

## Validation of the *Quercus* (Fagaceae) taxa described by Djavançhir Khoie

Parisa PANAHI\* , Ziba JAMZAD 

Botany Research Division, Research Institute of Forests and Rangelands, Agricultural Research, Education, and Extension Organization, AREEO, Tehran, Iran

Received: 04.10.2017 • Accepted/Published Online: 29.05.2018 • Final Version: 26.09.2018

**Abstract:** In a taxonomic revision of the genus *Quercus* L. in Iran, 25 taxa named by Djavançhir Khoie in 1967 were studied and evaluated. These taxa were described in his PhD thesis but not validly published according to Arts. 30.8. and 40.1. of the ICN. According to our studies, seven of them are accepted taxa. In this paper we validate them. The original descriptions are provided, an identification key for these taxa is presented, and the types are designated in MPU.

**Key words:** Hyrcanian forests, Iran, oak, validation, Zagros forests

### 1. Introduction

Oak species grow abundantly in forests of the west, northwest, and north of Iran, displaying remarkable morphological variation. Several taxonomic groups of oaks are very complex and caused controversy in different authors' taxonomic treatments. The most comprehensive study of the genus *Quercus* L. in Iran was carried out by Djavançhir Khoie in 1967, who described 25 taxa from Iran. These species were mostly considered in the synonym list in the subsequent authors' treatments, i.e. Menitsky (1971).

Reviewing the genus *Quercus* in Iran using micromorphological features (Panahi et al., 2011, 2012a, 2012b, 2012c, 2012d), we evaluated the named *Quercus* taxa. Seven out of 25 of Djavançhir Khoie's names proved to be independent taxa with their own diagnostic characters, but the remaining ones were recognized as synonymies of other accepted species. The taxa described by Djavançhir Khoie in his PhD thesis were not validly published according to Art. 30.8. of the ICN (McNeill et al., 2012). Furthermore, no type specimens were indicated in his PhD thesis (Art. 40.1. of the ICN), so they were considered invalid names, needing validation.

### 2. Materials and methods

The *Quercus* species of Iran were studied using common taxonomic methods. The identification of species was performed using different identification keys. The original images of specimens of *Quercus* taxa described

by Djavançhir Khoie, from the herbarium of Montpellier University, MPU (acronyms according to Thiers, 2018), were studied. Meanwhile, we studied Djavançhir Khoie's specimens with the same collecting data but different accession numbers in the herbarium of the Natural Resources Faculty of Tehran University (NRFUT). During identification of the studied specimens we used the international code for nomenclature to define the correct names and to validate previously published names (McNeill et al., 2012). Seven names were accepted and validated according to the ICN code.

### 3. Results and discussion

The comparison of the type specimens of taxa described by Djavançhir Khoie with the validly published and accepted *Quercus* names showed that seven out of 25 species described by him merit being independent species. The diagnostic morphological characters of acorns, leaves, and glands as well as the previously studied micromorphological traits proved their independence from their closely related accepted names. Type specimens are designated and the names are validated. The diagnostic characters in relation to their closely related species are presented in an identification key. We also provide the original Latin descriptions of taxa described in "Les chênes de l'Iran" by Djavançhir Khoie. Pictures of the holotypes, preserved in MPU, are also presented (Figures 1–7).

Based on morphological characteristics, an identification key to the *Quercus* taxa newly described here

\* Correspondence: panahi@rifr-ac.ir



Figure 1. *Quercus apiculata* Djav.-Khoie, sp. nov. (holotype: MPU 310539).

and some closely related taxa in Iran is presented below:

1-Leaf lobed or ±entire; cupule scales appressed or slightly patent ..... 2

-Leaf dentate, serrate with acuminate or ±spinose dents; cupule scales patent, recurved, or short appressed ..... 7

2-Leaves deeply lobed ..... 3

-Leaves shallowly lobed.....4

3-Leaves with ±entire lobes; petiole short, ±5 mm long .....  
 ..... *robur* subsp. *pedunculiflora*

-Leaves with dentate lobes; petiole long, ±10 mm long .....  
 ..... *longipes*

4-Leaves obovate with short rotundate uniform lobes.....5

-Leaves elliptic with mucronate-dentate or acute dentate lobes ..... 6

5-Branches glabrous; lower surface of leaves shortly pubescence; stipules deciduous .....  
 ..... *petraea* subsp. *iberica*

