

## A FLORISTIC STUDY ON THE WEEDS OF WHEAT FIELDS OF ZANJAN PROVINCE, IRAN

Farrokh Ghahremaninejad<sup>1\*</sup>, Robab Shabkhiz<sup>2</sup> and Sogol Fereidounfar<sup>1</sup>

### ABSTRACT

*Weed is one of the most important factors that decrease yield and quality of wheat crop, therefore identification of weeds is so valuable in its management strategies. Availability of weeds information of a specific region will aid us select the best method for control and manage them in our planning. Due to existence of so many different weed species in wheat fields of Zanjan province (Iran), this survey was conducted to cover seven different areas selected randomly from different locations of the province during 2003-04. In each field, 9 to 13 plot samples with a W pattern were located at three different grow stages of wheat i.e. tillering, stem elongation and heading. The species of the weeds were mostly determined based on Flora Iranica. According to this study, 126 angiospermous taxa of 107 genera in 30 families were recorded as weeds from the Zanjan province. All of the recorded specimens were donated to FAR Herbarium. The largest families were Brassicaceae (including 24 species, making 16.3% of the total), Poaceae (22 species, 14.9%), and Asteraceae (17 species, 11.5%). Among them, 24 families belonged to dicotyledons and seven families were monocots.*

**Key words:** Agriculture, flora, Iran, survey, weeds inventory, wheat, Zanjan.

### INTRODUCTION

A weed in a general sense is a plant that is considered by the user of the term to be a nuisance, and normally applied to unwanted plants in human-controlled settings, especially farm fields and gardens, but also lawns, parks, woods, and other areas. More specifically, the term is often used to describe native or nonnative plants that grow and reproduce aggressively. Generally, a weed is a plant in an undesired place (Whitson, 1992). Weeds act as energy drains in the entire managed ecosystem such as agricultural crops, forestry, range management, aquaculture and horticulture (Shah and Khan, 2006). These are one of the most important factors that decrease yield and quality of wheat. The classification of a plant as a

---

<sup>1</sup> Department of Plant Biology, Faculty of Biological Sciences, Kharazmi University (Tarbiat Moallem University), Mofatteh Ave., Tehran, Iran.

<sup>2</sup> Jihad-e-Agriculture Organization, Hefze-Nabatat of Zanjan, Zanjan, Iran.

\*Corresponding author's email: [ghahremaninejad@gmail.com](mailto:ghahremaninejad@gmail.com)

weed is not based on any intrinsic characteristic or biological feature, but depends on human values associated with a particular point of reference (e.g. Perrins *et al.* 1992). Thus a plant which is considered as a weed or not, depends on the circumstances in which it is growing and also on the person who copes with them. For example, an individual of a particular crop species may be considered as a weed when its presence among other crops is unwanted, or a horticultural plant may be considered a nuisance weed when growing in agricultural systems. Similarly, the same weed may be considered weed by one person but it will be an important plant for someone else.

Changes in agricultural practices and techniques as well as commodity handling, transportation and storage systems and/or trading patterns will all affect the prevalence and dispersal of weeds. For these and other reasons the weed flora is never static, with some species rising in importance, others are diminishing, and new species appearing (Darbyshire, 2003). A large proportion of man's essential nutrients are contained in the wheat grain. In addition to its high nutritive value, the low water content, ease of transport and processing and good storage qualities have made this crop the most important staple food of more than one billion people or 35 per cent of the world's population (Feldman, 1976). Wheat (*Triticum aestivum* L.) is one of the most significant annual self-pollinated winter grain crop (Khan *et al.*, 2012). Yield loss due to weed competition in Iranian wheat fields has been reported to be about 21%. Few studies have been conducted to determine the competitiveness of Iranian winter wheat cultivars against weeds (Baghestani *et al.*, 2006).

The present work is an inventory of and reference guide for weed flora of Zanjan, primarily those important weeds of wheat crop. Zanjan province is located in West Iran, covering an area of 22, 164 km<sup>2</sup>, in 35°37' N and 47° 49' E (Fayyaz *et al.*, 2010). Due to existence of so many different species of weeds in Zanjan province (Iran) wheat fields, this survey covered seven different areas which were selected randomly from different points of the province.

## **MATERIALS AND METHODS**

This study was conducted during 2003-04 which was based on the collected specimens from fields. The collected specimens were processed by conventional method for drying and making herbarium sheets. All the collected specimens were deposited in FAR herbarium, Kharazmi University (Tarbiat Moallem University), Tehran, Iran (acronym as in Thiers, 2008+). Considering the wheat fields only, some wheat fields were randomly selected from different points of the province of Zanjan, Iran. In each of the fields, 9 to 13 quadrates with a W-pattern were selected at three different growing stages of wheat

crop i.e. tillering, stem elongation and heading. Samples of the weeds were identified according to the "Flora Iranica" (Rechinger, 1963-2010). This study is the first floristically research on crop fields of Zanzan, Iran. Our inventory of the studied weeds in Zanzan province was compared with "Weeds of Iran" (Shimi and Termeh, 1994).

## RESULTS AND DISCUSSION

As a result of the study, 30 families, 107 genera, and 126 species were determined and documented. The largest families were Brassicaceae (including 24 species with a composition of 16.3% out of the total determined weed species), Poaceae (22 species, 14.9%), and Asteraceae (17 species, 11.5%). Among them, 24 families belonged to dicotyledons, and seven families belonged to monocotyledons of which 38 species were new records (introductions) in the province. All of the materials recorded were finally deposited in the Farabi Herbarium, Kharazmi (Tarbiat Moallem) University (FAR).

A total of 126 vascular plants taxa of 107 genera in 30 families were recorded from Zanzan province, Iran. For each species, and any recognized subspecific taxa, information is given on synonymy, common names. Other comments are sometimes included on taxonomy and/or agricultural issues. The most important work about Iranian weeds is of Shimi and Termeh (1994). Based on this valuable investigation, there were 581 native weed species in Iran. For all of the taxa in the presented list, after the scientific name, the English and Persian names are mentioned, respectively; Persian names are in italic. For Persian names, if exist, we used "A dictionary of Iranian plant names" written by Mozaffarian (1996). After each family name, the reference(s) used for each taxon determination is (are) mentioned.

