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Perspectives on the use of *Platanus orientalis L.* Ganja plane trees in the treatment of some diseases in Azerbaijan

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ABSTRACT

Platanus orientalis is the Eastern plane tree native to the Eastern Mediterranean. It is distributed in several layers in North America, the Pacific Ocean, Europe, Mexico, and the Atlantic Ocean. It is a species suitable for transcontinental migration. During the analysis, it was proven that modern species belong to more ancient lineages. The genesis of this flora and the analysis of phylogenetic studies have revealed that *Platanus orientalis L.* is an ancient species of Ganja city and is widely used in landscaping. Depending on where it grows, plane trees can act as a dominant or subdominant species in an ecosystem. According to scientific studies, plane trees, distinguished by their natural beauty, are distinguished in folk medicine for the treatment of various diseases and their medicinal properties. Since ancient times, the use of natural treatment methods and medicinal plants has been very beneficial for human health. The Oriental plane tree is widely used in the treatment and prevention of various diseases. In order to create balance in the ecosystem, it is important to protect both old and young trees and manage them in a balanced manner in the protection of urban greenery. The importance and benefits of plane trees with medicinal properties are mentioned in the article.

INTRODUCTION

Platanus orientalis L. is a tall, sympodial deciduous tree with thick branches, bark shedding in layers, long-stalked, radially veined leaves, and anemogram tall, complex fruits consisting of nuts and walnuts. It is a relict species that has survived from the Tertiary period to the present day. Plane trees mainly like fertile and moist soils, but are also somewhat drought-resistant. Depending on the growing location, plane trees can act as a dominant or subdominant species in the ecosystem.

Figure 1. General view of the trunk of the Ganja plane tree.

One of the ancient species of Ganja city, the plane trees symbolically play a specific role in the natural and socio-cultural life of people. They are monumental, resilient trees of local community origin, passed down from

generation to generation, carrying the ethno-ecological characteristics of the city (Figure 1) (Novruzov&Bayramova&Cavadova; Tagıyeva&Bayramova 2024). Millennial plane trees are not only a natural heritage, but also have great historical, cultural, and ecological value, as well as providing many benefits to the ecosystem and people (Bayramova&Guliyeva&Akhundova; Bayramova&Tagıyeva&Aliyeva 2024). Ecologically, Platanus orientalis produces oxygen, purifies the air, and creates a habitat for various living beings (Guliyeva&Aliyeva&Mammadova 2024). At the same time, it provides a living and sheltering environment for various bird species, insects, and other living beings. The root system of plane trees is effective in preventing soil erosion and maintains the structural stability of the soil. In addition, this tree species plays an important role in regulating the water cycle and maintaining water balance.

The main objective of the study

The main objective of the study is to study the biological and pharmacological properties of *Platanus orientalis L.* tree, especially to investigate the anti-inflammatory, antioxidant and antibacterial effects of bioactive substances present in its bark and leaf parts. At the same time, the aim is to evaluate the role of this plant in protecting the environment and ensuring biodiversity by looking at its ecological functions.

Platanus orientalis is related to the anti-inflammatory effect of the ancient plane tree species on many diseases. The plant, which is distinguished by its antioxidant and antibacterial properties, can be used as a medicinal plant. The leaves and bark of the plane tree contain strong antioxidant substances. Examples of these substances include flavonoids, tannins, alkaloids, saponins and phenolic compounds.

Platanus orientalis L. is a valuable tree species for extreme weather conditions due to its very long lifespan and drought tolerance. Depending on the conditions, it can cope with temporary flooding and is suitable for large gardens, parks and cities.

Material and methodology of the study

During the study, monitoring was conducted in many areas of Ganja city, including Khan Baghi, Baghbanlar, Attarlar, Shakhsevenlar, Chokak neighborhood, etc. around the city. Oriental plane trees, which are widespread in Ganja city with rich biodiversity, are of special importance as a traditional architectural monument. While conducting a survey from the city residents, information was obtained about the medicinal importance of plane trees and their recommendations and an analysis was conducted. A total of about 100 Platanus orientalis were recorded in various areas. The majority of the recorded trees, namely 68 species, are young plane trees, and 32 species are plane trees of various ages. There are a number of differences between old and young trees in terms of their biological characteristics, size, ecological role, and medicinal importance.

The bark of the *Platanus orientalis L.* plane tree was used in the research. Since the plane tree bark contains flavonoids, tannins, alkaloids, saponins, and phenolic compounds, it was collected and brought to the laboratory to obtain the essential oils and antioxidant substances contained in the bark in laboratory conditions (Figure 2) (Abdullahi Abubakar & Mainul Haque 2020).

