Monitoring of Harmful Insect Species in Urban Conditions in Selected Model Areas of Slovakia

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Abstract

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Research was carried out in 7 model urban areas of Slovakia (Nitra, Topoľčany, Komárno, Partizánske, Piešťany, Prievidza, Trnava) in 2005–2006. Research was aimed at phytophagous insects damaging allochthonous and autochthonous ornamental woody plants, growing in the urban environment. Because of the importance of alien (introduced) species in this country, we were also interested in this problem. Field research was realized minimally three times per vegetation period. We collected samples of damage symptoms, adult samples or larval samples. In total, we recorded 409 species and 5 varieties of phytophagous insects in the examined areas. From that number the order *Lepidoptera* accounted for the highest percentage (29.25%). We recorded 52 species of alien insects. During the research period we recorded 9 new alien species for Slovakia in the model areas.

Keywords: pest; ornamental woody plant; alien species

In the last years, not only abroad but also in this country there appeared publications dealing with hygienic conditions of non-forest and urban greenery and with harmful factors that affect it. The knowledge of hygienic conditions of ornamental woody plants and the knowledge of diseases, pests and all negative impacts on the urban environment can considerably contribute to the skilled and professional care of urban greenery (Gregorová 2006). Whereas the microclimate in forest stands is more favourable and stable, woody plants growing out of forest are much more exposed to unfavourable climatic impacts. In addition, various types of sites where woody plants grow are connected with the impact of other strong stressors (more intensive pollution stress, higher dust element content, compacted and crusted soil, water contamination by pesticides, chemical pollutants, etc.). Many introduced species also belong to non-forest woody plants that are less resistant in our conditions, or there are woody plants on less favourable or unfavourable sites (Gregorová *et al*. 2007). By these activities fast ageing process of trees or to death and their functions decreases appear. These activities are supported by biotic harmful organisms such as fungi and insect pests.

The attention of the scientific and professional community in the last decade was especially attracted by invasive and alien organisms, because they represent significant factors of ecosystem degradation and threaten the plant production (Glavendekić & Mihajlović 2007). Invasions of alien species of organisms have continued. This effect is connected with the increased frequency of

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goods transportation (trucks) (increased trade and production of the SR economy) and with the climate change (Zúbrik *et al*. 2007). Climatic changes in the temperate zone which are connected with gradual global warming bring about a number of side-effects. One of these side-effects is the migration of thermophilic pests and plants to the north. The quantity and assortment of harmful organisms are changing, on the plants there occurs various physiological damage (Darnadyová 2007). Biological invasions of alien species are presently recognised as the second cause of the loss of biological diversity, following the destruction of habitats, and they also have serious economic consequences (Vitousek *et al*. 1996, 1997; Wilcove *et al*. 1998; Mack *et al*. 2000; Perings *et al*. 2000; Pimentel *et al*. 2000). This movement has accelerated a substantial increase in biological invasions by allowing the organisms to pass the natural barriers that limit their dispersal (Liebhold *et al*. 1995; Levine & D'Antonio 2003). The major part of information about insect invasions comes from North America or Australasia. In other regions (e.g. Europe, South America, Asia, Africa), the ecological impact of invasive insects has been studied to a much lesser extent, partly because insect invasions have been less critical for the environment in these regions than in North America, Australasia and most oceanic islands (Kenis & Péré 2007). In 1994, Mattson *et al*. (1997) estimated that there 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).

MATERIALS AND METHODS

In 2005–2008 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. 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. 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) were used.

RESULTS AND DISCUSSION

In the course of research on town greenery (2005–2008) we recorded the harmful activity of 409 species and 5 varieties of insect pests on woody plants. There were 52 non-indigenous insect species out of this number of species, which accounted for about 12.26%. The following orders were represented in these amounts: Auchenorrhyncha (1.65%), Acarina (8.73%), Lepidoptera (29.25%), Sternorrhyncha (18.16%), Coleoptera (13.44%), Hymenoptera (14.39%), Diptera (11.79%), Heteroptera (2.36%), Dermaptera (0.24%). In the following list we present the particular pest species that were recorded in the interest areas.

