INSTITUTE OF FORESTRY • BELGRADE
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SUSTAINABLE FORESTRY
COLLECTION 87-88, 2023

ODRŽIVO ŠUMARSTVO
ZBORNIK RADOVA 87-88, 2023

DOI: 10.5937/SustFor2388125M
UDK: 712(437.1/.2)
Original scientific paper

ASSESSMENT OF BIOTIC THREATS TO URBAN GREENERY: A CASE STUDY IN STROMOVKA PARK, ČESKÉ BUDEJOVICE

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Abstract: *Urban greenery, consisting of tree lines, parks and park forests, plays an important role in improving the aesthetics and general well-being of the urban environment. This study focuses on Stromovka Park in České Budejovice and examines the health status of various tree species. The research spans the period from 2021 to 2022 and uses the route method to monitor the occurrence of biotic pests and pathogens, especially mites and insects. Several economically important organisms were identified in the study, including Aceria fraxiniflora (Felt, 1906), Byctiscus betulae (Linnaeus, 1758), Curculio glandium Marsham, 1802, Eriophyes inangulis Nalepa, 1919, Fomes fomentarius (L.) Fr. 1849, Halyomorpha halys (Stål, 1855), Ips typographus (Linnaeus, 1758), Lymantria dispar (Linnaeus, 1758), Loranthus europaeus Jacq., Oxycarenus lavaterae (Fabricius, 1787), Pemphigus spyrothecae Passerini, 1856, Phyllonorycter issikii (Kumata, 1963), Polygraphus poligraphus (Linnaeus, 1758), Prociphilus fraxini (Fabricius, 1777), Rhytisma acerinum Schwein., (1832), Sacchiphantes viridis (Ratzeburg, 1843) and Tetraneura ulmi (Linnaeus, 1758). While most of these organisms showed normal, natural abundance values, increased values were observed in A. fraxiniflora, E. inangulis and O. lavaterae. The application of holistic plant protection principles, from proper cultivation and species selection to monitoring and control measures, remains crucial for maintaining the vitality and longevity of urban green spaces exposed to various biotic and abiotic stress factors.*

Keywords: Urban pests, city parks, monitoring, woody plants, pest occurrence, urbanisation

PROCENA BIOTIČKE UGROŽENOSTI GRADSKOG ZELENILA: STUDIJA SLUČAJA U PARKU STROMOVKA, ČEŠKE BUDEJOVICE

Sažetak: *Urbane zelene površine, sastavljene od drvoreda, parkova i park-šuma, igraju važnu ulogu u poboljšanju estetike i opšte dobrobiti urbanih sredina. Ovo istraživanje se fokusira na Stromovka park u Češkim Budejovicama i proučava zdravstveno stanje različitih vrsta drveća. Istraživanje obuhvata period od 2021. do 2022. i koristi maršutnu metodu kako bi se pratila pojava štetočina i patogena, posebno grinja i insekata. U*

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istraživanju je identifikovano nekoliko ekonomski važnih organizama, uključujući Aceria fraxiniflora (Felt, 1906), Byctiscus betulae (Linnaeus, 1758), Curculio glandium Marsham, 1802, Eriophyes inangulis Nalepa, 1919, Fomes fomentarius (L.) Fr. 1849, Halyomorpha halys (Stål, 1855), Ips typographus (Linnaeus, 1758), Lymantria dispar (Linnaeus, 1758), Loranthus europaeus Jacq., Oxycarenus lavaterae (Fabricius, 1787), Pemphigus spyrothecae Passerini, 1856, Phyllonorycter issikii (Kumata, 1963), Polygraphus poligraphus (Linnaeus, 1758), Prociphilus fraxini (Fabricius, 1777), Rhytisma acerinum Schwein., (1832), Sacchiphantes viridis (Ratzeburg, 1843) i Tetraneura ulmi (Linnaeus, 1758). Dok su većina ovih organizama pokazivala uobičajeno prisustvo, povećana brojnost primećena je kod A. fraxiniflora, E. inangulis i O. Lavaterae . Primena principa holističke zaštite biljaka, počevši od odgovarajućeg odabira i selekcije biljnih vrsta do praćenja i kontrolnih mera, ostaje ključna za očuvanje vitalnosti i dugovečnosti urbanih zelenih prostora izloženih različitim biotskim i abiotskim stresnim faktorima.

