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The Flowering Period and Biological Characteristics of Large-Leaved Alqor (*Mediasia macrophylla* Pimen) under Plantation Conditions

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Abstract

Large-leaved alqor (*Mediasia macrophylla* Pimen) is both a medicinal and a spice plant and is well known among the population for its various therapeutic properties. Its aboveground parts are considered a fragrant raw material used in perfumery. Large-leaved alqor (*Mediasia macrophylla* Pimen) is a perennial medicinal and spice plant belonging to the Apiaceae family and occurs only in natural habitats. Due to its continuous utilization, the species' role and abundance within phytocenoses have been gradually declining. When cultivated from seeds, *Mediasia macrophylla* Pimen flowers in the second year of the vegetation period. Depending on abiotic factors, the period from bud formation to flower opening takes an average of 20 - 22 days. In its natural distribution area, the petals of large-leaved alqor are whitish, whereas under plantation cultivation conditions they were observed to be yellow. The prolonged flowering phase is associated with abiotic factors and with the late formation of buds on annually formed generative shoots. During the study, the structure of the flower, the number of stamens and pistils, the mode of pollination, the diameter and height of buds and flowers, stem structure and stem diameter at different stages of the flowering phase, as well as physiological changes occurring in the flower and its other organs, were observed and recorded. Daily flowering rhythm and seasonal flowering rhythm were also monitored, and the results were documented. During observations of the daily flowering process, air temperature and relative humidity were measured using a psychrometer.

Keywords

Mediasia macrophylla, Medicinal, Spice, Flowering Phase, Vegetation

1. Introduction

The use of spice plants as food and medicine dates back to ancient times and originates from the early stages of human development. In order to survive and meet their needs, humans have long utilized the roots, stems, leaves, flowers, fruits, and seeds of various surrounding plants. In recent years, population growth has led to an increasing demand for medicinal, essential oil-bearing, forage, and melliferous plants. As the demand for medicinal plant products continues to rise, the volume of harvested raw materials has also increased. This, in turn, may result in a sharp limitation or even complete cessation of raw material collection due to the depletion of natural populations of certain medicinal plants in their native habitats. Taking these factors into account, the cultivation of medicinal plants under irrigated experimental field conditions is considered one of the most important issues of the present time [1].

At present, interest in medicinal plants is steadily increasing. During the global pandemic, greater attention to human health, increased awareness of healthy lifestyles, the preference of individuals with chronic diseases for natural remedies to enhance the immune system, and the perceived safety and benefits of natural products have led to a sharp increase in investment in scientific research in this field and in global market demand for medicinal plants.

In this context, special attention is being paid to studying the conditions for domestication, morphology, anatomy, ontogenesis, and phytochemical properties of large-leaved alqor (*Mediasia macrophylla* Pimen), a promising medicinal plant of significant economic importance belonging to the Apiaceae family, as well as to creating an electronic database of bioecological information based on these studies. It is known that large-leaved alqor (*Mediasia macrophylla* Pimen) is both a medicinal and a spice plant, and it is the only species of its genus found in Central Asia. The genus name *Mediasia* is derived from "Asia media" (Middle Asia) with rearranged word order, while the species epithet *macrophylla* reflects its large leaves [2].

Large-leaved alqor (*Mediasia macrophylla* Pimen), a member of the Apiaceae family, is considered endemic to the flora of Central Asia. In Uzbekistan, it grows on mountain slopes at elevations ranging from 1500 to 2800 meters above sea level. The species is distributed across the Tashkent, Fergana, Namangan, and Surkhandarya regions.

Alqor is particularly rich in essential oils, especially in its leaves, flowers, and seeds. Therefore, it is traditionally used by local populations as a food plant and culinary spice. Dairy products prepared with the addition of alqor remain unspoiled for an extended period (up to 15 - 20 days). The dried leaves and seeds, whether shade- or sun-dried, are widely used for pickling cucumbers, tomatoes, cabbage, apples, melons, watermelons, and other products. The plant retains its characteristic pleasant aroma for a long time.

It is mainly used to impart flavor to various dishes and in the preparation of meat and fish preserves. The complex lipids present in its composition are also

utilized in the food industry. *Mediasia macrophylla* is a xerophytic plant adapted to arid conditions. Under natural conditions, it predominantly grows in mountainous areas, particularly on rocky and gravelly slopes [3]-[6].