Auchenorrhyncha: ***Jassidae*** *Idiocerus populi* (L., 1761), *Ribautiana ulmi* (L., 1758), *Tettigella viridis* (L., 1758), *Cercopidae Aphrophora salicina* (Goeze, 1778), *Aphrophora alni* (Fallén, 1805), *Cercopis vulnerata* (Rossi, 1807), ***Cicadellidae*** *Edwardsiana rosae* (L., 1758), ***Membracidae*** *Stictocephala bisonia* (Kopp & Yonke, 1977),

Acarina: ***Eriophyidae*** *Aceria pseudoplatani* (Corti, 1905), *A. tenellus* (Nalepa, 1892), *A. macrorrhynchus* (Nalepa, 1889), *A. macrochelus* (Nalepa, 1891), *A. tristriata* (Nalepa, 1890), *A. erinea* (Nalepa, 1891), *A. brevitarsa* (Kiefer, 1939), *A. quercina* (Canestrini, 1891), *A. heteronyx* (Nalepa, 1891), *A. populi (*Nalepa, 1890), *A. platanoideus* (Roivainen, 1947), *A. pyracanthi* (Canestrini, 1890), *Aculus tetanothrix v. craspedobius* (Nalepa, 1889), *A. tetanothrix* v. *laevis* (Nalepa, 1889), *Eriophyes padi* (Domes, 2000), *E. macrotrichus* (Nalepa, 1889), *E. goniothorax* (Nalepa, 1889), *E. convolvens* (Nalepa, 1892), *E. fraxinivorus* (Nalepa, 1909), *E. triradiatus* (Nalepa, 1892), *E. tiliae tiliae* (Nalepa, 1890), *E. tiliae v. nervalis* (Nalepa, 1890), *E. tiliae v. leiosoma* (Nalepa, 1892), *E. tiliae v. exilis* (Nalepa, 1892), *E. inaequalis* (Wilson & Oldfield, 1966), *Phytoptus tetratrichus* (Nalepa, 1891), *Epitrimerus trilobius* (Nalepa, 1891), *Vasates quadripes* (Schimer, 1869), *Cecidophyes psilaspis* (Nalepa, 1893), ***Tetranichidae*** *Eotetranychus aes-*

culi (Reck, 1950), *E. carpini* (Oudemans, 1905), *E. tiliarum* (Herman, 1804), *Metatetranychus ulmi* (Koch, 1836), *Tetranychus urticae* (Koch, 1836),

