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MORPHOLOGICAL STUDY FOR *VALERIANELLA KOTSCHYI* BOISS. AND *V. MURICATA* (STEV.) BAXT. (*VALERIANACEAE*) IN KURDISTAN, IRAQ

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Abstract

This study a survey for the species *Valerianella kotschyi* Boiss. and *V. muricata* (Stev.) Baxt (Valerianaceae) in Kurdistan, Iraq was presented along with survey and identification of samples preserved in some Iraqi herbaria. Several scientific excursions were made to different regions in Kurdistan and a comparative study was conducted on the vegetative and reproductive parts. These have been reinforced by graphs. The present study dealt with the environment and geographical distribution and a map was designed for this purpose.

Key words: Survey, Kurdistan, Iraq, *Valerianella kotschyi*, *V. muricata*, Valerianaceae.

Introduction

One of the families that found in Iraq is Valerianaceae family which involves 300 species throughout the world that are distributed on 10 genera (Simpson, 2006), while in Iraq involves 15 species distributed on 3 genera (Al-Rawi, 1964). Zohary (1964) pointed out to the presence of 10 species of the genus *Valerianella* in Iraq, as well as Rechinger (1964) also stated that 13 species were found in low lands of Iraq. In Europe, Walters (1976) stated that 22 species of the genus were found involving *V. kotschyi*. In Turkey, Coode and Matthews (1972) also mentioned that 31 species of the genus were found involving the two studied species, and in Saudi Arabia, Migahid (1978) indicated only 1 species. In Iraq, Al-Rawi (1964) mentioned the distribution of 15 species of *Valerianella*, and Ridda & Daood (1982) stated that 13 species of the genus were found indicating the districts in which the species are distributed. Khalaf (1980) pointed out to the presence of 9 species in Sinjar mountain and Faris (1983) mentioned 4 species in Piramagrun mountain. In Iran, Rechinger (1969) mentioned 24 species of *Valerianella*, while Ghahreman and Attar (1999) mentioned 25 species. Both Fatah (2003) and Ahmed (2010) did not mention any species of the Valerianaceae family plants in Haybat Sultan mountain and Darband Gomaspan respectively [Muthik Abd Muslim Guda and Almayahi (2016), Ahmad (2013)]. While Ahmad (2013) mentioned 4 species of *Valerianella* in Hawraman mountain. The present study aimed to study the morphological characters and the geographical distribution of the species *V. kotschyi* and *V. muricata* in Kurdistan region of Iraq, as well as fixation some ecological notes and study of plant specimens found in some Iraqi herbaria to add a small part to the Flora of Iraq.

Materials and Methods

Several scientific excursions (about 30 excursion) were made to different districts of Kurdistan (MAM, MRO, MSU, FKI, FAR and FNI) during Spring and Summer season of the years 2016-2017 for plant specimens collection, some Iraqi herbarial specimens were used, these specimens were identified by helping of some keys especially in Flora of Turkey, the specimens were made herbarially to become formal specimens, and putted in herbarium of Education college. Species

geographical distribution was cleared with fixation of some ecological notes, and map (fig. 1) was putted.

Results

1.***Valerianella*** Miller, Fl. Lo. La. Iraq, Rechinger, 571 (1964); Fl. Iranica, Rechinger, 69/30. 4:1 (1969); Fl. Turkey, Coode & Matthews, 4: 559 (1972). Syn: *Fedia* Gaertn., Fruct. Sem. Pl. 2 (1791). Annual herbs, erect, often branched. Indumentum of retrorse, asperous papillae or puberulence, sometimes more or less glabrous, especially in upper parts of plant. Basal leaves entire to sinuate-dentate, spatulate and cuneate at base or oblanceolate or oblong and more or less sessile. Median leaves with more pronounced teeth. Upper leaves usually with a few very distinct teeth at the base. Inflorescence a contracted cyme. Calyx variously toothed or coronate, regular or irregular, sometimes inflated or absent. Corolla not spurred, regularly 5-fid. Fruit 3-locular with 2 sterile loculi [Coode and Matthews (1972)].

