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## Six new species of *Alchemilla* series *Calycinae* (Buser) Rothm. (Rosaceae) from the Caucasus

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**Keywords:** aggregate, apomicts, Georgia, morphology, Russia, taxonomy.

**Summary.** Descriptions and illustrations of the key morphological characters for six new species of *Alchemilla* ser. *Calycinae* (*A. bezengiensis*, *A. kazbekensis*, *A. longipedicellata*, *A. muldaschevii*, *A. pseudotranscaucasica*, *A. ptyschensis*) are presented. *A. bezengiensis* (*A. aggr. ellenbergiana*) differs from related species by hairy stems throughout and/or densely hairy hypanthia, and/or hairy lower leaf surface. *A. kazbekensis* (*A. aggr. dura*) is formally close to *A. ser. Elatae* by having patent indumentum of stems and petioles that differs it from all other *Calycinae*. *A. longipedicellata* (*A. aggr. abchasica*) is distinguished from most members of the aggregate by fewer leaf lobes and/or glabrous hypanthia, from other *Calycinae* – by numerous teeth of leaf blades and/or slightly dissected leaves. The three last species belong to *A. aggr. transcaucasica* being quite similar by appearance. *A. muldaschevii* differs from relatives by having entirely glabrous stems and orbicular upper radical leaves with overlapped basal lobes. *A. pseudotranscaucasica*, in comparison with others, has evenly hairy leaves beneath and stems hairy throughout, but glabrous hypanthia. *A. ptyschensis* is distinguished from other species of the aggregate by stems hairy only at the lowermost internode; from other *Calycinae* – besides the stem indumentum by longer truncate leaf lobes and glabrous at the base main veins of leaf blades.

## Шесть новых видов ряда *Calycinae* (Buser) Rothm. (*Alchemilla*, Rosaceae) из Кавказа

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**Ключевые слова:** агрегат, апомикты, Грузия, морфология, Россия, таксономия.

**Аннотация.** *Alchemilla* ряда *Calycinae* (*A. bezengiensis*, *A. kazbekensis*, *A. longipedicellata*, *A. muldaschevii*, *A. pseudotranscaucasica*, *A. ptyschensis*). *A. bezengiensis* (*A. aggr. ellenbergiana*) отличается от родственных видов полностью опушенными стеблями и/или густо опушенными гипантиями, и/или опушенной нижней поверхностью листьев. *A. kazbekensis* (*A. aggr. dura*) формально близок *A. ser. Elatae* благодаря оттопыренному опушению стеблей и черешков, которое отличает его от всех других представителей ряда *Calycinae*. *A. longipedicellata* (*A. aggr. abchasica*) выделяется среди других представителей агрегата меньшим количеством лопастей листьев и/или голыми гипантиями. Последние три вида принадлежат к *A. aggr. transcaucasica*, будучи при этом довольно схожими внешне. *A. muldaschevii* обладает, в сравнении с близкими видами, совершенно голыми стеблями и округлыми верхними прикорневыми листьями с перекрывающимися краевыми лопастями. *A. pseudotranscaucasica* отличается от других представителей равномерно опушенными листьями снизу, полностью опушенными стеблями, но при этом голыми гипантиями. *A. ptyschensis* же, в отличие от других видов агрегата, имеет стебли, опушенные только на самом нижнем междоузлии; от многих других видов *Calycinae* отличается, помимо опушения стеблей, относительно большей длиной притупленных лопастей и голыми при основании главными жилками листьев.

## Introduction

While preparing a “Caucasian Flora Conspectus” (2008), numerous collections in the Herbarium of the V. L. Komarov Botanical Institute of Russian Academy of Sciences (Saint-Petersburg, Russia) (LE) were researched. Analysing previous studies of *Alchemilla* L. species diversity in the Caucasus region (Buser, 1894, 1896, 1906a, b; Rothmaler, 1933; Juzepczuk, 1934a, b; Rothmaler, 1938, 1939; Juzepczuk, 1941, 1957, 1967), Crimea (Juzepczuk, 1933, 1938), Iran (Fröhner, 1969), and Turkey (Pawłowski, 1972; Pawłowski, Walters, 1972; Ponert, 1973; Kalheber, 1994; Hayirlioğlu-Ayaz, Beyazoğlu, 1997; Hayirlioğlu-Ayaz, 2000; Hayirlioğlu-Ayaz, Kalheber, 2002), I came to conclusion that some specimens should be considered as representatives of several new species, and six of them belong to *A. ser. Calycinae* (Buser) Rothm. Review for a new system of aggregates within this series was presented earlier (Chkalov, 2020). There, a key for all Caucasian members of the series, including species described below, was introduced. The aim of this study is to describe new for science *Alchemilla* species.

## Materials and methods

The study is based on a morphological approach. The material of Caucasian *Alchemilla* in LE and MW was investigated by the author. Many samples of the original material for comparison were obtained through on-line platforms: B (Curators Herbarium B. URL: <http://ww2.bgbm.org>); C, M (JSTOR. URL: <https://plants.jstor.org>); E (RBGE. URL: <https://data.rbge.org.uk>); FI (*Museo di Storia Naturale – Sezione Botanica “F. Parlatore” dell’Università di Firenze*. URL: <http://parlatore.msn.unifi.it>); G (Catalogue des herbiers de Genève (CHG). URL: <http://www.ville-ge.ch>); H (FinBIF. URL: <https://laji.fi>); K (Kew. URL: <http://apps.kew.org>); MW (Seregin. URL: <https://plant.depo.msu.ru>); P (MNHN. URL: <https://science.mnhn.fr>); S (Herbarium Catalogue (S). URL: <http://herbarium.nrm.se>); W, WU, JE (Virtual Herbaria. URL: <https://herbarium.univie.ac.at>). Terminology used in the descriptions was explained elsewhere (Chkalov, 2011, 2015). Distribution of species is characterised according to a scheme applied in the “Caucasian Flora Conspectus” (2008) and presented below taking into account also the specimens non-cited here.

## Six new species of *Alchemilla*

*Alchemilla bezengiensis* Czkalov, **sp. nov.** (Figs. 1, 2; table)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. ellenbergiana* Rothm.).

**Type:** “[Russia] Terskaya oblast, alpine [...] (WNW) adjacent to the Ullu-Guluk plateau, upper reaches of the Bezengi river. 10 VII 1913. E. A. and N. A. Busch” (LE-01072764!).

**Description.** Plant of small size, 10–30 cm. Rhizome, rather thin, up to 0.8 cm. Stems 3–4, ascending, 2–4 times higher than radical leaves, up to 30 cm, evenly densely or sparsely pubescent throughout with appressed silky hairs.

All radical leaves similar, up to 9 cm, leaf blade length 1.5–2.5 cm, widely reniform or reniform, undulate, angle of sector 32–42°, hairy only on the teeth and folds above, evenly ± densely hairy beneath; 5–7-lobed, lobes 19–25 %, central zone 67–74 %, first principal vein 96–103 %, second principal vein 87–96 % of leaf length (l. l.); with lobes arcuate to semicircular, with incisions between lobes 12–17 % of l. l., 19–25 % of lobe length, with distance between bases of incisions 107–121 % of lobe width, with width 211–300 % of lobe length; with 4–5 teeth at each side of lobe, acutish, equally-sided, triangularly ovate, straight, slightly curved, almost equally sized, the lowermost teeth to 1.5 times less than the standard tooth; length of standard tooth 8–10 % of l. l., 40–46 % of lobe length, with apical tooth 50–69 % of standard tooth length, a bit shorter than neighboring ones. Leaves with 60–100 teeth in total. Petioles densely pubescent throughout with appressed silky hairs. Stipules of radical leaves brownish.