Chernenko, T. V., Glushenkova, A. I., and Nigmatullaev, A. M. studied the lipids present in the leaves of *Mediasia macrophylla*. The classes of neutral, glycolipids, and phospholipids and their fatty acid composition were identified. The contents of chlorophyll and carotenoid pigments in the leaves and lipid extracts were also determined. The essential oil was isolated by steam distillation, and the presence of both free and bound fatty acids in its composition was recorded. In addition, the researchers established that the chemical compounds found in the leaves and stems of *Mediasia macrophylla* possess therapeutic properties useful in the treatment of rheumatism, nephritis, eczema, herpes, gastrointestinal and liver diseases, as well as for healing damaged tissues. Furthermore, it was found that local populations use an infusion of the roots to stop bleeding [7] [8].

Kamilov, Kh. M. and Nikonov, G. K., while studying the fruits of *Athamanta macrophylla* (Rgl. and Shmalh.) collected in late September from the Chimgan and Pskem valleys, identified two flavonoid subfractions in the RF 0.69 and 0.25 (4:1:5) system. Coumarins were detected in the roots of this species, whereas they had not previously been found in the fruits [9].

The studies conducted by Baser K. H. C., Özek T., Nigmatullaev A. M., Khadzimatov K. K., and Aripov K. N. [9] on the chemical composition of large-leaved alqor are of particular significance. They investigated the chemical composition of large-leaved alqor (*Mediasia macrophylla* Pimen) and reported several important findings. The leaves, stems, and fruits were identified as the main usable parts of the plant, with complex lipid contents of 0.89% in fresh leaves, 0.46% in stems, and 0.42% in fruits.

The leaves, flowers, and seeds of large-leaved alqor (*Mediasia macrophylla* Pimen) contain vitamins A, C, E, B_1, B_2, B_6, and PP, as well as folic acid and choline. The leaves, flowers, and seeds are also rich in essential oils, which impart a strong and pleasant aroma.

2. Research Object and Methods

In studying the flowering biology and daily flowering rhythm of the plant, the methods proposed by Ponomaryov, A. N. [5] and Rabotnov, T. A. [10] were applied. These methods are of great importance for observing the phenological, seasonal, and diurnal flowering biology of the research object.

Large-leaved alqor (*Mediasia macrophylla* Pimen) is a perennial medicinal and spice plant belonging to the Apiaceae family and occurs exclusively in natural habitats. Due to its continuous use, the species' role within phytocenoses has been gradually declining. The study area is located in Jizzakh region, where the distribution range of the species is very narrow. In the natural phytocenosis of the Zomin State Reserve, the population density is extremely low: within a 10 m^2 plot, only one or two individuals of the research species are encountered, while juniper

(*Juniperus* spp.) is the dominant plant. In contrast, in the plant phytocenosis of Mount Parandoz in the Nurata State Reserve, 8 - 10 individuals occur within a 10 m^2 area, and large-leaved alqor (*Mediasia macrophylla* Pimen) is the dominant species (Figure 1).

Both of the above-mentioned areas where large-leaved alqor (*Mediasia macrophylla* Pimen) is distributed are protected territories under state control (Zomin State Reserve—Kulsay: 39.590736˚N, 68.351009˚E; Nurata State Reserve—Parandoz: 40.48704˚N, 66.7784˚E). Access to these areas is restricted, and the use of plant populations within the reserves is strictly prohibited.

Figure 1. Flowering phase of large-leaved alqor (*Mediasia macrophylla* Pimen) (Nurata State Reserve—Parandoz, 40.48704˚N, 66.7784˚E).

In order to conserve the plant within its natural distribution range, expand the scope of its utilization, and involve it in many areas of everyday life, the necessity has arisen to domesticate large-leaved alqor (*Mediasia macrophylla* Pimen).

Natural populations of large-leaved alqor (*Mediasia macrophylla* Pimen.) are found in the Nurata and Zaamin Nature Reserves. In these areas, where the species grows on sandy and stony substrates, its growth parameters differ significantly from those observed under plantation conditions. Specifically, the Nurata and Zaamin State Nature Reserves, where the natural populations are distributed, are located in mountainous regions, and the spring and summer seasons begin approximately one month later compared to the foothill zones.

