

A SYNOPSIS OF THE GENUS *RANUNCULUS* (RANUNCULACEAE) IN IRAN

M. Pakravan & M. Assadi

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Ranunculus is the largest genus of Ranunculaceae, with an estimated 600 species distributed worldwide, especially with numerous species in the temperate zones. Based on collecting living plants in the field and analysis of 750 specimens from various herbaria, 59 species were recognized from Iran. In this paper, the taxonomy of the genus mainly follows that of Farsi version of the genus in Flora of Iran with some changes where necessary. According to these data one new species, four new records, three synonyms, and one status change were proposed during the last 30 years. The taxa are differentiated mainly by the shape and size of their leaves, calyx form, and fruits. Correct names and synonyms are presented. Ecological conditions and habitat of many species were studied by sampling in the habitat. An identification key was prepared and the synopsis of the species is proposed here. Diagnostic characteristic traits are presented for most of the taxa. Selected examined specimens are given for all the taxa.

Maneezheh Pakravan (correspondence <pakravan@alzahra.ac.ir>), Department of Plant Sciences, Faculty of Biological Sciences, Alzahra University, Tehran, Iran. -Mostafa Assadi, Research Institute of Forests and Rangelands, Agricultural Research Education and Extension Organization (AREEO), Tehran, Iran.

Keywords: *Batrachium*; distribution; flora; Iran; *Ranunculus*; synonym; taxonomy

خلاصه‌ای از جنس آلاله (*Ranunculus*, آلانگان Ranunculaceae) در ایران

منیژه پاکروان: دانشیار، گروه علوم گیاهی، دانشکده علوم زیستی، دانشگاه الزهراء، تهران، ایران

مصطفی اسدی: استاد پژوهش، موسسه تحقیقات جنگلها و مراتع کشور، سازمان تحقیقات، آموزش و ترویج کشاورزی، تهران، ایران
آلاله بزرگترین جنس تیره آلاله، با حدود ۶۰۰ گونه دارای پراکندگی جهانی به خصوص در نواحی معتدل است. بر اساس مطالعات انجام شده بر روی گیاهان جمع‌آوری شده از رویشگاه و نمونه‌های خشک از هر بار یوم‌های متعدد، تعداد ۵۷ گونه از ایران شناسایی شد. در این مقاله تاکسونومی جنس به‌طور عمده بر اساس نسخه فارسی ارائه شده در فلور ایران با تغییرات ضروری تنظیم شده است. بر اساس این داده‌ها یک گونه جدید، چهار گزارش جدید برای ایران، سه مترادف و یک تغییر وضعیت در طول ۳۰ سال گذشته برای جنس آلاله گزارش شده است. آرایه‌ها بر اساس شکل و اندازه برگ، وضعیت کاسبرگ‌ها و میوه از یکدیگر متمایز شده‌اند. نام صحیح و نام‌های مترادف نوشته شده است. ویژگی‌های اکولوژیکی و رویشگاهی بر روی نمونه‌های متعدد با نمونه‌برداری در طبیعت مورد بررسی قرار گرفت. کلید شناسایی گونه‌ها به همراه خلاصه‌ای از گونه‌ها ارائه شده است. صفات متمایزکننده برای بیشتر آرایه‌ها نوشته شده است. تعدادی از نمونه‌های مطالعه شده آرایه‌ها آورده شده است.

INTRODUCTION

Ranunculus L., the largest within the Ranunculaceae, encompasses around 600 species worldwide (Tamura 1993, 1995). The genus has a nearly cosmopolitan distribution with a remarkable variation in the life forms, thriving in diverse habitats.

Moreover, it exhibits several morphological adaptations to different environmental conditions (Paun & al. 2005; Emadzade & al. 2010).

The first complete taxonomic monograph of *Ranunculus* in SW Asia was published by Boissier (1862) and the second by Tamura (1993, 1995). Several

authors discussed and erected infrageneric classification of this huge genus such as De Candolle (1817), Gray (1821), Benson (1940), Hörandl & Emadzadeh (2011, 2012), and Emadzadeh & al. (2011).

Many genera previously considered at the sectional rank of *Ranunculus* (eg. *Coptidium* Beurl. ex Rydb, *Cyrtorhyncha* Nutt. ex. Torr. & A. Gray, *Ficaria* Guett., *Halerpestes* E. Greene, *Laccopetalum* Ulbr, *Oxygraphis* Bunge, *Peltocalathos* Tamura, *Gampsoceras* Steven, *Krapfia* DC, *Batrachium* DC.) are changed to generic rank (except *Gampsoceras*) based on the recent molecular phylogenetic studies (Rostrup 1958; Löve & Löve 1961; Wang 2001, Johansson 1998; Hörandl & al. 2005; Paun & al. 2005; Lehnebach & al. 2007; Hoot & al. 2008; Gehtke & Linder 2009; Hoffman & al. 2010; Emadzadeh & al. 2010, 2011; Hörandl & al. 2012; Rastipisheh & al. 2011). Also, many biosystematic studies on the genus have been done that could help the classification of the species, such as palynological studies on some species (Pakravan 2010; Pakravan & al. 2014; Akbari & al. 2017), cytogenetic studies (Rastipisheh & al. 2016), micromorphological studies on achene and petal (Jamshidnejad & al.; Nemati & al. 2009; Emadi & al. 2010). Hörandl & Emadzadeh (2012). Based on the combination of morphological characters and molecular data, the genus *Ranunculus* has been divided into two subgenera (subg. *Auricomus* Spach and subg. *Ranunculus*), and 17 sections.

In Flora Iranica (Iranshahr & al. 1992) 56 species, one subspecies one variety of *Ranunculus*, and three species of *Batrachium* were reported from Iran. Since then, one *Ranunculus* species has been considered a synonym (Pakravan 2010), three more recorded species of *Ranunculus* (Pakravan 2010; Bidarlord & al. 2016, Maroofi & Gholipour 2014), one species of *Batrachium* (Naqinezhad & al. 2016) and one new species of *Ranunculus* were added to flora of Iran (Pakravan 2012; Pakravan & Sharifnia 2023).

In a project on the Ranunculaceae family for the Flora of Iran (Assadi 1983) many herbarium and fresh specimens from different provinces of Iran were studied. The present synopsis aims to provide a reliable updated key based on morphological characters for species identification in Iran and to present information on accepted names, synonyms, delimitation of taxonomically difficult species, and their distribution. Infrageneric divisions of the genus are avoided in this paper but the species relationships are based on morphological characters.

MATERIALS AND METHODS

Identification of the species was done by using many available treatments (De Candolle 1818; Shishkin

1937; Davis & Cook 1965; Cook 1966; Mobayen & Maleki 1984; Dahlgren 1992; Iranshahr & al. 1992; Pakravan & Sharifnia 2023). In total 40 qualitative and quantitative morphological characters of 57 species, one subspecies, and a variety were used to prepare the descriptions of the species (not included in the present paper). Since fruit traits are of great value for species identification, only fully ripe flowers and fruits were suitable for study. An identification key, nomenclature citation, synonymies, phenology, and necessary discussions were also appended.

This study is based on field studies in Iran and the herbarium specimens of different herbaria such as TARI, TUH, IRAN, HNBG, ALUH (Thiers 2014+).

RESULTS AND DISCUSSION

Synopsis of the genus *Ranunculus* L. in Iran

Taxonomic summary

In this study comparing to Flora Iranica (Iranshahr & al.) *R. papyrocarpus* Rech. f. Aell. & Esfand., *R. trichocarpus* Boiss. & Kotschy var. *persicus* Boiss., *R. elbursensis* Boiss. and *R. pichleri* Freyn in Stapf have been considered as new synonyms. Also *R. renzii* Iranshahr & Rech. f., *R. oreophilus* M.B., *R. koeiei* Rech. f. and *R. procumbens* Boiss. have been reported after 30 years from Iran (Pakravan and Sharifnia 2023). *Ranunculus microflorus* (Pakravan 2012) as new species and *R. peltatus* (Naqinezhad & al. 2016), *R. damascenus* (Maroofi & Gholipour 2014), *R. meyerianus* (Pakravan 2010), *R. polyrhizus* (Bidarlord & al. 2016) as new records have been reported for the flora of Iran after Flora Iranica (Iranshahr & al. 1992).

