

ORIGINAL ARTICLE

Biomorphological Study of Some Plant Species Distributed and Used in the Lesser Caucasus

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ABSTRACT

107 families, 467 genera and 1200 species were identified in the specially protected natural areas of the Lesser Caucasus. This is 67.5% of the flora of Azerbaijan. Many wild fruit and berry plants that are spread and used in the forests of the Lesser Caucasus are grown in the determined seasons and species, from which various food products can be produced. Examples of these are hazelnuts, chestnuts, peanuts, and walnuts. There are also many cultivated varieties of these fruits, but the wild species have not been studied accurately and extensively until now. It should also be noted that Azerbaijan is considered one of the centers of initial natural distribution, formation (diversity) and domestication (domestication) of sorghum fruit plants. For this reason, in our research, we studied the bioecological characteristics of the walnut plant and the common chestnut plant, spreading in the Talish, Big and Small Caucasus mountains and forming pure (homogeneous) walnut forests, and studied the biomorphological characteristics.

Keywords: wild, biomorphological, cultivation, domestication, anatomical, flora

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INTRODUCTION

The territory of the Republic of Azerbaijan has a rich flora. In a relatively small area, almost all types of plants found in the world are spread in our republic. In terms of the total number of species, the flora of Azerbaijan is much richer than in other republics of the Caucasus. Plant species found in the republic make up 66% of the total number of plant species growing in the Caucasus [20].

Sorghum fruit plants are very widespread in our republic, especially in the Greater and Lesser Caucasus regions. The reason for this is the bioecological characteristics of those plants. Bioecological properties mean the biological properties that plants acquire under the influence of each other and environmental factors. So, sorghum fruit plants are constantly organically connected with the external conditions that surround them. As a result of the influence of external conditions, anatomical structure, morphological signs, biological characteristics, growth and development patterns change in plants [5; 9].

MATERIAL AND METHODS

The object of the research is the study of the biomorphological characteristics of plant species distributed in the territory of the Lesser Caucasus. Route and stationary methods were used in the research.

Description of life forms was given on the basis of the form proposed by K. Raunkier, I.G. Serebryakov, N.V. Chubatova and Prof. V.N. Sukachev. L. I. Prilipko and V. C. Hajiyev used a relatively simplified version. Biomorphological features are based on the system proposed by E.L. Nukhimovski(1997-2002) [7; 8; 12; 13].

REVIEW OF LITERATURE

On academician A.A. Grossheim's initiative, a special commission was created for the first time in 1926 to study the natural pastures of Azerbaijan, and the leadership of these works was entrusted to famous botanists A. Akhverdov and A. G. Dolukhanov, P. D. Yarashenko, T. S. Geydman, A. A. Kolakoviski, A. G. Dolukhanov, Y. M. Isayev and others.

A little later, R. Y. Rzazade and L. I. Prilipko conducted extensive research and observations in the mountainous zone of the Lesser Caucasus and determined their reserve [4; 9; 10].

During the past years, V.S. Guliyev conducted research in the grasslands of the Lesser Caucasus, determined the species composition of harmful and poisonous plants of that zone and developed measures to combat them [3].

V.D. Hajiyevev conducted extensive research on the problems of improving the root of summer pastures and hayfields in the mountainous zone of the Lesser Caucasus, and showed the modern condition, dynamics and economic importance of pastures [6].

In recent years, in the study of the vegetation of the mountainous zone of the Lesser Caucasus in our republic, V.S. Hajiyevev, A.A. Aliyev, V.S. Guliyev, Z.V. Vahabov, B.V. Karimov, E.E. Gurbanova and others have done great things [4; 5; 7].

In recent years, extensive research work has been carried out in the Department of Biology of ASAU in the study of the morphological-anatomical structural features of some medicinal plants of Azerbaijan. Thus, as a result of their research, Z.I. Humbatov, B.M. Aliyev, A.S. Sardarova, V.S. Novruzov, V.S. Mustafayeva, S.A. Gadimova and others obtained a number of important scientific and practical results [7].

