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CONTENT

BIOMORPHOLOGICAL, BIOECOLOGICAL, USEFUL CHARACTERISTICS, EFFECTIVE AND SUSTAINABLE USE OF TAXA OF THE SUBFAMILY CAESALPINIOIDEAE IN THE FLORA OF AZERBAIJAN

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Abstract. *At present, there are 460 wild-growing and cultivated leguminous species belonging to 70 genera in Azerbaijan. The taxonomic composition of the Fabaceae family includes 3 subfamilies: Caesalpinioideae, Mimosoideae, Faboideae. The article provides information about the genera and species belonging to the subfamily Caesalpinioideae, their distribution, morphological, bioecological, useful properties and effective use. Based on research and literature review, it was revealed that taxonomic changes and additions occurred in the subfamily Caesalpinioideae. The subfamily Caesalpinioideae includes 8 genera and 13 species. This includes genera: Gleditsia L., Cercis L., Gymnocladus Lam., Parkinsonia Plum. ex L., Ceratonia L., Senna L., Erythrostemon Klotzsch u Biancaea Tod. The genus Erythrostemon Klotzsch and the species Erythrostemon gillesii (Hook.) Klotzsch (Caesalpinia gillesii L.) are included in the flora of Nakhchivan MR for the first time. All studied 13 species belonging to 8 genera are useful plants. It is proposed and recommended to increase, continuously and effectively use their decorative, landscaping, decorative-garden, medicinal, coloring, superfood, fruit-bearing, nutritious, technical properties.*

Keywords: *subfamily, Caesalpinioideae, new species, decorative, useful*

INTRODUCTION

Legumes or Leguminosae, are a family of dicotyledonous plants of the order Legumes. The taxonomic composition of this family consists of annual and perennial herbs, trees and shrubs. They are easily recognized by their bark, fruit, and complex leaves. A.M. Asgerov shows that there are 70 genera and 460 species in the flora of Azerbaijan [Asgerov, 2016]. In the work "Wild plants of the flora of the Nakhchivan Autonomous Republic" it is noted that there are 502 types of legumes in 69 genera in wild and cultivated form in Azerbaijan. [Gasimov, Ibadullayeva et all., 2018]

Plants belonging to the leguminous family are the most abundant flowering plants and its species are found on all continents. Deciduous, evergreen, trees, shrubs, semi-shrubs, lianas and other types of plants are found here. The main diagnostic features are the regular structure of the leaves, most of them have a complex leaf structure, are located in the axils, many simple, slightly reduced flower groups have panicles, racemose or axillary racemes and heads.

With the exception of Mimosoidea, most calyces are zygomorphic. Petals usually 5, stamens 10, rarely 5 or more. The fruits are beans. The economic importance is great. The roots are rich in nitrogen bacteria, which play a key role in fertilizing the soil.

In the course of research conducted in the Botanical Garden of the Nakhchivan Institute of Bioresources, a new genus Erythrostemon klotzsch and Erythrostemon gillesii (Hook.) Klotzsch (Caesalpinia gillesii L.), belonging to this family, were discovered and introduced [WFO, 2023].

MATERİAL AND METHOD

In the course of the research, phenological observations were made over the distribution

areas of species, natural conditions, phytocenoses formed by them, formations, associations, macro-microgroups of plants, range and their species composition using experimental methods - classical and modern botanical; Flora of Azerbaijan, 1950-1961; Flora European part of the USSR, 1974-1994, ecological, statistical, generally accepted geobotany [Yaroshenko, 1969; Ramensky, 1971; Serebryakov, 1964; Gadzhiev V., 2004; Grossheim A., 1949; Prilipko L., 1981, 1970; Vasilevich V., 1969; Beideman I., 1954]. From fundamental works [International Code of Botanical Nomenclature (IUCN, 2012), World Flora Online], etc. has been used.

RESULTS

Fabaceae Lindl. in the world flora shows that the family includes 650 genera and up to 18,000 species. In the taxonomic composition, 3 subfamilies are distinguished: Caesalpinioideae , Mimosoideae , Papilionoideae.

