

**FIRST REPORT OF THE NEARCTIC FLATID
PLANTHOPPER *METCALFA PRUINOSA* (SAY)
IN THE REPUBLIC OF KOREA
(HEMIPTERA: FULGOROIDEA)¹**

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The flatid planthopper *Metcalfa pruinosa* (Say) is a native Nearctic species found from southeastern Canada south to Florida and west to Minnesota, Texas, and eastern Colorado (Wilson and Lucchi, 2001; Wilson, personal observation). It also has been recorded from Bermuda (Wilson and Hilburn, 1991). Records of *M. pruinosa* from other New World localities (Metcalf, 1957) are considered unreliable because this species can be confused with other species of *Metcalfa* as well as with flatids in the genera *Ormenis* and *Melormenis* (see Caldwell and Martorell, 1950). Comparison of the structures of the aedeagus, anal segment (= anal flap, anal tube), and genital style (= paramere) with illustrations in Shepard (1939), Holzinger et al. (2003), or Yang and Chang (2000) are required to correctly identify this species.

Metcalfa pruinosa was introduced into northern Italy in the 1970s (Dlabola, 1981) and has spread rapidly throughout Italy to Sicily and Sardinia, and from Spain to France, Corsica, Switzerland, Germany, Austria, Czech Republic, Hungary, Slovenia, Croatia, Romania, Bulgaria, Greece, western Russia, and western Turkey (Zangheri and Donadini, 1980; Duso, 1984; della Guistina, 1986; Cravedi, 1989; Jermini et al., 1995; Bonavia et al., 1998; Lauterer, 2002; Pons et al., 2002; Holzinger et al., 2003; Karsavuran and Güclü, 2004; Kahrer, 2005; Trenchev et al., 2007; Souliotis et al., 2008; Gnezdilov and Sugonyaev, 2009; Preda and Skolka, 2009). Here we provide the first records of *M. pruinosa* in northeastern Asia. Because the literature on *M. pruinosa* is scattered in often difficult-to-locate journals, we also review studies on this planthopper's bionomics in North America and in Europe where it is adventive.

Metcalfa pruinosa is relatively uncommon in the USA (Wilson and Lucchi, 2001) and rarely causes damage to its host plants. The few examples of its economic impact include damage to citrus (*Citrus* spp.) due to nymphal feeding on buds that had been subjected to a late frost and some damage by nymphs to dahlias (*Dahlia* sp.), privet (*Ligustrum amurense* Carriere) and salvia (*Salvia* sp.) (Walden, 1922, 1927; Wene, 1950; Wene and Riherd, 1954; Dean and Bailey,

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1961). *Metcalfa pruinosa* is extremely polyphagous, principally on woody plants, and has been recorded in the USA from more than 120 species in more than 50 families (Wilson and Lucchi, 2000) and in Italy from more than 280 species in 75 families (Bagnoli and Lucchi, 2000).

Invasion into new areas by *M. pruinosa* is due to importation of plants with eggs, short range flights, and via vehicle transport. These flatids were introduced into a nursery in the Czech Republic via egg-bearing plants that were imported from Italy (Lauterer, 2002). Evidence of short range flights through the tree canopy includes numerous *M. pruinosa* captured in two Sante canopy traps (ca. 7 m. and 12 m.) placed in a forested area in Warrensburg, Missouri, from July through September, 2009 (Wilson, personal observation). In Italy, transport was aided by vehicles parked near food plants (Pantaleoni, 1989).

Populations of *M. pruinosa* can reach high densities where it has been introduced. For example, in a study of population densities four 50 m transects were established in comparable forest areas in Tuscany, Italy, and Missouri, USA. The first *M. pruinosa* nymph encountered marked the starting point of each transect; every branch, twig, and leaf for 50 m was examined. In Tuscany 11,571 nymphs were counted over four transects, but only 72 were found in the Missouri transects (Wilson and Lucchi, 2001). Although populations can reach high levels, they often do not appear to cause widespread damage. In Italy an outbreak of *M. pruinosa* did cause significant damage to soybeans (*Glycine max* (L.) Merr., Fabaceae) (Ciampolini et al., 1987). Dense populations certainly have some effect on their woody host plants and the copious amounts of honeydew they produce can result in the growth of sooty mold. In Italy and southern France, honeydew is gathered by honeybees and the honey harvested by apiarists is sold as "Meile di Melata di *Metcalfa*" (Wilson and Lucchi, 2007).

A few studies examined the possibility that *M. pruinosa* could serve as a pathogen vector. *Metcalfa pruinosa* nymphs and adults were able to acquire grapevine fanleaf virus (GFLV) and grapevine leafroll-associated virus 3 (GLRaV-3) from infected potted grapevines (*Vitis vinifera* L., Vitaceae) in a greenhouse study in Italy but did not transmit the viruses to healthy plants (Materazzi et al., 1998). Adults collected from northern Italian weeds and orchards harbored phytoplasmas in the aster yellows (16SrI) and apple proliferation (16SrX) groups (Danielli et al., 1996) but there was no evidence that *M. pruinosa* transmitted these pathogens to plants. Field-collected nymphs were able to acquire clover proliferation (16SrVI) and elm yellows (16SrV) phytoplasmas from infected plants in France but did not transmit them to healthy plants (Clair et al., 2001). Various phytoplasmas were detected in the eggs, nymphs, and adults of *M. pruinosa* in a field and laboratory study in Italy, and one, aster yellows phytoplasma (16SrI-C), was transmitted to caged grapevines (Guadagnini et al., 2000).

