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SYSTEMATIC REVIEW OF THE GENUS *Hypericum* L. IN FLORA OF AZERBAIJAN

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СИСТЕМАТИЧЕСКИЙ ОБЗОР РОДА *Hypericum* L. ВО ФЛОРЕ АЗЕРБАЙДЖАНА

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Abstract. Among the widespread plant species in Azerbaijan, the genus *Hypericum* L. which dates back to the Cenozoic era and belongs to the family Hypericaceae takes special place. 80% of the total number of species belonging to the Hypericaceae family are concentrated in the genus *Hypericum*, which is distinguished by its many-sided areas of application, especially in the pharmaceutical, decorative and dye industries. This genus is considered one of the largest genera of flowering plants in terms of species diversity (22%). Although research on the systematics of the genus *Hypericum* has been conducted by many scientists around the world, the general characteristics and taxonomic composition of the species distributed in the flora of Azerbaijan have not been studied for the last 50 years. As a result of our research, it was determined that there are not 15 species, but 19 species, 1 subspecies and 1 variety belonging to the genus in the flora. The characteristics, descriptions and synonyms of sections, species, subspecies were given.

Аннотация. В Азербайджане среди широко распространенных видов растений особое место занимает род *Hypericum* L., восходящий от кайнозойской эры и относящийся к семейству Нурегисеае. 80% от общего числа видов, принадлежащих к семейству Нурегисеае сосредоточены в роде *Hypericum*, который отличается многогранностью применения, особенно в фармацевтической, декоративной и красильной промышленности. Этот род считается одним из крупнейших родов цветковых растений по видовому разнообразию (22%). Хотя исследования по систематике рода *Hypericum* проводились многими учеными мира, общая характеристика и таксономический состав видов, распространенных во флоре Азербайджана, не изучались в течение последних 50 лет. В результате наших исследований установлено, что во флоре насчитывается не 15 видов, а 19 видов, 1 подвид и 1 разновидность, принадлежащее к этому роду. Даны характеристики, описания и синонимы секций, видов, подвидов.

Keywords: *Hypericum*, genus, subspecies, flora, endemic species.

Ключевые слова: зверобой, род, подвиды, флора, эндемичные виды.

Material and Method

The research is based on own materials collected during 4 years of field research by us in different botanical-geographical regions of Azerbaijan and in 2015-2022. Also, in this study were used numerous herbarium specimens stored at the Institute of Botany of the Azerbaijan National Academy of Sciences (BAK), the Berlin Botanical Garden and Museum (BGBM), as well as in various herbarium funds of the world (GBIF). Stationary surveys were conducted in all available

areas from low mountain belt to high mountain belt in the administrative districts on different routes in 2015-2022. For the molecular-phylogenetic (2016-2018) and anatomical (2021) studies were used the controversial species of this genus which was collected from different regions of Azerbaijan.

Introduction

Hypericum L. is a genus represented by more than 500 species, widespread in warm-temperate areas throughout the world, as well as on the Azerbaijan flora. This genus is represented in Azerbaijan by 19 species including two endemic species.

According to the classification of phylogenetic groups (APG IV) of angiosperm this genus was grouped as follows:

Regnum Plantae
Divisio Tracheophyta
Classis Magnoliopsida
Superordo Rosanae
Ordo Malpighiales
Familia Hypericaceae
Subfamilia Hypericoideae
Tribus Hypericae
Genus *Hypericum* L.

The most important diagnostic features for the designation of the species of this genus are considered the structure of the flower organs, the shape of the secretor and translucent glands (dotted, striped, linear). These translucent glands, which are found in the vegetative (root — pericycle; stem — core, pericycle, phloem; leaf — phloem, veins) and generative (petal, sepal, ovary) organs, are divided into 3 groups that are anatomically different from each other:

The first group includes multicellular black or red glands connected with veins, consisting of a single or two rows of smooth cell layers, containing hypericin, pseudohypericin.

The second group includes spherical pale glands of schizogenic origin, containing hyperforin substance and essential oils. Third group includes resinous pale glands located in the ovary of the plant (especially in the wall of the ovary) and protecting the seed from external influences. The glands included in the first group play an important role in the process of photosynthesis.