The Caesalpinioideae subgroup studied by us included 13 species from 8 genus (Diagr.1, Table 1).

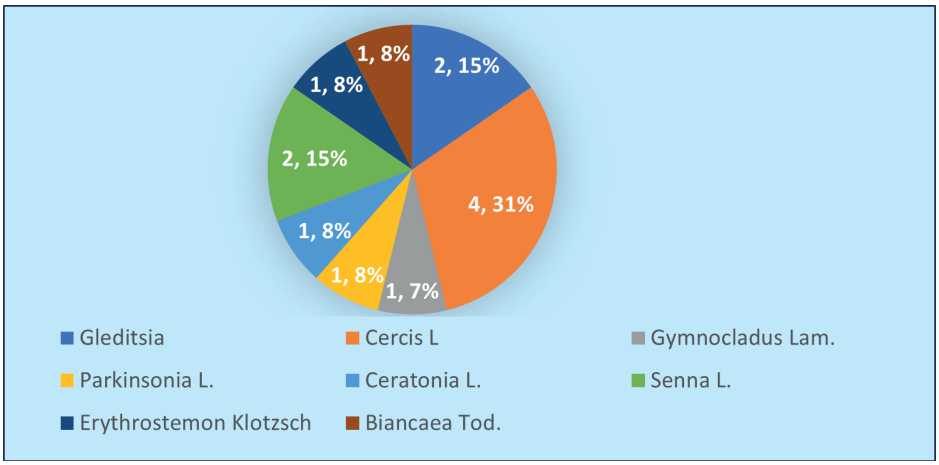

Diagram 1. *Taxonomic composition of the subfamily Caesalpinioideae*

Table 2.

Bioecological characteristics of species of the subfamily Caesalpinioideae

№	Species	Life form	Phenophase		Ecological Group	Origin
			flowering	fruit		
1.	Erythrostemon gillesii (Hook.) Klotz.	tree, bush	V-VI	VII-X	mesoxerophyte	america
2.	Biancaea decapetala (Roth) O.Deg.	bush	V_-VI	VII-X	mesoxerophyte	asia
3.	Cercis siliquastrum L.	tree	IV-V	IX-X	xeromesophyte	asia, europe
4.	Cercis chinensis Bunge.	tree	IV-V	IX-X	xeromesophyte	asia
5.	Cercis griffithii Boiss.	tree	IV-V	IX-X	mesoxerophyte	asia
6.	Cercis canadensis L.	tree	IV-V	IX-X	mesoxerophyte	america
7.	Ceratonia siliqua L.	tree	III-V	VI-VII	mesoxerophyte	asia
8.	Gleditsia triacanthos L.	tree	IV-VI	IX -XI	xeromesophyte	america
9.	Gleditsia caspia Desf.	tree	IV-V	IX-X	xeromesophyte	asia

10.	Senna alexandrina Mill.	bush	VII-VIII	IX-X X-XI	mesoxerophyte	asia, africa
11.	Senna italica Mill.	bush	VI-VII	VIII-IX	mesoxerophyte	america
12.	Gymnocladus dioicus C.Koch	tree	IV-VI	VII-VIII	mesoxerophyte	america
13.	Parkinsonia aculeate L.	tree	III-V	VI-VII	mesoxerophyte	america, africa

Genus: Gleditsia L.

Among the 12 species of the genus distributed in North and South America, temperate and subtropical Asia and tropical Africa, there are 2 species in the Caucasus and Azerbaijan (1 of which is cultivated). Flowers short-legged, are unisexual,. Calyx tube convex disc, 3-5 narrow lobes. Uneven leaves 3-5, free. Stamens 6-10, free. The ovary is two, there are many ovules. The pods are flat, leathery, compressed from the sides and almost unopened. Its simple or stem-derived branches are spiny with simple or double pinnate leaves.

