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LEAFHOPPERS, PLANTHOPPERS, FROGHOPPERS AND CIXIIDS (AUCHENORRHYNCHA) ON PIGWEEDS AS VECTORS OF PLANT DISEASES

Monika TÓTHOVÁ[1], Peter TÓTH[2], & Ľudovít CAGÁŇ[2]
[1]Department of Plant Protection, Slovak Agricultural University, Slovakia
[2]Department of Sustainable Development, Slovak Agricultural University, Slovakia

Summary

In our research carried out in Slovakia at locality Nitra and Dolná Malanta during 1995-1997, *Amaranthus retroflexus* L. served as a host for 24 Auchenorrhyncha species from sweep-net collection. Of them 11 species were known as phytoplasma or virus vectors worldwide. These were *Aphrodes bicinctus* (Schrank), *Eupteryx atropunctata* (Goeze), *Zyginidia pullula* (Boheman), *Fieberiella florii* (Stål), *Macrosteles laevis* (Ribaut), *Macrosteles quadripunctulatus* (Kirschbaum) and *Psammotettix alienus* (Dahlbom) from Cicadellidae, *Laodelphax striatella* (Fallén) and *Dicranotropis hamata* (Boheman), from Delphacidae, *Hyalesthes obsoletus* Signoret from Cixiidae and *Philaenus spumarius* (Linnaeus) from Cercopidae. The most abundant species were *P. allienus*, *Z. pullula* and *L. striatella*. They were abundant especially during second half of vegetation (August - September). Based on these information *A. retroflexus* is an important source of vector of plant diseases.

Key words: *Amaranthus retroflexus,* Cercopidae, Cicadellidae, Cixiidae, Delphacidae, plant diseases, viruses, phytoplasma

Introduction

Insect vectors of many plant diseases are found within the series Auchenorrhyncha (Hemiptera), which include some of the most devastating pests of major agricultural crops throughout the world. Direct damage are caused by insect feeding, but the greatest economic importance of Auchenorrhyncha is that they are vectors of viral and phytoplasmal plant diseases. In this time of increasing incidence of viral diseases especially in cereals in Slovak conditions, the weeds from the genus *Amaranthus* may play an important role.

Methods

During 1995-1997, the occurrence of the Auchenorrhyncha species associated with *Amaranthus retroflexus* L. were observed at localities Nitra and Dolná Malanta in Slovakia (Table 1). Insects were collected by sweeping-catching at the edges of maize fields on 3x25 plants. Chosen plants were approximately same sized at each locality and collection date. Insect were swept from June to September at weekly intervals.

Results and discussion

In our research carried out in Slovakia during 1996-1997, *Amaranthus retroflexus* L. served as host for 24 Auchenorrhyncha species belonging to the family Cicadellidae, Cixiidae, Cercopidae and Delphacidae. Of them 11 species were known as phytoplasma or virus vectors worldwide (Table 1). *Amaranthus caudatus* L. is susceptible to 50 viruses, *A. retroflexus* to 25 (http://image.fs.uidaho.edu/vide/famly007.htm). These viruses are different from those transmitted by Auchenorrhyncha species found on *Amaranthus* plants. The rest 13 species as *Empoasca decipiens* (Paoli), *E. solani* (Curtis), *Anaceratagallia ribauti* (Ossiannilsson), *Arboridia velata* (Ribaut), *Balclutha punctata* (Fabricius), *Mocydia crocea* (Herrich-Schäffer), *Psammotettix kolosvarensis* (Matsumura) *Mocuellus collinus* (Boheman), *Euscelidius schenckii* (Kirschbaum), *Streptanus sordidus* (Zetterstedt), *Psammotettix confinis* (Dahlbom) *M. variatus* (Fallén) from Cicadellidae and *Reptalus quinquecostatus* (Duffour) from Cixiidae do not serve, according literature, as a vector of plant diseases.
Among the virus carriers the most abundant during each observed years, were *Psammotettix allienus*, *Zyginidia pullula* and *Laodelphax striatella*. They were abundant especially during second half of vegetation (August - September) (Vráblová et al. 2001). These species threaten mainly cereals and also maize (Table 1).
During 2001-2002 wheat dwarf virus (WDV) and barley yellow dwarf virus (BYDV) were determined in Slovakian cereal crops. Vectors of BYDV are aphids, WDV is transmitted by *P. allienus* (Vajcichová et al. 2002), one of the most abundant species found on *Amaranthus* spp. Because stubble after harvest of cereals is often weeded by *Amaranthus* plants, and these plants serve as refugees for virus carriers, we not recommend growing cereals in sequence.

Table 3. World-wide literature notes about host plants of Auchenorrhyncha species, viral and mycoplasmal plant diseases transmitted by the species found on *Amaranthus* spp. in Slovakia.

