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Primary Results of *Ipomoea nil* (L.) Roth. of Introduction Conditions in Tashkent Botanical Garden

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Abstract

The article is devoted to the study of bioecological features of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden. Seeds were sown 8 - 10 cm deep in the first decade of April. Seed germination averaged 85% - 90%. The beginning of vegetation and leaf regrowth in Tashkent is observed in the second decade of April. The flowering phase was observed in the first decade of August and fruiting was noted in the first decade of September. Biometric indicators of the plant during the generative phase were revealed as follows: plant height 2.95 ± 0.22 m, generative shoot length 2.62 ± 0.24 m, number of leaves 46.5 ± 3.59 pcs., leaf length 10.11 ± 0.49 cm, root length 19.85 ± 0.88 cm, number of flowers 42.8 ± 2.37 pcs., flower diameter 4.82 ± 0.28 cm. Potential seed productivity (PSP) of the plant was noted 13.5 ± 0.5 pcs., real seed productivity (RSP) was 10.8 ± 0.44 pcs. And in turn, the seed productivity coefficient (SPC) amounted to 80.0% ± 1.31%. The primary results prove, according to the success of *Ipomoea nil* introduction, the noted indicators in Tashkent conditions.

Keywords

Ipomoea nil, Tashkent Botanical Garden, Phenology, Vegetation, Flowering, Fruiting, Correlation

1. Introduction

Climate change is changing the biodiversity around the world and among the key responses to spatial and seasonal changes in environmental temperature are changes in phenology, that is, changes in seasonal life-cycle events [1] [2]. In the middle

and high latitudes in the Northern Hemisphere, spring events usually occur earlier, while autumn events occur later, mainly due to rising temperatures [3]. In general, responses are expected to be faster and more distinct, the higher the latitude or altitude, the lower the average temperatures [4].

Global climate change has recently accelerated significantly, opening the way for mankind to increase the biological diversity of cultivated crops by introducing heat-loving crops in the northern latitudes [5].

Ipomoea nil is an annual herbaceous climbing plant, a species of the genus *Ipomoea* in the family Convolvulaceae. From ancient times it was used and cultivated as a medicinal plant, later it began to be cultivated to a greater extent as an ornamental plant. It is universally cultivated as a garden or houseplant. It is appreciated for its funnel-shaped flowers, many varieties are bred that differ in color, size of flowers and leaves. A very popular cultivated plant in Japan, a "symbol of fleeting beauty" in Japanese literature. Poisonous plant. Used in traditional Chinese medicine [6].

The natural distribution area is the tropics of North and South America: Mexico, the Antilles, the countries of Central America, as well as all (with the exception of Chile) the countries of South America [7].

It is cultivated throughout the world, often runs wild. As an alluvial plant, *Ipomoea nil* is found on the Arabian Peninsula, in South Asia, in most countries of East and Southeast Asia (including China and Japan), in the Philippines, in Australia and in some territories of the Pacific Ocean. In nature, it grows in thickets on mountain slopes, along roadsides, in fields, is woven into hedges. It occurs at altitudes from 0 to 1600 m above sea level [8].

Ipomoea nil seeds have toxic properties. To taste, they are bitter and caustic, cause numbness of the tongue. In traditional Chinese medicine, mature dried plant seeds are used (sometimes they are additionally fried over low heat until they begin to burst, and then, after cooling, finely grind), here they are known under the generalized pharmaceutical name Pharbitidis Semen. They are used as a diuretic, laxative, expectorant and anthelmintic [9].

Seeds of the plant have been used since ancient times in China as a laxative. In the VIII century, the plant got from China to Japan, where at first it was cultivated precisely as a medicinal, but over time it became more and more perceived as decorative [6].

Ipomoea nil, like all representatives of the genus, loves moderately moist, nutritious, loose, light soils. The presence of lime in its composition is not a problem. It is not recommended to plant plants in areas with highly acidic, heavy, clayey and waterlogged soil. Lowlands with stagnant cold air or precipitation are also not suitable for cultivating crops. *Ipomoea nil* is also very sensitive to lighting. If other species get along well in semi-shaded areas, then this species accepts only sunny places. Another important feature of the plant is the excess of organic matter. There is no point in adding organic matter to the soil if it is fertile enough. Excess fertilizers will only accelerate the growth of green mass; this will not affect the

abundance of flowering. On the contrary, the plants will have worse flowers. Therefore, it is enough to apply a complex of mineral fertilizers closer to the onset of flowering. It is very important to limit the amount of nitrogen fertilizers [10].