-Branches and lower surface of leaves covered with dense yellow hairs; stipules persistent .....  
 ..... *macranthera*

6-Leaves oblong, indistinctly lobed. Hilum prominent with a brown ring at the base .....  
 ..... *infectoria* subsp. *boissieri* var. *tenuicarpa*

-Leaves elliptic, entire. Hilum slightly prominent or flat, without a brown ring at the base .....  
 ..... *infectoria* subsp. *boissieri* var. *pfaeffingeri*

7-Leaves ovate, broad ovate ..... 8

-Leaves oblong, oblong-ovate, oblong-elliptic ..... 9

8-Leaves ±regularly serrate, nerves not branched. Cupule scales appressed, fragile ..... *brantii*  
 -Leaves biserrate, nerves branched at the apex of teeth. Cupule scales rhomboid, hard ..... *saei*  
 9-Leaf teeth with 1 mm long spines. Cupule scale thin, fragile ..... 10  
 -Leaf teeth with longer spine. Cupule scale thick, hard ..... 11  
 10-Gland large, ±30 mm long, subcylindrical; cupule scales thick long ±12 mm long, hilum plane without black brown ring ..... *castaneifolia* subsp. *undulata*  
 -Gland small, ±22 mm long, ovate; cupule scales short ±5 mm long, hilum convex with black brown ring .....

..... *castaneifolia* subsp. *castaneifolia* var. *minuta*  
 11-Leaves oblong, ovate-lanceolate, with cuneate or rotundate base ..... *libani*  
 -Leaves oblong-elliptic, oblong, with cordate to cuneate base ..... 12  
 12-Leaves oblong-elliptic, with cordate base; leaf margin lyrate ..... *ophiosquamata*  
 -Leaves oblong-ovate, oblong-lanceolate, with cuneate to obtuse base; leaf margin sinuate-undulate, serrate ..... 13  
 13-Leaf margin sinuate-undulate; covered by hairs on both surfaces. Cupule scales long, ligulate, arched, recurved .....  
 ..... *magnosquamata*



Figure 2. *Quercus castaneifolia* subsp. *castaneifolia* var. *minuta* Djav.-Khoie, var. nov. (holotype: MPU 310541).



Figure 3. *Quercus castaneifolia* subsp. *undulata* Djav.-Khoie, subsp. nov. (holotype: MPU 310547).



Figure 4. *Quercus magnosquamata* Djav.-Khoie, sp. nov. (holotype: MPU 310548).





Figure 6. *Quercus saei* Djav.-Khoie, sp. nov. (holotype: MPU 310553).



Figure 7. *Quercus infectoria* subsp. *boissieri* var. *tenuicarpa* Jamzad & Panahi, comb. nov. (holotype: MPU 310557).



-Leaf margin serrate; covered by hairs only on lower surface. Cupule scales short and appressed ..... *apiculata*

**3.1. *Quercus apiculata* Djav.-Khoie, sp. nov.** (Figure 1)

Type: Iran, forests of Kurdistan Province, between Baneh and Sardasht, near Kokhin, 1280 m, 19.09.1965, *K. Djavanichir* (Holotype: MPU 310539, isotype: MPU 310540).

Subg. *Quercus*, Sect. *Cerris* Loudon, Subsect. *Aegilops* (Rchb.) Menitsky

Arbor mediocris, 5–6 m alta, ramis glabris, gemmis conicis glabris, foliis deciduis. Foliorum venatio complanata. Folia lanceolata, basi rotundata, margine utrinque 9–14 dentibus acutis et aristatis praedita. Inflorescentia mascula brevis, in axi pilosa, floribus 4–5 staminatis. Inflorescentia feminea brevis, 1–2 flores cum 3 stylis linearibus-recurvatis ferens. Cupula subcylindrica, squamis cupulae totis adhaerentibus (neque tamen earum parvis apiculis recurvatis extra prominentibus). Squamae ad summitatem cupulae lineares, longae atque ad basim recurvae. Glans subcylindrica, cicatrice parum prominente, post duobus annis ad maturitatem perveniens (Djavanichir Khoie, 1967, pls. 22–25).