Abbreviations for geographic areas are as follow: Khodanadeh, KH; Zanzan, ZA; Khoramdarreh, KO; Ijroud, IJ; Mahneshan, MA; Tarom, TA; Abhar, AB; Irrigated farm, IR; Rainfed farm, RA. It should be known that when a weed is more frequently occurring in each type of the irrigated or rain fed farms, it is indicated as "common" in parenthesis in front of it.

### Monocots

#### **Amaryllidaceae** Juss.

*Ixilirion tataricum* (Pall.) Roem. & Schult

Dist. in the prov.: KH, AB, TA, ZA. – Farm type: IR (common), RA. – Perennial; 475 m (TA) to 1867 m (KH). – Voucher spec.: 13220. – This species is recorded by Shimi & Termeh (1994) as a weed from Iran.

#### **Cyperaceae** Juss.

*Cyperus difformis* L.

Dist. in the prov.: TA. – Farm type: IR. – Annual; 447 m to 557 m. – Voucher spec.: 13231. –This species is recorded by Shimi and Termeh (1994) as a weed from Iran.

#### **Iridaceae** Juss.

*Gladiolus segetum* Ker-Gawl

Dist in the prov.: ZA, KH, KO, AB. – Farm type: IR, RA (common). – Perennial; 185 m (KH) to 1813 m (AB). – Voucher spec.: 13240. –This species is recorded by Shimi and Termeh (1994) as a weed from Iran.

#### **Alliaceae** J.Agardh

*Allium atroviolaceum* Boiss.

Dist. in the prov.: KH, KO, MA, ZA. – Farm type: IR, RA (common). – Perennial; 141 m (ZA) to 1780 m (KH). – Voucher spec.: 13275. –In Shimi and Termeh (1994) four species for the genus are recorded, but *A.atroviolaceum* is not mentioned.

#### **Liliaceae** Juss.

*Gagea lutea* (L.) Ker-Gawl.

Dist. in the prov.: KO, TA. – Farm type: IR. – Perennial; 467 m (TA) to 1780 m (KO). – Voucher spec.: 13256. –In Shimi and Termeh (1994) two species for the genus are recorded, but *G. lutea* is not mentioned.

*Tulipa schmidtii* Fomin

Dist. in the prov.: ZA, KO, TA. – Farm type: IR, RA (common). – Perennial; 467 m (TA) to 1780 m (KO). – Voucher spec.: 13248. –This genus is not recorded by Shimi and Termeh (1994).

#### **Hyacinthaceae** Batsch ex Borckh.

*Muscari neglectum* Guss.

Dist. in the prov.: ZA, TA, AB, KH. – Farm type: IR (common), RA. – Perennial; 474m (TA) to 1874 m (AB). – Voucher spec.: 13221. –It is mentioned in Shimi and Termeh (1994).

#### **Poaceae** Barnhart

*Aegilops cylindrical* Host.

Dist. in the prov.: KO, TA, IJ. – Farm type: IR, RA. – Annual; 161 m (KO) to 1637 m (KO). – Voucher spec.: 13077. –In Shimi and Termeh (1994) two other species of *Aegilops* has mentioned (*Ae. crassa*, *Ae. triuncialis*).

*Alopecurus myosuroides* Huds.

Dist. in the prov.: KH, TA, AB, ZA. – Farm type: IR. – Annual or biennial; 474m (TA) to 1986 m (ZA). – Voucher spec.: 13074. –It is mentioned in Shimi and Termeh (1994).

*Avena fauta* L.

Dist. in the prov.: KO, TA, KH, AB, ZA, IJ, MA. – Farm type: IR, RA (common). – Perennial; 474 m (TA) to 1867m (KH). – Voucher spec.: 13065. –It is mentioned in Shimi and Termeh (1994).

*Avena sativa* L.

Dist. in the prov.: KO, TA, KH, ZA, IJ. – Farm type: IR (common), RA. – Annual; 557 m (TA) to 1867 m (KH). – Voucher spec.: 13283. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *A. sativa* is not mentioned

*Bromus japonicus* (Murray.) Thunb.

Dist. in the prov.:TA, ZA, AB. – Farm type: IR (common), RA. – Annual; 510 m (TA) to 1874m (AB). – Voucher spec.: 13280. –It is mentioned in Shimi and Termeh (1994).

*Bromus sterilis* Lang ex Kumm. & Sendt.

Dist. in the prov.: AB, TA, ZA. – Farm type: IR. – Annual; 465m (TA) to 1988m (AB). – Voucher spec.: 13270. –It is mentioned in Shimi and Termeh (1994).

*Bromus tectorum* L.

Dist. in the prov.: KO, TA, MA, ZA, IJ, AB. – Farm type: IR (common), RA. – Annual; 474 m (TA) to 4517 m (TA). – Voucher spec.: 13079. – It is mentioned in Shimi and Termeh (1994).

*Calamagrestis pseudophragmites* (Hall.f.) Koel

Dist. in the prov.: TA, AB. – Farm type: IR. – Perennial; 510 m (TA) to 1988 m (AB). – Voucher spec.: 13068. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *C.pseudophragmites* is not mentioned.

*Cynodon dactylon* (L.) Pers.

Dist. in the prov.: KO, AB, KH, IJ. – Farm type: IR (common), RA. – Annual; 1490 m (IJ) to 1823 m (AB). – Voucher spec.: 13232. –It is mentioned in Shimi and Termeh (1994).

*Dactylis glomerata* L.

Dist. in the prov.: AB. – Farm type: IR. – Perennial; 1698 m (AB) to 1813 m (AB). – Voucher spec.: 13171, 13063. –It is mentioned in Shimi and Termeh (1994).

*Hordeum glaucum* Steud

Dist. in the prov.: KO, TA, MA, IJ, AB. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1874 m (AB). – Voucher spec.: 13066. –It is mentioned in Shimi and Termeh (1994).

*Hordeum murinum* L.

Dist. in the prov.: TA, MA, ZA, AB. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1823 m (AB). – Voucher spec.: 13064. – It is mentioned in Shimi and Termeh (1994).

*Hordeum vulgare* L.