Unfortunately, until today, there are no introduction studies of *Ipomoea nil* in the conditions of Uzbekistan.

Based on the above, the purpose of this study, the introduction study of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden.

2. Research Methods

Planting material, that is, seeds were brought from Japan. Seeds were sown at 8 - 10 cm depth in the first decade of April in the laboratory "Introduction of medicinal plants" of the Tashkent Botanical Garden named after Academecian F.N. Rusanov at the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan.

Phenological observations were carried out every 3 days from the beginning of April to the end of August using the generally accepted method for annual plants [11]. When studying the biology of flowering, we carried out according to the method of A.P. Ponomarev (1960), and also the seed productivity of plants by T.T. Rakhimova (2009) [12] [13]. The results of the studies were statistically calculated using the method of Rokitsky (1973) [14] and processed using the Past 3 program.

Tashkent Botanical Garden is located in the north-eastern part of Tashkent (473.3 m above sea level). Tashkent Botanical Garden is the largest in the Central Asian region, and in Uzbekistan it is registered as a unique natural site. Its area of 68 hectares of land is divided into 5 sections: plants of the East Asian, Indochinese, circumboreal (Crimea, Caucasus, Europe), North American and Central Asian floristic region. Our research was conducted on the experimental section of the laboratory "Introduction of medicinal plants" of Tashkent Botanical Garden [15].

Ipomoea nil is an annual (sometimes short-lived perennial) herbaceous plant. The stems are thin, twining or creeping, somewhat angular, in adult plants they reach 2 to 5 m in length. The pubescence of the plant is low or moderate, the hairs are simple, from 1 to 4 mm long, reddish-brown. The leaf petioles can have different lengths—from 2 to 15 cm. The leaf blades are broadly ovate or almost round, from 4 to 15 cm in diameter, cordate at the base, with a pointed apex; entire, sometimes three- or five-lobed [8].

3. Results

Seeds were sown 8 - 10 cm deep in the first decade of April. The beginning of vegetation and leaf regrowth in Tashkent was observed in the second decade of April. The germination rates of the plant seeds averaged 85% - 90%. At this time, the biometric indicators of the plant were noted as follows: the height of the plant averaged 9.62 ± 0.37 cm, the shoot length was 3.68 ± 0.17 cm and the root length was 5.4 ± 0.15 cm (**Figure 1**).

Leaf regrowth and bud appearance in *Ipomoea nil* in Tashkent was observed in

the first decade of August. The earliest flowering was noted on 03.08, later than 10.08. The duration of flowering in one plant is on average 20 - 25 days and varies with the fruiting phase, since in some bushes fruiting is observed in the phases of flowering at the same time. In this phase, biometric indicators of the plant are marked as follows: plant height 2.95 ± 0.22 m, generative shoot length 2.62 ± 0.24 m, number of leaves 46.5 ± 3.59 pcs., leaf length 10.11 ± 0.49 cm, root length 19.85 ± 0.88 cm, number of flowers 42.8 ± 2.37 pcs., flower diameter 4.82 ± 0.28 cm (Figure 2).

Figure 1. Beginning of *Ipomoea nil* vegetation in Tashkent Botanical Garden.

Figure 2. Flowering phase and underground part of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden.

Fruiting was observed in late August-early September. The seed formation period lasts about 10 - 15 days. Each capsule forms on average 8 - 15 seeds of 0.5 - 0.8 mm in size. The diameter of the capsules is on average 1.5 - 2.5 cm. For better visualization of the seed productivity of *Ipomoea nil*, we studied 10 bushes of plants (n = 10) forming fruits. As a result, the potential seed productivity (PSP) of the plant was 13.5 ± 0.5 pcs., the real seed productivity (RSP) was 10.8 ± 0.44 pcs and, in turn, the seed productivity coefficient (SPC) was 80.0% ± 1.31% (Figure 3).