Y.A. Aslanova [1] studied landscape-type vegetation based on rocks and outcrops in the highlands of the Lesser Caucasus. As a result of the research, it was determined that plants form chasmophyte and lithophyte life forms on the outcrops and skirts of rocks in the conditions of a moving substrate with a long rhizome system. Usually *Drababrunii folia* Stev., *Minuartiaoreina* (Mattf.) Schischk types and many species of the *Sedum* genus are met in the area. Among the rocks with a shallow soil layer, plant groups consisting of two or three species are found with occasional fragments. For example, at an altitude of 2200-2400 meters on the southern slopes of the cliffs of the Kapaz mountain system, sub association fragments consisting of *Campanula tridentata* Schreb., *Astragalus incertus* Ledeb., *Saxifraga cartilaginea* Willd., and on the northern slopes *Carex tristis* Bieb., *Cerastium multiflorum* C.A.Mey. are spread.

RESULTS AND DISCUSSION

As a result of conducted studies [2; 17] 107 families, 467 genera and 1200 species were identified for Goygol National Park, Eldar pine, Garayazi and Korchay State Nature Reserves of the Lesser Caucasus. In the systematic structure of the flora, 820 species belong to 26 leading families.

This is 67.5% of the flora. Asteraceae (126) represented by more than 50 species, Fabaceae (101), Poaceae (80), Rosaceae (68), Scrophulariaceae (59), Caryophyllaceae (58), Lamiaceae (56) represent 45% of the flora. The remaining 82 families include a total of 394 species (32.2%). Out of 467 genera, 202 genera (43.3%) belong to 13 families. 56 families are unisexual, 18 are disexual, Polypodiaceae, Liliaceae, Alliaceae, Onagraceae, Malvaceae, Anacardiaceae are represented by three, Crassulaceae, Gentianaceae, Orobanchaceae, Rubiaceae by four and finally Hyacinthaceae and Saxifragaceae by five genera. In the forests of the Lesser Caucasus, in addition to the above-mentioned representatives of the family, many wild fruits and berries grow, from which various food products can be produced. Forest apple, pear, medlar, hawthorn, cherry-plum, cranberry, cherry, forest grape, rose hip, currant, tea tree, blackberry, raspberry, forest strawberry, wild hazelnut, chestnut, beech, walnut, wild pomegranate, date, silverberry, ziziphus, white and black mulberry are examples of such fruits. There are also many cultivated varieties of these fruits, but the wild species have not been accurately and extensively studied until now [5].

In our research work, we have studied the bioecological characteristics of the walnut plant and the common chestnut plant, spreading mainly in the Talish, Greater and Lesser Caucasus mountains and forming pure (homogeneous) walnut forests, and studied its biomorphological characteristics.

From a physical and geographical point of view, the territory of Azerbaijan consists of Greater Caucasus, Lesser Caucasus, Kura-Araz, Talish and Nakhchivan provinces. Apart from Kura-Araz province, walnut is naturally distributed in the territory of four other provinces. Mainly spreading in Talish, Greater and Lesser Caucasus mountains, it forms both pure (homogeneous) walnut forests, and grows mixed with other forest-forming species in broad-leaved mountain forests. In Azerbaijan, it occurs only in small areas compared to walnut forests, in valleys, river valleys and depressions with sufficient moisture in the soil. It occurs more often in relatively large areas in Talish mountains, and for this reason, some researchers accept the natural distribution of walnut in Azerbaijan only in the Talish region, bordering Iran. The fact that walnut grows in Talish together with Caucasian date, chestnut-leaved oak, ironwood, Zelkova tree, in

the Greater Caucasus, Caucasian date (*Zagatala* region), walnut, beautiful birch, oriental beech, chestnut, and in the Lesser Caucasus, eastern sycamore (*Zengilan* region) and other relicts of the third period plants confirms its natural distribution in those areas.

