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CONTENTS

APIACEAE LINDL IN FLORA OF NAKHCHIVAN AUTONOMOUS REPUBLIC: POISONOUS SPECIES OF THE CELERY FAMILY

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Abstract: This article delves into the unique and abundant vegetation in the Nakhchivan region, which is a part of ancient Azerbaijan. The region's climate is markedly continental, characterized by ample solar radiation and moisture abundance, alongside low plant humidity containing biologically active substances. These factors have had a positive impact on the quantity of such substances in the plants. Notably, the Nakhchivan Autonomous Republic stands out from other regions of Azerbaijan in terms of the percentage of chemical compounds within the diverse composition of its flora. Plants that possess these unique properties have extensive applications in the field of medicine. However, it's important to acknowledge that in some instances, plants with chemical compounds can be toxic to both humans and animals that consume them, occasionally resulting in fatal consequences.
During the course of the research, it was observed that species from the *Apiaceae Lindl*. family were not present in the Nakhichevan region. Furthermore, 12 species belonging to 9 chapters of the urban associations were identified. These chemical compounds have applications in the field of medicine.
Keywords: *Apiaceae Lindl*., Astrantia., poisonous plants, alkaloids, glycosides

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Introduction:

Ancient Azerbaijan, as well as the climatic conditions of the Nakhchivan region, boasts a remarkably diverse vegetation when compared to other regions within the republic. The unique composition of vegetation in the Nakhchivan Autonomous Republic sets it apart from other regions of Azerbaijan. However, the presence of certain chemical compounds in specific plants can pose risks to both humans and animals that consume them, occasionally resulting in fatal consequences. These toxic compounds encompass a range of substances, including alkaloids, glycosides, saponins, various acids, lactones, dyes, essential oils, and mucilage, among others. The region's sharply continental climate, marked by intense solar radiation and moderate moisture levels, influences the presence and concentration of these compounds within the plant species. Consequently, the flora of the Nakhchivan Autonomous Republic is distinguished by its distinctive composition, patterns of species distribution, origins, and other specific attributes. Many of these plants, known for their chemical properties, find extensive use in the field of medicine.

Materials and methods:

A comprehensive study conducted in the Nakhchivan Autonomous Republic identified a total of 3,021 plant species, classified into 8 classes, 104 orders, 176 families, and 908 genera. Within this extensive floral diversity, it was found that 302 plant species belonging to 6 classes, 49 families, and 109 genera are characterized as poisonous. The research also focused on the examination of the Apiaceae Lindl family, specifically exploring the urban settlements of this species and its bioecological characteristics, as well as patterns of distribution based on elevation.

Within the global flora, flowering plants represent a highly prevalent and economically significant group, comprising a wide array of genera and over 3000 known varieties. In Azerbaijan's flora, there are 75 genera and 184 species, and within the Nakhchivan Autonomous Republic's flora, there are 57 genera and 107 species. Throughout this research, compounds with medicinal applications were identified in 12 species belonging to 9 genera within the Nakhchivan region (Ibadullayeva, 2005); (Ibadullayeva, 2004).

Between 1998 and 2005, S. Ibadullayeva conducted extensive and thorough research on celery, delving into its distribution within the Azerbaijani flora, natural resources, systematics, biomorphological characteristics, ecological properties, and practical applications (include references to these studies as needed).

Result and discussion:

Celery-like plants belonging to the family of perennial, biennial, or annual herbs, the flowers of which are complex, in some cases annual. There are covering leaves at the base of the stem. The flower is actinomorphic, or the outsider is isomorphic. They are usually same-sex. Sepals are tuberous or truncated. Petals 5, stamens 5, ovary lower, two-lobed. In each nest there is an interdependent seed. Its column consists of two and also nine and nine, connecting with each other, forming a ring. The fruit is a two-nest box, two-part. Each of the 3 sides of the seed is smooth, the back is ribbed, there are depressions between the ribs. Most often, second ribs are formed in these depressions. Sometimes there are incisions on the fruits. The endosperm is not smooth, curved or striped. The leaves are petiolate, multi-layered, or multi-layered. There are no sublayers. The stem in the form of an expanded trunk wraps around. Their stems are hollow, and there are also caterpillar passages. This season, among the plants to which it belongs, is extremely useful, especially the water, essential oil and also the preparations are its plants.

Astrantia L. - A genus of yeast corals, out of 10-13 species distributed in Asia Minor, Central and Southern Europe, there are 5 species in the Caucasus, 2 in Azerbaijan. In the Nakhchivan Autonomous Republic, only *Astrantia Maxima* Pall. - A type of large atrial fibrillation is listed in the Red Book of the Nakhchivan Autonomous Republic[6, pp.487-489].

*Astrantia maxim*a Pall.- The large size of corals and the small number of their populations, ecological, zoogenic and anthropogenic factors due to their limiting effect on risk - LR [c-Least Concern-LC]status is listed in the Red Book of the MR (Talibov, 2010) It is distributed in small numbers in the Batabatmesh of the Shahbuz district, on mesophilic meadows in the foothills of the Kukudag, in the foothills of the Julfa district and in the Tillyakmesh of the Ordubad district.

It is considered a poisonous plant because of the alkaloids contained in it. This is a perennial plant, reaching a height of 70 cm. the umbrella is located at the end of the stem. The lower stem leaves are long-stemmed, 3 (4) are separate, scalpel, the lateral ones are wider, toothed-ciliated along the edges, the middle and upper stem leaves are sessile, and the lower stem leaves are stem-embracing, three-partitioned or three-partitioned. The umbrella is 3.5-4 cm in diameter, rigidly ciliated at the edges, greenish on the outside, pink inside. The flowers are numerous, narrow scalpel. The calyx is toothed, with a narrow wedge-shaped base, 1.5 mm long. The fruit is up to 10 mm long, multicellular. Blooms in June-July, seeds ripen in July-August. Honey-bearing, ornamental and medicinal plant. This is a mesophyte. It is included in the Lesser Caucasus geographical area. During flowering, the large Tremor contains alkaloids in all sense organs. When drying, the number of alkaloids decreases significantly. According to many fiber authors, the root of yeast cranberry has a laxative property, because of the unpleasant smell, it is not eaten by animals on pastures and is considered a poisonous plant of pastures.

Chaerophyllum L. -Of the 7 species of the genus Cacix found in Azerbaijan, 2 are considered poisonous plants of pastures. And in the flora of naxcivan Mr one of 4 species, *Chaerophyllum Aureum* L. (Gl. maculatum Wild. ex DC.)- The golden cacix is poisonous. Cacix Golden is a herbaceous and poisonous plant 25-50 cm high with a potato-like tuber underground. The leaves have the shape of a stem arrow and are dark green in color. The flowers are arranged on a stem in the form of an inflorescence and are unisexual. There

are female flowers on the underside of this corolla, and male flowers on the upper side, and unproductive flowers in the form of hairs between them. The top of this bush is fleshy and convex, with a yellow leaf in the shape of a hat. Since this succulent plant is pollinated by insects, its flowers have attractive beautiful colors and exude a sharp unpleasant smell. Its fruits were red and orange in color and the size of blue peas, ripen in autumn. People use fresh leaves and roots. When the plant becomes poisonous in fresh form, dried and boiled, the toxic substances lose their effect. It contains starch, saponin and the alkaloid thymine. Eating a fresh plant can cause nausea, vomiting, diarrhea and poisoning, characterized by cardiac arrhythmias that can even lead to death. The literature indicates the presence of an insufficiently studied kerophyll alkaloid in cacix and poisoning of horses, pigs, pigs (Guliyev &ets, 1961).

Conium maculatum L. -Spotted celery of star anise-*Apiaceae* Lindl. chapters, star anise-Conium L. it includes the floor. The genus has 4 species distributed in Europe, Siberia and Asia Minor, one species is found in the Caucasus, in Azerbaijan, as well as in the Nakhchivan Autonomous Republic. It is widespread on forest edges, meadows, limestone meadows, plantings, in residential areas, along roadsides.

