Iraqi Journal of Agricultural Sciences –2026:57(1):19-34
P-ISSN: 0075- 0530/ E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/zqvv1y66

SYSTEMATIC REVISION OF *PICRIS* L. (ASTERACEAE-CICHORIEAE) DISTRIBUTED IN THE RAWANDUZ (MRO) DISTRICT OF KURDISTAN REGION-IRAQ

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ABSTRACT

The present research provides the first comprehensive and integrated taxonomic revision of *Picris* spp. distributed in the Rawanduz (MRO) district- Kurdistan Region- Iraq, a region where members of the genus have long been considered taxonomically challenging. Two species, the biennial to perennial *Picris strigose* and annual *Picris kotschyi*, were documented and examined using detailed morphological, micro-morphological, and anatomical analyses. Plant Materials were collected from natural populations representing different elevations, and a wide range of diagnostic characters were evaluated, including vegetative and reproductive morphology, trichome structure, achene features, ecological preferences, and geographical distribution within Iraq. Anatomical investigations, based on transverse section of stems, leaves, and peduncles, revealed several traits of diagnostic value, such as stomatal type, leaf thickness, vessel arrangement, vascular bundle number, and variation in the indumentum of vegetative and reproductive structures. Notably, the distinction between the two species was strongly supported by the number and structure of glochidiate hooked hairs, heteromorphism versus homomorphism of the achenes, peduncle morphology at fruiting, and the presence or absence of persistent basal collars. These features, when combined, provide reliable and consistent discrimination criteria, particularly in cases where flowering-stage materials alone are difficult to separate. The study also reports new local records for both species within the MRO district, including Halgurd mountain and Safin mountain, contributing to the regional understanding of *Picris* biogeography. Based on limited population sizes, habitat disturbance, and observed anthropogenic threats, both species are assessed as Critically Endangered (CR) in Iraq according to IUCN criteria. Overall, this work offers the most detailed and updated taxonomic account of *Picris* in the Kurdistan Region and highlights the importance of integrating morphological and anatomical evidence in resolving complex species boundaries.

Key words: Asteraceae, Kurdistan Region-Iraq, Morphology and Anatomy, *Picris*, Systematic Revision, Species Delimitation.

Received: 11/8/2023, Accepted: 8/11/2023, Published: 26/1/2026

INTRODUCTION

The genus *Picris L.* (Linnaeus, 1753) is a genus of flowering plants in the family Asteraceae tribe Cichorieae, and subtribe Hypochoeridinae (Leontodontinae), (Ghazanfar, 2024). According to the most recent treatment of the tribe Cichorieae (Kilian et al., 2009) the Hypochaeridinae comprise seven genera: *Hedypnois*, *Helminthotheca*, *Hypochaeris*, *Leontodon*, *Picris*, *Scorzoneroides*, and *Urospermum*. The genus *Picris* comprises approximately 40–50 species distributed in Eurasia, Africa, Australia, and New Zealand, with putative evolutionary centers in the Mediterranean Basin and Asia Minor (Al Mouslem, 2022; Zareh and Hassan 2025). It includes several taxonomically critical groups of closely related species, as well as polymorphic species with complex infraspecific variation and complicated

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evolutionary histories. The genus is undoubtedly a challenge for taxonomic research (Lack, 1979). The species *Picris hieracioides* L. is certainly one of the taxonomically most critical and highly polymorphic species of this genus in Europe, and was recently of great interest by botanist and taxonomists (Besse, 2021; Majeed and Salih, 2023a; Hamza et al., 2024; Zaman et al., 2025), because of the ambiguity of variation patterns observed within the species (e.g. continual morphological variation, discrepancies between genetic and morphological data). According to the flora of Iran, 6 species recognized and distributed in Iran (Rechinger et al., 1977) and 9 of the *Picris* species recognized and distributed in Turkey (Davis, 1965). In flora of Turkey Davis (1965) stated that *Picris* is a difficult genus, as the species can only be determined after close inspection of the indumentum, achene and pappus. The vegetative parts are extremely variable. In Iraq, the genus *Picris* represented by five species occurred in various parts of the country (Guest and Townsend, 1966; Ghazanfar et al., 2019), among them three species have been recorded in Kurdistan region. In Iraq Guest and Townsend (Guest and Townsend, 1966) relies mainly for taxonomical study of this genus mainly on morphological characteristics. Although, anatomical characters are an important tool in plant systematics (Shahzad et al., 2022) and have been widely used in taxonomic treatments and systematic studies (Ahrens, 2024; Salih, 2023; Majeed and Salih, 2023b), anatomical data on Asteraceae taxa, particularly on *Picris* species in Iraq are still very limited. To our knowledge, no comprehensive study has been carried out to date clarifying the nomenclature, intergeneric and interspecific diagnostic characters of *Picris* in the genera, nor on specific level. Therefore, the present study was conducted detailed morphological, an updated and synthetic distribution, and anatomical characteristics of two *Picris* species occurring in Kurdistan Region-Iraq, more specifically in MRO district to distinguish between the two closely related species belonging to *Picris* genus also relationship among them were revealed for the first time.

MATERIALS AND METHODS

Plant materials and identification

Plant samples were collected from natural populations during the growing seasons 2020-2021 and 2021-2022 from Rawanduz (MRO) district/Kurdistan Region-Iraq. Plant identification were established using the flora of Iraq (Guest and Townsend, 1966; Ghazanfar et al., 2019) flora Iranica (Rechinger et al., 1977), and flora of Turkey (Davis, 1965). The voucher specimens were deposited in the University of Sulaimani, College of Agricultural Engineering Science Herbarium of the College of Agricultural Engineering Science (SUFA, acronym according to Thiers (2021) for references and further investigation. The altitude and global positioning system coordinates were recorded on a Garmin Rino GPS (device. Geographical distribution mapped using QGIS software, for each specimen collected, and each collection points. Further, species synonyms and complete, detailed distribution data (countries and regions) followed (Hassler, 2023).

Anatomical study

In order to study different anatomical features, freshly-collected materials have been fixed in Carnoy's solution composed of 60% ethanol, 30% chloroform and 10% glacial acetic acid (Dhale, 2023; Khasim et al., 2024). The micro-morphological study has been conducted through studying and investigation upper (adaxial) and lower (abaxial) epidermis of the leaves taken by hand using stripping of epidermis. Stomatal index was assessed in both upper and lower epidermis according to

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Haworth et al. (2012). Type and shape of trichomes (indumentum) on the stem, leaf, peduncle, phyllaries have been investigated and measured by the ocular of the microscope in (µm). Free hand sectioning methods have been used to examine internal anatomical features through studying cross sections of each of stem, peduncle, and leaves of plants at flowering stage. Iodine in potassium iodide (IKI) and safranin 1% were mainly used to stain primary and secondary walls respectively.

RESULTS AND DISCUSSION

Taxonomic treatment

The result of this study provided each of the field survey, generic and infraspecific identification, environment and geographical distribution, conservation status, description, and species key characters. This study showed that the *Picris* represented by two species in the MRO district of the Kurdistan Region-Iraq, namely *Picris strigosa* and *Picris kotschyi*.

1. *Picris strigosa* Bieb., Fl. Taur. -Caucasus. 2:250 (1808).