The cultivation and plantation experiments of *Mediasia macrophylla* Pimen. were carried out under field conditions in the Bakhmal district of Jizzakh region. The annual precipitation in the Bakhmal district ranges between 400 - 500 mm, with rainfall occurring mainly during spring and autumn. The soils are predominantly gray (sierozem) soils, which are considered highly suitable for horticulture and agriculture.

The research object was planted under field plantation conditions. The selected plantation site was favorable for cultivation due to its foothill location, fertile soil, and the absence of a need for artificial irrigation. The experimental plot measured 5 × 6 m. Taking into account the plant's life form and rhizomatous root system, seeds were sown at 40 cm intervals, with 60 cm spacing between rows. The soil was treated with organic fertilizers and biohumus prior to planting.

During the experiment, irrigation was not applied, as seasonal rainfall in the area was sufficient to ensure effective plant growth and successful outcomes. Regular observations were conducted, and the results were systematically recorded.

Observations were conducted daily at 08:00, 12:00, 16:00, and 20:00. Temperature and relative humidity were monitored using a Elitech RC-5 data logger (accuracy: ±0.5˚C, ±3% RH) placed 1.5 meters above the ground in the center of the plantation. The study included a sample size of 10 randomly selected plants, with 17 - 35 individual flowers monitored per plant.

3. Results

According to observations on the structure of the vegetative and generative organs of large-leaved alqor (*Mediasia macrophylla* Pimen) conducted by Sasha W. Eisenman, David E. Zaurov, and Lena Struwe, the following characteristics were noted: the stem thickness ranges from 1.5 to 3 cm; the plant has several stems, 0.5 - 1.5 m in height, hollow, cylindrical and longitudinally striated, thick, and covered with short, dense hairs. The leaves are consistently broad-ovate, 20 - 60 cm long and 20 - 40 cm wide, covered with short hairs, and borne on long petioles. The leaflets are 4.5 - 12 cm long and 3.5 - 10 cm wide, with cordate bases. The compound umbels are apical, 5 - 10 cm in diameter, with 13 - 23 unequal rays; the umbellets are 5 - 6 mm wide and contain approximately 20 flowers. The flowers are white or greenish-yellow and densely pubescent on the outside. The fruit consists of two mericarps forming a schizocarp; the mericarps are flattened, oval in outline, 5 - 6 mm long. The upper leaves are often trilobed, and when crushed, the leaves emit a pleasant aroma. The species is distributed in the Tashkent, Samarkand, Fergana, Kashkadarya, and Surkhandarya regions of Uzbekistan, as well as in the Osh, Chuy, and Jalal-Abad regions of Kyrgyzstan [10].

In large-leaved alqor (*Mediasia macrophylla* Pimen), vegetative buds are arranged oppositely on the stem and terminate in a single apical vegetative bud, whereas generative buds develop either in the axils of vegetative buds or at the apex of generative shoots in the form of compound inflorescences. When grown from seed, the plant flowers and bears fruit in the second year of the vegetation period.

According to its branching pattern typical of the family, large-leaved alqor (*Mediasia macrophylla* Pimen) belongs to the group of monopodially branching plants that form botryoid inflorescences. In this type, growth is indeterminate, and lateral shoots are also often considered indeterminate. The main inflorescence is well defined, and flowers open in acropetal succession from bottom to top. Botryoid inflorescences may be simple or compound in structure.

Large-leaved alqor (*Mediasia macrophylla* Pimen) forms a compound umbel inflorescence, in which simple umbels collectively form a compound umbel. Beneath each simple umbel, small involucral bracts are present, while larger involucral bracts are located at the points where the simple umbels join.

The budding process began in the first decade of May. Depending on abiotic

factors, it takes an average of 20 - 22 days for buds to open into flowers. The buds are surrounded at the base by long, ligulate involucral bracts. Each simple umbel is enclosed by 4 - 5 to 8 - 9 bracts, whereas compound umbels are surrounded by 10 - 12 to 20 - 22 ligulate bracts. The length of the ligulate bracts is up to 5 - 6 mm, and their width is 1 - 2 mm. These bracts dry and fall together with the petals.