Ključne reči: Urbane štetočine, gradski parkovi, monitoring, drvenaste vrste, pojava štetočina, urbanizacija

1. INTRODUCTION

Urban parks and open green spaces play an important role in improving the quality of life in an urbanised society. Empirical studies repeatedly show the impact of urban parks, forests and green spaces, as well as elements such as trees and water, on various aspects of urban life. These natural components not only provide environmental services such as purifying air and water, filtering wind and noise and stabilising the microclimate, but also contribute significantly to social and psychological well-being. The benefits of green spaces are widely recognised and contribute significantly to making modern cities more liveable. Research conducted by Chiesura (2004) suggests that spending time in parks can reduce stress levels, promote contemplation, rejuvenate residents and foster a sense of peace and tranquility. Contemporary understanding emphasises the role that green spaces play in creating well-functioning and liveable cities. These spaces serve, among other things, to support activities and promote everyday health, preserve biodiversity, shape the cultural identity of cities, create opportunities and provide natural solutions to the technical challenges of cities (Kabisch et al., 2016). Given the value of green spaces, it is essential in cities to assess the condition of trees and monitor them continuously. This data is crucial for understanding the condition of forests and their ability to adapt to climate change (Brašanac-Bosanac et al., 2022). However, urban greenery is threatened by both living organisms and environmental factors. The presence of insects, mites and diseases poses a challenge to the health and appearance of plants in green spaces (Ding et al., 2020; Dodds & Orwig, 2011; Dreistadt et al., 1990; Hanousková et al., 2004; Kovač et al., 2021; Moricca et al., 2018).

Due to the importance of urban parks the authors decided to assess the condition of the trees in the largest city park in České Budějovice (South Bohemia), Stromovka Park, which is 68 hectares in size and has the character of a forest park or natural landscape (Milosavljević et al., 2022). It was created in the 1950s and 1960s through voluntary efforts and was originally divided into Stromovka and Dlouhá louka. The park underwent significant changes, including the transformation

of the Bagr pond into a swimming pool, reconstruction after a major flood in 2002 and the eradication of the Canadian poplar.

The composition of the trees evolved from fast-growing species to target trees such as oak, beech, maple, lime, pine and spruce (Milosavljević et al., 2022). The meadows have a natural diversity, with various grasses and flowering species. The park has a rich flora and fauna, and over 60 species of birds have been counted during the breeding season. Notable species include the European roller [*Coracias garrulus* Linnaeus, 1758] and the smallest bird in Europe, the goldcrest [*Regulus regulus* (Linnaeus, 1758)] (Macková, 1997). In 1993, a rough botanical survey in Stromovka found a total of 135 species of herbaceous vascular plants (Hanousková, 2006; Hanousková et al., 2004; Werquin & Attwell, 2005). Stromovka serves both ecological and aesthetic purposes and is registered as an important landscape element. Neglected in the past, with improved maintenance, the area has developed into a recreational area with footpaths, inline skating and cycle paths, benches and playgrounds. Addressing these challenges is vital to ensure that urban green spaces remain sustainable and vibrant in the future. Plant diseases and pests can have a significant impact on the health of tree species and it is important to identify them accurately in order to take appropriate action.

The objectives of this study were to: 1) assess the presence of potential pests and diseases, 2) assess the most prevalent species and address their potential impact on the health of tree species in the park.

2. MATERIAL AND METHODS

2.1. Study area

The study was conducted in Stromovka Park (48° 96' N, 14° 27' E) in 2021 and 2022 (Figure 1). From April to September, observations were made to quantify and evaluate the presence of pests and diseases. These observations provided valuable insight into the current state of pests and their potential impact on the environment.

