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POLYGONUM AVICULARE (POLYGONACEAE) SUBSPECIES, NEW RECORDS FOR THE FLORA OF IRAN

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Abstract. *Polygonum aviculare* is a widely distributed annual herb. Number of segregates from this highly variable taxon has been described as independent species or different subspecies on the basis of habit, heterophyllous and homophyllous leaves and the length of perianth tube. Most proposed subspecies are partially sympatric and their distributions have been affected greatly by humans. Our studies show that *P. aviculare* has two subspecies in Iran. These infra-specific taxa can be differentiated by length of perianth tube and some features of outer tepals.

Key words: *Polygonum aviculare*, subspecies, variation, Iran

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Introduction

The taxonomic limits of the large genus *Polygonum* L. s.l. have been the subject of a tremendous number of studies using morphology, chromosome numbers and phytochemical study (Wolf & McNeill 1987; Ronse Decraene & Akeroyd 1988; Ronse Decraene *et al.* 1998; Hong *et al.* 2000; Salama & Marraiki 2010; Mosaferi & Keshavarzi 2011). Most studies support a subdivision of *Polygonum* s.l. into smaller, more homogenous groups. In fact, species once placed in the genus *Polygonum* are now realized to belong to two different tribes (Ronse Decraene & Akeroyd 1988; Ronse Decraene *et al.* 1998; Hong *et al.* 2000).

This genus approximately consists of 230 accepted species in the world (The Plant List 2013) and 29 species in Iran (Rechinger & Schiman-Czeika 1968; Mozaffarian 2012).

P. aviculare L. grows from plains up to 3500 m a.s.l., as a weed in cultivations, on waste grounds and moist and shady areas. It is widely distributed in temperate and subtropical regions of both hemispheres. *P. aviculare* is a taxonomically polyploid complex of self breeding annuals but cross pollination is also possible. On the basis of Styles (1962), some taxonomists accepted *P. aviculare* in narrow sense with diagnostic features from other taxa of the *P. aviculare* complex (*P. aviculare, P. arenastrum* Boreau., *P. boreale* Small., *P. rurivagum* Jord. ex Boreau.), while some others believe in *P. aviculare* s.str. with infra-specific taxa (Costea & Tardif 2005).

Isoenzyme studies showed that the complex has an allopolyploid origin (Meerts *et al.* 1998). Moreover patterns of variation in achene surface suggested the hybrid origin of some species of the complex (Yurtseva 2001). Multivariate analyses on European and North American accessions recognized some populations with intermediate characteristics (Meerts *et al.* 1990; Costea & Tardif 2003).

As a part of broader investigations on biosystematics and molecular studies in *Polygonum* in Iran, we have focused here on *P. aviculare*. Due to high variability of this taxon in Iran, in this study we consider morphology of different accessions of *P. aviculare* s.str. to find diagnostic features for lower taxa separation and to record new subspecies for the Flora of Iran.

Fig. 1. Map showing the studied populations in Iran as black dots.

Material and methods

Morphometric studies were performed on 15 populations of *P. aviculare* native to Iran from 12 provinces (Fig. 1). Vouchers are deposited in herbarium of Alzahra University. Photographs were taken by Dino-Lite Pro digital microscope.

Results

***Polygonum aviculare* subsp. *depressum* (Meisn.) Arcang.**

Plants green, homophyllous or subheterophyllous. Stem branched at base, ochrea with proximal part cylindric to funnelform, 3-6 mm, with distal part soon disintegrating and leaving almost no fibrous remains, membranous, margins nearly lacerate; petiole 1-1.5mm; leaves light to dark green, lateral veins visible, elliptic to lanceolate, 8-21×2.7-6 mm, 3-4.1 times as long as wide, apex obtuse or acute. Inflorescence solitary or with 3-5 flowers at tips of branches. Pedicels enclosed in ochreae, 1-1.3 mm. Flowers: perianth 2-2.9×1-1.9 mm, 1.3-2 times as long as wide; tube 50-57% of perianth length; tepals green or pink with white margins, oblong or rarely ovate, flat or cucullate in fruit, outer tepals not pouched at base; midviens unbranched; stamens 5-6. Achenes exserted or enclosed from perianth, dark to light brown, 3-gonous, 2-2.8×1.3-2.2 mm, roughened (Fig. 2).

