

A REVISION OF POLYGONUM L. SENSU LATO (POLYGONACEAE) IN IRAN

V. Mozaffarian

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The genus *Polygonum* L. is reviewed based on the literature and available herbarium materials. A synopsis and identification key based on recently division of the *Polygonum* sensu lato to 3 different genera: *Polygonum* L. sensu stricto, *Bistorta* Adans. and *Persicaria* Mill. are provided to the ca. 45 accepted taxa. In addition, the checklist of accepted species and synonyms including selected studied specimens are given. Furthermore, *Polygonum iranicum* which has been collected from Fars province is described as a new species from Iran. *Persicaria salicifolia* which has been collected from Khuzestan province is reported as a new species record from Iran.

Valliolah Mozaffarian, Research Institute of Forests and Rangelands, P. O. Box; 13185-116, Tehran.

Key words. *Bistorta*, *Persicaria*, *Polygonum*, *Polygonaceae*, Revision, Iran.

بازنگری جنس علف هفت بند *Polygonum* L. sensu lato در ایران

ولی‌اله مظفریان، دانشیار پژوهش مؤسسه تحقیقات جنگلها و مرتع کشور.

طی بازنگری جنس علف هفت بند در ایران براساس اطلاعات موجود در منابع گیاهشناسی و نمونه‌های موجود در هرباریوم مؤسسه تحقیقات جنگلها و مراتع کشور (TARI) و جمع‌آوری نمونه‌های تازه، گونه‌های این جنس در سه جنس *Polygonum*, *Bistorta*, *Persicaria* جای داده شده و ۴۵ گونه پذیرفته شده از این جنس‌ها همراه با کلید شناسایی آنها و شرح کوتاهی از ویژگیهای گیاهشناختی و با اشاره به تعدادی از نمونه‌های مطالعه شده مربوط به هر یک از این گونه‌ها در این مقاله ارائه شده است. در ضمن یک گونه جدید از جنس علف هفت بند بنام *Polygonum iranicum* و یک گزارش تازه برای ایران بنام *Persicaria salicifolia* که از استان خوزستان جمع‌آوری گردیده نیز معرفی می‌شود.

INTRODUCTION

The author has been revising the genus *Polygonum* L. sensu lato in Iran for the draft of Flora of Iran (in Persian Language). *Polygonum* (L.) sensu lato is the largest genus of *Polygonaceae* and has about 430 cosmopolitan, but especially temperate, some xerophytes (*Polygonum* sensu stricto), with loose and mostly axillary and rarely spike-like leafy inflorescence. Some water plants with dense leafless spike-like inflorescence (*Bistorta* Adans. and *Persicaria* Mill.), which may however be found almost as often on land. The genus *Polygonum* after Rechinger and Schiman-Czeika (1968) draft of Fl. Iranica has been subject of several studies, partly circumscription of the genus have been changed (Flora of Pakistan no. 205). Based on the inflorescence character, species with spike-like dense and approximate flowers have been transferred to the genus *Bistorta* and *Persicaria*. In a comprehensive study, the author has used different available references including Floras and papers

(Komarov 1936); (Webb & Chater 1964); (Zohary 1966); (Coode & Cullen 1967); (Assadi 1988); Mozaffarian (1988); Aghabeigi (2001); Qaiser (2001); Khosarvi & Porrmahdi (2008); Mosaferi et al. (2010).

In this paper the genera *Polygonum* L. sensu stricto, *Bistorta* Adans. and *Persicaria* Mill. have been subject of studies. The majority of the species of *Polygonum* are found in Irano-Turanian region and species of *Persicaria* in Hyrcanian province of Euro-Siberian region. Some of the species are aquatic and cosmopolitan plants. Some species of the genus *Polygonum* have more or less limited distribution in Iran and grow individually or in small isolated patches such as *P. botuliforme* Mozaff., *P. iranicum* Mozaff. But some species, such as *P. arenastrum* Boreau and *P. patulum* M. B. have widespread distribution in the country.

The aim of this paper is to revise the taxonomy of the genus *Polygonum* L. sensu stricto, *Bistorta* Adams and *Persicaria* Mill. in Iran, presenting an

identification key to the known taxa and reporting one new species of *Polygonum* and a new record of *Persicaria*.

MATERIAL AND METHODS

By using existing Floras about 590 herbarium specimens in the herbarium of Research Institute of Forests and Rangelands (TARI) were examined and determined based on morphological characters.

RESUTLS

Polygonum L.

Key to the determination of accepted species of Polygonum

- 1. Plant climbing; leaves cordate-sagittate or cordate 2
 - Plants not climbing; leaves not as above 4
- 2. Perennial; stem trailing to many marters long scandent on trees, the lower part woody. A cultivated plant in Iran **1. P. baldschuanicum**
 - Annual; stem trailing up to 3 m but not woody at base. Wild growing plants 3
 - 3. Fruiting pedicels 1-3 mm, shorter than perianth; perianth segments wingless, bluntly keeled **2. P. convolvulus**
 - Fruiting pedicels 5-8 mm, as long as or longer than perianth; perianth segments winged on the back
 - 3. P. dumetorum
- 4. Inflorescence a branched panicle; perianth yellowish **4. P. alpinum**
 - Inflorescence axillary, rarely spike-like, leafless or rarely leafy 5
 - 5. Perennial herbs 6
 - Annual herbs 20
 - 6. Stems long and virgate, up to 20-70 cm, with a hard woody stock 7
 - Stems short, often prostrate, up to 20 cm. high, with or without hard woody stocks. 10
 - 7- Basal and lower cauline leaves lanceolate or oblong-ovate, nerved, with cartilaginous-crenulate margins **5. P. iranicum**
 - Basal and lower cauline leaves lanceolate or narrowly linear, non cartilaginous. Inflorescence leafy. perianth up to 3.5 mm 8
 - 8. Nut somewhat longer than broad. Stems often prostrate **6. P. hyrcanicum**
 - Nut up to 2 times longer than broad. Stems often erect or ascending 9
 - 9. Leaves narrowly linear-lanceolate; lower ones up to 30x2 mm. Pedicels very short **7. P. setosum**
 - Leaves linear-lanceolate; lower ones 30 (-50) x 3 mm. Pedicels equal with perianth **8. luzuloides**
 - 10- Flower bearing branches prostrate, herbaceous, short or long. Plants only indurate at base or with hard woody stocks 11

- Flower bearing branches long conspicuous. Plant at flowering time with broad leaves or leafless and often deciduous 13
- 11- Flower bearing branches prostrate, woody. Leaves small, up to 15 mm. long, with revolute margins. Stems and branches thick **9. P. alpestre**
 - Flower bearing branches prostrate. Plant at the base woody or cushion shaped 2
 - 12. Dwarf cushion-shaped plant, often with flower bearing branches not longer than leaves. Flowers covered by leaves. Leaves cylindric to sussage shaped **11.P. botuliforme**
 - Plant with woody stocks. Flower bearing branches prostrate **10. P. serpyllaceum**
 - 13. Plants with leafy flowering branches. Ochreae long and conspicuous 14
 - Plants with leafless flowering branches or often deciduous. Ochreae short 17
 - 14. Branches long spiny. Ochreae long and conspicuous **19. P. spinosum**
 - Branches non spiny 15
 - 15. Leaves shorter than ochreae or lower leaves ± longer, with revolute margin **14. P. paronychioides**
 - Leaves longer than ochreae 16
 - 16. The entire plant except ochreae papillose. Leaves linear, flat or with revolute margin, aged branches often grayish-white. Flowers always single **13. P. afghanicum**
 - The entire plant papillose or glabrous. Leaves ovate - lanceolate, with revolute margins. Aged branches often green or greenish-yellow or brown. Flower often in group of 3 **12. P. thymifolium**
 - 17. Plant with abbreviated internodes, often ± up to 5 mm, rarely to 10 mm, branches short and indurated **18. P. salicornioides**
 - Internodes often longer and branches long and herbaceous 18
 - 18. The entire plant except perianth glabrous or papillose-minutely scabrous. Branches erect and long. Internodes long. Ochreae 5-6 veined **17. P. aridum**
 - The entire plant except ochreae velutinous or softly papillose. Branches short 19
 - 19. Plant caespitose, with thick branches, relatively loose and few branched. Leaves ovate . Flowers 1 **16. P. khaje-Jamali**
 - Plant caespitose with thin branches, densely branched. Leaves ovate to lanceolate. Flower 1 or 2 **15. P. dumosum**
 - 20. The whole inflorescence leafless 21
 - The whole inflorescence consisting of leafy branches 24
 - 21. Nuts 4-5 mm long **28. P. kitaebelianum**
 - Nut not more than 3 mm long 22