Stem leaves 2–3 per stem, evenly spread along it, beside the lowermost inflorescence branch widely obovate, cuneate, sessile, central zone 59–74 % of l. l., 1-lobed, with two basal lobes, lobes 9–11 % of l. l., with 1–2 teeth at each side, plain, 13–20 teeth in total. Inflorescence narrow and poor, with 1–2(3) inflorescence branches, assembled in the upper 1/3–1/2 of stem. The lowermost inflorescence branch 1–2 times longer than internode, with hairy branchlets throughout, each with 2–3 nodes, 10–20 flowers. Monochasia dense, the lateral with almost no stipule (0–0.5 of pedicel length), with no axis, 4–5 flowers. Terminal monochasia similar to lateral ones. Flowers of medium size, hypanthia shortly obconical, with fruit campanulate or semiglobose, without

neck, entirely hairy with appressed hairs, 0.90–1.65 mm lg., ratio width : length (w/l ratio) 67–100 %; pedicels 1.5–3(4) hypanthia lg., glabrous. Sepals triangular ovate, (0.90)1.25–1.60 mm lg., (76)85–140 % of hypanthium lg., w/l ratio 44–72(111) %, ciliate or barbate. Epicalyx segments lanceolate to ovate, (0.65)1.20–1.35 mm lg., 65–125(144) % of hypanthium lg., 72–104 % of sepal lg., width 40–61(82) % of sepal width, w/l ratio 31–44(62) %, glabrous or rarely ciliate.

**Distribution and habitat.** Alpine belt in the Central Caucasus, Eastern Transcaucasus.

**4. CC:** 4b. Malk.; **9. ETC:** 9d. Murgh.-Murovd.

**Affinity.** *A. retinerviiformis* Juz. differs from this species by orbicular and orbicular reniform leaves and glabrous lower leaf surfaces; *A. akdoganica* Kalheber differs by having glabrous upper internodes of stem, less numerous leaf lobes, and more teeth on them (6–7 at each side); *A. ancerensis* Kalheber, in comparison with this species, has glabrous upper internodes of stem, subglabrous leaf blades beneath, barely hairy hypanthia; *A. stricta* Rothm. is distinguished by glabrous upper internodes of stem, glabrous lower leaf surfaces, and greater number of teeth of leaf lobes (7–9 at each side); *A. wischniewski* Rothm. and *A. ellenbergiana* Rothm. (*A. beyazoglyi* Kalheber) differ by having glabrous hypanthia; *A. venosa* Juz. differs by orbicular or orbicular reniform leaves, barely hairy hypanthia, and larger angle of leaf sector (40–50°).

**Etymology.** The species is named after the river (“Bezengi”) in the basin of which it was collected.

*Alchemilla kazbekensis* Czkalov, **sp. nov.** (Figs. 1, 3)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. dura* Buser).

**Type:** “[Georgia] Tiflis province, Dusheti distr., Mt. Kazbek, near the Dezdorak glacier, gravelly slope beside snowfield. 3 VIII 1916, P. N. Krylov, E. I. Steinberg” (LE-01072770!).

**Paratype:** “[Russia] N. A. Busch, Iter caucasicum VIII. Kuban prov., 1907, N. Busch, B. Klopotow 721” (LE-01072771!).

**Description.** Plant of medium size, up to 18–21 cm. Rhizome rather thick, up to 1 cm. Stem 1–5, erect, ascendant or prostrate, 2–3 times higher than radical leaves, up to 21 cm, densely pubescent with erectopatent hairs on the lower half, sparsely in the upper half, to glabrous in the 1–2 uppermost internodes.

All radical leaves similar, up to 4–10 cm, leaf blade length 2.5–3.5 cm, orbicular reniform to orbicular with overlapped basal lobes (in the smallest plants), ± undulate, angle of sector 35–41°, glabrous, hairy only on the teeth, to sparsely pubescent above, evenly densely hairy beneath; 7–9-lobed, lobes 23–29 %, central zone 67–75 %, first principal vein 97–100 %, second principal vein 83–91 % of l.l.; with lobes arcuate to semicircular, with incisions between lobes 6–12.5 % of l. l., 23–29 % of lobe length, with distance between bases of incisions 108–123 % of lobe width, width 170–244 % of lobe length; with 5–7(8) teeth at each side of lobe, acute, equally-sided, triangular, triangular falcate, straight, curved, almost equally-sized, the lowermost teeth to 1.5 times less than the standard tooth; length of standard tooth 6.5–9.5 % of l. l., 26–42 % of lobe length, with apical tooth 67–100 % of standard tooth length, similar size to neighboring ones. Leaves with 90–125 teeth, petioles densely pubescent throughout with erectopatent hairs, with stipules brown or purplish.

Evenly-spread stem leaves numbering (4)5–6 per stem beside the lowermost inflorescence branch reniform or widely reniform, truncate or subcordate, almost sessile, petioles less than 1/4 of leaf length; the lower leaves with long petioles, central zone 63–66 % of l. l., 4–5-lobed (without the two basal ones); lobes 28–31 % of l. l., with 4–5 teeth at each side, ± undulate, 50–65 teeth in total. Inflorescence narrow and very poor, with 2–3(4) inflorescence branches, assembled in the upper 1/5–1/4 of stem. The lowermost inflorescence branch 0.5–1.3 times longer than its internode, with glabrous branchlets (except the lowermost branchlets), with 3–5 nodes, 5–20 flowers. Monochasia quite dense, the lateral with almost no stipule, 0–0.5 of pedicel length, with no axis, 4–5 flowers. Terminal monochasia with almost distinct stipule, 1–2 of pedicel length, with axis about 1 of pedicel length, 4–5 flowers. Flowers of large size, hypanthia shortly obconical, with fruit shortly campanulate or semiglobose, with neck, glabrous, 1.15–1.50 mm lg., w/l ratio 46–60 %; pedicels 1.5–3(5) hypanthia lg., glabrous. Sepals narrowly ovate to ovate, 1.38–2.00 mm lg., 120–150(163) % of hypanthium lg., w/l ratio 35–58 %, glabrous. Epicalyx segments lanceolate to narrowly ovate, (1.43)1.70–2.50 mm lg., 114–150(208) % of hypanthium lg., 76–128 % of sepal lg., width 68–81(117) % of sepal width, w/l ratio 26–45 %, glabrous.

