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Agrotechnics and Medicinal Properties of *Phacelia Tanacetifolia* in Soil-Climate Conditions of Sirdaryo Region

Abdurashidova Malohat Abduqodir qizi*¹

1. Lecturer at Gulistan State University

*Correspondence: mabdurashidova107@gmail.com

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Abstract: *Phacelia tanacetifolia* is introduced into many countries due to its high ecological adaptability and economic benefits. However, its introduction into new territories may cause a number of ecological and agronomic problems. The rapid spread of the plant and aggressive growth in new territories may threaten ecological stability and lead to changes in regional flora and fauna. In addition, the adaptability of mountain *phacelia* to external conditions and its competition with alien plants pose a threat to some ecosystems. Therefore, before introducing the *phacelia* plant, it is necessary to carefully study its ecological impact and take the necessary measures. Scientific and practical research is needed to improve the action and efficiency of this plant.

Keywords: Flora, medicinal plant, honey plant, introduction, *Phacelia tanacetifolia*, pharmaceuticals, beekeeping.

Introduction

There are more than 182,000 species of wild flowering plants in the world, of which 600–650 species are cultivated. Today, humans use more than 3,000 cultivated and wild plant species for food purposes. Also, in the field of medicine, about 12,000 species of plants are used for various therapeutic purposes.

These data demonstrate the importance of the efficient use of natural resources and their cultivation. This process helps to increase the role of medicinal and food plants in meeting food and medical needs.

Medicinal plants have been known to humanity since ancient times, and they have been widely used not only as food but also as a source of biologically active substances. There is historical evidence that these plants were used for medicinal purposes in Sumerian civilization 5,000 years ago. For long historical periods, medicinal plants served as the sole source of medicinal products [1].

Today, approximately 50% of medicinal preparations produced worldwide are prepared from medicinal plants. In particular, most medicines for cardiovascular, liver, and gastrointestinal diseases, as well as expectorants and hemostats, are created based on these plants.

About 4,500 species of higher plants are distributed in Uzbekistan, of which 1,200 species have medicinal properties. In the republic, 112 species of medicinal plants are officially permitted for use in

medicine, 80% of which grow naturally. This confirms that Uzbekistan's medicinal plant reserves are rich and biologically diverse [2].

In order to meet the needs of the pharmaceutical industry and the population for medicinal plant raw materials, as well as to expand the production of modern medicines, a number of measures have been defined in the Republic of Uzbekistan. Specifically, in accordance with paragraph 3 of the minutes of the Cabinet of Ministers meeting No. 222 dated August 5, 2013, the creation of industrial-scale plantations of medicinal plants was established to organize enterprises for the cultivation of medicinal plants and the production of new medicinal products.

Also, according to paragraph 1.12 of the minutes of the meeting No. 5 dated January 20, 2015, measures have been developed for the development of the forestry system in 2015-2017, as well as for the further expansion of the cultivation, procurement, and processing of medicinal and food plants.

These measures are aimed at developing the pharmaceutical industry by organizing the production of medicinal plant raw materials on an industrial scale. They play an important role in improving the production process of modern medicines and meeting the population's needs for natural medicines [3].

The demand for medicinal plant products in Uzbekistan is increasing every year. This situation leads to an increase in the procurement of raw material reserves for medicinal plants. However, as a result of the depletion of natural reserves due to increased demand, there is a risk that the process of preparing raw materials for certain medicinal plants will be limited or completely stopped.

To solve this problem and ensure the rational use of medicinal plant reserves, it is necessary to establish their cultivation and cultivation on industrial plantations. This approach creates broad opportunities for preserving natural resources, stabilizing the production of medicinal products, and developing the pharmaceutical industry [4].

Research object and methods

The object of the study was the plant *Facelia tanacetifolia* Benth (*Phacelia tanacetifolia* Benth), belonging to the family Hydrophyllaceae.

Phacelia tanacetifolia is an annual plant of the Hydrophyllaceae family, used mainly as a honey-juice and green fertilizer. It has a straight and erect, branched stem 50-100 cm high, covered with fine hairs.

The leaves are lobed, 5-15 cm long, deeply dissected, and covered with coarse hairs. The flowers are gathered in compound corymbose inflorescences and are mainly bell-shaped. The flowers consist of 5 petals, 5 stamens, and 1 pistil, attracting bees and other pollinators due to their pleasant scent.

The fruit is a dry pod, with 2-4 seeds in each. The seeds are small, elliptical, and coarse-grained, possessing the ability to be stored for a long time. This plant possesses a well-developed taproot system and is resistant to various soil and climatic conditions, including cold and drought.

Such biological properties of *Phacelia tanacetifolia* allow it to be used as a nectar plant, green fertilizer, and even as an ornamental plant.

Agrotechnics. *Phacelia tanacetifolia* is an annual plant with the following characteristics:

- Vegetation period: 40–60 days
- Root system: highly developed
- Flowering period: long-lasting
- High ability to secrete nectar

These properties make it valuable as a green fertilizer (siderate) and honey crop.