22. Flowers approximate. Leaves soon deciduous, linear, linear-lanceolate **29. P. argyrocoleon**

- Flowers loose and distant, regularly interrupted. Leaves not soon deciduous, after flowering remained on the branches 23

23. Stems long, striate, up to 25-80 cm, greenish-yellow. Flowers rather large and loose **27. P. patulum**
- Stems short 10-20 cm long, thin, pale green, cernous. Flower small **26. P. olivascens**

24. Stems short, not more than 7 cm high, prostrate; upper internodes very short, thus the whole plant beset by rather large, silvery-white ochreae. Leaves setiform **23. P. molliaeforme**

- Plants not as above 25

25. Plant erect, ascending, or decumbent. Leaves variable in size; cauline leaves larger, broadly lanceolate or obovate-lanceolate or narrowly lanceolate to almost linear; rameal leaves smaller; bracteal leaves much more smaller **25. P. aviculare**

- Plants mostly prostrate. Leaves smaller and similar to each other (not variable) 26

26. Plant profusely long branched. Cauline and branches leaves similar, narrowly to broadly elliptic **24. P. arenastrum**

- Plants not as above 27

27. Flowers 4-6 in the axil, pedicellate, approximate; pedicels 3-4 times the length of the perianth **20. P. corrigioloides**

- Flowers 1-3 in the axil, sessile or nearly sessile, loose 28

28. Flowers borne in fascicles of 1-2 in the axils of the upper leaves. Perianth subcampanulate, lobed up to middle. Nuts nearly equal with perianth **21. P. polycnemoides**

- Flowers borne in fascicles of 1-3 in the axils of the upper leaves. Perianth tubular; perianth segments 3 times shorter than perianth. Nuts equal with perianth **22. P. rottboellioides**

Sect. **Pleuropterus** (Turcz.) Benth & Hooker, Genera plant. 3: 99 (1883).

Large perennial volubilis plants with climbing flexuosus stems. Flowers numerous, disposed in terminal and axillary panicles.

1. P. baldschuanicum Regel, Acta Hort. Petrop. 8: 684 (1883)

Studied specimens. Tehran: Damavand, 1800 m, Mozaffarian 45358 (TARI).

Cultivated as ornamental plant in different parks and in the Iran National Botanical Garden and many temperate cities in Iran.

Typical characters. Perennial; stem trailing to many meters long, scandent on trees or walls, the lower parts woody, with brownish-gray bark and numerous lenticels. Ochreae pellucid, cylindric, appressed to

stem. Leaves oblong-ovate, cordate at base, petiolate. Inflorescence paniculate, to 50 cm. long. Flowers white. Nut ca. 4 mm long, acute, with strongly concave faces.

Sect. **Tiniaria** Meisn., Monogr. Gen. Polyg. Prodr. 43 et 63 (1826).

Annual plants. Stems climbing, thin, flexuosus. Flowers disposed in racemes or spike-like inflorescence.

2. P. convolvulus L., Sp. Pl. 364 (1753).

Syn.: *Fagopyrum carinatum* Moench, Meth. 290 (1794). *F. convolvulus* (L.) H. Grass, Bull. Geogr. Bot. 23: 21 (1913).

Studied specimens. Gorgan: Park e Golestan, S. of Tange Gol, 1850m, Wendelbo and Cobham 14406 (TARI); Gilan: Bandar-e Anzali, sea level, Mozaffarian & Maassoumi, 65247 (TARI); Azarbaiejan: Arasbaran protected area, between Doghrun and Saigram-Dagh, 2500-2700m, Assadi and Sardabi 24182 (TARI); 6 Km from Germe to Eni, west of Esmar village, 900-1200m, Mozaffarian and Nowrozi 34964 (TARI); Yazd: Mehriz, Kuh e Lakhese, 1950-2650m, Mozaffarian 77706 (TARI); Khorassan: Mashhad, N. slope of Binalud mountains, above Zoshk village, Rudkhane Abdollah, 2100-3000m Mozaffarian 48872 (TARI); Tehran: Damavand, 12 Km S. of Damavand, Akhorbadin, 1750-2000m, Mozaffarian 39652 (TARI)
Typical characters. Annual. Stem to 1m long, climbing, sulcate. Leaves petiolate, rounded or oblong ovate, cordate to hastate at base. The outer segments of perianth obtuse angular, without prominent wing. Pedicels shorter than 2mm long. This species growing as a weed in the field and forestry area.

3. P. dumetorum L., Sp. Pl. ed. 2: 522 (1762).

Syn.: *Fagopyrum membranaceum* Moench, Meth. 290 (1794).

Studied specimens. Gorgan: Zarrin Gol, 900m, Riazi 7787 (TARI); Mazandaran: Nowshahr, Alamde, Manuchehr Kala. Ca. 20m, Mozaffarian 45533 (TARI); lowest part of Hezarcham in Chalus road, 1220m N. 36, 28, 55, E. 51, 14, 61 Mozaffarian 93797 (TARI).

Typical characters. Annual. Stem up to 3m long, climbing. Leaves cordate, acute, glabrous. Outer segments of perianth enlarging into membranaceous wings. Pedicels often longer than 2 mm.

Sect. **Aconogonon** Meissn. Monogr. Polyg. (1826) 43.

Syn.: *Aconogon* Tourn. -*Acontogonum* Asch. et Gr. Synops. IV (1913) 840; *Aconopogon* Morj Enum. P I. from Korea 129 (1922); *Pleuropteropyrum* H. Gross, Bull. Geogr. Bot. XXIII (1913) 90.

Perennial plants. Flowers in a lax paniculate inflorescence. Perianth yellowish or white. Styles 3.

Achene trigonous, with sharp angles.

4. *P. alpinum* All., Fl. Pedem 2: 206, t. 67 F. 1 (1785).
Syn.: *P. undulatum* Murr. in Comm. Gotting. 5: 34 (1774); *P. polymorphum* Ldb., Fl. Ross. 3, 1: 542 (1847-49).

Studied specimens. Azarbaiejan: between Khoy and Maku, Arab-Dizechi 2150m, Assadi and Mozaffarian 30271 (TARI); Arasbaran protected area 2400-2700m, Assadi and Sardabi 24308 (TARI); Salmas, west of Salmas, Pereshkhan border of Turkey, 2100m Mozaffarian 69930 (TARI).

Typical characters. Stems erect, up to 100 cm. Leaves lanceolate-acuminate, pilose above and beneath. Inflorescence a broad panicle. Plant mostly growing in wet place and wood margins.

Sect. **Polygonum** Tourn. Instit 510 (1719).

Syn.: Sect. *Avicularia* Meisn., Monogr. Polyg. Prodr. 43 et 85 (1826).

Annual or perennial. Stems terete, often sulcate, erect or prostrate; ochreae hyaline, at least above, usually lacinate. Flowers in bracteate lax spikes, or in axillary fascicles. Perianth segments colored, with a green keel. Styles 3.

5. *P. iranicum* Mozaff., sp. nov. (Fig. 1)

Planta multicaulis, basi lignosa, glabra. Caules basi indurati 50-70 cm alti ± prostrati, virgati, in parte superiore parce ramosi, striati; ochreae ± tubulosae, in parte inferiore coriaceae brunneae opaeae, nervosae, in parte superiore hyaline, membranaceae, nervosae laceratae; glabrae; ochreae florales superioribus similes sed longiores. Folia caulina inferiora coriacea, breviter petiolata, 25-35 × 10-12 mm, oblongo-ovata vel oblongo-lanceolata, basi cuneata, apice acuta, prominente nervosa, margine cartilagineo-crenulata; folia caulina mediana et superiora lanceolata, acuta, prominente nervosa, summa folia floralia inconspicua. Flores axillares singuli vel terni, inferiores remoti, superiores ± approximati, breviter pedicellati; pedicelli 0.5-1.5mm longi. Perigonium 2-2.5mm longum, basi herbaceum, apicem roseum. Nux. trigonus. Sytli 3.

Type. Iran, Fars, S. of Estahbanat, Kuhe Bash N.29,06 E. 54,01, 1915m Mozaffarian 97461 (holotypus TARI).

Other studied specimens. Fars, S. of Estahbanat, Kuhe Bash 1700 -2200m Mozaffarian 47025 (TARI); road from Fasa to Estahbanat; Runiz, Darre Morghak 1700m. Mozaffarian 97462 (TARI).