***Ranunculus* L.**, Sp. Pl. 1: 548. 1753-Type: *Ranunculus acris* L., Sp. Pl. 2, 1753, incl. *Batrachium* (DC.) S.F. Gray 1821 and *Gampsoceras* Steven 1852.

Annual or perennial plants, with mostly herbaceous, terrestrial, or aquatic stems. Root simple or thick and rhizome-like or tuberous. The leaves are alternate, pinnate, often basal, simple or compound, pinnate, combed, three-parted, or divided in aquatic species. Inflorescence solitary, compound cyme, or panicle. The flowers are yellow, white, or red, with 3-5 sepals, attached to the petals, spreading or turned down. Petals usually 5 or more, with a nectary scale at the base. Stamens numerous. Receptacle spherical, cylindrical or oblong elongated, hairy or glabrous. Achene few or many; style permanent, straight or curved beak; Fruit surface smooth, prickly, warty or hairy.

Diagnostic key to *Ranunculus* L. taxa in Iran

1. Aquatic. Leaves floating or submerged; leaf segments linear 2
- Terrestrial. Leaves without linear segments 5
2. Leaves biform 3. *R. peltatus* Schrank

- Leaves uniform 3

3. The number of achenes more than 50 4

- The number of achenes less than 50
..... 2. *R. trichophyllus* Chaix ex Vill.

4. Achenes glabrous. Nectar scale pyriform
..... 1. *R. sphaerospermus* Boiss. & Blanche

- Achenes striate, somewhat hairy at the base of style.
Nectar scale lunate 4. *R. rionii* Lagger (Nym.)

5. Annuals 6

- Perennials 15

6. Leaves entire, dentate, or undulate at the margin .. 7

- Leaves divided 8

7. Flowers sessile, Achene persistent
..... 5. *R. laterifolius* DC.

- Flowers stalked. Achenes deciduous
..... 6. *R. ophioglossifolius* Vill.

8. Stigma reduced. Achenes small with transverse
rogues and reduced beak. Receptacle hollow. Flowers
small, less than 10 mm in diameter 9

- Stigma persistent on fruit. Achene large with a
prominent beak. Receptacle solid. Flowers large, more
than 10 mm in diameter 10

9. Achene smooth. Stem bent, branched. Flowers 2-5
mm in diameter 12. *R. dolosus* Fisch. & C.A.Mey.

- Achene rugose. Stem upright. Flowers 7-10 mm in
diameter 11. *R. scleratus* L.

10. Fruiting head stellate in shape, hairy with long and
twisted beak, oblong at the base, 12-14 mm in length .
..... 13. *R. pinardii* Boiss.

- Fruiting head not stellate in shape, glabrous with short
beak 11

11. Basal leaves circular or renal with shallow lobes
and dentate at the margin. Flowers 5-7 mm in diameter.
Peduncles bent in fruiting stage 10. *R. chius* DC.

- Basal leaves three parted, simple or compound.
Flowers larger than the above mentioned. Peduncle
straight 12

12. Sepals spreading. Achenes 3-9. Nectar scale fan-
shape 14. *R. arvensis* L.

- Sepals recurved. Achenes more numerous 13

13. Leaves three-parted. Achenes spiny, 7-8 mm long;
beak triangular at the base. Peduncle shorter than lateral
leaves 8. *R. muricatus* L.

- Leaves compound. Achenes 2-5 mm long, smooth, or
tuberculate. Peduncle longer than lateral leaves 14

14. Peduncle 1-5 cm long. Achene with acute
projection; beak bent, 1-5 mm long 9. *R. cornatus* DC.

- Peduncle 0.5-3 cm long. Achene with tubercles, with
navicular margin and straight beak less than 1 mm long
..... 7. *R. marginatus* d'Urv.

15. Plant with thickened roots 16

- Plant without thickened roots but sometimes with bulb
..... 34

16. Leaves palmate or three-parted 17

- Leaves pinnate 29

17. Sepals recurved 18

- Sepals spreading or divergent 22

18. Leaves three parted up to near the base 19

- Leaves compound, segments sessile 20

19. Fruiting head oblong, 5-6 mm width. Petals oval
shape. Achene with erect beak, hairy
..... 16. *R. oxyspermus* Willd.

-Fruiting head oval in shape, 6-7 mm wide. Petals
broadly oval in shape. Achene with bent beak
..... 17. *R. damascenus* Boiss. & Gaill.

20. Leaf segments long petiolated 21

- Leaf segments sessile 21. *R. illyrichus* L.

21. Achene rounded, papery and flat
..... 26. *R. macropodioides* Briq.

- Achene not rounded, with convex surface
..... 24. *R. termei* Iranshahr & Rech.f.

22. Flowers red 30. *R. asiaticus* L.

- Flower yellow 23

23. Leaves with a bulb at the axis (a swollen fleshy
tissue) 3. *R. bulbiferous* Boiss. & Hohen.

- Leaves without a bulb at the axis 24

24. Sepals persistent
..... 27. *R. elymaticus* Boiss. & Hausskn.

- Sepals deciduous 25

25. Achene slightly swollen 26

- Achene compressed 27

26. Plant hairy 34. *R. eriorrhizus* Boiss. & Buhse

- Plant glabrous 33. *R. straussii* Bornm.

27. Fruiting head spheroidal, 4 mm in diameter
..... 28. *R. koeiei* Rech. f.

- Fruiting head oval, 6-26 mm in diameter 28

28. Leaves simple with shallow lobes
..... 22. *R. afghanicus* Aitch. & Hemsl.

- Leaves simple, divided up to near the base or
compound 3. *R. aucheri* Boiss.

29. Sepals recurved 30

- Sepals spreading or divergent 31

30. Leaves cuneiform and obtuse. Achene punctate-
alveolate 20. *R. cicitarius* Schlechtend.

- Leaf segments linear. Achene covered with tubercules
..... *R. procumbens* Boiss.

31. Achene hairy 32

- Achene glabrous 33

32. Achene beak erect. Stem glabrous
..... 32. *R. dalechanensis* Iranshahr & Rech.f.

- Achene beak curved, with projection at the base. Stem
hairy 18. *R. macrorrhynchus* Boiss.

33. Leaves tripartite with tripartite segments. Stem
pilose. Achene surface reticulated, beak 2-3 mm long
..... 25. *R. leptorrhynchus* Aitch. & Hemsl.

- Leaves tripinnate. Stem villous. Achene punctate;
beak 1.5-2.5 mm 19. *R. millefolius* Banks & Sol.

34. Leaves simple 35

- Leaves compound with various shapes	36
35. Cauline leaves glabrous or with simple and sparse hairs. Stem up to 120 cm long. Sepal spreading	15. <i>R. lingua</i> L.
- Leaves with strigose hairs. Stem up to 20 cm long. Sepals recurved	6. <i>R. strigillosus</i> Boiss. & A. Huet
36. Leaves pinnately divided	37
- Leaves not pinnately divided	39
37. Stem glabrous	57. <i>R. crymophilus</i>
- Stem hairy	38
38. Young achene glabrous	59. <i>R. zenjanensis</i> Iranshahr & Rech.f.
- Young achene hairy	58. <i>R. renzii</i> Iranshahr & Rech. f.
39. Leaf segments sessile	40
- Leaf segments petiolated	48
40. Achene without beak or with a short and erect beak	41
- Achene with curved beak	42
41. Stem tuberous at the base	43. <i>R. bulbosus</i> L.
- Stem never tuberous at the base	44. <i>R. polyrhizus</i> Stephan ex Willd.
42. Achene beak more than 1.2 mm long	43
- Achene beak shorter than 1.2 mm long	44
43. Leaves tripartite, with almost shallow divisions	55. <i>R. constantinopolitanus</i> (DC.) d'Urv.
- Leaves deeply 3-5 partite, divided up to the base; middle segment sessile or with short stalk	47. <i>R. diversifolius</i> Gilib.
44. Leaves deeply 3-5 partite, with narrow lanceolate or oval segments	45
- Leaves tripartite with broad rhombic or rounded segments	47
45. Plant tall, covered with long hairs. Petiole rather long	46
- Plant dwarf, covered with short and scabrous hairs. Petiole short	39. <i>R. oreophilus</i> M. Bieb.
46. Achene surface punctate	54. <i>R. kotschyi</i> Boiss.
- Achene surface smooth	42. <i>R. polyanthemus</i> L.
47. Rhizome long. Stem ascending and glabrous. Calyx glabrous	37. <i>R. brachylobus</i> Boiss. & Hohen.
- Rhizome short. Stem erect and hairy. Calyx hairy	35. <i>R. amblyolobus</i> Boiss. & Hohen.
48. Middle segments of basal leaves with a short-broadened petiole; lateral segments sessile	36. <i>R. buhsei</i> Boiss.
- Middle segments of basal leaves with long petiole; lateral segments with short petiole or sessile	49
49. Plant with creeping stem	40. <i>R. repens</i> L.
- Stem not creeping	50
50. Leaves covered with silky hairs	51. <i>R. sericeous</i> Banks & Soland.
- Leaves without silky hairs	51
51. Achene hairy	52