Picture 2

Picture 3

Picture 4

The collected shell samples were weighed on a “Kern PFB 1200-2” laboratory scale to the nearest 5 g (Figure 3,4).

After weighing the shell samples, they were first kept under running water for 30 minutes to remove dust and contaminants. As the second stage of the sterilization process, they were shaken in a “Daihan Scientific SHO 2D” shaker at 170 rpm for 5 minutes using a Fary disinfectant (Figure 5,6).

Picture 5

Picture 6

Then, Maceration (storage in solution) and distillation methods were used to separate the essential oils from the plant materials.

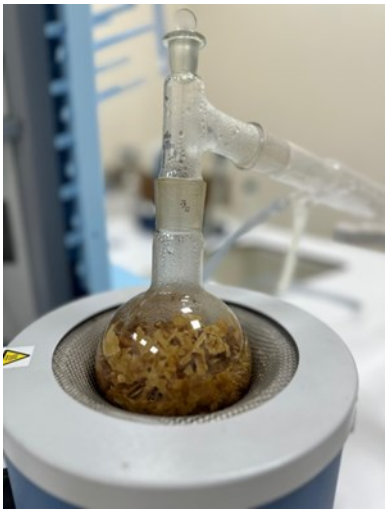
Maceration method

Maceration method, which is one of the extraction methods for extracting bioactive substances from various parts of the plane tree plant, was used. This method is mainly carried out at room temperature and allows the preservation of sensitive, heat-resistant compounds. Two solution samples were used to use the maceration method. The first solution was distilled water, and the second solution was medical ethanol (40%). First, we collect the bark samples collected and washed from plane trees in a 500 ml laboratory beaker and add 250 ml of distilled water.

We add the plane bark samples weighed on a scale to the distilled water to which the plant materials have been added. The temperature of the water to be used for the maceration process should be 100^0 C. For the second sample, 240 ml (40%) ethyl alcohol and 10 g of bark samples were added to a 500 ml laboratory beaker. The plant materials are stored in both solutions for 24 hours at room temperature in menstruum. The main purpose of storing the samples in the solvent (menstruum) is the process of complete separation of the essential oils and other antioxidant substances contained in the product over time. It is also to ensure complete separation of the bioactive substances contained in the plane bark, especially flavonoids, tannins, alkaloids and other antioxidant substances. This process ensures complete extraction of the substances and their accumulation in high concentrations in the solvent. The menstruum should be selected in such a way that it does not harm human health and does not react negatively with the substances contained in the plant samples. Plant samples were stored in 250 ml of pure distilled water and 240 ml (40%) ethanol for 24 hours (Figure 7,8).

Picture 7

Picture 8



Picture 9

The active ingredient components that are released into the solvent at the end of 24 hours are subjected to a filtration process for filtration. During this time, active ingredients, including flavonoids, tannins, alkaloids, etc., pass into the solvent. The main goal here is to filter out and retain the substances that are separated during the maceration process. The active ingredients dissolved in the solvent are retained and the solid particles that are not visible to the eye are separated. The purity of the extract is increased and made suitable for subsequent stages.

Then, the filtered plant samples were stored in the dark for 72 hours. The purpose of storage was to ensure the complete dissolution of the substances in the solution. When using the maceration method, it is very important to properly adjust the pH level of the reaction medium. When using the maceration method, the pH of the reaction medium was adjusted to a neutral environment by using the "Pl-700 AL" parka device. This prevents the extract from being damaged by acid hydrolysis or oxidation. Then, the extracted solution was placed in special packaging for storage in a special refrigerator at -40^0 C to maintain its composition. Increasing the effectiveness of maceration optimizes the transfer of active substances to the solvent.

Distillation method

Distillation method, which is a physical method to separate the components in liquids based on their boiling point, was used (Qing-Wen Zhang & Li-Gen Lin & Wen-Cai Ye; 2018). To obtain the extract by distillation method, 50 g of plane bark was weighed on a "Kern PFB 1200-2" laboratory scale. The weighed plane bark samples were added to a flask and 400 ml of distilled water was added to it. The distillation process was carried out at a temperature of 100 ^{0}C for 10 minutes. After completing the distillation process, the obtained solution was collected in a special laboratory flask and stored at a temperature of -20 ^{0}C (Figure 9). The main purpose of using the distillation method here is that there is no chemical contamination since only distilled

water is used as a solvent. The high temperature of 100°C ensures complete removal of volatiles, while the low temperature of -20°C helps to stabilize the extract. This is important for the stability of the active ingredients and the prevention of oxidation.