Lepidoptera: ***Gracillariidae*** *Acrocercops brongniardella* (Fabricius, 1798), *Caloptilia betulicola* (Hering, 1928), *C. cuculipennella* (Hübner, 1796), *C. roscipennella* (Hübner, 1796), *Cameraria ohridella* (Deschka & Dimic, 1986), *Gracillaria syringella* (Fabricius, 1794), *Parectopa robiniella* (Clemens, 1863), *Parornix finitimella* (Zeller, 1850), *Parornix anglicella* (Stainton, 1850), *Phyllonorycter geniculella* (Ragonot, 1874), *P. acerifoliella* (Zeller, 1839), *P. joannisi* (Le Marchand, 1936), *P. ulmifoliella* (Hübner, 1817), *P. agilella* (Zeller, 1846), *P. platani* (Staudinger, 1870), *P. froelichiella* (Zeller, 1839), *P. tenerella* (Joannis, 1915), *P. apparella* (Herrich-Schäffer, 1855), *P. spinicolella* (Zeller, 1846), *P. lautella* (Zeller, 1846), *P. salictella* (Zeller, 1846), *P. nicellii* (Stainton, 1851), *P. pastorella* (Zeller, 1846), *P. robiniella* (Clemens, 1859), *P. esperella* (Goeze, 1783), *P. cerasicolella* (Herrich-Schäffer, 1855), *P. heegeriella* (Zeller, 1846), *P. quercifoliella* (Zeller, 1839), *P. trifasciella* (Haworth, 1828), *P. comparella* (Duponchel, 1843), *P. tristrigella* (Haworth, 1828), *P. coryli* (Nicelli, 1851), *P. maestingella* (Müller, 1764), *P. roboris* (Zeller, 1839), *P. issikii* (Kumata, 1963), *P. leucographella* (Zeller, 1850), *Phyllocnistis unipunctella* (Stephens, 1834), *P. saligna* (Zeller, 1839), *P. xenia* (Hering, 1936), *P. labyrinthella* (Bjerkander, 1790), ***Bucculatricidae*** *Bucculatrix frangutella* (Goeze, 1783), *B. thoracella* (Thunberg, 1794), ***Alucitidae*** *Alucita hexadactyla* (Linnaeus, 1758), ***Heliozelidae*** *Antispila metallella (*Denis & Schiffermüller, 1775), *A. treitschkiella* (Fischer von Röslerstamm, 1843), *Cossidae Zeuzera pyrina* (L., 1761), ***Yponomeutidae*** *Argyresthia thuiella* (Packard, 1871), *A. Trifasciata* (Staudinger, 1871), *Prays fraxinella* (Bjerkander, 1784), *Scythropia crataegella* (L., 1767), ***Lyonetiidae*** *Lyonetia clerkella* (L., 1758), *Leucoptera malifoliella* (Costa, 1836), ***Coleophoridae*** *Coleophora kuehnella* (Goeze, 1783), *C. serratella* (Linnaeus, 1761), *C. ibipennella* (Zeller, 1849), *C. flavipennella* (Duponchel, 1843), *C. lutipennella* (Zeller, 1838), *C. hemerobiella* (Scopoli, 1763), ***Sesiidae*** *Sesia apiformis* (Clerck, 1759), ***Tortricidae*** *Archips piceana* (L., 1758), *A. xylosteana* (Linnaeus, 1758), *Cydia fagiglandana* (Zeller, 1841), *C. pomonella* (L., 1758), *C. splendana* (Hübner, 1799), *C. amplana* (Hübner, 1825), *Epinotia tedella* (Clerck, 1759), *Pammene rhediella* (Clerck, 1759), *P. fasciana* (L., 1761), *Pseudargyrotoza conwagana* (Fabricius, 1775), *Retinia resinella* (L., 1758), *Rhyacionia buoliana* (Denis & Schiffermüller, 1775), *Zeiraphera rufimitrana* (Herrich-Schäffer, 1851), ***Gelechiidae*** *Coleotechnites piceaella* (Kearfott, 1903), ***Pyralidae*** *Dioryctria abietella* (Denis & Schiffermüller, 1775), *Nephopterix angustella* (Hübner, 1796), ***Sphingidae*** *Lathoe populi* (L., 1758), *Mimas tiliae* (L., 1758), *Sphinx ligustri* (L., 1758), *S. pinastri* (L., 1758), ***Geometridae*** *Erannis defoliaria* (Clerck, 1759), *Operophtera brumata* (L., 1758), ***Limantriidae*** *Calliteara pudibunda* (L., 1758), *Euproctis chrysorrhoea* (L., 1758), *Lymantria dispar* (L., 1758), *Orgyia antiqua* (L., 1758), *O. recens* (Hübner, 1819), ***Arctiidae*** *Hyphantria cunea* (Drury, 1773), ***Libytheidae*** *Libythea celtis* (Laicharting, 1782), ***Nepticulidae*** *Acalyptris platani* (Müller-Rutz, 1934), *Ectoedemia cerris* (Zimmermann, 1944), *E. occultella* (L., 1767), *Stigmella speciosa* (Frey, 1858), *S. confusella* (Wood & Walsingham, 1894), *S. microtheriella* (Stainton, 1854), *S. nivenburgensis* (Preissecker, 1942), *S. hahniella* (Wörtz, 1890), *S. luteella* (Stainton, 1857), *S. lemniscella* (Zeller, 1839), *S. szoecsiella* (Borkowski, 1972), *S. atricapitella* (Haworth, 1828), *S. betulicola* (Stainton, 1856), *S. crataegella* (Klimesch, 1936), *S. salicis* (Stainton, 1854), *S. prunetorum* (Stainton, 1855), *S. carpinella* (Heinemann, 1862), *S. hemargyrella* (Kollar, 1832), *S. trimaculella* (Haworth, 1828), *S. tityrella* (Stainton, 1854), *S. centifoliella* (Zeller, 1848), *S. ulmivora* (Fologne, 1860), *S. plagicolella* (Stainton, 1854), *S. tiliae* (Frey, 1856), ***Tischeriidae*** *Coptotriche angusticollella* (Duponchel, 1843), *Tischeria ekebladella* (Bjerkander, 1795), *T. decidua* (Wocke, 1876), *T. dodonaea* (Stainton, 1858), ***Noctuidae*** *Acronicta rumicis* (L., 1758), *Panolis flammea* (Denis & Schiffermüller, 1775), *Phlogophora meticulosa* (Linnaeus, 1758), ***Papilionidae*** *Iphiclides podalirius* (L., 1758),

