

The hidden urban parasite: occurrence of mistletoe (*Viscum album*) in selected areas of Prešov

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Abstract

European mistletoe (*Viscum album*) is an evergreen hemiparasitic shrub that represents an increasing challenge for urban greenery in Central Europe. This study aimed to map the occurrence of mistletoe on urban trees in selected parts of the city of Prešov (eastern Slovakia) and to evaluate its relationship with selected characteristics of host trees. Field surveys were conducted in publicly accessible areas, where tree species, basic dendrometric parameters, health status, and mistletoe infestation characteristics were recorded. Out of 241 surveyed trees, 45 individuals (18.7%) were infested with mistletoe. A total of 607 mistletoe clumps were recorded, with a high average number per infested tree (13.5). Infestation was most frequent on *Acer pseudoplatanus*, *Acer platanoides*, and *Tilia cordata*. Mistletoe occurred predominantly in the middle and upper parts of tree crowns, and trees with reduced health condition often exhibited higher infestation intensity. Spatial analysis revealed a clustered distribution pattern, indicating local spread within the urban environment. The results confirm that European mistletoe represents a significant long-term stress factor for urban trees in Prešov and highlight the need for systematic monitoring and targeted management to reduce its negative impacts on tree vitality and urban safety.

Key words: *Viscum album*, urban greenery, hemiparasitic plant, tree health, mistletoe infestation, Prešov

Introduction

European mistletoe (*Viscum album* L.) is an evergreen hemiparasitic shrub that grows on the branches of both deciduous and coniferous trees. Through specialized organs called haustoria, it extracts water and mineral nutrients from its host, while maintaining its own photosynthetic activity (Zuber 2004). Although mistletoe is culturally perceived as a symbol of tradition and has been historically associated with medicinal use, its ecological role in urban environments is more complex and often problematic. In cities, *Viscum album* represents a significant stress factor for urban trees (Figure 1). By reducing water availability and nutrient balance, mistletoe weakens host vitality, contributes to crown degradation, and increases the risk of branch breakage, which may pose safety hazards in parks, streets, and residential areas (Černý 1976; Rigling et al. 2010; Baltazár 2016). At the same time, mistletoe plays an important ecological role by providing food and shelter for birds, which are also the exclusive vectors responsible for its dispersal (Zuber 2004).

The distribution of mistletoe in Slovakia is spatially uneven and shows a pronounced tendency to concentrate in urban areas, where favorable microclimatic conditions, particularly the urban heat island effect, support its survival and spread (Hajdúk 1977; Eliáš 1981, 1985, 2002, 2010, 2011, 2014; Dobbartin et al. 2005; Baltazár et al. 2018). Several Slovak cities, including Prešov, have been identified as hotspots of mistletoe occurrence with a high diversity of host tree species (Rejmánek et al. 1978; Dostál 1985).



Figure 1. Norway maple (*Acer platanoides*) infested by mistletoe in Prešov.

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Despite its visible presence, mistletoe infestation in urban greenery is often underestimated and insufficiently monitored. Given the high occurrence of suitable host trees and favorable environmental conditions, systematic research on *V. album* in the city of Prešov is essential for understanding its impact on tree health and for supporting effective management of urban green infrastructure. The aim of this study was to map the occurrence of European mistletoe on urban trees in selected parts of the city of Prešov and to evaluate its relationship with selected characteristics of host trees, particularly species composition, health status, and crown characteristics.

Materials and methods

Field research was conducted during the winter season 2025 – 2026 in selected parts of the city of Prešov (eastern Slovakia), specifically in accessible sections of Sídliisko 2 (Marka Čulena Street and Levočská Street) and Sídliisko 3 (Alexander Dubček Park), see Figure 2. Only publicly accessible trees were surveyed due to limited access to private areas.