Conium maculatum L. -Spotted badyanin is a poisonous plant with an unpleasant odor, blooming from May to early July. The leaves are very similar to parsley. Sometimes it can reach two meters in height. The flowers are small and white. Basically, he can live on the roadsides, among bushes and ruins, on the edges of fields and even in garbage. Despite the venom, the appearance of the bucket is not terrible at all. There are reddish spots on the trunk. The chopped leaves of the plant resemble rosehip leaves. If it is crushed by hand, it will smell very bad. Even all parts of the plant, namely the root, stem, leaves and even seeds, are poisonous (Dudar, 1970). In ancient Greece, mortals were sentenced to death, as a great mercy, by drinking the poison of star anise, which killed a person without causing him suffering. Socrates committed suicide with poison derived from this plant, after his famous speech in defense of himself. In addition to the severe and sometimes fatal effects observed in animal experiments, such as brain disorders in puppies, it has been established that Badyan poison can have serious consequences. Cases of poisoning can lead to death within a mere 2-3 hours. To be lethal, Badyan poison must be transformed into a darker, liquid form, and this poisonous substance is used in pharmaceuticals. Remarkably, just 0.5 to 1 gram of the substance coniine, which is present in Badyan, is sufficient to kill an adult. It can also induce respiratory paralysis.

Badyan is a tall plant with stems reaching heights of 60-180 cm. These stems are branching, finely furrowed, and hollow. The leaves are smooth, with the lower part appearing reddish-brown. In the first year, leaves emerge around the root, while in the second year, the stem develops. The lower leaves are three-lobed, wide-triangular, measuring 30-60 cm in length, and they lack a stalk. They are oblong-ovoid, pinnately dissected, and occasionally have white tips. The middle and upper leaves are smaller and complex, consisting of narrow, stalkless sheaths. The terminal leaves are oblong, scalpel-shaped, or appear split.

The plant produces small white flowers, each with five petals. These flowers are clustered into numerous, shield-shaped clusters, forming a bouquet. The leaves are scalpel-shaped and narrow, with indistinct teeth along the edges, typically numbering between 3 and 7, and they are smooth with a distinctive background. The fruit is rounded and ovoid, measuring 3-3.5 mm in length. The twisted column's length can extend up to 1 mm. The roots are whitish in appearance. Badyan typically flowers in June and July, with fruit ripening occurring in August and September.

Various parts of the Badyan plant, including the stems, leaves, and flowers, are utilized for medicinal purposes. Leaves are harvested at the base, and immature seeds are collected along with the planted area. It's important to note that Badyan is a poisonous plant, containing the alkaloid coniine, along with methylconiine, conhydrin, pseudoconhydrin, and conimein substances. Additionally, seeds contain about 2% fatty oils, leaves contain 0.1%, flowers contain up to 0.24%, and fruits contain 2% alkaloids. It also contains quercetin, kaempferol, 0.08% essential oil, and alcoholic acid.

From a chemical and biological perspective, Badyan's alkaloid content classifies it among plant alkaloids. Alkaloids are intricate nitroge-

nous organic compounds derived from plants, often found in alkaline form and capable of reacting with acids. The term "alkaloids" is rooted in the Arabic word "alkali," meaning basic or alkaline, combined with the Greek word "eidos," signifying similarity. Essentially, "alkaloids" conveys the idea of compounds with alkaline properties. Oxygen-containing alkaloids are typically crystalline or amorphous substances, commonly colorless, odorless, and with a bitter taste. In contrast, nitrogen-containing alkaloids are usually volatile liquids in their pure form, known for their unpleasant properties and inherent toxicity. This group of alkaloids is included in species within various plant families, including Aconitum maculatum, Nicotiana tabacum (tobacco), *Nicotiana rustica* (wild tobacco), *Anabasis aphylla* (leafless female), and others. Alkaloids that are derivatives of piperidine and pyridine are present in multiple Badyan varieties, including spotted Badyan and obeliainflata. These alkaloids have a benzene core containing N and NH, which can stimulate the respiratory center, and they are used to regulate breathing in specific medical situations.

Badyan is employed for various medicinal purposes, serving as a diuretic, sedative, anti-inflammatory agent, analgesic, and anticonvulsant for conditions such as chorea, epilepsy, diphtheria, and migraine. This plant has been effectively employed to address various health issues, including acute respiratory infections, muscle spasms, anuria, anemia, dysmenorrhea, and syphilis. The treatment has yielded positive results. The leaves are used to combat rheumatism and serve as a hemostatic agent, while the fruits are used to address conditions such as epilepsy, cardiovascular diseases, and skin cancer.

Now, let's delve into the details of another plant, Dorema D. Don, which includes only one species in the genus Dorema: *Dorema glabrum* Fisch. & C.A. Mey. This particular species is considered endangered and has been listed in the Red Book of the Nakhchivan Autonomous Republic due to its decreasing population dynamics and the threat of extinction. It is primarily found in the Validagh, Dahnadag, Duzdag, and Darashamvadaridag regions of Azerbaijan, with the majority of collected materials coming from areas near salt deposits.

Dorema is a perennial plant with a stem covered in fibrous sheaths at the base. The stem can reach heights of 2-3 meters and is cylindrical in shape. Its leaves are leafy and typically triangular-ovate, displaying a feathery appearance. These leaves consist of segments that are 6-smoothie, oblong-scalar-shaped, and serrated. The umbrella of this plant is hollow, simple, and typically contains 8-12 flowers. The flowers themselves have petals that are up to one centimeter long, with 1-2 or 3-4 flowers per long branch in the flower group. The petals are glabrous and exhibit a whitish-yellow color. The fruit measures 5-8 mm in length and is elliptical, smooth, and multi-ridged. It contains ISAP-shaped ribs and ducts occurring singly or in pairs. The column is curved outward, and the plant emits an unpleasant strong odor. It blooms in June and July, with seed ripening taking place in July and August. This plant is valued for its essential oil and is categorized as a xerophyte. While Dorema is part of the Atropatan geographical area, it's important to note that the plant is toxic to foragers, and there are reports of early spring grazing animals, such as sheep, goats, and cattle, being affected.

Now, let's move on to Ferula, a genus with 6 species in the Caucasus and 4 species in Azerbaijan, including the Nakhchivan Autonomous Republic. One of its species, Ferula oopoda (Boiss. & Buhse) Boiss., is in critical condition and has been listed as critically endangered in the Red Book of the gardener MR. While it is found in a small area on the southern slope of salt, it is the sole representative in the territory of Nakhchivan MR. Materials collected from Duzdag were described in relation to this plant. Ferula oopoda is a tall perennial herbaceous plant with a compact root, growing up to one meter in height. Its stem is straight, solid, and cylindrical with a 1.5 cm diameter. The old leaves, which have deteriorated, are covered with fibrous sheaths. The leaves around the root are long-stemmed and wide, with a rhombus-shaped appearance. The initial segments are 3-4 sparse-shaped sections, measuring 2-5 cm by 1.5-2 cm. The central part is leafy and has 13-22 rays, with typically 2 long-petioled side umbrellas. The umbrellas contain 10-15 flowers, and the petals are up to 1.5 mm long, pale yellow in color, ellipsoid, pointed, and inlaid at the tip. The fruits are elliptical, up to 10 mm in length,

flattened, with edges measuring one mm in width. The ribs are prominent, the canals are undifferentiated and narrow. Ferula oopoda blooms in May-June, with fruits ripening in June-July.

The geographical region in which this plant is found is influenced by anthropogenic factors, particularly the presence of a television transmitter station, leading to a critical environmental situation resulting from the discharge of certain materials (Dzhafarov, 1985). This plant is known for its essential oil and color. The plant contains various compounds, including tannins, resins, starch, alkaloids, saponin, and essential oils. It is recognized for its aphrodisiac properties and is employed in the treatment of sexual disorders.

Let's explore some fascinating details about different plant species.

Heracleum L. - This genus is home to around 70 species commonly found in temperate zones spanning Europe, Asia, America, India, and the Himalayas. In the Caucasus, there are 25 species, with 7-8 species found in Azerbaijan, and 5 species in the Nakhchivan Autonomous Republic. One particular species, *Heracleum albovii* Manden, is especially sensitive and limited in its distribution, earning a vulnerable status listed in the Red Book of the gardener MR. This plant thrives in the middle and upper mountain regions in the Army District of the Nakhichevan AR, as well as in cold mountain, Yaglydere, Agyurdandurmus, and the ash-pebble, rocky, and grassy sand dunes.

Heracleum albovii Manden is known to induce skin photodermatitis upon contact with sunlight, resulting in 2-3 degrees of burns on the skin. Preventive measures include covering the affected area with a black cloth and thoroughly dousing it with water. This perennial plant's stem typically reaches heights of 40-50 cm, and its leaves have an ovoid, double-feathery appearance with dense, short gray soft-feathering on both sides. The plant has white-yellowish petals, and its elliptical fruit measures 6-7 mm in length. It blooms from June to August and reproduces via seeds. It's valued for its essential oil and is categorized as a mesoxerophyte. It falls within the Atropatan geographical area.