Synonyms:

Picris glaucescens DC.; Prodr. [A. DC.] 7: 130 (1838)

Picris glomerata K. Koch; Linnaea 23: 666 (1851)

Picris laevis C.A.Mey.; Verz. Pfl. Casp. Meer.: 59 (1831)

Picris persica Gand.; Bull. Soc. Bot. France 65: 53 (1918)

Picris strigosa subsp. *turcomanica* Bornm. & Sint.

Picris strigosa var. *subinflata* Bornm. & Gauba

Picris subinflata (Bornm. & Gauba) Rech.f.; Oesterr. Bot. Z. 97: 261 (1950)

Picris turcomanica (Bornm. & Sint.) Gand.; Bull. Soc. Bot. France 65: 53 (1918)

Picris turcomanica (Bornm. & Sint.) Soják; Novit. Bot. & Del. Sem. Hort. Bot. Univ. Carol. Prag., 50 (1962), nom. Illeg.

Erect biennial to perennial, plant Hight 62.6(42.0-86.0) cm, massive woody rootstocks with dried bases of stems and leaves of earlier season. Indumentum of rigid 2- and 4- hooked hairs, less frequently 3-hooked hairs. Stems 52.0 (37.0-67.0) cm long, markedly angular, stiff, strictly branched. Foliage often reduced; basal leaves oblanceolate,12.0 (7.0-18.0) × 1.0 (0.4-2.2) cm, apex acute, margin dentate, base truncate, yellow color; cauline leaves oblanceolate-lanceolate, 11.5 (5.0-22.0) × 1.2 (0.8-1.5) cm, margins entire to distantly and shallowly dentate, apex acute to mucronate, base truncate, green-yellowish green. Peduncles not thickened at fruiting stage. Involucres obconical. Head 1.0 (1.0-1.3) × 0.9 (0.7-1.0) cm; receptacle naked; phyllaries with densely rigid glandular hooked hair and densely white tomentose , three series of phyllaries, outer phyllaries 0.4 (0.3-0.6)×0.1(0.1-0.2) cm, liner, margin entire, apex acute, yellowish green; middle seriate phyllaries 0.6(0.6-0.8)×0.15(0.1-0.2) cm, lanceolate-linear, margin entire, apex acute-mucronate, yellowish green; inner phyllaries 1.1(1.0-1.2)×0.2(0.1-0.3) cm, lanceolate, margin, entire, apex acute, yellowish green. Florets bright yellow, longer than phyllaries. Achenes homomorphic, fusiform, attenuate at base and apex, 6.0(5.0-7.0) ×0.85(0.5-1.0) mm, transversely rugose, brown, glabrous, unbeaked. Pappus plumose, golden at the base brown-milky white at the apex, (Figure 1- 4).

Vernacular name: Its common name in Kurdish language is Şîroye Kurdan.

Phenology: Flowering at mid-Jun, Fruiting: Aug. (-Sep.).

Habitat and frequency of the species: Occasional in the forest zone of Iraq

Local distribution: MAM, Gara Dagh, Sersang; MRO, Lolan, between Rayat and Haji Umaran, Haji Umaran; MRO, N.E. of Rania, of Pishtashan, Kew-a Rash; MSU, Zewiya,

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Qaradagh, Balkha, Tawila, Avroman FUJ, Ashur, in Anth. FUJ/FKI, Fatha, in Anth.

In current study the species collected in MRO, Haji Umran; MRO, Halgurd mountain, it is the new records for the Halgurd mountain.

Distribution in the world: S-European Russia; Egypt (Nile Valley); Turkmenistan; Northern Caucasus; Georgia [Caucasus]; Armenia; Azerbaijan; Turkey (E-Anatolia, Inner Anatolia, N-Anatolia, NE-Anatolia, S-Anatolia, SE-Anatolia, SE-Anatolia: Mesopotamian Anatolia, SW-Anatolia); Iran (EC-Iran, NE-Iran: Mts., N-Iran, Iranian Aserbaijan, S-Iran, W-Iran); Lebanon (Antilebanon, C-Lebanon); Syria (C-Syrian Desert, W-Syrian Mountains).

Specimens examined: Halgurd mountain, alt: 1871 m, collected on15-6-2022 by Nawroz Salam, and Haji Umaran, alt:1649 m, collected on 15-6-2022 by Nawroz Salam

Habitat: Roadsides, wasted places, private and common gardens in Tikrit city and from private and common gardens in Chewarta and Sulaimanya city. In Tikrit city, the species is associated with different plants, among them, *Citrus sinensis*, *Convolvulus* sp., *Cynodondactylon*, *Cyperus rotundus*, *Imperata cylindrica*, *Mentha* sp., *Medicago* sp., *Morus* trees., *Prunus arminiaca*, *Rosa* sp. and *Trifolium* sp. In Sulaimanya, the associate plants include *Morus* and legume trees and some Asteraceae ornamental plants, (Figure 8).

Conservation Status according to IUCN criteria: ====The species is widespread in Asia, and extremely rare in Kurdistan Iraq, in current study only found twice near the Persian frontier in the central sector of the lower thorn-cushion zone in the Rawanduz district (MRO), Haji Umran area and Halgurd mountain. This species is under the impact of the different threat in Iraq and the major threat are agriculture, pesticide, urbanization, climate change and overgrazing. Based on the International Union for Conservation of Nature (IUCN), criteria (C) Small population size and decline, and criteria (B) Very small or restricted population the species is critically endangered (CR) in Iraq.

2. *Picris kotschyi* Boiss., Fl. Orient. 3:738 (1875)

Erect to ascending, annual. Plant height 66.0(43.0-78.0) cm. Indumentum on stems and leaves consisting of rigid 2-hooked hairs, peduncle and phyllaries indumentum rigid 2- and 4-hooked hairs, less frequently 3-hooked hairs. Stem 61.6 (39.0-72.0) cm long, yellowish green at the base the upper part is green. Basal leaves oblanceolate 5.5 (4.0-7.0) × 0.5(0.4-0.6) cm; apex mucronate; margin dentate; base truncate; ochre. Cauline leaves oblanceolate-lanceolate, 6.5(3.0-10.0) × 0.8(0.5-1) cm; margins entire-distantly dentate; apex acute-mucronate; base truncate; green-yellowish green. Peduncles thickened at fruiting stage. Involucres obconical. Head 1.3(1.0-1.5) × 0.9(0.8-1.0) cm. Receptacle naked. Phyllaries with rigid glandular hooked hairs, densely white tomentose, three series of phyllaries; outer phyllaries 0.5(0.4-0.7) ×0.1 cm, liner-lanceolate, margin entire, apex acute; yellowish green; middle phyllaries 0.5(0.5-0.7)×0.1(0.1-0.2) cm, lanceolate shapes, margin entire, apex acute, yellowish green; inner phyllaries 1.1(1.0-1.2)×0.2(0.1-0.3), lanceolate, margin entire, apex acute, yellowish green. Achenes heteromorphic, fusiform, transversely rugose, attenuate at base and apex, 6.2(5.0-7.0) ×1.8(1.0-2.5) mm; outer achenes dull brown; inner achenes golden brown, glabrous, unbeaked, easily dehiscent from the receptacle. Pappus plumose, the base is golden brown, milky white at the apex, (Figure 1-3, 5).