Plant perennial, many-stemmed, glabrous, at the base woody. Stems at the base hardened, up to 50-70cm high, prostrate, virgate, non branched or in upper part loosely branched, striate. Ochrea tubular, in the lower part leathery mat brownish, nervose in the upper part hyaline, nerved, lacerate, glabrous; ochrea in upper part of the stem similar to lower ones but longer. Lower

cauline leaves leathery, shortly petiolate, 25-35cm long, 10-12cm wide, oblong-ovate, cuneate, acute, prominently nervose, cartilagineous-crenulate margin; upper cauline leaves lanceolate, acute, prominently nervose; upper floriferous cauline leaves non conspicuous. Flowers axillary 1-3, lower ones remote, upper ones ± close to each other, shortly pedicellate; pedicels up to 0.5-1.5mm long. Perianth 2-2.5mm long, at the base herbaceous, in upper part rose coloured. Nut trigonous. Styles 3.

The new species matches with perennial long virgately branched group of *Polygonum* in sect. *Polygonum* and ± close to *P. arianum* Grig. which differs with it by having shorter perianth up to 2-2.5 mm (not more than 5mm), entirely glabrous stem (not pappilose-pilose in the upper part), oblong-ovate or oblong-lanceolate, lower cauline leaves (not lanceolate acute).

6. *P. hyrcanicum* Rech. f., Ann. Nat. Mus. Wien 53,1: 352 (1942).

Syn.: *P. equisetiforme* auct. Fl. Persiae, nec Sibth. & Sm. (1809).

Studied specimens. Gorgan: between road to Almehr and Behkade, 1300m, Wendelbo and Cobham 14235 (TARI); 59km to Marave Tappe on the road from Gomishan, CH4, ca. zero m, Assadi & Abouhamzeh 43297 (TARI); Mazandaran: Kandavan pass-Chalus, 850m Runemark and Mozaffarian 25787 (TARI); 9Km from Haraz road to Chalus road on the road to Balade, 1150m Mozaffarian and Abohamzeh 42626 (TARI); Chalus road, between Duzdebon and Dalir, 1200m, N. 36, 20 E. 51, 12 (WA2), Assadi 89351 (TARI); Gilan: Mordabe Anzali, ca.-25m, Mozaffarian 66241 (TARI); Azarbaiejan: Dashte Moghan, Khodaafarian, 150m, Mozaffarian 64263 (TARI).

Typical characters. Perennial. Stems many, often prostrate to ascending. Leaves lanceolate, acute, and attenuate toward petiole. Inflorescence spike-like, bracteate; flowers axillary 1 or 2, pedicellate; pedicels 1-2mm. long. Nut trigonous, smooth, almost black.

7. *P. setosum* Jacq., Obs. Bot. 3: 8 tab. 57 (1768), non willd. (1799).

Studied specimens. Azarbaiejan: 10 Km from Oshnavieh to Urumieh, 1700m, Zehzad and Siami 5805 (TARI); ca. 50 Km W. of Khoy near the Turkish border, between the village Aland and Razi, 2330m, Assadi and Olfat 68862 (TARI); Kermanshah: between Kermanshah and Pave, before Shamshir, Mansur-Aghai village, Kuh-e Shahu, 1700-2300m N. 34,50 E. 46,35 (PDI) Assadi & Mehregan 89252 (TARI); Lorestan: Oshtorankuh, above the village Tihun, 2500-3200m, Assadi and Mozaffarian 37151 (TARI), 37085 (TARI); Chaharmahal-e Bakhtiary: road from Shahr-e kurd to Naghan, N. of Sulegan, kuh-e Shahpurnaz,



Fig. 1. *Polygonum iranicum* ($\times 0.5$); flower ($\times 5$).

2100m, Mozaffarian 57452 (TARI); Sabz kuh, kuh-e Hezardarreh, 2300-2500m, Mozaffarian 58182 (TARI). *Typical characters.* Perennial with hard woody stock. Stems unbranched, erect, strict, glabrous. Leaves lanceolate to linear-lanceolate, less than 5mm. broad. Ochreae long, tubular, many-nerved, lacerate. Inflorescence a branched spike. Nut included in the perianth.

8. *P. luzuloides* Jaub. & Spach, III. Pl. or. 2: 37 (1845). *Studied specimens.* Hamadan: Gardane-Asadabad to Kuh e Gharavol Khaneh, 2500-2700m, Mozaffarian 64998 (TARI); ca. 20 Km S. of Nahavand, Kuh-e Garru, above Cheshmeh-Gamasab (TT3), 2600m, Assadi & Mozaffarian 36993 (TARI); Ganjname, slope of Alvand mountain, 2100m, Assadi 61057 (TARI); Kurdistan: ca. 50Km N.W. of Sanandaj, kuh-e Chehelcheshme, Duzakh-darreh, 2000m Assadi 75326 (TARI); Tehran: Arak, Kuh-e Rasvand, from Hesar, Morvaridar valleys, 2000-2500m Mozaffarian (63717 TARI); E. slope of Kuh e Rasvand, from Babakhodadad, 2100-2750m Mozaffarian 64205 (TARI); Shahzand, Souroneh, Kuh e Souroneh 2000-2650m, Mozaffarian 48271 (TARI).

Typical charaters. Very similar to *P. setosum*, but the leaves lanceolate, more than 5mm broad. Stem branched below the inflorescence.

9. *P. alpestre* C. A. Mey., Verz. Pfl. Cauc. 157 (1831). Syn.: *P. ammanioides* Jaub. & Spach, III. Pl. Or. 2: 28, tab.119, (1844). *P. alpestre* C. A. Mey. var. *ammanioides* (Meisn.) Boiss., Fl. Or. 4: 1038 (1879). *P. cognatum* Meisn. var. *alpestre* (C. A. Mey.) et var. *ammanioides* (Jaub. & Spach) Meisn. in DC. Prodr. 14: 96 (1856).

Type. Tالش Mountains.

Studied specimens. Mazandaran: Lar valley, 2450-2550m, Wendelbo & Assadi 13331 (TARI); Azarbaiejan: 5km from Salavat to Golidaragh, 1500m Mozaffarian & Nowrozi 35080 (TARI); Arasbaran protected area, Doghrun, mountain, 2500m, Assadi & Sardabi 23954 (TARI); Hejarandost to Makidi, 1400-1750m, Assadi & Maassoumi 20138 (TARI); Kalan, mountain on the west side of guard station, 2470-2550m, Jamzad et al. 70274 (TARI); Urumieh, Razhan, 2000m, Sabeti 2909 (TARI); Lorestan: 21 km on road from Shulabad to Aligudarz, 2000m, Runemark & Lazari, 26387 (TARI); Tehran: 8 km from Tafresh on the road to Saveh, 2200m, Assadi & Shirdelpur 13156 (TARI).

Typical characters. Perennial, glabrous to minutely papillose plant. Stems prostrate, with indurated basal part and short internodes, mostly covered by flowers. Leaves ovate-lanceolate to elliptic, with revolute rough papillose margins. Ochreae hyaline, longer than

internodes. Nut shorter than perianth, up to 3mm, trigonous, smooth, nitens. Styles 3.

10. *P. serpyllaceum* Jaub. & Spach, III Pl. Or. 2: 24 (1844).

Syn.: *P. radicosum* Boiss., Fl. Or. 4: 1039 (1879).

Studied specimens. Mazandaran: S. of Ramsar, E. of Lapasar 2950m. Runemark & Maassoumi 21663 (TARI); Lorestan: Aligudarz, Shulabad, Ghlikuh, 2200-3500m, Mozaffarian & Sardabi 42533 (TARI); Kuhgiluyeh and Boirahmad: N. Side of Kuh-e Dena, above the village Noghol 3500-4000m, Assadi & Abouhamzeh 46168 (TARI); Chaharmahal-e Bakhtiary: N. Slope of Rocky Mountain of Kallar, S. of Khederabad, 2600-3200m, Mozaffarian 58129 (TARI) and Mozaffarian 96818 (TARI); Seman: ca. 20 Km N. W. of Shahrud, above Nekarman, Kuh-e Shahvar, 3700-3950m, Assadi & Mozaffarian 40875 (TARI); Tehran: Shemshak, Dizin, 3000-3500m, Mozaffarian & Mohammadi 49071 (TARI).

Typical characters. Plant dense pulvinate-caespitose, glabrous. Stems many. Flowering branches up to 8cm long, thin, flexuose, ± similar to *P. alpestre* but leaves much smaller, rarely similar but not roughly papillose at the margin. Ochreae shorter than internodes, without dense flowers.

11. *P. botuliforme* Mozaffarian Iran. J. Bot. 4: 62 (1988).

Studied spectimens. Tehran: Arak, Kumijan, Vafs Mountains, 2100-2500m, Mozaffarian 63722 (TARI); 12 Km from Vafs to Kumijan, 2500m, Mozaffarian 67753 (TARI).

Typical characters. Densely pulvinate-caespitose, glabrous. Flowering branches very short up to 1-2cm, flexuose; internodes short. Leaves orbicular, sassage-shaped. Nut trigonous, smooth, nitid. Styles 3.

