

# A REVISION OF THE GENUS NOAEA MOQ. (CHENOPODIACEAE) IN IRAN

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The genus *Noaea* is revised in Iran. Three known species of the genus are recognized from Iran. *N. mucronata* is the most widespread species with three subspecies, including subsp. *mucronata*, subsp. *tournefortii*, and subsp. *leptoclada*. *N. mucronata* subsp. *leptoclada* is the new combination. *N. major* and *N. minuta* are the annual species with much more restricted distribution and are recorded for the first time from Iran.

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Key words. *Chenopodiaceae*, *Noaea*, taxonomy, Iran.

آرایه‌شناسی جنس *Noaea* در ایران

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جنس *Noaea* در ایران مورد بررسی قرار گرفته است. هر ۳ گونه شناخته شده جنس از ایران تشخیص داده می‌شود. گونه *N. mucronata* با ۳ زیرگونه زیر فراوان‌ترین گونه است.

زیرگونه *subsp. mucronata*, *subsp. tournefortii*, *subsp. leptoclada* و *N. major* ترکیب جدیدی است. گونه *N. mucronata subsp. leptoclada* و *N. minuta* گیاهانی یکساله با انتشار محدودی هستند که برای اولین بار از ایران گزارش می‌شوند.

## INTRODUCTION

The plant family *Chenopodiaceae* has a wide distribution in Iran, mostly flowering in autumn and under collection. Therefore, former revisions mostly have been based on poor materials. The author started studies on this family several years ago. Due to the poor collection of the family, collecting put into priority. Then the author started preparation of a revision for the Flora of Iran (in Persian). Meanwhile, preparation of the Flora Iranica started more or less parallel which was recently published (Rechinger 1997). It seems still many parts of the Flora Iranica have been based on inadequate materials and field studies.

The genus *Noaea* has a wide distribution in Iran, which was recently revised by the author. In this paper identification keys, descriptions and distributions are given for the known species in Iran. For the genus *Noaea* in Flora Iranica (Hedge 1997) only *N. mucronata* (Forssk.) Aschers & Schweinf. without any subspecific classification was recognized from Iran. In this paper *N. mucronata* is divided to three subspecies. Moreover, *N. major* and *N. minuta* are recorded for the first time from Iran.

## History

The genus *Noaea* was described by Moquin-Tanden (1849). He included in the genus seven species, nowadays two of them namely, *N. tournefortii* (Spach) Moq. and *N. spinosissima* Moq. remains under the genus *Noaea*. The others have been transferred to the other genera, i. e. *Salsola* L. *Gamanthus* Bge. and *Girgensohnia* Bge. ex Fenzl. Bunge (1862) revised the genus. He recognized six species, namely *N. griffithii* Bge., *N. spinosissima*, *N. tournefortii*, *N. daghestanica* (Turcz.) Bge., *N. major* Bge. and *N. minuta* Boiss. & Balansa. Aellen (1953) revised the genus again. He recognized four species for the genus, transferring *N. daghestanica* to the genus *Salsola* as *S. daghestanica* (Turcz.) Lipsky and reducing *N. tournefortii* (Spach) Aellen to subspecies level, namely *N. mucronata* subsp. *tournefortii* (Spach) Aellen. Meanwhile, he divided the species *N. mucronata* (Syn.: *N. spinosissima*) to two subspecies, five varieties and a form. Freitag and Khani (1987) transferred *N. griffithii* to the genus *Salsola*, based on the horizontal embryo character. Even if this paper does not cover the whole distribution of the genus but it includes the whole, up to now, known taxa of it.

**DELIMITATION OF THE GENUS**

Obviously, the genus *Noaea* is closely related to the genus *Salsola*. Traditionally, the main character has been used to distinguish *Noaea* from *Salsola* is vertical versus horizontal embryo. However, this character is not constant as in some species of *Salsola*, more to the horizontal, vertical or/and oblique embryo have been observed. Table 1 shows list of the Iranian *Salsola* species with the orientation of embryo other than horizontal. Therefore, as in none species of *Noaea* horizontal embryo have been observed this character seems to be reliable to separate *Noaea* from *Salsola*. However, delimitation of some of the genera in *Chenopodiaceae* needs further investigations (Freitag 1997).

**TAXONOMIC TREATMENT**

**Noaea** Moq.

Annual or perennial. Leaves alternate, non-succulent. Flowers solitary in leaf axils along the stems or spiny branches, hermaphrodite, bi-bracteate. Perianth segments 5, winged in fruiting stage. Stamens 5; anthers bearing a sessile, non-vesicular appendage. Stigma 2. Embryo spiral, vertical.