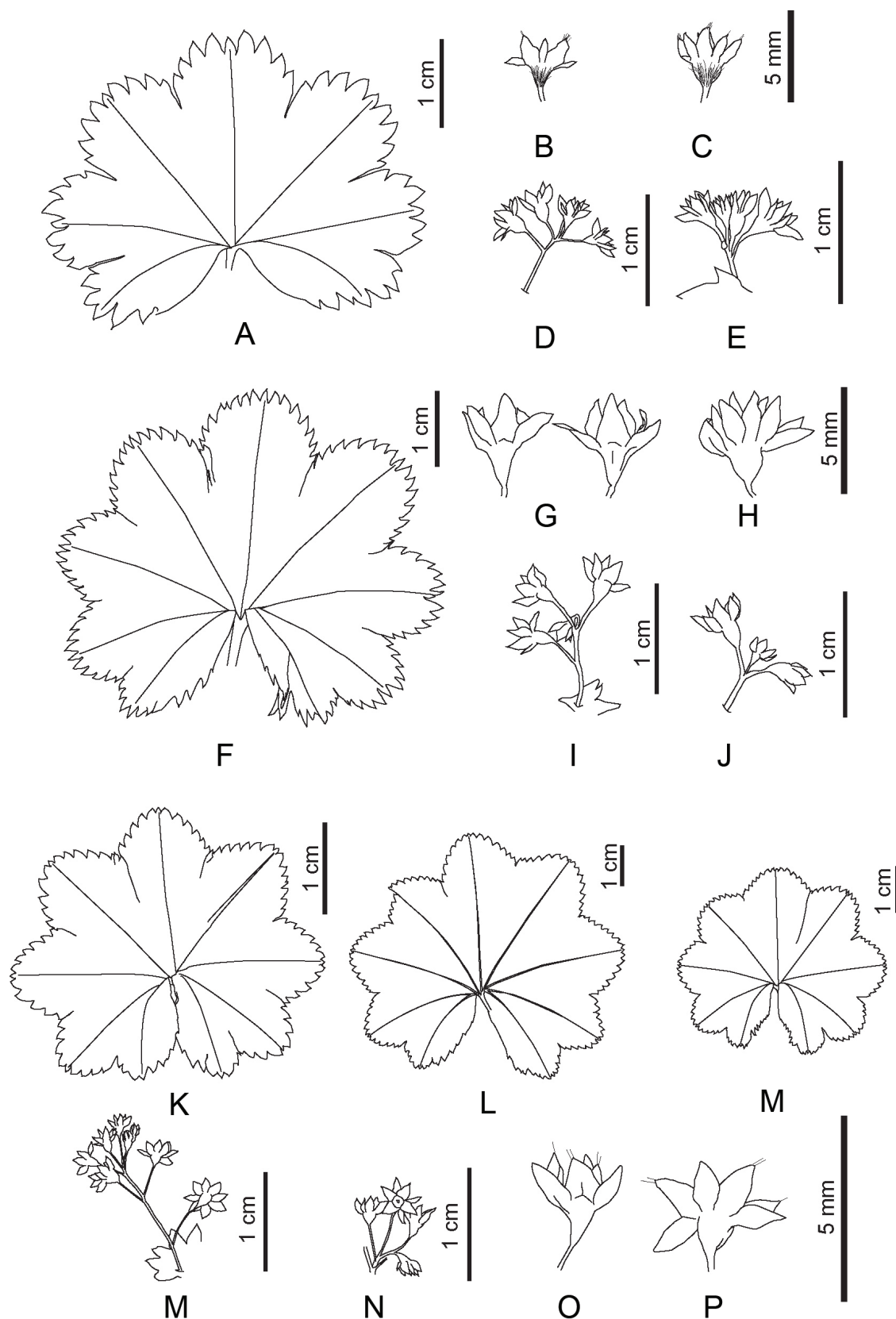


Fig. 1. Morphological features of *Alchemilla* species. *A. bezengiensis*: A – leaf blade of radical leaf; B – blooming flower; C – flower with mature fruit; D – terminal monochasium; E – lateral monochasium. *A. kazbekensis*: F – leaf blade of radical leaf; G – blooming flower; H – flower with mature fruit; I – terminal monochasium; J – lateral monochasium. *A. longipedicellata*: K – leaf blade of upper radical leaf; L – leaf blade of medium radical leaf; M – leaf blade of lower radical leaf; N – terminal monochasium; O – lateral monochasium; P – blooming flower; Q – flower with mature fruit.



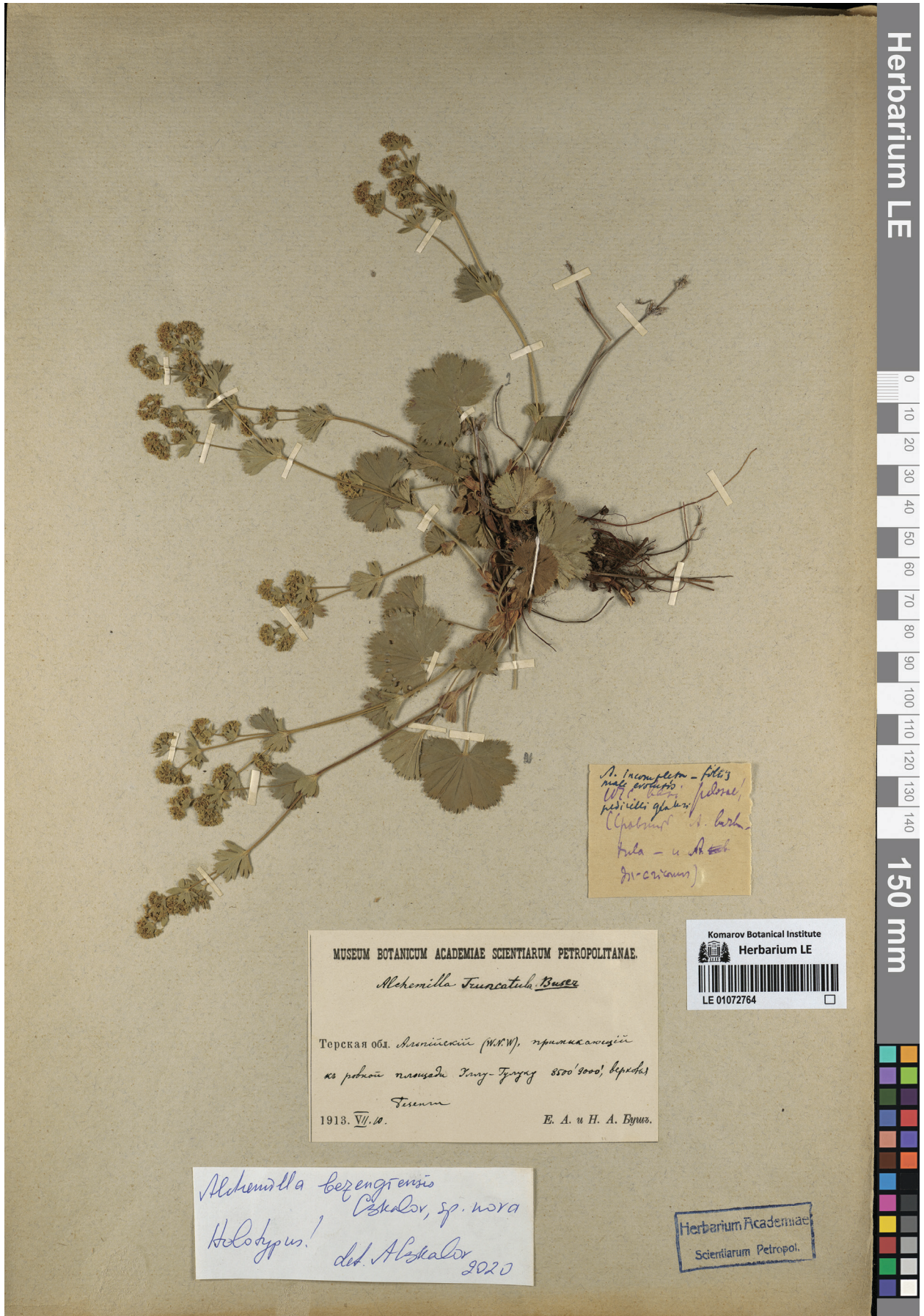


Fig. 2. Holotype specimen of *Alchemilla bezengiensis*.



**Distribution and habitat.** Grows in alpine belt in the Western Ciscaucasus and Central Transcaucasus.

**3. WC:** ?; **8. CTC:** 8a. Kart.-S. Oss.

**Affinity.** From all the “true” *Calycinae* species, it is distinguished by patent indumentum. The species of *A. ser. Elatae*, which are related by the formal features, such as *A. epipsila* Juz., *A. stellulata* Juz., *A. circassica* Juz., *A. laeta* Juz., *A. hessii* Rothm., differ from this species by having numerous teeth on leaf lobes, (7)8–10 at each their side, short incisions between lobes (less than standard tooth length), and overall appearance.