Walnut - (*Juglans regia* L.) belonging to the nut family - (*Juglandaceae* A.Rich. ex Kunth.), collected in 7 genera in the northern hemisphere, more than 60 species, and 2 species are distributed in Azerbaijan. It is a magnificent tree with long life (300-400 years), large trunk, and height of 30-40 meters and diameter of 1.5-2.0 meters, with a wide canopy. Young shoots (1-2 years old) are greenish-brown in color, with a hollow stepped partition. The bark is light-gray in color, smooth when young and later longitudinal cracks appear from the lower part of the trunk. In old trees, the trunk is dark brown and covered with transverse and longitudinal cracks. The umbrella is spherical or dome-shaped. When growing in an open field, the diameter of the canopy is usually equal to the height of the tree. Canopy development directly determines productivity, and there is a close relationship between these two indicators. As a rule, the increase in the growth indicators of the umbrella is reflected in the increase in the yield in the same order. The leaves are compound single pinnate and consist of 5-11 leaflets. The edges of the leaf blade are smooth, bare, relatively dark on top, and relatively light-green on the bottom. The largest leaf blade is located alone in the feather. The leaves are arranged alternately in the trunk and have a nutty aroma typical of walnut. Its life span is 250-300 years. Walnut is a monoecious plant, its flowers are unisexual.

Generative (sexual) organs are located separately within the tree. Stamens are located in special earrings, and female flowers (fruit flowers) are formed from the top shoots of last year's branches and are located singly or several (up to 5, and if more than 5 are classified as a cluster form). Earrings and female flowers are formed a year ago in the current year's buds. The earrings are singly on the side of the stem, two together upside down, or one vegetative shoot, and an earring is located under it. Flowering is observed at the same time as leafing. When ripe, the earrings are 10-20 cm long and up to 1 cm in diameter. When the ears are ripe, the pollen is spread by the wind over a long distance (up to 10 km). In female flowers, the inflorescence is 4-toothed, united to 2 sepals and transmitting scales, the ovary is inferior and one-lobed. The column is short and 2-lobed, velvety reddish in color and has a toothed mouth. The main biological characteristic of walnut flowering and fruiting is the phenomenon of dichogamy, which is the fact that male flowers (earrings) and female flowers (fruit flowers) within the same tree do not ripen at the same time and occur at different times. In some trees, female flowers grow on those trees after the earring is completely pollinated. At the same time, in other trees, the same phenomenon occurs on the contrary - some time after the ripening of the female flowers, the earrings begin to pollinate. According to the type of dichogamy, the trees whose ears begin to pollinate initially are called protoandric (PA), and those whose female flowers develop first are called protogonic (PG). The pollination period of earwigs lasts on average 4-5 days (maximum 10 days), and the period of receiving pollen of females lasts 6-7 (9) days. The difference in the flowering of different sexual organs within the tree is 3-5 (7) days. Hot and dry weather conditions shorten the pollination period by accelerating the ripening time of the ears. Temperature drop and rainy weather conditions, on the contrary, can extend the pollination of earrings up to 10-12 days with certain intervals. An increase in temperature, as well as rainy weather, shortens the period of pollen reception (fertilization) of female flowers. As a result of dichogamy, the flowering of walnut lasts 2-3 weeks. If abnormal climatic conditions do not occur on that eve (last spring frosts are not observed), the probability of complete destruction of generative organs in walnut trees decreases (approaches zero). When abnormal climatic conditions occur, protoandric trees and female flowers in protoandric trees and female flowers and vice versa, protoandric trees and female flowers and protogonic trees can die. Observations confirm that the sequence of flowering of earlobes and stipules within the tree does not change.

The type of dichogamy (PA and PG) is a stable biological property, and external factors affect only the date, duration and interval of ear and female maturation. As a result of dichogamy, walnut trees are cross-fertilized. Vegetative propagation method ensures the stability of all properties and also transfers the dichogamy type of the propagated variety or form to the seed planting material and keeps it stable (the seed planting material is either PA or PG). Therefore, it is important to plant trees of the reverse digamy type (10-20%) to ensure fertilization when planting walnut orchards from vegetatively propagated planting material. Walnut fruit consists of 2 parts - pericarp (external) and endocarp (internal). The outer pericarp is a leathery, fleshy side of the fruit - it is an acorn. The endocarp inside the shell is called a nut. The endocarp (inner fruit sheath) consists of a woody hard seed coat, inside which is the kernel (seed sheath) and the embryo. The seed coat (endocarp) of the nut consists of 2 parts; a seam is formed on both sides at the point where the pods meet. Inside the shell, the kernel is divided into 2 parts by a leather partition [9; 18; 19].