Vernacular name: Its common name in Kurdish language is Gullê Zardê.

Phenology: Flowering at May-Jun, Fruiting: July- August

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Local distribution: This study provided the new record for the flora of Safin Mountain at Shaqlawa, MRO district.

Distribution in the world: Egypt (NW-coastal Egypt); Turkey (E-Anatolia, S-Anatolia, SE-Anatolia, SE-Anatolia: Mesopotamian Anatolia); Syria (Jazira, NW-Syria).

Habitat: Roadsides, wasted places, private and common gardens in Tikrit city and from private and common gardens in Chewarta and Sulaimanya city. In Tikrit city, the species is associated with different plants, among them, *Citrus sinensis*, *Convolvulus* sp., *Cynodondactylon*, *Cyperus rotundus*, *Imperata cylindrica*, *Mentha* sp., *Medicago* sp., *Morus* trees., *Prunus arminiaca*, *Rosa* sp. and *Trifolium* sp. In Sulaimanya, the associate plants include *Morus* and legume trees and some Asteraceae ornamental plants, (Figure 8).

Specimens examined: Safin mountain, alt:1115 m, 11-6-2022, collected by Nawroz Salam.

Conservation Status according to IUCN criteria: The species is widespread in Asia, and extremely rare in Kurdistan Iraq, in current study only found once near the Persian frontier in the central sector of the lower thorn-cushion zone in the Rawanduz district (MRO), Safin mountain. This species is under the impact of the different threat in Iraq and the major threat are agriculture, pesticide, urbanization, climate change and overgrazing. Based on the International Union for Conservation of Nature (IUCN), criteria (C) Small population size and decline, and criteria (B) Very small or restricted population the species is critically endangered (CR) in Iraq.

Transvers sections of Stem, Leaf, Peduncle characteristics

A species is often classified based on its morphology, but when the morphology is identical without any clear diversifications, classification can be inaccurate. In this case, the identification of the specimens could be powered by anatomical features (Ahrens, 2024; Rheindt et al., 2023), since the anatomical features are proven by conserving their characteristics in different environmental conditions, and they provide significant and accurate taxonomic evidence, which can be used to isolate and diagnose different taxonomic groups (Rashid et al., 2022; Katinas, 2025).While it is important to study anatomical aspects in order to support the taxonomy of the genus, there are no anatomical studies on the two species of *Picris* currently being studied in Iraq. Perhaps this is due to the fact that Asteraceae anatomy has been studied mainly in species with economic value or widespread distribution. The anatomical characteristics of the two species of *Picris* are summarized below based on epidermal strips and cross sections of their leaf, stem, and peduncle. The species belonging to the *Picris* under investigation has amphistomatic leaves. Two types of stomatal complex, tetracytic (staurocytic) and anomocytic, were recognized. Anomocytic stomatal type was dominant followed by tetracytic and tricytic. The epidermal cells were ovate in shape with striate cell wall. The leaf thickness was (450) micrometer in *P. kotschyi* and (400) micrometer in *P. strigose*. Number of vessel rows were different between the two species, there were 10-12 rows in *P. kotschyi*, and 8-9 rows in *P. strigose*. Number of vessel elements in each rows were 3-5 in *P.kotschyi* and 2-4 in *P. strigose*, (Figure 5 and 6). The transverse section in the stem showed that the stem is polygonal-ovate or semicircular in *P. kotschyi* and polygonal-ovate in *P. strigosa*. However, the stem cross section was taken from the base of the stem and near to the middle of stem length, the stem appeared hollow for both species. The stem cross section for both of the species under study showed several layers, the outermost

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layer (first layer) the epidermis consisted of only one layer of elongated, have no intercellular spaces, cells with straight to undulate cell walls. The epidermis from outside is covered with a thin layer of cuticle. Next layer internal of the epidermis is cortex, consists of several layers 5-6 layers in *P. kotschyi* while there are only 5 layers in *P. strigosa*. The results demonstrated that the cortex layer included collenchyma cells of lamellar collenchyma type. In the angular regions these collenchyma cells were consisted of 5-6 layers for the species under study. Inward of the collenchyma cell region, there are several layers of parenchyma cells, their size become larger toward the pith of the stem, their shapes are variable from ovate to spherical, and they were with visible intercellular spaces, (Figure 7). The vascular bundle consists of a phloem strand present outside the xylem strand, on the same radius side by side which is called collateral vascular bundle. The vascular cylinder consists of several vascular bundles, they were divergent in their number, shape, and size. There were 9-11 vascular bundles in *P. strigosa*, 12-14 vascular bundles in *P. kotschyi*. Xylem tube shape was circular to ovate, number of vessel rows were different between the two species, it was 5-6 rows in *P. kotschyi*, and 6-8 rows in *P. strigosa*. Number of vessel elements in each rows were 2-3 in *P. kotschyi* and 3-4 in *P. strigose*, (Figure 7). The transverse section in the peduncle showed polygonal-circular in *P. kotschyi* and polygonal-ovate in *P. strigosa*. The peduncle appeared hollow for both species. Indumentum on the peduncle of *P. strigosa.* was with 4-barbed glochids, while those present on the stem and peduncle of *P. kotschyi* were with two to 3-barbed glochids. Further, the glandular hooked indumentum on the peduncle of *P. kotschyi* were much longer than those present on the stem and peduncle of *P. strigosa*, (Figure 7).The present study revealed the occurrence of two species of *Picris* (*P. strigosa* and *P. kotschyi*) in MRO district of Kurdistan Region-Iraq. There are obviously close relationships between these two species in respect of the flower and fruit morphology as well as indumentum characters. Both species in the MRO are closely related to each other and there are doubt and difficulty to distinguish them in flowering state, fruiting material being thus necessary for certain identification. Moreover, the identification with morphological features more supported using micro-morphological of trichome features along with anatomical characteristics. In flora of Iraq (Guest and Townsend, 1966) and flora Iranica (Rechinger et al., 1977) five species under the genus *Picris* have been recorded including *P. strigosa, P. kotschyi, P. pauciflora, P. babylonica*, and *P. longirrostris*. From which two of them (*P. longirrostris* and *P. babylonica*) are desert plants only found in the North of Iraq, the *P. babylonica* is the common species in those locations, and the other three species recorded in Kurdistan Region-Iraq (South of Iraq) namely *P. strigosa*, *P. kotschyi*, and *P. pauciflora*. However, in this study only *P. strigosa* and *P. kotschyi* were able to collected and investigate from Kurdistan Region. *Picris strigose* consider as a common species in the region. In this study extensive morphological, geographical distribution, ecological, and anatomical features were used to distinguish the two species of *Picris* distributed in MRO district. *P. strigosa* and *P. kotschyi* were the two morphologically apparently differ species, they are differed in their ecological preferences and life forms, the former (*P. strigosa*) is usually biennial to perennial, occupies dry, sunny habitats at higher altitudes, whereas the latter (*P. kotschyi*) is often a short-lived annual, occurring predominantly in semi-natural or natural habitats, often man-made habitats on roadsides