Dist. in the prov.: KH, ZA, AB. – Farm type: IR. – Annual; 1688 m (AB) to 1877 m (KH). – Voucher spec.: 13222. –In Shimi and Termeh (1994) five other species for the genus are recorded, but *H. vulgare* is not mentioned.

*Lolium rigidum* Gaud

Dist. in the prov.: TA, ZA, AB. – Farm type: IR. – Annual; 474 m (TA) to 1874 m (AB). – Voucher spec.: 13072. –It is mentioned in Shimi and Termeh (1994).

*Lolium temulentum* L.

Dist. in the prov.: KO, TA, AB. – Farm type: IR. – Annual; 465 m (TA) to 1799 m (AB). – Voucher spec.: 13257. –It is mentioned in Shimi and Termeh (1994).

*Nardurus subulatus* (Banks & Soland) Bar

Dist. in the prov.: KO, TA, KH, AB. – Farm type: IR, RA. – Annual; 467 m (TA) to 1844 m (KH). – Voucher spec.: 13071. –This genus is not recorded by Shimi and Termeh (1994).

*Poa bulbosa* var. *vivipara* Koch

Dist. in the prov.: TA, AB. – Farm type: IR. – Perennial; 465 m (TA) to 1874 m (AB). – Voucher spec.: 13069. –It is mentioned in Shimi and Termeh (1994).

*Phalaris arundinaceae* L.

Dist. in the prov.: KO, TA, ZA, IJ, AB. – Farm type: IR (common), RA. – Perennial; 474 m (TA) to 1874 m (AB). – Voucher spec.: 13241. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *P.arundinaceae* is not mentioned.

*Phalaris minor* Retz

Dist. in the prov.: KO, TA, ZA, IJ, AB. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1813 m (AB). – Voucher spec.: 13067. –It is mentioned in Shimi and Termeh (1994).

*Schismus arabicus* Nees.

Dist. in the prov.: KH, TA, ZA. – Farm type: IR. – Annual; 467 m (TA) to 1986 m (ZA). – Voucher spec.: 13036. –This genus is not recorded by Shimi and Termeh (1994).

*Secale cereale* L.

Dist. in the prov.: KH, ZA, MA, AB. – Farm type: IR (common), RA. – Annual; 1297 m (MA) to 1874 m (AB). – Voucher spec.: 13242. –It is mentioned in Shimi and Termeh (1994).

*Sorghum halepense* (L.) Pers

Dist. in the prov.: TA, AB. – Farm type: IR. – Perennial; 467 m (TA) to 1698 m (AB). – Voucher spec.: 13243. –It is mentioned in Shimi and Termeh (1994).

## **Dicotyledons**

### **Apiaceae** Lindl.

*Daucus carota* L.

Dist. in the prov.: KH, ZA, AB. – Farm type: IR (common), RA. – Annual; 164 m (ZA) to 1874 m (AB). – Voucher spec.: 13223. –It is mentioned in Shimi and Termeh (1994).

*Falcaria scioides* Asch

Dist. in the prov.: KH, ZA, MA, IJ. – Farm type: RA. – Annual; 1280 m (MA) to 1850 m (KH). – Voucher spec.: 13264. –It is mentioned in Shimi and Termeh (1994).

*Scandix pecten-veneris* L.

Dist. in the prov.: KH, ZA, AB. – Farm type: IR (common), RA. – Annual; 1799 m (AB) to 1970 m (ZA). – Voucher spec.: 13249. –It is mentioned in Shimi and Termeh (1994).

*Turgenia latifolia* (L.) Hoffm.

Dist. in the prov.: KH, ZA, MA, TA, IJ. – Farm type: IR, RA. – Annual; 1297 m (MA) to 1874 m (AB). – Voucher spec.: 13288. –It is mentioned in Shimi and Termeh (1994).

### **Asteraceae** Dumort.

*Achillea millefolium* L.

Dist. in the prov.: KO, IJ, MA, AB. – Farm type: IR, RA (common). – Perennial; 1380 m (MA) to 1875 m (AB). – Voucher spec.: 13233. –It is mentioned in Shimi and Termeh (1994).

*Achillea vermicularis* Trin.

Dist. in the prov.: KO, IJ, ZA, TA, MA, AB. – Farm type: IR, RA (common). – Perennial; 1380 m (MA) to 1986 m (ZA). – Voucher spec.: 13013. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *A.vermicularis* is not mentioned.

*Acroptilon repens* DC. subsp. *repens*

Dist. in the prov.: KO, IJ, ZA, KH, MA, AB. – Farm type: IR, RA (common). – Perennial; 1489 m (IJ) to 1789 m (KH). – Voucher spec.: 13224. –It is mentioned in Shimi and Termeh (1994).

*Bellis perrenis* L.

Dist. in the prov.: KO, TA, KH, AB. – Farm type: IR (common), RA. – Perennial; 474 m (TA) to 1844 m (KH). – Voucher spec.: 13276. –This genus is not recorded by Shimi and Termeh (1994).

*Carthamus oxyacantha* M.B.

Dist. in the prov.: KO, MA, KH, ZA, IJ, AB. – Farm type: IR, RA (common). – Annual; 1372 m (MA) to 1990 m (ZA). – Voucher spec.: 13258. –It is mentioned in Shimi and Termeh (1994).

*Centurea depressa* M.B.

Dist. in the prov.: KO, TA, KH, ZA, IJ, AB. – Farm type: IR, RA. – Annual; 510 m (TA) to 1867 m (KH). – Voucher spec.: 13289. –It is mentioned in Shimi and Termeh (1994).

*Cichorium intybus* L.

Dist. in the prov.: IJ, ZA, KH, AB. – Farm type: IR, RA. – Annual; 1630 m (IJ) to 1895 m (ZA). – Voucher spec.: 13080. –It is mentioned in Shimi and Termeh (1994).

*Echinops dichrous* Boiss. & Hausskn.

Dist. in the prov.: TA, KH, ZA, IJ, AB. – Farm type: IR. – Annual; 467 m (TA) to 1818 m (ZA). – Voucher spec.: 13012. –This genus is not recorded by Shimi and Termeh (1994).

*Lactuca serriola* L.

Dist. in the prov.: KO, KH, ZA, IJ, MA, AB. – Farm type: IR, RA. – Annual or biennial; 1280 m (MA) to 1867 m (KH). – Voucher spec.: 13279. –It is mentioned in Shimi and Termeh (1994).