**Etymology.** The species is named after the mountain (“Kazbek”), where it was collected.

*Alchemilla longipedicellata* Czekalov, **sp. nov.** (Figs. 1, 4)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. abchasica* Buser).

**Type:** “[Russia] Circassia, prope opp. Krasnaja Poljana, m. Atshishcho, prope stat. meteorologicam, in declivibus lapidosis. 24 VII 1937. S. Juzepczuk 250” (LE-01072774!, specimen marked by asterisk).

**Paratype:** “[Russia] Circassia, prope opp. Krasnaja Poljana, m. Atshishcho, inter stat. meteorologicam et cataractam, in declivibus umbrosis in fageto-altiherbeto, ad tramitem, 1937, S. Juzepczuk 373” (LE-01072775!).

**Description.** Plant of varying size, small to large, 12–45 cm. Rhizome rather thin, up to 0.8 cm. Stems 2–4, ascendent or erect, rather slender, 1.5–3(4) times higher than radical leaves, up to 45 cm, glabrous, except for the lowermost internode with appressed indumentum.

Lower and medium radical leaves orbicular reniform or reniform with narrow sinus or touching basal lobes, with angle of sector 37–39°, mostly glabrous, hairy only along main veins and on basal lobes beneath; 5–7-lobed, with lobes 17–28 %, central zone 70–84 % of l. l. Lobes arcuate, somewhat triangular in shape, or plain, with incisions among lobes 6–14.5 % of l. l., 23–52 % of lobe length, with 5–6 teeth at both sides of lobe, acutish, almost equally-sided, widely triangular mammillate, straight, curved, equally sized; length of standard tooth 4–7.5 % of l. l., 16–27 % of lobe length, with apical tooth 32–50 % of standard tooth length, much smaller than the neighboring ones. Leaves with 65–105 teeth in total. Petioles densely pubescent with appressed hairs.

Upper radical leaves 3–30 cm, leaf blade length 1.5–5.5 cm, orbicular with overlapped basal lobes,

rather undulate and plicate, angle of sector to 45°, glabrous above, sparsely hairy beneath, densely on basal lobes, with glabrous 1/4–1/2 of main veins; 7–9-lobed, lobes to 30 %, central zone from 68 % of l.l.; with lobes arcuate to widely semiovate, somewhat triangular in shape; with incisions between lobes from 3.5 % of l. l., from 12 % of lobe length, with distance between bases of incisions 108–111 % of lobe width, width 197–218 % of lobe length; with 6–8(9) teeth at each side of lobe, acutish or almost obtuse, unequally-sided, semiovate or triangularly semiovate, outwardly oblique, curved, unequally sized teeth, teeth of middle of the lobe up to 3 times larger than the lowermost one; length of standard tooth from 5 % of l. l., from 16 % of lobe length, with apical tooth from 32 % of standard tooth length, much smaller than neighboring ones, but at the same level. Leaves with 100–150 teeth in total. Petioles pubescent with appressed hairs. Stipules of radical leaves purple.

Evenly-spread stem leaves numbering 5–7 per stem, beside the lowermost inflorescence branch orbicular reniform, with short petioles 1/5–1/4, central zone 67–74 % of l. l., 5-lobed, lobes 19–23 % of l. l., with 4–5 teeth at each side, arcuate to shortly parabolic, with 46–64 teeth in total. Inflorescence rather wide, with 2–4 widespread inflorescence branches, assembled in the upper 1/3–1/2 of stem. The lowermost inflorescence branch (0.5)1–2.5 times longer than its internode, with glabrous branchlets, 2–6 nodes, (5)10–35 flowers. Monochasia quite lax, the lateral with stipule, 0.5–1 of pedicel length, with distinct axis (0.5–1 of pedicel length), 3–5 flowers. Terminal monochasia with distinct stipule 0.5–2 pedicel length, distinct axis (1–2 of pedicel length), 6–9 flowers. Flowers of small size, hypanthia very shortly obconical, with fruit shortly campanulate or obconical, without neck, glabrous, (0.75)0.90–1.45 mm lg., w/l ratio 73–93(110) %; pedicels very long, 3–6(8) hypanthia lg., glabrous. Sepals ovate to widely triangular ovate, 1.00–1.45 mm lg., 100–133 % of hypanthium lg., w/l ratio 51–80 %, ciliate. Epicalyx segments narrowly triangular ovate to lanceolate, 1.08–1.73 mm lg., 107–120(150) % of hypanthium lg., 104–119 % of sepal lg., width 56–104 % of sepal width, w/l ratio 41–51 %, glabrous.

**Distribution and habitat.** Grows in herbaceous places in mountain forests and on slopes in the Western Transcaucasus.

**7. WTC:** 7a. Tuap.-Adl.

**Affinity.** From most species of *A. ser. Calycinae* (such as *A. retinervis* Buser) with glabrous hypanthia, it differs by having barely dissected leaves.

*A. procerrima* S. E. Fröhner differs by higher pubescent stems, up to 2/3 of their height, hairy main veins throughout; *A. debilis* Juz., being similar in appearance, is distinguished by glabrous bases of main veins of lower leaves and hairy those of upper leaves, by widely reniform lower leaves with very wide sinus (angle between veins of basal lobes more than 110°), fewer teeth number of stem leaves (2–3 at each lobe side); *A. dura* Buser differs by having very falcate curved teeth of leaves, obtuse leaf lobes (vs. a kind of triangular or rounded ones), bigger angle of leaf sector (40–50°) of the lower and medium leaves. It differs from most species of *A. aggr. abchasica* through glabrous hypanthia and fewer leaf lobes.

**Etymology.** The species is named due to its very specific elongate pedicels.

*Alchemilla muldaschevii* Czakalov, **sp. nov.** (Figs. 5, 6)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. transcaucasica*).

**Type:** “[Georgia] Abchasia, trajectus Kluchor, in initio viae (vetustae) Militari-Suchumensis juxta ejus marginem. 25 VIII 1937. S. Juzepczuk 856” (LE-01072779!, specimen marked by asterisk).

**Paratypes:** “[Russia] Reg. auton. Karatshai, prope pag. Dombai, in faucib. fl. Ptysh ad cataractam I, in schistosis. 1937. S. Juzepczuk 939” (LE-01072781!, + duplicate 935, LE-01072783!, LE-01072810!); “prope pag. Teberda, in faucib. fl. Azgek, loco herboso ad ripam fluvii, 1937, S. Juzepczuk 538” (LE-01072780!, LE-01072782!).

**Description.** Plant of small or medium size, 10–30 cm. Rhizome rather thin, up to 0.8 cm. Stems 1–3, ascendent, rather robust, 1.5–3 times higher than radical leaves, up to 30 cm, glabrous in all internodes.

Lower and medium radical leaves orbicular or reniform with very narrow sinus, with angle of sector (37)42–47°, glabrous in most, hairy only along the upper 1/3–1/2 of main veins; 5–7-lobed, with lobes 22.5–24 %, central zone 70–77 % of l. l. Lobes plain or arcuate, often obtuse, with incisions among lobes 8–14 % of l. l., 34–63 % of lobe length, with 4–5 teeth at both sides of lobe, acutish, almost equally-sided, widely triangular mammillate, outwardly directed, curved, equally sized; length of standard tooth 6.5–10.0 % of l. l., 27–43 % of lobe length, with apical tooth 43–74 % of standard tooth length, much smaller than neighboring ones, thus, lobes at the tops recessed. Leaves with 60–100 teeth in total. Petioles glabrous.