DISCUSSION

Both extract samples obtained as a result of the research work are used as an alternative treatment for many diseases in traditional folk medicine, including kidney, mouth ulcers, gingivitis, cardiovascular, joint and phytotherapy. When taken, the extract and infusion obtained from the plant have a calming, immune-boosting, digestive and cell regeneration effects.

The main goal of studying the medicinal value of the plane tree plant is to widely apply natural treatment methods, especially to protect against the side effects of chemical drugs, to determine the potential for the use of biologically active substances in the plane tree in the pharmaceutical industry, and to provide alternative treatments for people by using them more effectively in pharmacology and biotechnology. Thanks to these components, plane tree can potentially be used in the treatment of inflammation, bacterial infections, skin problems, digestive system disorders and joint diseases.

Since ancient times, plane tree has been used as a medicinal plant. Although it is not widely used in modern medicine, plane tree is very popular in ancient folklore in the East as a medicinal plant. According to ethno-botanical information, the bark or leaves of the plant were boiled in vinegar to strengthen the gums. In modern folk medicine, plane tree leaves are also used as an ophthalmological remedy. In general, the plant is promising as a medicinal product.

Anti-inflammatory effect of plane tree

Infusions and extracts made from plane tree leaves are used for rheumatism, joint pain, tooth, throat, and skin inflammation. During the intake of the infusion, inflammation in the body decreases, immunity is strengthened, and it is effective against various diseases. For this, the classic infusion method is used.

In the treatment of skin diseases such as eczema, acne, fungal infections, wounds, and burns, 2 tablespoons of dried plane leaves are steeped in 1 cup of boiling water for 20 minutes, filtered, and applied to the problem area 2-3 times a day. When using this method, it is possible to reduce inflammation in the skin, fight infections, and accelerate the healing process. It prevents the spread of infection and helps the skin renew. This is an effective folk medicine remedy.

Rheumatism and joint pain it used in arthritis and rheumatism. When joint pain occurs, 1 teaspoon of dried plane leaves is steeped in 1 cup of boiling water for 15 minutes and drunk 2 times a day after meals. It is also used externally as a compress on painful areas. During use, inflammation is reduced, mobility in the joints is increased, and blood circulation is improved. It is possible to achieve better results when this method is used for a long time.

In case of respiratory tract asthma, bronchitis, cough, sore throat, sycamore leaf tea is used. Brew 1 teaspoon of dried plane leaves in 200 ml of boiling water and drink it warm 2 times a day. You can use steam inhalation to cleanse the lungs. Boil 3 tablespoons of plane leaves in 1 liter of water, remove the pot from the stove and cool it a little so that the steam is not too hot. Cover your head with a towel, hold your face to the steam and breathe for 5-10 minutes. You can repeat this 2-3 times a day. During application, breathing becomes easier and has an expectorant effect.

In case of gingivitis, mouth ulcers, toothache, boil 1 tablespoon of plane leaves in 1 cup of water, cool it and gargle 2-3 times a day. This is beneficial for the health of the mouth and throat. When used, inflammation is reduced, mouth ulcers are healed, and bad breath is eliminated.

To stop a nosebleed, it is recommended to soak a cold infusion in a cotton ball and place it on the nose. When stopping minor bleeding, crush a plane leaf and place it on the wound and hold it for a few minutes. Bleeding decreases and healing is accelerated. Washing the eyes with a plane leaf infusion has a positive effect when treating eye redness, inflammation, and itching. You should soak a cotton ball in it and apply it to the eyes twice a day. Since the eyes are sensitive organs, sterile conditions are the main condition when using the infusion.

CONCLUSION

The plane tree is widely used in both traditional and modern medicine with its numerous healing properties. However, it is important to use each plant in a correct and balanced way. Although infusions made from the plant's leaves are used for daily health support, extracts are more concentrated and ideal for long-term use. Although the plane plant is natural and beneficial, it is important to consult a specialist before using it. The phenolic compounds and flavonoids contained in the plane tree have strong antioxidant properties. These substances reduce cell damage, fight free radicals and slow down the aging process.

Before using any medicinal plant, it is necessary to consider allergies or other potential side effects. The final result of using medicinal plants is not limited to their medicinal properties, but also helps to protect the natural environment and ensure the balance of the ecosystem. The plane plant has great potential due to both its therapeutic and ecological importance and may be more widely used in alternative treatment methods in the future.

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