- Achene glabrous	54
52. Sepals spreading	49. <i>R. sojakii</i> Iranshahr & Rech. f.
- Sepals recurved	53
53. Middle segments of leaves petiolate. Flower diameter less than 2.5 cm	50. <i>R. tricocarpus</i> Boiss. & Kotschy
- Middle segments of leaves sessile. Flower diameter more than 2.8 cm	52. <i>R. grandiflorous</i> L.
54. Flower small, less than 1 cm diameter	53. <i>R. microflorous</i> Pakravan
- Flowers larger, more than 1 cm diameter	55
55. Achene's beak very short, almost straight, more or less broadly triangular	41. <i>R. meyerianus</i> Rupr.
- Achene's beak developed	56
56. Achene beak circinate, 2-4 mm long. Leaves large	45. <i>R. brutius</i> Ten.
- Achene beak curved but not circinate	57
57. Plant indumentum scabrous and villous	38. <i>R. sahandicus</i> Boiss. & Buhse
- Plant pilose or glabrous	58
58. Leaves tripartite, pinnately divided. Achene beak less than 1 mm long	46. <i>R. merovenssis</i> Grossh.
- Leaves tri parties, with ciliate hairs or semi add pressed. Achene beak more than 1 mm long	48. <i>R. caucasicus</i> M.B.

Species reported from Iran

1. *Ranunculus sphaerospermus* Boiss. & Blanches in Boiss., Diagn. Pl. Or. Nov. Ser. 2, 5: 6 (1856).

Syn.: *R. peltatus* Shrank subsp. *sphaerospermus* (Boiss. & Blanches) Meikle, Notes Roy. Bot. Gard. Edinburgh 23:16 (1959). *Batrachium sphaerospermum* (Boiss. & Blanches) Iranshahr, Fl. Ir. 171: 195 f (1991).

Selected examined specimens: Gilan: Anzali, Mozaffarian 62235 (TARI); Mazandaran: Nodahak village, Akbari 11056 (ALUH); Azerbaijan: Targavar, 1400 m, Izadpanah & Taheri 68281 (TARI); Kurdistan: Marivan to Sanandaj road, Mozaffarian 74716 (TARI); Khuzestan: Ahudasht, 100 m, Foroughi 3087 (TARI);

General distribution: Balkan Peninsula, W and Central Asia, Himalaya Mt. and Iran. Ponds, slow streams, 100 - 1400 m.

The Kurdistan province is a new distribution record for this species after Flora Iranica.

Characteristic traits: Submerge plant with dissected leaves. Achenes numerous and glabrous.

2. *R. trichophyllus* Chaix in Vill., Hist. Pl. Dauphinè 1:335 (1786).

Syn.: *Ranunculus aquatilis* L. subsp. *trichophyllus* (Chaix) Moore & More, Contr. Cybele Hibern. 5 (1866); *Batrachium trichophyllum* (Chaix) Bosch, Prodr. Fl. Bat. 1: 7 (1850).

Selected examined specimens: Azerbaijan: Ashrafi 102747 (TARI); Ardabil: Naqynejad & Akbari 1105

(ALUH); Mazandaran: Akbari 11053 (ALUH); Gilan: Naqynejad 9605 (HUMZ); Kurdistan: Runemark & Mozaffarian 27464 (TARI); Tehran: Naqynejad 4032 (HUMZ).

General distribution: N. temperate regions; SW Australia, Tasmania, New Zealand, Iran. Wetlands and slow streams, 20-2450 m.

Characteristic traits: Submerge plant with dissected leaves and glabrous achene.

3. *R. peltatus* Schrank, Baier. Fl. 2: 103 (1789).

Selected examined specimens: Ardabil: 43 km on the road of Ardabil to Khalkhal, near to Neor lake, 2553 m Naqinezhad & Bidarlord 3002 (HUMZ); Aghadaghi, 2296 m, Ashrafi 2296 (TARI).

General distribution: Europe, SW & E Asia, Australia, and N.C America, Iran. Ponds, slow streams, from 2300-2550 m.

Characteristic traits: Perennial and aquatic plant which is distinguished by biform leaves. A very rare species in Iran, which was recently recorded from the mentioned location (Naqinezhad & al. 2016).

4. *R. rionii* Lagger. *Flora* 31: 49 (1848).

Selected examined specimens: Azerbaijan: Ardabil, Zehzad & al. 70538 (TARI); Maku, 1130 m, Foroughi 7958 (TARI); Kermanshah: Fatahi & Lashkarboluki 314 (TARI); Fars: Pabot 29407 (TARI); Khuzestan: Mozaffarian 62236 (TARI); Baluchestan: Taftan Mt., Mozaffarian 53054 (TARI).

General distribution: C. Europe, Balkans, SW Asia, Himalayas, W China, S Africa and western, N America, Iran. 20-2800 m. The Kermanshah, Ardebil, Khuzestan, and Baluchestan provinces are new distribution records for this species (after Flora Iranica).

Characteristic traits: Annual aquatic plant with dissected leaf segments and glabrous, striate achene.

5. *R. lateriflorus* DC., Reg. Veg. Syst. Nat. 1: 251 (1817).

Selected examined specimens: Azerbaijan: Terme & Moussavi 41814 (IRAN); Mazandaran: South of Ramsar, Runemark & Maasoumi 21669 (TARI).

General distribution and ecology: S. C Europe, Russia, Transcaucasia, W Syria, Syrian Desert, Siberia, C, Asia, N. W Africa, and Iran. It grows in moist habitats, especially swamps, from 1750-2950 m.

It is a rare species in Iran, known from mountains in the North and NW of Iran. The Mazandaran province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: Annual, dwarf plant with entire leaves and papillate achene.

6. *R. ophioglossifolius* Vill., Hist. Pl. Dauph. 3: 731(1789).

Selected examined specimens: Mazandaran: Chalus, Amini & Zare 7085 (HNBG); Gilan: Mozaffarian 65127 (TARI);

General distribution and ecology: S.W Europe, NW Asia, Africa, and Iran. Marshes.

The Mazandaran province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: Annual plant with erect branch and minute swelling achene.

7. *R. marginatus* d'Urv., Mem. Soc. Linn. Paris1: 318 (1822).

-var. *trachycarpus* (Fisch. & C.A.Mey.) Aznavour, Magyar Bot. Lapok 1: 297 (1902).

Syn.: *R. trachycarpus* Fisch. & C.A. Mey., Ind. Sem. Horti Petrop. 3: 46 (1837).

Selected examined specimens: Gilan: Mozaffarian 65132 (TARI); Mazandaran: Amini & Zare 9216 (HNBG); Kermanshah: Pol-e Zahab, Hatami 2274 (TARI); Baluchestan: Runemark & al. 22363 (TARI).

General distribution and ecology: S. Europe, Crimea, Caucasia, N. Iran, W. Syria, Cyprus, Egypt. Streams, river banks, and other moist places, 500-900 m.

Characteristic traits: Annual plant with erect branches. Achene papillate with a short beak.

8. *R. muricatus* L., Sp. Pl. 555 (1753).