Prangos Lindl. - The Prangos genus boasts 5 species in Azerbaijan and 4 species in Nakhchivan. Among these, *Prangos ferulacea* (L.) Lindl. (also known as *P. biebersteinii* Karjag.), commonly referred to as "Ordinary chashir," is a poisonous perennial plant that can reach a height of 150 cm. It has a dense, tall, and branched trunk, along with striking yellow flowers, albeit with a sharp and somewhat unpleasant odor. Its oblong leaves measure 40 cm in length and have a multi-feathered structure. The plant's umbrellas have 6-16 rays, and its petals are greenish-yellow. Its ovoid fruit ranges from 15-20 mm in length. *Prangos ferulacea* blooms in May-June and yields fruits in June-August. It grows on dry and stony slopes of upper mountain areas but gives off an unpleasant odor, deterring herbivores from consuming it. In fact, it's known to cause blindness in horses, making it detrimental in pastures as it overshadows forage crops and diminishes their value.

Smyrniopsis L. - In the Smyrniopsis genus, there are 4 species, and one of them, Smyrniopsis aucheri Boiss., grows in areas with excess moisture, such as rivers, lake surroundings, fertile fields, and stony-rocky thickets in the Caucasus, Azerbaijan, and the Nakhchivan AR. This species, commonly referred to as "Oseleləklivəsiazəcək" in Nakhchivan, is a perennial plant with a height exceeding 120-150 (250) cm. It features a wobbly trunk and opposite or whorled branches. The stem and lower stem leaves are large with a double-section, ovoid appearance, and densely stemmed initial parts. Upper leaves are larger and less partitioned. The umbrellas have 12-15 rays and consist of 5-6 scalar or scalar-linear leaves, with each dressing comprising 1-3 small leaves. The flowers are yellow and dioecious, featuring a long, crafted tooth, and the fruit is ovoid-shaped and about 6-7 mm long. This plant blooms in June and produces seeds in July.

Kumarin liandefiris, known for its essential oil, is a mesophyte plant. Its geographical distribution extends to Iran.

This species is typically found in the mid-mountain belt near dry rivers. Although it has historically been concentrated in specific areas of the Shahbuz Rayon mountains, it has begun to extend to broader regions. One of the key factors contributing to this expansion is its resilience to cattle grazing due to the intensive seed production. Local populations are actively fighting against this invasive species. It can be

observed growing along valleys, reaching elevations of up to 2,800 meters in the Kukudag region.

In recent times, Kumarinliandefiris has also started to spread to other areas of the Nakhchivan Autonomous Republic, particularly in the north-western part of Kukudag at elevations ranging from 2,000 to 2,300 meters. This expansion has raised concerns, leading to its inclusion in the "green sheet" of the Red Book of the Nakhchivan Autonomous Republic.

Conclusion:

The research conducted in the Nakhchivan Autonomous Republic has revealed the presence of various species from the Apiaceae Lindl. family, with nine genera identified, including 12 species. Some of these species contain toxic compounds and have diverse applications in medicine. The richness and high biological activity of these genera, along with their abundance in the region, offer significant potential for various uses.

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2-HYDROXY-5 (1-METHYLTYCLOHEXYL)-SYNTHESIS REAGENT OF ACETOPHENONE

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Abstract: The article is devoted to 2-hydroxy-5(1-methylcyclohexyl)-reagent for the synthesis of acetophenone. The purpose of this study is to expand the scope of scientific research related to the synthesis of acetophenone. The research of this work was carried out on the basis of the experimental method.
Keywords: hydroxy-5 (1-methyltyclohexyl)-synthesis reagent, catalytic acylation, Y-type zeolite

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Introduction:

Recent literature reviews indicate that chemical additives and compounds added to the production of polymer materials, oils, and various goods receive considerable attention. Among these chemical compounds, alkylphenols and their derivatives possess distinct advantages. One of their noteworthy features is their enduring resistance to light, atmospheric conditions, and temperature fluctuations. Consequently, approximately 70-75% of the chemical additives currently used in the industry are constituted of compounds based on alkylphenols (Armstrong, 1966).

Depending on their composition and structure, these chemical additives can serve functions like antioxidants, stabilizers, brighteners, oxygenators, and more. Therefore, the multifunctional characteristics of chemical additives created through the combination of various components are of great interest. It's worth noting that chemical additives with acetyl and hydroxyl fragments, as found in the literature, are widely utilized as photostabilizers and thermostabilizers (Bijelic, 2019).

Objective:

The goal of this study is to expand the scope of scientific research related to acetophenone synthesis. Specifically, the study focuses on the production of 2-hydroxy-5 (1-methylcycloalkyl) acetophenones through acylation reactions using para-(1-methylcyclopentyl) - and para-(1-methylcyclohexyl) phenols in conjunction with pickling vinegar and a Zn-based nanocatalytic system. The aim is to extend the range of scientific investigations and determine new areas of application for these compounds.

Materials and methods:

The experimental section details the initial substances employed for obtaining methylcycloalkylacetophenones, including para-(1-methylcyclopentyl)- and para-(1-methylcyclohexyl) phenols, along with the use of pickling vinegar as a chemical component. The pickling vinegar used is characterized by the following physical-chemical properties: Boiling Point = 118°C, Melting Point = 16.7°C, Molar Mass = 60 g/mol. Additionally, a catalyst is prepared in nano-scale with ZnCl2.

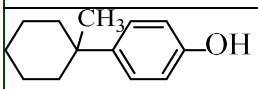
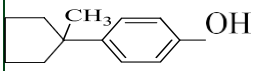
Para-(1-methylcyclopentyl) and para-(1-methylcyclohexyl) phenols undergo catalytic cycloalkylation with the participation of Y-type zeolite catalysts impregnated with a mixture of phenol, 1-methylcyclopentene, 1-methylcyclohexene, KU-23 (DUST 20298-74), and phosphate pickling vinegar (Bijelic, 2019).

Table 1 outlines the physical and chemical properties of para-(1-methylcycloalkyl) phenols. The structure of the synthesized compounds is determined using IQ and 1H NMR analysis methods. IQ spectra are recorded using the Bruker ALPA IQ-FurYE spectrometer, while 1H NMR spectra are

recorded at 300.13 MHz using the Bruker TOPSPIN apparatus in CDCl3 solution.

The reaction involving para-(1-methylcyclohexyl) phenol and pickling vinegar is described as follows:

Table1. Physico-chemical properties of para- (1-methylcycloalkyl) phenols

Structural formulas	Melting Point, °C/10 mm	T_m,°C	M.Wt	Element composition, %			
				Hesablanıb		Tapılıb	
				C	H	C	H
	161-164	96	190	82.1	9.5	81.4	8.9
	145-148	90	176	81.8	9.1	81.3	9.6

Results and discussions:

The provided reaction is carried out using the following procedure: 16.5 g (0.12 mol) of anhydrous nano-weighed ZnCl2 and 16.5 g (0.27 mol) of iced vinegar are placed in a flask and heated. When the temperature reaches 100°C, 19.0 g (0.1 mol) of para-(1-methylcyclohexyl) phenol is gradually added to the mixture, and the temperature is raised to 120-160°C. The mixing of components continues for 20-60 minutes. Then, the mixed chloride solution is rinsed with a 10% aqueous sodium hydroxide solution and filtered under reduced pressure. The intended product is washed with ethanol, and its physicochemical properties are determined. (Bijelic, 2019)

One of the key factors influencing the direction of the acylation reaction of para-(1-methylcyclohexyl) phenol with vinegar is the reaction temperature. The yield of the reaction product depending on temperature and time is shown in Figure 1.