**3.2. *Quercus castaneifolia* C.A.Mey. subsp. *castaneifolia* var. *minuta* Djav.-Khoie, var. nov.** (Figure 2)

Type: Iran, Mazandaran, forests of Caspian, near Lajim, 14 Oct. 1965, *K. Djavanichir* (Holotype: MPU 310541).

Subg. *Quercus*, Sect. *Cerris* Loudon, Subsect. *Cerris* Loudon

Squamae cupulae longae. Glans parva, ovata, cicatrice valde convexa, fascia fusco-nigrescente circumcincta (Djavanichir Khoie, 1967, pl. 37).

**3.3. *Quercus castaneifolia* C.A.Mey. subsp. *undulata* Djav.-Khoie, subsp. nov.** (Figure 3)

Type: Iran, Guilan, forests of Caspian, forests of Astara, Jiranaband, 90 m, 29 Sept. 1965, *K. Djavanichir* (Holotype: MPU 310547).

Subg. *Quercus*, Sect. *Cerris* Loudon, Subsect. *Cerris* Loudon

Glans et cupula magnae; cupula hemisphaerica. Squamae inferiores latae et recurvatae, circa medium (cupulae) longissimae (10–13 mm) patentes et in apice ad alto atque etiam intra recurvatae. Glans subcylindrica (Djavanichir Khoie, 1967, pl. 43).

**3.4. *Quercus magnosquamata* Djav.-Khoie, sp. nov.** (Figure 4)

Type: Iran, Kurdistan Province, forests of Chenareh (35 km N.E. Marivan), 1580 m, 3 Nov. 1963, *K. Djavanichir* (Holotype: MPU 310548).

Subg. *Quercus*, Sect. *Cerris* Loudon, Subsect. *Aegilops* (Rchb.) Menitsky

Arbor usque ad 15 m alta, ramis subglabris, gemmis conicis glabris subglabrisve, foliis deciduis. Foliorum venatio plana. Folia late lanceolata, basi rotundata, margine utrinque 10–14 latis dentibus praedita. Stamina 4–5. Styli 3, lineares et recurvati. Cupulae amplissimae. Squamae in parte inferiore cupulae latae, crassae atque subito mucronatae, circa medium (cupulae) loratae et recurvato-arcuatae. Glans longa, cylindrica, cicatrice lata fere exserta, post duobus annis ad maturitatem perveniens (Djavanichir Khoie, 1967, pls. 58–60).

**3.5. *Quercus ophiosquamata* Djav.-Khoie, sp. nov.** (Figure 5)

Type: Iran, Kurdistan Province, between Baneh and Armardeh, 1630 m, 6 Nov. 1963, *K. Djavanichir* (Holotype: MPU 310552).

Subg. *Quercus*, Sect. *Cerris* Loudon, Subsect. *Aegilops* (Rchb.) Menitsky

Arbor 11–13 m alta, ramis mediocriter pilosis, gemmis subglabris, foliis deciduis. Foliorum venatio plana. Folia anguste elongata, basi cordata, margine utrinque 13–17 undulato-sinuatis aristatisque dentibus praedita, supra subglabra, inferne leviter tomentosa. Stamina 4–5. Styli 3, lineares et recurvati. Cupula cylindrica basi plana. Squamae basilares plurimae, modo regulatim scutulato dispositae, circa medium (cupulae) rhombicae, superne elongatae: dispositio squamarum appositarum pelli anguis conspectu persimilis. Glans magna, subcylindrica, cicatrice satis magna, post duobus annis ad maturitatem perveniens (Djavanichir Khoie, 1967, pls. 61–63).

**3.6. *Quercus saei* Djav.-Khoie, sp. nov.** (Figure 6)

Type: Iran, Fars, forests of Muleh-Galeh, South West of Shiraz, 2062 m, 23 Nov. 1965, *K. Djavanichir* (Holotype: MPU 310553, isotype: MPU 310554).