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in lowlands (or at low altitudes in mountains), (Bing et al., 2024; Hamza et al., 2024), (Table 1). The leaves of the two species were with highly different characters of shape and margins, (Figure 1). In the field and at the time of flowering periods the stem base basal collar remaining of previous year makes *P. strigosa* clearly distinct from its morphologically similar taxa *P. kotschyi* (Table 1). The size and color of the involucral bracts and more importantly the indument on each of stem, leaves, peduncle, and involucral bracts are among the characters most commonly used to distinguish *Picris* spp. The tribe more specifically the genus is characterized by present of very striking, stiff, glochidiate (anchor-shaped) unique hairs on the vegetative parts (Lack, 1979; Hamza et al., 2024). These hairs are different in shape, length and number of hook on different vegetative parts (stem, leaves, peduncles, and involucral bracts). Under the microscope the most important features are the trichome hooks, as the trichomes on the *P. kotschyi* stem and peduncle are with two to 3-barbed glochids, while those present on the stem and peduncles of the *P. strigose* are with 4-barbed glochids. The trichomes on the *P. kotschyi* leaves are with two barbed glochids and *P. strigose* are with two to 4-barbed glochids. The trichomes on the *P. kotschyi* phyllaries are 2- and 4-barbed glochids hairs, less frequently 3-barbed glochids hairs, and *P. strigose* are with two to 4-barbed glochids, (Figure 5, Table 1). Further, fruit characters have proved to be particularly helpful for the delimitation of taxa within this genus. *P. strigosa* possess only one type of brown achenes, in contrast *P. kotschyi* possess two types of dark-brown achenes (Heteromorphic). In *P. kotschyi* the inner achenes are lighter in color and more straight, the outer achenes are curved toward the inside, and the peduncle inflated at the fruiting stage.

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Table 1. Comparison characteristics among the two species

Characters	*P. strigose*	*P. kotschyi*
Plant Habit	Biennial to perennial	Annual
Indumentum type on stem	Glandular 2-4 hooked hair	Glandular 2 hooked hair less frequently 4 hook hair
Stem Base Collar	Present	Absent
Basal Blade size (cm)	7.0 (5.0-12.0) × 1.0 (0.4-2.2)	5.5 (4.0-7.0) × 0.5 (0.4-0.6)
Cauline Blade size (cm)	11.5 (5.0-22.0) × 1.2 (0.8-1.5)	1.2 (0.8-1.5) × 0.8 (0.5-1)
Indumentum type on leaf	Glandular 2 or 4 hooked hair	Glandular 2 hooked hair
Bract shape	Oblong – Linear	Oblanceolate to Linear
Indumentum type on bract	Glandular 2 or 4 hooked hair	Glandular 2, 3, or 4 hooked hair
No. of head /plant	45.0 (12.0-78.0)	25.0 (20.0-30.0)
No. of florets in one head	55.0 (42.0-55.0)-	37.0 (35.0-40.0)
No of phyllary rows / Capitola	3 rows	3 rows
Total number of phyllaries	25.0 (24.0-30.0)	22.0 (20.0-24.0)
No. of phyllaries in first row(outer)	6.0 (6.0-8.0)	5.0 (5.0-6.0)
Size of the phyllaries in first row (outer) (cm)	0.4 (0.3-0.6) ×0.1 (0.1-0.2)	0.5 (0.4-0.7) ×0.1(similar width)
No. of phyllaries in second row(middle)	6.0 (5.0-7.0)	5.0 (5.0-6.0)
Size of the phyllaries in second row(middle) (cm)	0.6 (0.6-0.8) ×0.15 (0.1-0.2)	0.5 (0.5-0.7) × 0.1 (0.1-0.2)
No. of phyllaries in third row (inner)	13.0 (12.0-14.0)	12.0 (12.0-13.0) ×0.1 (0.1-0.2)
Size of the phyllaries in third row (inner) (cm)	1.1 (1.0-1.5) ×0.25 (0.2-0.3)	1.1 (0.9- 1.3) ×0.2 (0.1-0.3)
Indumentum type on phyllaries	Glandular2-3hooked hair	Glandular2-4 hooked hair, less frequently 3 hooked hairs
Achene type	Homomorphic	Heteromorphic
Achene surface	transversely rugose -atenuat at the base and above	outer achene curved and border base, transversely rugose - atenuat at above inner achene straight,
Achene size (mm)	6.0 (5.0-7.0) × 0.85 (0.5-1.0)	6.2 (5.0-7.0) × 1.8 (1.0-2.5)
Anther color	Milky white - light yellow	Yellow
Elevation above sea level (m)	980-1871	250-1200
Habitat	Living on sandy soil or rocky soil, uncultivated grounds, dry mountain, sunny, place, hillside, cliffs.	Living on roadsides, rocky, uncultivated, calcareous ground, dry mountain

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Figure 1. Leaves of *Picris* species (from left to right = basal to upper cauline leaves). A = *P.kotschyi*, B= *P.strigosa*

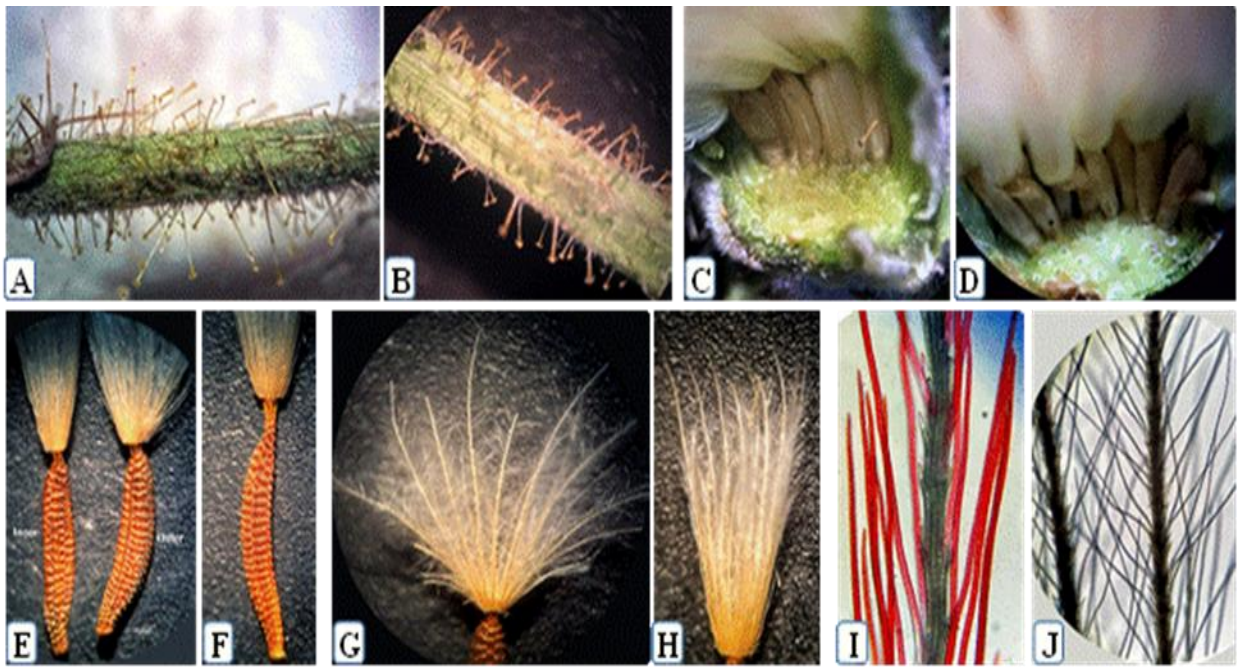

Figure 2. stem indumentum (A, B), receptacle shape (C, D), achenes (E, F), pappus (G-J) *P. kotschyi* of (A, C, F, G, I) and *P. strigose* (B,D,F,H,J).