*Matricaria chamomilla* L.

Dist. in the prov.: KO, TA, ZA, IJ, AB. – Farm type: IR. – Annual; 510 m (TA) to 1720 m (ZA). – Voucher spec.: 13225. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *M. chamomilla* is not mentioned.

*Senecio cineraria* DC.

Dist. in the prov.: TA, MA, IJ. – Farm type: IR (common), RA. – Annual. – Voucher spec.: 13250. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *S. cineraria* is not mentioned.

*Sonchus tenerrimus* L.

Dist. in the prov.: KO, TA, MA, ZA, IJ, AB. – Farm type: IR (common), RA. – Annual; 557 m (TA) to 1796 m (AB). – Voucher spec.: 13271. – It is mentioned in Shimi and Termeh (1994).

*Taraxacum montanum* (C.A.Mey.) DC.

Dist. in the prov.: KO, TA, KH, ZA, MA, AB. – Farm type: IR (common), RA. – Annual or perennial; 141 m (ZA) to 1990 m (ZA). – Voucher spec.: 13265. –It is mentioned in Shimi and Termeh (1994).

*Taraxacum bessarabicum* Hand.-Mazz

Dist. in the prov.: KO, TA, MA, ZA, IJ, AB. – Farm type: IR (common), RA. – Annual or Biennial; 474 m (TA) to 1867 m (KH). – Voucher spec.: 13234. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *T.bessarabicum* is not mentioned.

*Tragopogon graminifolius* DC.

Dist. in the prov.: MA, TA, KH, ZA, AB. – Farm type: IR, RA. – Annual; 474 m (TA) to 1893 m (ZA). – Voucher spec.: 13226. –It is mentioned in Shimi and Termeh (1994).

*Tragopogon marginatus* Boiss. & Buhse

Dist. in the prov.: MA, KO, ZA, IJ. – Farm type: IR, RA (common). – Perennial; 1297 m (MA) to 1986 m (ZA). – Voucher spec.: 13284. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *T. marginatus* is not mentioned.

*Xanthium strumarium* L.

Dist. in the prov.: MA, KH, ZA, IJ, AB. – Farm type: IR, RA (common). – Annual; 1630 m (IJ) to 1789 m (KH). – Voucher spec.: 13259. –It is mentioned in Shimi and Termeh (1994).



**Boraginaceae** Juss.*Alkana bracteosa* Boiss.

Dist. in the prov.: MA, TA, KH, ZA. – Farm type: IR, RA (common). – Perennial; 1702 m (MA) to 1986 m (ZA). – Voucher spec.: 13251. – This genus is not recorded by Shimi and Termeh (1994).

*Anchusa italica* Retz. var. *italic*

Dist. in the prov.: MA, TA, IJ, AB. – Farm type: IR (common), RA. – Biennial or perennial; 467 m (TA) to 1737 m (IJ). – Voucher spec.: 13014, 13062. –It is mentioned in Shimi and Termeh (1994).

*Nonnea caspica* (Willd.) G.Pon. subsp. *caspica*

Dist. in the prov.: ZA, TA, KH, KO, IJ, AB. – Farm type: IR, RA. – Annual; 510 m (TA) to 1818 m (ZA). – Voucher spec.: 13285. –It is mentioned in Shimi and Termeh (1994).

*Nonnea lutea* (Desr.) Reichenb.

Dist. in the prov.: ZA, TA, KO, KH, AB. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1737 m (IJ). – Voucher spec.: 13227. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *N. lutea* is not mentioned.

*Nonnea persica* Boiss.

Dist. in the prov.: ZA, IJ, MA, AB. – Farm type: IR, RA (common). – Annual; 1297 m (MA) to 1875 m (AB). – Voucher spec.: 13061. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *N. persica* is not mentioned.

*Lithospermum tenuiflorum* L.

Dist. in the prov.: ZA, TA, KH, AB. – Farm type: IR, RA. – Annual; 510 m (TA) to 1874 m (AB). – Voucher spec.: 13281. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *L. tenuiflorum* is not mentioned.

*Rochelia disperma* (L.F.) C.K.Ch.

Dist. in the prov.: ZA, KO, MA, KH. – Farm type: IR, RA. – Annual; 1297 m (MA) to 1986 m (ZA). – Voucher spec.: 13235. –It is mentioned in Shimi and Termeh (1994).

**Brassicaceae** Burnett*Alyssum linifolium* Steph. & Willd. var. *linifolium*

Dist. in the prov.: ZA, IJ, MA, KO. – Farm type: IR, RA (common). – Annual; 1489 m (IJ) to 1818 m (ZA). – Voucher spec.: 13076. –It is mentioned in Shimi and Termeh (1994).

*Alyssum minus* (L.) Rothm

Dist. in the prov.: ZA, IJ, KH, MA, KO. – Farm type: IR, RA. – Annual; 1489 m (IJ) to 1818 m (ZA). – Voucher spec.: 13286. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *A. minus* is not mentioned.

*Brassica juncea* L.

Dist. in the prov.: ZA, IJ, MA, KO, TA. – Farm type: IR, RA. – Annual; 467 m (TA) to 1737 m (IJ). – Voucher spec.: 13027. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *B. juncea* is not mentioned.

*Capsella bursa-pastoris* (L.) Medik

Dist. in the prov.: MA, KH, TA. – Farm type: IR (common), RA. – Annual or biennial; 467 m (TA) to 1867 m (KH). – Voucher spec.: 13266. –It is mentioned in Shimi and Termeh (1994).

*Cardaria draba* (L.) Desv

Dist. in the prov.: ZA, KH, AB, KO, TA. – Farm type: IR (common), RA. – Perennial; 467 m (TA) to 1986 m (ZA). – Voucher spec.: 13075. –It is mentioned in Shimi and Termeh (1994).

*Chorispora persica* Boiss.

Dist. in the prov.: ZA, IJ, AB, KO. – Farm type: IR, RA (common). – Annual; 181 m (AB) to 1672 m (ZA). – Voucher spec.: 13029. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *C. persica* is not mentioned

*Chorispora tenella* (Pall.) DC.