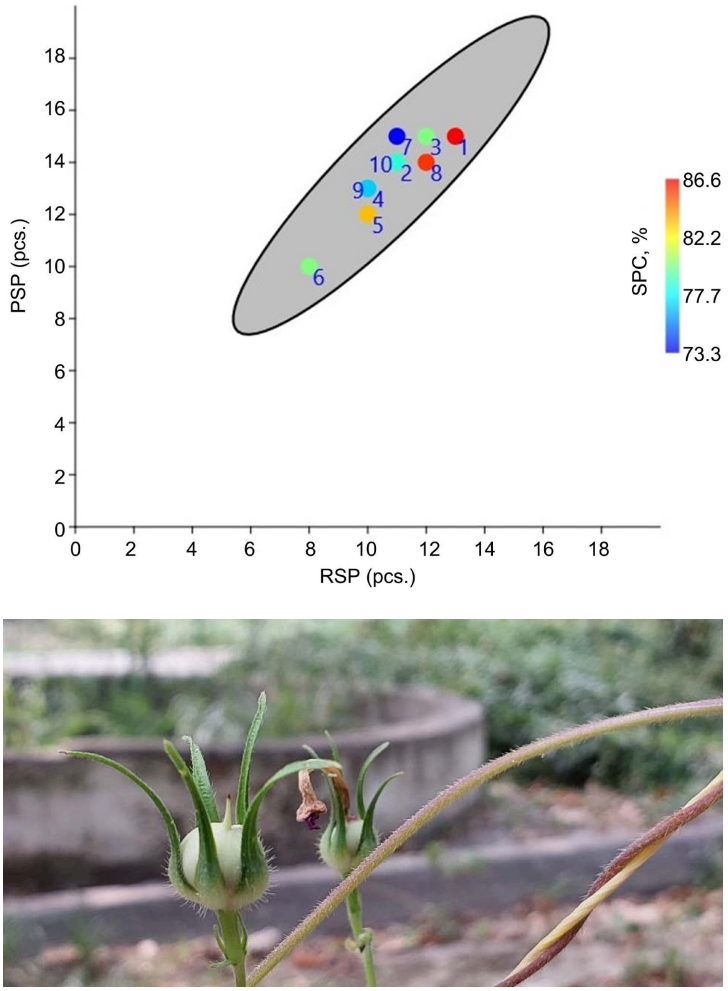

Figure 3. Seed productivity of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden.

According to phenological observations, it was found that plant vegetation begins at positive temperatures (18˚C - 23˚C) by the beginning of the vegetation. The flowering phase begins at temperatures of 35˚C - 37˚C and during the fruiting phase, a decrease in temperature to 29˚C - 32˚C is noted.

For better visualization of the influence of climatic and edaphic factors on the growth and development of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden, we conducted an analysis of the correlation r-Pearson. For the

correlation analysis of plant growth and development, climatic factors, air temperature, air humidity and soil surface temperature were selected at the beginning of vegetation, flowering and fruiting phases. As a result, the correlation between factors such as air temperature and soil temperature on plant growth and development is a positive correlation r = 0.89. The correlation between air humidity is negative r = 0.95 (Figure 4).