Large-leaved alqor (*Mediasia macrophylla* Pimen) produces a compound umbel (a compound botryoid inflorescence type), in which flowers open from bottom to top, and the growth of the generative shoot is continuous. In the axil of a single vegetative bud and on a generative stem, there are 5 - 7 to 12 - 15 flowering peduncles. Each peduncle bears 5 to 7 - 12 compound umbels. The onset of the initial budding phase of large-leaved alqor (*Mediasia macrophylla* Pimen) was recorded on May 7, 2024. At the initial budding stage, the pedicel length was 1 - 2 mm, and the diameter of the simple umbel was 3 - 4 mm. The mass budding phase occurred in the third decade of May, during which more than 70% of the flowers formed buds. The first day of the flowering phase began on May 30. During flowering, the pedicel length reached 3 - 5 mm, and the diameter of the simple umbel was 7 - 8 mm. A compound umbel contained from 8 - 10 to 22 - 25 simple umbels. The flower diameter of large-leaved alqor (*Mediasia macrophylla* Pimen) during flowering was 1 - 2 mm (Figure 2).

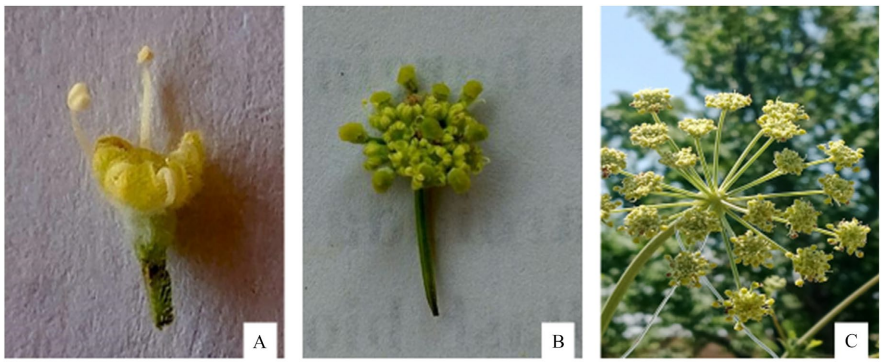

Figure 2. Large-leaved alqor (*Mediasia macrophylla* Pimen): (A) single flower view; (B) simple umbel view; (C) compound umbel inflorescence view.

Figure 3. Flower opening (anthesis) of large-leaved alqor (*Mediasia macrophylla* Pimen).

The flower of large-leaved alqor (*Mediasia macrophylla* Pimen) is bisexual, with a simple perianth; the sepals are reduced. During flowering, the petals open first, followed by the elongation of the stamens and pistils. The petals are whitish (as

observed in the natural distribution area) or pale yellow (under plantation field conditions). In both research environments, the filament is whitish and the anthers are pale yellow; the number of stamens is five, and when the flowers are fully open, the filament length is 4 - 5 mm (**Figure 3**). The pistils are light green, fleshy, inferior, and bicarpellate. When the flowers are open, the pistil length is 2 - 3 mm. Before anthesis, the flowers are oriented upward; after full opening, they bend slightly downward. Flower longevity depends on air temperature and humidity and lasts from 3 to 8 days. After 2 - 3 days, the petals of opened flowers turn whitish, and after 4 - 5 days they begin to dry. After 1 - 2 days, the anthers dehisce and pollen is released. The acceleration of this process depends on air temperature and proceeds more rapidly at higher temperatures. Pollination of the research object occurs by entomophily, with common yellow bees (*Apis mellifera* L.) as the main pollinators.

The end of the budding period was recorded on June 8, 2024. The mass flowering period occurred in the first decade of June. Before the flowering phase was completed, the first formed flowers began to set fruit, starting on June 15. The flowering phase ended in the third decade of June.

In the second year of flowering, newly formed annual generative shoots began budding somewhat later, on May 14-15. At the onset of budding, the height of the generative shoots was 90 - 100 cm.

During flowering, the diameter of the main flowering stem was as follows: 1.5 cm in the upper part, 3.2 cm in the middle part, and 4.0 cm in the lower part. At the same time, the diameter of the main vegetative stem was 1.0 cm in the upper part, 1.6 cm in the middle part, and 2.0 cm in the lower part. All measurements were carried out using a vernier caliper.

During the seasonal flowering process, the peak flowering period occurred in the first and second decades of June (in the 2024-2025 period). The lack of synchrony in the flowering phase is due to the non-simultaneous maturation of buds.