12. *P. thymifolium* Jaub. & Spach, III. Pl. Or. 2: 22 (1844).

Syn.: *P. kotschyanum* Boiss., Fl. Or. 4: 1040 (1879).

Type. Iran, between Shiraz and Fasa.

Studied specimens. Gorgan: Parke Golestan, Almeh, 1350-1700 m Mozaffarian and Abouhamzeh 59072 (TARI); Chaharmahal-e Bakhtiary: Shahre Kurd, Babaheidar, Sefid dane, Kuh e Kalak, opposite to Dashte Lagharak, 2750-2956 m, Mozaffarian 57739 (TARI); S. slope of Kuh e Jahanbin from Ghaleh Tak, 2350-2950 m, Mozaffarian 57510 (TARI); Khorassan: Esferayen, N. slope of Kuh-e Shah-jahan, from Darparchin-e bala village 1700-2500 m, Mozaffarian 48456 (TARI); Tandure National Park, between Shekarab and Chehelmehr, 1600-1900 m, Assadi & Maassoumi 50716 (TARI); Tehran: 35 km to Firouzkuh, on the road from Damavand, 2080m, Assadi & Mozaffarian 35205 (TARI).

Typical characters. Dense papillose-pubescent or glabrous small undershrub to 40cm high. Rhizome strong, oblique, easily disintegrating; woody stems 12–18cm long. Leaves lanceolate or lanceolate – oblong, revolute margined, attenuate at base, sessile, acuminate. Ochreae glabrous, oblong, often lacinate. Inflorescence interrupted racemes. Nut lustrous, oval-trigonous.

13. *P. afghanicum* Meisn. in DC., Prodr. 14: 90 (1856).

Studied specimens. Fars: 20 Km from Estahbanat to Neyriz, S. of Bakhtegan lake, 1700m, Mozaffarian 47098 (TARI); S. of Estahbanat, Kuh e Bash, 1700–2200m, Mozaffarian 46994 (TARI); Hormozgan: Kuh e Genu, 1900–2000m, Mozaffarian 44711 (TARI); ca. 50 Km NE. of Senderk, Araghin, 1100–1600m, Mozaffarian 44581 (TARI); N slope Rocky Mts. of Bokhon, N. of Fareghan, 1500–2000m, Mozaffarian 44711 (TARI); Baluchestan: ca. 40km N. of Khash, Kuh e Taftan from Torsh-Ab, Assadi 22897 (TARI); 22880 (TARI); Khorassan: Esferayen, Shahjahan, Mts. Region, Rocky soily Mt. Tourkan, 1400–2500m, Mozaffarian 48635 (TARI); 18 km from Sabzevar to Esferayen, 1600 m, Mozaffarian 48395 (TARI); Mashhad, between Shandiz and Zoshk, Abardeh, 1500 m, Mozaffarian 48796 (TARI); 87 km from Neishabour to Kashmar, 1850–2000 m, Assadi & Mozaffarian 35522 (TARI); Semnan: Touran protected area, foot mountain of Kuh Peyghambar, Freitag & Jadidi 29039 (TARI).

Typical characters. Perennial, dense caespitose to undershrub, except ochreae all part of the plant papillose-pubescent. Flowering branches ascending or prostrate, ± woody at base, and length end, branched at tip, densely leafy. Leaves linear, flat, and slightly revolute at margins. Ochreae glabrous, shorter than internodes. Nut trigonous, lustrous, black. Styles 3.

14. *P. paronychioides* C. A. Mey. ex Hohen., Bull. Soc. Nat. Mosc. 4: 356 (1838), (Fig. 2).

Syn.: *P. paronychia* C. A. Mey., Verz. Pfl. Cauc. 158 (1831). non Cham. & Schlecht. (1828). *P. mucronatum* Royle ex Bad., Trans. Linn. Soc. 18: 115 (1841). *P. lemnanianum* Meisn. in DC., Prodr. 14: 91 (1856).

Studied specimens. Azarbaiejan: 2 Km N.E. of Khalkhal, 1800–2050m, Mozaffarian & Nowrozii 34037 (TARI); Hamadan: ca. 8 Km E. of Ganjname, 2750m, Assadi & Mozaffarian 36854 (TARI); Asadabad, Khondab and Ghasemabad, NE slope Kuh – e Gharavul Khane, 2100–2500 m, Mozaffarian 64657 (TARI); Gardane- Asadabad to Kuh-e Gharavul Khane, 2500–2700 m, Mozaffarian 64995 (TARI); Lorestan: 55 Km from Arak to Malayer, 2100 m, Mozaffarian & Maassoumi 48067 (TARI); Esfahan: Kashan, Ghamsar, kuh-e Ghebleh, 1900–2250m, Mozaffarian 41131 (TARI); Chaharmahale-Bakhtiary:

Shahr-e Kurd, N. slope of Kuh-e sefid, 2100–2300 m, Mozaffarian 57965 (TARI); Tehran: Mountains NW of Tehran, Suleghan valley, 1600 m, Assadi, Mozaffarian and Nowrozii 33672 (TARI); Karaj, Kuh-e Dashte, 2000–2500 m, Assadi and Mozaffarian 33347 (TARI).

Typical characters. Perennial herb with a very stout woody stock, minutely scabrous or glabrous. Stems prostrate, 5–15 cm long, densely leafy; leaves and ochreae often overlapping. Leaves linear, mucronate. Ochreae hyaline, conspicuous. Nut trigonous, nitidus, black.

15. *P. dumosum* Boiss., Diagn. Pl. Or. Nov. Ser. 1,7: 83 (1846), (Fig. 3).

Studied specimens. Chaharmahal-e Bakhtiary: Shahr-e Kurd, Shalamzar, Aghasabz. 2400 m, Mozaffarian 54607 (TARI); road from Lordegan to Yasuj, Maymand, Margh-e Chenar, Kottuk, 1750 m, Mozaffarian 54467 (TARI); Fars: Shiraz, Park-e Bamu, 1750–2000 m, Mozaffarian 71501 (TARI); Dashte Arzhan, protected area, 1850 m, Mozaffarian 46914 (TARI).

Typical characters. Shrubby plant, 15–20cm high, many-branched, flowering branches 15–20 cm long, erect to ascending, papillose-pubescent. Ochreae 6–10mm long, lacerate. Leaves linear-elliptic with revolute margins, papillose-pubescent, soon deciduous. Flowers 1 or 2. Nut trigonous, smooth. Styles 3.

16. *P. khaje-jamali* Khosravi & Poormahdi, Ann. Bot. Fennici 45: 477–480 (2008).

Studied specimen. Fars: 10 Km SE. of Sarvestan, Post-e Chenar, 1650–1750m, Mozaffarian 46720 (TARI).

Typical characters. Similar to the preceding species, but branches thicker. Lower leaves ± persistent, ovate. Flower 1.

17. *P. aridum* Boiss. & Hausskn. in Boiss., Fl. Or. 4: 1042 (1879).

Studied specimens. Esfahan: Semirum, Abmalakh, Kuh e Dena, 1700 m, Mozaffarian 58244 (TARI); Chaharmahal-e Bakhtiary: Sabzkuh, Kuh e Hezar darreh, 2300–2750 m, Mozaffarian 58190 (TARI); S. slope of Gardaneh Rokh, 2250 m, Mozaffarian 57980 (TARI); Fars: Nurabad, Doshman Ziary region, Abzalu village, Kuh e Tasak, 1900–2500 m, Mozaffarian 45803 (TARI); N. of Kuh e Dena, Abmalakh, 2000–2600 m, Assadi & Mozaffarian 31342 (TARI); 31546 (TARI); Shiraz, 40 Km on the road to Ardakan, 2130 m, Assadi & Mozaffarian 31052 (TARI); Eghlid to Ardakan, around Kharestan and Saadatabad between Cherkas and Kakan, 2150m, V. Mozaffarian 71349 (TARI).

Typical characters. Shrubby plant; stems and branches glabrous or minutely papillose-scaber; median internods more than 10mm long. Leaves shorter than 1–3mm long, linear-lanceolate, glabrous, and soon deciduous.



Fig. 2. *Polygonum paronychioides* ($\times 1$); flower ($\times 15$).