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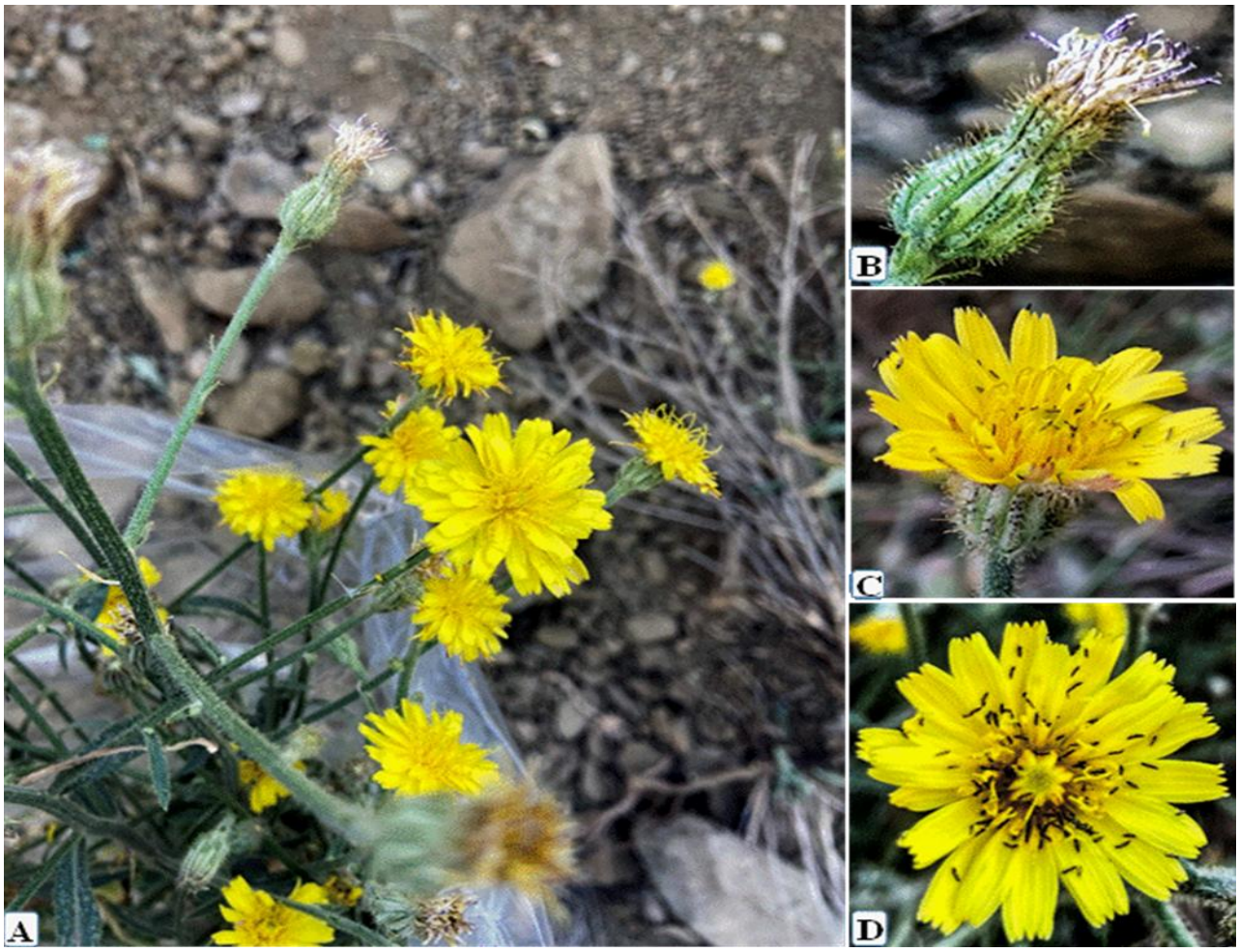

Figure 3. Capitola and Flower of P. kotschyi

Figure 4. Capitola and Flower of *P.strigosa*

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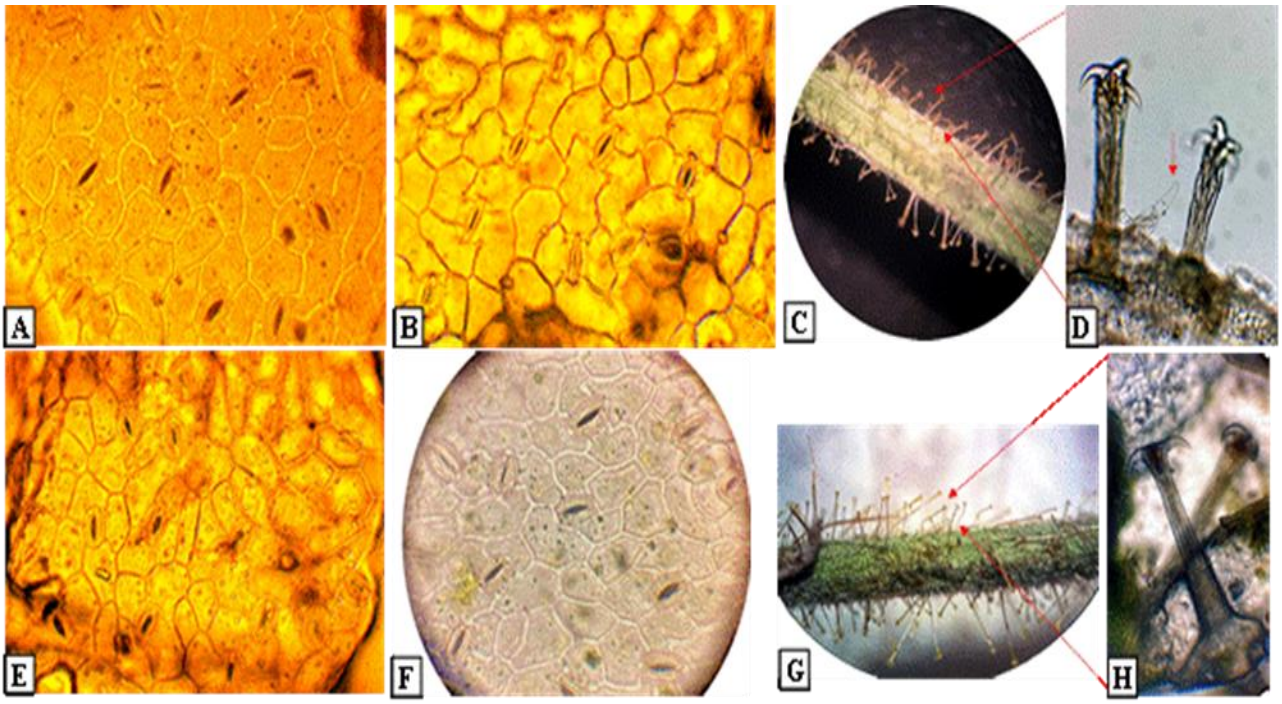