1- Calyx glabrous, fruiting calyx cup-shaped, crown flat and broad

1- *V. kotschyi*

1-Calyx pubescent, fruiting calyx urceolate, crown erect and narrow

2- V.muricata

1- *V. kotschyi* Boiss., Fl. Lo. La. Iraq, Rechinger, 576 (1964); Fl. Iranica, Rechinger, 69/30. 4: 13 (1969); Fl. Turkey, Coode & Matthews, 4: 576 (1972).

Annual herb, (11-30) cm, pubescent, stem erect, ascending, branched or unbranched, green. Leaves decussate, connated at the base, Basal leaves oblanceolate, narrowly oblanceolate, margin entire, apex obtuse, base truncate, (15-40)×(3-11) mm. Lower cauline leaves narrowly elliptic, very narrowly elliptic, margin entire, dentate, pinnatifid, apex obtuse, acute, base truncate, (21-32)×(6-12) mm. Upper cauline leaves linear, cultrate, narrowly oblanceolate, very narrowly elliptic, margin entire, dentate, pinnatisect (with two or four small

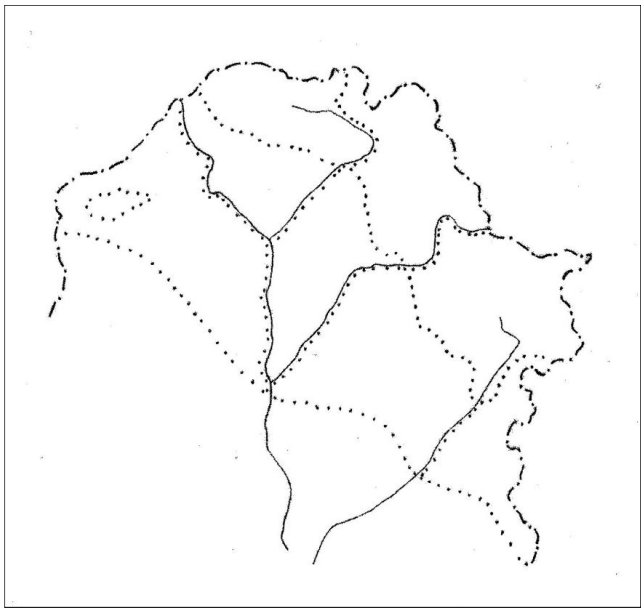

Fig 1: A map shows the geographical distribution of the tow species

1 ***V. kotschyi*** 2 *V. muricata*

V. kotschyi

V. muricata

Plate 1: Photographs of the studied species

Basal leaves

Lower cauline leaves

Upper cauline leaves

Flowering heads with bracts

Plate 2: *Valerianella kotschyi*: Vegetative parts with flowering heads

segments at the base), apex acute, acuminate, base truncate, (11-37)×(2-5) mm. Inflorescence semi-globular, (3-8)×(3-6) mm, peduncle costate, pubescent, green, green-yellow, (5-12)×(0.3-1.0) mm. Bracts linear, linear-cultrate, margin entire, apex acute or acuminate, base truncate, (4.5-10.0)×(0.5-1.0) mm, bracteoles narrowly ovate, membranous, webbed (the membranous margins running down and continuous with the winging of the inflorescence branches), margin entire, pilose, apex acute, base rounded, (2.1-4.0)×(0.6-2.0) mm. Flowers hermaphrodite, entomophilous [Watson and Dallwits (1992)], sessile. Calyx coronate, Sepals 6 or 7, connate to form a limb and a tube, spreading, limb lobes weakly hooked at apices, green, glabrous, (0.6-0.8)×(0.7-1.0) mm,