Dist. in the prov.: ZA, KH, AB, MA, KO, TA. – Farm type: IR, RA. – Annual; 467 m (TA) to 1818 m (ZA). – Voucher spec.: 13025. –It is mentioned in Shimi and Termeh (1994).

*Clypeola lappacea* Boiss.

Dist. in the prov.: ZA, MA, KO, AB. – Farm type: IR, RA (common). – Annual; 1375 m (MA) to 1813 m (AB). – Voucher spec.: 13058. –This genus is not recorded by Shimi and Termeh (1994).

*Conringia perfoliata* (C.A.Mey.) Busch

Dist. in the prov.: ZA, IJ, MA, KO. – Farm type: IR, RA. – Annual; 1327 m (MA) to 1698 m (ZA). – Voucher spec.: 13051. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *C. perfoliata* is not mentioned

*Conringia orientalis* (L.) Andrz

Dist. in the prov.: ZA, IJ, MA, KO. – Farm type: IR, RA. – Annual or biennial; 1327 m (MA) to 1698 m (ZA). – Voucher spec.: 13228. –It is mentioned in Shimi and Termeh (1994).

*Descurainia sophia* (L.) Webb

Dist. in the prov.: AB, KH, TA, KO. – Farm type: IR (common), RA. – Annual or biennial; 557 m (TA) to 1844 m (KH). – Voucher spec.: 13082. –It is mentioned in Shimi and Termeh (1994).

*Erysimum sisymbrioides* C.A.Mey

Dist. in the prov.: ZA, KO. – Farm type: RA. – Annual; 1312 m (ZA) to 1598 m (KO). – Voucher spec.: 13030. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *E. sisymbrioides* is not mentioned.

*Goldbachia laevigata* (M.B.) DC.

Dist. in the prov.: ZA, AB, KH, TA, KO. – Farm type: IR (common), RA. – Annual; 557 m (TA) to 1874 m (AB). – Voucher spec.: 13244. –It is mentioned in Shimi and Termeh (1994).

*Isatis cappadoeica* Desv.

Dist. in the prov.: ZA, AB, KH, KO. – Farm type: IR, RA. – Perennial; 1637 m (KO) to 1995 m (ZA). – Voucher spec.: 13260. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *I. cappadoeica* is not mentioned

*Isatis minima* Bunge

Dist. in the prov.: ZA, MA, IJ, KO. – Farm type: IR (common), RA. – Annual; 1375 m (MA) to 1986 m (ZA). – Voucher spec.: 13252. –It is mentioned in Shimi and Termeh (1994).

*Lepidium perfoliatum* L.

Dist. in the prov.: ZA, MA, AB, KO. – Farm type: IR (common), RA. – Biennial or perennial; 1327 m (MA) to 1975 m (ZA). – Voucher spec.: 13059. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *L. perfoliatum* is not mentioned

*Malcolmia spryginoides* (L.) Rbr

Dist. in the prov.: ZA, MA, IJ, KO, AB. – Farm type: IR, RA. – Annual; 1297 m (MA) to 1757 m (ZA). – Voucher spec.: 13059. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *M. spryginoides* is not mentioned

*Neslia apiculata* Fisch. & Mey.

Dist. in the prov.: ZA, AB, IJ, TA, KO. – Farm type: IR (common), RA. – Annual; 474 m (TA) to 1975 m (ZA). – Voucher spec.: 13081. –It is mentioned in Shimi and Termeh (1994).

*Raphanus raphanistrum* L.

Dist. in the prov.: ZA, TA, MA. – Farm type: IR (common), RA. – Annual; 474 m (TA) to 1698 m (ZA). – Voucher spec.: 13236. –It is mentioned in Shimi and Termeh (1994).

*Sinapis arvensis* L.

Dist. in the prov.: ZA, IJ, TA, KH. – Farm type: IR, RA. – Annual; 510 m (TA) to 1785 m (KH). – Voucher spec.: 13272. –It is mentioned in Shimi and Termeh (1994).

*Sisymbrium irio* L.

Dist. in the prov.: ZA, KO, MA, IJ, KH. – Farm type: IR, RA. – Annual; 1327 m (MA) to 1986 m (ZA). – Voucher spec.: 13287. –It is mentioned in Shimi and Termeh (1994).

*Sisymbrium septulatum* DC.

Dist. in the prov.: TA, KH. – Farm type: IR, RA. – Annual; 474 m (TA) to 1867 m (KH). – Voucher spec.: 13028. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *S. septulatum* is not mentioned

*Sameraria armena* (L.) Desv.

Dist. in the prov.: ZA, MA, IJ. – Farm type: IR, RA. – Annual; 1598 m (MA) to 1896 m (ZA). – Voucher spec.: 13292. –This genus is not recorded by Shimi and Termeh (1994).

*Thlaspi perfoliatum* L.

Dist. in the prov.: ZA, KO, AB, MA, IJ. – Farm type: IR, RA. – Annual; 1297 m (MA) to 1799 m (AB). – Voucher spec.: 13277. –It is mentioned in Shimi and Termeh (1994).

### **Caryophyllaceae** Juss.

*Silene conoidiea* L.

Dist. in the prov.: IJ, KO, AB, TA, ZA. – Farm type: IR, RA. – Annual; 1489 m (IJ) to 1986 m (ZA). – Voucher spec.: 13245. –It is mentioned in Shimi and Termeh (1994).

*Vaccaria pyramidata* Medicus

Dist. in the prov.: IJ, KO, MA, AB, TA, ZA. – Farm type: IR, RA. – Annual; 557 m (IJ) to 1925 m (ZA). – Voucher spec.: 13261. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *V.pyramidata* is not mentioned

### **Chenopodiaceae** Vent.

*Atriplex aucherii* Moq.

Dist. in the prov.: IJ, KO, MA, AB, TA, ZA. – Farm type: IR, RA. – Annual; 557 m (IJ) to 1925 m (ZA). – Voucher spec.: 13237. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *A. aucheri* is not mentioned

*Chenopodium album* L.

Dist. in the prov.: KH, MA, AB, TA, ZA. – Farm type: IR, RA. – Annual; 474 m (TA) to 1747 m (KH). – Voucher spec.: 13253. –It is mentioned in Shimi and Termeh (1994).

*Chenopodium murale* L.

