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ALIEN PEST SPECIES ON WOODY PLANTS IN URBAN CONDITIONS OF SLOVAKIA

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In 2006–2014 research on the phytophagous insects of ornamental woody plants (trees and shrubs) was carried out in various urban areas, which are located in west part of the Slovak Republic. During research was found on ornamental woody plants 437 species and 5 varieties of animal pests. From that number the alien species accounted 59 species. During years 2006–2014 were recorded 16 new alien pest species for Slovakia. The highest number of alien species in Slovakia comes from Asia area (23 species). Many species expand to Slovakia also from North America (18 species) and Mediterranean (15 species). The least number of alien species comes from Africa. Two recorded alien species have unknown origin. From the all recorded alien pest species the orders *Hemiptera* (25 species) and *Lepidoptera* (15 species) accounted the highest number. Many invasive and introduced pest species better adapted to temperature amplitude in Slovakia and they find optimal conditions to reproduction.

Keywords: alien pest, woody plants, Slovakia, climate change

Introduction

The changes in global and also in urban climate and increased levels of primary and secondary pollutants components in air create a new environment conditions for growth and development of woody plants in forests, landscape and Urban areas. These factors create new possibilities for using of woody plants from warmer conditions. In present a lot of introduced woody plants are in use. It is a result of successful woody plants introduction and acclimatization (Supuka, 2007; Sidorová et al., 2013). The attention of scientific and professional public in the past decade was especially attracted by invasive and alien organisms, because they represent significant factors of ecosystem degradation and threaten the plant production (Glavendekić and Mihajlović, 2007). Invasions of alien organism species continue. This effect is connected with increased frequency of goods transaction (truck) (increased trade and economy production of SR) and with climate changes raiding (Zúbrik, Kunca and Vakula, 2007). Biological invasions by alien species are presently recognised as the second cause of loss in biological diversity, following the destruction of habitats, and have also large economical consequences (Vitousek et al., 1996, 1997; Perings et al., 2000; Pimentel et al., 2000). This movement has precipitated a substantial increase in biological invasions by allowing organisms to pass the natural barriers that limit their dispersal (Liebhold et al., 1995; Levine and D'Antonio, 2003).

In Europe region apprehensions from random introduction of non-indigenous plants and biotic pests species increases. Because of native enemies absence and changed ecological conditions accidentally introduced pest species may begin behave quite abruptly in a new environment (Hrubík, 2002). Some of these pest species also cross on native woody plants and in cooperation with other unfavourable environment factors they may cause mortification of whole forest woody plants vesture. However majority of non-indigenous pests is fixed only to city environment.

In an urban environment, which is characterized by specific unfavourable conditions, the negative influence of insect pests raises. Research has found out that the individual factors actuating in city greenery objects have a different signification for specific species and for whole terrestrial vertebrate families, mainly in dependence on their migration and adaptation abilities. In industrial cities with high pollution environment degree we can observe that multitude of insects with secret manner of life (mining and gall-forming species, midges, scales) increases, and contrariwise, the multitude of predators and parasitic species which are more sensitive on these conditions decreases (Hrubík, 1988). The most informations about insect invasions come from North America or Australasia. In other regions (e.g. Europe, South America, Asia, Africa), the ecological impact of invasive insects has been much less studied, partly because insect invasions have been less critical for the environment in these regions than in North America, Australasia and most oceanic islands (Kenis and Pere, 2007). In 1994, Mattson et al. (1994) estimated that there

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were more than 368 alien phytophagous species in wooded areas of America north of Mexico. In contrast, insect invasions in forests are much less documented in Europe (Roques, 2007).

In care of city and forest greenery it is important to dedicate higher attention to protection, justification and to timely damage causes discovery. Premise of successful protection to harmful factors are correct diagnosis, knowledge and harmful factor classification according to symptoms which we detected on damaged woody plant. Another justification premise is control and prognosis on its basis (Zúbrik, Novotný et al., 2004).