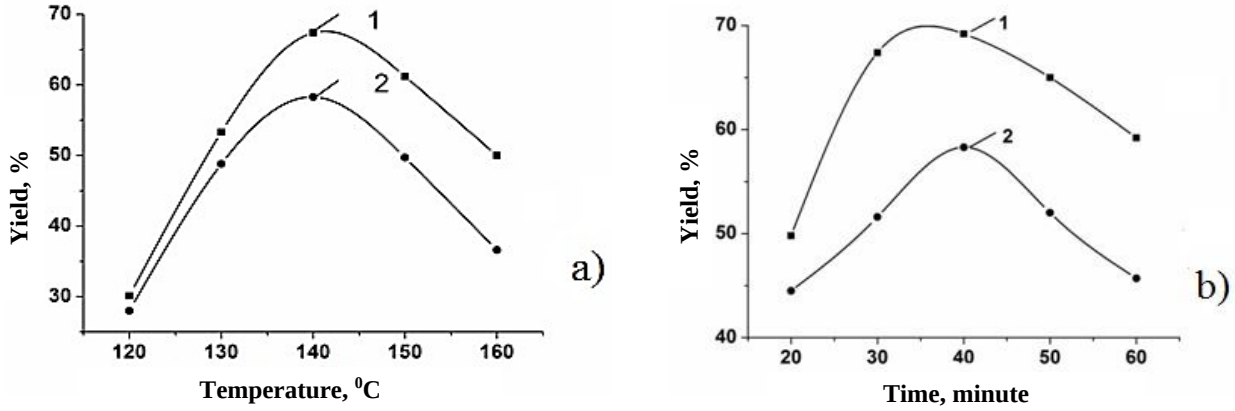


Figure 1. Temperature (a) and time (b) dependence of the yields of 2-hydroxy-5(1-methylcyclohexyl)-(1) and 2-hydroxy-5 (1-methylcyclopentyl)-(2) acetophenones.

As can be seen from Figure 1 (curve 1, a), at lower temperatures, below 120°C, the yield of 2-hydroxy-5(1-methylcyclohexyl) acetophenone decreases significantly, reaching 30.1% (relative to the initial cycloalkylphenol). By increasing the temperature from 120°C to 140°C, the purposeful action increases the yield of the product from 30.1% to 67.4%. Raising the temperature to 160°C is not favorable and results in a decrease in the yield to 57.5%. This drop at higher temperatures is attributed to the formation of undesirable by-products.

The purposeful reaction time significantly affects the yield of the target product. The reaction time was studied within a range of 20 to 60 minutes. (Bijelic, 2018)

As shown in Figure 1 (curve 1, b), when the initial components of the reaction are allowed to interact for 30 minutes, the yield of 2-hydroxy-5(1-methylcyclohexyl) acetophenone

reaches 67.4% relative to the initial para-(1-methylcyclohexyl) phenol. Changing the reaction time, whether increasing or decreasing, does not lead to significant variations in the product yield.

Thus, under the given conditions of the acylation reaction involving para-(1-methylcyclohexyl) phenol with pickling vinegar and a nano-sized ZnCl2 catalyst at 140°C for 30 minutes, the yield of the target product, 2-hydroxy-5 (1-methylcyclohexyl) acetophenone, is 67.4% relative to the initial para-(1-methylcyclohexyl) phenol.

Once the target product is obtained, its IR and 1H NMR spectra are recorded to determine its chemical structure and physicochemical properties.

Figures 2 and 3 provide the IR and 1H NMR spectra of 2-hydroxy-5(1-methylcyclohexyl) acetophenone, respectively**.**

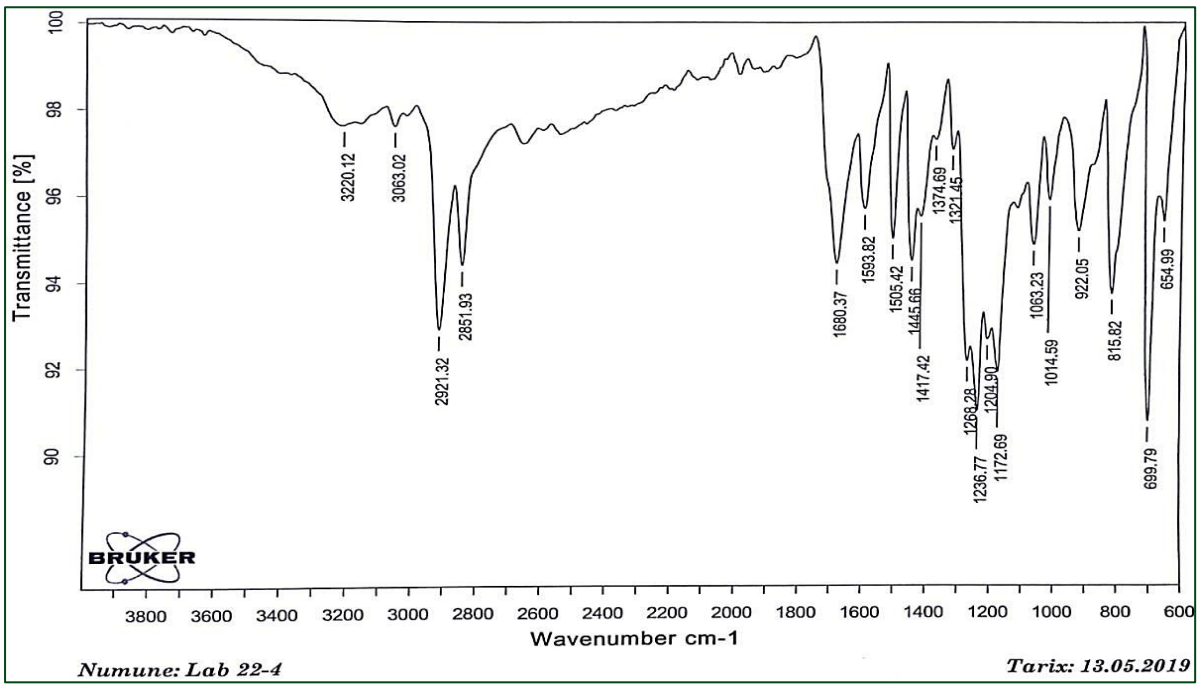


Figure 2. IR-spectrum of 2.2-Hydroxy-5 (1-methylcyclohexyl) acetophenone

The IR spectrum results of 2-Hydroxy-5(1-methylcyclohexyl) acetophenone are presented in

The 1H NMR spectrum of 2-Hydroxy-5(1-methylcyclohexyl) acetophenone consists of four signals with intensity ratios of 3:10:1:4.

- The singlet at 1.2 ppm corresponds to the methyl (CH3) group.
- The multiple at 1.77 ppm is associated with the 1.5 ppm saturated hydrocarbon group.
- The OH group appears as a singlet at 8 ppm.
- The protons of the aromatic ring can be observed in the range of 6.5-7 ppm.

This confirms the chemical structure of 2-Hydroxy-5(1-methylcyclohexyl) acetophenone**.**

The reaction is carried out using the method described above: 16.5 g (0.12 mol) of anhydrous nano-weighed ZnCl2 and 16.5 g (0.27 mol) of icy vinegar are placed in a flask and heated. When the temperature reaches 90°C, 17.6 g (0.1 mol) of para-(1-methylcyclopentyl) phenol is gradually added to the mixture, and the temperature is raised to 120-160°C. The mixing of the components continues for 20-60 minutes, and then the resulting chloride solution is washed with a 10% aqueous solution of chloride under reduced pressure. The intended product is washed with ethyl alcohol, and its chemical structure and physicochemical properties are

determined. (Bhatt& etc, 2017)

Table 2. The results of the IQ-spectroscopic analysis of 2-Hydroxy-5 (1-methylcyclohexyl) acetophenone

Signals, cm-1	Location in the structural formula
654	Information of the group of phenol
699,815	substituted benzene core
922,1014	C-H bond in a cycle
1063	O-H bond
1204, 1236,1268	C-O bond
1374	Deformation vibration of the C-H bond in the CH3 group
1417,1445	Deformation vibration of the C-H bond in the C(O)CH2 group
1505	Benzene nucleus
1593	C bond in aromatic hydrocarbons
1680	C=O
2851,2921	Valence vibration of the C-H bond in the CH3 group
3063	H-C=C-H
3220	O-H bond in the OH group

Chemical structure of the substance:

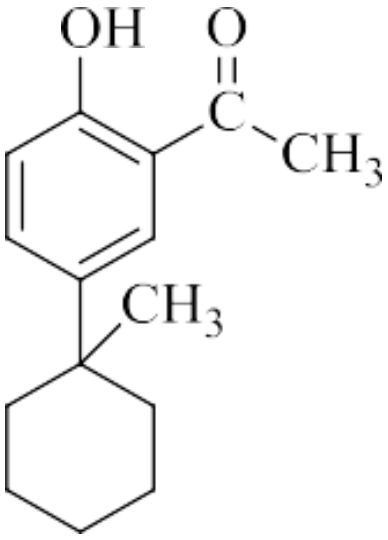


Figure 3. 21H NMR spectrum of 2-Hydroxy-5 (1-methylcyclohexyl) acetophenone

Empirical formula: C15H20O2, Molar mass: 232
Boiling point: 166-168 °C (at 10 mm of mercury pressure)
Melting point: 114.8 °C

Additionally, a catalytic acylation reaction was carried out with para-(1-methylcyclopentyl) phenol and vinegar:

The results of the catalytic acylation reactions of para-(1-methylcyclopentyl) phenol with vinegar are shown in Figure 1.