Dist. in the prov.: KH, MA, IJ, KO, AB, TA. – Farm type: IR, RA. – Annual; 176 m (KH) to 1874 m (AB). – Voucher spec.: 13267. –It is mentioned in Shimi and Termeh (1994).

### **Convolvulaceae** Juss.

*Convolvulus arvensis* L.

Dist. in the prov.: KH, MA, IJ, KO, AB, ZA. – Farm type: IR, RA. – Perennial; 1327 m (MA) to 1986 m (ZA). – Voucher spec.: 13282. –It is mentioned in Shimi and Termeh (1994).

### **Dipsacaceae** Juss.

*Cephalaria syriaca* Schrad

Dist. in the prov.: KO, ZA, IJ. – Farm type: IR, RA (common). – Annual; 1489 m (IJ) to 1672 m (ZA). – Voucher spec.: 13273. –It is mentioned in Shimi and Termeh (1994).

### **Euphorbiaceae** Juss.

*Euphorbia heteradenia* Jub & Spach

Dist. in the prov.: KH, MA, IJ, KO, AB. – Farm type: IR, RA (common).  
– Perennial; 1297 m (MA) to 1879 m (AB). – Voucher spec.: 13048. –  
It is mentioned in Shimi and Termeh (1994).

*Euphorbia virgata* W.K.

Dist. in the prov.: KH, MA, IJ, KO, AB. – Farm type: IR, RA (common).  
– Perennial; 1297 m (MA) to 1875 m (AB). – Voucher spec.: 13291. –  
In Shimi and Termeh (1994) nine other species for the genus are  
recorded, but *E. virgata* is not mentioned.

#### **Fabaceae** Lindl.

*Alhagi camelorum* Fisch.

Dist. in the prov.: MA, IJ, KO. – Farm type: RA. – Perennial; 1327 m  
(MA) to 1706 m (IJ). – Voucher spec.: 13050. –In Shimi and Termeh  
(1994) the other specie for the genus is recorded, but *A. camelorum* is  
not mentioned

*Coronilla varia* L. subsp. *Varia*

Dist. in the prov.: ZA, AB. – Farm type: IR. – Perennial; 1650 m (AB)  
to 1698 m (ZA). – Voucher spec.: 13238. –It is mentioned in Shimi  
and Termeh (1994).

*Lathyrus aphca* L.

Dist. in the prov.: ZA, AB, TA, KH. – Farm type: IR, RA. – Annual; 474  
m (TA) to 1844 m (KH). – Voucher spec.: 13254. –It is mentioned in  
Shimi and Termeh (1994).

*Sophora alopecuroides* L.

Dist. in the prov.: ZA, AB, MA, TA, KH. – Farm type: IR, RA. –  
Perennial; 474 m (TA) to 1817 m (KH). – Voucher spec.: 13045. –This  
genus is not recorded by Shimi and Termeh (1994).

*Vicia villosa* Roth.

Dist. in the prov.: ZA, AB, MA, TA, KH. – Farm type: IR, RA. –  
Perennial; 474 m (TA) to 1817 m (KH). – Voucher spec.: 13046. –It is  
mentioned in Shimi and Termeh (1994).

#### **Fumariaceae** DC.

*Fumaria vailantii* Loisel

Dist. in the prov.: ZA, KO, MA, IJ, KH. – Farm type: IR, RA. –  
Perennial; 1327 m (MA) to 1850 m (KH). – Voucher spec.: 13037. –It  
is mentioned in Shimi and Termeh (1994).

*Fumaria asepla* Boiss.

Dist. in the prov.: ZA, AB, IJ, TA, KH. – Farm type: IR, RA. – Annual;  
474 m (TA) to 1986 m (ZA). – Voucher spec.: 13290. –In Shimi and  
Termeh (1994) four other species for the genus are recorded, but *F.*  
*asepla* is not mentioned

#### **Geraniaceae** Juss.

*Geranium stepporum* Davis

Dist. in the prov.: ZA, AB, KO, IJ, KH. – Farm type: IR, RA (common). – Perennial; 1489 m (IJ) to 1990 m (ZA). – Voucher spec.: 13246. –It is mentioned in Shimi and Termeh (1994).

**Lamiaceae** Lindl.

*Lamium amplexicule* L. var. *amplexicule*

Dist. in the prov.: ZA, AB, IJ, TA, KO. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1799 m (AB). – Voucher spec.: 13083. –It is mentioned in Shimi and Termeh (1994).

*Salvia palaestina* Benth.

Dist. in the prov.: ZA, AB, KO, TA, KH. – Farm type: IR, RA. – Perennial; 467 m (TA) to 1874 m (AB). – Voucher spec.: 13239. –In Shimi and Termeh (1994) three other species for the genus are recorded, but *S.palaestina* is not mentioned

**Linaceae** DC. ex Grey

*Linum mucronatum* Bertol subsp. *mucronatum*

Dist. in the prov.: AB, KO. – Farm type: IR. – Perennial; 1087 m (KO) to 1813 m (AB). – Voucher spec.: 13033. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *L.mucronatum* is not mentioned

*Linum ustatissimum* L.

Dist. in the prov.: ZA, AB, IJ, KO, KH. – Farm type: IR (common), RA. – Annual; 1598 m (KO) to 1850 m (KH). – Voucher spec.: 13034. –In Shimi and Termeh (1994) two other species for the genus are recorded, but *L.ustatissimum* is not mentioned

**Malvaceae** Juss.

*Malva parviflora* L.

Dist. in the prov.: ZA, AB, MA. – Farm type: IR, RA (common). – Annual; 1327 m (MA) to 1813 m (AB). – Voucher spec.: 13035. –It is mentioned in Shimi and Termeh (1994).

**Papaveraceae** Juss.

*Glaucium elegans* F. & M.

Dist. in the prov.: ZA, IJ, KH. – Farm type: IR, RA. – Annual; 1479 m (IJ) to 1990 m (ZA). – Voucher spec.: 13262. –It is mentioned in Shimi and Termeh (1994).

*Glaucium grandiflorum* Boiss. & Huet

Dist. in the prov.: ZA, AB, TA, KH. – Farm type: IR (common), RA. – Perennial; 474 m (TA) to 1986 m (ZA). – Voucher spec.: 13039. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *G.grandiflorum* is not mentioned

*Hypocoum pendulum* L.