Soil and climatic conditions of the Syrdarya region

The territory of the Syrdarya region mainly has the following characteristics:

- Soils: sierozems and solonchaks
- Climate: sharply continental
- Annual precipitation: 250–300 mm
- High temperatures during the growing season

Facelia is relatively resistant to salinization and thrives even in low-fertility soils[5].

Fundamentals of Agrotechnics

Soil preparation

- Autumn plowing: 25–30 cm deep
- Spring cultivation: for moisture retention

Sowing period

- Early spring (end of March - beginning of April)
- In autumn, it is also possible to sow green mass as a secondary green manure crop on land

cleared of crops.

Sowing rate

- 8-12 kg/ha of seeds
- Row spacing: 12-15 cm

Care

• Light irrigation (if necessary) is applied more frequently due to high drought conditions in the Syr Darya[6].

- Has the ability to destroy weeds
- Application of mineral fertilizers (NPK)
- Increases the reactivity and porosity of the soil

Yield

- Green mass: 200-300 c/ha
- High nectar yield
- Due to its high nectar yield, it is sown as a secondary crop for beekeepers.

Medicinal properties

Phacelia tanacetifolia has the following medicinal properties:

- Anti-inflammatory effect
- Antibacterial properties
- Due to the presence of ether, it has a calming effect on the nervous system[7].
- It has the property of strengthening immunity

In folk medicine, it is used in the form of infusions and decoctions.

Ecological and economic significance

- Improves soil structure
- Promotes nitrogen accumulation
- An important source of nectar for bees
- Effective in crop rotation

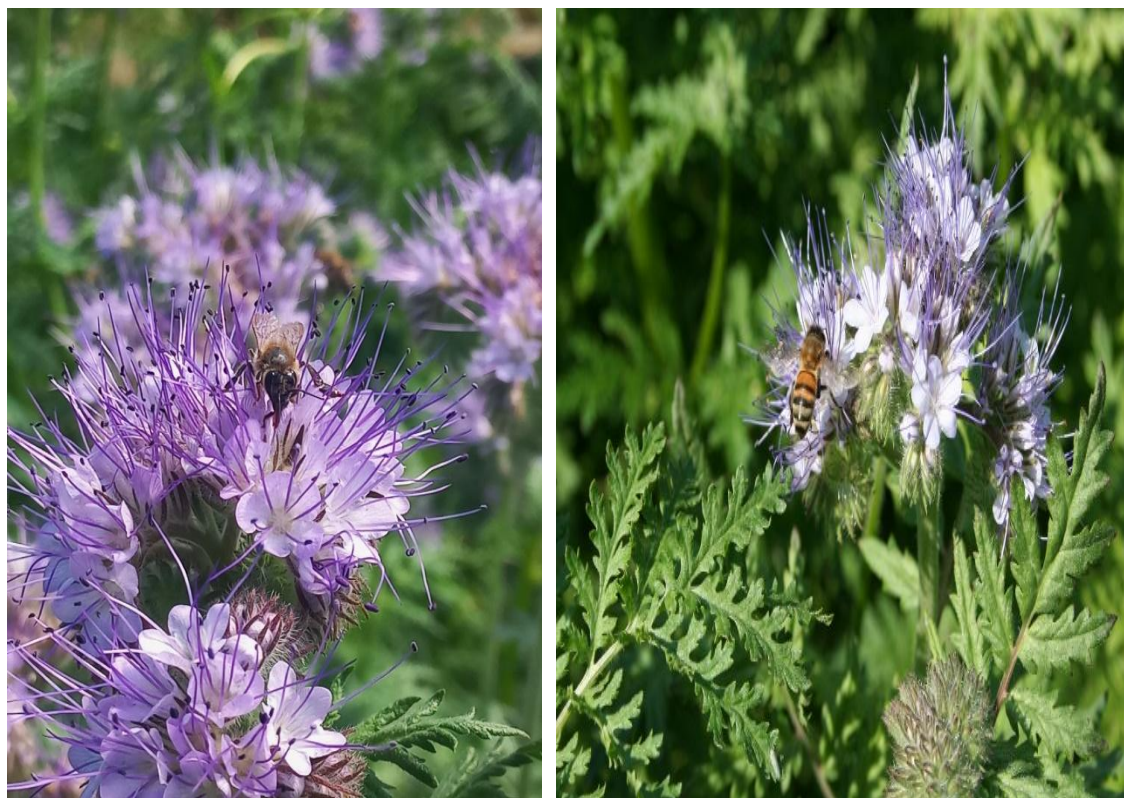


Figure 1. Overview of the *Phacelia tanacetifolia* plant.

Phacelia tanacetifolia flowers and fruits in July-August, and is also cultivated as a nectar plant. The research work was conducted at the research center and experimental site of the Department of Medicinal Plants and Botany of Gulistan State University in the Syrdarya region[8].