**Key to the species**

- 1- Perennial **1. N. mucronata**
- Annuals **2**
- 2- Plant ca. 20 cm tall. Stem more or less glabrous. Flowers on spikelike branches or sometimes along the main stem. Appendages as long as the anthers **2. N. major**
- Plant up to 11 cm tall. Stem densely covered by hairs. Flowers along the main stem, dense. Appendages 1/4 of the anthers **3. N. minor**
- 1. N. mucronata** (Forssk.) Asch. & Schweinf, Mem. Inst. Egypt. 2: 131 (1889). Syn.: *Salsola mucronata* Forssk., Fl Aegypt. -Arab. 56 (1775); *N. mucronata* var. *horrida* Aellen, Mitt. Basler Bot. Ges. 1 (1): (1953); *N. mucronata* f. *humilis* (Boiss.) Aellen, l. c. 12; *N. mucronata* var. *elongata* Aellen, l. c. 12; *N. mucronata* subsp. *tournefortii* (Spach) Aellen var. *inermis* Aellen et var. *armata* Koeie & Aellen, l. c. 13.
- Perennial, often woody at base, up to 1 m tall, branched from base, glaucous, sometimes reddish, glabrous or covered by small hairs, sometimes with long hairs in leaf or flower axils. Leaves up to 5 cm long, linear-filiform. Spiny branches 2.5-6 cm long. Flowers on main or spiny branches. Bracts short, equalling or longer

Table 1. Iranian *Salsola* species with the orientation of embryo other than horizontal.

| Species                                | Embryo orientation              |
|--|---------------------------------|
| <i>S. arbusculiformis</i> Drob.        | Horizontal or vertical          |
| <i>S. soda</i> L.                      | Horizontal, oblique or vertical |
| <i>S. gemmascens</i> Pall.             | Oblique                         |
| <i>S. yazdiana</i> Assadi              | Oblique                         |
| <i>S. sclerantha</i> C. A. Mey.        | Horizontal or vertical          |
| <i>S. aucheri</i> (Moq.) Bge. ex Iljin | Horizontal, vertical or oblique |
| <i>S. cana</i> C. Koch                 | Horizontal or vertical          |
| <i>S. futilis</i> Iljin                | Horizontal or vertical          |
| <i>S. tomentosa</i> (Moq.) Spach       | Horizontal or vertical          |
| <i>S. lachnantha</i> (Botsch.) Botsch. | Horizontal or vertical          |
| <i>S. brachiata</i> Pall.              | Horizontal or oblique           |
| <i>S. crassa</i> M. B.                 | Horizontal or oblique           |
| <i>S. turcomanica</i> Litv.            | Horizontal or oblique           |

than the flowers, lanceolate or ovate-lanceolate, acute or acuminate, gibbous at the base. Perianth segments 3-4 mm long, lanceolate, acute or acuminate, membranous, enervate, winged in fruiting stage; wings median, unequal. Anthers ca. 2 mm long, cleft to the middle; appendages 0.5-1 mm long, triangular, acute. Style 1.5 mm long; stigma 1 mm long.

This species has a wide distribution in the Irano-Turanian region. Morphologically very variable, based on this variation Aellen (1952) described many subspecific taxa. However, many intermediates are

found between the forms, sometimes in the same area. In this paper three subspecies are recognized which more to the morphological characters, they are geographically separated.

### Key to the subspecies

- 1- Spiny branches robust, clearly spiny.
  - Floral leaves and bracts often shorter than the flowers. Lower leaves ca. 2 cm long, soon falling. subsp. **mucronata**
  - Spiny branches absent or weak. Floral leaves and bracts longer than the flowers. Lower leaves up to 4 cm long,

persistent. 2

- 2- Lower half of the perianth segments membranous or cartilaginous in fruiting stage. Wings well developed. Spiny branches leafless. Flowers on main or spiny branches      subsp. **tournefortii**
- Lower half of the perianth segments woody in fruiting stage. Wings small. Spiny branches bearing many small leaves. Flowers usually on main branches      subsp. **leptoclada**

-- subsp. **mucronata**

Syn.: *Anabasis spinosissima* L. f., suppl. Pl. Syst. Veg. 173 (1781); *Noaea spinosissima* (L. f.) Moq. in DC. Prodr. 13 (2): 209 (1849).