Dist. in the prov.: ZA, KO, AB, MA, KH. – Farm type: IR (common), RA. – Annual; 1310 m (MA) to 1986 m (ZA). – Voucher spec.: 13161, 13053. –It is mentioned in Shimi and Termeh (1994).

*Roemeria hybrida* (L.) DC.

Dist. in the prov.: ZA, MA, TA, KH. – Farm type: IR, RA (common). – Annual; 557 m (TA) to 1760 m (KH). – Voucher spec.: 13268. –It is mentioned in Shimi and Termeh (1994).

*Roemeria refracta* DC.

Dist. in the prov.: ZA, KO, MA, TA, KH. – Farm type: IR, RA (common). – Annual; 557 m (TA) to 1990 m (ZA). – Voucher spec.: 13274. –It is mentioned in Shimi and Termeh (1994).

### **Plantaginaceae** Juss.

*Plantago lanceolata* L.

Dist. in the prov.: ZA, MA, TA, AB, KH. – Farm type: IR (common), RA. – Perennial; 474 m (TA) to 1986 m (ZA). – Voucher spec.: 13229. –It is mentioned in Shimi and Termeh (1994).

*Plantago psyllium* L.

Dist. in the prov.: ZA, TA, AB, KH. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1986 m (ZA). – Voucher spec.: 13255. –It is mentioned in Shimi and Termeh (1994).

### **Polygonaceae** Juss.

*Polygonum patulum* M.B.

Dist. in the prov.: ZA, KO, MA, AB, KH. – Farm type: IR (common), RA. – Annual; 1327 m (MA) to 1867 m (KH). – Voucher spec.: 13293. –It is mentioned in Shimi and Termeh (1994).

*Polygonum corrigioloides* L.

Dist. in the prov.: ZA, TA, KO, AB, KH. – Farm type: IR (common), RA. – Annual or rarely perennial; 474 m (TA) to 1813 m (AB). – Voucher spec.: 13031. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *P.corrigioloides* is not mentioned.

*Polygonum molliaeforme* L.

Dist. in the prov.: ZA, TA, AB, MA. – Farm type: IR (common), RA. – Annual; 510 m (TA) to 1986 m (ZA). – Voucher spec.: 13032. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *P.molliaeforme* is not mentioned.

### **Ranunculaceae** Juss.

*Adonis aestivalis* L.

Dist. in the prov.: ZA, TA, IJ, KO, AB, MA, KH. – Farm type: IR, RA. – Annual; 474 m (TA) to 1986 m (ZA). – Voucher spec.: 13247. –It is mentioned in Shimi and Termeh (1994).

*Ceratocephalus falcatus* (L.) Pers.

Dist. in the prov.: IJ, KO, AB, MA. – Farm type: IR, RA. – Annual; 1598 m (KO) to 1737 m (IJ). – Voucher spec.: 13056. –It is mentioned in Shimi and Termeh (1994).

*Consolida ambigua* (L.) Ball & Heywood

Dist. in the prov.: IJ, ZA, KO, TA, AB, MA. – Farm type: IR, RA (common). – Annual; 467 m (TA) to 1990 m (ZA). – Voucher spec.:

13057. –In Shimi and Termeh (1994) the other specie for the genus is recorded, but *C.ambigua* is not mentioned

*Ranunculus arvensis* L.

Dist. in the prov.: ZA, KO, TA, AB, MA. – Farm type: IR, RA (common). – Annual; 510 m (TA) to 1990 m (ZA). – Voucher spec.: 13054. –It is mentioned in Shimi and Termeh (1994).

*Ranunculus polyanthemos* L.

Dist. in the prov.: ZA, KO, IJ, AB, MA. – Farm type: IR, RA. – Perennial; 1280 m (MA) to 1736 m (IJ). – Voucher spec.: 13055. –In Shimi and Termeh (1994) seven species for the genus are recorded, but *R. polyanthemos* is not mentioned

### **Resedaceae** DC. ex Gray

*Reseda lutea* L.

Dist. in the prov.: ZA, KO, IJ. – Farm type: RA. – Annual or perennial; 1736 m (IJ) to 1990 m (ZA). – Voucher spec.: 13159–It is mentioned in Shimi and Termeh (1994).

### **Rosaceae** Juss.

*Hulthemia persica* (Mich.) Bornn

Dist. in the prov.: KO, IJ, KO, MA. – Farm type: RA. – Perennial; 1372 m (MA) to 1844 m (KH). – Voucher spec.: 13043. –This genus is not recorded by Shimi and Termeh (1994).

*Sanguisorba minor* Scop

Dist. in the prov.: ZA, KO, AB, TA. – Farm type: IR (common), RA. – Perennial; 467 m (TA) to 1986 m (ZA). – Voucher spec.: 13278. –This genus is not recorded by Shimi and Termeh (1994).

### **Rubiaceae** Juss.

*Galium aparin* L.

Dist. in the prov.: ZA, KH, TA, AB. – Farm type: IR (common), RA. – Annual; 467 m (TA) to 1867 m (KH). – Voucher spec.: 13263. –It is mentioned in Shimi and Termeh (1994).

*Galium humifusum* L.

Dist. in the prov.: ZA, KO, IJ, AB, KH, MA. – Farm type: IR (common), RA. – Perennial; 510 m (TA) to 1990 m (ZA). – Voucher spec.: 13041. –In Shimi and Termeh (1994) four other species for the genus are recorded, but *G.humifusum* is not mentioned

*Galium tricorrrnutum* Dandy

Dist. in the prov.: ZA, KO, AB, KH, TA. – Farm type: IR (common), RA. – Annual; 474 m (TA) to 1874 m (AB). – Voucher spec.: 13042. –It is mentioned in Shimi and Termeh (1994).

*Galium verum* L.

Dist. in the prov.: AB, KH, MA. – Farm type: IR, RA. – Perennial; 1327 m (MA) to 1860 m (KH). – Voucher spec.: 13230. –It is mentioned in Shimi and Termeh (1994).



**Scrophulariaceae** Juss.*Veronica hederifolia* L.

Dist. in the prov.: ZA, KO, TA, AB, KH. – Farm type: IR (common), RA.  
– Annual; 474 m (TA) to 1875 m (AB). – Voucher spec.: 13044. –It is mentioned in Shimi and Termeh (1994).