Gleditsia triacanthos L. It is a broad crowned tree reaching 40 (45) m high. The trunk branches are long, hard, simple and branched with dark brown spines (Fig. 1).

Figure 1. *Gleditsia triacanthos L.*

The spines are usually three-pronged on branches and trunks, 10 cm long. The trunk is very branched, 40 (50) cm long. Leaves 20 cm long, opposite, double or double pinnate, long petiolate, leaflets egg-like-lanceolate or oblong-ovate, margins small or entire, short petioles, 1.5-2 cm long.

The flowers are inconspicuous, greenish, hairy, fragrant, up to 8 cm long [5], monosexual, sometimes bisexual, in dense axillary narrow cylindrical clusters. Calyx and petals are hairy. The pods are 40 (50) cm long, flat, long, leathery, curly-wavy or arched, bordered at the edges, compressed at the end, dark brown in color, soft inside. The core is 12-15 mm long, 4.5-6 mm wide, oval-shaped, brown or dark brown, hard-shelled, smooth and shiny. It blooms in May-June and gives seeds in September-November. It is planted and grown. It is rarely found in the wild in the lowland, semi-desert and semi-steppe regions of Azerbaijan: Absheron, Lankaran, Mugan, Kur-Araz plain, Bozgir plateau, north of the Lesser Caucasus. Its wood is strong, tough, impenetrable life barriers indispensable for the construction of protective forest strips along roadsides, gardens and in arid regions. It is the main raw material source of the construction industry. It is a honey plant.

The coffee drink is made from my seeds and is eaten by cattle, pigs and wild boars. It contains 3.5% ash, 14.0% protein, 12.0% protein, 12.4%, 18.3% cellulose and 51.6% nitrogen-free extractives [Flora of Azerbaijan, 1954]. Beans contain a lot of sugar. Its leaves contain 191.9 mg/% vitamin C and its leaves contain 278 mg/% vitamin C. Illustrated from Argentina.

Gleditsia caspia Desf. - It is a 16-20 m tall tree with scattered branches, wine-like or oval umbrellas, the bark of the branches is greenish-light yellow, covered with dark gray spines. The leaves are arranged in a ball, non-double-lobed and sometimes bi-lobed. Leaves up to 5 cm long are large, oblong-elliptical, broad, entire or slightly protruding edges. The inflorescences are shorter than the leaves. Calyx and

petals hairy. Pods long, straight or slightly sickle-shaped, 20-30 cm long, broad, leathery, dark brown, bluish veins, not fully opened. The seed is 11-12 mm long, 6-7 mm wide, oblong dark brown, with an average of 15 seeds per pod.

It is common in the plains and mountainous areas of Lankaran and Astara region in Azerbaijan. It spreads in groups in mixed forests or forest clearings, steppes. It is depicted in the Caucasus (Talish) - from the shores of the Caspian Sea. It has an important role in the formation of different forest types in the forest ecosystem.

Here Carpinus caucasica, Quercus longipes, Parrotia persica, Ulmus foliacea Gilib., Dyospiros lotus and alder coexist on light, well-moistened alluvial soils. In oak forests, on dry soils of forest-steppe zones grows together with Quercus castaneifolia [Nabiyeva, Ibragimov, 2015]. Its wood is strong and hard, it is used in carving, carpentry, and the soft fleshy part of the bean is used by local people in dishes. A coffee drink is made from its seeds. It is suitable for hedges as it combs well.

Ripe fruits and young leaves are used as medicinal raw materials. The fruits are harvested when the beans are dark in color and break easily. They should be dried in a dryer at a temperature of 50-60°C or in the open air. The leaves are harvested in dry sunny weather in the first half of summer, and after drying they can be stored in bags or closed wooden containers for up to two years. Its fruits contain triterpene saponins, alkaloids (triacanthin), flavonoids, tannins and mucous substances, as well as vitamins C and K.