During the mass flowering period of large-leaved alqor (*Mediasia macrophylla* Pimen), which occurs in the first decade of June, flower opening is continuous throughout the day; however, the number of flowers opening depends on temperature and humidity. The highest number of flowers opening occurs between 12:00 and 14:00, when the air temperature reaches +25˚C to +30˚C and relative humidity is 30% - 34%. At this time, the number of open flowers составляет 60% - 63% of the total number of flowers. The peak of flowering activity occurs at around 14:00. Flower opening continues until 20:00. Once flowers open, they do not close again in the evening (**Figure 4**).

Flower opening lasts for 20 - 25 days depending on weather conditions. The duration of flower opening is influenced by the age of the plant and air temperature; shoots formed in the current year produce buds later, which in turn prolongs the overall flowering phase of the plant. The mature fruit splits into two mericarps, forming a paired schizocarp that remains suspended on the pedicel. By the end of the flowering period, the length of the flowering shoot reaches 280 - 300 cm.

The flowering percentage was calculated as the ratio of open flowers to the total number of buds observed. The diurnal flowering rhythm (Figure 4) was plotted based on the hourly rate of new flower openings. Statistical analysis was performed using OriginPro 2024, and significance was determined at $P < 0.05$.

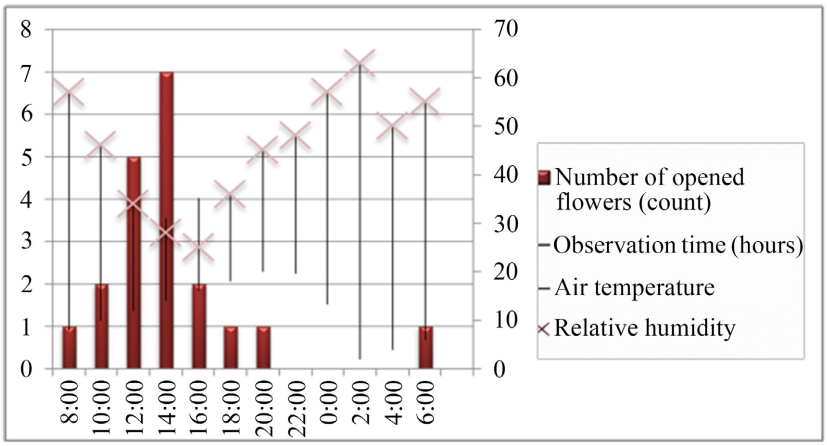

Figure 4. Diurnal flowering rhythm of large-leaved alqor (*Mediasia macrophylla* Pimen).

In 2025, the flowering onset was recorded on May 2, with the peak flowering period occurring between June 1 and June 16. During the peak, the average number of active flowers per plant reached 35, which is significantly higher/lower than previous years.

The variation in flower color is potentially linked to anthocyanin accumulation and changes in vacuolar pH as the flower matures. While the extended 47-day flowering period observed in 2025 suggests a higher potential for seed yield, it necessitates strategic harvesting. Specifically, for essential oil production, the optimal harvest window is during the peak flowering stage when chemical concentration is highest; therefore, we recommend artificial cultivation practitioners to maintain consistent soil moisture during this period to maximize essential oil accumulation.

4. Discussion

During the study of large-leaved alqor (*Mediasia macrophylla* Pimen.), noticeable morphological differences were observed between plants growing in natural populations and those cultivated under plantation conditions. In natural habitats, the petals of individual plants were predominantly whitish, whereas plants grown in plantation fields developed yellow petals. This variation may be attributed to several environmental and ecological factors.

First, the natural populations are distributed in mountainous regions where the onset of spring occurs approximately one month later than in foothill areas. Such a delay leads to a shortened and postponed vegetation period, which directly influences plant growth and developmental processes. The relatively lower temperatures characteristic of mountain environments likely play a significant role in

determining floral pigmentation and other morphological traits.

Furthermore, differences in soil conditions may also contribute to the observed variation. The soils of the foothill plantation sites are more fertile and nutrient-rich compared to the rocky and less developed substrates typical of natural habitats. Enhanced soil fertility may promote more intensive metabolic activity and pigment accumulation, resulting in changes in flower coloration.

Overall, these findings suggest that environmental factors, particularly temperature regime and soil fertility, substantially influence the morphological characteristics of *Mediasia macrophylla*.