Sternorrhyncha: ***Psyllidae*** *Cacopsylla pyrisuga* (Förster, 1848), *Psylla buxi* (L., 1758), *Psyllopsis fraxini* (L., 1758), ***Lachnidae*** *Cinara curvipes* (Patch, 1912), *C. cuneomaculata* (del Guercio, 1909), *C. pini* (L., 1758), *C. tujafilina* (Del Guercio, 1909), *C. pilicornis* (Hartig, 1841), *Lachnus roboris* (L., 1758), *Schizolachnus pineti* (F., 1781), ***Callaphididae*** *Callaphis juglandis* (Goeze, 1778), *Drepanosiphum platanoidis* (Schrank, 1801), *D. acerinum* (Walker, 1848), *Eucallipterus tiliae* (Linnaeus, 1758), *Phyllaphis fagi* (L., 1767), ***Aphididae*** *Acyrthosiphon caraganae* (Cholodkovsky, 1908), *Aphis fabae* (Scopoli, 1763), *A. spiraephaga* (Müller,

1961), *A. gossypii* (Glover, 1877), *A. craccivora* (Koch, 1854), *A. sambuci* (L., 1758), *A. pomi* (De Geer, 1773), *A. viburni* (Scopoli, 1763), *A. ilicis* (Kaltenbach, 1843), *A. schneideri* (Börner, 1940), *A. idaei* (van der Goot, 1912), *A. farinosa* (Gmelin, 1790), *A. grossulariae* (Kaltenbach, 1843), *Anoecia corni* (Fabricius, 1775), *Capitophorus elaeagni* (Del Guercio, 1894), *Dysaphis crataegi* (Kaltenbach, 1843), *Elatobium abietinum* (Walker, 1849), *Euceraphis betulae* (Koch, 1855), *Euceraphis punctipennis* (Zett., 1828), *Hyadaphis tataricae* (Aizenberg, 1935), *Chaitophorus leucomelas* (Koch, 1854), *Liosomaphis berberidis* (Kaltenbach, 1843), *Myzus persicae* (Sulzer, 1776), *M. cerasi* (Fabricius, 1775), *M. ligustri* (Mosley, 1841), *Patchiella reaumuri* (Kaltenbach, 1843), *Periphyllus venetianus* (Hille Ris Lambers, 1966), *P. aceris* (L., 1761), *Prociphilus xylostei* (De Geer, 1773), *Pterocallis albida* (Boerner, 1940), *Rhopalomyzus lonicerae* (Siebold, 1839), ***Aleurodidae*** *Aleurochiton complanatus* (Baer, 1849), ***Pemphigidae*** *Pemphigus spyrothecae* (Passerini, 1860), *P. affinis* (Kaltenbach, 1843), *P. populinigrae* (Schrank, 1801), *P. populi* (Courchet, 1879), *P. bursarius* (L., 1758), *P. borealis* (Tullgren, 1909), *Prociphilus bumeliae* (Schrank, 1801), *Schizoneura ulmi* (L., 1758), *Tetraneura ulmi* (L., 1758), ***Adelgidae*** *Adelges laricis* (Vallot, 1836), *Dreyfusia nordmannianae* (Eckstein, 1890), *D. piceae* (Ratzeburg, 1844), *D. prelli* (Grosmann, 1935), *Eopineus strobus* (Hartig, 1837), *Gilletteella cooleyi* (Gillette, 1907), *Pineus pini* (Macquart, 1819), *Sacchiphantes viridis* (Ratzeburg, 1843), ***Phylloxeridae*** *Phylloxera coccinea* (Heyden, 1837), ***Coccidae*** *Aspidiotus hederae* (Vallot, 1829), *Parthenolecanium corni* (Bouché, 1844), *Physokermes piceae* (Schrank, 1801), ***Pseudococcidae*** *Heliococcus bohemicus* (Šulc, 1912), *Eriococcidae Cryptococcus fagisuga* (Lindinger, 1936), *Pulvinaria floccifera* (Westwood, 1870), *Trichochermes walkeri* (Förster, 1848), ***Diaspididae*** *Carulaspis visci* (Schrank, 1781), *Leucaspis pini* (Hartig, 1839), *Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886), *Unaspis euonymi* (Comstock, 1881),