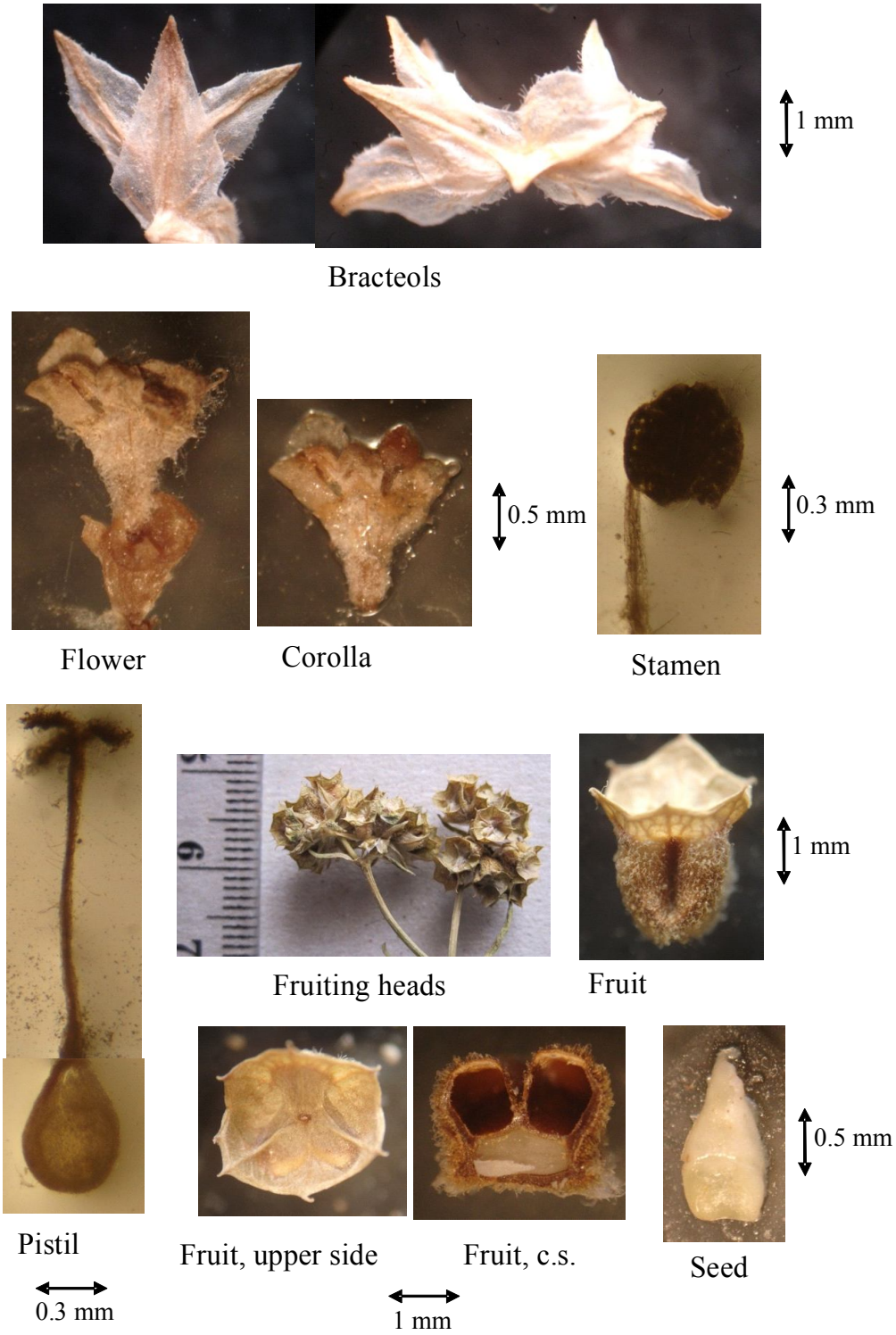

Plate 3: *Valerianella kotschyi*: Reproductive parts with bracteols

tube cup-like, green, (0.4-0.8)×(0.3-0.6) mm. Corolla of limb and tube, pubescent, yellow, limb of 5 lobes, lanceolate, apex obtuse, limb (0.5-0.7)x(0.8-1.3) mm, the tube (0.7-1.0)×(0.5-0.7) mm. Stamens 3, epipetalous, at the end of the tube, exerted, filaments filiform, yellow, (0.7-0.9) ×(0.05-0.08) mm, anthers oblong, yellow, versatile with the filament, (0.4-0.7)×(0.3-0.4) mm. Pistil 1, 3-locular with 2 sterile loculi, ovary inferior with a single pendulus ovule in the fertile locule, ovoid, yellow, (0.4-0.7)×(0.3-0.6) mm, style filiform, terminal attachment with the ovary, yellow, (1.4-1.8)×(0.05-0.08) mm, stigma bi-branched, yellow, (0.2-0.25)×(0.04-0.06) mm. Fruiting head semi-

