobasis*), costate (in *S. orientalis*), quadrangular (in *S. scopolii*) or quadrangular and winged (in *S. umbrosa*).

**Leaves:** Leaves are herbaceous with thick or thin texture, also variable in shape and size. They can be lanceolate, ovate, obovate, triangular, cordate in shape, simple, entire and lanceolate (e. g. *S. leucoclada*, *S. crassicaulis*), simple, very large and crenate or dentate at margin (e. g. *S. megalantha*, *S. umbrosa*, *S. scopolii*, *S. crenophila*, *S. iranica*,...), simple and parted (more species such as *S. variegata*, *S. pruinosa* and etc.) or pinnatisect and apparently compound (e.g. *S. elburzensis* and *S. gaubae*). Also *Scrophularia* includes three forms of phyllotaxi: alternate, opposite or verticillate (with three or four leaves in each node).

**Inflorescence:** Inflorescence is thyrses in most species or rarely racemose in *S. xylobasis* and *S. denaensis* with one or two flower in each cyme . *Scrophularia* is classified in two large groups based on the shape of inflorescence. The first group comprises frondose that inflorescence branches inserted at the axil of leaves (e.g. *S. vernalis*, *S. kurdica*, *S. ghahremani*, *S. denaensis* and...). In the second group inflorescence has only bract and bracteoles (most species, *S. variegata*, *S. pruinosa* and...).

**Calyx:** Calyx segments are five and orbicular or elliptic with scariose white margin or without it. Margin of segments can be flat in most species or undulate in *S. pruinosa* and *S. olympica*. In some

species as *S. denaensis* and *S. tortuosissima*, calyx segments accrescent in fruiting time that is rare.

**Corolla:** Corolla is urceolate or tubulose or ventricose. Color of corolla is red in *S. striata* and most species, yellow in *S. megalantha*, and *S. flava*, green in *S. umbrosa*, purple in *S. variegata* or brownish in *S. rostrata* or pinkish in *S. farinosa*. Length of corolla is 3 mm in *S. striata* and 20 mm long in *S. megalantha* which has the largest corolla in the genus. Lips are equal or unequal which is one of the important characters for distinguishing of species.

**Stamen:** Stamens are four, two long and two short. Anthers are variable in color, white, yellow, purple and red. Filaments are glabrous, lanate and glandular in most species.

**Staminode:** Fifth stamen is reduced to staminode that inserted at the base of upper lip and can be linear, triangular, flabellate, orbicular, trapezoid and rhombic. Some species have not staminode, e. g. *S. tortuosissima*, *S. nervosa* and *S. orientalis*.

**Capsule:** Capsule is conical, rarely rostrate, glabrous, hirsute or glandular.

**Distribution:** The species of *Scrophularia* are distributed in north, northwest, west, central mountain region, northeast and rarely south of Iran.

**Ecology and habitat:** The species of *Scrophularia* are distributed in temperate region in high mountains rocky slopes, forests, riversides and rarely in hot deserts, altitude varies from 40 to 3400 m from sea level.

## Material and Methods

This paper is based on the examination of high numbers of specimens of the TARI, TUH, IRAN, FUMH Shiraz and Esfahan herbaria of Research centre of Agricultural and Natural Resources. Also the studies were done in the field.

### *Scrophularia iranica* Attar, sp. nov. -Fig. 1

Perennis, herbacea, robusta, usque 100 cm alta, viridia, e rhizomate paucicaulis. Caules quadrangulares, alati, simplices vel ramosi, glanduloso-hirsuti. Folia opposita, membranacea; lamina 4.5-25x3-13 cm, ovata vel oblonga, crenata vel duplicato-crenata, hirsuto-glandulosa, basi cordata vel truncata; petioli usque ad 14 cm longo suffulti. Inflorescentia bracteata, raro basi frondosa; thyrsus pauci-florue. Cymae oppositae, vel raro alternatae; cymae inferiores 5-florae, summae 1-florae. Pedunculi ± 10 mm longi, atroglandulosi; pedicelli 1-5 mm longi, atroglandulosi sed infra calycem



Fig. 1. *Scrophularia iranica* (x 0.64); flower (x 2.5).

abrupte glabrescentes. Bractee basales cymarum frondosae, ovatae, dentatae, superiore bracteosae, 10x1 mm, lanceolatae vel lineares, irregulariter

dentatae, glabrae. Calycis laciniae ellipticae, 4x2 mm, glabrae, anguste albo- vel rufo-marginatae. Corolla  $\pm$  7 mm longa, viridia, tum ochracea, lobis inaequilongis.