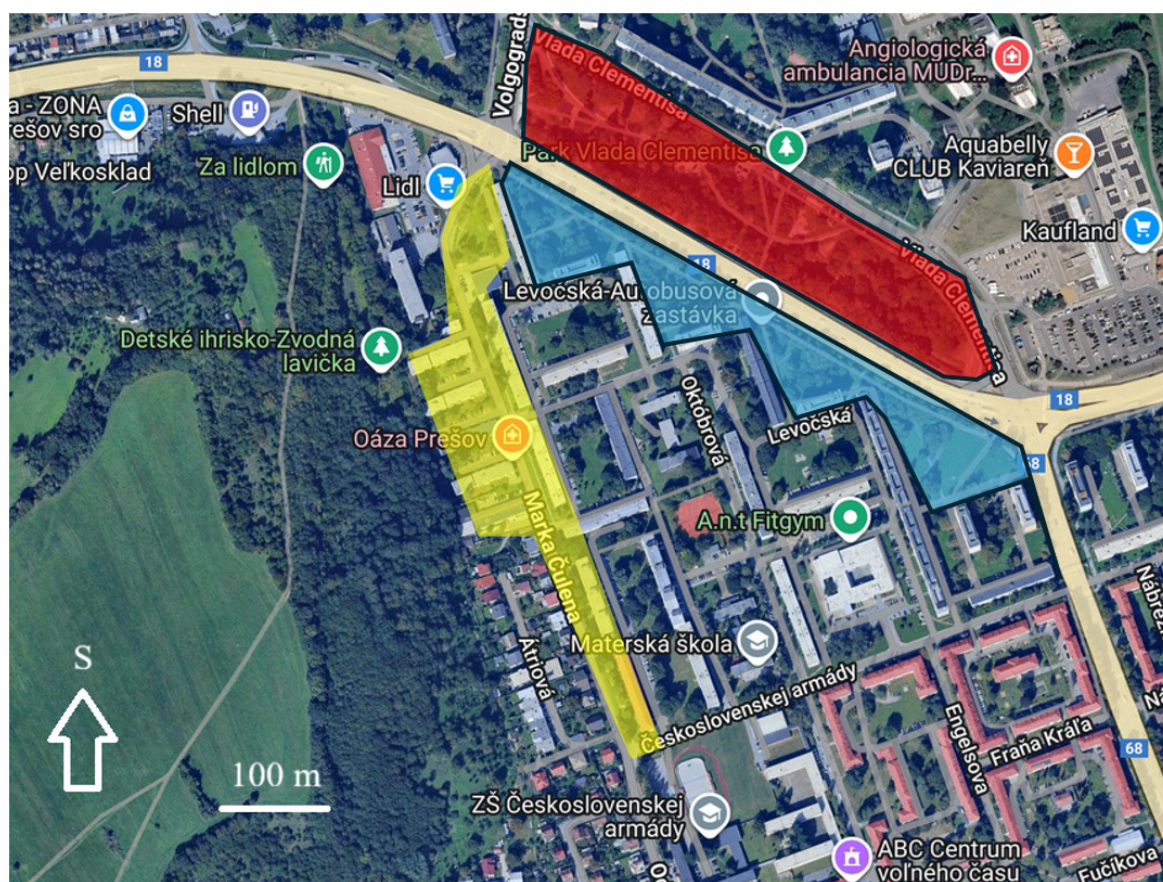


Figure 2. Map of the study area, created using www.google.com/maps. The yellow polygon represents Marka Čulena Street, the blue polygon represents Levočská Street, and the red polygon represents Alexander Dubček Park.

The study focused on urban trees infested with European mistletoe (*V. album*). Each infested tree was recorded and assigned a unique identification number. Tree location was determined using GPS coordinates to enable spatial analysis of mistletoe distribution. For each tree, species identity was determined in the field, and basic dendrometric and biological parameters were recorded. Trunk circumference was measured at 1.3 m above ground level, while tree height was estimated and classified into three height categories (1 – low tree (up to 10 m), 2 – medium-tall tree (10–20 m), 3 – tall tree (over 20 m)). Tree health status was visually assessed and classified into four categories ranging from healthy to declining (1 – healthy tree without visible

damage, 2 – slightly damaged tree, 3 – weakened tree with obvious signs of reduced vitality, 4 – dying tree).

Mistletoe infestation was evaluated by recording the number of mistletoe clumps per tree, their size (classified into three categories based on clump diameter (1 – small mistletoe (up to 20 cm in diameter), 2 – medium-sized mistletoe (20–50 cm), 3 – large mistletoe (over 50 cm)), and their position within the tree crown (lower, middle, or upper part). Supplementary field notes, including mechanical damage or proximity to infrastructure, were recorded to support data interpretation. Spatial analysis of infested trees based on GPS data was visualized using artificial intelligence tools (ChatGPT).