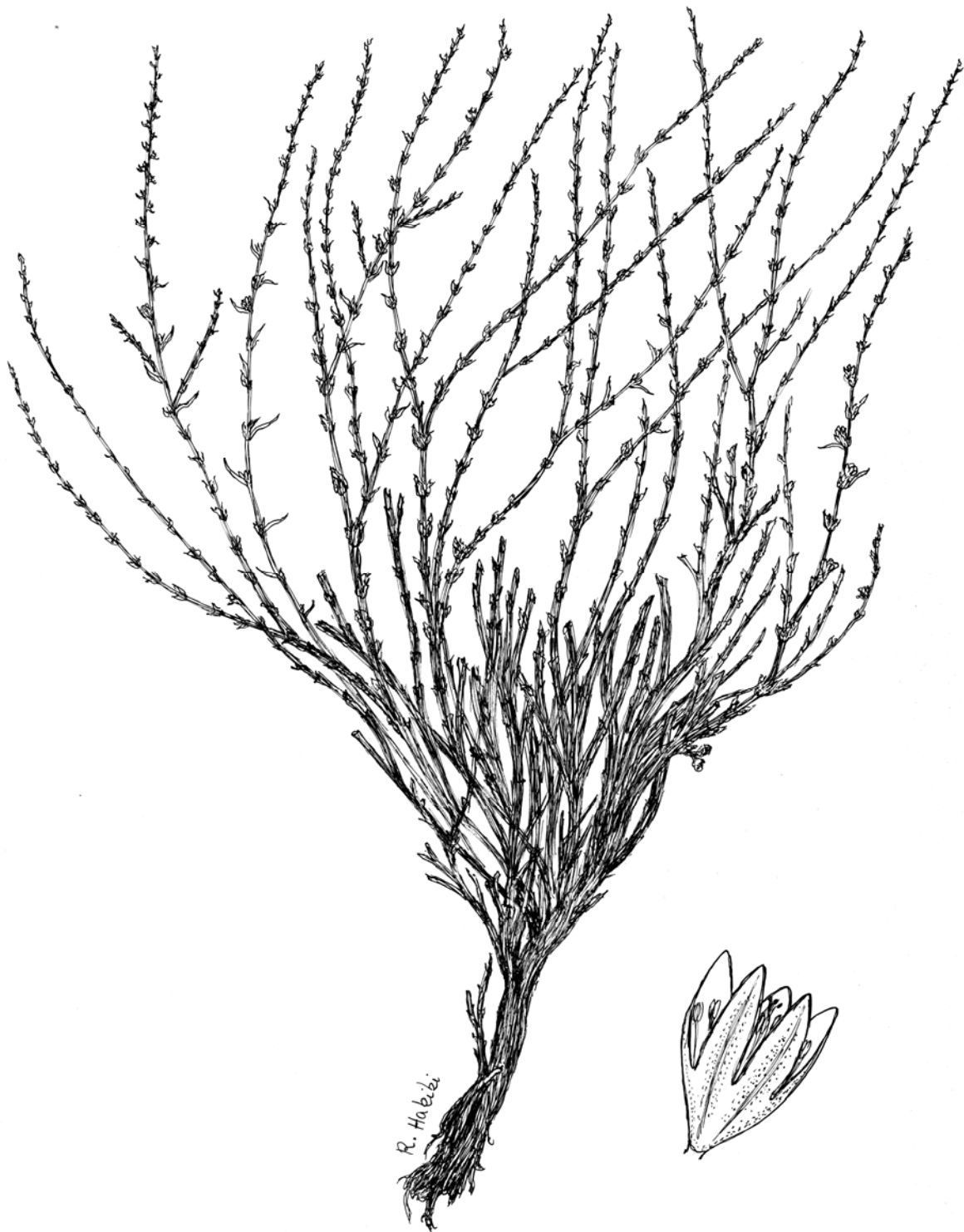


Fig. 3. *Polygonum dumosum* ($\times 0.7$); flower ($\times 7$).

18. *P. salicornioides* Jaub. & Spach, III, Pl. Or. 2: 33 (1845).

Studied specimens. Chaharmahal-e Bakhtiary: S. slope of Kuh e Jahanbin from Ghaleh Tak, 2350–2950 m, Mozaffarian 57509 (TARI); Kuhgileuye and Boirahmad: road from Yasuj to Kakan, N. slope of Kuh e Kachian, 2500–2900 m, Mozaffarian 72165 (TARI); Fars: Shiraz, Bamu protected region, 1900 m Dehbozorgi 32779 (TARI); Bamu, protected region, Cheshme Fil to ridge of Kuhe-Bamu, 1900–2650 m, Wendelbo and Foroughi, 17615 (TARI); Hormozgan: Bokhon, Tashgerd and Boneh Mountains, 1800–2700 m, Mozaffarian 52464 (TARI)

Typical characters. Dense shrubby-caespitose; branches 15cm long, rigid, erect, ascending, many branched; internodes very short, striate-angular, tomentose-pubescent. leaves oblong-lanceolate, ± tomentose, soon deciduous. Nut trigonous. Styles 3.

19. *P. spinosum* H. Gross. in Engler, Bot. Jahrb. 49: 340 (1913).

Studied specimens. Kerman: S. slope of Kuh-e Khabr, 3500 m, Assadi & Miller 25197 (TARI); Above Lalezar village, Kuh e Lalezar, 3000–3500 m, Assadi 83168 (TARI); ca. 70 Km. NWW. of Ravar near the town Kuhbanan, Davedan mountain (DV1), 2400–3200m, Assadi & Bazgosha 56171(TARI); Yazd: Deh-e Bala, Shirkuh, 3000 m, Foroughi and Assadi 17945 (TARI).

Typical characters. Densely shrubby-caespitose, pubescent; old branches indurate, spinescent; spines ± 5mm long; young branches prominently pubescent, with short internodes. Leaves linear-lanceolate.

20. *P. corrigioloides* Jaub. & Spach, III, Pl. Or. 2: 34 (1845).

Studied specimen. Kerman: Baft, 2200 m, Dini and Bazargan 30621 (TARI); 30617 (TARI); Sistan and Baluchestan: Zabol, Zehak, 500 m, Valizade and Ramak Maassoumi 1143 (TARI); 1141 (TARI); Zabol to Miankangi, Dust Mohammad Khan, 500 m, Mozaffarian 63442 (TARI)

Typical characters. Annual, rarely perennial, glabrous. Stems thin, prostrate, flexuous, at length ascending; lower internodes longer than leaves. Leaves linear-spatulate, narrowed toward the base. Nut small, lustrous, black, trigonous, shorter to longer than perianth

21. *P. polycnemoides* Jaub. & Spach, III, Pl. Or. 2: 30 (1845).

Syn.: *P. olivieri* Jaub. & Spach, l.c. 31 (1845).

Studied specimens. Azarbaiejan: 2 km NE of Khalkhal 1800-2050 m, Mozaffarian & Nowrozi 34059 (TARI); Hamadan: Kuh-e Alvand, 2700 m, Assadi & Mozaffarian 36834 (TARI); Lorestan: 61 km on the road from Aligudar to Shulabad, valley after the pass,

2400 m, Runemark and Lazari, 26237 (TARI); Esfahan: Kuh e Karkas, 2800 m, Foroughi 7808 (TARI); Chahrmahale Bakhtiary: Sabz kuh, Kuh-e Hezar darreh, 2300-2750 m, Mozaffarian 58187 (TARI); Lordegan, Sarkhon, Gandumkar, 2200 m, Mozaffarian 54892 (TARI); Hormozgan: Bandar-Abbas, Bokhon, Tashgerd and Boneh mountains, 1800-2700 m, Mozaffarian 52427 (TARI); Khorassan: Mashhad, N. slope of Binalud, above Zoshk, Rudkhan-e Abdullah, 2100-3000 m, Mozaffarian 48828 (TARI); Semnan: ca. 20 km N. W. of Shahrud, above Nekarman, Kuh-e Shahvar, 3000-3200 m, Assadi & Mozaffarian 40823 (TARI). Tehran: W. of Tehran, Suleghan valley, 2000 m, Assadi & Mozaffarian 32739 (TARI); Firuzkuh, between Mahabad and Anzeha, 2000 m, Mozaffarian 54242 (TARI);

Typical characters. Annual. Stem prostrate, branched from base; internodes longer than leaves. Ochreae shorter than leaves. Leaves lanceolate to subulate-linear. Flowers 1 or 2 in the axil. Perianth segments shorter than the tube. Nut nearly equal to shorter than perianth, trigonous.

22. *P. rottboellioides* Jaub. & Spach, III, Pl. Or. 2: 32 (1845).

Syn.: *P. tubulosum* Boiss., Diagn Pl. Or. Nov. Ser. 1,7: 83 (1846). *P. durum* Brenckle, Phytologia 3: 365 (1950).