Upper radical leaves up to 15 cm, leaf blade length 1.5–3.5 cm, orbicular with overlapped basal lobes, rather undulate and plicate, angle of sector to 51°, glabrous, except for the upper 1/3–1/2 of main veins, but leaves with hairy petioles pubescent on the veins throughout; 7–9-lobed, lobes to 36 %, central zone from 59 % of l. l.; with lobes arcuate to triangularly semicircular and equally-sided triangular, with incisions between lobes from 7 % of l. l., to 36 % of lobe length, with distance between bases of incisions 100–140 % of lobe width, with width 130–200 % of lobe length; with 6–7 teeth at each side of lobe, acute, very unequally-sided, triangularly ovate, straight, oblique, curved, unequally sized, lowermost teeth up to 3 times shorter than standard tooth; length of standard tooth to 11(13) % of l. l., from 27 % of lobe length, with apical tooth from 33 % of standard tooth length. Leaves with 100–120(135) teeth in total. Petioles mostly glabrous, some evenly pubescent with appressed hairs. Stipules of radical leaves purple.

Evenly-spread stem leaves 5–7 per stem, beside the lowermost inflorescence branch reniform or widely reniform, with short petioles 1/5–1/4, central zone 67–80(87) % of l. l., 5-lobed, lobes (20)23–26 % of l. l., with 4–5 teeth at each side, plain to shortly parabolic, with 36–75 teeth in total. Inflorescence rather wide, with 3–4(5) widespread inflorescence branches, assembled in the upper third, rarely in the upper half of stem. The lowermost inflorescence branch 0.5–2 times longer than its internode, with glabrous branchlets, 2–8 nodes, (5)15–40 flowers. Monochasia quite lax, the lateral with stipule 1–2 of pedicel length, clear axis, 1.5–2 of pedicel length, 6–9 flowers. Terminal monochasia with stipule 0.5–1(3) pedicel length, clear axis (1–2 of pedicel length), 7–10 flowers. Flowers of medium size, hypanthia shortly obconical, with fruit shortly campanulate or semiglobose, without neck, glabrous or rarely with solitary hairs, 1.10–1.50 mm lg., w/l ratio 67–95 %; pedicels 1.5–3(4) hypanthia lg., glabrous. Sepals elongate ovate or ovate, 1.12–1.40 mm lg., (85)113–124 % of hypanthium lg., w/l ratio 58–82 %, glabrous. Epicalyx segments narrowly lanceolate, 1.13–1.43(1.63) mm lg., 102–138 % of hypanthium lg., (87)102–130 % of sepal lg., width 60–87 % of sepal width, w/l ratio 32–54 %, glabrous or rarely with solitary hairs.

**Distribution and habitat.** Grows in herbaceous places along dirt roads and river banks, in rock crevices in the Western Transcaucasus, Western and Central Ciscaucasus.



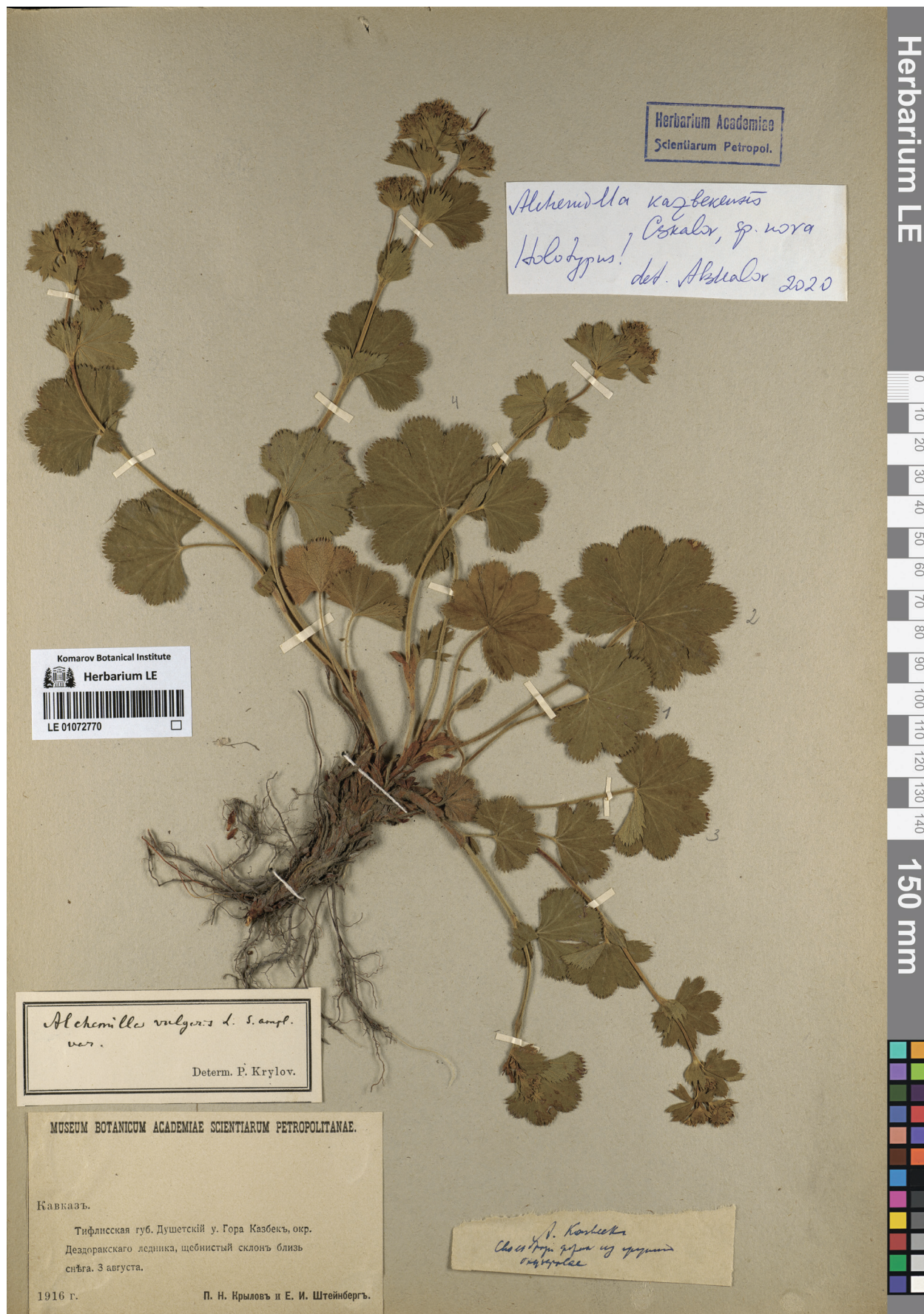


Fig. 3. Holotype of *Alchemilla kazbekensis*.





Fig. 4. Holotype specimen of *Alchemilla longipedicellata*.



**3. WC:** 3c. Urup.-Teb.; **7. WTC:** 7a. Tuap.-Adl., 7b. Abkh.; **8. CTC:** 8a. Kart.-S. Oss.

**Affinity.** From most species of this series *A. muldaschevii* differs by entirely glabrous stems and orbicular upper leaves with overlapped basal lobes (including described below *A. pseudotranscaucasica*, *A. ptyschensis*). The last also differs by hairy petioles of all leaves, narrower sepals, short axis of monochasium, and by having a neck of flowers with fruits. *A. adelodictya* Juz. differs from this species by having all glabrous petioles of radical leaves (vs. ± hairy), most leaf blades being widely reniform or reniform with semicircular lobes (vs. mostly orbicular leaf blades with lobes to triangular); *A. microdictya* Juz. is distinguished by rounded leaf lobes and deeper incisions between them (1.5–2.5 of standard tooth length) vs. triangular ones with incisions 0.5–1.5 of standard tooth length.