Coleoptera: ***Lucanidae*** *Lucanus cervus* (L., 1758), *Dorcus parallelipipedus* (L., 1758), ***Bruchidae*** *Bruchidius ater* (Marsham, 1802), *B. siliquastri* (A. Delobel, 2007), ***Scarabaeidae*** *Amphimallon solstitiale* (L., 1758), *Cetonia aurata* (L., 1761), *Miltotrogus vernus* (Germar, 1823), *Potosia cuprea* (Fabricius, 1775), ***Buprestidae*** *Agrilus biguttatus* (F., 1777), *Coraebus florentinus* (Herbst, 1801), *Trachys minutus* (Linnaeus, 1758), ***Elateridae*** *Ampedus sanguineus* (L., 1758), *Athous niger* (L., 1758), ***Anobiidae*** *Ernobius mollis* (L., 1758), ***Scolytidae*** *Phloeosinus thujae* (Perris, 1855), *Scolytus ratzeburgi* (Janson, 1856), *S. intricatus* (Ratzeburg, 1873), ***Cerambycidae*** *Aromia moschata* (L., 1758), *Hylotrupes bajulus* (L., 1758), *Megopis scabricornis* (Scopoli, 1763), *Rhagium inquisitor* (L., 1758), *Rhagium sycophanta* (Schrank, 1781), *Saperda populnea* (L., 1758), ***Chrysomelidae*** *Agelastica alni* (L., 1758), *Clytra laeviscula* (Ratzeburg, 1837), *Cryptocephalus pini* (L., 1758), *Galerucella viburni* (Paykull, 1799), *Chrysomela populi* (L., 1758), *Oulema melanopus* (L., 1758), *Plagiosterna aenea* (L., 1758), *Phyllodecta vulgatissima* (L., 1758), *Phyllodecta vitellinae* (L., 1758), ***Alticidae*** *Altica quercetorum* (Foudras, 1860), *Crepidodera plutus* (Latreille, 1804), ***Attelabidae*** *Attelabus nitens* (Scopoli, 1763), *Byctiscus populi* (L., 1758), *Deporaus tristis* (F., 1794), ***Curculionidae*** *Cionus fraxini* (De Geer., 1775), *Cryptorhynchus lapathi* (L., 1758), *Curculio glandium*(Marsham, 1802), *C. nucum* (L., 1758), *C. elephas* (Gyllenhal, 1836), *Magdalis ruficornis* (L., 1758), *Otiorhynchus sulcatus* (F., 1775), *O. rotundatus* (Gmelin, 1790), *O. singularis* (L., 1767), *O. lugdunensis* (Boheman, 1843), *Phyllobius oblongus* (L., 1758), *P. arborator* (Hbst., 1797), *P. argentatus* (L., 1758), *Rhynchaenus jota* (F., 1787), *R. fagi* (L., 1758), *R. alni* (L., 1758), *R. quercus* (L., 1758), *Rhamphus oxyacanthae* (Marsham, 1802), *Apionidae Apion simile* (Kirby, 1811), ***Meloidae*** *Lytta vesicatoria* (Linnaeus, 1758),