Studied specimens. Azarbaiejan: 42 km to Nohour, Lisar protected area, 2450 m, Foroughi & Assadi 13768 A (TARI); Lorestan: 58 km from Aligodarz to Shulabad, the pass N. of Ghalikuh, 2900 m, Runemark and Lazari, 26157 (TARI); Fars: Firuzabad, Meimand, Kuh e Sefidar from Tange Riz, 1750-2850 m, Mozaffarian 71434 (TARI); Khorassan: 20 km from Sabzevar to Neyshabur, 1300 m, Assadi & Mozaffarian 35401 (TARI); Semnan: Shahrud, Turan protected area, neck mountain between Asbkeshan and Bargh, Rechinger 51034 (TARI); Tehran: Chalus road, Karaj Dam, Kushk-e Bala, 1800-2100 m, Mozaffarian 63500 (TARI); Firuzkuh, Simindasht, 1500 m, Mozaffarian 54340 (TARI).

Typical characters. Decumbent to ascending annual herbs, 3-18 cm. Stems and branches slender, usually papillose. Leaves linear-lanceolate, longer than internodes. Flowers 1-3 subsessile. Nut adherent to narrowly tubular perianth, narrowly oblong to ovate, black.

23. *P. molliaeforme* Boiss., Diagn. Pl. Or. Nov. Se. 1,7: 84 (1846), (Fig. 4).

Syn.: *P. acaule* Boiss. Fl. Or. 4: 1043 (1879) non Hook (1890).

Type. Iran, Kuh e Dena.

Studied specimens: Chaharmahal-e Bakhtiary:



Fig. 4. *P. molliaeforme* ($\times 1$); flower ($\times 10$).

Sabzkuh, Mozaffarian 97418 (TARI); Semnan: Chastkhkhoran, 1620 m, Riazi, 3842 (TARI); Tehran: Shemshak, Dizin, 3000-3500 m, Mozaffarian and Mohammadi 49075 (TARI); Arak, Mountains above the village Latedar, 2100-2600 m, Assadi 75054 (TARI).

Typical characters. Dwarf glabrous annual plant. Stems dichotomously branched, up to 5 cm.; internodes shortened. Ochreae hyaline, nerveless, lanceolate acuminate, somewhat inflated from base. Leaves linear, sessile. Flowers small, 2 mm. long, subsessile. Nut 2 mm long, oval, flattened, lustrous, and nearly black.

24. *P. arenastrum* Bureau, Fl. Centr. Fr. ed. 3,3: 559 (1875).

Syn.: *P. aequale* Lindm., Svensk Bot. Tidskr. 6: 692 (1912). *P. aviculare* L. subsp. *aequale* (Lindm.) Ascherson & Graebner, Syn. Fl. Milleleur. 4: 848 (1913).

Studied specimens. Azarbaiejan: Bostanabad, margin of Ghurigol lake, 1950 m, Assadi et al. 68451 (TARI); Kurdistan: 15 km N. of Biston, Bernaj village 1300 m, Hamzhee and Mirabdali 1629 (TARI); Lorestan: Oshtorankuh, 2200-3300 m, Mozaffarian and Sardabi 42461 (TARI); Chahrmahal-e Bakhtiary: Brojen, 2200 m, Mozaffarian 57189 (TARI); Sabzkuh, Mozaffarian 97418 (TARI); Tehran: Daryache Tar, Damavand, 2600 m, Dini and Arazm 17282 (TARI). Fars: between Sisakht and Borujen at Meymand, 1600 m, Assadi and Mozaffarian 31320 (TARI). Tehran to Karaj, Garmdarreh, Kuh e Dashte, 1900 m, Mozaffarian 94289 (TARI); Botanical Institute of Iran, 1320 m, K.

P. Buttler 31823 (TARI).

Typical characters. Annual glabrous plant, with \pm indurated basal part, leafy throughout, prostrate or procumbent. Ochreae shorter than internodes. Leaves linear, oblong to elliptic with prominent nerves beneath. Flowers borne in fascicles in axils of upper leaves. Nut trigonus, equal or a little longer than perianth.

25. *P. aviculare* L., Sp. Pl. 362 (1753). *sensu stricto*
Syn.: *P. heterophyllum* Lindm., Svensk Bot. Tidskr. 6: 960 (1912).

Studied specimens. Gorgan: Gharagol, E of Hutan, Hewer 3765, 3743 (TARI). Esfahan: Kashan, 830 m, Babakhanlu & Amin 17533 (TARI). Khorassan: ca. 45 km N. of Shirvan, Golul-protected area, N. of the village Sarani, 1500 m, Assadi & Maassoumi 50553 (TARI); Semnan: Touran protected area, Shakhe Biar, 1160 m, Freitag & Mozaffarian 28833 (TARI); Shahrud, Shesh village, SW. of Razeh, 1260-1340 m, Freitag & Mozaffarian 28714 (TARI).

Typical characters. Annual herb. Stems usually procumbent or prostrate, rarely ascending. Leaves elliptic to ovate-lanceolate. Flowers 1-3 in fascicles; perianth \pm 2 mm. long. Nut trigonus, rugulose or smooth, brown or nearly black. Styles 3.

This is a widespread herb, usually growing in waste places and field, and very similar to *P. arenastrum* Bureau.

26. *P. olivascens* Rech. f. & Schiman - Czeika, Fl. Iranica, no. 56 (1968).

Studied specimens. Baluchestan: 35 km from Iranshahr to Bazman, 570 m, Runemark and al. 22588 (TARI); Khorassan: neck Mt. 15-20 km S. of Ghaen, 1800-1900 m, Runemark & Sardabi 23702 (TARI).

Typical characters. Annual herb. Stems divaricately branched, ascending, thin flaccid, fragile, usually drooping. Perianth white 2.5 - 3 mm long. Nut trigonous, smooth, dark brown.

Very similar to *P. aviculare*, but nut smooth. Stem and branches drooping.

27. *P. patulum* M. B., Fl. Taur.-Cauc. 1: 304 (1808).

Syn.: *P. bellardi* auct. non. All. p. p. *P. bellardi* var. *patulum* (M. B.) Meisn. in DC. Prodr. 14: 99 (1856).

Studied specimens. Azarbaiejan: 2 km NE. of Khalkhal, 1800-2050 m, Mozaffarian & Nowrozii 34053 (TARI); Kurdistan: N. of Sanandaj, Dashte Obato, 2000 m, Tavakoli & Khaledian 1419 (TARI); Hamadan: Ca. 70 km from Bijar to Hamadan, before Ghahord village, 1800 m, Assadi 61024, 61030 (TARI); Chaharmahal-e Bakhtiary: Sabzkuh, kuh-e Hezardarreh, 2300-2750 m, Mozaffarian 58189 (TARI); Brojen, 2200 m, Mozaffarian 57190 (TARI); Tehran: Damavand, 1800 m, Mozaffarian 32214 (TARI).

Typical characters. Annual herb. Stem with elongated internodes. Leaves long elliptic to lanceolate-linear,

acuminate. Inflorescence lax, terminal, with 1-2 flowers at each node; Flowers 3-4 cm. long, pedicellate; the pedicels as long as perianth. Nut trigonous-ovoid, acuminate, lustrous, punctuate.

28. *P. kitaibelianum* Sadl., Fl. Comit. Pested. 1.1: 287 (1825).

Syn.: *P. bellardi* Boiss. Fl. Or. 4: 1034 (1879), non All. (1785). *P. bellardi* var. *typicum* Beck in Reichenb., Icon. Fl. Germ. 24: 67 (1905).

Studied specimen. Tehran: The Iran National Botanical Garden, 1320 m, Salehi & Nowroozi 32073 (TARI).

Typical characters. Very similar to *P. patulum* M. B. but fruits larger. Nut 4-5 mm. long, trigonous, nearly black, completely covered by accrescent perianth.

29. *P. argyrocoleon* Steud. ex Kunze, Linnaca 20: 17 (1847).

Studied specimens. Mazandaran: by Lavij river, ca. 5 km S. of Nosratabad, 150 m, Wendelbo & Assadi 14505 (TARI); Kermanshah: road of Ravansar to Pave, Hamzehee and Hatami 1850 (TARI); Hormozgan: Bandar Abbas, Fareghan, Meymand, 1100 m, V. Mozaffarian 52511 (TARI); Chaharmahal-e Bakhtiary: Sabzkuh, Mozaffarian 97418 (TARI); Tehran: 69 km from Save to Tehran, 1000 m, Assadi 61111 (TARI).

Typical characters. Annual glabrous herb or persisting through the winter; stems strongly branched, erect or ascending. Leaves few, lanceolate to linear-lanceolate, acute, flat, soon deciduous. Inflorescence branches virgate, with long internodes, with rather dense flowers. Nut 2 mm long, trigonous, smooth, and nearly black.

Bistorta Adans.

Syn.: *Polygonum* sect. *Bistorta* (Adans.) D. Don. Fl. Nepal 69 (1825).