**Etymology.** The species was named in honour of Uralian florist and *Alchemilla* collector Albert A. Muldashev (Ufa Institute of Biology, Ufa Federal Research Center of Russian Academy of Sciences, Ufa, Russia).

*Alchemilla pseudotranscaucasica* Czkalov, **sp. nov.** (Figs. 5, 7)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. transcaucasica* Rothm.).

**Type:** “[Georgia] Abchasia, trajectus Kluchor, in initio viae (vetustae), Militari-Suchumensis juxta ejus marginem. 25 VIII 1937. S. Juzepczuk” (LE-01072790!, specimen marked by asterisk).

**Description.** Plant of small or medium size, up to 25 cm. Rhizome quite thin, up to 0.7 cm. Stems 1–3, erect or ascendent, rather robust, 1.5–2 times higher than radical leaves, up to 25 cm, sparsely hairy with appressed hairs throughout.

Lower and medium radical leaves reniform with narrow sinus or touching basal lobes to orbicular with overlapped basal lobes, with angle of sector 53–65°, the lowermost nearly entirely glabrous, hairy only along the upper 1/2–3/4 of main veins, but in most hairy on the teeth above and evenly hairy with appressed hairs beneath; 5–7-lobed, with lobes 24–33 %, central zone 63–73 % of l. l. Lobes plain or shortly trapezoids, obtuse, with incisions among lobes 5–13 % of l. l., 16–34(54) % of lobe length, with 5–6 teeth at both sides of lobe, acutish, unequally-sided, triangular mammillate, triangular falcate, outwardly oblique, equally sized; length of standard tooth 8–12.5 % of l. l., 23–36 % of lobe length, with apical tooth 43–53 % of standard tooth length, much smaller than neighboring ones, thus,

lobes at the tops recessed. Leaves with 55–95 teeth in total. Petioles sparsely pubescent with appressed or subappressed hairs.

Upper radical leaves up to 11 cm, leaf blade length 2.5–4 cm, orbicular reniform with narrow sinus, slightly undulate, angle of sector from 44°, with the same indumentum as the others; 5–7-lobed, lobes to 35 %, central zone from 60 % of l. l.; with lobes trapezoid or semiovalate, with incisions between lobes from 7 % of l. l., to 35 % of lobe length, with distance between bases of incisions 113–118 % of lobe width, with width about 160 % of lobe length; with 7–9 teeth at each side of lobe, acute, almost unequally-sided, triangular falcate, outwardly oblique, unequally sized, the lowermost teeth to 5 times less than the standard tooth; length of standard tooth to 12.5 % of l. l., to 36 % of lobe length, with apical tooth from 27 % of standard tooth length. Leaves with 85–110 teeth in total. Petioles pubescent with appressed hairs. Stipules of radical leaves purple.

Mostly evenly-spread stem leaves 4–6 per stem, beside the lowermost inflorescence branch reniform or orbicular reniform, subcordate or truncate, with short petioles 0–25 %, central zone 67–80(87) % of l. l., 5-lobed, lobes (20)23–26 % of l. l., with 3–4 teeth at each side, arcuate to trapezoid, with 29–45 teeth in total. Inflorescence rather narrow, with (2)3–4 inflorescence branches, assembled in the upper 1/4–1/2 of stem. The lowermost inflorescence branch 0.3–1 times longer than its internode, with hairy branchlets throughout, 1–3 nodes, 3–10(30) flowers. Monochasia quite lax, the lateral with no stipule, with axis (0)0.3–1 of pedicel length, 3–5 flowers. Terminal monochasia with stipule 1–2 of pedicel length, clear axis (1–2 of pedicel length), 4–6 flowers. Flowers of large size, hypanthia shortly obconical, with fruit shortly campanulate, without neck, glabrous or rarely with solitary hairs, (1.25)1.50–2.00 mm lg., w/l ratio 72–92(100) %; pedicels (1.5)2–5 hypanthia lg., glabrous. Sepals narrowly triangular ovate, 1.50–1.90 mm lg., 95–120 % of hypanthium lg., w/l ratio 45–60 %, glabrous or rarely with solitary hairs. Epicalyx segments lanceolate, (1.50)1.75–2.50 mm lg., 100–122(167) % of hypanthium lg., 100–143 % of sepal lg., width 47–65(89) % of sepal width, w/l ratio 20–27(43) %, glabrous or rarely with solitary hairs.

**Distribution and habitat.** Grows in grassplots in the Western Transcaucasus.

**7. WTC:** 7a. Tuap.-Adl., 7b. Abkh.

**Affinity.** The differences with *A. muldaschevii* see above; those with *A. ptyschensis* are hairy throughout stems, long axis of monochasium, and

longer pedicels. There are not many species of *A. ser. Calycinae* with such long leaf lobes: *A. transcucasica* Rothm., *A. elevitensis* Kalheber, *A. kackarensis* Kalheber – they differ by having glabrous lower leaf surfaces. *A. procerrima* S. E. Fröhner is distinguished by less dissected leaf blades (central zone from 75 % of l. l.), shorter leaf lobes, 19–22 % of l. l. for upper and medium leaves. *A. tiryalensis* Pawł. differs by having fewer teeth number of leaf lobes (to 7 at each side), orbicular leaves mostly without sinus, ± hairy hypanthia.

**Etymology.** The species is named due to clear similarity in appearance to *A. transcucasica* Rothm.

***Alchemilla ptyshensis* Czkalov, sp. nov.** (Figs. 5, 8)

(*A. ser. Calycinae* (Buser) Rothm., *A. aggr. transcucasica* Rothm.).

**Type:** “[Georgia] Ermani, NE rocky slope of the Fidar-khokh volcano, 2500 m. 1938. V. Ya. Darbin” (LE-01072786!, specimen marked by asterisk).

**Paratypes:** “[Russia] Reg. auton. Karatshai, prope pag. Dombai, in faucib. fl. Ptysh ad cataractam I, in schistosis. 1937. S. Juzepczuk 935” (LE-01072810!); “Kuban prov., alder forests along the Makhar river, near the veterinary post, 4500’. 1909. N. A., E. A. Busch 972” (LE-01072787!); “[Georgia] terrain Ermani, the left bank of the Ermanidon river, 1938, I. I. Abramov (LE-01072788!); “Ermani, the right slope of the Middle-Ermanian gorge, subalpine meadow. 1938. V. Ya. Darbin” (LE-01072789!).

**Description.** Plant of small or rarely medium size, up to 10–15(35) cm. Rhizome quite thick, up to 1.1 cm. Stems 1(2), erect, rather robust, 1.5–2(3) times higher than radical leaves, up to 35 cm, only at the lowermost internode sparsely hairy with appressed hairs.

Lower and medium radical leaves reniform to orbicular reniform with distinct sinus, with angle of sector 40–54°, glabrous in most, hairy only along the upper 1/3–1/2 of main veins, sometimes sparsely at basal lobes beneath, along the margins; 5–7-lobed, with lobes 12–28 %, central zone 65–86 % of l. l. Lobes plain or shortly trapezoid, obtuse, with incisions among lobes 7–14.5 % of l. l., 50–75 % of lobe length, with 5–6 teeth at both sides of lobe, acutish, almost equally-sided, triangular mammillate, triangular falcate, straight, equally sized; length of standard tooth 7–11 % of l. l., 39–59 % of lobe length, with apical tooth 55–68(86) % of standard tooth length, much smaller than the neighboring

ones, thus, lobes at the tops recessed. Leaves with (50)70–100 teeth in total. Petioles sparsely pubescent with appressed or subappressed hairs.

