THE ORIGIN OF THE WOODY SPECIES OF PINES CULTIVATED IN THE SYLVA ARBORETUM IN GURAHONȚ, ROMANIA

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RESEARCH ARTICLE

Abstract
The Sylva Arboretum, located in Gurahonț, Romania, serves as a key site for the research and conservation of tree species, including pines. This arboretum boasts a remarkable assortment of tree species from around the world, with a particular focus on the origins of pine species, which are the subject of this study. The present work delves into the origins of the pines planted here, highlighting their ecological diversity. Through a meticulous analysis of the collected data, it was established that the majority of these species originate from Europe, North America, and Asia, with a particular emphasis on native species from the Carpathian Mountains. Furthermore, the research underscores the importance of introducing and acclimatizing exotic species, which play a crucial role in enhancing biodiversity and promoting ecological stability. The findings of this study have significant implications for the sustainable management of forest resources and biodiversity conservation amidst the challenges posed by climate change. In summary, the Sylva Arboretum exemplifies an effective model for the conservation and study of pine tree species, illustrating the critical need to integrate traditional knowledge with contemporary scientific approaches in the management of forest ecosystems.

Keywords: arboretum sylva, pinus, forest ecosystem, Biodiversity, Forest resources
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INTRODUCTION

The distinguished forestry engineer Eusebiu Ștefan took on the significant task of identifying and utilizing the geographical area known to the inhabitants of that period as the "old park," located within the picturesque boundaries of the Honțișor Valley, in the Gurahonț commune of Arad County. Both the Monograph of the Park, written by the esteemed engineer Eusebiu Ștefan in 1992, and the SYLVA Arboretum 1983, explicitly state that the "Garden Journal" contains a comprehensive account detailing the origins of this notable park. This documentation clarifies that between 1882 and 1889, significant efforts and steps were taken toward establishing a unique dendrological park, designed to encompass a layout defined by trees and flowers, accompanied meticulously by detailed planting instructions and cultivation guidelines. Furthermore, the aforementioned journal reveals that the initial plantings within the limits of Gurahonț began as early as 1750, with various botanists making observations starting in 1883. During this crucial period, the construction of the Arad-Brad railway was also underway, a project that began in 1885. It is noteworthy that the land upon which the "Sylva" Arboretum now stands was once part of the estate owned by Benjamin Boroș, who, with great foresight, developed this area into a space for recreation, cultivating both native and exotic plant species and maintaining the land with the diligence characteristic of a true nature enthusiast.

Upon the unfortunate death of Benjamin Boroș, the estate, which had been lovingly cared for, was inherited by his son, who, being a lawyer and lacking the necessary knowledge, made the decision to sell the property. Following the sale of this historically significant land, it fell into neglect and degradation, resulting in numerous destructive actions, including the removal of trees, acts which could be considered criminal, particularly cases of abusive grazing that further exacerbated the deterioration of the ecosystem.

In light of these unfortunate circumstances, in 1965, forestry engineer

Eusebiu Ştefan, visiting the site once known as the park, found it in a completely deplorable state, characterized by destruction, overcrowding, and extensive grazing, with parts of the area being used by certain individuals as an improvised refuge and recreational spot.

Subsequent to 1965, initial efforts were launched with the aim of transforming this neglected land area into a dendrological botanical garden, commonly referred to as an Arboretum, covering an area of 4.6 hectares, which represented the historical extent of the old park. It was also here that engineer Eusebiu Ştefan succeeded in expanding this park by an additional 8 hectares, ultimately recording the presence of 2,578 taxa with 3,465 specimens.

In the period after 1990, the efforts of engineer Eusebiu Ştefan to keep the entire area 12.6 ha were in vain because optimal solutions were not found to fairly reconcile the former owners of the land. Due to the resulting situation, in the period that followed only the initial area of 4.6 ha benefited from adequate care, to the detriment of the collection made on 8 ha. As argued by F. Morozan (2018): The negative effect of the authority of res judicata refers to the party who lost the trial, as he can no longer call into question his right in another trial. Thus, a solution agreed at the local level was found, and in 2003, by a decision of the Gurahonţ local council, the Sylva Arboretum entered the custody of the University of Oradea for a period of 49 years. Since 2015, the University of Oradea, the West University of Timisoara and the University of Agricultural Sciences and Veterinary Medicine of Banat, have joined a consortium for the management of the park.

In a broad and comprehensive examination of the climatic variable of temperature in the specified geographical region over the analyzed time period, it can be conclusively stated that:

- The annual average temperature fluctuates between 8.8°C and 12.2°C, which is considered extremely favorable for the vigorous and healthy growth of various plantation species. Moreover, the conclusions outlined above also apply to observations regarding the recorded annual minimum and maximum average temperatures during the same period. Analytical evaluation suggests that the soil composition in this region is predominantly classified as sandy clay, characterized by a significant presence of particles ranging from 0.2 to 1.002 mm in size, constituting approximately 57.2% of the total soil composition.

