

BIOLOGICAL SCIENCES

USE OF HIMALAYAN BIRCH (*BETULA UTILIS*) IN LANDSCAPING IN BULGARIA - BENEFITS AND RISKS

Glogov P.

Assoc. Prof., PhD

Silviculture and Management of Forest Resources

Zaemdzhikova G.

Assoc. Prof., PhD

Forest entomology, phytopatology and game fauna

Forest Research Institute- Bulgarian Academy of Sciences

Sofia, Bulgaria

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Abstract

The Himalayan birch (*Betula utilis*) is a valuable exotic species for landscaping, possessing a number of medicinal properties. Unfortunately, this is one of the host plants of the highly aggressive pest Japanese beetle (*Popillia japonica*), which has not yet been registered on the territory of the Balkan Peninsula. The aim of the present study which is held in September, 2024 is to present current data on the import of Himalayan birch in Bulgaria, the possibilities for its use in landscaping and the risk associated with the spread of the invasive Japanese beetle on the territory of the country.

To achieve the aim of the study, the following tasks are set: 1. Study of the import and distribution of the species for the needs of landscaping on the territory of Bulgaria; 2. A case study of an artificial plant community in the region of Lomazzo (North Italy) where the species *Betula utilis* var. *jacquemontii* (Spach) Winckler dominated the tree layer and is in poor health status. 3. Assessment of the defoliation of *B. utilis* individuals (in %) 4. Identification of the potential benefits and risks of using *B. utilis* in Bulgarian horticultural practice.

The survey shows that some garden centers and horticulture stores in Bulgaria (mainly in the cities of Sofia, Varna and Plovdiv) offer *B. utilis* and its subtaxa such as *B. utilis* 'Doorenbos' (form of *Betula utilis* var. *jacquemontii*), *B. utilis* 'Long Trunk' (weeping form). Both- whole individuals and graft plants are imported from Romania, Italy and the Netherlands. At the current stage, the species is distributed on the territory of the country in small quantities - single units intended for private home gardens.

The studied artificial plant community on the territory of Italian town Lomazzo has a clear three-layer structure and a mosaic distribution of the dominant heliophyte species. The total coverage of the tree floor is about 55%, and it is dominated by *B. utilis* var. *jacquemontii* (35% projected coverage). Over 80% defoliation of the crowns is recorded in all individuals as a result of an attack by *Popillia japonica*. For the rest of the plant species in the community, a large part of which are also found in Bulgaria at that stage, no damages caused by this pest were detected.

The conditions in Bulgaria at the moment (and given the climatic prospects) are far from the ecological requirements of the Himalayan birch, but nevertheless it is clear that its subtaxa are already being imported and planted in our country. This makes the species a potential vector for the expansion of Japanese beetle range. Therefore, along with the valuable decorative qualities and medicinal properties, the use of the Himalayan birch in landscaping carries some serious risks, the most significant of which is its vulnerability to *Popillia japonica*, and for this reason its import to our country as a decorative species must be strictly controlled.

Keywords: landscaping, decorative trees, invasive alien species, pests.

Introduction

The Himalayan birch (*Betula utilis* D. Don (Betulaceae) is a tree species reaching 20 m in height, due to the loss of the central stem at an early age, it often has a shrubby habitus. It is naturally distributed from Inner Mongolia north of China to Yunnan province in the south and over the Himalayan region of Afghanistan, Bhutan, India, and Nepal. The Himalayan birch is found mostly at 3000-4200 m a.s.l., sometimes descending to 1800-2100 m. Forms pure or mixed plantations with *Abies pindrow* (Royle ex D. Don) Royle, *Pinus wallichiana* A. B. Jacks., *Picea* spp. and other tree species. *B. utilis* prefers acid, neutral, and basic (alkaline) soils. This species can grow in semi-shade (light woodland) or no shade. It also requires moist soil. According to official data in Europe, the species was introduced only on the territory of the British Isles, but its

subspecies, forms and varieties are used in the landscaping of a number of countries such as the Netherlands, Germany, Italy, etc. [1, 2, 3, 4]

In the countries where it is distributed naturally *B. utilis* is a valuable timber tree of commercial importance. This species is versatile medicinal plant which is a unique source of phytochemical compounds such as betulin, lupeol, oleanolic acid, acetyloleanolic acid, betulic acid, lupenonesitosterol, methylbetulonate, methylbetultriterpenoid, karachic acid. The active constituents of Himalayan birch obtained from the plant shows anticancer, anti-inflammatory, anti HIV, antioxidant and antibacterial activity [1].

Betula utilis var. *jacquemontii* (Spach) Winckler is among the most preferred taxa of genus *Betula* (together with *Betula alleghaniensis*, *B. davurica*, *B. nigra*, *B. nigra* 'Heritage', *B. papyrifera*, *B. populifolia*,

B. pubescens, *B. Uber*) for feeding the larvae and adults of an invasive insect species - the Japanese beetle-*Popillia japonica* Newman (Scarabaeidae, Coleoptera) [5]. This pest is native to Japan and is registered as an invasive alien species in a number of countries in northern and central Europe and North America. The Japanese beetle has an unusually wide host range; it feeds on over 300 species of plants, both tree and shrub species, as well as agricultural crops, causing irreversible damage to their vegetative parts. At this moment, there is no evidence that *P. japonica* has been detected in Bulgaria. On the territory of our country, Japanese beetle can develop 1 generation per year, while in Europe it reaches up to 3 generations per year. Without management and control of this species, negative impacts can be expected on a number of plants of economic importance for Europe and in particular for Bulgaria [6].