This genus is separated from *Polygonum* L. sensu lato. with having thick rhizomes. Basal leaves with long sheathed petioles. Ochreae brown. Flowers in dense terminal spikes. Perianth pink. Styles 3 free.

1. *B. major* S. F. Gray. Nat. Arr. Britt. Plants II, 267 (1821), (Fig. 5).

Syn.: *Polygonum bistorta* L., Sp. Pl. 360 (1753).

Studied specimens. Mazandaran: 40 km S. of Ramsar, N. Slope of Kuh-e Khashechal, 2900-3600 m, Assadi & Maassoumi 51150 (TARI); Azarbaiejan: Kuh e Sahand, 2200-2900 m, Assadi & Mozaffarian 30661 (TARI); Hamadan: ca. 1 km E. of Ganjname, 2750 m, Assadi & Mozaffarian 36873 (TARI); Kuh e Alvand from Ebero and Simin, Kuh e Kolahghazi, 2200-3100 m, Mozaffarian 65051 (TARI).

Typical characters. Perennial herb with stout woody rhizomes. Stems ± erect. Lower leaves large, lanceolate often truncate at base, borne on winged petioles, glabrous. Raceme a spike like head.

Persicaria Mill.

Syn.: *Polygonum* L. sect. *Persicaria* (Mill.) Meisn., Monogr. Polyg. (1826).

This genus is separated from *Polygonum* by being annual rarely perennial usually hydrophilous herbs. Ochreae brownish membranaceous, truncate, ciliate or non ciliate. Flowers in ebracteate spikes. Styles 2 (-3), united below.

Key to the accepted species of Persicaria

1. Inflorescence a dense oblong spike; the flowers contiguous 2
- Inflorescence lax, linear; the flowers non contiguous 7
2. Ochreae long fimbriate; fimbria up to 20 mm long.

1. *P. barbata*

- Ochreae shortly ciliate or non ciliate; cilia up to 3 mm long 3

3. Ochreae non ciliate. Stem thick, with thickened nodes

4. *P. glabra*

- Ochreae shortly ciliate 4

4. Leaves ovate or ovate-cordate, acuminate; median cauline leaves more than 40 mm broad, ± long petioled. Plants usually more than 1 m high

3. *P. orientalis*

- Leaves broad or narrowly lanceolate, up to 40 mm broad, shortly petioled or nearly non petioled 5

5. Perennial herb. Leaves truncate or cordate at the base. Ochreae hirsute, truncate

2. *P. amphibia*

- Annual herb. Leaves attenuate or cuneate at base, with a distinct violet or brown blotch 6

6. Ochreae tubular, tightly clasping the stem, appressed hairy, long ciliate; cilia more than 1 mm long

6. *P. maculosa*

- Ochreae patent, mostly glabrous, entire or shortly ciliate or ciliate; cilia up to 1 mm

5. *P. lapathifolia*

7. Perennial herb. Ochreae brown, truncate, the nerves exerted as long aristae. Perianth eglandular, white

7. *P. salicifolia*

- Annual herb. Ochreae ciliate. Perianth eglandular or bearing brown glands 8

8. Annual herb. Ochreae brown, long cylindric, ciliate. Perianth 2.5-5 mm. pink or greenish, with yellowish or brownish glands

8. *P. hydropiper*

- Annual herb. Perianth eglandular 9

9. Leaves lanceolate-linear, up to 5 mm broad. Perianth up to 2.5 mm long

10. *P. minus*

- Leaves lanceolate, more than 7 mm broad. Perianth more than 3 mm long

9. *P. mitis*

1. *P. barbata* (L.) Hara, Fl. E. Himal. (1966).

Syn.: *Polygonum barbatum* L., Sp. Pl. 362 (1753).

Studied specimens. Gilan: Bandar-e Anzali, ca. 25 m, Mozaffarian 66206 (TARI); Kerman: Jiroft road, 500



Fig. 5. *Bistorta major* ($\times 0.45$); flower ($\times 4.5$).

m, Manchehri & Heravi, 245 (TARI).

Typical characters. Perennial long rhizomatous herb. Stem glabrous. Leaves linear to linear-lanceolate, acuminate, glabrous except margin, midrib and veins ciliate. Ochreae 10-35 mm. long, conspicuously strigose, tubular, long fimbriate; fimbriae up to 20 mm long

2. *P. amphibia* (L.) S. F. Gray, Nat. Arr. Brit. Pl. 8: 268 (1821).

Syn.: *Polygonum amphibium* L., Sp. Pl. 361 (1753). *Polygonum amphibium* var. *aquaticum* et var. *terrestre* Leyss., Fl. Hal. 391 (1761). *Polygonum amphibium* var. *decumbens* Klett & Richter, Fl. Phan. Gew. Ung. Leipzig 351 (1830).

Studied specimens. Mazandaran: Lar valley, 2420 m, Wendelbo & Assadi 13310 (TARI); Azarbaiejan: Mahabad lake, 1235m, Eizadpanah & Taheri 68350 (TARI); Chahrmahal-e Bakhtiary: Mordabe Chaghakhur, 2100 m, Mozaffarian 57458 (TARI).

Typical characters. Perennial with creeping branched rhizome rooting at the nodes. Stems erect, simple, to 1 m long or submersed. Leaves in land growing plants oblong-lanceolate, subsessile, appressed hairy; in floating lustrous, long-petioled, oblong. Ochreae elongated, truncate at summit.

3. *P. orientalis* (L.) Spach, Syst. Veg. 537 (1841).

Syn.: *Polygonum orientale* L., Sp. Pl. 362 (1753).

Studied specimens. Gilan: Bandar-e Anzali, Kanale Samzman Bekande, -20 m, Mozaffarian. Tehran: Resalat street, in the riverbed, 1400 m, Mozaffarian, Tehran-Karaj highway, in the river bed close to Eram Park, 1300 m, Mozaffarian.

Typical characters. Annual herb. Stem erect, branched, to 1 m or even up to 2.5 m long. Leaves short, petioled, oval, more rarely orbicular or broadly lanceolate, gradually attenuate to a point, 3-25 cm long and 1-15 cm broad. Ochreae cup-shaped or cylindric, with long bristles.

4. *P. glabra* (Willd.) M. Gomes, Ann. Inst. Seguda . Ensef-Habana 2: 278 (1896).

Syn.: *Polygonum glabrum* Willd., Sp. Pl. 2: 447 (1799).

Studied specimens. Gilan: Bandare-e Anzali, ca. -25 m, Mozaffarian 66251 (TARI), 94471 (TARI); Khuzestan: Ahvaz, between Albaji and pol-e Rudkhane Shawor, ca. 80 m, Mozaffarian 72233 (TARI); Shawor riverbed, ca. 80 m, Mozaffarian 93985 (TARI); Ahvaz to Shush, Hur-e Bamdez, from Kaab-e Beit e Abbud, ca. 50 m Mozaffarian 83598 (TARI).

Typical characters. Annual or perennial herb. Stems erect, few branched, up to 130 cm long and at the base ± fissured. Ochreae non ciliate.

5. *P. lapathifolia* (L.) S. F. Gray, Nat. Arr. Brit. Pl. 2: 270 (1821).

Syn.: *Polygonum lapathifolium* L., Sp. Pl. 360 (1753).

Typical characters. Tall annual. Stems ascending to erect, branched. Ochreae entire. Leaves lanceolate to very narrowly elliptic, cuneate at base, often with a blackish spot, usually glabrous, and always with pellucid yellowish glands or loosely pilose to densely tomentose beneath.

Very variable plant in size, indumentum and the degree to which the glands are developed. It may be divided to 4 subspecies as below.

1. Leaves glabrous or lax pilose 2

- Leaves densely woolly or tomentose below 3

2. Stem in upper part punctuate-maculate. Leaves glabrous below, sometimes with yellow glands; petiole and leaf margins strigose subsp. **nodosa**

- Stem in upper part non punctuate-maculate. Leaves glabrous below, often with red glands; petiole and leaf margins glabrous or plus minus strigose

subsp. **lapathifolia**

3. Upper leaves up to 4-times longer than broad, usually rather obtuse to rounded at apex, pale green

subsp. **brittingeri**

- Upper leaves large, more than 4-times longer than broad, usually acute

subsp. **pallida**

Subsp. **lapathifolia**

Syn.: *Polygonum lapathifolium* L., Sp. Pl. 360 (1753).

Studeid specimens. Gilan: Hashtpar, Lisar valleys, 270 m, Rushan, 7777 (TARI); Khuzestan: between Ahvaz and Shush, Shawor river bed, 120 m, Mozaffarian 72245 (TARI); Tehran: 12 km S. of Damavand, Akhorbadin, 1700-1800 m, Mozaffarian 45336 (TARI).