Staminodium reniforme, liberum. Stamina 4-5 mm longa; filamenta dense atroglandulosa. Capsula ignota. Perennial herb, robuste, up to 100 cm tall, bright green, with few-stemmed rhizome. Stem quadrangular, winged, simple or branched, hirsute-glandular. Leaves opposite, membranous, very large, 4.5-25x3-13 cm; blade ovate or oblong, crenate or double crenate at margin, obtuse or acute, truncate or indistinctly cordate at base, hirsute-glandulose in lower surface; petiole up to 14 cm long. Inflorescence bracteate, sometimes frondose at base; thyrsus few-flowered; cymes opposite or rarely alternate; lower cymes 5-flowered; uppers 1-flowered. Peduncle  $\pm$  10 mm long, covered by black glands. Pedicel 1-5mm long, with black glands, suddenly glabrous below

calyx. Lower bracts large, ovate, dentate, leaf-like; uppers 10x1 mm, lanceolate or linear, irregularly dentate, glabrous. Calyx segments elliptic, 4x2 mm, glabrous, with narrow white or reddish margin. Corolla  $\pm$  7 mm long, at first green, then yellow-brown; lips unequal. Staminode reniform, free. Stamens 4-5 mm long; filaments covered by dense black glands. Capsule not seen.

*Type:* Iran: Yassuj: between Kumehr and Kakan, Maregun waterfall, ca. 2360m, 26. 05. 2006, Attar & Zamani, 36108. (holotype: TUH).

*Habitat:* Moist places or riverside.

*Affinities:* *Scrophularia iranica* is closely related to three species compared in table 1.

Table 1. Comparison of *Scrophularia iranica* and its relatives

Characters	<i>S. scopolii</i>	<i>S. crenophila</i>	<i>S. umbrosa</i>	<i>S. iranica</i>
Stem	Quadrangular	Quadrangular	Quadrangular-winged	Quadrangular-winged
Stem indumentum	Hirsute-glandulose	Hirsute-glandulose	Glabrous	Hirsute-glandulose
Leaf size, indumentum	2-5x1-10cm, Hirsute-glandulose on nerves	2-10x1-6cm, Hirsute-glandulose on nerves	18x10cm, glabrous	4.5-25x3-13cm, Hirsute-glandulose on whole lower surface
Petiole length	$\pm$ 6 cm	$\pm$ 10 cm	$\pm$ 10 cm	$\pm$ 14 cm
Peduncle	$\pm$ 3 cm	$\pm$ 3 cm	$\pm$ 1.5 cm	$\pm$ 1 cm
Pedicel	$\pm$ 2 cm	$\pm$ 1.5 cm	$\pm$ 0.5 cm	$\pm$ 1.5 mm
Bract	10x1 mm	6x1 mm	10x2 mm	10x1 mm
Calyx segments	3.5x2.5 mm, glandulose	3x2.5 mm, hirsute-glandulose	4x2.5 mm, glabrous	4x2 mm, glabrous
Corolla length and color	9 mm, olivaceous green, with red margin	7.5 mm, green, with reddish brown margin	10 mm, green-brown	7mm, at first green, then yellow-brown
Staminode	Broad elliptic or hemispheric	Broad elliptic, emarginate	Reniform or hemispheric	Reniform
Filament indumentum	Dark-glandulose	Glandulose	Sparsely glandulose	Densely dark-glandulose
Stamen length	7 mm	5 mm	5.5 mm	4-5 mm

***Scrophularia denaensis* Attar, sp. nov.** –Fig. 2.

Suffruticosa, usque 20 cm alta. Caules numerosi, simplices, striata, pilosa, pili patuli, longi, multicellulares, glandibus stipitatis, albis, brevibus immixti. Folia opposita, superne alterna, basi attenuata, brevi petiolata; lamina elliptica, irregulariter dentata, villosa, pili multicellulares, longi, albi, patuli vel appressi., glandulosi, glandibus stipitatis, albis brevibus immixti; folia inferiora 7x4 mm, mediocre, 2 cm x 1.7 mm; superiora integra, 2.7 cm x 9 mm,

bracteaeformes. Inflorescentia bracteolata vel in parte basali indistincte foliosa; thyrsus laxus, racemosus; cymae infimae uni- vel biflorae. Pedunculi a 11mm longi; pedicelli usque 6mm longi, villosi, pili longi, densi, albi, patuli, glandulosi. Bracteolata bini, lineares. Calycis laciniae subequales, triangulares, 3x1 mm, fructiferae accrescentes, lineares, 6x1mm, marginem planae albae membranaceae, pilosae, pilis dense, longe, multicellularibus, brunneo-glandulosis.