Materials and methods

In 2006–2014 research on the phytophagous insects of ornamental woody plants (trees and shrubs) was carried out in interest areas in Nitra, Topoľčany, Komárno, Partizánske, Prievidza, Piešťany, Trnava, Bratislava, Mlyňany arboretum SAS. All these cities are located in the western part of the Slovak Republic. They are components of the Danubian lowland region and they are characterized by semi-arid and humid climate. The average annual total precipitation is about 600 mm. The average annual temperature is in the range of 8–11 °C. The research aim was the analysis of the phytophagous entomofauna composition on autochthonous and allochthonous woody plants. Especially the alien species were evaluated.

We realised the monitoring of woody plant damage in the examined localities 2–3 times per growing season. In the field we took the samples of damaged parts, and adults or larvae for further determination. For the purposes of determination publications by Skuhravý and Skuhravá (1998), Csóka (1997, 2003), Blackman and Eastop (1994), Schnaider (1976), Laštůvka and Laštůvka (1997), Péricart (1998) were used.

Results and discussion

During research we found on ornamental woody plants 437 species and 5 varieties of animal pests. From that number the alien species accounted 59 species. During years 2006–2014 were recorded 16 new alien pest species for Slovakia (Table 1).

After pest species quantification according to their origin, the highest number of alien species in Slovakia comes from Asia area (23 species). Many species expand to Slovakia also from North America (18 species) and Mediterranean (15 species). The least number of alien species comes from Africa. Two recorded alien species have unknown origin (Figure 1). In the last years alien species spread to Slovakia area mainly from asian and mediterranean region.

From the all recorded alien pest species the orders *Hemiptera* (25 species) and *Lepidoptera* (15 species) accounted the highest number (Figure 2).

Many invasive and introduced pest species better adapted to temperature amplitude in Slovakia and they find optimal conditions to reproduction.

On pest species occurence influenced mainly species composition of woody plants and ecological conditions as well as.

Table 1 List of new alien pest species for Slovak Republic

Order	Species	Origin	Host plant	Year of first record in Slovakia
Hemiptera	*Pseudaulacaspis pentagona* (Targioni – Tozzetti, 1887)	Asia	*Catalpa* sp.	2007
Hemiptera	*Pulvinaria hydrangeae* Steinweden, 1946	Asia	*Tilia* sp., *Hydrangea* sp.	2011
Hemiptera	*Myzocallis walshii* (Monell, 1879)	North America	*Quercus* sp.	2007
Hemiptera	*Cinara curvipes* (Patch, 1912)	North America	*Abies* sp.	2007
Hemiptera	*Leptoglossus occidentalis* Heidemann, 1910	North America	*Pinus* sp.	2005-2006
Diptera	*Obolodiplosis robiniae* (Haldemann, 1847)	North America	*Robinia* sp.	2005-2006
Diptera	*Amauromyza elaeagni* (Rohdendorf-Holmanová, 1959)	Mediterranean	*Elaeagnus* sp.	2006
Diptera	*Agromyza demeijerei* Hendel, 1920	Mediterranean	*Laburnum* sp.	2006
Hymenoptera	*Eurytoma amygdali* Enderlein 1907	Asia	*Amygdalus* sp.	2009
Hymenoptera	*Nematus tibialis* Newman 1837	North America	*Robinia* sp.	2007
Prostigmata	*Aceria pyracanthi* (Canestrini, 1890)	Mediterranean	*Pyracantha* sp.	2006
Coleoptera	*Bruchidius siliquastri* (A.Delobel, 2007)	Asia	*Cercis* sp.	2006
Coleoptera	*Megabruchidius tonkineus* (Pic, 1904)	Asia	*Gleditsia* sp.	2011
Coleoptera	*Acanthoscelides pallidipennis* (Motschulsky 1873)	Asia	*Amorpha* sp.	2012
Coleoptera	*Scobicia chevrieri* (Villa & Villa 1835)	Mediterranean	*Quercus* sp.?	2014
Lepidoptera	*Cydalima perspectalis* (Walker, 1859)	Asia	*Buxus* sp.	2012