*Selected specimens. Gilan:* Rudbar, Kalaj, Sabeti 2915. **-Gorgan:** 19 km from Maravetappeh to Incheboroon, ca. 100 m, Assadi & Abouhamzeh 43322. **-Mazandaran:** Kuh-e Alborz, 44 km from Kandavan to Haraz, 2350 m, Assadi & Salehi 31742. **-Azarbayejan:** 50 km from Zanjan to Tabriz, 1300 m, Assadi & Salehi 31941; between Salmas and Ourumieh, near Khan-Takhti, 1350 m, Assadi & Salehi 32039; Road from Tabriz to Ahar, 22 km to Ahar, 1900-2000 m, Mozaffarian & Mohammadi 37592; 45 km from Zanjan to

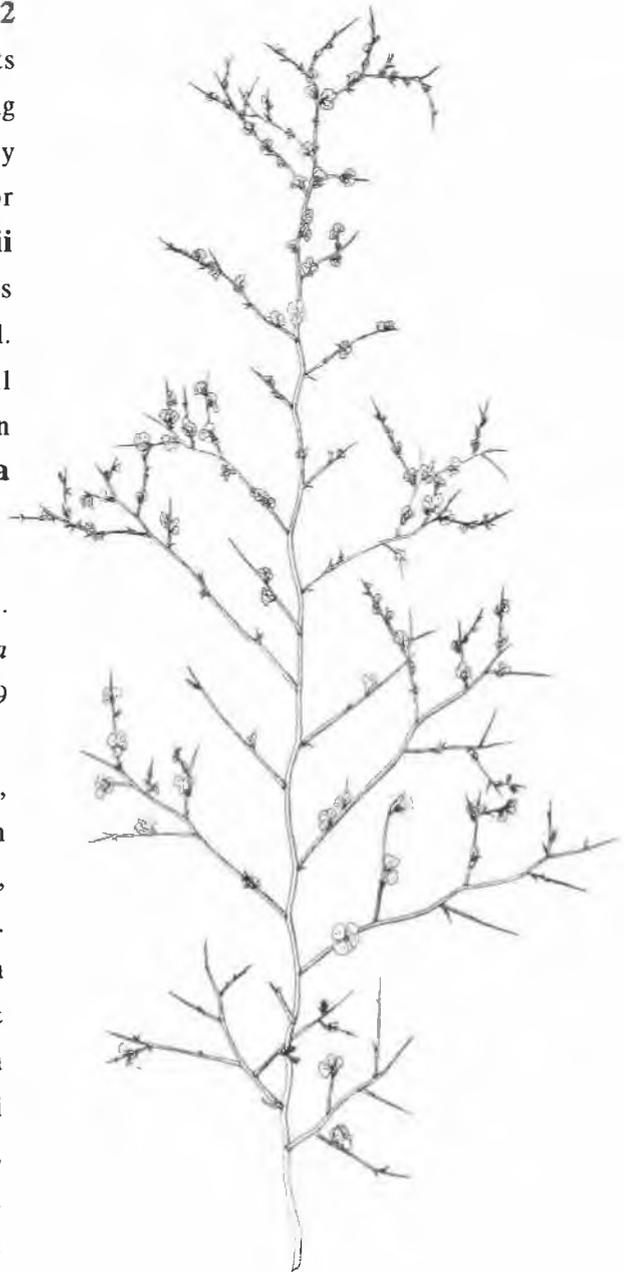


Fig. 1. *Noaea mucronata* subsp. *mucronata* (x0.4).

Bijar, 1550 m, Runemark & Mozaffarian 25920. -**Hamadan**: Ganjnameh, slopes of Kuh-e Alvand, 2100 m, Assadi 61065. -**Bakhtaran**: Between Ghasr-e Shirin and Khosravi, 900 m, Babakhanlou & Kernick 23923. -**Lorestan**: 39 km from Aligoodarz to Shulabad, 2200 m, Assadi & Karimi 43478. -**Esfahan**: Delijan, 1430 m, Sabeti 2900; 29 km from Nain to Ardestan, near Niestanak, 1850 m, Foroughi & Assadi 15157. -**Yazd**: 46 km from Mehriz to Abarghou, 2200 m, Assadi & Abouhamzeh 36467. -**Kohgilouyeh and Boirahmad**: 30 km E. of Behbahan, 400 m, Pabot 25990. -**Fars**: 23 km from Jahrom to Shiraz, 1010 m, Foroughi & Assadi 15089. -**Kerman**: 65 km SW. of Rafsanjan, 2500-2600 m, Jadidi 23824. -**Khorasan**: Mashhad to Sarakhs, after Mozduran, 650 m, Wendelbo & Foroughi 18877; near Bojnourd, 1100 m, Assadi & Abouhamzeh 43350. -**Semnan**: Between Shahrud and Bastam, 1500 m, Assadi & Mozaffarian 40935. -**Tehran**: Between Tehran and Karaj, Chitgar, 1320 m, Riazi 1883; 51 km from Ghom to Kashan, 800 m, Assadi & Abouhamzeh 36322.