Typical characters. Leaves glabrous or lax pilose, red dotted below. Peduncles non glandulose. Stems non maculate.

Subsp. **nodosa** (Pers.) A. Löve, Rit Landbunaoard. Atvinnd. Haskolans, B. No 3:109 (1948).

Syn.: *Polygonum nodosum* Pers, Synops. Pl. 1: 440 (1805); *Polygonum lapathifolium* L. subsp. *nodosum* Danser, ned. Kruidk, Arch. 1931.1.7 (1932) p. p.

Studied specimens. Azarbaiejan: Nowduz dam toward Mianeh, 2 km to Gavmish Goli, Ghale Huseinabad, 1200 m, Eizadpanah & Taheri 68376 (TARI); Urumieh to Ghasemlu, 12 km from Tumatar towards Ghasemlu, 1400 m, Eizadpanah & Taheri 68217 (TARI).

Typical character. Leaves glabrous, yellowish dotted below; petiole and leaf margins plus minus strigose. Peduncles glandulose. Stems in upper part punctuate-maculate.

Note. Our neighboring countries Floras do not separate *P. lapathifolia* subsp. *lapathifolia* from *P. lapathifolia* subsp. *nodosa* from each other except Flora of Pakistan (Qaiser, 2001). The two taxa are very close to each other and the most conspicuous character for separating these two subspecies is maculate-punctate stem in upper part and strigose petiole and leaf margins in

subsp. *nodosa*

Subsp. **brittingeri** (Opiz) Sojak, Preslia 46 (2): 153 (1974).

Syn.: *Polygonum brittingeri* Opiz, Naturalientausch 874 (1824); *Polygonum lapathifolium* L. var. *brittingeri* (Opiz) Beck in Rechinb, Icon. Fl. Germ. 24: 76 (1909).

Studied specimens. Mazadaran: Haraz road, Kahrud, 2050 m, Foroughi 2449, 2484 (TARI); Gilan: 120 km from Rasht to Ghazvin, margin of Molla-Ali river 650-700 m, Zehzad et al. 67176 (TARI); Azarbaiejan: 5 km from Ardabil to Astara, 1300 m, Assadi & Akhani, 61645 (TARI); Kermanshah: 30 km N. of Biston, Tange Ejdeha, 1300 m, Hamzhee and Lashkarbuluki, 1590 (TARI); Kuhgiluye and Boirahmad: Between Sisakht and Brujen, Meimand, 1600 m Assadi & Mozaffarian 31319 (TARI); Tehran: Ghazvin, Alamut, 1100 m, Babakhanlu 17532 (TARI).

Typical characters. Leaves densely tomentose to velutinous beneath; upper leaves 4 times longer than broad, usually obtuse to round at the apex, pale green.

Subsp. **pallida** (With) A. Love, Rit. Landbunaoard. Atvinnud. Haskolans B. no.3:109 (1948)

Syn.: *Polygonum pallidum* With., Arr. Br. Pl. ed. 3.2: 381 (1796); *Polygonum lapathifolium* L. var. *incanum* Boiss, Fl. Or. 4: 1030 (1879); *Polygonum lapathifolium* L. subsp. *tomentosum* (Schrank) Danser, Ned. Kruidk. Arch. 1931: 111 (1931); *Polygonum tomentosum* Schrank, Bayer, Fl. I: 669 (1789); *Polygonum scabrum* Moench, Meth 629 (1794).

Studied specimens. Azarbaiejan: ca. 10 km SE. of Mahnesan, Ghezel Ozan river bed, 1300 m, Assadi & Akhani 61215 (TARI); Tehran: Firuzkuh, between Mahabad and Anzeha, close to Mahbad, 2000 m, Mozaffarian 54249 (TARI).

Typical characters. Leaves densely tomentose to velutinous beneath; upper leaves with more than 4 times longer than broad, acute at apex, grey or yellowish-green.

6. P. maculata (Raf.) S. F. Gray., Nat. Arr. Brit. Pl. 2: 270 (1821).

Syn.: *Polygonum persicaria* L., Sp. Pl. 360 (1753); *Polygonum maculatum* Raf., Fl. Ludov. 29 (1817); *Persicaria maculosa* S. F. Gray., Nat. Arr. Brit. Pl. 2: 269 (1821).

Studied specimens. Gorgan: Road to Chahar bagh, 2000 m, Mozaffarian 77842 (TARI); Mazadaran: Nowshahr, Manuchehrkala, ca. 20 m, Mozaffarian 45530 (TARI); Chalus to Tunekabon, Kelardast, ca. 6 m Mozaffarian 93799 (TARI); Gilan: Lahijan, Safrabaste, ca. 15 m, Assadi 89416 (TARI); Azarbaiejan: Arasbarn protected area, Makidi, 1400 m Runemark & Assadi 22069, 31577 (TARI); Kermanshah: Sare-Pol-e Zahab, 550 m, Assadi &

Nikchehre 76228 (TARI); Fars: 57 km from Shiraz to Kazerun, Dasht-e Arjan, Cheshme Salman, 1800 m, Zehzad et al. 67015 (TARI);

Typical characters. Very similar to *P. lapathifolia*, but ochreae ciliate, flowers bright pink, and the leaves and peduncles eglandular.

7. P. salicifolia (Brouss. ex Willd.) Assenov, Fl. Reipubl. Popul. Bulgar. iii. 243 (1966).

Syn.: *Polygonum salicifolium* Brouss. ex Willd., Enum. Pl. Hort. Berol. 1: 428 (1809) non Del., Fl. Eg. 12 (1813); *P. scabrum* Poir. in Lam., Encycl. 6: 148 (1804) non Moench, Meth. 629 (1794); *P. serrulatum* Lag., Gen. et Sp. Nov. 14 (1816); Boiss., Fl. 4: 1028 (1879).

Studied specimen. Khuzestan: Dez protected area, a swamp close to Mianrud Environmental station 94272 (TARI).

Typical characters. Perennial. Stems ascending, branched. Ochreae brown, the nerves exerted as long arista, strigosus. Flowers white, in a group up to 6 in each node of the long spikes.

8. P. hydropiper (L.) Spach, Hist. Veg. 10: 536 (1841).

Subsp. **hydropiper**

Syn.: *Polygonum hydropier* L., Sp. Pl. 361 (1753); *Polygonum hydropiper* L. subsp. *megalocarpum* Densler, Bull. Jard. Bot. Buitenzorg ser 3.8: 188 (1827).

Typical characters. Annual. Stems erect. Ochreae brown, fringed. Leaves lanceolate to very narrowly ovate, acuminate. Inflorescence a very lax spike; the flowers ± distant. Perianth pink or greenish, with yellowish or brownish glands.

Studied specimens. Mazadaran: 30 km from Abbasabad to Kelardasth, 1100 m, Runemark and Mozaffarian 25798 (TARI); 31 km. From Chalus to Karaj, ca. 5.5 km. S of Marzanabad (WA2), 740 m, K.P. Buttler and K. Fauler 31894 (TARI); Gilan: Bandare Anzali, -25 m, Mozaffarian 66258 (TARI); Khuzestan: 20 km from Andimeshk to Ahvaz, 150 m, Mozaffarian 58441 (TARI).

9. P. mitis (Schrank) Assenov in Jordanov, Fl. Nar. Rep. Balg, 3: 239 (1966).

Syn.: *Polygonum mite* Schrank, Baier. Fl. : 668 (1789). *Studied specimens.* Gilan: Bandar-e Anzali -25m, V. Mozaffarian 66258 (TARI); 24 km from Rudbar to Rasht, 150-200 m, Zehzad et al. 67209 (TARI); Mazadaran: ca. 5 km from Abbasabad to Kelardastht, 120 m, Mozaffarian 93779 (TARI); Azarbaiejan: S. of Urumieh lake, Sumele canal, 1300 m, Assadi & Akhani 61342 (TARI).

Typical characters. Annual, similar to *P. hydropiper*, but smaller, 15-30 cm high. Leaves oblong-lanceolate, short petioled, 5-10 cm long, 1-2 cm broad; the margin and often the veins beneath, appressed hairy. Ochreae

covered with short hairs; the margin long-ciliate

10. P. minus (Hudson) Mozaffar., **comb. nov.**

Syn.: *Polygonum minus* Hudson, Fl. Angl. 1: 148 (1762).

Studied specimen. Tehran: Chitgar, 1320 m, Sabeti 7827 (TARI).

Typical characters. Annual. Stem slender, decumbent or ascending, more rarely glabrous, 15-30 cm long. Leaves linear-lanceolate, rounded or slightly narrowed at base, 5-7 cm long, 3-5 mm broad, quite glabrous or ± hairy on the veins and on the margin. Ochreae long ciliate on the margin.

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