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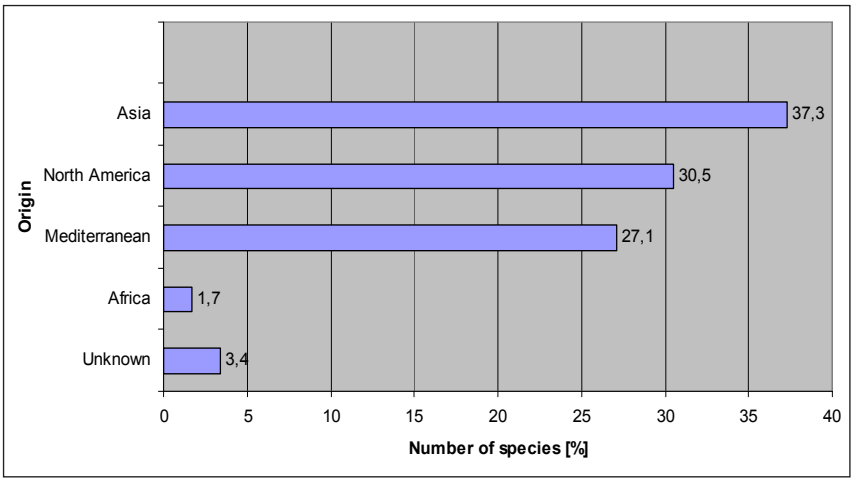

Figure 1 Percentage of alien pest species according to origin

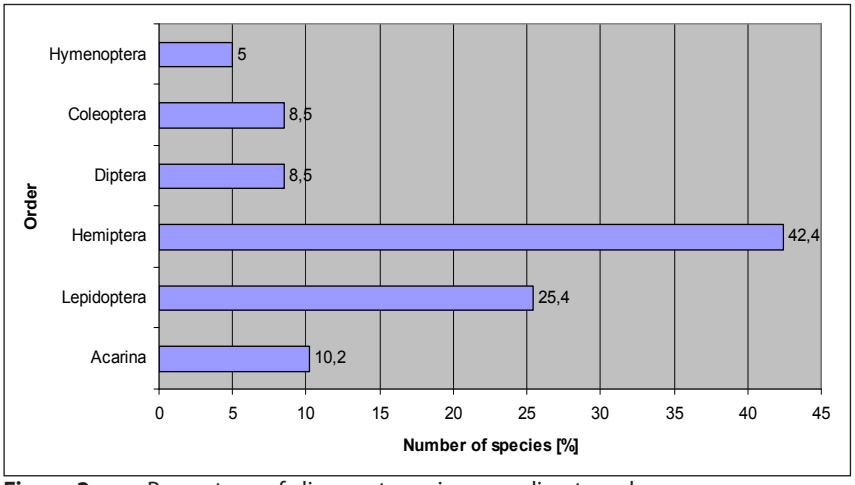

Figure 2 Percentage of alien pest species according to orders

In the last years we meet with alien or introduced pests, which occurence raise with trade increase of introduced woody plants in Slovakia and in the world. These species faund in slovak area suitable conditions for its developments. From results is visible, that the introduced woody plants are more damaged, which may be caused by natural predators absence. In the future we can await also alien pest tension increase, because of climate warming. During research were recorded 59 alien pest species. The asian species create the most number from total. That fact found also french scientists (Roques, 2007). In the last years occur mainly mediterranean and asian species, what prove 4 new mediterranean pest and 7 asian species in Slovakia. Although many of them are not harmfull for plants, but they are potential risk. Roques et al. (2009) also mentioned, that the new discovered mediterranean species in northern and western areas of Europe are very significant.