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Figure 1. *Study location - Stromovka Park*

2.2. Monitoring of the pests

Plant material was collected either randomly or based on symptoms present in the park. The collecting was conducted every two weeks during observed period (April-September). The samples were packed in plastic boxes and stored in a refrigerator at 5°C before being identified in the laboratory using MOTIC optical trinocular, model BA210E, and stereomicroscope, model STM 13 EEB. Taxonomic literature and keys were used for identification, such as those of Agrios, 2005; Amrine et al., 2003; Balachowsky, 1949; Beug et al., 2014; Ciceoi et al., 2017; Crowson, 1956; Hanousková et al., 2004; Hůrka, 2017; Johnson & Lyon, 1991; Mani, 1964; Pirone, 1978; Spadaro et al., 2020; Tomiczek & Jurc, 2007; Tubby & Webber, 2010; Zúbrik et al., 2013.

3. RESULTS

Various insects, mites and fungi were collected in Stromovka Park during the study period (Table 1). The organisms are categorised and the following taxonomic orders were identified: Lepidoptera, Coleoptera, Santalales, Hemiptera, Rhytismatales, Trombidiformes and Polyporales. Two species of Trombidiformes, two species of Lepidoptera, four species of Coleoptera, two species of Hemiptera, one species of Rhytismatales and one species of Polyporales were identified (Figure 1 and 2). All species collected in 2021 were also found in the following year, with

the same frequency, except for *Oxycarenus lavatere*, where the number of colonies decreased.

Table 1. *List of identified species*

Species	Family
Fungi	
Polyporales	
Fomes fomentarius (L.) Fr.	Polyporaceae
Rhytismatales	
Rhytisma acerinum (Pers.) Fr.	Rhytismataceae
Plants	
Santalales	
Loranthus europaeus Jacq.	Loranthaceae
Mites	
Trombidiformes	
Aceria fraxiniflora (Felt, 1906)	Eriophyidae
Eriophyes inangulis Nalepa, 1919	Eriophyidae
Insects	
Hemiptera	
Halyomorpha halys (Stål, 1855)	Pentatomidae
Oxycarenus lavaterae (Fabricius, 1787)	Oxycarenidae
Pemphigus spyrothecae Passerini, 1856	Aphididae
Prociphilus fraxini (Fabricius, 1777)	Aphididae
Sacchiphantes viridis (Ratzeburg, 1843)	Adelgidae
Tetraneura ulmi (Linnaeus, 1758)	Aphididae
Coleoptera	
Byctiscus betulae (Linnaeus, 1758)	Attelabidae
Curculio glandium Marsham, 1802	Curculionidae
Ips typographus (Linnaeus, 1758)	Curculionidae
Polygraphus poligraphus (Linnaeus, 1758)	Curculionidae
Lepidoptera	
Lymantria dispar (Linnaeus, 1758)	Erebidae
Phyllonorycter issikii (Kumata, 1963)	Gracillariidae

The percentage of the various taxa is shown in Figure 2. Photos of the frequently encountered pest species are shown in Figure 3.