Upper radical leaves up to 25 cm, leaf blade length 2–3(5) cm, orbicular with narrow sinus or less often overlapped basal lobes, plain, angle of sector from 40°, with the same indumentum; 7–9-lobed, lobes to 32 %, central zone from 58 % of l. l.; with lobes trapezoid or arcuate, with incisions between lobes from 7 % of l. l., from 27 % of lobe length, with distance between bases of incisions 108–131 % of lobe width, width 200–220 % of lobe length; with 6–7(8) teeth at each side of lobe, acute, almost equally-sided, triangular or triangular falcate, straight, oblique, unequally sized, the lowermost teeth up to 2.5 times less than the standard tooth; length of standard tooth from 6 % of l. l., 22–35 % of lobe length, with apical tooth 56–68 % of standard tooth length. Leaves with 100–130 teeth in total. Petioles sparsely pubescent with appressed or subappressed hairs. Stipules of radical leaves brown and purplish.

Stem leaves 3–4(5) per stem, assembled mostly in the upper half, beside the lowermost inflorescence branch reniform, subcordate or cuneate, with short petioles 1/5–1/3, central zone 67–80(87) % of l. l., 5-lobed, lobes (20)23–26 % of l. l., with 3–4(5) teeth at each side, plain to arcuate, with 46–70 teeth in total. Inflorescence rather narrow, with 3(4) inflorescence branches, assembled in the upper 2/5–2/3 of stem. The lowermost inflorescence branch 0.5–1.5 times longer than its internode, with glabrous branchlets, 3–5 nodes, 15–20(35) flowers. Monochasia quite lax, the lateral with stipule 1–2 of pedicel length, clear axis (0.5–1.5 of pedicel length), 4–6 flowers. Terminal monochasia with stipule 1–3 of pedicel length, clear axis, 1–2 of pedicel length, 5–7 flowers. Flowers of large size, hypanthia shortly obconical, with fruit ovoid or spherical, with neck, glabrous or with a few hairs, (1.25)1.38–1.88 mm lg., w/l ratio 57–74(96) %; pedicels 1–2 hypanthia lg., glabrous. Sepals elongate triangular, 1.62–1.95 mm lg., 87–120(135) % of hypanthium lg., w/l ratio 46–62 %, glabrous. Epicalyx segments lanceolate, (1.50)1.75–2.00 mm lg., (80)93–140 % of hypanthium lg., 90–118 % of sepal lg., width 50–70(77) % of sepal width, w/l ratio 27–47 %, glabrous or rarely with solitary hairs.

**Distribution and habitat.** Grows in river floodplains, alder forests, subalpine meadows, on rocky slopes in the Western Ciscaucasus and Central Transcaucasus.

**3. WC:** 3c. Urup.-Teb.; **8. CTC:** 8a. Kart.-S. Oss.

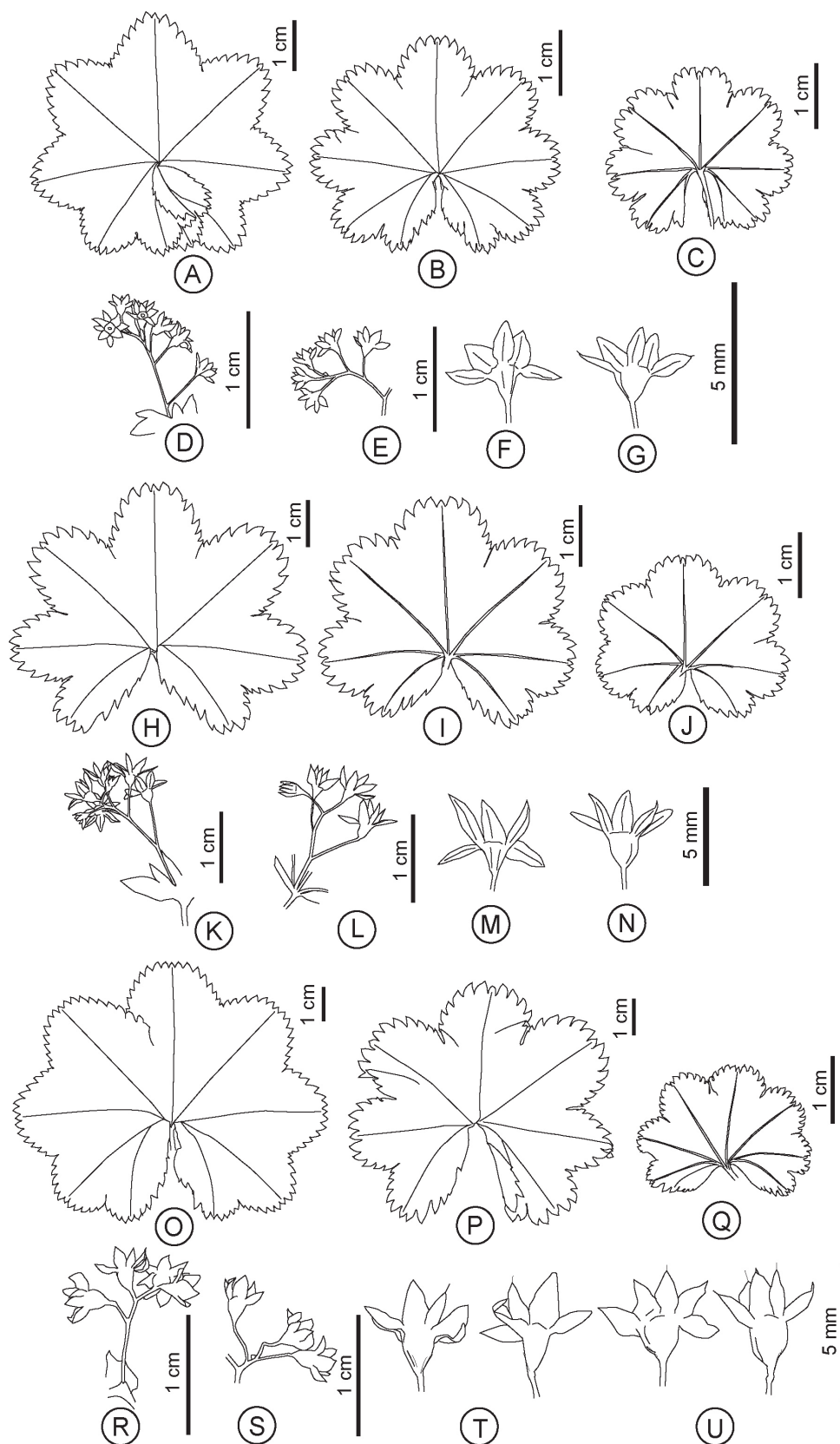


Fig. 5. Morphological features of *Alchemilla* species. *A. muldaschevii*: A – leaf blade of upper radical leaf; B – leaf blade of medium radical leaf; C – leaf blade of lower radical leaf; D – terminal monochasium; E – lateral monochasium; F – blooming flower; G – flower with mature fruit. *A. pseudotranscaucasica*: H – leaf blade of upper radical leaf; I – leaf blade of medium radical leaf; J – leaf blade of lower radical leaf; K – terminal monochasium; L – lateral monochasium; M – blooming flower; N – flower with mature fruit. *A. ptyschensis*: O – leaf blade of upper radical leaf; P – leaf blade of medium radical leaf; Q – leaf blade of lower radical leaf; R – terminal monochasium; S – lateral monochasium; T – blooming flowers; U – flowers with mature fruit.