Preparations from the plant are used for spasms of the gastrointestinal tract. This is due to the presence in the plant of a triacantine alkaloid, which is more active, but somewhat more toxic than papaverine. In medical practice, decoctions of fruits and leaves are used for chronic gastritis, peptic ulcer of the stomach and duodenum, chronic inflammation of the gallbladder and spastic colitis.

Genus: 2. Cercis L. - 6 species of the genus are distributed in Southern Europe, Western and Central Asia, Japan and North America. In Azerbaijan, there is a wild species similar to the cultivated one. Calyx campanulate, slightly curved, 5 broad and short-toothed. The corolla has 5 unequal petals. Stamens 10, free. Legumes are long-legged, thin, dense, late opening, with two wings. It is a tree and shrub with entire, heart-shaped leaves.

Cercis siliquastrum L. - tree 8-10 m tall or shrub 3-5 m tall. The leaves are alternate, simple, indented, deeply heart-shaped at the base, glabrous, entire, dark gray-green above, with upper veins (Fig. 2). The flowers are collected in few-flowered racemes in the axils. Calyx and corolla bright pink or reddish pink. The sail is shorter than the wings and the boat. The sail is shorter than the wings and the boat. Pods 7-9 cm long, light brown, shiny, oblong-linear, with very narrow wings, 1.5-2.5 mm along the upper slit (pictured), 4-9 (14) seeds.

Seeds 4-5 mm long, 3.5-4 mm wide, flat, oblong-ovate, dark brown, smooth. It blooms in april-may before the leaves are formed, the fruits ripen in september-october and remain

Figure 2. *Cercis siliquastrum L.*

on the tree for a long time. It is grown in various regions of Azerbaijan (Absheron, Lankaran, Lerik, Kur-Araz plain).

It was brought to the Nakhsivan MR by importation from outside. Noted in the botanical garden of the Institute of Bioresources AR ETN, in the park “Hotel Tabriz” in the city of Nakhchivan. Balkan-Asia Minor, common in the western and eastern Mediterranean, sometimes

found in the wild. Described from Italy. It is a valuable ornamental, technical and good honey plant.

Less demanding on fertile soil, drought-resistant and unpretentious. Its wood is hard, dense, well polished, used in carpentry and turning, yellow paint is obtained from its wood, and the leaves contain a dye. The common gervan is distinguished by a very high decorative effect during the flowering period. However, it is still underused.

Genus: 3. Gymnocladus Lam. - There are 5 species distributed in North America, East and Southeast Asia. In Azerbaijan, 1 species - Gymnocladus dioicus (L.) K. Koch is found as an ornamental plant in greenery in Absheron, Zagatala and Lankaran. It has a straight stem up to 25 meters high, leaves are double hairy, dark green, flowers are unisex, dioecious, petals 5, yellowish-green, sepals 5 parts, stamens 10, pods broad-oblong, thick and fleshy. It is a conifer and ornamental tree with delicate leaves and fragrant flowers. Its homeland is North America. In America, the beech tree is called the coffee tree because in the past its roasted seeds were used as a cheap substitute for coffee. It is used as an ornamental plant due to its double hairy large leaves that give the plants

Figure 3. *Gymnocladus dioicus (L.) K.Koch*

a beautiful appearance. Male trees are often grown for decorative purposes in parks and city streets (Fig.3).

Figure 4. *Parkinsonia aculeata L.*

Genus: 4. Parkinsonia L. - 1 of 5 species of the genus distributed in America - Parkinsonia aculeata L., is found in the green areas of Absheron and Barda in Azerbaijan (Fig. 4). It is a thorny tree reaching 10 meters in height. The petals of the 5-calyx-petaled flower are yellow, the inside of one of the petals is red or orange, the pods are narrow, the seeds are round. Useful for creating live hedges.

Parkinsonia aculeata - widely used in various systems of traditional medicine. The phytochemistry of its leaves, flowers and stems revealed the presence of glycosides, glycerides, flavonoids, reducing sugars, sterols and trace elements.