The aim of the present study is to present current data on the import of Himalayan birch in Bulgaria, the

possibilities for its use in landscaping and the risk associated with the spread of the invasive Japanese beetle on the territory of the country.

Materials and methods

The object of study is the species *B. utilis* and its subspecies, varieties and forms distributed in Europe. The investigation is conducted in September, 2024. To achieve the aim of the study, the following tasks are set:

1. Study of the import and distribution of the species for the needs of landscaping on the territory of Bulgaria. Questionnaire method is used to study the import and spread of *B. utilis* for the needs of Bulgarian landscaping including research of the presence of this tree species in garden centers and landscaping companies in different cities.

2. A case study of an artificial plant community in which the species *Betula utilis* var. *jacquemontii* (Spach) Winckler dominates the tree layer and is in poor health status. The study area is a hotel garden in the region of Lomazzo, Como province, Northern Italy (Fig. 1).



Fig. 1. Location of the study area

The field observations are made in the period 04-09 September 2024. The area of the community is 1000 m², elevation 300 m a.s.l., coordinates: 45°42'36.7"N 9°01'28.3"E (fig. 2). The following investigations are performed:

- phytocoenological characteristics of the community (species composition, vertical structure, coverage of plant species (in %). For the plant species identification and taxonomic nomenclature [2, 7] are used.
- identification of the main pest on *B. utilis* individuals in the study area is according to [8,9,10] and characteristics of its eco-biological features;



Fig. 2. Fragments of the studied artificial plant community and the degree of defoliation of the crowns of individuals of *B. utilis* var. *jacquemontii* due to *Popillia japonica* impact (Photo: P. Glogov)

3. Assessment of the defoliation of *B. utilis* individuals (in %) in accordance with the methodology of [11];

4. Identification of the potential benefits and risks of using *B. utilis* in Bulgarian horticultural practice.

Results and discussion

The survey shows that some garden centers and horticulture stores in Bulgaria (mainly in the cities of Sofia, Varna and Plovdiv) offer *B. utilis* and its subtaxa such as *B. utilis* 'Doorenbos' (form of *Betula utilis* var. *jacquemontii*), *B. utilis* 'Long Trunk' (weeping form). Both- whole individuals and graft plants are imported from Romania, Italy and the Netherlands. At the current stage, the species is distributed on the territory of the country in small quantities - single units intended for private home gardens.

The studied artificial plant community on the territory of Italian town Lomazzo has a clear three-layer structure and a mosaic distribution of the dominant heliophyte species. The total coverage of the tree layer is

about 55%, and it is dominated by *B. utilis* var. *jacquemontii* (35% projected coverage), accompanied by the species *Chamaecyparis lawsoniana* (A.Murray bis) Parl. (15%), *Robinia pseudoacacia* L. (5%), *Quercus castaneifolia* C.A.Mey. (5%); *Osmanthus fragrans* Lour. predominates in the shrub layer with a 35% coverage. The layer of the grasses has about 60% coverage, with a higher quantitative participation of the species *Trifolium repens* L. (15%), *Lavandula angustifolia* Mill. (5%), *Cynodon dactylon* (L.) Pers. (5%), *Bellis perennis* L. (2%) and other herb species.

On the territory of the studied area, 5 individuals of *B. utilis* var. *jacquemontii* are established with an average height of 5.5 m and average stem diameter 14.3 cm. Over 80% defoliation of the crowns is recorded in all individuals as a result of an attack by *Popillia japonica* (Fig. 3). For the rest of the plant species in the community, a large part of which are also found in Bulgaria at that stage, no damages caused by this pest are detected.



Fig. 3. Individuals of *P. japonica*. Pheromone trap. Leaf damage caused by Japanese beetle (Photo: P. Glogov)

Some horticulture specialists define Himalayan birch as an excellent landscape tree that displays a graceful form and mixes well with evergreens [12, 13]. Most of the the questioned representatives of Bulgarian garden centers and stores confirms its decorative qualities. This tree grows in a cold outdoor environment and the crown changes its contrasting colors according to the annual seasons. Its trunk the bark of which casually peels off is also very attractive. It offers incalculable advantages as a medicine plant, an important renewable natural resource, and also cleans the air from bacteria and viruses.

Identified problems and risks are connected with poorly growth in climates with hot, humid summers. Weakened and stressed birches become very vulnerable to pests like Japanese beetle, bronze birch borer, aphids, birch leaf miner, birch skeletonizer and dieback [12]

Conclusions

According to [14], *Popillia japonica* is the main pest on *B. utilis*. Although on its limited scale, the present study showed that the Japanese beetle preferentially attacks individuals of Himalayan birch. This choice is probably due to the fact that *B. utilis* is placed outside its natural range, in terms of altitude, temperature and humidity, which reduces the defenses of this tree species and makes it vulnerable to diseases and pests.

The conditions in Bulgaria at the moment (and given the climatic prospects) are far from the ecological requirements of the Himalayan birch, but nevertheless it is clear that its subtaxa are already being imported and planted in our country. This makes the species a potential vector for the expansion of Japanese beetle range, whose hosts are widely distributed in the EU, and the climatic conditions in Central and Southern Europe including in Bulgaria are suitable for the development of this pest. The larvae of the Japanese beetle feed on the roots of the host plants, which means that they can be introduced along with the soil from the saplings.

Therefore, along with the valuable decorative qualities and medicinal properties, the use of the Himalayan birch in landscaping carries some serious risks, the most significant of which is its vulnerability to *Popillia japonica*, and for this reason its import to our country as a decorative species must be strictly controlled.

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