*Distribution.* Europe, Turkey, Iran, Caucasus, C. Asia, Afghanistan, Iraq, Syria, Jordan, Palestine, Arabian Peninsula and

N. Africa.

-- subsp. **tournefortii** (Spach) Aellen, Mitt. Basler Bot. Ges. 1 (1): 13 (1953).  
Syn.: *Salsola* (*Halogeton*) *tournefortii* Spach in Kotschy in shed., *Anabasis tournefortii* Jaub. & Spach, Ill. Pl. Or. 2: 43 (1844-1846); *N. tournefortii* (Spach) Moq. in DC. Prodr. 13 (2): 208 (1849).

### Selected specimens

**Azarbayejan**: Ca. 10 km SE. of Mahneshan, margin of Ghezel Ozan river, 1300 m, Assadi & Akhani 61192; Orumieh, 1600 m, Zehzad & Farboudnia 4029; 60 km to Makou, on the road from khoy, 1000 m, Akbarzadeh & Salari 41136. - **Hamadan**: ca. 20 km S. of Nahavand, Kuh-e Garow, above Gamasab spring, 2600 m, Assadi & Mozaffarian 36995.

*Distribution.* Turkey, Iran, Iraq and Syria.

-- subsp. **leptoclada** (Woron.) Assadi, **comb. nov.**

Syn.: *Noaea tournefortii* (Spach) Moq. var. *leptoclados* Woron. in Shed. Busch, Marcowicz et Woron. Fl. Cauc. exc. 11-14: 22 (1909); *N. leptoclada* (Woron.) Iljin in V. L. Komarov (ed.) Flora of the U.S.S.R, vol. 6: 269 (1936).

*Specimen seen.* **Mazandaran**: SE. Chalous, between Pol-e Zoghal and Veisar,



Fig. 2. *Noaea mucronata* subsp. *tournefortii* (x0.5).



Fig. 3. *Noaea mucronata* subsp. *leptoclada* (x0.5).

500-700 m, Runemark & Mozaffarian 25889.

*Distribution.* Iran and Caucasus.

**2. *N. major*** Bge., *Anab. Revisio* 27 (1862).

Annual, ca. 20 cm tall, branched from the base, glaucous, nearly glabrous. Leaves up to 12 mm long, subulate-linear, acute, nearly arcuate, narrowly membranous at the margin. Flowers in the leaf axil of the stem or on spike-like branches. Bracts equalling or slightly shorter than the leaves, leaf-like. Perianth segments 3.5 mm long, lanceolate, acuminate, membranous, indistinctly 1-nerved; wings on the lower half of the perianth segments, with a thick median nerve. Anthers 0.5 mm long, slightly cleft; appendages 0.5 mm long, lanceolate-ovate, acute, sessile. Style 1 mm long; stigma 1.5 mm long.

*Specimens seen.* **Azarbajejan:** Zanjan, 28 km from Ghidar to Garmab, before the village Pire Marzban, 2100 m, Assadi 60997a. **-Tehran:** Ghazvin, s. n. et collect.

**3. *N. minuta*** Boiss. & Balansa, in Boiss., *Diagn. ser.* 2 (4): 76 (1859).

Annual, 3-11 cm tall, sometimes divided at

the base to many stems, glaucous, covered by long hairs. Leaves up to 16 mm long, subulate-linear, acute, arcuate, dense, broadly membranous at the margin. Flowers in the leaf axils of the spike-like stems. Bracts half as long as the leaves, leaf-like. Perianth segments 3-4 mm long, lanceolate, acute, membranous, indistinctly 1-nerved; wings on the lower half of the perianth segments, with a thick median nerve. Anthers ca. 1 mm long, slightly cleft; appendages ca. 0.2 mm long, triangular, obtuse, sessile. Style 1 mm long; stigma 1.5 mm long.

*Specimens seen.* **Azarbajejan:** Zanjan, 28 km from Ghidar to Garmab, before the village Pire Marzban, 2100 m, Assadi 60998; 22 km SE. Tabriz, 1800 m, Pabot 25920.

*Distribution.* Turkey, Iran and Caucasus.

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Fig. 4. *Noaea major* (right), *N. minuta* (left) (x0.6); ovary (x9); anther (x12).

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