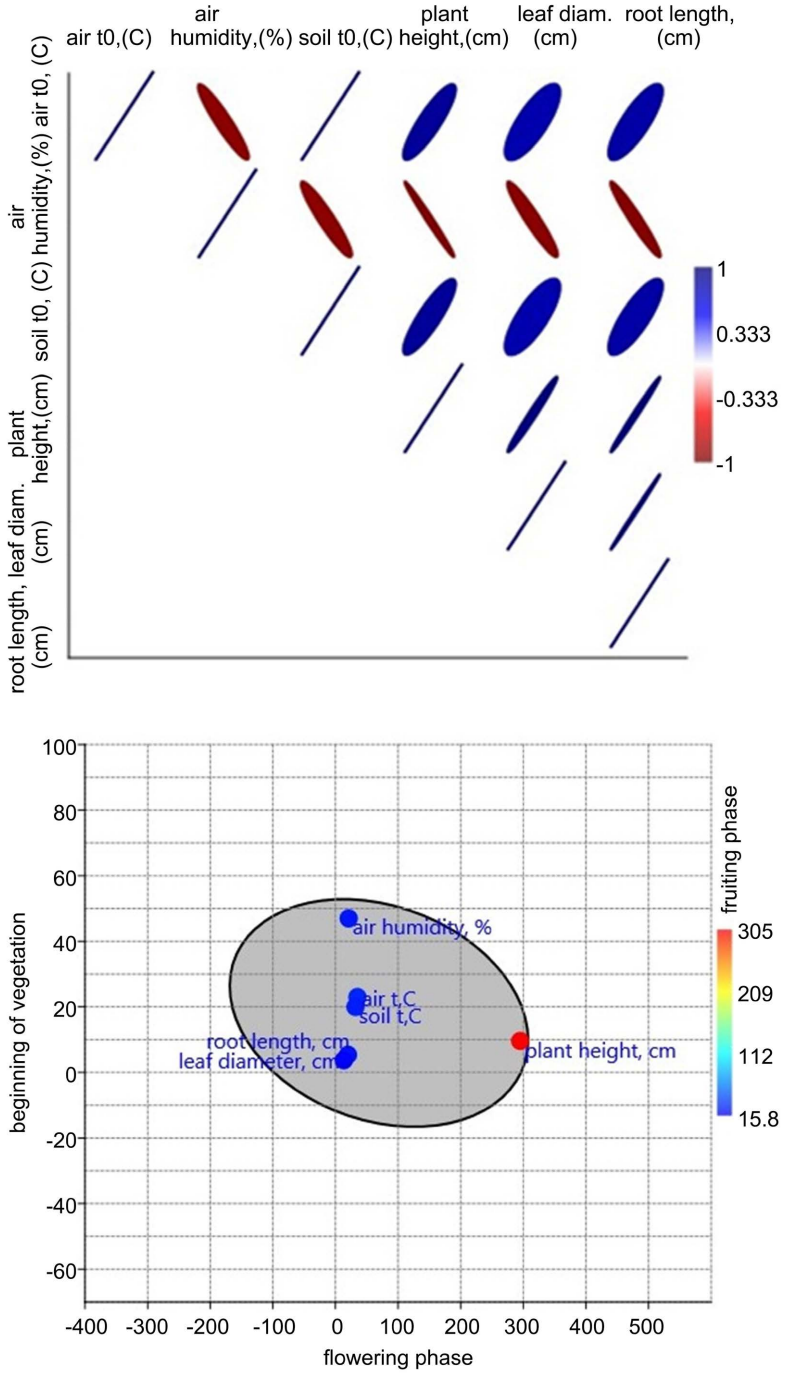

Figure 4. Correlation between factors on the growth and development of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden.

4. Discussion

Air temperature and soil temperature play a major role in plant development. The optimum air temperature for seed germination is from 18˚C to 20˚C. The difference in soil temperature between air temperatures varies up to 3˚C. These indicators are observed throughout the entire season of *Ipomoea nil* development in the Tashkent Botanical Garden. Extremely high or low temperatures can cause stress to the plant, which leads to the absence of flowering. In the hot summer months, it is necessary to observe, and maintain a sufficient level of soil moisture. Since, recently in our region in the summer there has been a tendency to increase the air temperature above 40˚C.

5. Conclusions

As a result of the primary introduction studies of *Ipomoea nil* in the conditions of the Tashkent Botanical Garden, the seed germination was on average 85% - 90%.

At positive temperatures from 18˚C to 23˚C, the beginning of vegetation is observed. The flowering phase begins at temperatures of 35˚C - 37˚C and during the fruiting phase, a decrease in temperature to 29˚C - 32˚C is noted.

The earliest flowering was noted on 03.08, the latest on 10.08. The duration of flowering in one plant is on average 20 - 25 days and varies with the fruiting phase, since in some bushes, fruiting phases are observed simultaneously with flowering.

The period of seed formation lasts about 10 - 15 days. Potential seed productivity (PSP) of the plant was 13.5 ± 0.5 pcs., real seed productivity (RSP) was 10.8 ± 0.44 pcs. and in turn the seed productivity coefficient (SPC) was 80.0% ± 1.31%.

The primary results prove, by the success of *Ipomoea nil* introduction, the noted indicators in the conditions of the Tashkent Botanical Garden.

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Conflicts of Interest

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

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