Studied populations: Lorestan province, Khorramabad (881, AUH), Mazandaran province, Gadook (901, AUH), Mazandaran province, 5 km Ramsar (902, AUH), Guilan province, 6 km Rasht to Tehran (891, AUH).

Fig. 2. *Polygonum aviculare* subsp. *depressum*: **a** – plant; **b** – flower bud; **c** – ochrea; **d** – achene; **e** – tepals; **f** – dorsal surface of leaf blade with prominent veins.

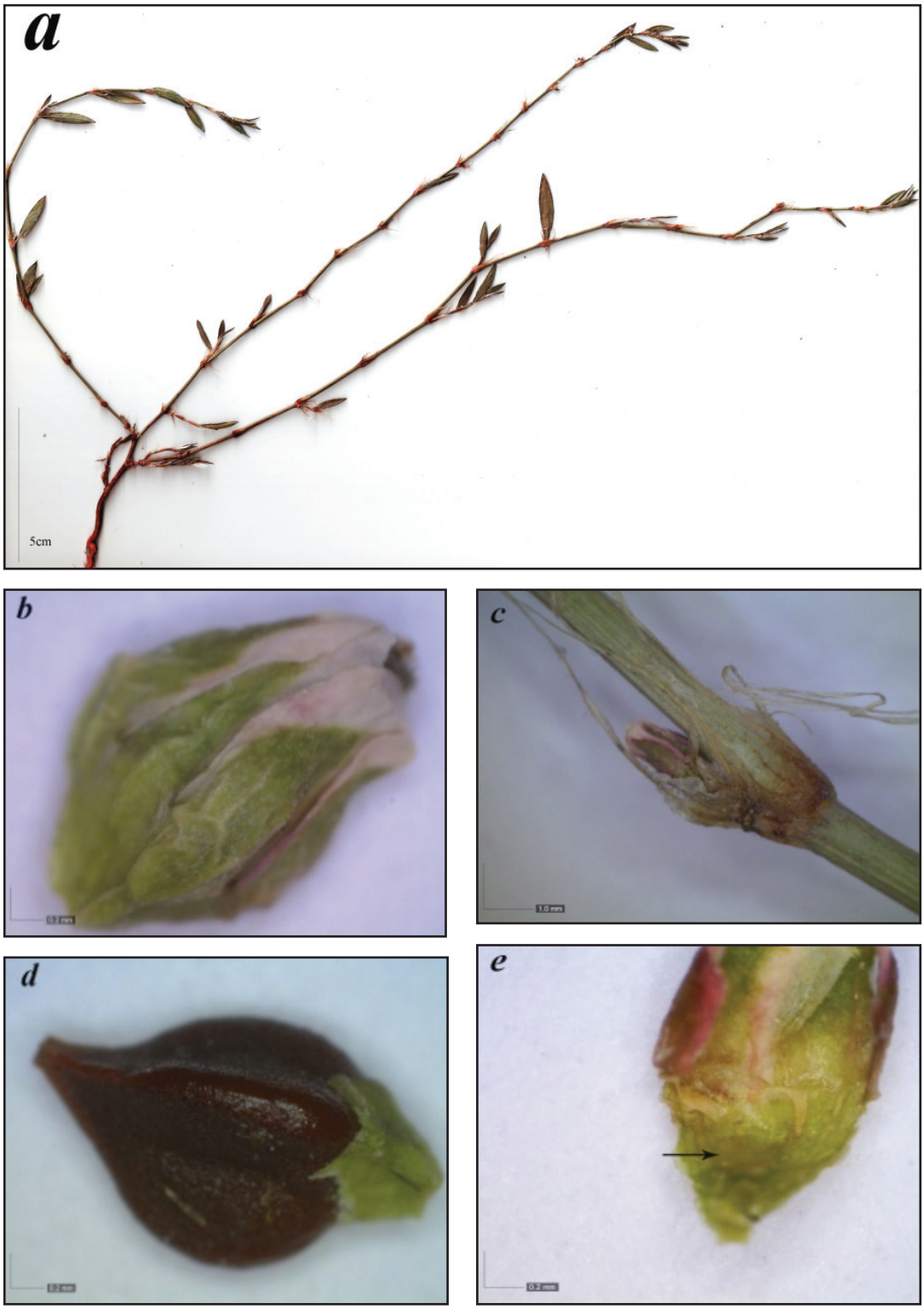

Fig. 3. *Polygonum aviculare* subsp. *buxiforme*: **a** – plant; **b** – flower bud; **c** – ochrea; **d** – achene; **e** – tepals (**arrow** shows the pouch).

***Polygonum aviculare* subsp. *buxiforme* (Small) Costea et Tardif.**

Plants gray-green, homophyllous. Stems 1-3, erect and unbranched. ochrea 4.5-5.5 mm, proximal part cylindric and distal part silvery with distinct veins; petiole 0.9-2 mm, lateral veins visible but not raised abaxially, lanceolate to elliptic, 15.5(22)×3.5(5.5) mm, 4(4.5) times as long as wide, apex acute to obtuse. Inflorescence mostly with solitary flowers but also with 2-4 flowers at tips of branches. Pedicels mostly enclosed in ocreae, 1mm. perianth 2.2(3)×(1.2)2 mm; tube 25-35% of perianth length; tepals overlapping, green with white or sometimes pink margins, oblong, apex cucullate, outer tepals pouched at base; veins branched; stamens 7. Achenes usually enclosed in perianth, light brown to brown, mostly 3-gonous, 2.2×1.4 mm, apex straight, roughened (Fig. 3).

Studied populations: Zanjan Province, Takestan (876, AUH), West Azarbaijan province, Urmia (882, AUH).

Discussion

P. aviculare is a polymorphic taxon which was split up into smaller taxa. Lindman (1912) was the first who classified variations in *P. aviculare* broad concept. He named *P. eaquale* Lindm. for homophyllous plants and *P. heterophyllum* Lindm. for heterophyllous plants with large leaves on the main stems and smaller ones on lateral branches.

