



Genetic diversity and morphological variability in *Polygonum aviculare* s.l. (Polygonaceae) of Iran

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Abstract

A molecular investigation was carried out on the variable species *Polygonum aviculare* using 109 plants from 12 Iranian populations. ISSR molecular markers were used for genetic study. AMOVA and Gst analyses revealed a high genetic variability both within and among populations. Mantel test showed positive significant correlation between genetic and geographical distance of populations. Structure and K-Means clustering revealed stratification in genetic characteristics of accessions. Networking and reticulation analyses showed some degree of gene exchange among populations. Consensus tree based on morphological and genetic data separated some of these populations from the others suggesting the existence of new taxa within this species.

Key words: Isolation by distance, Gene flow, Genetic admixture, *Polygonum aviculare*

Introduction

Polygonum aviculare complex (Polygonaceae Juss.), known as knotweed, is a group of annual selfing weeds that colonize open, human-made habitats (Meerts *et al.* 1990). Its members are polyploid and show extensive phenotypic plasticity and autogamy (Meerts *et al.* 1998). These weeds are able to adapt to different ecological conditions (Meerts 1995). They are annual inbreeding taxa that often form small patches of identical genotypes (Koopman *et al.* 2012). There are two opposite taxonomic concepts concerning the rank of *P. aviculare* Linnaeus (1753: 362–363) (see Costea & Tardif 2005):

1. *Polygonum aviculare* in narrow sense. This concept is based on the study by Styles (1962) who highlighted discontinuities between some of the species belonging to the *P. aviculare* complex [e.g., *P. aviculare* s.str., *P. arenastrum* Boreau (1857: 559), *P. boreale* Small (1894: 479) and *P. rurivagum* Jordan ex Boreau (1857: 560)], and the presumably different chromosome numbers.

2. *Polygonum aviculare* in broad sense which includes some infra-specific taxa (see e.g., Chrtek 1956, Karlsson 2000, Costea & Tardif 2003). *P. aviculare*, even defined in the narrower sense, is a polyploid complex with tetraploid ($2n = 40$) and hexaploid ($2n = 60$) cytotypes (Meerts *et al.* 1998).

In Iran several species belonging to the *Polygonum aviculare* complex occur: *P. aviculare* L. s.str., *P. arenastrum*, and *P. patulum* Marshall von Bieberstein (1808: 304). *P. aviculare* s.s can be distinguished from other species by some features such as variable size of cauline and branch leaves, shape of leaves and size of internodes (Mozaffarian 2012, Rechinger & Schiman-Czeika 1968). Moreover molecular studies on Asian *Polygonum* s.l showed that they are genetically differentiated from each other (Mosaferi *et al.* in prep, Yurtseva *et al.* 2010), therefore in the present study, the second concept of *P. aviculare* has been adopted.

P. aviculare is a cosmopolitan species and a widespread weed in all the temperate regions of the world and, more locally, in warmer climates. It has very wide ecological amplitude regarding the soil texture and humidity; although Grime *et al.* (1988) stated that it is largely restricted to alkaline soils (pH > 5.0). It has long been in use as a medicinal plant (Fogelfors 1984), with a high content of tannins and silica. Its seeds are starch-riched and they are used by