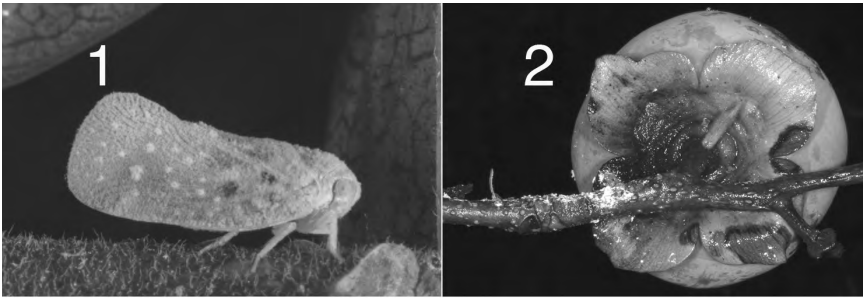
Several methods have been employed to control local infestations of *M. pruinosa*. Spraying with water, then crushing the nymphs under foot was suggested

by Walden (1927). Spraying nymphs with an aqueous solution of potassium nitrate removed them from their hosts and washed off the wax and honeydew but did not kill them (Greatti and Girolami, 1994). Pesticides such as 0.1% sumithion, chlorpyrifos, and imidacloprid have been used successfully. Chemical control, however, is probably not very effective because the planthoppers have such a wide host range (Bagnoli and Lucchi, 2000; Lauterer, 2002; Kahrer 2005). Pruning horticultural plants to destroy eggs was suggested by Walden (1922) and Kahrer (2005). Introduction of the parasitoid wasp *Neodryinus typhlocybae* (Ashmead) (Hymenoptera: Dryinidae) to southern Europe has proved to be very successful in controlling *M. pruinosa* populations (Pandolfo, 2000; Olmi, 2000; Sala and Foschi, 2000; Sacchetti, et al., 2000; Ciglar, et al., 1998; Lucchi and Wilson, 2003; Strauss, 2009).

Metcalfa pruinosa females insert eggs into cracks in the corky bark of trees and shrubs in mid-summer (Wilson and McPherson, 1981; Santini and Lucchi, 2000; Wilson and Lucchi, 2001). The eggs overwinter, hatch the following spring, and nymphs aggregate on twigs and under leaves where they suck phloem from their hosts. Fifth instar nymphs molt to adults in early summer; adults then disperse and mate about one month later (Santini and Lucchi, 2000). Courtship involves calling via substrate vibrations on their host plants. Calling and copulation occur under low light conditions after midnight (Virant-Doberlet and Zezina, 2007; Wilson and Lucchi, 2007). In the USA, nymphs of *M. pruinosa* commonly are found feeding in mixed species aggregations with the flatids *Flatormentis chloris* (Melichar) and *Ormenooides venusta* (Melichar), and the acanaloniid *Acanalonia conica* (Say) (Wilson and McPherson, 1980; Wilson and Lucchi, 2001). *Acanalonia conica*, a common planthopper in the eastern USA, has recently been introduced to Italy and is likely to expand its range as did *M. pruinosa* (D'Urso and Uliana, 2006; Aldin et al., 2008).

Occurrence of *Metcalfa pruinosa* in the Republic of Korea

Metcalfa pruinosa adults were first observed on persimmon (*Diospyros kaki* Thunb. (Ebenaceae)) in an orchard in Hanrim County, Kimhai, Gyeongnam Province, Republic of Korea, in August 2005. Nymphs and adults were subsequently observed on trees in Jinyoung County, Kimhai, in July 2008, and from May to September 2009. The persimmon fruits were covered with large amounts of wax and honeydew, which encouraged growth of sooty mold. In addition to persimmon, *M. pruinosa* nymphs or adults were observed on the following host plants: *Aralia cordata* Thunb., *Kalopanax septemlobus* (Thunb. ex A. Murr) Koidz. (Araliaceae); *Buxus* sp. (Buxaceae); *Camellia japonica* L. (Theaceae); *Chaenomeles sinensis* (Thouin) Koehne, *Prunus mume* Siebold & Zucc., *P. serrulata* Lindl., *Rubus crataegifolius* Bunge (Rosaceae); *Euonymus japonicus* Thunb. (Celastraceae); *Quercus aliena* Blume (Fagaceae); and *Robinia pseudoacacia* L. (Leguminosae). According to a local persimmon farmer, nymphs were most abundant on *Buxus* sp. and *R. pseudoacacia* in 2009.



Figures 1-2. *Metcalfa pruinosa* and damage to persimmon in the Republic of Korea. 1. Adult. 2. Wax residue from nymphal feeding.

The only native flatid species found in Korea are *Geisha distinctissima* Walker and *Mimophantia maritima* Matsumura. *Geisha distinctissima* is light green and polyphagous on woody dicots (Wilson et al., 1994). *Mimophantia maritima* is light brown and has a strongly anteriorly produced head; the fifth instar nymph was described and illustrated by Tsaur (1989) and Yang and Yeh (1994). Detailed descriptions and illustrations, including the male genitalia, of these two flatids are provided by Fang (1989) and Yang and Chang (2000).

Specimens examined. Specimens of *M. pruinosa* with the following data were examined: Republic of Korea: Gyeongnam Province, Jinyoung County, Kimhae, 27 August 2009, coll. H-S. Lee, 2 males, 5 females; USA: Missouri, Johnson County, Warrensburg, 2-24 September 2009, Sante canopy trap, coll. S. W. Wilson, 4 males, 4 females. Specimens are housed in the S. W. Wilson Planthopper Collection, University of Central Missouri, Warrensburg.

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