Subgenus *Quercus*, Sect. *Cerris* Loudon, Subsect. *Aegilops* (Rchb.) Menitsky

Arbor 8–10 m alta, ramis et gemmis tomentosus, foliis marcescentibus. Foliorum venatio plana. Folia ovata, basi cordata, superne leviter tomentosa, inferne dense tomentosa, venae laterales saepe trifurcatae. Stamina 6–7. Styli 3, lineares et recurvati. Cupulae subcylindricae, profundae, crassae, squamis magnis bene appositis, rhombicis, ad apicem angustum subito recurvatis. Glans post duobus annis ad maturitatem perveniens (Djavanichir Khoie, 1967, pls. 96–99).

*Quercus saei* is named in honor of Dr Karim Saei, who was the founder of the Natural Resources Science and Forestry Organization in Iran.

**3.7. *Quercus infectoria* Oliv. subsp. *boissieri* (Reut.) O.Schwartz var. *tenuicarpa* Jamzad & Panahi, comb. nov.** (Figure 7)

Type: Iran, Kurdistan Province, between Baneh and Iraq border (near Belakeh), 1650 m, 18 Sept. 1965, *K. Djavanichir*

(Holotype: MPU 310557, isotype: MPU 310558).

Basionym: *Q. infectoria* Olive. var. *tenuicarpa* Djav.-Khoie  
Based on the same type.

Subg. *Quercus*, Section *Quercus*, Subsect. *Quercus*

Cupula angustissima, ad oram constricta, basi longe convexa. Glans angusta, tenuis atque elongata, cicatrice fortiter convexa subelongata, a fascia angusta et nigra circumcincta, cotyledonibus saepe conjunctis (Djavanchir Khoie, 1967, pls. 128–129).

## References

- McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J et al. (2012). International Code of Nomenclature for Algae, Fungi, and Plants (Melbourne Code) Adopted By the Eighteenth International Botanical Congress Melbourne, Australia, July 2011. *Regnum Vegetabile* 154. Oberreifenberg, Germany: Koeltz Botanical Books.
- Menitsky GL (1971). *Quercus* L. In: Rechinger KH, editor. *Flora Iranica*, Vol. 77. Graz, Austria: Akademische Druck-u. Verlagsanstalt, pp. 3-18.
- Panahi P, Jamzad Z, Pourmajidian MR, Fallah A, Pourhashemi M (2011). A revision of chestnut-leaved oak (*Quercus castaneifolia* C. A. Mey., Fagaceae) in Hyrcanian Forests of Iran. *Caspian Journal of Environmental Sciences* 9: 145-158.
- Panahi P, Jamzad Z, Pourmajidian MR, Fallah A, Pourhashemi M (2012a). Foliar epidermis morphology in *Quercus* (subgenus *Quercus*, section *Quercus*) in Iran. *Acta Bot Croat* 71: 95-113.
- Panahi P, Jamzad Z, Pourmajidian MR, Fallah A, Pourhashemi M (2012b). Taxonomic implications of micro-morphological features for taxon delimitation within the *Quercus libani* complex (Fagaceae) in Iran. *Phytologia Balcanica* 18: 263-276.
- Panahi P, Jamzad Z, Pourmajidian MR, Fallah A, Pourhashemi M, Sohrabi H (2012c). Taxonomic revision of the *Quercus brantii* complex (Fagaceae) in Iran with emphasis on leaf and pollen micromorphology. *Acta Bot Hung* 54: 355-375.
- Panahi P, Pourmajidian MR, Fallah A, Pourhashemi M (2012d). Pollen morphology of *Quercus* (subgenus *Quercus*, section *Quercus*) in Iran and its systematic implication. *Acta Soc Bot Pol* 81: 33-41.
- Thiers B (2018) [continuously updated]. *Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff*. New York, NY, USA: New York Botanical Garden's Virtual Herbarium. Available online at <http://sweetgum.nybg.org/science/ih/>.

## Acknowledgments

The authors are grateful to the authorities of the herbarium of NRFUT (University of Tehran), and to Dr Vahid Etemad and Dr Anoushirvan Shirvani for permitting the use of the herbarium specimens. We wish to thank Dr Caroline Loup (herbarium of MPU) for providing the images of the holotypes and all data concerning Djavanchir Khoi's oak collection in the Montpellier herbarium. We also wish to thank Dr Manijeh Rajab Pourrahmati and Sareh Malaki for their help.