- Furthermore, the soil exhibits a slightly acidic reaction, as indicated by the low pH value of 5.65, which suggests an acidity level that may influence the biological and chemical processes occurring in this soil ecosystem..

MATERIAL AND METHOD

The SYLVA Arboretum is geographically located at 46°15'59" N, 22°20'47" E (Google Earth, 2024).

For determining the results, all pine specimens cultivated in the Sylva Arboretum were identified from the archive, with specifications regarding their origin.

Field data were collected to verify the presence or absence of these specimens, as well as their characteristics (height, number of existing specimens, health status). It should be noted that data were collected only for the 19 plots currently managed in this study.

The data were collected during the 2023-2024 period. The biomorphological analysis of the woody plants in the SYLVA Arboretum was conducted according to the criteria set by Sokolov S.Ya. and Sviazeva O.A. (1965), and more recently utilized by E., A. Parakhina et al. (2021), as follows:

D1 – tree size I (height greater than 20 m);
D2 – tree size II (height 16-20 m);
D3 – tree size III (height 11-15 m);
D4 – tree size IV (height up to 10 m);
K1 – shrub grade I (height greater than 6 m);
K2 – shrub grade II (height 4-6 m);
K3 – shrub grade III (height 2-4 m);
To4 – shrub grade IV (height up to 2 m).

RESULTS AND DISCUSSIONS

Arboretums represent meticulously curated botanical gardens primarily dedicated to the extensive collection, careful cultivation, and comprehensive study of a diverse range of trees and shrubs. These remarkable sanctuaries fulfill multiple functions, encompassing scientific research, conservation efforts, educational initiatives aimed at both students and the general public, as well as recreational opportunities that allow individuals to engage with nature.

The significance of arboretums lies not only in their ability to conserve biodiversity by providing living collections that serve as essential resources for ecological and evolutionary research, but also in their capacity to offer invaluable educational experiences to

learners of all ages, thereby enhancing public understanding of botanical sciences. Moreover, these vital landscapes contribute to broader urban greening initiatives and play a crucial role in environmental conservation efforts aimed at mitigating the impacts of urbanization and promoting ecological sustainability.

In essence, arboretums are not merely repositories of plant life but dynamic centers of knowledge that foster a deeper appreciation for the natural world and highlight the importance of conserving the diverse ecosystems of our planet. Ultimately, the multifaceted contributions of arboretums to society underscore their significance as both scientific institutions and community resources in the pursuit of environmental management and education.

Figure 1 **Specimens of Pinus sylvestris L., remaining from the old park of Beniamin Boroș**

Figure 2 **Specimen of Pinus pinaster Aiton and Pinus armandii Franch, Sylva Arboretum 2024**

Table 1

The Origin and Characteristics of Pine Trees in the Sylva Arboretum

No.	The Name	Size				Identification / Plot number	The number of specimens	The health condition	The origin
		D1	D2	D3	D4				
1	Pinus banksiana Lamb			*		146/IV	1	Good	Montreal Canada
2	Pinus nigra var.Poiretiana (Ant) Asch et Graebn		*			17/V	1	Good	Kamoni Ungaria
3	Pinus sylvestris L.		* *			21/V 102/VI	1 1	Good	Gurahonț Romania
4	Pinus strobus L.		*			44/V	1	Good	Simeria România
5	Pinus dalmatica Ait			*		77/V	1	Broken tree top	Kiev (Foemina) Ucraina
6	Pinus ponderosa Laws		* *			81/V 83/V	1 1	Good	Bazos Romania
7	Pinus Armandi Franch		*			96/V	1	Good	Kamoni Ungaria
8	Pinus koraiensis SZ		*			103/5	1	Good	Potsdam Germania
9	Pinus resinosa Ait		*			116/V	1	Good	Bazos Romania
10	Pinus peuce Griseb			*		11/VI	1	Good	Kamoni Ungaria
11	Pinus sylvestris ,,Glauca,,			*		19/VI	1	Good	Kamoni Ungaria
12	Pinus pinaster L.		*			57/VI	1	Good	Nancy Franta
13	Pinus pinaster Ait ,,Magrebiana,,		*			85/VI	1	Good	Antibes Franta
14	Pinus sylvestris var. hamata Stev		* *			128/VII 138/VII	1 1	Good	Chorog Tadjikistan
15	Pinus nigra var. Poiretiana(Ant)Aschers			*		147/VII	1	Good	Kamoni Ungaria
16	Pinus nigra var. caramanica(Loud)Rehd			* *		166/VII 196/VII	1 1	Good	Soci Rusia
17	Pinus monticola Lamb			* *		77/XI 78/XI	1 1	Good	Liege Belgia
18	Pinus rigida Mill		*			96/IX	1	Good	Otawa Canada
19	Pinus sylvestris L. var. mongolica Litvin		*			85/XIII	1	Good	Snagov Romania
20	Pinus Thunbergii Parl			*		89/XIII	1	Good	Snagov Romania
21	Pinus armandi Franch				*	90/XIV	1	Good	Alba Iulia Romania
22	Pinus sylvestris L. var. mongolica Litv			*		96/XIV	1	Good	Snagov Romania
23	Pinus mugo Turra		*			118/XVI	1	Good	Iasi Romania
24	Pinus kokiana Klotz ex C. Koch		*			96/XVIII	1	Good	Pamir Tadjikistan
25	Pinus sosnowskii Nakai		*			105/XVIII	1	Good	Tbilisi Georgia