**Solanaceae** Juss.*Hyoscyamus niger* L.

Dist. in the prov.: ZA, IJ, KH. – Farm type: RA. – Annual or biennial;  
1506 m (IJ) to 1860 m (KH). – Voucher spec.: 13269. –It is mentioned in Shimi and Termeh (1994).

**CONCLUSION**

Among the studied taxa, the largest families of weeds were Brassicaceae, Poaceae, and Asteraceae. The number of monocots species was 29; of which 12 (41%) were from irrigated farm, 4 were found in rain-fed farms (more common) and irrigated farms (13%), 11 were both from irrigated (more common) and rain-fed farms (37%), and 2 were equally found in the irrigated and rain fed farms (6.8%). In monocots the most important family was Poaceae which included 22 species. On the other hand, the number of dicot species was 98; of which 4 (4%) thrived in irrigated farms, 6 (6%) in rain fed farms, 20 (20%) in rain-fed (more common) and irrigated farms, 31 (31%) in both of rain-fed (more common) and irrigated farms, and 38 (38%) thrived in both irrigated and rain fed farms equally. In dicots the most important families were Asteraceae and Brassicaceae, with 18 and 24 species, respectively.

As a whole, 76 species were annual (60.6%), 38 were perennial (29.9%), 7 were annual or biennial (5.5%), 3 were annual and perennial (2.3 %), and 2 were biennial and perennial (1.5%). Sixteen (16) species of the annuals were monocots (12.5%), and 60 were dicots (48%). Twelve of the perennials were monocots (9.4%), and 26 were dicots (20.4%). Out of all the studied species, 77 were mentioned in Shimi and Termeh (1994), and 49 were not. Thus 49 species were recorded here for the first time based on this work. A list of all the reported weeds in alphabetical order of their botanical names is as follows:

Asteraceae: *Achillea vermicularis*, *Bellis perrenis*, *Matricaria chamomilla*, *Senecio cineraria*, *Taraxacum bessarabicum*, *Tragopogon caricifolium*, and *T. marginatus*. Alliaceae: *Allium atroviolaceum*. Boraginaceae: *Alkana bracteosa*, *Nonnea lutea*, *N. persica*, *Lithospermum tenuiflorum*. Brassicaceae: *Alyssum minus*, *Brassica juncea*, *Chorispora persica*, *Clypeola lappacea*, *Conringia perfoliata*, *Erysimum sisymbrioides*, *Isatis cappadoeica*, *Lepidium perfoliatum*, *Malcolmia spryginoides*, *Sisymbrium septulatum*, *Sameraria armena*.

Caryophyllaceae: *Vaccaria pyramidata*. Chenopodiaceae: *Atriplex aucherii*. Euphorbiaceae: *Euphorbia virgata*. Fabaceae: *Alhagi camelorum*, *Sophora alopecuroides*. Fumariaceae: *Fumaria asepla*. Lamiaceae: *Salvia palaestina*. Liliaceae: *Gagea lutea*, *Tulipa schmidtii*. Linaceae: *Linum mucronatum* subsp. *Mucronatum*, *L. usitatissimum*. Papaveraceae: *Glaucium grandiflorum*. Poaceae: *Aegilops cylindrical*, *Avena sativa*, *Calamagrestis pseudophragmites*, *Hordeum vulgare*, *Nardurus subulatus*, *Phalaris arundinaceae*, *Schismus arabicus*. Polygonaceae: *Polygonum corrigioloides*, *P. molliaeforme*. Ranunculaceae: *Consolida ambigua*, *Ranunculus polyanthemos*. Rosaceae: *Hulthemia persica*, *Sanguisorba minor* and Rubiaceae: *Galium humifusum*.

The richest genera were *Galium* with 4 species and *Bromus*, *Galium*, *Hordeum*, *Nonnea*, and *Tragopogon*, each with three species.

#### REFERENCES CITED

- Baghestani, M. A., E. Zand and S. Soufizadeh. 2006. Iranian winter wheat's (*Triticum aestivum* L.) interference with weeds: I. Grain yield and comparative index. Pak. J. Weed Sci. Res. 12(3): 119-129.
- Darbyshire, S.J. 2003. Inventory of Canadian agricultural weeds – Agriculture and Agri-Food Canada, Research Branch, Ottawa, Ontario.
- Fayyaz, M., S.F. Antahi and M.M. Charkhchian. 2010. Plant types of Zanzan province. Tehran.
- Feldman, M. 1976. Wheat. In: Simmonds, N.W.(ed.): Evolution of crop plants. Longman Scientific and technical. Harlow.
- Khan, N., Hashmatullah, K. Naveed, Z. Hussain and S.A. Khan. 2012. Assessment of allelopathic effects of parthenium (*Parthenium hysterophorus* L.) plant parts on seed germination and seedling growth of wheat (*Triticum aestivum* L.) cultivars. Pak. J. Weed Sci. Res. 18(1): 39-50.
- Mozaffarian, V. 1996. A dictionary of Iranian plant names. Farhang Mo'aser. Tehran.
- Perrins, J. Williamson, M. and Fitter, A. 1992. A survey of differing views of weed classification: implications for regulation of introductions. Biol. Conserv. 60: 47-56.
- Rechinger, K.H. (ed.) (1963–2010): *Flora Iranica*. – Vols 1–174, Akademische Druck - u. Verlagsanstalt, Graz, Vols 175–178, Naturhistorisches Museum, Wien.
- Shah, G. M. and Khan, M. A. 2006. Checklist of noxious weeds of district Mansehra, Pakistan. Pak. J. Weed Sci. Res. 12(3): 213-219.

- Shimi, S. and F. Termeh. 1994. Weeds of Iran. Plant Pests and Diseases Research Institute, Tehran, Iran. The History of Technology - Irrigation. Encyclopædia Britannica, 1994 edition.
- Thiers, B. 2008+ [continuously updated]: Index herbariorum: a global directory of public herbaria and associated staff. - New York: New York Botanical Garden-<http://sweetgum.nybg/ih/>
- Whitson, T. ed. 1992. Weeds of the West. Western Society of Weed Science.