Results

A total of 241 urban trees were surveyed in the selected areas of the city of Prešov, of which 45 trees (18.7%) were infested with European mistletoe (*V. album*). In addition, one tree (*Acer platanoides*) was simultaneously infested with Yellow mistletoe (*Loranthus europaeus* Jacq. (Figure 3)). Altogether, 607 mistletoe clumps were recorded, with an average of 13.5 clumps per infested tree and 2.5 clumps per tree when considering the entire surveyed dataset (maximum of 42 clumps; see Figure 4). Although the proportion of infested trees was relatively low, infestation intensity on affected trees was high.



Figure 3. *Acer platanoides* simultaneously infested by *Viscum album* and *Loranthus europaeus*.

Most infested trees were medium-height individuals (10–20 m), representing 76% of the sample, followed by tall trees (>20 m; 22%), while low trees (<10 m) were rarely infested (2%). Mistletoe was recorded on eight identified tree species and one genus (*Salix* sp.) (see Tab. 1). The most frequent host species were *Acer pseudoplatanus* (32%), *Acer platanoides* (30%), and *Tilia cordata* (20%), which together accounted for the majority of infested trees. Other host species (see Tab. 2) occurred only sporadically.

Table 1. Detailed overview of recorded infested trees.

Tree	Number of individuals	Relative abundance (%) of infested trees
<i>Acer pseudoplatanus</i>	14	32%
<i>Acer platanoides</i>	13	30%
<i>Tilia cordata</i>	9	20%
<i>Salix</i> sp.	3	6%
<i>Fraxinus excelsior</i>	2	4%
<i>Quercus rubra</i>	1	2%
<i>Carpinus betulus</i>	1	2%
<i>Acer campestre</i>	1	2%
<i>Sorbus aria</i>	1	2%



Figure 4. *Acer platanoides* infested with up to 42 mistletoe clumps.

The health condition of infested trees was predominantly classified as healthy (44%) or slightly damaged (42%). Trees assessed as weakened or declining were less frequent but often hosted a higher number of mistletoe clumps. The number of mistletoe clumps per tree ranged from 1 to 42 (see Figure 4), with the highest infestation levels observed mainly on maples and lime trees. Regarding clump size, medium (20–50 cm; 45%) and large clumps (>50 cm; 45%) predominated, while small clumps (<20 cm) accounted for only 10%. Mistletoe occurred most frequently in the middle (45%) and upper (40%) parts of tree crowns, whereas occurrence in the lower crown was less common (15%).