Hymenoptera: ***Tenthredinidae*** *Allanthus cinctus* (L., 1758), *Blennocampa pusilla* (Klug., 1816), *Caliroa cerasi* (L., 1758), *C. annulipes* (Klug, 1816), *Cladius grandis* (Serville, 1823), *Croesus septentrionalis* (L., 1758), *Eriocampa juglandis* (Fitch, 1857), *Euura amerinae* (L., 1758), *Hemichroa crocea* (Geoffroy, 1785), *Heterarthrus aceris* (Kaltenbach, 1856), *H. vagans* (Fallén, 1808), *Messa nana* (Klug, 1814), *Nematus salicis* (L., 1758), *Parna tenella* (Klug, 1816), *Periclista lineolata* (Klug, 1816), *Pontania proxima* (Serville, 1823), *P. viminalis* (L., 1758), *P. vesicator* (Bremi-Wolf, 1849), *Pristiphora abietina* (Christ., 1971), *Profenusa pygmaea* (Klug, 1816), *Scolioneura betuleti* (Klug, 1816), *S. nigricans* (Klug, 1818), ***Pamphiliidae*** *Acantholyda hieroglyphica* (Christ, 1791), *A. erythrocephala* (L., 1758), ***Vespidae*** *Vespa crabro* (L., 1761), ***Megachilidae*** *Megachile centuncularis* (L., 1758), ***Cimbicidae*** *Cimbex femorata* (L., 1758), *Siricidae Sirex juvencus* (L., 1758), ***Xiphydriidae*** *Xiphydria camelus* (L., 1758), ***Eurytomidae*** *Bruchophagus sophorae* (Crosby & Crosby, 1929), ***Cynipidae***

A. glutinosus (Giraud, 1859), *A. hungaricus* (Hartig, 1843), *A. inflator* (Hartig, 184), *A. fecundator* (Hartig., 1840), *A. solitarius* (Boyer de Fonscolombe, 1832), *A. testaceipes* (Hartig, 1840), *A. lucidus* (Hartig, 1843), *A. kollari* (Hartig, 1843), *A. grossulariae* (Giraud, 1859), *A. cydoniae* (Giraud, 1859), *A. anthracina* (Curtis, 1838), *A. coriarius* (Hartig, 1843), *A. conglomeratus* (Giraud, 1859), *A. curvator* (Hartig, 1840), *Biorhiza pallida* (Olivier, 1791), *Cynips quercuscalicis* (Burgsdorff, 1783), *C. quercusfolii* (L., 1758), *C. caputmedusae* (Hartig, 1843), *C. divisa* (Hartig, 1840), *C. disticha* (Hartig, 1840), *C. Longiventris* (Hartig, 1840), *Diplolepis rosae* (L., 1758), *Chilaspis nitida* (Giraud, 1859), *Neuroterus numismalis* (Fourcroy, 1785), *N. quercusbaccarum* (L., 1758), *N. laevisculus* (Schenck, 1863), *N. lanuginosus* (Giraud, 1859), *Trigonaspis megaptera* (Panzer, 1801), ***Argidae*** *Arge berberidis* (Schrank, 1802), *A. ochropa* (Gmelin, 1790),