Selected examined specimens: Mazandaran: Pakravan 3950 (ALUH); Gilan: Mozaffarian 65106, 65159 (TARI); Khuzestan: Izeh, Mozaffarian 70214 (TARI); Tehran: Babakhanloo & Amin 20016 (TARI).

General distribution and ecology: S. Europe, S.W. Asia, N. Africa and Iran. Moist fields, muddy roadsides, ditches, 20-1800 m. The Khuzestan province is a new distribution record for this species (after Flora Iranica).

Characteristics traits: Annual plant with spiny achene.

9. *R. cornotus* DC., Reg. Veg. Syst. Nat. 1: 300 (1817).

Selected examined specimens: Azerbaijan: Runemark & Foroughi 19823 (TARI); Ghahreman 454 (TUH); Kurdistan: Fattahi & Khaledian 599 (TARI); Bakhtiari: Mozaffarian 54680 (TARI); Khuzestan: Mozaffarian 63261 (TARI).

General distribution and ecology: S. Europe, Caucasia, Afghanistan, Iraq, Syria, Cyprus, Egypt and Iran. Wet meadows, fields, and ditches, 100-1400 m.

Characteristic traits: Annual plants with spiny and not beaked achene.

10. *R. chius* DC., Syst. Reg. Veg. Nat. 1: 299 (1817).

Syn.: *R. parviflorus* L. var. *persicus* Pau, Trab. Mus. Nac. Ci. Nat., Ser. Bot. 10: 370 (1980).

Selected examined specimens: Lorestan: Behboodi 122- B (IRAN); Khuzestan: Dezful, Maasoumi & Mahmoodi 100453 (TARI).

General distribution and ecology: Mediterranean region, Turkey, Tauria, and Iran. Moist fields, grassy slopes, and scrub, 400-860 m. The Khuzestan province is the new distribution record for this species (after Flora Iranica)

Characteristic traits: Annual plant easily recognized by its papillate achene with a broad, short, and bent beak. It is a rare species in Iran.

11. *R. scleratus* L., Sp. Pl. 551 (1753).

Syn.: *R. dolosus* sensu Iranshahr in Fl Ir. no. 171, Page 137 not Fisch. & C.A. May.

Selected examined specimens: Golestan: Hewan 3713 (TARI); Mazandaran: Pabot 2617 (TARI); Gilan: Wendelbo & Maasoumi 19136 (TARI); Azerbaijan: Assadi & al. 68440, 68441 (TARI); Ardabil: Zehzad & al. 70540 (TARI).

General distribution and ecology: Europe, S.W. & c. Asia, N. & Tropical Africa. Shallow waters, muddy places, 150-2050 m. The Khorasan province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: Annual plant easily recognized by triparted leaves, achene with short erect beak and wrinkled surface.

12. *R. dolosus* Fisch. & C.A. Mey. in Hohen, Enum., Pl. Talysh 148 (1838).

Selected examined specimens: Mazandaran: 15 Km from Sari to Ghaemshahr, Ghanbari & al. 861 (TARI); Nowshahr, Mazga village, Zare & Amini 3767 (HNBG); Gilan: 13 Km from Asalem to Khalkhal, 200-250 m, Zehzad, Taheri and Pakravan 67269 (TARI).

General distribution and ecology: Talish and Iran. Damp woodlands.

Characteristic traits: Annual plant with 3-5 parted leaves, smooth achene, and short erect beak.

13. *R. pinardii* (Steven) Boiss., Diagn. Pl. Orient. Ser. 2, 5: 10 (1856).

Syn.: *Gampsoceras pinardii* Steven, Bull. Soc. Imp. Naturalistes Moscou. 25: 542 (1852).

Selected examined specimens: Azerbaijan: Runemark & Foroughi 19681 (TARI); Kurdistan: Fattahi & Khaledian 599 (TARI).

General distribution and ecology: Turkey, Lebanon, Iraq Syria, and Iran. Rocky limestone slopes, 1300-1500 m. The Azerbaijan province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: Annual plant easily recognized with the stellate shape of fruit head, hairy achene with a long and curved beak.

14. *R. arvensis* L., Sp. Pl. 555 (1753).

Selected examined specimens: Mazandaran: Domanchik 31481 (TARI); Gilan: An Ala 17143

(TARI); Azerbaijan: Assadi & Mozaffarian 30714 (TARI); Kurdistan: Runemark & Mozaffarian 29133 (TARI); Hamedan: Pabot 1516 (TARI). Kermanshah: Hamzeh'ee & Lashkarboliki 543 (TARI); Lorestan: Rowshan 9683 (TARI); Esfahan: Yusefi 1563 (TARI); Kerman: Heravi 242 (TARI); Fars: Wendelbo & Foroughi 17630 (TARI); Khuzestan: Mozaffarian 53572 (TARI); Khorasan: Foroughi 1411 (TARI); Semnan: Riazi 7996 (TARI); Tehran: Amini & Bazargan 19223 (TARI).

General distribution and ecology: Europe: SW. Asia, N. Africa, Turkestan, and Iran. Different habitats but moist, 500-2600 m.

Note: The sculpturing of the achene exhibits considerable variability, ranging from smooth surfaces to spinose along the margins, and even completely thorny achenes. This diversity has led some floras to categorize it as a distinct variety. However, within populations, multiple forms of achenes coexist, transitioning seamlessly between various states. Furthermore, these different forms do not show any consistent correlation with other morphological characteristics. Therefore, we refrain from recognizing any distinct varieties based solely on achene morphology.

15. *R. lingua* L., Sp. Pl. 1: 549 (1753).

Selected examined specimens: Azerbaijan: Tabriz, Ashrafi 101669 (TARI); Gilan: Ghahreman & Aghustin 9558 (TUH).

General distribution and ecology: Europe, Caucasia, Siberia, Turkey, India and Iran. The semiaquatic plant prefers to grow in 40 cm of water of different wetland habits, -25-3000 m. The Azerbaijan province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: a rare plant, easily recognized by the tall stem, entire leaf with long petiole, and glabrous achene with short and bent beak.

16. *R. oxyspermus* Willd., Sp. Pl. 2: 1328 (1799).

Syn.: *R. oxyspermus* Willd. var. *curvirostris* Mobayen & Maleki, Iran Journ. Bot. 2(2): 124 (1984). Syn. nov.

Selected examined specimens: Mazandaran: Azarm & Bazargan 20129 (TARI); Azerbaijan: Olfat 48 (TARI); Kurdistan: Fattahi & Tavakoli 228 (TARI); Hamedan: Pabot 29419 (TARI); Kermanshah: Assadi & Hamzeh'ee 87923 (TARI); Esfahan: Nowroozi 2275 (TARI); Fars: Pabot 5956 (TARI); Khorasan: Assadi & Maassoumi 55762 (TARI). Tehran: Babakhanloo & Amin 18041 (TARI); Qazvin: Bazargan & Dini 8446 (TARI).

General distribution and ecology: Central Europe, S. & C. Russia, Turkey, Iraq, Afghanistan and Iran. Steppes, dry meadows, river valleys, sometimes as weeds in fields and roadside, 200-1800 m.

Characteristic traits: Perennial with fleshy root, dense soft hairs, achene with bent beak, and hairs with tuberculate base.

Mobayen & Maleki introduced a new variety (*R. oxyspermus* var. *curvirostris*) in which the characteristic feature of the fruit was the bent beak, but, in the picture that was provided for the type specimens (*R. oxyspermus*), the beak is not different from the main species. we consider this variety is considered as synonym to *R. oxyspermus*.

17. *R. damascenus* Boiss. & Gaill., Boiss., Diagn. Pl. Or. Nov. Ser. 2(6): 5 (1859).

Syn.: *R. oxyspermus* Willd. subsp. *damascenus* (Boiss. & Gaill.) Davis, Notes R.B.G. Edinb. 23: 143 (1960); *R. oxyspermus* var. *damascenus* (Boiss. & Gaill.) Post in Fl. Syria, 2(1) 1932.

Selected examined specimens: Kurdistan: Maroofi & Kargar 9882 (TARI).