Increasing the temperature of the acylation reaction from 120°C to 140°C, as shown in Figure 1 (line 2,a), results in an increase in the yield of the desired product from 28.0% to 58.3%. However, when the temperature is

further raised above 150-160°C, the yield of the desired product begins to decrease. At 150-160°C, the yield of acetophenone obtained from para-(1-methylcyclopentyl) phenol ranges from 36.6% to 49.7%.

The duration of the reaction in the reaction zone also plays a significant role in the yield of the desired product. For instance, when the reaction time is 20 minutes, the yield of the desired product is 44.5% (see Figure 1, line 2, b). Increasing the time to 40 minutes raises the yield of the desired product to 58.3%. However, further extension of the mixing time in the subsequent increment reduces the yield of the desired product to 45.7%. The decrease in the yield of the desired product with excessive mixing time in the reaction zone can be attributed to the formation of unwanted byproducts.

Therefore, the acylation reaction with vinegar was carried out purposefully in the presence of anhydrous nano-weighed ZnCl2 catalyst as follows: at a temperature of 135-140°C, for a reaction time of 30-40 minutes, the yield of 2-hydroxy-5 (1-methylcycloalkyl) acetophenones for the target product was found to be 58.3-67.4% compared to para-(1-methylcycloalkyl) phenol (Bluestone & etc, 2010)

After the removal and separation of 2-hydroxy-5(1-methylcycloalkyl) acetophenones from the reaction products, their chemical structures were confirmed using IR and 1H NMR spectroscopic techniques.

In the 1H NMR spectrum of 2-hydroxy-5(1-methylcycloalkyl) acetophenones, a singlet CH3 group is observed at 1.22 ppm, and a singlet from the saturated hydrocarbon group is observed at δ=1.77 ppm. The singlet OH group proton at 5-6 ppm matches with the proton of 2-hydroxy-5(1-methylcyclohexyl) acetophenone in the previous spectra. The 1,2,4-trisubstituted benzene ring manifests itself in the chemical shifts at 6.87 ppm.

In the IR spectrum of the substance, the stretching bands of the para-substituted benzene ring are found at 825, 1240, 1510, and 1592-1610 cm-1, and a maximum band of the associated OH group is observed at 3220 cm-1.

The unmovable bands characterizing the methyl group are found at 2920, 2850 cm-1 (the valence vibration of the OH group) and 1440 cm-1 (the valence vibration of the CH2 group). Bands at 1365 and 2940 cm-1 correspond to the methyl group. The C=O band of the C(O)CH2 group is observed at 1242, 1265, 1276, and 1335 cm-1, and the deformation band of the C-H group is found at 1440, 1460 cm-1 in the unmovable bands.

Thus, the chemical composition of 2-hydroxy-5(1-methylcycloalkyl) acetophenones is substantiated with evidence.

Chemical composition of 2-hydroxy-5 (1-methylcycloalkyl) acetophenones:

Empirical formula: C14H18O2

Molar mass: 218

Boiling point: 150-152 °C (at 10 mm of mercury pressure)

Melting point: 113.3 °C

Conclusion:

Catalytic acylation reactions with vinegar were studied in the presence of anhydrous nano-weighed ZnCl2 catalyst for para-(1-methylcycloalkyl)- and para -(1-methylcyclohexyl) phenols.

It was determined that at a reaction temperature of 135-140°C, for a duration of 30-40 minutes, the yield of 2-hydroxy-5(1-methylcycloalkyl) acetophenones for the target product ranges from 58.3% to 67.4% compared to para-(1-methylcycloalkyl) phenol.

The physicochemical properties of 2-hydroxy-5 (1-methylcycloalkyl) acetophenones were determined, and their chemical compositions were confirmed using IR and 1H NMR spectroscopic methods.

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BASIC ASPECTS OF IN VITRO PROPAGATION TECHNOLOGY FOR FRUIT PLANTS

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Abstract: The article highlights the key aspects of micropropagation technology, one of the methods for vegetative propagation of fruit plants, which has several advantages distinguishing it from other propagation methods.

Keywords: micropropagation, plant, growth environment, rooting, adaptation, rooting

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Introduction:

It is not possible to achieve progress in the field of non-technical development of new biotechnologies. The priority in the development and preparation of scientific and technical priorities has been the multiplication of plants through plant cells, seeds, and vegetative organs. This method allows for a rapid increase in the morphogenetic potential of the plant organism, resulting in an increase in the potential for success in human economic activity. This method allows for a rapid increase in the morphogenetic potential of the plant organism, resulting in an increase in the potential for success in human economic activity. In vitro conditions have solved a number of agricultural problems, including plant biology and plant cell division. It is certainly necessary for the research of these problems to be carried out by highly qualified personnel.

Methodology:

The technology of micropropagation of plants plays a crucial role in the development of science and technology. It enables people to obtain plants with genetic identity to the donor plant, for a whole year in one area. The method of propagating plants in vitro is studied and widely applied in various countries. The best practical results have been obtained through this technology, and the micropropagation of plants has created a new industry.

The advantages of micropropagation combine several aspects. Micropropagation is a non-sexual method that creates genetically identical forms, preserving the genetic material homogeneity. In this way, it is possible to quickly propagate high-value plants and sterile genotypes. Multiplication, speed, and reproducibility provide a ratio of 1:1000000, which allows for the reduction of breeding and selection periods by 2-3 times. Micropropagation also provides a possibility for meristematic shoots to be grown in a synthetic medium, thus achieving a rapid elimination of viruses and other pathogenic microorganisms. It is also possible to increase the yield and profitability of plants, and achieve the goal of extending the dormancy period in vitro conditions. This will increase productivity and profitability.

Results and discussion:

Micropropagation technology consists of several stages:

- Initiation (culturing)
- Proliferation (culturing)
- Rooting (rhizogenesis)
- Adaptation or acclimatization

In the first stage, it is necessary to ensure that the explant is sterile and adapted to the environment, as the success of the micropropagation process depends on obtaining the initial shoots. (Figure 1)

Figure 1. Explant collection and sterilization

In order to stimulate the subsequent development of the isolated explant in vitro conditions, various culture media, including Murashige-Skoog (MS), DKW, Hamberg (B5), and their modifications, are used. The addition of plant hormones to the culture media primarily depends on the plant species, the stage of isolation, and the explant itself (Ahmad, 2003) The temperature and light requirements vary depending on the plant species. Typically, temperatures between +20°C and +25°C are used, along with an illumination intensity of 2000-4500 lux and a photoperiod of 16/8 hours. After 3-4 weeks, individual secondary shoots or somatic embryos form to continue the propagation process. (Lukicheva, 2016)

The goal of the second stage of micropropagation is to maximize the number of obtained protocorms, callus masses, shoots, embryoids, or other structures. It is essential to stimulate the differentiation processes of morphogenetic structures during the multiplication of microclones actively. In most cases, modifying the phytohormonal balance by using culture media from the first stage is sufficient.

In this stage of micropropagation, the composition of the culture medium plays a crucial role in accelerating morphogenesis processes to achieve success. Often, vitamins and growth regulators (modulators) are added to culture media such as MC, DKW, Knudson, Morel, Anderson, Linsmayer-Skoog (LS), and others. The morphogenetic response of the explant depends on the relative concentration of auxins and cytokinins. Higher concentrations of auxins aid in root formation but hinder shoot morphogenesis, while increased cytokinin concentrations activate shoot formation but suppress root development. Balancing these substances results in normal plant development.

During propagation, if each somatic embryo produces approximately five new embryos within 20-25 days, the number can grow to hundreds of thousands within a year, depending on the plant species. At this stage, bacterial contamination can occur due to the lack of natural protection mechanisms in starting explants. Therefore, testing for the presence of infections and cleaning the embryos with various antibiotics are essential practices. (Figure 2)

Figure 2. Reproduction of micro plants

The conditions of the third stage of micropropagation technology should comply with the specific physiological requirements of the propagated plant species. It involves rooting the in vitro shoots, and it is closely related to the induction of adventitious roots. (Fig.3) Certain phenolic compounds, such as fluorescein, chlorogenic acid, quercetin, rutin, and floridzin, can be effective during the rooting of some plant species. (Besedina, 2010)

In the rooting stage, simplified culture media are used, with reduced amounts of mineral salts and sucrose, typically halved in concentration. Except for cytokinin's, auxin levels are usually decreased. (Kalinin, & etc.1980)

To optimally stimulate root formation, short-term subcultivation on media containing auxins is recommended, followed by transferring the shoots to a substrate with no hormones or reduced hormone concentrations. Many authors suggest performing root formation initiation in darkness and attribute it to the strengthening of the inhibitory process of cytokinin depletion in the dark.