Figure 5. Leaf epidermis of the studied taxa. Leaf cross section of *P. kotschyi* (A, adaxial epidermis, B, abaxial epidermis, C, glandular hooked trichome on the stem), and *P. strigosa* (D, upper epidermis, E, Lower epidermis, F, glandular hooked trichome). In C, note multicellular eglandular hairs abundant species under the study

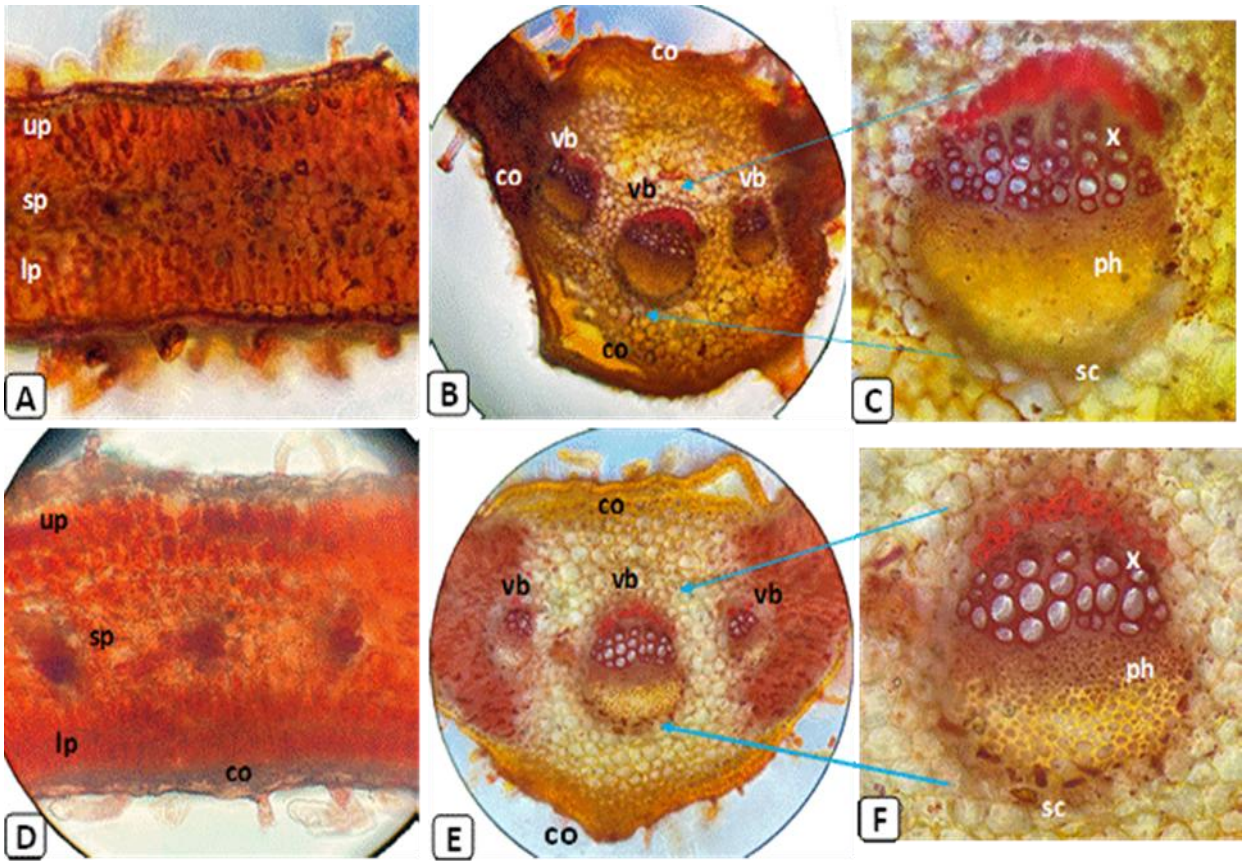

Figure 6. Transverse sections of leaf (A-C) = *P. kotschyi*, (D-F) = *P. stigosa*

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P-ISSN: 0075- 0530/ E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/zqvv1y66

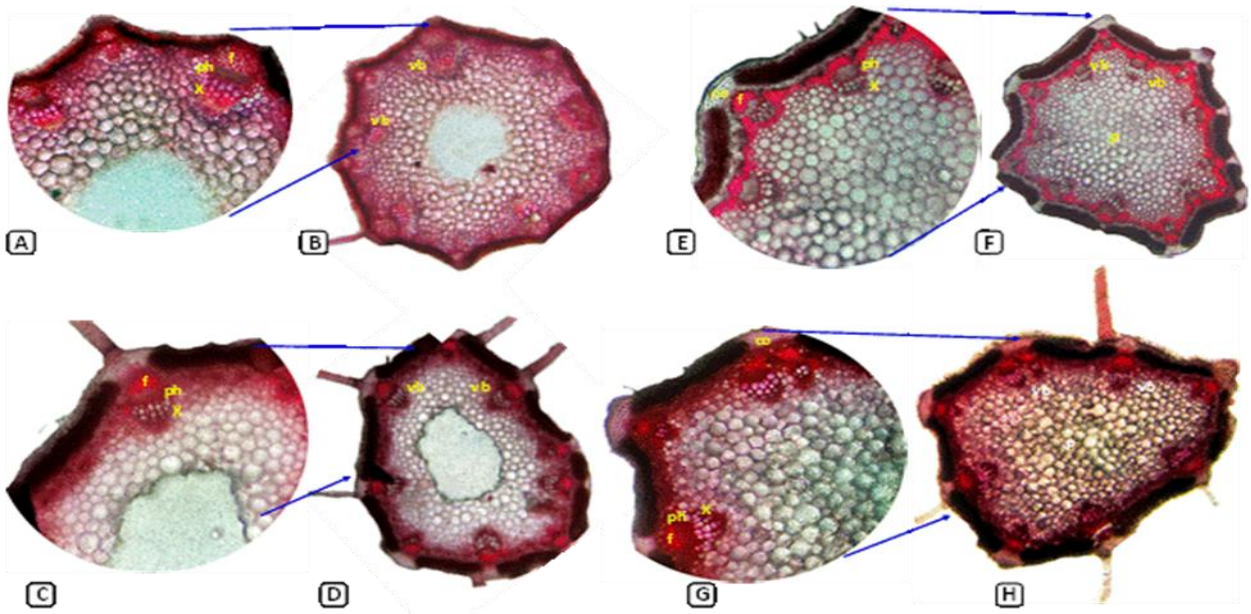

Figure 7. Stem and peduncle in cross section. *P. kotschyi* (A and B, stem; E and F, peduncle), *P. strigose* (C and D, peduncle; G and H, Stem). vascular bundles (vb), pith (p), fiber (f), collenchyma (co), phloem (ph), xylem (x).