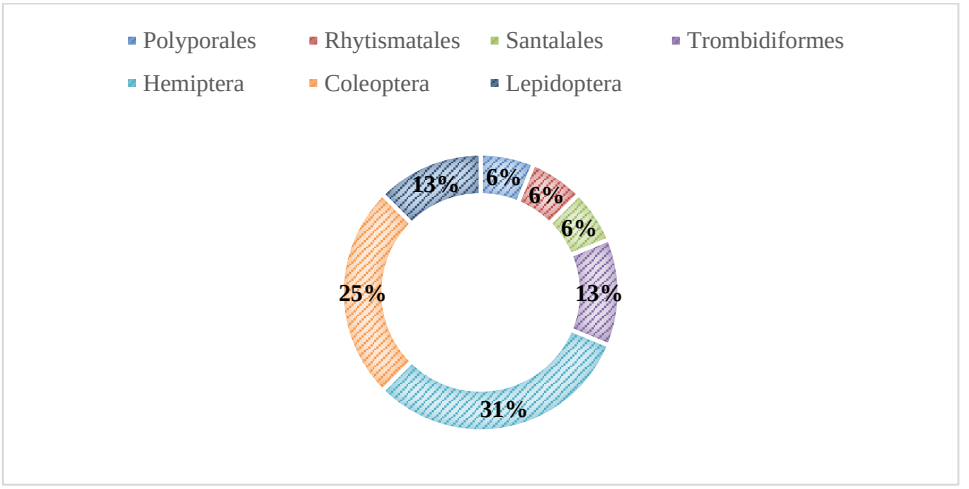

Figure 2. *Percentage of the identified species during monitoring*

(a) ***Prociphilus fraxini*** **(b)** ***Rhytisma acerinum*** **(c)** ***Bycticus betulae***

(d) ***Eriophyes inangulis*** **(e)** ***Aceria fraxiniflora*** **(f)** ***Oxycarenus lavaterae***

Figure 3. *Representatives of the identified pests*

4. DISCUSSION

The results of two years monitoring included seventeen pest species that are important for health of park trees. While most of these organisms had normal, natural

abundance values, increased values were observed for: *A. fraxiniflora*, *E. inangulis* and *O. lavaterae*. As it has been shown in Table 1, *A. fraxiniflora* and *E. inangulis* belong to family Eriophyidae. Eriophyoid mites have successfully spread across the globe primarily infecting woody species (Jiang et al., 2021; Navajas et al., 2010). The genus Eriophyes is globally recognized for its ability to form gall and erinea. These mites tend to colonize only a limited range of species. The symptoms caused by a mite infection vary depending on both the host tree and the specific mite species involved. The recognizable signs of an infection include the formation of galls or felt like patches known as erinea. Leaves affected by erinea often display, sometimes yellowish spots on their surface while the opposite side carries clusters of mites. *Tilia* spp. (Tiliaceae). *Alnus* spp. (Betulaceae), alongside with *Fraxinus* spp. (Oleaceae) are especially vulnerable to eriophyoid mite infections suggesting that these mites have adapted mechanisms to overcome the chemical defenses of their host trees (Jiang et al., 2021). It is crucial to remain vigilant, about these infections as they can inflict harm upon trees and plants alike. Regular monitoring and early detection can effectively curtail their spread, minimize the resulting damage. *A. fraxiniflora* has been found in Europe (Hungary) for the first time in 2019 (Korda et al., 2019). The presence of this mite led to changes in the growth and appearance of the flowers and fruits, which took on a shape reminiscent of spongy galls (Korda et al., 2019). The flower clusters became distorted (Figure 3e). *E. inangulis* is a mite species that frequently forms galls on the leaves of *Alnus* spp (Jiang et al., 2021). Although these infections occur only sporadically, they can severely impair the function of the leaves. It has been shown that gall-causing parasites cause changes in the structure, physiological processes and biochemical composition of their host plants. Gall formation has been observed to alter gas exchange in leaves, such as photosynthetic rate, stomatal conductance and water utilisation efficiency (Jiang et al., 2021). Therefore, infections by *E. inangulis* have the potential to significantly affect plant health and productivity.

The Lime Seed Bug-*O. lavaterae*, belongs to the family Lygaeidae (Table 1) and the subfamily Oxycareninae. It is a species that occurs in many parts of the world, including Europe, Asia and North America (Arslangündoğdu et al., 2018). In Czech Republic it was first recorded in 2004 (Nedvěd et al., 2023). The adult is about 5-6 mm long and the usually red, white and black in colour. It is commonly found on lime trees (*Tillia* spp.), hence its name, but it can also be found on other trees such as elm, oak and maple (Arslangündoğdu et al., 2018; De Jaegere et al., 2016; Nedvěd et al., 2014; Neimorovets et al., 2020; Velimirović et al., 1992). The most affected is small-leaved lime (*Tilia cordata* Mill.). The laboratory study showed that fecundity in females feeded by *T. cordata* is 230 eggs (Kalushkov & Nedvěd, 2010). The lime seed bug is considered to be a pest because it feeds on the seed of trees, branches and leaves, which can weaken and damage them (Jurc, 2011).