Basal leaves

Lower cauline leaves

Upper cauline leaves

Flowering heads with bracts

Plate 4 : *Valerianella muricata*: vegetative parts and flowering heads with bracts

globular, (5.5-10)×(4.5-8) mm, fruit 3-locular with 2 sterile loculi, indehiscent, cup-shaped, pubescent, pilose, brown, yellow, crowned with the fruiting calyx with 6-7 lobes, each with weak hook at the apex, (1.1-2.1) × (1.3-2.2) mm, the crown (0.5-1.0)×(2.2-3.1) mm, the tube (1.2-2.2) × (1.4-2.3) mm. Seed single in the fertile locule, very broadly ovoid, yellow, (1.0-2.0)×(0.8-2.0) mm. (plates 1, 2, 3).

Syntypes: in Mesopotamia, Aucher 2077; [Syria] prope Aleppum, Kotschy 108a, sub *V. hamate*, (K! BM!). [Coode and Matthews (1972)]

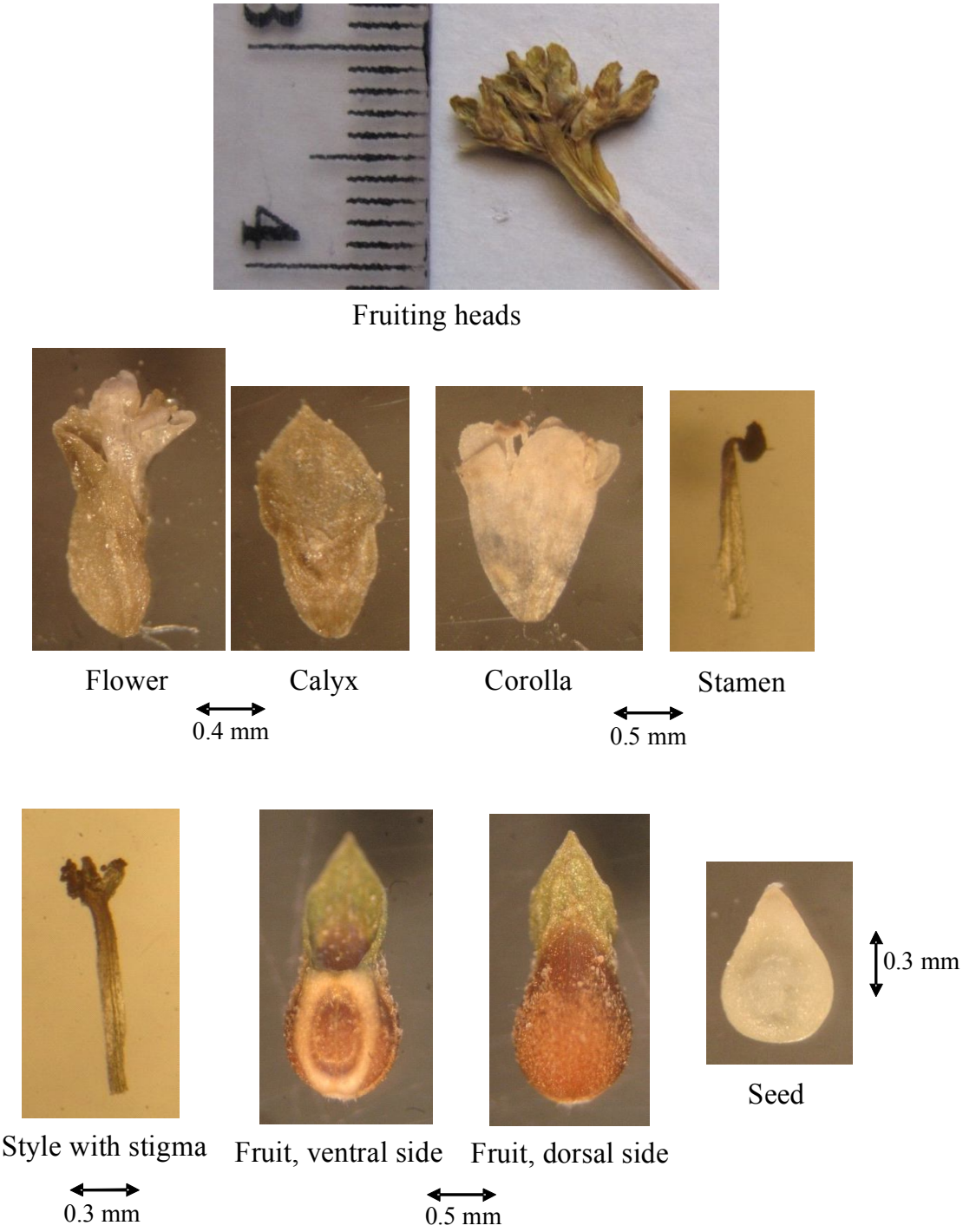

Plate 5: *Valerianella muricata*: Reproductive parts with fruting heads

Selected samples from the studied specimens

MAM: ESUH/ Girbeesh, 900 m, 24.5.2016, A. Sardar & M. Sh. Sulaiman, 7121; MRO: Bekhal, 600 m, 11.4.2016, Al-Khayat, A. Sardar & H. Osman, 7123; MSU: Chachamal, 710 m, 28.3.2017, A. Sardar & B. Abdullah, 7125.