Studies show that it has various pharmacological activities. It has been used for centuries as an antipyretic, diaphoretic, and abortifacient. In Mexico, the leaves are soaked and used as a cure for fever and epilepsy. Recent studies show its other uses such as antibacterial, hepatoprotective, antifertility and antidiabetic.

Genus: 5. Ceratonia L. - 1 species - Ceratonia siliqua L. distributed in the countries of the Eastern Mediterranean. This is a large tree with umbrella branches, reaching 12 meters in height. Its flowers are grayish, smell bad, it is a monoecious, dioecious plant. Often 3 types of flowers develop on the plant: 1. 5 stamens without pistil; 2. Stamens bisexual on long stalks; 3. Stamens are bisexual on a short stalk. The fruit is eaten. It contains a lot of sugar. It is inoculating. Cultivated in Absheron (Fig. 5).

From Greek sératioon, seras means horn. In

Figure 5. *Ceratonia siliqua L.*

ancient Rome, seeds were used as a measure of weight in the weighing system, which was equivalent to about 0.19 g - one carat. In ancient times, the mass of precious stones was measured by the seed of the plant. It got its name from the bread tree of Iona because its dried beans smell like yeast.

Carob is a rich source of potassium, calcium, sodium, magnesium and iron minerals. In addition, insoluble fiber, polyphenols and tannins have a positive effect on health. Due to its antioxidant properties, it has a special importance as a natural antibiotic. It has the feature of cleansing the blood and relieving vascular blockages, it is beneficial for heart and vascular health. Thanks to a healthy and balanced diet, it is indispensable in the treatment of many diseases, from heart disease to cancer, from diabetes to hypertension. It is also beneficial for the cardiovascular system, especially due to its antioxidant properties.

Fenugreek is one of the must-have plants in your kitchen for a healthy diet.

Genus: Senna Mill. (Cassia L.) - More than 450 species of this genus are distributed in countries with tropical and subtropical climates. In the flora of Azerbaijan there are 4 species in the Caucasus and 3 species in Azerbaijan.

According to modern taxonomy, Cassia obovata Coll. - Italian senna (Senna italica Mill.); Cassia acutifolia Delile and C. angustifolia Vahl. The species has been modified as Senna Alexandrina Mill. The height of the bush is up to 1.5-2 m. In the inflorescence there are 5 leaves, yellow petals and 10 stamens. The style of the staminate thread is thin and curved. The pods are leathery, petiolate, petiolate, flat or cylindrical, leathery and split across. Distinctive features of the mentioned species of the genus are the number and number of leaflets on the leaves. Flowering and fruiting in July-September. Grown in Absheron.

Species of the genus are valuable ornamental and medicinal plants. Its medicinal value has been known to the Arabs since ancient times. The drug made from the plant is called senadeiglaxena. It contains sennosides A and B. Medically important parts of senna are leaves or infusions of beans (folia sennae) as a laxative. Various preparations are prepared from its leaves (Viennese drink, etc.). Crushed leaves are part of the powder for hemorrhoids [Zelinsky, 1951]. Sana tea softens the gastrointestinal tract and has a choleretic effect. It is mainly used as a laxative for chronic atonic constipation, anal fissures and hemorrhoids.

Genus: Caesalpinia Plum.ex L.

The species included in the genus are medium-sized evergreen trees or shrubs (sometimes lianas) that shed their leaves for the winter. It has mainly spiny, bipinnate leaves. The flowers are collected in bunches, sometimes forming panicles at the ends of the branches. Petals 5-separate, stamens 10, free. Pods ovoid or lanceolate, flat, leathery. Seeds inverted-ovoid, flat. Cesalpinia is common in various parts of America and Asia with a tropical and subtropical climate.

The genus includes about 40 species. There are 2 species of the genus in Azerbaijan: Caesalpinia gilliesii (Wall. ex Hook.) D. Dietr. and C. japonica Sieb. et Zucc.