Family/ Species	**Host plant (literature)**	Vector of	**Literature cited**
Cixiidae			
Hyalesthes obsoletus Signoret	*Vitis vinifera, Convolvulus arvensis, Urtica dioica, Artemisia vulgaris, Senecio erucifolia, Ranunculus bulbosus, Solanum nigrum, S. tuberosum, Lycopersicon esculentum, Cardaria draba, Prunus domestica, Syringa vulgaris, Ficus carica, Ulmus* sp.	grapevine yellows, stolbur	Maixner & Weber 1999, Mori et al. 1999, Rivenez & Bonjotin 1997, Ozbek et al. 1987, Martini et al. 1999, Sforza et al. 1998, Nast 1972
Delphacidae			
Laodelphax striatella (Fallén)	wheats, barley, triticale, oats, maize, rice, grasses	barley yellow striate mosaic cytorhabdovirus, wheat Iranian stripe tenuivirus, maize rough dwarf fijivirus, rice black-streaked dwarf fijivirus, Nilaparvata lugens reovirus, rice stripe tenuivirus, cereal tillering disease	Bertschinger 1994, Sharzei & Izadpanah 1998, Naibo 1994, Zhou et al. 1998, Bae & Kim 1994, Nakashima & Noda 1995, Lindsten & Gerhardsen 1971, Ossiannilsson 1978
Dicranotropis hamata (Boheman)	Oats, wheat, timothy, *Lolium perenne, Deschampsia caespitosa, Agrostis tenuis, Holcus lanatus, Elytrigia repens, Arrhenantherum elatius, Alopecurus pratensis*	Oat dwarf disease, oat sterile-dwarf virus, cereal tillering disease	Hasan 1939, Raatikainen & Vasarainen 1964, Lindsten & Gerhardsen 1971, Ikäheimo & Raatikainen 1963
Cercopidae			
Philaenus spumarius (Linné)	*Carduus nutans*, grasses, *Solidago rugosa, Erigeron glaucus, Medicago sativa*, *Hieracium pilosella, H. praealtum, H.caespitosum, H. Lepidulum,* economically crops, tomato, strawberry, vine crops, total number exceed 1000 species	Peach yellows virus, virus of Pierce's disease of vine, Pierce Disease caused by Xylella fastidiosa, tomato stolbur disease	Grant et al. 1998, Uriarte & Schmitz 1998, Karban & Strauss 1993, Byers et al. 1999, Ossiannilsson 1981, Vlasov et al. 1992, Quilici et al. 1998, Syrett & Smith 1998, European and Mediterranean Plant Protection Organization
Cicadellidae			
Aphrodes bicinctus (Schrank)	Fabaceae *Lycopersicon esculentum, Solanum melongena, Helianthus annuus, Daucus carota, Solanum tuberosum,* tobacco, *Trifolium*,	stolbur, aster yellows, phyllody viruses, dwarf,	Tishechkin 1998, Ossiannilsson 1981, Lodos & Kalkandelen 1982, Genite & Stanyulis 1975, Chiykowski 1977
Eupteryx atropunctata (Goeze)	*Chrysantemum balsamita, C. vulgare, Solanum tuberosum, Lamium album, Glechoma hederacea, Arctium*, *Salvia splendens, S. officinalis, Verbena <multiply> hybrida, Dahlia pinnata, Zinnia elegans, Helianthus annuus, Mentha piperita, M. aquatica, Melissa officinalis, Thymus* spp., *Cannabis sativa, Vicia* sp., *Trifolium, Phaseolus vulgaris, Artemisia* sp., *Althaea* spp.,	potato spindle tuber viroid ?	Vidano & Arzone 1978, Ossiannilsson 1981, Werner-Solska 1983, Bilewicz-Pawinska & Pankanin-Franczyk 1995, Soika & Labanowski 1996, Nowacka & Bielejewski 1978, Nowacka et al. 1974, Scaltriti 1989, Patschke et al. 1997, Lodos & Kalkendelen 1984, Hoebeke & Wheeler 1983

	Ocimum sanctum, Origanum spp., *Salvia*		
Zyginidia pullula (Boheman)	*Zea maize, Sorghum*, wild and cultivated species of Gramineae, *Oryza*	possible vectors of grapevine flavescence doree virus	Ossiannilsson 1981, Tavella & Arzone 1992, Vidano & Arzone 1985, Vettorello 1991, Lodos & Kalkandelen 1984
Fieberiella florii (Stål)	Rosaceae, *Prunus avium*	witches' broom disease of apple (phytoplasma), apple proliferation disease (phytoplasma), western X-disease	Lemoine 1997, Bliefernicht & Krczal 1995, Steenwyk et al. 1995, Nast 1972
Macrosteles laevis (Ribaut)	*Zinnia elegans, Callistephus chinensis*, leys, umbelliferous and alliaceous vegetable, cereals, *Lolium perenne, Medicago sativa,* winter wheat	European aster yellows, oat blue dwarf, stolbur disease of tomato and asters,	Soika & Labanowski 1996, Nowacka & Zoltanska 1974, Lindsten et al. 1970, Murtomaa 1967, Heinze 1959, Ossiannilsson 1983, Malschi & Dumitru 1992
Macrosteles quadripunctulatus (Kirschbaum)	Celery, *Catharanthus roseus, Chrysanthemum carinatum, C. frutescens*	Chrysanthemum yellows phytoplasma, Tagetes witches' broom	Bosco et al. 1997, Belli et al. 1972, Nast 1972
Psammotettix alienus (Dahlbom)	Cereals, wheat, barley, Apera spica-venti	Wheat dwarf virus, wheat dwarf monogeminivirus,	Ossiannilsson 1983, Raatikainen & Vasarainen 1976, Lindsten & Lindsten 1999, Vacke & Cibulka 1999

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