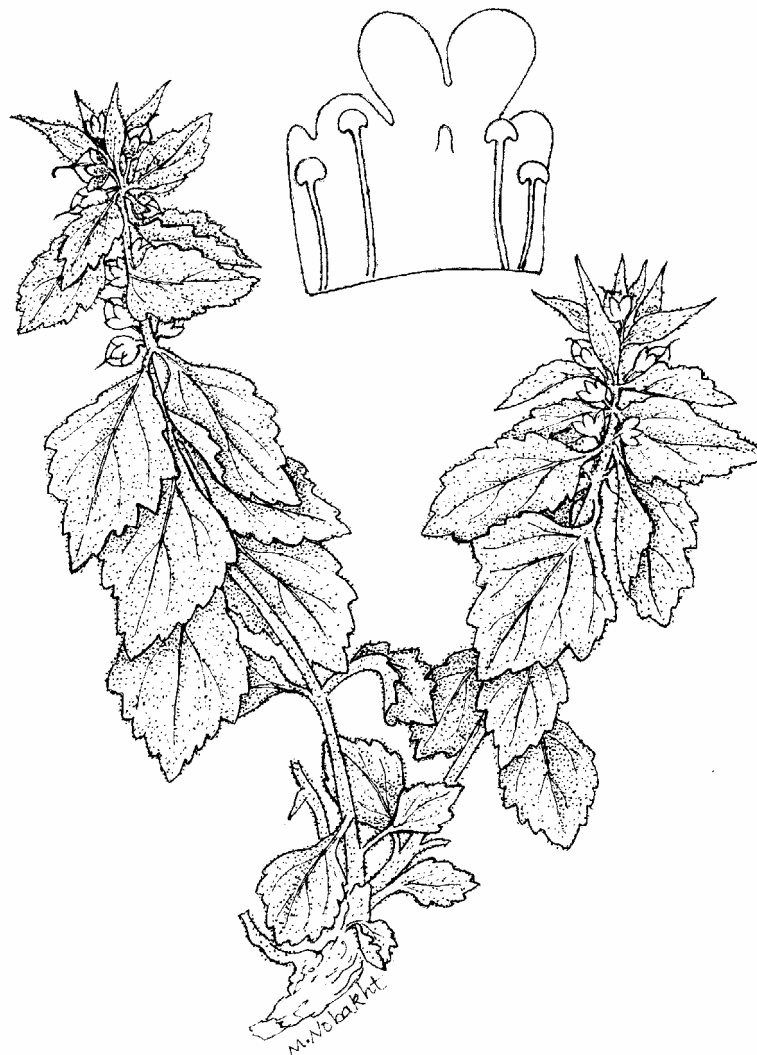


Fig. 2. *Scrophularia denaensis* (x1); flower (x3).

Corolla 8.5 mm longa, rosea, plus minus basi constricta, lobis subaequilongis vel lobis superioribus indistincte longioribus, rotundatis. Staminodium parvum, lineare, apice obscure dilatatum, liberum. Stamina ad 10 mm longa, breviter exserta; antherae in sicco brunnescentiae; filamenta glandulosa. Capsula sphaeroidea, apiculata, 4x4mm, flava, pilosa, glandulosa, glandibus stipitatis brevibus immixta; stylus persistens, 8 mm longus. Semina brunnea vel atro-brunnea, elliptica vel subovata, curvata, indistincte pustulata.

Suffruticose, up to 20 cm high. Stem numerous, simple, striate, with spreading long multicellular hairs and white shortly stipitate glands. Leaves opposite, toward the apex alternate, attenuate at base into short petiole; limb elliptic, irregularly dentate or parted,

densely hairy; hairs multicellular, long, white spreading or appressed, with glandular tip, mixed with small white stipitate glands; lower leaves 7x4 mm; medians larger, 2x1.7 mm; upper leaves 2.7x9 mm, entire at margin, bract-like, gradually attenuate towards apex. Inflorescence frondose, apparently racemose; lower cyme 1-2-flowered, uppers 1-flowered. Peduncle in lower cymes 11 mm, in uppers up to 3 mm long; pedicel up to 6 mm long, with long dense white spreading glandular hairs. Bracteoles linear, binate, covered by dense long hairs, 2.5x0.5mm. Calyx segments subequal, at first triangular, 3x1mm, then accrescent in fruit, linear, 6x1mm, indistinctly membranous at margin, covered by dense long multicellular hairs; glands with brown tip. Corolla 8.5 mm long, pink, slightly constricted at base; lips subequal or upper lip slightly longer; all