They are annual or perennial bare, hairy grass, shrub, semi-shrub, and rarely short trees. The stem is cylindrical, rounded, ribbed, erect, straight, creeping, 2-4-stalked, woody base, simple or dichotomic branching, pale, hairy, scabrid, glandular. The leaf is wide egg-shaped, ovoid, lanceolate or lancet-shaped, whorled, simple, papillose, hairy, vesicular, veiny, sessile or short-stalked, plain, without stipula, alternate, opposite or verticillate, twisted at the edges, black dotted or pale glandular, vascular branches are simple perforated, densely triangular spiral. The flowers ($Ca_{4-5} Co_{4-5} A_{5-\infty} G_{(3-5)}$) are located mainly in the axils of the leaves, gathered in monosexual, spirocyclic or cyclic, diecious, actinomorphic, cyme-like, cylindrical, spike-like, pyramidal broom or racemose peltate flower groups. Seeds are small, cylindrical, elliptical, numerous, dotted-porous or linear porous, yellowish-brown, reddish-brown or dark purple-brown porous, hairy, tip nose-shaped, narrow-winged base, without endosperm, large, fleshy, straight or wrapped embryo. The fruit is a red or black dehiscent or non-dehiscent capsule or berry.

Results and Discussion

It was determined that the genus *Hypericum* distributed in the flora of Azerbaijan consists of 19 species, 1 subspecies and 1 variety belonging to 7 sections. Brief information on each section, species, subspecies and variety are given (Table 1).

Label data of herbarium copies belonging to 12 species (1 subspecies, 1 variety) included in the genus and stored in the Herbarium Fund (BAK) of the Institute of Botany of Azerbaijan NAS were analyzed, and an electronic database of these species was created. As a result of the analysis of the herbarium copies stored in the fund, it was revealed that there were 298 herbarium specimens on the genus. It has been established that these specimens were collected by prominent botanists such as A. A. Grossheim, I. I. Karyagin, L. Prilipko, R. Rzazade, G. Gurvitch, I. Beydeman, T. Heydeman, I. Isayev, G. Akhundov, I. Hajiyevev, N. Shipchinskiy, M. Sakhokia etc. [1-11].

Table 1

SPECIES DIVERSITY

Sections	Species	Subspecies and variety
<i>Androsaemum</i> (Duhamel) Godr.	<i>H. androsaemum</i> L.	
<i>Coridium</i>	<i>H. asperuloides</i> Czern. & Turcz.	
<i>Inodora</i> Stef.	<i>Hypericum xylosteifolium</i> (Spach) N. Robson	
<i>Hypericum</i>	<i>H. tetrapterum</i> Fries	
	<i>H. perforatum</i> L.	<i>subsp. veronense</i> (Schrank) H. Lindb.
	<i>H. elegans</i> Steph. ex Willd.	
<i>Adenosepalum</i> Spach.	<i>Hypericum formosissimum</i> Takht.	
<i>Hirtella</i> Stef.	<i>H. scabrum</i> L.	<i>var. micranthum</i> Boiss.
	<i>H. lydium</i> Boiss.	
	<i>H. pseudolaeve</i> N. Robson	
	<i>H. karjaginii</i> Rzazade	
	<i>H. elongatum</i> Ledeb.	
	<i>H. helianthemoides</i> (Spach) Boiss.	
	<i>H. davisii</i> N. Robson	
<i>Taeniocarpium</i> Jaub. et Spach.	<i>H. hirsutum</i> L.	
	<i>H. venustum</i> Fenzl	
	<i>H. linarioides</i> Bosse	
	<i>H. theodorii</i> Woronow	
	<i>H. nummularioides</i> Trautv.	

We collected 80 herbarium specimens belonging to the genus from different regions of the republic for 2015-2022 years and handed them over to the herbarium fund (<http://hypericum.myspecies.info>). Of these 298 samples collected from botanical and geographical regions of the republic in different years (1925-2022), 25 belong to *H. androsaemum*, 12 to *H. elongatum*, 9 to *H. hirsutum*, 1 to *H. karjaginii*, 49 to *H. linarioides*, 6 to *H. lydium*, 138 to *H. perforatum*, 13 to *H. perforatum subsp. veronense*, 33 to *H. scabrum*, 1 to *H. scabrum var. micranthum*, 3 to *H. tetrapterum*, 4 to *H. theodorii*, 2 to *H. helianthemoides*, 2 to *H. formosissimum* species (Figure).

Conclusion

In Azerbaijan flora was registered 19 species of *Hypericum*. These are *H. androsaemum*, *H. davisii*, *H. elongatum*, *H. formosissimum*, *H. hirsutum*, *H. linarioides*, *H. lydium*, *H. nummularioides*, *H. perforatum*, *H. pseudolaeve*, *H. scabrum*, *H. tetrapterum*, *H. theodorii*, *H. venustum*, *H. karjaginii*, *H. xylosteifolium*, *H. asperuloides*, *H. elegans*, *H. helianthemoides* (<http://www.worldfloraonline.org>).