In the past and also in present were woody plants introduced from Asia and America, therefore the most number of pests has origin in these areas. However, many alien pest started they harmfull activity in longer time period. Hrubík (1988) mentioned, that in the past were any pests species on asian and american woody plants, or they occur very sporadically (*Cercis canadensis* L., *Cotoneaster dammeri* Schneid., *Elaeagnus angustifolia* L., *Robinia pseudoacacia* L., *R. hispida* L., *Tilia americana* L., ...). In present we acounted some alien and indigenous pest on that aforesaid woody palnts species. The important role in plant protection in Europe have pest species, which do not occur in Slovakia, but they were found in adjacent states. They are species as a asian longhorned beetle *Anoplophora glabripennis* Motsch., planthopper *Metcalfa pruinosa* (Say), which occurence in Slovakia is possible, because it was found in Cech Republic in 2001 (Lauterer and Malenovsky, 2002). The Urban environment is suitable mainly for many aphids species, because they like drier and warmer conditions. It caused more intensive gradations of some species. This fact mentioned also the authors Zúbrik, Kunca, Vakula et al. (2008).

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References

BLACKMAN, R. L. – EASTOP, V. F. 1994. Aphids on the world's tree as An Identificational and Informational Guide. Wallingford, Oxon : CAB International VIII, 1994, 1024 pp. ISBN 0 85198 877 6.

CSÓKA, G. 1997. Gubacsok. Budapest : Agroinform kiadó, 1997, 160 p. ISBN 963-502-638-2

CSÓKA, G. 2003. Levélaknák és levélaknázók. Budapest : Agroinform kiadó, 2003, 192 p. ISBN 963-502-785-0

GLAVENDEKIĆ, M. – MIHAJLOVIĆ, L. 2007. Citrus flatid planthopper *Metcalfa pruinosa* (SAY) (*Hemiptera*: *Flatidae*) and locust gall midge *Obolodiplosis robiniae* (Haldeman) (*Diptera*: *Cecidomyiidae*) new invasive alien species in Serbia. In: Alien arthropods in South East Europe – crossroad of three continents. Sofia : University of Forestry, 2007, p. 5–9

HRUBÍK, P. 1988. Živočíšni škodcovia mestskej zelene. Bratislava : VEDA, 1988, 196 p.

HRUBÍK, P. et al. (2002). Pestovanie a ochrana cudzokrajných drevín na Slovensku. Zvolen : Ústav ekológie lesa SAV, 2002. 200 p. ISBN 80-967238-5-5

KENIS, M. – PERE, Ch. (2007). Ecological impact of invasive insects in forest ecosystems. In: Alien invasive species and

DOI 10.15414/2014.9788055212623.71–74

international trade. Warsaw : Forest Research Institute, 2007, pp. 118–122 ISBN 978-83-87647-64-3

LAŠTŮVKA, A. – LAŠTŮVKA, Z. 1997. *Nepticulidae mitteleuropas*. Ein illustrierter Begleiter (*Lepidoptera*). Brno : Konvoj, 1997, 230 p. ISBN 80-85615-61-4

LAUTERER, P. – MALENOVSKY, I. 2002. *Metcalfa pruinosa* (Say, 1830) introduced into the Czech Republic (*Hemiptera*, *Flatidae*). In: Beiträge zur Zikadenkunde, 2002, no. 5, pp. 10–13.

LEVINE, J. M. – D'ANTONIO, C. M. 2003. Forecasting biological invasions with increasing international trade. In: Conservation Biology, 2003, no. 17, p. 322–326.

LIEBHOLD, A. M. – MacDONALD, W. L. – BERGDAHL, D. – MASTRO, V. C. 1995. Invasion by exotic forest pests: A threat to forest ecosystems. In: Forest Sciences Monographs, 1995, no. 30, p. 1–49.

MATTSON, W. J. 1997. Exotic insects in North American forests: Ecological systems forever altered. In: Proceedings of the Conference on Exotic Pests of Eastern Forests (ed. K. O. Britton). USDAForest Service and Tennessee Exotic Pest Plant Council, Nashville, Tennessee, 1997, pp. 187–193.