General distribution and ecology: Turkey, Syria, Iraq, and Iran. Grows in temperate biomes and sandy places in mountains.

Characteristic traits: Perennial species with tuberous roots.

This species was recorded from the Kurdistan province for the first time in 2014 (Maroofi & Gholipour 2014). It is similar to *R. oxyspermus*, but its achenes are glabrous with an erect beak.

18. *R. macrorrhynchus* Boiss., Diagn. Pl. Or. Nov. Ser. 1, 6: 10 (1846).

Selected examined specimens: Azerbaijan: Runemark & Foroughi 19596 (TARI); Kermanshah: Hamzeh'ee & Asri 87921 (TARI); Tehran: Amini & Moussavi 20067 (IRAN).

General distribution and ecology: Turkey, Iraq, and Iran. Sandy Places, 1600-2750 m.

Characteristic traits: Easily recognized by fleshy roots, dissected leaves, and hairy achene with a curved beak.

19. *R. millefolius* Banks & Soland. in Russel, Nat. Hist. Aleppo ed. 2, 2:254 (1794).

Selected examined specimens: Kurdistan: Fattahi & Khaledian 594 (TARI); Kermanshah: Lashkarboluki & Hatami 214 (TARI); Lorestan: Wendelbo & Assadi 16696 (TARI).

General distribution and ecology: Turkey, Cyprus, Syria, Iraq, and Iran. Rocky slopes, open scrub, fields, and roadsides, 1160-3850 m.

Characteristic traits: Perennial with fleshy root, pinnatisect leaves, and glabrous achene with a slightly curved beak.

20. *R. cicutarius* Schlechtend., Animadvers. 25 (1819). (Fig. 2)

Selected examined specimens: Golestan: Assadi & Maasoumi (TARI); Gilan: Manjil, Near Baresar, 1100

m, Assadi & Shahmohamadi 60057 (TARI); Semnan: Foroughi 9818 (TARI).

General distribution and ecology: Talish, Caucasus, and Iran. Meadow, semi-temperate climate. Sometimes as a weed in fields and roadsides, 20-2060 m.

Characteristic traits: Perennial with fleshy roots, pinnatisect leaves, and glabrous achene with a straight to slightly bent beak.

21. *R. illyrichus* L., Sp. Pl. 522 (1753).

Syn.: *R. syroussii* Mobayen, Iran. Journ. Bot. 2: 122 (1984).

Selected examined specimens: Azerbaijan: between Maku and Khoy, Arab Dizeji village, 2150 m, Assadi & Mozaffarian 30267 (TARI).

General distribution and ecology: Europe, Caucasus, Turkey, and Iran. Damp alpine meadow and sometimes sandy soil. A very rare species, it was collected once from Iran.

Characteristic traits: Triparted leaves with linear segments, without petiole, reflexed sepal, small fruit with straight to recurved beak.

22. *R. afghanicus* Aitch. & Hemsl., Journ. Linn. Soc. Bot. London 19: 148 (1882).

Selected examined specimens: Khorasan: Assadi & Maasoumi 50430 (TARI); Semnan: Foroughi 7997 (TARI).

General distribution and ecology: Afghanistan, Pakistan, Middle Asia, and Iran. Steppe slopes and alpine zone, 1500-2800 m.

Characteristic traits: Perennial with fleshy roots, palmate leaves with shallow lobes, and compressed achene with ± erect beak.

23. *R. aucheri* Boiss., Ann. Sci. Nat., Bot. Ser. 2, 16: 351 (1841). (Fig. 1)

Syn.: *R. elbursensis* Boiss. Fl. Or. 1: 34 (1867); *R. elbursensis* Boiss. var. *aucheri* (BOISS.) Parsa, Fl. Iran, 2: 216 (1986); *R. pichleri* Freyn in Stapf, Denkschr. Akad. Wiss. Wien Math. -Nat. Kl. 51: 23 (1886); *R. aucheri* Boiss. var. *Bungeanus* Boiss., Fl. Or. 1: 34 (1867).

Selected examined specimens: Mazandaran: Izadpanah & al. 69280 (TARI); Kurdistan: Wendelbo & Assadi 16885 (TARI). Kermanshah: Wendelbo & Assadi 16800 (TARI). Lorestan: Wendelbo & Assadi 16421, 16413 (TARI). Esfahan: Nowruzi 3707 (TARI); Bakhtiari: Mozaffarian 64361 (TARI); Kohgiluyeh va Boyer Ahmad: Mozaffarian 64361 (TARI); Yazd: Assadi & Wendelbo 16481 (TARI); Fars: Askarikhah 31911 (TARI); Zanjan: Maasoumi 64851 (TARI). Tehran: Assadi & Shahsavari 69677 (TARI); Markazi: Assadi 79025 (TARI).

General distribution and ecology: Caucasia, Talish, Turkey and Iran. Alpine zones, 1500-2900 m.

Characteristics traits: Palmate leaves with shallow to dissected lobes, faveolate, and hairy achene with \pm uncinatate beak.

Note: *Ranunculus aucheri* was described by Boissier (1867) as characterized by having triparted leaves with stalked middle segments, linear-lanceolate segments, and hairy fruit with long beaks (examined specimens: 41329, 16421, 64361, 8002, 3449, 3451). He also had described var. *bungeanus* from Esfahan province as characterized by having lobed leaves but without linear-lanceolate segments (examined specimens: 16385, 17336, 79010, 9149, 20141, 9377, 29416, 17228, 3448, 3450). *Ranunculus elbursensis* was also described by Boissier (1867) and differed from *R. aucheri* only in having leaves with sessile segments and fruit with short beak (Type materials were studied: W 0052287, WU 0041632, WU 0041633, WU 0041634). On the other hand, Freyn described *R. pichleri* from Hamedan (1886) as characterized by having leaves with short stalk and narrow segments. This species is very closely related to *R. elbursensis* and *R. aucheri*. Based on Iranshahr (Iranshahr & al. 1992) *Ranunculus pichleri* is intermediate between *R. elbursensis* and *R. aucheri*. Since stalk in leaf segment is a variable character observed in the individual specimens in one population and is linked with intermediate states, then these characters cannot be used for separating the species. The length of the beak changes during the growth period. Since many specimens with intermediate size in beak length, stalk, and shape of leaf segments are observed and also, they share the common distribution range, therefore, we did not recognize them as distinct taxa (Pakravan & Sharifnia 2023), while they are considered as independent and valid species in Flora Iranica (Iranshahr & al. 1992).

24. *R. termei* Iranshahr & Rech. f., Fl. Iranica. 171: 167 (1992).

Selected examined specimens: Azerbaijan: Sabeti 7983 (TARI); Kohgiluyeh -Boyrhmad: Terme & al. 41802 (IRAN); Bakhtiari: Mozaffaria 54814, 54810 (TARI).

General distribution and ecology: Endemic in Iran. Alpine zone, 2150-2650 m. The Azerbaijan and Bakhtiari provinces are new distribution records for this species (after Flora Iranica).

Characteristics traits: Triparted leaves with dissected segments, large flower, convex hairy achene with \pm straight beak.

25. *R. leptorrhynchus* Aitch. & Hemsl., Trans. Linn. Soc. Ser. 2, 3: 20 (1888).

Selected examined specimens:

Golestan: Assadi & Maasoumi 50072 (TARI); Khorasan: Jamzad & al. 75812 (TARI); Darre Gaz, Vafae & Mohammad Zadeh 471 (TARI).

General distribution and ecology: Afghanistan, Pakistan, Turkmenistan and Iran. Foothills, 650-1900 m.

Characteristic traits: Perennial species with fleshy roots, twice triparted leaves. Achene striate; beak \pm erect, bent at the top.

Note: The specimens mentioned as *R. leptorrhynchus* by Iranshahr (1992) (50072, 50706, and 60075) have beak about 1.5 mm long and punctate achene surface, which was determined as *R. cicutarius* (Pakravan & Sharifnia 2023).

26. *R. macropodioides* Briq., Annuaire Conserv. Jard. Bot. Geneve 11-12: 177 (1908).