The presence of pests in parks can be a problem for both visitors and the overall well-being of the ecosystem (Parsons & Frank, 2019). To address this issue, it is important to establish pest monitoring programmes. One approach to pest monitoring is to use traps and baits to capture and identify the types of pests that are present in a park. This allows park managers to develop targeted pest control strategies that are effective and also environmentally sound. In addition, inspections of park facilities and vegetation help to identify threaten areas and prevent further

spread (Ciceoi et al., 2017; Dodds & Orwig, 2011; Hanousková et al., 2004; Mujezinović et al., 2011). Regular monitoring of parks also serves as a measure against invasive species that can cause serious damage to local ecosystems. By identifying and removing pests, substitution of plants with more resilient ones, park managers can help maintain a thriving and diverse ecosystem for future generations. The data collected during this period can be used to monitor and manage insect populations in the future.

5. CONCLUSION

Urbanisation is a growing phenomenon that brings various environmental challenges. One of these challenges is the impact on pests. When natural balance is disturbed, it leads to changes in the distribution and abundance of pests. This can affect the health and functionality of trees, as pests can damage or even kill trees, while their natural enemies play a role in controlling pest populations. During our surveys, we found 17 species that are potentially detrimental for plants in Stromovka Park. Three species: *A. fraxiniflora, E. inangulis* and *O. lavaterae* were the most frequent. It was noticed that *Fraxinus* spp. and *Tillia* spp. are more affected by the pest than the other species observed. Also, the proximity of tree species is one of the reasons for the easy spread of pests, which could be improved by planting differently, using more diverse species than the same ones in the tree row. In summary, implementing a pest monitoring programme is part of effective management of any park. Using a combination of traps, baits, visual inspections and other techniques, park managers can efficiently control pests while protecting the health of the ecosystem. Through monitoring and maintenance, urban parks can ensure that they remain a safe and enjoyable environment for their visitors for many years to come.

REFERENCES

Agrios, G. N. (2005). *Plant pathology* (5th ed). Elsevier Academic Press.

Amrine, J. W., Stasny, T. A. H., & Flechtmann, C. H. W. (2003). *Revised keys to world genera of Eriophyoidea (Acari: Prostigmata)*. Indira Pub. House.

Arslangündoğdu, Z., Hizal, E., & Acer, S. (2018). First record of *Oxycarenus lavaterae* (Fabricius, 1787) (Heteroptera, Lygaeidae) in Turkey. *Applied Ecology and Environmental Research*, *16*(2), 1305–1311. https://doi.org/10.15666/aeer/1602_13051311

Balachowsky, A. S. (1949). *Coleopteres, Scolytides*. Faune de France 50.

Beug, M. W., Bessette, A. E., & Bessette, A. R. (2014). *Ascomycete fungi of North America: A mushroom reference guide*. University of Texas Press.

Brašanac-Bosanac, L., Ćirković-Mitrović, T., Čule, N., Česljar, G., Eremija, S., & Đorđević, I. (2022). Urban forests and climate change. *Sustainable Forestry: Collection*, *85–86*, 1–12. https://doi.org/10.5937/SustFor2285001B

Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, *68*(1), 129–138. https://doi.org/10.1016/j.landurbplan.2003.08.003

Ciceoi, R., Gutue, C., Gutue, M., & Roşca, I. (2017). *Current Status of Pests Associated with Urban Vegetation in Bucharest Area*. *9*, 181–190.

Crowson, R. A. (1956). *Handbooks for the identification of British insects. Vol. IV, Part 1. Coleoptera: Introduction and keys to families.* Royal Entomological Society of London.