lobes with rounded tip. Staminode reduced into linear appendage, indistinctly broad at tip, free. Stamens more or less 10 mm long, exerted; dried anthers brownish; filaments glandulose. Capsule subspherical, apiculate, 4x4mm, yellow, covered by glandular hairs, sometimes mixed with shortly stipitate glands, with persistent 8mm long style. Seeds light or dark brown, elliptic to subovate, curved, indistinctly pustulate

*Affinities.* *Scrophularia denaensis* is related to *S. farinosa*, but is distinguished by following characters: plant lanate glandulose (not farinose); inflorescence frondose, racemose (not bracteate, thyrses); calyx segments linear in fruit, 6x1mm (not suborbicular, 2x2 mm); corolla up to 8.5 mm long (not 10 mm long); staminodium linear (not broad elliptic); capsule densely lanate-glandulose (not sparsely glandulose).

*Type:* Iran, Yassuj: between Kumehr and Kakan, Maregun waterfall, ca. 2300m, 26. 05. 2006, Attar & Zamani, 36109 (holotype: TUH, Isotype: TARI).

*Other specimen:* Iran: Yassuj: between Kumehr and Kakan, Maregun waterfall, Maregun village, 2200 m, Mozaffarian, 47453.

*Habitat:* Rocky slopes.

### ***Scrophularia papyracea* Attar, sp. nov.**

Suffruticosa, glabrescens, usque 30 cm alta. Caules numerosi, costati, simplices. Folia ca. 2-2.5x2.3-3 cm, opposita, sessilia, subamplexicaulia, ovata vel ovato-cordata, acuta, obtusa vel apiculata; folia infima denticulata usque integra; folia media et superiora integra. Inflorescentia bracteolata; thyrsus laxus; cymae inferiorae alternate, superiores oppositae; pedunculi ad 1 cm longo, superiores 4 mm longo; pedicelli 1-6 mm longi. Bracteae cymarum superiorum lanceolato-triangularae 4x2 mm; bracteolae lineares vel triangulares, breves. Calycis laciniae subaequales, 3 mm longae, 2 mm latae, oblongae vel ellipticae, obtusae vel acutae, margine planae membranacea vel rubescentes. Corolla tubulosa, 6 mm longa, viridis, lobis superioribus ad 2 mm longis, rotundatis, margine rubescentibus. Stamina 5 mm longa, inclusa. Staminodium apicem versus liberum, flabellatum, lobis lateralibus subaequilongis. Capsula glabra, 5x5 mm, rotundata, apiculata; semina immaturata.

Suffruticose, glabrous, up to 30 cm long. Stems numerous, almost simple, striate. Leaves opposite, sessile, subamplexicaul, ovate-cordate, acute, obtuse or sometimes apiculate; lowers dentate to entire at margin; medians and uppers entire. Inflorescence bracteose, few-flowered; cymes alternate below, opposite above; lower cymes with up to 1cm long

peduncle, in upper cyme 4 mm long; pedicel 1-6mm long. Bracts in lower cyme lanceolate-triangular, 4x2 mm; bracteoles linear or triangular, short. Calyx segments subequal, 3x2mm, oblong to elliptic, with white or reddish flat margin. Corolla 6 mm long, upper lip 2 mm long, green, reddish at margin. Stamens included, 5 mm long. Staminode free above, flabellate, subequal with lateral lobes. Style up to 4 mm long. Capsule glabrous, 4x4 mm, apiculate. Seeds immature.

*Type:* Lorestan: Aligudarz to Baznavid, Darr-e Abesefid, 2100m, 1996.7.7, Mozaffarian, 77214. (holotype. TARI).

*Affinities.* *S. papyracea* is morphologically related to *S. crassiuscula* but it is distinguished from it by following characters: leaves not black-punctate; corolla green reddish (not reddish yellow); peduncle 5-12 mm long (not upto 6 mm); staminode flabellate (not broad elliptic); capsule 3x3 mm (not 6x5 mm).