Figure 6. *Erythrostemon gilliesii (Hook.) Klotzs.*

Erythrostemon gilliesii (Hook.) Klotzsch. (Caesalpinia gliesii Wall.) [World Flora Online]. It is also known as bird of paradise (desert bird of paradise, bird of paradise bush). It is an evergreen or deciduous tree or shrub with or without thorns (Fig. 6). Compound leaves are doubly paired, lower leaves. The flowers are gathered in bunches and often form brooms at the ends of the branches. The calyx is short-tubular or five-lobed. Petals claw-shaped, five-parted, stamens 10, free. The female is sessile, there are few ovules, the style is long, thin.

The beans are ovoid or lanceolate, usually with a flat skin. Seeds ovoid, flat. Grows fast, some species grow in rocky areas and open areas in dry areas, and some species grow in wet areas, around rivers. Cultivated as an ornamental tree in tropical and subtropical countries. Reproduction occurs through seeds.

It was brought to the dendrology garden of Mardakan in Azerbaijan from the Crimea, multiplied and multiplied [Mamedov, 2010]. It is recommended to be used in Baku and Absheron greens.

The species found in other regions of our republic was not found in the Nakhchivan MR flora. Numerous shrubs were grown as valuable ornamental plants in the AR ETN Bioresources Institute Botanical Garden, phenological observations were made for 3 years, and tolerance to frost and high temperature was observed. These well-adapted shrubs bloom and bear fruit every year. Currently, this shrub, which continues to the harsh frost and heat of the autonomous republic, is planned to be applied in greening by increasing it.

Bianceae decapetala (Roth) O. Deg. - (Caesalpinia japonica Sieb. et Zucc.). It is a shrub 2-4 m high, with branches, shedding leaves. The flowers are light yellow, long, with red teeth, collected in a racemose group. The beans are wide, elongated, the head side is prickly. The fruits ripen in October. This species has also been introduced in the Mardakan dendrological garden. Adapted to the climate, these shrubs are very suitable for landscaping and creating decorative hedges. As a result of the studies, it was found that the aqueous methanolic extract of the plant has anti-inflammatory and antipyretic effects with the n-hexane extract it contains (China, Pakistan, India, etc.). Its leaves are used in the treatment of burns, gall and stomach diseases, and its roots, stems and bark are used to reduce pain, diarrhea and skin bruises. The seeds are anthelmintic, antipyretic, analgesic and astringent. It is used in the treatment of neuralgia, dysentery and malaria.

In India and the Malay Archipelago, some species of Cesalpina were formerly used as raw materials to obtain red dye, and the plant itself was called the red dye tree. These species are widely used in medical practice of different countries as agents with ulcer, analgesic, antiviral, immunomodulatory, anticancer, as well as antibacterial, antidiabetic, adaptogenic, anti-inflammatory, antipyretic, antimicrobial and antirheumatic effects [Parveen et all., 2014; Bhadoriya et all., 2012].

In general, these species are highly valued in landscaping because of the beautiful flowers and delicate membranous leaves, drought tolerance. It is widely used in gardens and parks in Baku and in landscaping in many regions of Azerbaijan, especially on saline soils. It can also be widely used to strengthen slopes and sandy areas. The sticks root easily in moist soil.

Research conducted among the people in various regions of our republic has revealed that most of these plants are unaware of their medicinal values. They know and use information about Carob from websites and TV shows.

CONCLUSION

In the subsection Caesalpinioideae, which is the subject of the study, 8 genera and 13 species have been identified:

- The genus Erythrostemon Klotzsch and the species Erythrostemon gillesii (Hook.) Klotzsch (Caesalpinia gillesii L.) are included in the flora of Nakhchivan MR for the first time.
- All these species are recognized as ornamental plants in our republic. Ethnobotanical studies of local residents of different ages have shown that only carob is used as a medicinal plant, and the medicinal value of other species is unknown to local residents.
- All 13 species belonging to 8 genera examined are useful plants. It is recommended and recommended for continuous and effective use due to its decorative, landscaping, decorative and horticultural, medicinal, coloring, superfood, fruiting, nutritive, technical properties.

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