Diptera: ***Cecidomyiidae*** *Acericecis vitrina* (Kieffer, 1909), *Anisostephus betulinus* (Kieffer, 1889), *Contarinia tiliarum* (Kieffer, 1890), *Craneiobia corni* (Giraud., 1863), *Dasineura fraxini* (Bremi, 1847), *D. rubella* (Kieffer, 1896), *D. kellneri* (Henschel, 1875), *D. crataegi* (Winnertz, 1853), *D. tiliamvolvens* (Rübs., 1889), *D. irregularis* (Bremi, 1847), *D. acrophila* (Winnertz, 1853), *D. gleditchiae* (Osten Sacken, 1866), *Didimomyia tiliacea* (Bremi, 1847), *Dryomyia circinans* (Giraud, 1861), *Drisina glutinosa* (Giard, 1893), *Jaapiella volvens* (Rübsaamen, 1917), *Janetia cerris* (Kollar, 1850), *Macrodiplosis pustularis* (Bremi, 1847), *Mikiola fagi* (Hartig, 1839), *Monarthropalpus flavus* (Schrank, 1776), *Obolodiplosis robiniae* (Haldemann, 1847), *Oligotrophus juniperinus* (L., 1758), *Rabdophaga salicis* (Schrank, 1803), *R. rosaria* (H. Loew, 1850), *Taxomyia taxi* (Inchbald, 1861), *Thecodiplosis brachyntera* (Schwägrichen, 1835), *Zygiobia carpini* (Loew, 1874), *Wachtiella rosarum* (Hardy, 1850), *Trypetidae rhagoletis cerasi* (L., 1758), *R. alternata* (Fallén, 1814), *R. meigenii* (Loew, 1844), ***Heleomyzidae*** *Suillia oldenbergii* (Czerny, 1904), *Agromyzidae agromyza demeijerei* (Hendel, 1920), *A. albitarsis* (Meigen, 1830), *A. alnibetulae* (Hendel, 1931), *Amauromyza elaeagni* (Rohdendorf-Holmanová, 1959), *A. verbasci* (Bouche, 1847), *Aulagromyza populicola* (Walker, 1853), *A. luteoscutellata* (de Meijere, 1924), *A. heringii* (Hendel, 1920), *A. cornigera* (Griffiths, 1973), *Chromatomyia lonicerae* (Robineau-Desvoidy, 1851), *Ch. periclymeni* (Hendel, 1922), *Liriomyza congesta* (Becker, 1903), *L. amoena* (Meigen, 1830), *Phytomyza agromyzina* (Meigen, 1830) *P. atricornis* (Meigen, 1838), ***Anthomyiidae*** *Strobilomyia laricicola* (Karl, 1928), *Strobilomyia anthracina* (Czerny, 1906),

Heteroptera: ***Tingidae*** *Corythucha ciliata* (Say, 1838), *Stephanitis pyri* (F., 1775), ***Miridae*** *Oxycarenus lavaterae* (Fabricius, 1787), ***Pyrrhocoridae*** *Pyrrhocoris apterus* (L., 1758), *Lygaeidae Arocatus longiceps* (Stål, 1872), ***Pentatomidae*** *Elasmucha grisea* (Linnaeus, 1758), *Palomena viridissima* (Poda, 1761), ***Acanthosomidae*** *Acanthosoma haemorrhoidale* (L., 1758), ***Coreidae*** *Leptoglossus occidentalis (*Heidemann, 1910),

Dermaptera: ***Forficulidae*** *Forficula auricularia* (L., 1758).

During our research, we also found 9 new alien species for Slovakia among the non-indigenous pest species. These were the following species:

Acalyptris platani (Müller-Rutz, 1934) – leaf-mining insect on *Platanus* species; 11. 9. 2008 Nitra, urban park

***Aceria pyracanthi* (Canestrini, 1890)** – gall mite damaging firethorn leaves; 18. 10. 2006, 1. 9. 2008 Nitra, Botanical Garden, Slovak University of Agriculture

***Cinara curvipes* (Patch, 1912)** – aphid sucking on white fir branches; 13. 4. 2007 Mlynany Arboretum of SAS, 17. 4. 2007 Nitra, urban park

***Myzocallis walshii* (Monell, 1879)** – aphid sucking on red oak leaves; 5. 6. 2008 Partizánske, urban park

***Pseudaulacaspis pentagona* (Targioni-Tozzetti, 1886)** – polyphagous scale, damaging leaves, fruits and branches of southern catalpa; 6. 7. 2007 Nitra, 10. 7. 2008, Trnava

***Obolodiplosis robiniae* (Haldemann, 1847)** – gall midge rolling leaves of locust (all species); first record in 2006, now in all analysed localities

***Bruchidius siliquastri* (A. Delobel, 2007)** – bruchid damaging redbud seeds; 23. 4. 2006 Mlynany Arboretum, 20. 4. 2008 Nitra

***Amauromyza elaeagni* (Rohdendorf-Holmanová, 1959)** – miner mining leaves of Russian olive tree; only one record in 20. 7. 2006 Nitra, urban park