### **Key to species**

1. Inflorescence distinctly leafy (frondose) 2
- Inflorescence leafless (bracteate) or subfrondose 6
2. Capsule covered by erect dense hairs and glandular hairs, rarely glabrous 3
- Capsule glabrous 4
3. Inflorescence thyrses, 4-5-flowered; staminode absent *S. vernalis* L.
- Inflorescence racemose, 1-2-flowered; staminode linear *S. denaensis* Attar
4. Calyx segments with dense brown sessile glands at margin; staminode absent
- S. ghahremanii* Attar & Hamzeh'ee
- Calyx segments and staminode not as above 5
5. Plant long hairy; staminode nearly rounded or spatulate or trapezoid *S. oxysepala* Boiss.
- Plant glabrous; staminode triangular, shallowly 3-parted above *S. kurdica* Eig. var. *glabra*
6. Inflorescence subfrondose 7
- Inflorescence distinctly bracteate 9
7. Corolla 3-5 mm long
- S. shulabadensis* Attar & Hamzeh'ee
- Corolla longer 8
8. Calyx segments glandular *S. scopolii* Hoppe ex Pers
- Calyx segments eglandular *S. crenophila* Boiss.
9. Leaves verticillate 10
- Leaves alternate or opposite 12
10. Corolla purple to red; staminode present
- S. kermanica* Ghahreman & Mirtadzadini
- Corolla green to rubescence 11
11. Leaves pinnatiparted *S. orientalis* L.
- Leaves entire, dentate or serrate at margin

	<i>S. nervosa</i> Benth.	30. Staminode absent; inflorescence racemose	
12. Leaves alternate	13		<i>S. xylobasis</i> Rech.f.
- Leaves opposite	18	- Staminode present; inflorescence thyrse	31
13. Plant annual	<i>S. ilwensis</i> C. Koch	31. Leaves white-cartilagineous at margin	
- Plant perennial	14		<i>S. deserti</i> Del.
14. Leaves undivided	15	- Leaves not as above	32
- Leaves divided	16	32. Margin of calyx segments white, undulate, 0.5-1.5 mm wide	33
15. Leaves lanceolate, entire	<i>S. leucoclada</i> Bunge	- Margin of calyx segments not undulate, rarely white	35
- Leaves lanceolate, coarsely dentate at base	<i>S. syriaca</i> Benth.	33. Plant often pruinose; staminode linear	
16. Corolla to 8.5 mm long; upper lip crenulate at margin	<i>S. valida</i> Grau		<i>S. pruinosa</i> Boiss.
- Corolla up to 5 mm long	17	- Plant not pruinose; staminode subrounded	34
17. Staminode large, up to 3 mm long		34. Margin of calyx segments 0.5mm wide	
	<i>S. azerbaijanica</i> Grau		<i>S. olympica</i> Boiss.
- Staminode smaller, up to 1.5 mm long	<i>S. striata</i> Boiss.	- Margin of calyx segments 1.5mm wide	
			<i>S. sanguina</i> Grau
18. Leaves broad, rarely lanceolate, undivided, indistinctly dentate or crenate or dentate at margin	19	35. Corolla yellow	36
- Leaves variously parted	27	- Corolla green, pink, red or purple	37
19. Leaves entire, sometimes indistinctly dentate		36. Leaves broadly serrate; bracts sparsely glandulose	
	<i>S. crassicaulis</i> Boiss.		<i>S. flava</i> Grau
- Leaves crenate or dentate	20	- Leaves irregularly pinnatisect; bracts glabrous	
20. Lips subequal; staminode absent	<i>S. nikitinii</i> Gorsck.		<i>S. ispahanica</i> Attar & Nowrouzi
- Lips unequal; staminode present	21	37. Corolla 10 mm long, bright pink	<i>S. farinosa</i> Boiss.
21. Corolla lemon yellow, 20 mm long		- Corolla shorter, in other color	38
	<i>S. megalantha</i> Rech.f.	38. Stem solitary; inflorescence up to 50 cm long	
- Corolla green, olivaceous or brown-green, rarely red, up to 10 mm long	22		<i>S. rechingeri</i> Grau
22. Stem leaves sessile	<i>S. amplexicaulis</i> Benth.	- Stem and inflorescence not as above	39
- Stem leaves petiolate or shortly petiolate	23	39. Plant dwarf; leaves crenate, dentate or entire	40
23. Calyx segments 1.5x1.5 mm, glandular-hairy; pedicel glabrous below calyx		- Plant larger	41
	<i>S. chlorantha</i> Kotschy & Boiss. ex Boiss.	40. Corolla reddish yellow; peduncle up to 6 mm long; capsule 6x5 mm	<i>S. crassiuscula</i> Grau
- Plant not as above	24	- Corolla green, reddish; peduncle 5-12 mm long; capsule 3 x 3 mm long.	<i>S. papyracea</i> Attar
24. Corolla red or reddish	25	41. Capsule distinctly rostrate; corolla brownish green, 7 mm long	<i>S. rostrata</i> Boiss. & Buhse
Corolla green or yellowish green	26	- The characters combination not as above	42
25. Plant green, up to 100 cm tall; stem winged		42. Corolla 5 mm long; upper lip 3 mm long and 4 mm wide; staminode spatulate	<i>S. puberula</i> Boiss.
	<i>S. iranica</i> Attar	- The characters combination not as above	43
Plant canescent, short; stem unwinged		43. Plant pruinose, with grayish-green habit	
	<i>S. schiraziana</i> Attar & Hatami		<i>S. zuvadica</i> Grossh.
26. Calyx segments glandular		- Plant not as above	44
	<i>S. cattariifolia</i> Boiss. & Heldr.	44 Staminode reniform, elliptic or subrounded	45
- Calyx segments glabrous	<i>S. umbrosa</i> Dumort.	- Staminode linear	52
27. Leaves pinnatisect, apparently compound	28	45. Plant almost leafless, only leafy in lower part	
- Leaves irregularly parted	30		<i>S. subaphylla</i> Boiss.
28. Leaves bipinnatisect; plant biennial, stout, 60-110 cm tall		- Plant leafy	46
	<i>S. mesopotamica</i> Boiss.	46. Corolla red or pale red	47
- Leaves pinnatisect, apparently compound; plant perennial	29	- Corolla green or yellowish	53
29. Corolla 6-9 mm long; leaflets small, subequal		47. Peduncles and pedicels spinose; habit of plant similar to <i>Alhagi</i>	<i>S. alhagioides</i> Attar & Joharchi
	<i>S. elburzensis</i> Bornm.	- Peduncles and pedicels not as above	48
- Corolla 5.5 mm long; leaves lyrate, with large terminal lobes	<i>S. gaubae</i> Bornm.	48. Plant totally farinose	49
		- Plant not farinos	51