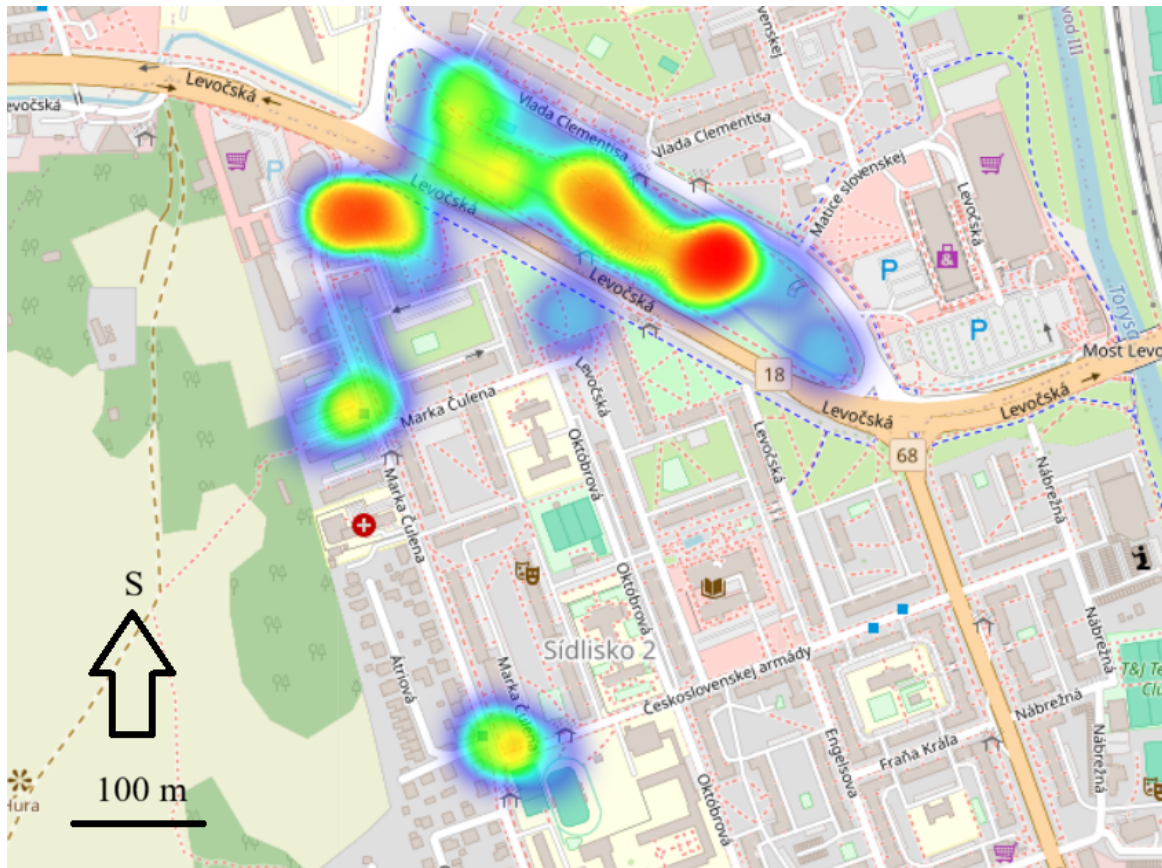


Figure 5. Map of mistletoe hotspots, generated from collected GPS data using artificial intelligence (ChatGPT).

Spatial analysis based on GPS data revealed a predominantly clustered distribution pattern of infested trees (Figure 5). Strongly infested trees were often located in close proximity, indicating local, focal spread of mistletoe within the urban environment.

Discussion

Results from Prešov revealed a higher prevalence of mistletoe infestation (18.7%) compared to values reported from other urban environments, such as Southwest China (5.87%) (Niu et al. 2024) and Vienna (3.06%) (Bilonozhko et al. 2025), indicating that infestation levels may be more pronounced under certain Central European urban conditions. Despite this, a similar pattern was observed in terms of spatial distribution, as infestation in Prešov was clearly clustered, which is consistent with findings from Vienna and Kaliningrad (Skrypnik et al. 2020; Bilonozhko et al. 2025), where mistletoe occurrence tends to form aggregated hotspots rather than being evenly distributed across the landscape.

The host spectrum identified in this study, dominated by species of the genera *Acer* and *Tilia*, corresponds well with previous research, where these taxa are among the most frequently infested in urban environments (Skrypnik et al. 2020; Bilonozhko et al. 2025). Furthermore, although the proportion of infested trees in Prešov remained relatively moderate, the intensity of infection was high,

with an average of 13.5 mistletoe clumps per infested tree. This finding aligns with other studies reporting that mistletoe often exhibits relatively low prevalence but high infection intensity on individual host trees (Skrypnik et al. 2020).

The observed preference for medium and tall trees supports the generally accepted relationship between tree size (or age) and mistletoe occurrence, as larger trees provide more suitable conditions for establishment and persistence of the parasite (Skrypnik et al. 2020; Niu et al. 2024). In addition, the clustered spatial pattern detected in this study suggests localized dispersal processes, most likely mediated by birds and facilitated by the proximity of suitable host trees, as also documented in other urban ecosystems (Skrypnik et al. 2020).

Overall, the results confirm that mistletoe distribution in urban environments is driven by a combination of host species composition, tree size, and spatial arrangement of vegetation, rather than by a single dominant factor, which is in agreement with conclusions drawn from other European urban studies (e.g. Bilonozhko et al. 2025).

Conclusion

The results of this study demonstrate that European mistletoe is a common and locally concentrated component of urban greenery in the city of Prešov. Although only a minority of surveyed trees were infested,

affected individuals often hosted a high number of mistletoe clumps, indicating long-term and unmanaged infestation. Mistletoe occurrence was strongly associated with specific host species, particularly maples (*Acer* spp.) and small-leaved lime (*Tilia cordata*), and was more frequent in the middle and upper parts of tree crowns. Trees with reduced health condition tended to exhibit higher infestation intensity, suggesting that mistletoe may contribute to the weakening of host trees in urban environments.

Recommendations for the City of Prešov

Based on the findings of this study, it is recommended that the city of Prešov implements regular monitoring of mistletoe occurrence, with particular attention to highly susceptible tree species. Early-stage and targeted removal of mistletoe clumps should be applied to limit further spread. In addition, host species susceptibility should be considered in future urban tree planting and management strategies to reduce long-term risks to tree vitality and public safety.

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