De Jaegere, T., Hein, S., & Claessens, H. (2016). A Review of the Characteristics of Small-Leaved Lime (*Tilia cordata* Mill.) and Their Implications for Silviculture in a Changing Climate. *Forests*, *7*(3), 56. https://doi.org/10.3390/f7030056

Ding, S., Hu, H., & Gu, J.-D. (2020). Diversity, Abundance, and Distribution of Wood-Decay Fungi in Major Parks of Hong Kong. *Forests*, *11*(10), 1030. https://doi.org/10.3390/f11101030

Dodds, K. J., & Orwig, D. A. (2011). An invasive urban forest pest invades natural environments—Asian longhorned beetle in northeastern US hardwood forests. *Canadian Journal of Forest Research*, *41*(9), 1729–1742. https://doi.org/10.1139/x11-097

Dreistadt, S. H., Dahlsten, D. L., & Frankie, G. W. (1990). Urban Forests and Insect Ecology. *BioScience*, *40*(3), 192–198. https://doi.org/10.2307/1311364

Hanousková, I. (2006). *Green-structures and Urban Planning: České Budějovice*. ÚSBE.

Hanousková, I., Boháč, J., Sedláček, F., Šerá, B., Lepšová, A., & Zacharda, M. (2004). Harmful organisms in urban green areas. *Ekológia (Bratislava)*, *23*(1), 56–58.

Hůrka, K. (2017). *Brouci České a Slovenské republiky = Beetles of the Czech and Slovak Republics* (2. nezměněné vydání). Kabourek.

Jiang, Y., Ye, J., Veromann-Jürgenson, L.-L., & Niinemets, Ü. (2021). Gall- and erineum-forming *Eriophyes* mites alter photosynthesis and volatile emissions in an infection severity-dependent manner in broad-leaved trees *Alnus glutinosa* and *Tilia cordata*. *Tree Physiology*, *41*(7), 1122–1142. https://doi.org/10.1093/treephys/tpaa173

Johnson, W. T., & Lyon, H. H. (1991). *Insects that feed on trees and shrubs* (2nd ed., rev). Comstock Pub. Associates.

Jurc, M. (2011). Rjava lipovka [*Oxycarenus lavaterae* (Fabricius, 1787)] je v Sloveniji vse pogostejša. *Novice Iz Varstva Gozdov*, *4*, 5–6.

Kabisch, N., Strohbach, M., Haase, D., & Kronenberg, J. (2016). Urban green space availability in European cities. *Ecological Indicators*, *70*, 586–596. https://doi.org/10.1016/j.ecolind.2016.02.029

Kalushkov, P., & Nedvěd, O. (2010). Suitability of food plants for *Oxycarenus lavaterae* (Heteroptera: Lygaeidae), a mediterranean bug invasive in central and South-East Europe. *Proceedings of the Bulgarian Academy of Sciences*, *63*(2), 271–276.

Korda, M., Csóka, Gy., Szabó, Á., & Ripka, G. (2019). First occurrence and description of *Aceria fraxiniflora* (Felt, 1906) Acariformes: Eriophyoidea) from Europe. *Zootaxa*, *4568*(2), 293–306. https://doi.org/10.11646/zootaxa.4568.2.5

Kovač, M., Diminić, D., Orlović, S., & Zlatković, M. (2021). Botryosphaeria Dothidea and Neofusicoccum Yunnanense Causing Canker and Die-Back of Sequoiadendron Giganteum in Croatia. *Forests*, *12*(6), 695. https://doi.org/10.3390/f12060695

Macková, M. (1997). *Ptáci parku Stromovka v Českých Budějovicích.* [Diplomová práce]. Jihočeská univerzita, Pedagogická fakulta.