Figure 3. Plants rooted in a laboratory condition

Sometimes rooting can be carried out under non-sterile conditions, but for this, the rooting process must be performed in a growth chamber or room with controlled high atmospheric humidity. The mentioned factors indicate that despite the complexity of the root formation intensity's dependence on several factors, the in vitro rooting process can be successfully managed.

The fourth and final stage of the micropropagation technology is adaptation, which involves acclimating the plants obtained under laboratory conditions to non-sterile environmental conditions. This is a crucial and challenging stage because around 70% of plant regenerants face this step during micropropagation. The adaptation process for plant regenerants is divided into four stages:

- Adaptation under laboratory conditions.
- Adaptation under greenhouse conditions.
- Adaptation under shaded conditions.
- Adaptation under open field conditions. (Fig.4)

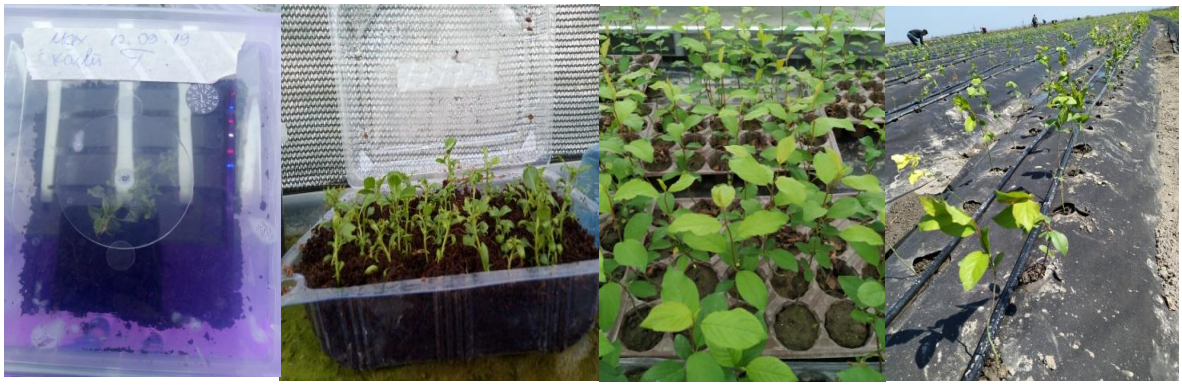

Figure 4. Stages of adaptation of plant-regenerants to open field conditions

Conclusions:

In this stage of micropropagation, the composition of the culture medium plays a crucial role in accelerating morphogenesis processes to achieve success.

To optimally stimulate root formation, short-term subcultivation on media contain-ing auxins is recommended, followed by transferring the shoots to a substrate with no hormones or reduced hormone concen-trations. Adaptation is the crucial and challenging stage be-cause around 70% of plant regenerants face this step during micropropagation.

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STUDY OF VARIOUS VARIETAL SAMPLES OF WHITE CABBAGE IN BREEDING NURSERIES

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Abstract: In the work on the selection and seed production of headed cabbage, there is a need to select plant samples with various morphological characteristics and evaluate these features of the selected samples. Therefore, when studying the characteristic traits identified during the conducted research, the dynamics of these traits were examined when describing the varieties. The studied varieties of white-headed cabbage were selected based on their economic characteristics in the respective nurseries and underwent an evaluation based on morphological traits.
Keywords: white-headed cabbage, selection, phenological observation, trial, seed plant, Anak, duration of vegetation

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Introduction:

The primary aim of intensifying agricultural practices is to increase agricultural production and improve its quality to meet the growing demand of the population. In this regard, our current research is directly aimed at addressing the drought-resistant, high-yield, and high-quality vegetable crop gene pool, paving the way for the intensification of vegetable production in agriculture.

Result and discussion:

This article discusses the research conducted on the selection of summer white head cabbage plant samples and the creation of new varieties that yield continuous and abundant harvests, differentiated by the duration of growth.

As we know, drought is one of the most significant negative factors that affect the growth dynamics of vegetable plant species, including cabbage plants, especially white head cabbage. This is because the primary focus, especially the white head cabbage, is a long-lasting vegetative cycle, which primarily coincides with dry periods in the summer. Therefore, researchers have conducted extensive agricultural practices and prepared long-term plans for combating drought, creating continuous varieties of white head cabbage. (Figure 1)

During the research year 2019-2020, experiments were carried out at the Absheron experimental base of the Azerbaijan Scientific Research Institute of Vegetable Growing (hereinafter the Institute) in the summer cabbage field of the Selection Department, following the subject plan and methodology for conducting selection experiments on summer white head cabbage samples.

As we know, the cabbage plant, like other plants, has a wide range of species diversity. Moreover, a variety of research has been conducted on several main varieties of cabbage for various purposes.

Figure 1. An example of the studied white cabbage

Observations of phenology in summer white cabbage samples in the collection nursery

Results of the research: The technical maturity in the selection area began on October 20-23. The number of days from mass emergence to the start of technical maturity was 105-108 days, and from mass emergence to mass maturity was 112-115 days. (Figure 2)

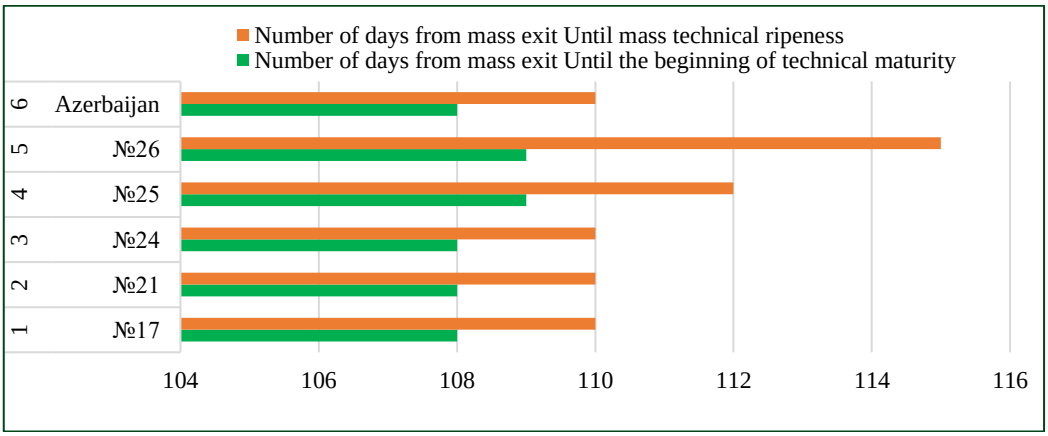

Figure 2. Phenological observations in the collection nursery of spring cabbage samples

Dynamics of changes in the shapes of the heads of cabbages shown in the table 1. "Based on the experience of the selection research of summer white cabbage in the 2018, this year, the same samples have been planted in the control nursery, taking into account the superiority of the biological and productive indicators of the samples in the selection nursery, as shown in the figure 3. As can be seen from the figure, the yield in samples numbered 17 and 25 is 320.0-325.0 c/ha, in samples numbered 21 and 24, it is 330.0-335.0 c/ha, while in sample number 26 and the control variety, it has been 290.0 c/ha in Azerbaijan. as shown in the figure. When compared for productivity, sample #8/1 showed a higher yield of 202 kg/ha. On the other hand Figure 8d, it was observed that the quantity of obtained seeds in the Azerbaijani variety was higher by 36 grams**.** (Figure 4).