49. Basal leaves in rosette with 1-6 cm long petiole; staminode linear or absent 50  
 - Basal leaves not rosette; staminode broadly elliptic  
*S. variegata* M. B. subsp. *cinerescens* (Boiss.) Grau
50. Staminode linear; plant grayish *S. rosulata* Stiefelh.  
 - Staminode absent; plant green  
*S. khorassanica* Attar & Joharchi
51. Peduncles thin; lower cymes up to 8-flowered  
*S. variegata* M. B. subsp. *variegata*  
 - Peduncles hardly thickened; lower cymes 1-2-flowered  
*S. crassipedunculata* Attar & Joharchi
52. Lower cymes up to 12-flowered  
*S. libanotica* Boiss.  
 - Lower cymes up to 6 -flowered; anthers yellowish or reddish  
*S. frigida* Boiss. subsp. *frigida*
53. Plant glaucous  
*S. frigida* Boiss. subsp. *haussknechtii* Bornm. ex Grau  
 - Plant green 54
54. Corolla more or less 8 mm long; plant tortose  
*S. tortousissima* Attar & Joharchi  
 - Corolla shorter; plant not tortose 55
55. Calyx segments glabrous 56  
 - Calyx segments often glandular 57
56. Corolla 4 mm long; anthers yellow  
*S. atropatana* Gross.  
 - Corolla 6 mm long; anthers white or red  
*S. glauca* Decne.
57. Lower cymes 6-12-flowered; thyrses dichotomously branched  
*S. svartiana* Gabrielian  
 - Lower cymes 1-7-flowered; thyrses not as above 58
58. Lower cymes 3(-7)-flowered; calyx segments elliptic, 2.5 x 2 mm; staminode linear  
*S. scoparia* Pennell

- Lower cymes 1-2-flowered; calyx segments suborbicular, 2 x 1.5 mm; staminode rounded  
*S. gorganica* Rech. f.

### Acknowledgments

I am grateful to Dr. Mostafa Assadi for supporting this project and his useful helps during the studies. I wish to thank Dr. Musa Iranshahr for editing the Latin diagnoses Mr. Behnam Hamzeh'ee for editing the text, Mrs. Fatemeh Aghabeigi, curator of IRAN herbarium for providing the herbarium specimens, and Miss. Nowbakht for preparing the illustrations.

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