Mani, M. S. (1964). Leaf Galls. In W. W. Weisbach & P. Van Oye (Eds.), *Ecology of Plant Galls* (pp. 94–135). Springer Netherlands. https://doi.org/10.1007/978-94-017-6230-4_7

Milosavljević, M., Tabaković-Tošić, M., Furtula, D., Marković, M., Gagić-Serdar, R., & Momirović, N. (2022). The epizootic case caused by *Entomophthora muscae* (Cohn) Fresen in the Czech Republic. *Sustainable Forestry: Collection*, *85–86*, 119–125. https://doi.org/10.5937/SustFor2285119M

Moricca, S., Bracalini, M., Croci, F., Corsinovi, S., Tiberi, R., Ragazzi, A., & Panzavolta, T. (2018). Biotic Factors Affecting Ecosystem Services in Urban and Peri-Urban Forests in Italy: The Role of Introduced and Impending Pathogens and Pests. *Forests*, *9*(2), 65. https://doi.org/10.3390/f9020065

Mujezinović, O., Čabaravdić, A., Treštić, T., & Dautbašić, M. (2011). Zdravstveno stanje urbanog drveća sarajeva s posebnim osvrtom na štete od snijega. *Radovi Šumarskog Fakulteta Univerziteta u Sarajevu*, *41*(1), 101–110. https://doi.org/10.54652/rsf.2011.v41.i1.143

Navajas, M., Migeon, A., Estrada-Peña, A., Mailleux, A.-C., Servigne, P., & Petanović, R. (2010). Mites and ticks (Acari). Chapter 7.4. *BioRisk*, *4*, 149–192. https://doi.org/10.3897/biorisk.4.58

Nedvěd, O., Chehlarov, E., & Kalushkov, P. (2014). Life History of the Invasive Bug *Oxycarenus lavaterae*(Heteroptera: Oxycarenidae) in Bulgaria. *ACTA ZOOLOGICA BULGARICA*, *66*(2), 203–208.

Nedvěd, O., Kalushkov, P., & Hodek, I. (2023). Termination of diapause in the lime seed bug *Oxycarenus lavaterae*(Heteroptera: Lygaeoidea: Oxycarenidae). *European Journal of Entomology*, *120*, 150–156. https://doi.org/10.14411/eje.2023.019

Neimorovets, V. V., Shchurov, V. I., & Zamotajlov, A. S. (2020). Report on Findings of *Oxycarenus lavaterae* (Fabricius, 1787) (Heteroptera, Lygaeidae) in Russia. *Entomological Review*, *100*(4), 521–528. https://doi.org/10.1134/S0013873820040090

Parsons, S. E., & Frank, S. D. (2019). Urban tree pests and natural enemies respond to habitat at different spatial scales. *Journal of Urban Ecology*, *5*(1), juz010. https://doi.org/10.1093/jue/juz010

Pirone, P. P. (1978). *Diseases and pests of ornamental plants* (5th ed). John Wiley and sons, Wiley-interscience publ.

Spadaro, D., Agustí, N., Ortega, S. F., & Hurtado Ruiz, M. A. (2020). Diagnostics and Identification of Diseases, Insects and Mites. In M. L. Gullino, R. Albajes, & P. C. Nicot (Eds.), *Integrated Pest and Disease Management in Greenhouse Crops* (pp. 231–258). Springer International Publishing. https://doi.org/10.1007/978-3-030-22304-5_8

Tomiczek, C., & Jurc, M. (2007). *Bolesti i štetnici urbanog drveća*. Šumarski fakultet ; Šumarski institut.

Tubby, K. V., & Webber, J. F. (2010). Pests and diseases threatening urban trees under a changing climate. *Forestry*, *83*(4), 451–459. https://doi.org/10.1093/forestry/cpq027

Velimirović, V., Đurović, Z., & Raičević, M. (1992). *Oxycarenus lavaterae* Fabricius (Lygaeidae, Heteroptera) new pest on lindens in southern part of Montenegro. *Zaštita Bilja*, *43*(1), 69-72.

Werquin, A. C., & Attwell, K. (2005). *COST Action C11: Green structure and urban planning : final report*. EUR-OP.

Zúbrik, M., Kunca, A., & Csóka, G. (2013). *Insects and diseases damaging trees and shrubs of Europe: A colour atlas*. NAP. éd.