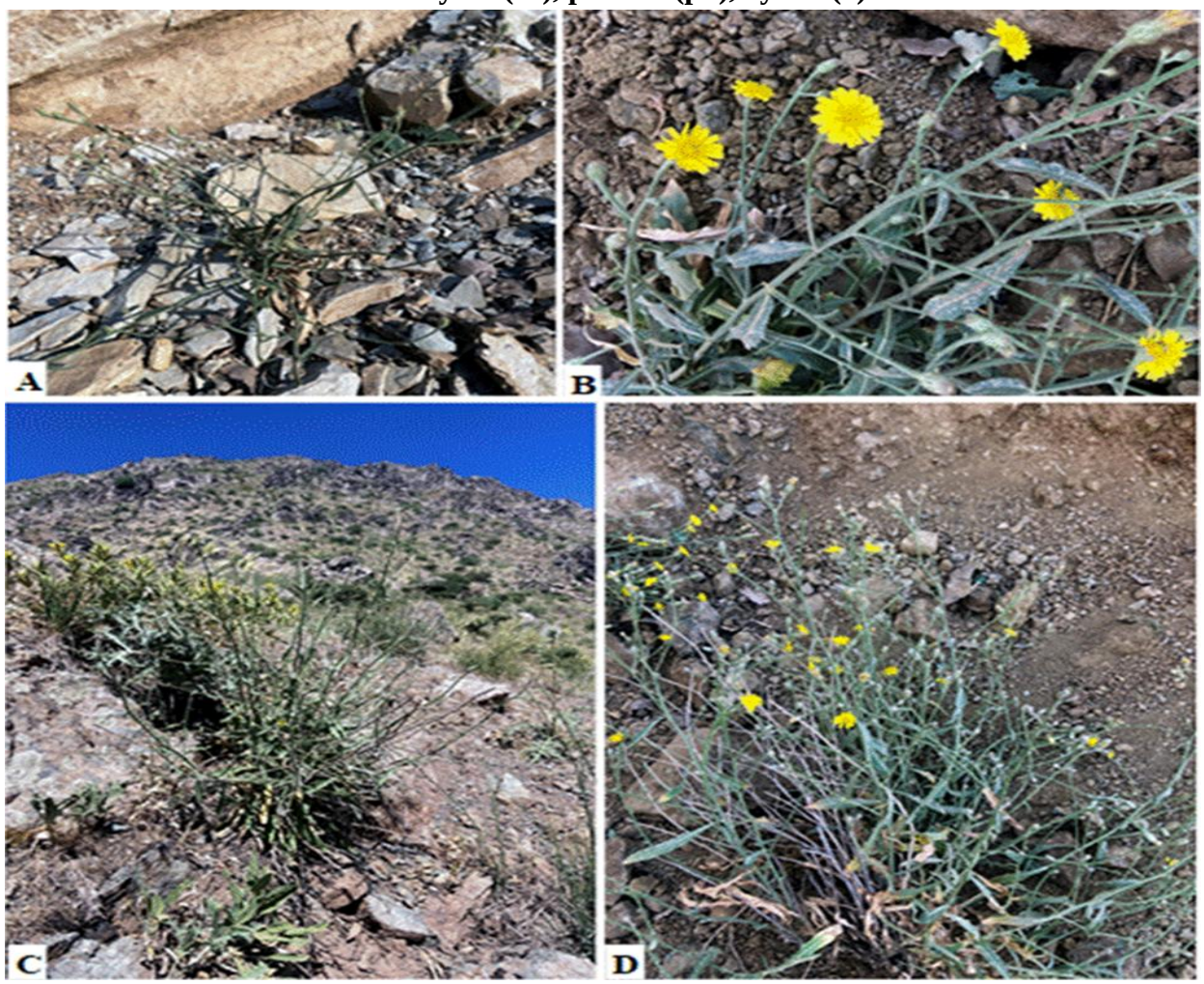

Figure 8. Natural habit of the species under study. A: *P. kotschyi*, B, C, D: *P. strigosa*

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CONCLUSION

We can conclude that the total morphological variation along with the total anatomical variation of transverse section of stem, leaf, and peduncles and leaf epidermis, stomatal index and stomatal complex of these two species all together has impact on the diagnostic identification of them.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

DECLARATION OF FUND

The authors declare that they have not received a fund.

AUTHOR/S DECLARATION

We confirm that all Figures and Tables in the manuscript are original to us. Additionally, any Figures and images that do not belong to us have been incorporated with the required permissions for re-publication, which are included with the manuscript.

AUTHOR'S CONTRIBUTION STATEMENT

All authors contributed equally to all aspects of the study and manuscript preparation.

REFERENCES

- Ahrens, D. (2024). Species diagnosis and DNA taxonomy. In DNA Barcoding: Methods and Protocols (pp. 33-52). New York, NY: Springer US. https://doi.org/10.1007/978-1-0716-3581-0_2
- Al Mouslem, A. K. (2022). Antidiabetic and hypolipidemic potentials of extract of Picris Babylonica in streptozotocin-induced diabetic model in rats. Biomedical and Pharmacology Journal, 15(1), 261-267. https://dx.doi.org/10.13005/bpj/2362
- Besse, P. (2021). Molecular Plant Taxonomy. Springer US. https://doi.org/10.1007/978-1-0716-0997-2
- Bing Yang, Zhenxin Zhang, Cai-Qing Yang, Ying Wang, Michael C Orr, Hongbin Wang, Ai-Bing Zhang, (2024). Identification of Species by Combining Molecular and Morphological Data Using Convolutional Neural Networks, Systematic Biology, Volume 71, Issue 3, May 2022, Pages 690–705, https://doi.org/10.1093/sysbio/syab076
- Davis, P. H. (1965). MATERIALS FOR A FLORA OF TURKEY X. Notes from the Royal Botanic Garden Edinburgh, 26(2), 165-201. https://doi.org/10.24823/nrbge.1965.2665
- Dhale, D. A. (2023). Advanced Techniques in Plant Sciences. Book Saga Publications. https://books.google.com/books?hl=en&lr=&id=wzPBEAAAQBAJ&oi=fnd&pg=PA1&dq=related:EClUuNS0ancJ:scholar.google.com/&ots=ncLgRaYEIs&sig=GiI6fVoP-lKoxMpO7HUeHXt9sFo
- Ghazanfar, S. A. (2024). Biogeography and conservation in the Arabian Peninsula: A present perspective. Plants, 13(15), 2091. https://doi.org/10.3390/plants13152091
- Ghazanfar, S., J. Edmondson, and D. Hind, Flora of Iraq. Volume 6, Compositae, ed. S.A. Ghazanfar, J. Edmondson, and D. Hind. Vol. Volume 6. 2019, Kew, UK: Published on behalf of the Ministry of Agriculture, Republic of Iraq by Royal Botanic Gardens, Kew. viii, 1-458. https://www.researchgate.net/publication/382105551_Flora_of_Iraq_Vol_6_Compositae
- Guest, E. and C. (1966). Townsend, Flora of Iraq. Vol. 2. Ministry of Agriculture of the Republic of Iraq. https://books.google.iq/books?id=BM0gAQAAIAAJ
- Hamza, R. G., Muhammed Salih, R. H., & Ahmad, N. S. (2024). Delimitation of Iraqi Scorzonera L.(Cichorieae, Asteraceae) species in Sulaimani District (MSU), Kurdistan Region, based on morphological characterization. Passer Journal of Basic and Applied Sciences, 6(1), 115-123.