Environment & Geographical Distribution

Find as separated individual within the area, in clay, limestone, rocky clay soils; altitude: 300-1450 m; flowering: March-May.

Starts in distribution from Amadyia district (MAM) in Matin mountain (Sulav), Gali Baadri, Girbeesh, and reach Rowanduz district (MRO) in Khoshkan villege (Sakran mountain, Bikhma, Balisan valley, Safin mountain, Shera Swar, Darbandi Gomaspan, then elongated to Sulaimanyia district (MSU) in Qaradagh, Sarchnar, Tasluja, Chamchamal, in Kirkuk district (FKI) distribute

between Kirkuk and Qara Hanjeer, Kirkuk, and in Erbil district (FAR) distribute between Erbil and Daratu, Erbil, Ain Kawa, Bahrka, between Ain Kawa and Pirzeen, Jadeeda (on Aski Kalak road), and Kandinawa. (figure 1).

2-*V. muricata* (Stev.) Baxt, Fl. Lo. La. Iraq, Rechinger, 574 (1964); Fl. Iranica, Rechinger, 69/30. 4: 16 (1969); Fl. Turkey, Coode & Matthews, 4: 581 (1972). Syn: ***Fedia muricata*** Stev. in Roemer & Schultes, Syst. Veg. 1: 366 (1817); ***V. truncate*** Fl. URSS 23: t. 34 f. 2 (1958).