***Agromyza demeijerei* (Hendel, 1920)** – miner mining leaves of golden-chain tree; 25. 7. 2006 Nitra, urban park

***Leptoglossus occidentalis* (Heidemann, 1910)** – coreid bug damaging pine seeds; 23. 5. 2006 Nitra, urban park

Insect pests of woody plants occurring in the urban environment represent a group which is the

priority object of a very small number of scientists in the Slovak space. The monitoring of these species is important because they cause damage both to ornamental plants and to commercial woody plants. It is important to know the biology of pests damaging ornamental plants in the European and global context because of cooperation in plant protection. More attention should be paid mainly to alien species in order to prevent their invasions and calamity gradation. In European countries various lists of insect pests and fungal diseases exist, but in Slovakia there is no list that would include forest pests and pests which also occur in the urban environment.

References

Blackman R.L., Eastop V.F. (1994): Aphids on the World's Trees: An Identification and Information Guide. CABI Publishing, Wallingford.

Csóka G. (1997): Gubacsok. Agroinform Kiadó, Budapest,.

Csóka G. (2003): Levélaknák és levélaknázók. Agroinform Kiadó, Budapest.

Darnadyová K. (2007): Premnoženie suchomilných a teplomilných škodcov na poľnohospodárskych plodinách v niektorých lokalitách východného Slovenska v roku 2007. In: Druhé rastlinolekárske dni Slovenskej rastlinolekárskej spoločnosti. Združenie pestovateľov obilnín. Bratislava: 89–91.

Glavendekić M., Mihajlovi 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: 5–9.

Gregorová B., Holub V., Černý K. (2007): Vliv klimatických faktorů a imisí na vývoj poškození dřevin rostoucích mimo les. In: Zpravodaj ochrany lesa – Aktuální problémy ochrany lesa. Zväzok 14. Výzkumný ústav lesního hospodářství a myslivosti, Jíloviště, 33–36.

Gregorová B. *et al*. (2006): Poškození dřevin a jeho příčiny. ZO ČSOP, Praha.

Kenis M., Péré Ch. (2007): Ecological impact of invasive insects in forest ecosystems. In: Alien invasive species and international trade. Forest Research Institute, Warsaw: 118–122.

Levine J.M., D'Antonio C.M. (2003): Forecasting biological invasions with increasing international trade. Conservation Biology, **17**: 322–326.

Liebhold A.M., MacDonald W.L., Bergdahl D., Mastro V.C. (1995): Invasion by exotic forest pests: A threat to forest ecosystems. Forest Sciences Monographs, **30**: 1–49.

Mack R.N., Simberloff D., Lonsdale W.M., Evans H., Clout M., Bazzaz F.A. (2000): Biotic invasions: Causes, epidemiology, global consequences and control. Ecological Applications, **10**: 689–710.

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

Perings C., Williamson M., Dalmozzone S. (2000): The economics of biological invasions. Edward Elgar, Cheltenham.

Pimentel D., Lach L., Zuniga R., Morrison D. (2000): Enviromental and economic costs of nonindigenous species in the United States. Bioscience, **50**: 53–65.

Roques A. (2007): Old and new pathways for invasion of exotic forest insects in Europe. In: Alien invasive species and international trade. Forest Research Institute, Warsaw: 80–88.

Skuhravý V., Skuhravá M. (1998): Bejlomorky lesních stromů a keřů. Matice lesnická, Písek.

Vitousek P.M., D'Antonio C.M., Loope L.L., Westbrooks R. (1996): Biological invasions as global environment change. American Scientist, **84**: 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 Journal of Ecology, **21**: 1–16.

Zúbrik M., Kunca A., Vakula J. (2007): Inv̈azne a nepôvodné druhy hmyzu a húb na Slovensku a ochrana európskeho priestoru zabezpečovaná „EPPO". In: Aktuálne problémy v ochrane lesa. Národné lesnícke centrum, Zvolen: 83–88.

Wilcove D.S., Rothstein D., Dubow J., Phillips A., Loso E. (1998): Quantifying threats to imperiled species in the United States. Bioscience, **48**: 607–615.

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