Syn.: *R. macropus* Boiss. & Buhse, Nouv. Mem. Soc. Nat. Mosc. 12: 5 (1860) non Hook., Icon Pl. 1 634 (1844). *R. papyrocarpus* Rech.f., Aell. & Esfand., Anz. Math. -Nat. Kl. Osterr. Akad. Wiss. 89: 221 (1951).

Syn. nov.

Selected examined specimens: Yazd: Ariavand & al. 1398 (TARI); Kerman: Foroughi & Assadi 16337 (TARI).

General distribution and ecology: Afghanistan, Pakistan, and Iran. Alpine zone, 1900-3800 m.

Characteristic traits: Papyry achene with a short beak. Note: Based on a study of specimens of the type location of *R. macropodioides* and also pictures of type materials (W 1958-0002321), we observed that all characteristics of this species (such as leaf shape, leaf indumentum, and fruit shape) are similar to *R. papyrocarpus*. Boissier (1867) noticed immature fruits of the type specimen. Iranshahr (1992) has indicated the fruit size is different between *R. macropodioides* and *R. papyrocarpus* (fruit 1 mm broad in *R. macropodioides* and 2.5-3 in *R. papyrocarpus*), whereas different sizes were found in the same specimen. Because of the size of the fruit is due to the ripening stage and we observed many specimens from Yazd (type location of *R. papyrocarpus*) which were similar to Kerman specimens (type location of *R. macropodioides*), *R. papyrocarpus* was considered as a synonym of *R. macropodioides* (Pakravan & Sharifnia 2023).

27. *R. elymaticus* Boiss. & Hausskn. in Boiss., Fl. Or. Suppl., (1888).

Syn.: *R. thala* Mobayen, Iran. Journ. Bot. 2: 123 (1984).

Selected examined specimens: Bakhtiari: Iranshahr & Mussavi 34651 (TARI). Kohgiluyeh and Boyer Ahmad, 3050-3150 m, Jamzad & al. 69519 (TARI); Dena Mountain, Tange-ye namaky, 3950 m, Safyani 230 (TARI).

General distribution and ecology: Endemic. Alpine zone, 2300-3150 m.

Characteristic traits: Perennial species with fleshy roots, twice three-parted leaves, glabrous and rounded achene with a short and erect beak.

28- *R. koeiei* Rech. f., Dansk. Bot. Arkiv 15, 4: 10 (1954-1955).

Selected examined specimens: Kermanshah: Gahvareh, 1550-1650 m, Nemati & Roshan Zadeh 37065 (TARI).

General distribution and ecology: Endemic. Alpine zone.

Characteristics traits: Three parted leaves, hairy achene with a short beak.

This species was reported after about 30 years in Iran. (Pakravan & Sharifnia 2023)

29. *R. procumbens* Boiss., Ann. Scienc. Nat. Ser. 2, 16: 355 (1841).

Selected examined specimens: Azerbaijan: Salmas, Zavieh-jik village, Darreh Goli, 1559-1900 m, Alizadeh & Khodakarimi 44215 (TARI).

General distribution and ecology: Turkey and Iran. Alpine zone, 900-1650 m.

Characteristics traits: Achene with projection and a very long beak.

30. *R. asiaticus* L., Sp. Pl. 552. (1753).

Selected examined specimens: Kermanshah: Nemati & Roshanzadeh 3731 (TARI); Lorestan: Wendelbo & Assadi 16675 (TARI); Ilam: Mozaffarian 92866 (TARI); Fars: Assadi & Sardabi 41608 (TARI); Khuzestan: Assadi & Abuhamez 38805 (TARI); Dezful: Ghafary 1365 (TARI).

General distribution and ecology: N Africa, Crete, Cyprus, Turkey, Syria, Iraq and Iran. Semitropical region, 220-1900 m.

Characteristics traits: A geophyte plant characterized by dark red color of flowers and compressed achene with a somewhat curved beak.

31. *R. bulbiferus* Boiss. & Hohen. in Boiss., Diagn. Pl. Or. Nov. Ser. 1, 8: 3 (1849).

Selected examined specimens: Azerbaijan: Runemark & Foroughi 19747 (TARI); Zanjan: Maasoumi 64852 (TARI). Tehran: Dini & Arazm 20113 (TARI).

General distribution and ecology: Endemic. Alpine zone, from 1800-3200 m. The Azerbaijan and Zanjan provinces are new distribution records for this species (after Flora Iranica).

Characteristics traits: Easily recognized by bulbiferous leaf base and glabrous, rounded achene with erect beak.

32. *R. dalechanensis* Iranshahr & Rech. f., Fl. Iranica. 171: 160 (1991).

Syn.: *R. procumbens* Boiss., Fl. Or. Suppl.: 14 (1888) non (1841).

Selected examined specimens: Kermanshah: Sonqor, Dalakhani mt., 3100 m, Nemati 10372 (RANK).

General distribution and ecology: Endemic. Alpine zone, at the peak of Dalakhani mountain, 2700-3300 m.

Characteristics traits: Pinnate leaves, appressed or spreading calyx, and hairy achene with a long and circinate beak.

33. *R. strassii* Bornm., Beih. Bot. Centrbl. 27, 2: 290 (1910).

Selected examined specimens: Kohgyluyeh and Boyer Ahmad: Jamzad & al. 69487 (TARI); Bakhtiari: Mozaffarian 57694 (TARI).

General distribution and ecology: Endemic. Alpine zone, 1650-3600 m.

Characteristic traits: Three parted palmate leaves. Achene convex, reticulate, and hairy.

34. *R. eriorrhizus* Boiss. & Buhse, Nouv. Mem. Soc. Nat. Mosc. 12: 5 (1860).

Selected examined specimens: Yazd: Mirhosseini & Soltani 1580 (TARI); Kerman: Moussavi 35041 (IRAN).

General distribution and ecology: Endemic. Alpine zone, 2700-3450 m.

Characteristic traits: Hairy species with fleshy roots, three-parted palmate leaves, and convex, glabrous \pm inflated achene with a short beak.

35. *R. amblyolobus* Boiss. & Hohen., Diagn. Pl. Or. Nov. ser. 1, 8: 5 (1849).

Syn.: *R. oreophilus* sensu Iranshahr in Fl. Iran. 171:175 (1991) non M. B.

Selected examined specimens: Mazandaran: Khatamsaz 57129 (TARI); Azerbaijan: Zehzad & al. 70539 (TARI); Hamedan: Assadi & Mozaffarian 36834 (TARI); Lorestan: Veiskaramy 23819 (TARI); Kohgyluyeh va Boyer Ahmad: Ghandi 33323 (TARI); Tehran: Wendelbo 17227 (TARI).

General distribution and ecology: Endemic. Alpine zone, mountains near the snow-line, 1200-3600 m. The Hamedan, Lorestan and Kohgyluyeh va Boyer Ahmad provinces are new distribution records for this species (after Flora Iranica).

Characteristic traits: Easily recognized by flabellate leaves, solitary flowers, glabrous achene with \pm circinate beak.

36. *R. buhsei* Boiss., Fl. Or. 1: 45 (1867).

Syn.: *R. caucasicus* M.B. var. *buhsei* (Boiss.) Buhseh., Fl. Cauc. Crit. 3, 3: 158 (1903).

Selected examined specimens: Mazandaran: Assadi 73310 (TARI). Ardebil: Pakravan 23390 (ALUH). Tehran: Assadi & Shahsavari 69655 (TARI).

General distribution and ecology: Endemic. Alpine zone, 2200-2450 m.

Characteristic traits: Easily recognized by stipitate leaf segments, solitary flower, smooth sepals, and glabrous achene with a curved beak.

37. *R. brachylobus* Boiss. & Hohen. in Boiss., Diagn. Pl. Or. Nov. Ser. 1, 8:6 (1849).

Selected examined specimens: Mazandaran: Kelardasht, 1800 m, Terme 1427 (IRAN); Azerbaijan: 50 Km N Sarab, Sabalan mountain, Moeenoldin 9105 (TARI). Hamedan: Alvand mountains, 2700 m, Assadi & Mozaffarian 36834 (TARI); Alvand mountains, Pabot 1687 (TARI); Yazd: Deh bala, Assadi & Ranjbar 82830 (TARI). Tehran: N Kandovan pass, 2450 m, Runemark & Mozaffarian 25775 (TARI); Alamut Mountain, 2700-3000 m, Mirfakhraee 20068 (TARI); Chalous, near Azadbar, 2700-2900 m, Assadi & Shahsavari 69689.