Annual herb, (12.5-42) cm, pubescent, stem erect, ascending, branched, green, green-yellow. Leaves decussate, connated at the base, Basal leaves oblanceolate, narrowly oblanceolate, margin entire, apex obtuse, rounded, base truncate, (10-30)×(2.5-4.0) mm. Lower cauline leaves narrowly oblanceolate, very narrowly elliptic, cultrate, margin entire, apex obtuse-acute, rounded, acuminate, base truncate, (13-40)×(2.0-4.5) mm. Upper cauline leaves linear, narrowly oblanceolate, narrowly oblong, margin entire, apex acuminate, rounded, obtuse-rounded, base truncate, (14-32)×(1.2-5.0) mm. Inflorescence semi-globular, (3.0-4.5)×(2.0-3.5) mm, peduncle costate, pubescent, green, green-yellow, (4-12) ×(0.4-0.7) mm. Bracts narrowly elliptic, cultrate, linear, margin entire, apex obtuse, acuminate, base truncate, (7-12)×(0.5-3.0) mm, bracteols oblanceolate, narrowly oblong, membranous, webbed (the membranous margins running down and continuous with the winging of the inflorescence branches), margin entire, apex acute, base truncate, (2.4-2.9)×(0.6-0.8) mm. Flowers hermaphrodite, entomophilous [Muthik Abd Muslim Guda *et al*. (2016)], sessile. Calyx coronate, form a limb and a tube, limb coronate, erect, green, pubescent, (0.7-0.9)×(0.6-0.8) mm, tube tubular-cup shape, green, (0.6-0.9)×(0.5-0.8) mm. Corolla of limb and tube, yellow, limb of 5 lobes, oblanceolate, apex obtuse, limb (0.3-0.5)×(0.8-1.1) mm, the tube (0.7-1.0)×(0.5-0.7) mm. Stamens 3, epipetalous, at the upper part of the tube, exerted , filaments filiform, yellow, (0.55-0.75)×(0.05-0.07) mm, anthers broadly oblong, yellow, versatile with the filament, (0.15-0.35) ×(0.05-0.10) mm. Pistil 1, 3-locular with 2 sterile loculi, ovary inferior with a single pendulus ovule in the fertile locule, oblong, yellow, (0.4-0.9)×(0.5-0.8) mm, style filiform, terminal attachment with the ovary, yellow, (0.7-1.0)×(0.07-0.09) mm, stigma tri-lobed, yellow, (0.15-0.30) ×(0.20-0.35) mm. Fruiting head semi-globular, (4-6)x(5-7) mm, fruit 3-locular with 2 sterile loculi, indehiscent, urceolate, pubescent, brown, with erect crown, (0.7-1.3) ×(0.6-0.9) mm, limb, (0.7-1.0)×(0.5-0.8) mm, the fruiting calyx tube (0.8-1.6)×(0.6-1.1) mm. Seed single in the fertile locule, ovoid, white-yellow, (0.6-1.1)×(0.5-0.8) mm. (plates 1, 4, 5).

Type: Tauria, Stev., H. (11).

Selected samples from the studied specimens

MAM: ESUH/ Gali Balinda, 800 m, 25.4.2016, A. Sardar, M. Ibrahim, 7131; MRO: Sakran mountain, 1700 m, 22.5.2016, Al-Qaisi & A. Sardar, 7133; MSU: Tawela, 1400 m, 9.5.2017, A. Sardar and B. Abdullah, 7136.

Environment and Geographical Distribution

Find as separated individual within the area, in clay, rocky clay soils; altitude: 500-1700 m; flowering: April-June.

Starts in distribution from Amadyia district (MAM) in Gali Balinda, Kilia Shada (in Gali Dohuk), then continue to MRO district and present in Sakran mountain, Piran mountain; in MSU district it is found in Tawela. (figure 1).

Discussion

This study dealt with the species of *Valerianella kotschyi* and *V. muricata* (Valerianaceae) from limited aspects including the study of morphological characters as well as the study of environment and their distribution in the studied districts.

One of *Valerianella* characters which have a taxonomical importance is the calyx which is coronate, spreading, weakly hooked at apices of the lobes, glabrous in *V. kotschyi*, and coronate, erect, pubescent in *V. muricata*. The cauline leaves in *V. kotschyi* are entire, dentate, or pinnatifid, while in *V. muricata* are entire. It seems that the anther is oblong in *V. kotschyi*, while in *V. muricata* is broadly oblong. Another character which has an important role is the seed which is very broadly ovoid in *V. kotschyi*, and ovoid in *V. muricata*. The corolla hairs are pubescent in *V. kotschyi*, while the corolla is glabrous in *V. muricata*. The fruit has the same taxonomic importance as the flowering calyx. The other characters did not show any taxonomical importance or have limited taxonomical importance. During the scientific excursions to the different districts, the specimens of each species were collected. The flowering period extended from the beginning of March to the end of May in *V. kotschyi*, while in *V. muricata* it is started from the beginning of April to the end of June, and the tow species were annuals. The research was somewhat capable to cover the geographical distribution and the environment of the tow species and appeared that the species *V. kotschyi* is more distributed than *V. muricata*.

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