Table 1.Dynamics of changes in the shapes of the heads of samples in the collection nursery

Order number	Number of breeding samples' heads	Shapes of cabbage heads				
		Circular	circular-flat	Flat	oval	cone - shaped
1	№17	98,0	2,0	-	-	-
2	№21	94,0	6,0	-	-	-
3	№24	90,0	10,0	-	-	-

4	№25	87,0	13,0	-	-	-
5	№26	-	3,0	97,0	-	-
6	Azerbaijan			97.0		

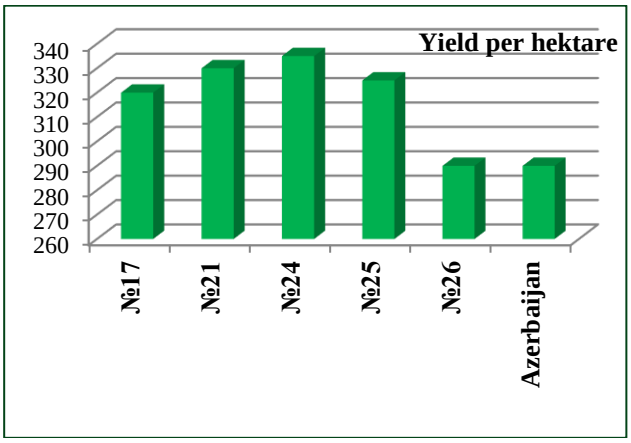

Figure 3. The yield of varietal samples in the collection pitomnik

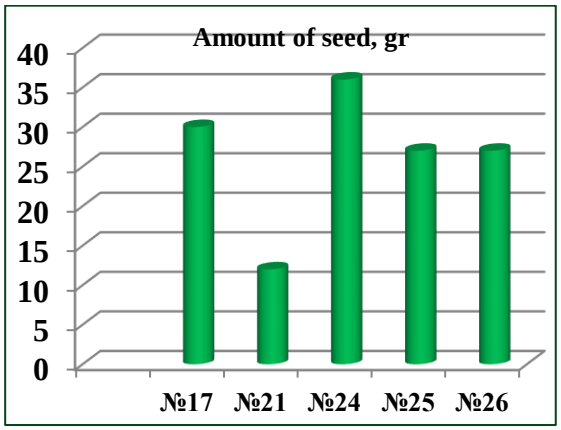

Figure 4. Using the seed from the maternal selection sample that was planted one seed at a time in the collection nursery

The phenological variability of the competitive variety-trial nursery's variety samples is evident from the consecutive development phases among the variety samples in this nursery (Table 2). The analysis of phenological observations is provided in during the research, a comparative analysis was carried out on the weight and productivity of the seedlings of white cabbage samples in a competitive sorting trial nursery.

Table 2.Phenological observations in the competitive variety trial nursery

Number of rows	Sample numbers	Mass output	Date		Number of days from mass exit	
			technical maturity		Until the beginning of technical maturity	Until mass technical maturity
			initial stage	massi		
1	№8/1	11.07	20.10	27.10	107	110
2	№13-4b	10.07	20.10	28.10	109	115
3	Azərbaycan	10.07	20.10	26.10	106	110

The quantity and productivity of seed obtained from the perennial summer white cabbage varieties subjected to a competitive sorting trial nursery:

Cabbage is primarily a biennial plant. In the first year of vegetation, the cabbage plant forms the main head. In the second year of vegetation, seed-bearing plants develop from these heads, which also flower and produce seeds. The seed of the cabbage plant consists of very segmented pods. Its seeds are small, large, thin, and come in various colors such as red, black, and brown. The seeds can remain viable for 4-6 years without losing their germination percentage when stored under suitable conditions.

Conclusion:

Therefore, during research, in addition to other parameters in the selection of parental forms or their evaluation in breeding work, special attention should be paid to these indicators.

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DECORATIVE CHARACTERISTICS OF INTRODUCED WILD APPLE (*MALUS* MILL) SPECIES IN ABSHERON

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Abstract: The ecological significance of introduced decorative apple (*Malus Mill*.) species to the Central Botanical Garden has been studied in the article. Research has been conducted on 19 apple plant species, and it has been determined that the majority of these studied apple species have been evaluated with a score of 3 and 4 for their decorative qualities. These species maintain their decorative appearance for an extended period during the spring, summer, and autumn seasons. Specifically, M.*mandshurica*, M.*micromalus*, M.*baccata*, M.*niedzwetzkyana*, M.*pumila*, M.*purpurea*, M.*orientalis* have been rated with 4 points, while the following species: M.*spectabilis*, M.*hupehensis*, M.*sargentii*, M.*floribunda*, M.*zumi*, M.*prunifolia*, M.*halliana*, M.*sieversii*, M.*cerasifera* have been rated with 3 points. Based on statistical results, the fact that many of these species are considered highly promising and promising indicates their better adaptation to the Absheron conditions. In this regard, the selection of consistently decorative species included in separate clusters and their use in improving the ecological situation in Absheron and obtaining new varieties in decorative gardening and breeding work is purposeful.
Keywords: Malus, introduction, decorativeness, greening, vitality, cluster

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Introduction:

Environmental security issues, which are one of the key factors in ensuring sustainable development, have been incorporated into the national security strategy of many countries due to their importance and national priorities (Agayev, 2013). The development of an environmental security system is not only based on scientific principles but also plays a decisive role in disseminating this idea across all sectors of society (Aremenko, 1964). The issue of environmental protection has been recognized as one of the fundamental functions of states by international legal theorists, aimed at the continuous, sustainable use of the Earth's natural resources for the benefit of current and future generations and the effective management of the global environment to protect against harmful effects (ANAS, 2012). Addressing the violation of ecological balance and the negative effects it poses to living organisms, including plants, is one of the most important issues facing every individual (Sadigov, 2019). Evaluating the prospects and decorative qualities of apple varieties is crucial for their selection and use in greening and landscaping in various areas.

Many wild apple species are distinguished by their high decorative qualities. (E.L. Wolf, 1915) noted in the book "Decorative Shrubs and Trees for Parks and Gardens" that there is no other beautiful flowering plant suitable for decorating gardens except apple. French horticulturist L. Tille recognized the high decorative characteristic of the M.*niedzwetzkyana* species and said, "There is nothing more interesting than this small tree" (Aremenko, 1964)

Various researchers around the world have found that wild apple species, widespread in Central Asia, are resilient to various biotic and abiotic factors in the environment (Sadiqov, 2019). E.N. Sadiqov has obtained various new apple varieties by using wild apple species as rootstocks. According to L.M.Yaremenko Decorative apples belong to the group of light-loving plants. In well-lit areas, their growth and development are accelerated, enhancing their decorative qualities, and they are successfully

used in landscaping. M.S. Aleksandrov (Aleksandrova, 2014) and Y.V. Sedina (Sedina, 2010) have noted that many wild apple species differ in morphological characteristics and are annually decorative. Small-fruited decorative apples are well-known to gardeners and decorators, and there is a growing demand for such varieties. According to K.Q. Tkachenko (Tkachenko, 2009), apple varieties are typically used for their beautiful flowers, fruits, decorative appearance during flowering and fruiting periods, and the autumnal coloring of leaves (Aleksandrova, 2014). In addition to productive apple orchards in various countries, it is also possible to see numerous decorative apple plantations along roadsides (Serebryakov, 1952).

In this regard, the research work is relevant, as it can play a crucial role in identifying resilient apple varieties with high quality, which can contribute to improving the ecological situation and their use in decorative gardening.

Material and methods:

As the research material, 19 wild apple species from the collection area of the Central Botanical Garden were selected. The research assessed the prospects based on vitality indicators (Suhih, 1979) and decorative qualities (Suhih B.F. 1979) of the apple species. To evaluate the decorative qualities of the studied species, a five-point scale suggested by B.F.Suhikhin was used (Suhih, 1979). Plants with decorative features during the vegetation period were rated with 4 points, and those possessing them during a specific time of the vegetation period were rated with 3 points. The obtained results were statistically analyzed, organized, and scientific and practical conclusions were drawn. Cluster analysis of samples was carried out using the Ward method based on the Euclidean genetic distance index.

Results and discussions:

For assessing the decorative characteristics of the species based on planting types: individually (in the foreground and perspective) and in groups (along alleys, in gardens, on street plantings, in hedges, vertical landscaping, etc.), the species were grouped. (Table 1). When selecting varieties for decorative gardening, several decorative qualities are taken into consideration, including the external appearance of plants (height, shape, color of leaves, flowers, and fruits), color change in summer and autumn, flowering (timing of blooming), and the duration of fruiting. Other important factors include abundant flowering, the effectiveness of flowers, resistance to diseases and pests, soil requirements, adaptability to drought, cold, and continuous foliage.

It has been determined that almost all varieties are highly decorative, both when planted individually and in groups. Some apple varieties exhibit higher decorative qualities when planted individually. When planted individually, they attract more attention with their external appearance, flowers, and fruits. *M.spectabilis*, *M.prunifolia*, M.*sieversii*, and *M.mandshurica* varieties are more effective in hedges and along roadsides, while *M.sargentii* is more suitable for lawns and around tall trees.