Walnut stands out for its polymorphism. Polymorphism (poly-many, morpho-form) is the existence of a variety of forms within the population of individuals of the same species that are distinguished from each other by morphological, biological, ecological, economic, commodity, and other indicators. The diversity of walnut forms is observed in its flowering, fruiting, leaf shape, color, productivity, tolerance of the tree, etc. Due to the morphological indicators of its fruits, the variety is more widespread [9]. The coefficient of variability of fruits in natural populations is 200...600% and is given in table 1.

Table 1. Diversity of wild walnut fruits in Azerbaijan (polymorphism)

Amplitude of change	Indicators of fruits						
	Hmm	D ₁ mm	D ₂ mm	Form factor	Mass in grams	Shell thickness mm	Kernel yield%
Minimum	27,51	25,08	24,99	0,92	5,06	0,92	23,35
Medium	36,53	30,41	32,39	1,16	10,08	0,45	47,74
Maximum	57,74	42,07	42,35	1,52	24,10	2,92	58,66

Nut: H - length, D₁ and D₂ - diameters of the shell and between seams, respectively, K - shape factor ($K = 2H / (D_1 + D_2)$), when K₁ it is elongated and when K=1 it is spherical.

Thus, the variability in terms of percentage of kernel extract is 250%, in terms of shell thickness it is 300% and in terms of fruit mass it is 500%.

Of particular importance is the rotation around the root of the nut. As a rule, they are located in the lower part of the stem near the root throat. That spin is formed as a result of the activity of a large number of "sleeping" shoots in this part of the trunk. At first, those shoots do not develop and this can continue for decades. Later, when the height growth of the tree slows down or stops completely, plastic materials are used in a different way. Plastic substances are mainly used to produce fruit, to increase the diameter of the stem, and also to form that spinner. Dormant shoots, which are located in large quantities in the lower part of the trunk, begin to develop weakly, and gradually, year by year, a layer of dead wood begins to form on them.

Walnut leaves contain aromatic essential substances and phytoncides that are released into the air. These phytoncides destroy disease-causing bacteria. There are no blood-sucking insects under the walnut canopy.

Walnut trees have a strong root system. In addition to the spindle root that reaches the deep layers of the soil, horizontal roots that can spread over long distances are also developed in the upper layers of the soil, which makes it very useful against erosion. After drying, the shed leaves are used as quality fodder. This factor must be taken into account and walnut trees should be widely used in the creation of forest amelioration plantations against erosion in the conditions of Azerbaijan [9, 17].

Common chestnut (*Castanea sativa* Mill.) belongs to the Fagaceae family. Three of the seven genera of this family are found in Azerbaijan. These are the genera *Castanea* (chestnut), *Quercus* (oak), *Fagus* (beech). Of the 30 species of the chestnut (*Castanea*) genus, only common chestnut (sometimes called edible or planted chestnut) is naturally distributed in Azerbaijan and cultivated since ancient times. It can be found in the Greater and Lesser Caucasus, Lankaran and Karabakh on the mountain slopes, in the lower mountain belt areas, in the composition of peanut, peanut-wales trees. Chestnut is a monoecious, dioecious plant. The trees differ from each other in terms of their growth characteristics, they are mostly straight-stemmed and have tall umbrellas. It is a tall, long-lived tree plant with a wide canopy. The height of the tree is 30-40 meters. The trunk is thick, straight, the bark is black and scaly. Young branches are brown and hairy. Spindle roots go very deep into the soil. Chestnut male and female flowers and spread to the sides (around). The leaf is simple, elliptic, the stem side is sword or heart-shaped. The edge of the leaf is serrated, very thick, the color of the upper part is darker than the lower part [11; 14; 15].

Male and female flowers are located separately on a tree. Male flowers are in the form of long earrings. They are located in the leaf axils of young branches, they are very fragrant, and they are white-yellowish in color. Its length does not exceed 20 cm. There are 8-12 flowers separately on one earring. Female flowers are located on annual stems, 2-3 in a leaf axil. Petals of female flowers are 3-4 pieces; The fruit is thorny, acorn-like, and the acorn separates during the ripening period. There are 2-3 chestnuts in one kerzak. The upper skin of the fruit is dark and light-cinnamon, chestnut in color. The place of attachment of the fruit to the grain is different depending on the variety and shape [14; 15; 16].

From the above, it can be seen that walnuts and chestnuts should be widely used in every situation, taking into account the beneficial properties of the plants.

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