According to the “Red List of endemic plants of the Caucasus” was determined that 3 (*H. formosissimum*, *H. nummularioides*, *H. xylosteifolium*) out of 19 species are endemic species to Caucasus and 2 (*H. karjaginii*, *H. theodorii*) are endemic species to Azerbaijan. Also, 2 out of this species are relict (*H. androsaemum*, *H. xylosteifolium*) plants from the glacial period

(<https://www.gbif.org>; <http://ww2.bgbm.org>).

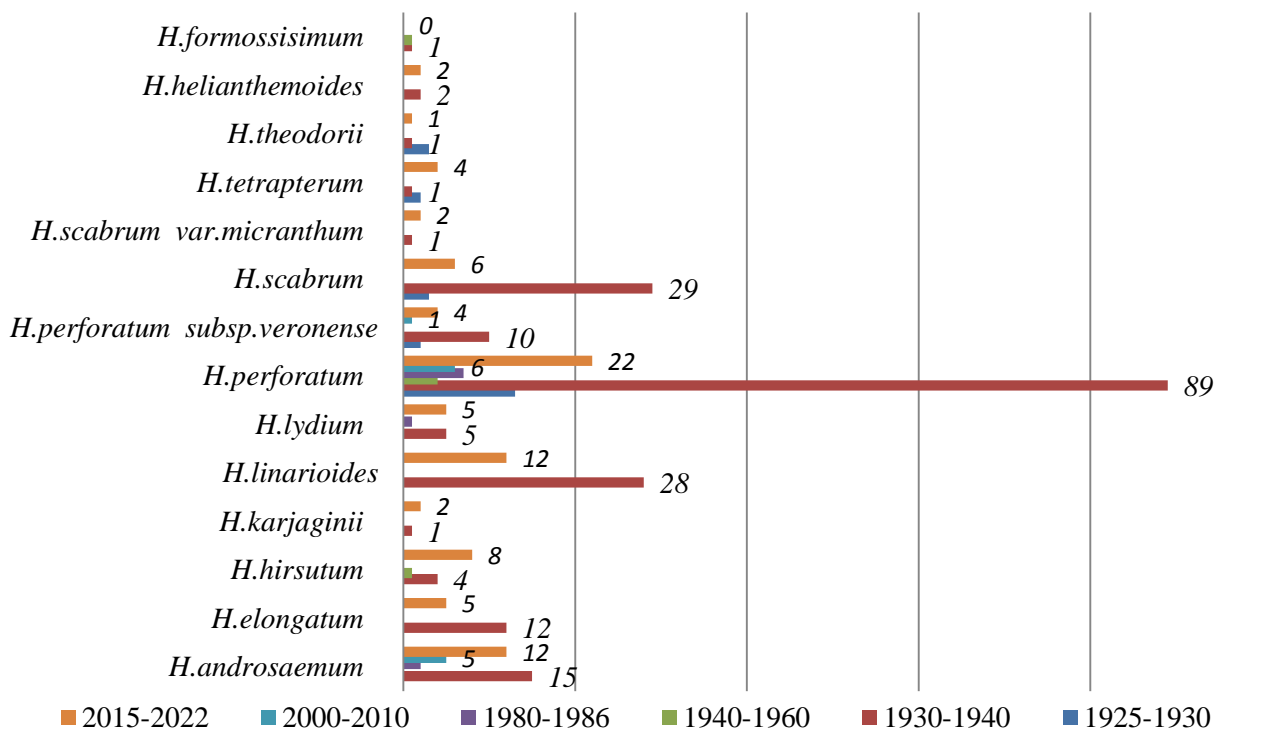


Figure. Quantity of herbarium samples belonging to the genus *Hypericum* stored in the Herbarium Fund of Azerbaijan NAS

The classification adopted by the International Union for Conservation of Nature (IUCN) was used to assess rare and endangered species of this genus distributed in the flora of Azerbaijan (Table 2). According to this classification system, the status of rare and endangered species of the *Hypericum* L. distributed in Azerbaijan flora has been clarified.

Table 2
 RARE AND ENDANGERED SPECIES DISTRIBUTED IN THE FLORA OF AZERBAIJAN

IUCN	Species
VU A3C (Vulnerable)	<i>H. karjaginii</i>
DD (Data Deficient)	<i>H. nummularioides</i>
VU A3C (Vulnerable)	<i>H. lydium</i>
CR A3c (Critically Endangered)	<i>H. linarioides</i>
VU A3C (Vulnerable)	<i>H. theodorii</i>
EN B2 ab (II, III) (Endangered)	<i>H. formosissimum</i>

According to the quantitative criteria which used in the assessment of rare species (A, B, C, D, E), out of the species of the genus found in our flora, 1 is defined as being critically endangered (CR), 1 as endangered (EN), 3 as weakened population, vulnerable to adverse effects (VU), and 1 as data deficient (DD).

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