Meerts (1995) identified two subspecies (ssp. *aviculare* and ssp. *depressum*) in populations of *P. aviculare* in Belgium. Based on his observations, these taxa showed variations in overall plant shape, habitats and size of leaves and internodes. Subspecies depressum comprised prostrate plants with shorter internodes and smaller leaves. Our studies in this taxon are in congruent with him.

Costea & Tardif (2005) described six subspecies of *P. aviculare* for Flora of North America. Ratio of perianth tube to perianth length, veins of perianth and protrusion at the base of outer tepals are diagnostic characters between two subspecies *depressum* and *buxiforme*.

In Flora of Turkey, three species *P. aviculare, P. arenastrum* and *P. mesembricum* Chrtek. were mentioned as *P. aviculare* agg. Although it is believed that *P. aviculare* and *P. arenastrum* are not homogenous and further collections and studied were needed (Coode & Collen 1967). Qaiser (1974) described *P. aviculare* and *P. arenastrum* as independent species. He believed in some intermediate taxa between these two species, but no varieties or subspecies were mentioned for Flora of Pakistan.

In spite of different treatments of this variable taxon in different resources, we believe in two subspecies for the Flora of Iran. These taxa are mainly differentiated by the proportion of the fused part in the length of the perianth and by the presence or absence of pouch at base of the outer tepals.

Identification key

1. Perianth tube is 50-57% of perianth length 2

- Perianth tube is up to 35% of perianth length 3

2. Outer tepals with unbranched midviens and no pocket at base ..... subsp. *depressum*

3. Outer tepals with branched midviens and pocket at base ..... subsp. *buxiforme*

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