General distribution and ecology: Caucasia, Turkey, and Iran. Alpine zone, 1800-3000 m.

Characteristics traits: Three parted leaves, solitary flower, and smooth achene with a curved beak.

38. *R. sahandicus* Boiss. & Buhse, Nouv. Mem. Soc. Nat. Mosc. 12: 8 (1860).

Selected examined specimens: Azerbaijan: Assadi & Mozaffarian 30726 (TARI).

General distribution and ecology: Endemic. Alpine zone, 1600-2600 m.

Characteristics traits: Easily recognized by three-parted leaves with a stipitate median segment with dense hirsute hairs and smooth achene with marginal nerve and curved beak.

39. *R. oreophilus* M.B., Fl. Taur-Cauc. 3: 383 (1819).

Selected examined specimens: Azerbaijan: Assadi & Maasoumi 20211 (TARI).

General distribution and ecology: Europe, Crimean Peninsula, Caucasia, and Iran. Alpine zone, 1600-2600 m.

These localities are reported after about 30 years from Iran. (Pakravan & Sharifnia 2023)

Characteristics traits: Perennial, leaf three-parted with narrow segments, smooth, compressed achene with a curved beak.

40. *R. repens* L., Sp. Pl. 554 (1753).

Selected examined specimens: Mazandaran: Nemati & Mehrabian 2508 (ALUH); Azerbaijan: Assadi & Shahsavari 65920 (TARI); Ghazvin: Mozaffarian 87310 (TARI); Tehran: Mehrabian 2570 (ALUH).

General distribution and ecology: Europe, Caucasia, Turkey, Siberia, N. Africa, S.W. Asia and Iran. Damp soils, meadows, wood, banks of rivers and lakes, 200-2900 m.

Characteristics traits: It is characterized by creeping and rooting runners, glossy flowers, and flattened, bordered achene with a curved beak.

41. *R. meyerianus* Rupr., Fl. Cauc. I, (1869).

Selected examined specimens:

Azerbaijan: Assadi & Maasoumi 20266 (TARI).

General distribution and ecology: Europe, Caucasia, Turkmeina, and Iran. Alpine zone, from 200-2500 m.

Characteristics traits: Leaf triparted with deep dissected segments, with long appressed hairs. Achene compressed, smooth with a very short and broad beak.

42. *R. polyanthemos* L., Sp. Pl. 554 (1753).

Selected examined specimens: Golestan: Assadi & Hemati 88845 (TARI); Mazandaran: Runemark & Assadi 73474 (TARI); Azerbaijan: Pakravan 3513 (ALUH); Khorassan: Memariani & al. 3897 (TARI); Semnan: Terme & al. 3940 (IRAN); Tehran: Assadi & Mozaffarian 35321 (TARI).

General distribution and ecology: Europe, Turkey, Caucasia, Siberia, and Iran. Damp woods, 1000-2400 m. The Khorasan, Semnan, and Tehran provinces are new distribution records for this species (after Flora Iranica).

Characteristic traits: Easily recognized by large flowers in much-branched and globular fruiting clusters. Achene glabrous with a short-curved beak.

43. *R. bulbosus* L., Sp. Pl., 554 (1753).

-subsp. *aleae* (Willk.) Rouy & Fouc. Fl. France 1: 106 (1893).

Syn.: *R. aleae* Willk., Linnaea 30: 84 (1859-60).

Selected examined specimens: Gilan: Mahiar 13817 (TARI); Espili, Saeedi 18583 (TARI).

General distribution and ecology: Europe, Turkey, Caucasia, Iraq, and Iran. Dry pastures, grassy slopes, and woodlands, 23-1500 m.

Characteristic traits: Easily recognized by the bulb-like swelling base of the stem, triparted leaves with stalked central segment, reflexed sepals, and rounded, compressed, smooth achene with a short and curved beak.

44. *R. polyrhizus* Stephan ex Willd., Sp. Pl. ed. 4 (von Willdenow.) 2 (2): 1324 (1799).

Selected examined specimens: Ardebil: Bidarlord 15887 (FAR, T).

General distribution and ecology: Turkey, Caucasia, Central Asia, Russia, Siberia Turkmenia, and Iran. Alpine screes, steppes, and meadows, from 2800-2900 m. This is a new addition to the genus for Flora Iranica (Bidarlord & al. 2016).

Characteristic traits: Dwarf plants, three-parted leaves with dissected segments, ovate and hairy achene with short curved beak.

45. *R. brutius* Ten, Prodr. Fl. Nap. 61 (1810-1815).

Selected examined specimens: Mazandaran: Zare 9257 (HHNBG); Gilan: Assadi & Shahmohamadi 60122 (TARI); Ardebil: Jamzad & al. 70390 (TARI).

General distribution and ecology: Europe, Turkey, and Iran. Alpine meadow, 1400-2500 m. The Gilan and

Ardebil provinces are new distribution records for this species (after Flora Iranica).

Characteristic traits: Easily recognized by leaf with large segments and teeth and achene with a long, curved beak.

46. *R. merovens* Grossh., Beih. Bot. Centrbl. 44, 2: 212 (1927).

Selected examined specimens: Ardebil: Pakravan 3514 (ALUH).

General distribution and ecology: Caucasia and Iran. Alpine zone, 1400-3450 m.

These localities were reported after about 30 years from Iran. (Pakravan & Sharifnia 2023)

Characteristic traits: Easily recognized by tripartite leaves with pinnate segments, ovate smooth achene with a short straight beak with a bent tip.

47. *R. diversifolius* Boiss. & Kotschy in Boiss., Fl. Or. 1: 45 (1867).

It is reported from Khalil-kuh mt., (Azerbaijan province) in Flora Iranica, but we did not observe it in any herbaria in Iran.

General distribution and ecology: Turkey, Iraq, and Iran. Alpine zone, 2600-3000 m.

Characteristic traits: Perennial, triparted leaves, rounded, smooth achene, with a curved beak.

48. *R. caucasicus* M.B., Fl. Taur. -Cauc. 2: 27. (1801).

Selected examined specimens: Mazandaran: Hamzei 71042 (TARI); Gilan: Wendelbo & Assadi 27789a (TARI); Ardebil: Pakravan 3518 (ALUH); Hamedan: Assadi 75148 (TARI); Semnan: Wendelbo & Foroughi 12911 (TARI); Tehran: Assadi & Shahsavari 69673 (TARI).

General distribution and ecology: Turkey, Caucasia, and Iran. Alpine zone, 1400-3630 m.

Characteristic traits: Perennial, with triparted leaves and deeply dissected segments, with serrate margin, ovate, compressed achene with marginal vein and long curved beak.

49. *R. sojakii* Iranshahr & Rech.f., Fl. Iranica, 171: 184 (1992).

Syn.: *R. trichocarpus* Boiss. & Kotschy var. *persicus* Boiss., Fl. Or. 1: 47 (1859).

Selected examined specimens: Mazandaran: Maasoumi 56792; 56851; 56796 (TARI); Azarbayjan: Assadi & Shahsavari 65670 (TARI); Semnan: Foroughi 9816, 9817 (TARI); Tehran: Assadi & Maasoumi 61130 (TARI).

General distribution and ecology: endemic to Iran. Alpine meadow, 1500-3050 m.

Characteristic traits: Triparted leaves, and tri-lobed segments, rounded to ovate, compressed, hairy achene with erect beak and bent tip.

Note: *Ranunculus trichocarpus* var. *persicus* introduced from Elborz Mt. bears leaves with rounded segments that are not similar to *R. trichocarpus* (with linear segments), other features such as fruit and sepals

are similar to *R. sojakii*. Therefore, it is considered a synonym of *R. sojakii*.

50. *R. trichocarpus* Boiss. & Kotschy in Boiss., Fl. Orientalis 1: 47 (1867).

Selected examined specimens: Azerbaijan: Foroughi & Assadi 13919 (TARI); Tehran: Mirfakhrae 20112 (TARI).