CONCLUSIONS

The origin and characteristics of the pine specimens meticulously cataloged in the esteemed Sylva Arboretum are notable for the fact that a substantial majority, constituting a significant 50%, originates from Romania. This can be easily explained by referring to the comprehensive monograph expertly authored by the distinguished engineer Eusebiu Ştefan. This situation is contextualized within the historical framework of the Communist regime, which predominated in earlier periods, a time when establishing correspondence and maintaining communication with other institutions and similar entities in the same field of study was exceedingly difficult. It appears that a remarkable collaboration existed between engineer Eusebiu Ştefan and several entities located within the geographical confines of Hungary, as evidenced by the interesting statistics indicating that the percentage of pine specimens cultivated in the arboretum is an impressive 17% of the total pine species cultivated in this sanctuary.

The provenance of pine taxa, accounting for 7%, is deduced to be from both Canada and France based on the empirical data collected in the current investigation. The provenance of pine taxa, comprising 4%, has been established for Ukraine, while a uniform percentage of 3% is recorded for each of the following nations: Germany, Russia, Belgium, Tajikistan, and Georgia.

Debazac E.F. (1964) argues that pines, except for those species whose native habitats are specifically mountainous or subalpine regions, have not withstood the harsh conditions of the Hort de Dieu. ("Thus, large reforestation species such as Scots pine, Austrian black pine, and Corsican pine yielded poor or mediocre results. The failure of American-origin pines (P. strobus, P. rigida, P. ponderosa, P. banksiana) has been more or less complete. Only mountain pines, such as Pinus cembra, P. pence, P. leucodermis, P. uncinata, and P. pumilio, are vigorous, though all grow slowly.")

The various species within the genus Pinus, when situated within the confines of an arboretum, play an extremely crucial role in enhancing the local ecosystem, not only by increasing biodiversity but also by facilitating processes associated with ecological restoration. These species simultaneously exert a significant influence on the interactions between the various species within that ecosystem. These multifaceted contributions can be viewed as encompassing a wide range of direct and indirect ecological functions that are vital for maintaining ecological balance. More specifically, the presence of different Pinus species serves to create and support suitable habitats for a multitude of diverse organisms, aids in the restoration of degraded areas, and influences the complex dynamics of plant communities through intricate mechanisms involving both interspecies competition and their potential for coexistence in a shared environment.

With regard to biodiversity enhancement, Pinus species can support a diverse range of plant and animal species by providing habitat and resources. For instance, in Portugal, Pinus pinaster forests are associated with various taxonomic groups, and management decisions can enhance biodiversity conservation in these areas (Maia et al., n.d.). In Indonesia, Pinus merkusii forests support a variety of tree species, with 83 species recorded in different growth stages, indicating their role in maintaining species diversity (Supartono et al., 2023).

Another aspect is species diversity, where Pinus species can both support and inhibit biodiversity. In some cases, they facilitate the growth of native species by providing a habitat that mimics natural succession processes, as seen in the facilitation of endangered cloud forest species under Pinus patula plantations (María Luz et al., 2016).

Habitat provision: Pine forests can serve as important habitats for various species, including some that are endangered. They offer structural diversity that supports different life forms, although this can vary depending on management practices and site quality (Ponce et al., 2017).

Arboretum Sylva, currently appreciated and recognized as a vast and well-organized open-air laboratory, fundamentally dedicated to the rigorous study and systematic observation of a diverse range of plant life forms, serves as a vital component of the practical training and experiential learning of students enrolled in the Department of Forestry and Forest Engineering of the University of Oradea, with various educational activities and exercises carried out within its limits. The remarkable and diverse collection of pine species, together with a significant multitude of other tree species that have been carefully cultivated, carefully organized and strategically positioned in this special location, is poised to exert a profoundly

beneficial influence on ecological and environmental outcomes in the future.

Figure 3 **Practical activity of students from the Department of Forestry and Forest Engineering, University of Oradea**

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