Fig. 6. Holotype specimen of *Alchemilla muldaschevii*.



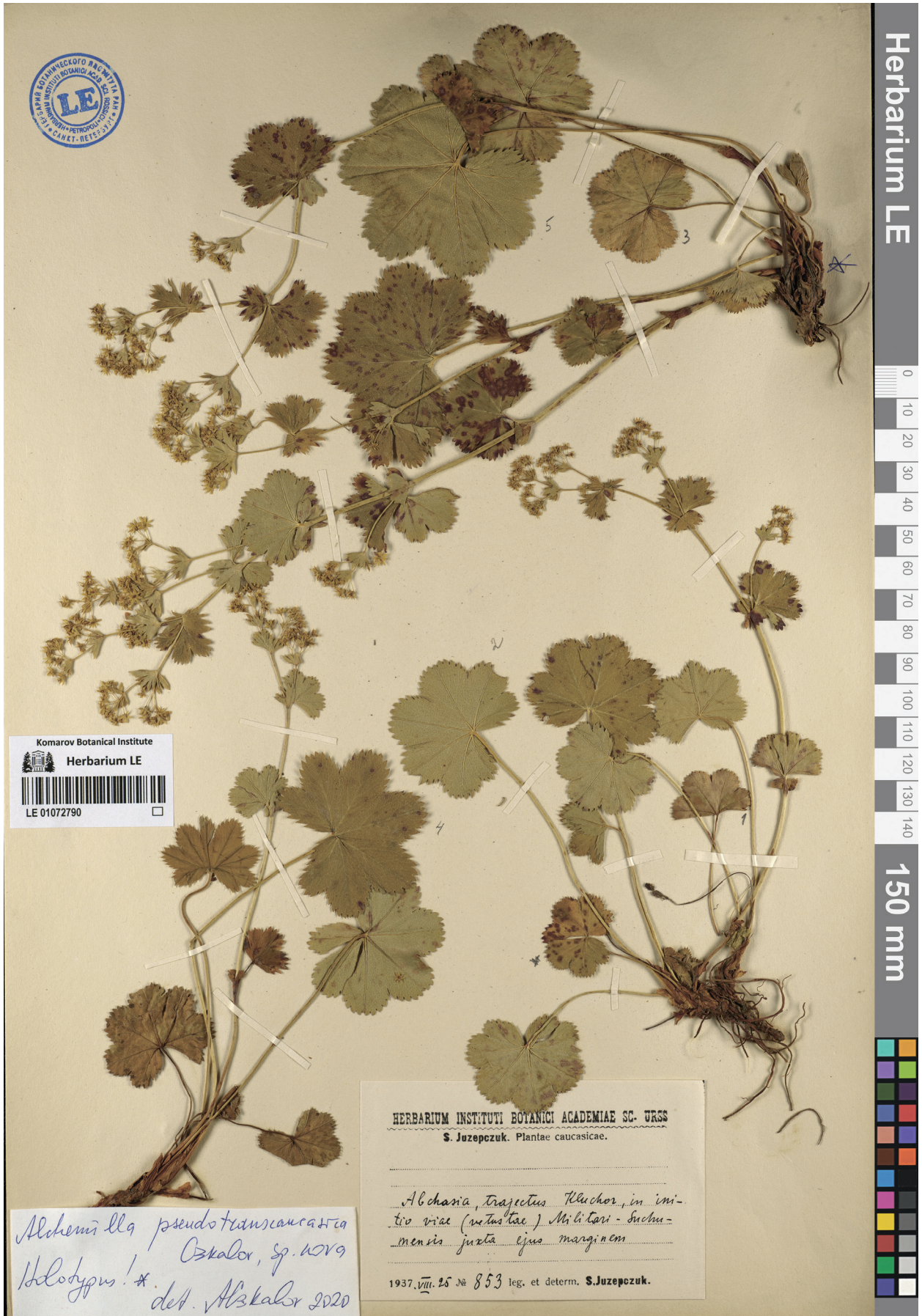


Fig. 7. Holotype specimen of *Alchemilla pseudotranscaucasica*.





Fig. 8. Holotype specimen of *Alchemilla ptyschensis*.



**Affinity.** Differences with *A. muldaschevii* and *A. pseudotranscaucasica* see above. *A. retinervis* Buser and *A. dura* Buser differ from this species by stems more highly pubescent, up to the half; also, the first one differs by entirely hairy main veins, and the second – by shorter leaf lobes (1/6–1/4 of leaf length). *A. procerrima* S. E. Fröhner is distinguished by stems higher pubescent (including the

upper half), hairy radical leaves beneath and main veins throughout. *A. debilis* Juz. is similar by formal features but differs by having shorter leaf lobes (1/5–1/4 of l. l.) with shorter incisions between them (0.5–1 of standard tooth length).

**Etymology.** The species is named after the river (“Ptysh”) in basin of which it was collected.

Table

Differentiating characters of described *Alchemilla* species

Traits	<i>A. aggr. ellenbergiana</i>	<i>A. aggr. dura</i>	<i>A. aggr. transcaucasica</i>			<i>A. aggr. abchasica</i>
	<i>A. bezengiensis</i>	<i>A. kazbekensis</i>	<i>A. muldaschevii</i>	<i>A. pseudotranscaucasica</i>	<i>A. ptyshensis</i>	<i>A. longipedicellata</i>
TTNL	60–100	90–125	100–120(135)	85–110	100–130	100–150
TNLL	4–5	5–7(8)	6–7	7–9	6–7(8)	6–8(9)
CZ	67–74	67–75	59–77	60–73	58–86	68–84
ATL	50–69	67–100	43–74	43–53	55–86	32–50
ID	12–17	6–12.5	8–14	5–13	7–14.5	6–14.5
LLF	arc / semic	arc / semic	tr / tr-semic / arc	trap / semiov	trap / arc	tr-semiov / arc
SIS	1	2/3	0	1	1/4	1/4
SID	App	E	App	App	App	App
PI	D	D	G	S	S	D
PeL	1.5–3(4)	1.5–3(5)	1.5–3(4)	(1.5)2–5	1–2	3–6(8)
MAL	0	1	1–2	1–2	1–2	1–2
HI	D	G	Gs	Gs	Gs	G
Ne	No	Yes	No	No	Yes	No

Note. TTNL – total teeth number of the inner radical leaves; TNLL – teeth number on one side of the radical leaf lobe; CZ – central zone, %; ATL – apical tooth to standard tooth length ratio, %; ID – incision (between leaf lobes) to leaf length ratio, %; SIH – stem indumentum spreading: from totally glabrous (0) to 1/4... 1/2 ... 2/3 of the stem height hairy, and hairy throughout (1); LLF – leaf lobe form in the inner radical leaves: arc – arcuate, semic – semicircular, semiov – semiovate, tr-semic – semicircular somewhat triangular, tr-semiov – semiovate somewhat triangular, tr – triangular, trap – trapezoid; SID – stem indumentum direction: App – appressed, E – erectopatent; PI – indumentum in petioles of the outer radical leaves: D – dense, G – glabrous, S – sparse; PeL – pedicel length: pedicel to hypanthia length ratio; MAL – axis length of the terminal monochasia: monochasia axis to pedicel length ratio; HI – hypanthia indumentum: D – dense, G – glabrous, Gs – glabrous with solitary hairs; Ne – presence of narrowing (a neck) under sepals in the upper part of hypanthium.

Bold frame – a unique feature among these species; grayish field – a specific value among the one-aggregate species.

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