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Summary

Urban parks are an important part of every city's infrastructure. They offer people a place to relax and connect with nature. Yet the presence of pests in these parks can be a problem for both visitors and the health of the ecosystem. A two-year study of Stromovka Park, the largest city park in České Budějovice, identified seventeen pest species [*Aceria fraxiniflora* (Felt, 1906), *Byctiscus betulae* (Linnaeus, 1758), *Curculio glandium* Marsham, 1802, *Eriophyes inangulis* Nalepa, 1919, *Fomes fomentarius* (L.) Fr. 1849, *Halyomorpha halys* (Stål, 1855), *Ips typographus* (Linnaeus, 1758), *Lymantria dispar* (Linnaeus, 1758), *Loranthus europaeus* Jacq., *Oxycarenus lavaterae* (Fabricius, 1787), *Pemphigus spyrothecae* Passerini, 1856, *Phyllonorycter issikii* (Kumata, 1963), *Polygraphus poligraphus* (Linnaeus, 1758), *Prociphilus fraxini* (Fabricius, 1777), *Rhytisma acerinum Schwein.*, (1832), *Sacchiphantes viridis* (Ratzeburg, 1843*)* and *Tetraneura ulmi* (Linnaeus, 1758)] that affect the well-being of park trees. The study found that the tree species *Fraxinus* spp. and *Tillia* spp. were more affected by pests than other species observed. One of the reasons for the easy spread of pests is the proximity of the tree species. This problem could be addressed by planting a greater diversity of species instead of the same species in a tree row. To protect the park's ecosystem and the health of its visitors, it is important to address the problem of pests. Park managers should consider different pest control measures. By taking proactive steps, the park can continue to provide a beautiful and safe environment for its visitors.

PROCENA BIOTIČKE UGROŽNOSTI GRADSKOG ZELENILA: STUDIJA SLUČAJA U PARKU STROMOVKA, ČEŠKE BUDEJOVICE

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Rezime

Gradski parkovi su važan deo infrastrukture svakog grada. Oni nude ljudima mesto za opuštanje i povezivanje sa prirodom. Ipak, prisustvo štetočina u ovim parkovima može biti problem i za posetioce i za zdravlje ekosistema. Dvogodišnje istraživanje sprovedeno u parku Stromovka, najvećem gradskom parku u Češkim Budejovicama, identifikovalo je sedamnaest vrsta štetočina [*Aceria fraxiniflora* (Felt, 1906), *Byctiscus betulae* (Linnaeus, 1758), *Curculio glandium* Marsham, 1802, *Eriophyes inangulis* Nalepa, 1919, *Fomes fomentarius* (L.) Fr. 1849, *Halyomorpha halys* (Stål, 1855), *Ips typographus* (Linnaeus, 1758), *Lymantria dispar* (Linnaeus, 1758), *Loranthus europaeus* Jacq., *Oxycarenus lavaterae* (Fabricius, 1787), *Pemphigus spyrothecae* Passerini, 1856, *Phyllonorycter issikii* (Kumata, 1963), *Polygraphus poligraphus* (Linnaeus, 1758), *Prociphilus fraxini* (Fabricius, 1777), *Rhytisma acerinum Schwein.*, (1832), *Sacchiphantes viridis* (Ratzeburg, 1843*)* and *Tetraneura ulmi* (Linnaeus, 1758)], koji utiču na zdravlje parkovskog drveća. Studija je otkrila da su *Fraxinus* spp. i *Tillia* spp. bile više pogođene štetočinama nego druge biljne vrste. Jedan od razloga za lako širenje štetočina je blizina drveća. Ovaj problem bi se mogao rešiti sadnjom većeg broja vrsta umesto iste vrste u drvoredu. Da bismo zaštitili ekosistem parka i zdravlje njegovih posetilaca, važno je pozabaviti se problemom štetočina. Upravnici parkova bi trebali da razmotre različite mere kontrole štetočina. Preduzimajući proaktivne korake, park može da nastavi da pruža prelepo i bezbedno okruženje za svoje posetioce.