Table 1. **Classification of apple varieties by planting type**

№	Species name	Main planting types							
		groups	one by one one by one		along alleys (in gardens)	street plantings	unstructured living hedges, on borders	"In living hedges with a given shape"	if vertical landscaping
			foreground	in prospect					
1.	*M. spectabilis*	+	+	-	+	+	-	-	-
2.	*M. hupehensis*	+	-	+	-	+	-	-	-
3.	*M. sargentii*	+	-	+	-	-	-	-	+
4.	*M. floribunda*	+	-	+	-	+	-	-	-
5.	*M. zumi*	+	-	+	-	+	-	-	-

6.	*M. prunifolia*	+	-	+	+	+	+	+	+
7.	*M. mandshurica*	+	+	-	+	-	-	-	+
8.	*M. halliana*	+	-	+	-	-	-	-	-
9.	*M. micromalus*	+	-	+	-	+	-	-	+
10.	*M. prattii*	+	-	+	-	-	-	-	-
11.	*M. baccata*	+	-	+	+	-	-	-	+
12.	*M. hissarica*	+	-	+	-	-	-	-	-
13.	*M. kirghisorum*	+	+	+	+	-	-	-	+
14.	*M. niedzwetzkyana*	+	-	+	-	-	+	+	+
15.	*M. sieversii*	+	-	+	+	+	-	-	-
16.	*M. cerasifera*	-	-	-	+	-	-	-	-
17.	*M. pumilia*	-	-	+	-	-	-	-	+
18.	*M. purpurea*	+	+	+	-	-	-	-	-
19.	*M. orientalis*	+	+	-	-	+	-	-	-

Therefore, they are widely used in creating park compositions. *M.halliana, M.niedzwetzkyana,* and *M.micromalus* varieties are suitable for botanical gardens, dendrological collections, and for shading in urban areas. Their large size also makes them suitable for planting along roadsides. (Gurbanov, 2015) kirghisorum and *M.orientalis* varieties can be planted in forests, both individually and in groups. *M.baccata* is particularly decorative during the flowering period, making it suitable for various mixed and multi-stem groups. Different-sized, circularly trimmed trees are used in these groups. In the center of the group, holly, oak, and common medlar trees are planted. *M.coronaria* is part of the American group and is found in the forests of North America. Its flowers are white or pink, and it is highly decorative. *M.hissarica* is often encountered alongside oak and various trees. *M. purpurea* is effective for planting both individually and in combination with silver-leaved plants (such as silverberry, chokeberry, silver oak, etc.) (Robinson, 2006) The decorative quality of the studied varieties has been assessed using a rating scale (Table 2).

It has been established that the decorative qualities of most species are rated at 3-4 points. The species maintain a decorative appearance for a long time in spring, summer, and autumn. *M.mandshurica, M.Micromalus, M.baccata, M.niedzwetzkyana, M.pumila, M.purpurea, M.orientalis,* receive 4 points, while the remaining species, including *M.spectabilis, M. hupehensis, M.sargentii, M.floribunda, M.zumi, M.prunifolia, M.halliana, M.sieversii, M.cerasifera,* are rated at 3 points.

One of the indicators of decorative quality is the external appearance of trees. M. hupehensis, *M.floribunda, M.prunifolia, M.halliana, M.cerasifera, M.micromalus, M.pratti, M.baccata, M.niedzwetzkyana, M.purpurea* have a beautiful appearance both during flowering and fruiting. *M.niedzwetzkyana, M.purpurea, M.sieversii* varieties are highly effective in decorative horticulture because their leaves, bark, flowers, fruits, and wood have a reddish pigment (anthocyanin). In breeding, it can be used as initial material in obtaining apple varieties with red flesh.

Table 2. The evaluation of the decorative qualities of apple varieties

№	Species name	Scores				
		1	2	3	4	5
1.	*M. spectabilis*	-	-	+	-	-
2.	*M. hupehensis*	-	-	+	-	-
3.	*M. sargentii*	-	-	+	-	-
4.	*M. floribunda*	-	-	+	-	-
5.	*M. zumi*	-	-	+	-	-
6.	*M. prunifolia*	-	-	+	-	-
7.	*M. mandshurica*	-	-	-	+	-
8.	*M. halliana*	-	-	+	-	-
9.	*M. micromalus*	-	-	-	+	-
10.	*M. prattii*	-	-	-	-	-

11.	*M. baccata*	-	-	-	+	-
12.	*M. hissarica*	-	-	-	-	-
13.	*M. kirghisorum*	-	-	-	-	-
14.	*M. niedzwetzkyana*	-	-	-	+	-
15.	*M. sieversii*	-	-	+	-	-
16.	*M. cerasifera*	-	-	+	-	-
17.	*M. pumila*	-	-	-	+	-
18.	*M. purpurea*	-	-	-	+	-
19.	*M. orientalis*	-	-	-	+	-

In various types of plantings, beautiful contrasting compositions can be created, especially when planted next to groups of light green or silvery-colored trees. These species are used in landscape design for single and group hedges.

During the statistical analysis of the obtained results, the data were systematized and grouped based on viability indicators. The species studied using the Euclidean genetic distance index were divided into 5 main groups based on viability indicators (Figure 1).

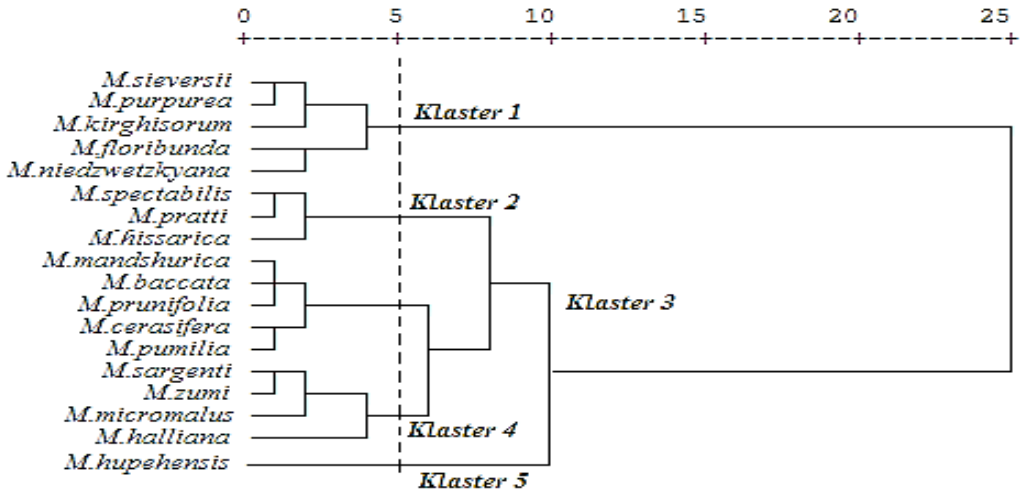

Figure 1. Grouping of apple species based on the application of the Euclidean genetic distance index according to the indicators of apple species' viability.

It turned out that the species included in cluster 5, in terms of viability indicators, differed from the other species. Analysis of the results showed that this species is relatively less promising compared to others. The 5 types included in cluster 1 were entirely promising, while the types included in clusters 2, 3, and 4 were also promising.

It should be noted that the high number of clusters indicates a significant diversity among apple varieties. Those within the same cluster are similar to each other in terms of their vital characteristics, while they differ from the varieties in other clusters. Therefore, it is possible to select varieties with the highest qualities from different clusters for breeding work to develop new varieties with superior characteristics.

The majority of the varieties have been rated with 3 and 4 points based on their decorative qualities. The flowers of the studied varieties are white, pink, and red in color, making them suitable for creating beautiful compositions in individual and group plantings in gardens, along roadsides, and in parks (Figure 2).

Figure 2.Decorative appearance of some apple varieties: 1, 2 - M. pumila, 3-M. niedzwetzkyana; 4th, 5th. si versions; 6th spectabilis, 7th. hissarika, 8th kirghizorum; 9th floribunda; 10 - M. bakkata, 11 - M. mandshurika, 12 - M. prunifolia

Conclusion:

Based on the results, it should be emphasized that the full and prospective adaptability of the studied varieties to the Absheron conditions is indicative of their suitability. Selecting decorative and stress-tolerant varieties that belong to different clusters and continuing ecological improvement in the Absheron region is appropriate for leadership in ornamental horticulture and the development of new varieties in breeding work.

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