General distribution and ecology: Turkey, Iraq, and Iran. Alpine zone, 1700-3200 m.

Characteristic traits: Easily recognized by triparted leaf blades with stalked middle segments and severely reflexed sepals.

51. *R. sericeus* Banks & Soland. in Russel, Nat. His. Aleppo, ed 2, 2: 254 (1794).

Syn.: *R. sericeus* var. *chrysanthus* Mobayen & Maleki, Iran Journ. Bot. 2 (2): 124 (1984).

Selected examined specimens: Mazandaran: Nemati & Mehrabian 2512 (ALUH); Azerbaijan: Mahmoodi 99710 (TARI); Kurdistan: Fatahi 1415 (TARI); Kermanshah: Assadi 60874 (TARI); Lorestan: Runemark & Lazari 26037 (TARI); Esfahan: Rahimi Nezhad & Nowroozi 1628 (TARI); Chaharmahal and Bakhtiari: Mozaffarian 97163 (TARI); Tehran: Nemati 3706, 2511 (ALUH).

General distribution and ecology: Turkey, Iraq, Syria, and Iran. Alpine zone, 1600-2200 m.

Characteristic traits: Easily recognized by silky hair on the stem and leaves, smooth achene with a marginal vein, and erect triangle beak.

52. *R. grandiflorus* L., Sp. Pl. 55 (1753).

Syn.: *Ranunculus sabalanicus* Mobayen & Maleki, Iran. Journ. Bot. 2: 120 (1984).

Selected examined specimens: Mazandaran: Assadi & Maasoumi 51302 (TARI); Azerbaijan: Assadi & Maasoumi 2045(TARI); Kurdistan: Fatahy & Khaledian 661(TARI); Esfahan: Nowroozi & Etemad 549(TARI); Kohgiluyeh and Boyer-Ahmad: Jamzad & al. 69438 (TARI); Khorasan: Assadi & Maasoumi 55826 (TARI).

General distribution and ecology: Turkey, Caucasia, and Iran. Alpine zone, from 1150-3400 m.

These are the first records from Mazandaran, Kurdistan, Esfahan, Kohgiluyeh Boyer-Ahmad, and Khorasan provinces (after Flora Iranica).

Characteristic traits: Easily recognized by dense pilose indumentum, large and glossy flowers with reflexed sepals, and glabrous achene with a short and curved beak.

53. *R. microflorus* Pakravan, Science Asia, 38: 419 (2012).

Selected examined specimen: Hamedan: Assadi 75125 (TARI).

General distribution and ecology: Endemic. Alpine zone, 2500-3400 m.

This is a new addition to the genus for Flora Iranica.

Characteristic traits: Easily recognized by small flowers and glabrous achene with erect beak.

54. *R. kotschyi* Boiss., Diagn. Pl. Or. Nov. Ser. 1, 6: 5 (1846).

Syn.: *R. lurorum* Koeie & Rech., f., Dansk Bot. Arkiv 15,4: 8 (1955).

Selected examined specimens: Gilan: Sbeti 20052 (TARI); Azerbaijan: Assadi & Shahsavari 66002 (TARI); Zanjan: Mahmudi 100097 (TARI).

General distribution and ecology: Endemic. Damp or mountain woods and meadow, 1800-2600 m.

Characteristic traits: It is a tall perennial species with large and glossy flowers and punctate achene with a short and curved beak.

55. *R. constantinopolitanus* (DC.) d'Urv., Mem. Soc. Inn. Paris 1: 317 (1822).

Syn.: *R. farsicus* Rech. f., Anz. Math-Nat. Kl. Osterr. Akad. Wiss.88: 222 (1951); *R. constantinopolitanus* (DC.) d'Urv. var. *farsicus* (Rech. f.) Mobayen & Maleki, Iran. Journ. Bot. 2: 119 (1984).

Selected examined specimens: Mazandaran: Pakravan 2503 (ALUH); Gilan: Assadi & Shahmohamadi 60085 (TARI); Ardebil: Assadi & Maassoumi 20211b (TARI); Azerbaijan: Mozaffarian 30548 (TARI); Kurdistan: Khaledian & al. 1116 (TARI); Hamedan: Foroughi 7942 (TARI); Esfahan: Nowroozi 2106 (TARI); Kohgiluyeh and Boyer Ahmad: Jamzad & al. 69438 (TARI); Fars: Borjian 2350, 1370 (TARI); Tehran: Amini & Bazargan 19392 (TARI).

General distribution and ecology: Europe, Caucasia, Turkey, Iraq, Syria and Iran. Mountain woods and pastures, 1100-2600 m.

Characteristic traits: Perennial tall plants with hairy, shallow lobed leaf and glabrous achene with a long-curved beak.

56. *R. strillogilosus* Boiss. & Huet ex Boiss., Diagn. Pl. Or. Nov. Ser. 2 (5): 7 (1856).

Selected examined specimens: Azerbaijan: Assadi & Olfat 68801 (TARI); Zanjan: Jarchi 165 (TARI).

General distribution and ecology: Turkey, Caucasia, and Iran. Alpine zone, 2100-2800 m.

Characteristic traits: Easily recognized by entire leaves with parallel veins, reflexed sepals and convex achene with a short-curved beak.

57. *R. crymophilus* Boiss. & Hohen. in Boiss., Diagn. Pl. Or. Ser. 1., (8): 6 (1849).

Selected examined specimens: Mazandaran: Terme & al. 39788 (IRAN); Semnan: Assadi & Maassoumi 21068 (TARI); Azerbaijan: Assadi & Shahsavari

65941 (TARI); Zanjan: Mahmudi & al. 100749 (TARI); Lorestan: Mozaffarian & Sardabi 4258 (TARI); Tehran: Mozaffarian & Mohamadi 49292 (TARI); 3500 m, Mozaffarian & Mohamadi 49064 (TARI).

General distribution and ecology: Endemic. Alpine zone, 2750-4100 m. The Azerbaijan and Lorestan provinces are new distribution records for this species (after Flora Iranica).

Characteristic traits: Perennial, dwarf species with pinnatisect leaves, solitary flower, and glabrous achene with a curved beak.

58. *R. renzii* Iranshahr & Rech.f., Fl. Iranica, 179 (1992).

Selected examined specimens: Azerbaijan: Maassoumi & Nikchehreh 80234 (TARI); Hamedan: Assadi & Mozaffarian 36872 (TARI).

General distribution and ecology: Endemic. Alpine zone, 2000 to 3150 m. The Hamedan province is a new distribution record for this species (after Flora Iranica).

Characteristic traits: Easily recognized by hairy and pinnatisect leaves and hairy achene with a curved beak.

59. *R. zenjanensis* Iranshahr & Resh.f., Fl. Iranica, 188 (1992).

Selected examined specimens: Azerbaijan: Assadi & Shahsavari 65941 (TARI); Zanjan: Mussavi & al. 41825 (IRAN).

General distribution and ecology: Endemic. Alpine zone, 2200-3400 m.

Characteristic traits: Perennial species with hairy three pinnate sect. leaves, 4-6 flowers, and glabrous achene with a curved beak.

DISCUSSION

Based on this study, the taxonomic changes of the genus *Ranunculus* after Flora Iranica are as follows:

R. microflorus (Pakravan 2012) as a new species and *R. peltatus* (Naqinezhad & al. 2016), *R. damascenus* (Maroofi & Gholipour 2014), *R. meyerianus* (Pakravan 2010), *R. polyrhizus* (Bidarlord & al. 2016) are recognized as new records to Iran.

Ranunculus trichocarpus var. *persicus*, *R. elbursensis* and *R. pichleri*, have been considered as new synonyms.

Although the Flora of Iran (Pakravan & Sharifnia 2023) has been published recently, some changes in the identification key have been presented here. In this article, as well as the diagnostic features of the species and some points about the habitat of the species have been presented for the first time.



Fig. 1. *Ranunculus aucheri*. Iran, Dizin Mountain (Photographed by M. Pakravan in 2019).



Fig.2. *Ranunculus cicutarius* Schlechtend. Iran, Gilan, Damash, (Photographed by M. Pakravan in 2020).

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