Syrdarya region - The weather is sharply changeable and dry. The average annual temperature is 14°C. Often, hot winds (garmsel) dry out the soil and negatively affect plant development. The growing season is 218 days. Annual precipitation is 180–220 mm, mainly in winter. The soils are predominantly light, weakly loose sierozems, slightly and moderately saline, and, according to their mechanical arrangement, loamy and loamy. Saline and solonchak soils are found on the plains [9].

Result and Discussion

The obtained results show that *Phacelia tanacetifolia* is an annual plant that grows well in various soil and climatic conditions, and its bioecological properties allow for its wide application. This plant is relatively frost-resistant and thrives even in arid climatic conditions. Its root system develops strongly and spreads across the fertile soil layer, which increases the efficiency of its cultivation and cultivation in large quantities[10].

This increases the importance of the plant's bioecological properties, especially as a honey-juice and green fertilizer. Its efficient development and adaptation to many environmental conditions make it one of the most important plants in ensuring the stability of ecosystems and preserving natural resources.

Phacelia tanacetifolia is a plant widely used in agriculture, with its primary significance being its use as a nectar and green fertilizer. As a nectar, this plant has the ability to attract bees and plays a crucial role in increasing honey production. The pleasant scent and colorful flowers of *Ph. tanacetifolia* attract bees and other pollinators, which in turn improve the pollination of other plants.

As a green fertilizer, *Ph. tanacetifolia* is effective in enriching the soil, and its root system increases soil fertility. This plant helps increase soil porosity and improves the activity of beneficial microorganisms in the soil. Therefore, it is used in agriculture to improve soil conditions and increase crop yields.

Furthermore, *Phacelia tanacetifolia* is cultivated in various soil and climatic conditions due to its high ecological adaptability. This ensures that it is one of the most common plants in agrotechnics

and sustainable agricultural practices. Its importance in the ecosystem serves to preserve soil, develop beekeeping, and ensure the stability of agricultural ecosystems [11].

Phacelia tanacetifolia is of great importance in beekeeping. Its flower parts and pleasant scent attract bees, which plays an important role in making the honey production process efficient. The high nectar production of the flowers of *Ph. tanacetifolia* is a good food source for bees, resulting in an increase in the quality and quantity of honey.

Furthermore, the long-term flowering of this plant provides bees with a long-term source of nectar, which improves the productivity of beekeeping.



Figure 2. A sample of the *Phacelia tanacetifolia* plant planted in the experimental field.

Phacelia tanacetifolia is also beneficial for beekeeping from an ecological perspective, as it enriches the soil and increases land fertility, thereby improving the quality of the bees' habitat. Therefore, the *Ph. tanacetifolia* plant is widely used as one of the primary plants in beekeeping, and its role is crucial for the efficient implementation of the honey production process [12].

The cultivation technology of the *Phacelia tanacetifolia* plant is an important practice for ensuring its use as a honey-sweet and green fertilizer. To grow this plant, it is necessary to correctly select optimal soil and climatic conditions, as well as agrotechnical measures [13].

The most favorable soil types for *Phacelia tanacetifolia* are fertile, rich in organic matter, and well-irrigated soils. The plant is frost-resistant and thrives in dry and moderately hot climates. For sowing seeds, the soil temperature must be 10-12°C, and the plant also requires well-lit areas.

During the cultivation process, it is important to correctly perform such actions as sowing seeds, watering, fertilizing, and protecting plants from pests. Seeds are sown at a depth of 1-2 cm, and the distance between them should be 20-25 cm. It is necessary to maintain soil moisture before the *facelia* blooms, and it is recommended to apply phosphorus and nitrogen fertilizers to achieve good results.

During the flowering period, the plant not only increases honey production but also enriches the soil and increases its fertility. As a green fertilizer, *Ph. tanacetifolia* is effective in enriching soil and preventing erosion. Therefore, the cultivation technology of *Ph. tanacetifolia* must be carried out correctly and regularly to ensure its effective use in agriculture [14].

The plant *Phacelia tanacetifolia* is notable among new plants of agrotechnical and ecological importance. Its introduction into new territories expands the possibilities for its effective use in

agriculture. *Ph. tanacetifolia* successfully adapts to new conditions due to its high ecological adaptability and rapid development characteristics.

The introduction of the *Phacelia tanacetifolia* plant will provide significant assistance in ensuring environmental sustainability in agriculture, increasing soil fertility, and developing beekeeping. Therefore, the widespread introduction of this plant into new territories leads to agrotechnical and economically efficient results [15].

Conclusion

Cultivating *Phacelia tanacetifolia* in the conditions of the Syrdarya region is economically and ecologically beneficial. It allows for increased soil fertility, increased honey production, and its use as a medicinal product. When the *Phacelia tanacetifolia* plant is introduced into new territories, it is necessary to further deepen the analysis regarding its environmental adaptability and economic benefits.

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