PERINGS, C. – WILLIAMSON, M. – DALMOZZONE, S. 2000. The economics of biological invasions. Cheltenham, United Kingdom : Edward Elgar, 2000, pp. 1–249.

PÉRICART, J. 1998. Hémiptères Lygaeidae euroméditerranéens. Faune de France 84A. Paris, France : Fédération Francaise des Sociétés de Sciences Naturelles, 1998, 468 p.

PIMENTEL, D. – LACH, L. – ZUNIGA, R. – MORRISON, D. 2000. Enviromental and economic costs of nonindigenous species in the United States. In: BioScience, vol. 50, 2000, no. 1, pp. 53–65.

ROQUES, A. 2007. Old and new pathways for invasion of exotic forest insects in Europe. In: Alien invasive species and international trade. Warsaw : Forest Research Institute, 2007, pp. 80–88. ISBN 978-83-87647-64-3

ROQUES, A. et al. 2009. Alien Terrestrial Invertebrates of Europe. In: Handbook of Alien Species in Europe. Netherlands : Springer, 2009, pp. 63–79. ISBN 978-1-4020-8280-1

SCHNAIDER, Z. 1976. Atlas uszkodzeń drzew i krzewów powodowanych przez owady i pajęczaky. Warszawa : Państwowe wydawnictwo naukowe, 1976, 320 p.

SIDOROVÁ, M. – GABERLE, M. – DAVIDOVÁ, M. – HANZLÍK, K. – ROUBALOVÁ, L. – PROKŮPEK, T. – HÁJEK, T. – NÁVRAT, P. – BAKAY. L. 2013. O strom více. 1. vyd. Praha 1 : reSITE, 2013, 23 p. ISBN 978-80-260-4348-5

SKUHRAVÝ, V. – SKUHRAVÁ, M. 1998. Bejlomorky lesních stromů a keřů. Písek : Matice lesnická, 1998, 174 p.

SUPUKA, J. 2007. Dreviny v mestskom prostredí z hľadiska zmien enviromentálnych podmienok a globálnej klímy. In: Aklimatizácia a introdukcia drevín v podmienkach globálneho otepľovania. Arborétum Mlyňany SAV : Arborétum Mlyňany SAV, 2007, 224 p. ISBN 978-80-969760-1-0

VITOUSEK, P. M. – D'ANTONIO, C. M. – LOOPE, L. L. – WESTBROOKS, R. 1996. Biological invasions as global environment change. In: American Scientist, vol. 84, 1996, no. 5, pp. 468–478.

VITOUSEK, P. M. – D'ANTONIO, C. M. – LOOPE, L. L. – REJMANEK, M. – WESTBROOKS, R. 1997. Introduced species: a significant component of human-caused global change. New Zealand, In: Journal of Ecology, vol. 21, 1997, no. 1, pp. 1–16.

ZÚBRIK, M. – KUNCA, A. – VAKULA, J. 2007. Inázne a nepôvodné druhy hmyzu a húb na Slovensku a ochrana európskeho priestoru zabezpečovaná "EPPO". In: Aktuálne problémy v ochrane lesa. Zvolen : NLC, 2007, pp. 83–88. ISBN 978-80-8093-0141

ZÚBRIK, M. – KUNCA, A. – VAKULA, J. et al. 2008. Prognóza vývoja škodlivých činiteľov s ohľadom na globálnu klimatickú zmenu a predpoklad ich dopadu na zdravotný stav lesov. In: Aktuálne problémy v ochrane lesa. Zvolen : NLC, 2008, pp. 103–115. ISBN 978-80-8093-040-0.

ZÚBRIK, M. – NOVOTNÝ, J. et al. 2004. Kalendár ochrany lesa. Bratislava : Polnochem, 2004, 94 p. ISBN 80-969093-3-9