https://doi.org/10.24271/psr.2023.419571.1402

- Hassler, M. (2004) World Plants. Synonymic Checklist and Distribution of the World Flora. Version 16.3. https://www.worldplants.de/world-plants-complete-list/complete-plant-list/?name=Melanthera-nivea#plantUid-401743
- Haworth, M., Marino, G., Loreto, F., & Centritto, M. (2021). Integrating stomatal physiology and morphology: evolution of stomatal control and development of future crops. Oecologia, 197(4), 867-883. https://doi.org/10.1007/s00442-021-04857-3
- Katinas, L. (2025). Trichomes in Asteraceae: names standardization and a unified classification. The Botanical Review, 91(1), 1-50. https://doi.org/10.1007/s12229-024-09311-6
- Khasim, S. M., Thammasiri, K., Rao, S. R., & Rahamtulla, M. (2024). Plant Techniques: Theory and Practice. CRC Press. https://doi.org/10.1201/9781003503682
- Kilian, N., Gemeinholzer, B., & Lack, H. W. (2009). Cichorieae. Systematics, evolution, and biogeography of Compositae, 343-383. https://www.researchgate.net/publication/256460195_Cichorieae
- Lack, H. W. (1979). The genus Picris (Asteraceae, Lactuceae) in Tropical Africa. Plant Systematics and Evolution, 131(1), 35-52. https://doi.org/10.1007/BF00984121
- Linnaeus, C. (1764). Species plantarum, exhibentes plantas rite cognitas ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas (Vol. 4). De Trattnern. https://doi.org/10.5962/bhl.title.65726
- Majeed, H. O., & Muhammed Salih, R. H. (2023b). Iris zagrica subsp. penjwenica, Iris zagrica subsp. warteica, two new subspecies from the Iraqi Kurdistan region belonging to Iris section Zagrica. Passer Journal of Basic and Applied Sciences, 5(2), 404-409.
- Majeed, H., & Salih, R. (2023a). Two new subspecies of Crocus biflorus L.(Iridaceae) from the Iraqi Kurdistan region using morphological and molecular methods. https://doi.org/10.26353/j.itahort/2023.1.5267
- Rashid, Z. S. A., Amri, C. N. A. C., & Shahari, R. (2022). The taxonomic study of trichome morphology in selected Asteraceae species of Pahang, Malaysia. Malaysian Applied Biology, 51(4), 1-4. https://doi.org/10.55230/mabjournal.v51i4.01
- Rechinger, K. H., Lack, H. W., & Van Soest, J. L. (1977). Compositae: Lactuceae. Akademische Druck u. Verlagsanstalt. https://www.scribd.com/document/646663287/flora-iranica1-174
- Rheindt, F. E., Bouchard, P., Pyle, R. L., Welter-Schultes, F., Aescht, E., Ahyong, S. T., ... & Pape, T. (2023). Tightening the requirements for species diagnoses would help integrate DNA-based descriptions in taxonomic practice. PLoS Biology, 21(8), e3002251. https://doi.org/10.1371/journal.pbio.3002251
- Salih, R. H. M. (2023). Comparative Analysis of Cichorieae Tribe (Asteraceae) Chloroplast Genomes: Insight to Structure, Repetitive DNA, and Phylogeny. Jordan Journal of Biological Sciences, 16(3). https://doi.org/10.54319/jjbs/160311
- Shahzad, A., Iqbal, S., Kayani, S., Shafiq, T., Zafar, M., Naeem, M., & Yasmin, H. (2022). Anatomical and palynological investigation within flora of family Asteraceae. bioRxiv, 2022-04. https://doi.org/10.1101/2022.04.22.489184

Iraqi Journal of Agricultural Sciences –2026:57(1):19-34
P-ISSN: 0075- 0530/ E-ISSN: 2410-0862
DOI: https://doi.org/10.36103/zqvv1y66

- Thiers, B. Index herbariorum: a global directory of public herbaria and associated staff. 2021 22 December 2021]; Available from: http://sweetgum.nybg.org/science/ih
- Zaman, W., Ayaz, A., & Park, S. (2025). Integrating morphological and molecular data in plant taxonomy. Pak. J. Bot, 57(4), 1453-1466. http://dx.doi.org/10.30848/PJB2025-4(27)
- Zareh, M., & Hassan, M. (2025). Achene Diversity in Some Species of Crepis and Picris (Asteraceae). Feddes Repertorium, 136(3), 218-235. https://doi.org/10.1002/fedr.70015

Iraqi Journal of Agricultural Sciences –2026:57(1):19-34
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مراجعة تصنيفية لأنواع الجنس *Picris* L. (ASTERACEAE–CICHORIEAE) الموزعة في مقاطعة الرواندوز MRO في إقليم كردستان–العراق

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المستخلص

يقدم هذا البحث أول مراجعة تصنيفية شاملة ومتكاملة لأنواع *Picris* spp. المنتشرة في منطقة راوندوز (MRO) بإقليم كردستان العراق، وهي منطقة لطالما اعتُبرت فيها أعضاء هذا الجنس صعبة تصنيفيًا. تم توثيق نوعين، *Picris strigose* ثنائي الحول إلى دائم، و *Picris kotschyi* الحولي، وفحصهما باستخدام تحليلات مورفولوجية ومورفولوجية دقيقة وتشريحية مفصلة. تم جمع النباتات من مجموعات طبيعية تمثل ارتفاعات مختلفة، وتم تقييم مجموعة واسعة من الصفات التشخيصية، بما في ذلك صفات مورفولوجية الخضرية والتكاثرية، وبنية الشعيرات، وسمات الثمرة achene، والتفضيلات البيئية، والتوزيع الجغرافي داخل العراق. كشفت التحقيقات التشريحية، المستندة إلى المقطع العرضي للسيقان والأوراق والسويقات، عن العديد من السمات ذات القيمة التشخيصية، مثل نوع الثغور، وسمك الورقة، وترتيب الأوعية، وعدد الحزم الوعائية، والتباين في بنية الخضري والتكاثري. تجدر الإشارة إلى أن التمييز بين النوعين كان مدعومًا بقوة بعدد وبنية الشعيرات المعقوفة glochidiate، وتباين شكل الأشواك مقابل تماثلها، ومورفولوجيا السويقة عند الإثمار، ووجود أو غياب الأطواق القاعدية الدائمة. توفر هذه السمات، عند دمجها، معايير تمييز موثوقة ومتسقة، لا سيما في الحالات التي يصعب فيها فصل صفات عند الإزهار وحدها .كما تُشير الدراسة إلى تسجيلات محلية جديدة لكلا النوعين داخل منطقة MRO، بما في ذلك جبل هلكورد وجبل سفين، مما يُسهم في الفهم الإقليمي للجغرافيا الحيوية لـ *Picris*. بناءً على أحجام السكان المحدودة، واضطراب الموائل، والتهديدات البشرية الملحوظة، يُصنف كلا النوعين على أنهما مهددان بالانقراض بشكل حرج (CR) في العراق وفقًا لمعايير الاتحاد الدولي لحفظ الطبيعة. بشكل عام، يُقدم هذا العمل أحدث وأدق تصنيف لـ *Picris* في إقليم كردستان، ويُبرز أهمية دمج الأدلة المورفولوجية والتشريحية في حل حدود الأنواع المعقدة..

الكلمات المفتاحية: عائلة النجمية، إقليم كردستان–العراق، صفات الظاهرية و التشريحية، *Picris*، المراجعة المنهجية، تحديد الأنواع.