5. Conclusions

Observations and measurements were carried out under field experimental conditions. After being grown from seed, large-leaved alqor (*Mediasia macrophylla* Pimen) flowered in the second year of the vegetation period. Depending on abiotic factors, the average period from bud formation to flower opening was 20 - 22 days. In the natural distribution area, the petals of large-leaved alqor (*Mediasia macrophylla* Pimen) were observed to be whitish, whereas under plantation cultivation conditions they were yellow. The prolonged flowering phase is explained by abiotic factors and by the late formation of buds on annually formed generative shoots.

During the study, the flower structure, the number of stamens and pistils, the mode of pollination, the diameter and height of buds and flowers, stem structure and stem diameter at different stages of the flowering phase, as well as physiological changes occurring in the flower and its other organs, were observed and recorded. Diurnal and seasonal flowering rhythms were monitored, and the results were documented. During observations of the diurnal flowering process, air temperature and relative humidity were measured using a psychrometer.

The duration of flower opening depends on plant age and air temperature; shoots formed in the current year produce buds later, which prolongs the overall flowering phase. During the seasonal flowering process, the mass flowering period (for 2024-2025) occurred in the first decade of June. The duration of seasonal flowering of large-leaved alqor (*Mediasia macrophylla* Pimen) in 2024 lasted from May 7 to June 22, totaling 45 days. In 2025, the seasonal flowering duration increased to 47 days.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Jurayeva, D.E. (2023) Methods for Preparing Raw Materials of Medicinal Plants in Medicine. *Proceedings of the International Conference on Scientific Research in Natural and Social Sciences*, Toronto, 5 May 2023, 31-35.

[2] Khojimatov, O.K. and Bussmann, R.W. (2023) *Mediasia macrophylla* (Regel &

Schmalh.) Pimenov—APIACEAE. In: Khojimatov, O.K., *et al.*, Eds., *Ethnobiology of Uzbekistan*: *Ethnomedicinal Knowledge of Mountain Communities*, Springer International Publishing, 491-495. https://doi.org/10.1007/978-3-031-23031-8_50

[3] Usmonxodjayev, A., Basitxanova, E.I., Pratov, O.P. and Djabbarov, A. (2018) Etymological Modern Encyclopedia of Medicinal Plants Growing in Uzbekistan. Yangi asr avlodi Publishing House. (In Uzbek)

[4] Khassanov, F.O., Tojibaev, K.Sh. and Turdiboev, O.A. (2024) Endemic Genera in the Flora of Middle Asia. Kamelinskie Chteniya (Special Issue), 266-270.

[5] Ponomaryov, A.N. (1960) Study of Flowering and Pollination of Plants. In: *Field Geobotany*, Vol. 2, Academy of Sciences of the USSR, 9-18. (In Russian)

[6] Ikromova, Y., Umurzakova, Z. and Rasulova, Z. (2025) Determination of Germination of *Mediasia macrophylla* Pimen. Seeds in Plantation Conditions. *E3S Web of Conferences*, **650**, Article No. 02003. https://doi.org/10.1051/e3sconf/202565002003

[7] Chernenko, T.V., Glushenkova, A.I. and Nigmatullaev, A.M. (2002) Lipids from *Mediasia macrophylla* Leaves. *Chemistry of Natural Compounds*, **38**, 307-309. https://doi.org/10.1023/a:1021657520719

[8] Bahora, N., Abdukodir, M., Nurali, M., Nigina, F., Tursunmurod, D., Asatillo, R. and Sabina, K. (2026) GC-MS Analysis of Essential Oil Isolated from *Mediasia macrophylla* Plants. *Central Asian Journal of Medical and Natural Science*, **7**, 243-247.

[9] Baser, K.H.C., Özek, T., Nuriddinov, K.R., Nigmatullaev, A.M., Khadzimatov, K.K. and Aripov, K.N. (1997) Essential Oils of *Mediasia macrophylla* (Regel et Schmalh.) Pimen. and *Foeniculum vulgare* Mill. from Uzbekistan. *Journal of Essential Oil Research*, **9**, 249-250. https://doi.org/10.1080/10412905.1997.9699474

[10] Rabotnov, T.A. (1975) Study of Coenotic Populations to Determine the Life Strategy of Plant Species. *Bulletin of the Moscow Society of Naturalists* (*Biology Section*), **80**, No. 2.