APHIDS ASSOCIATED WITH CHRYSANTHEMUMS IN THE UNITED STATES

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Abstract

A key to 15 aphid species known to colonize cultivated and native chrysanthemums in the United States is provided; each species is described and characteristic structures are illustrated. A brief summary of taxonomic characters, cultivated and wild hosts, and distribution within the United States and throughout the world are also given for each species.

Key Words: aphididae, aphids, chrysanthemum, taxonomic keys

Resumen

Se ofrece una clave para identificar quince especies de áfidos que se sabe colonizan crisantemos, cultivados y indígenas, en los Estados Unidos; se describen e ilustran las estructuras características de cada especie. Se incluye para cada especie un resumen breve de las características taxonómicas, los hospedantes cultivados y indígenas, y la distribución en los Estados Unidos y por todo el mundo.

Chrysanthemums are a long-time favorite of both professional growers and hobbyists. The genus Chrysanthemum (Asteraceae = Compositae) includes such well-known flowers as shasta-daisies, pyrethrum, marguerites or Paris-daisies, and annual chrysanthemums (Everett 1981). The great diversity of the plant's form, growing habits, and color has contributed to the popularity of the cultivated varieties of this flower, namely Chrysanthemum morifolium Ram. Although the share of the chrysanthemum market has declined since 1981 (Voigt 1989), potted chrysanthemums were the second leading potted flowering plant produced in the United States in 1987 (Anonymous 1991). The wholesale value of potted and florist chrysanthemums for 1993 was more than $95 million and nearly $9 million for standard chrysanthemums for 36 reporting states (Anonymous 1994).

Several species of aphids can become established on greenhouse and outdoor plantings. Large colonies of aphids can greatly reduce plant vigor and kill the plant through mechanical injury. However, even a few feeding aphids can damage plants because they produce a sticky substance called honeydew. As the aphids feed, honeydew is excreted and accumulates on the leaves and flowers. In the higher humidity of a greenhouse, honeydew provides an excellent substrate for the growth of black sooty mold. Large areas of mold covering the leaves can reduce photosynthesis and also result in an unattractive plant with a much lower market value. Additionally, aphids can transmit several viral diseases that injure chrysanthemums.

A diverse aphid fauna—at least 15 species—is known to colonize cultivated and wild chrysanthemums in the United States. A brief summary of taxonomic characters, hosts, worldwide distribution, and U.S. distribution is given for each of the 15 species. Aphids treated here are: Aphis fabae Scopoli, Aphis gossypii Glover, Aulacorthum dir-
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cumflexum (Buckton), Aulacorthum solani (Kaltenbach), Brachycaudus cardui (L.), Brachycaudus helichrysi (Kaltenbach), Coloradoa rufomaculata (Wilson), Macrosiphoniella sanborni (Gillette), Macrosiphoniella subterranea (Koch), Macrosiphoniella tanacetaria (Kaltenbach), Macrosiphum euphorbiae (Thomas), Myzus ascalonicus Doncaster, Myzus ornatus Laing, Myzus persicae (Sulzer), and Pleotrichophorus chrysanthemi (Theobald). Descriptions, figures, and keys are included as an aid for those responsible for detection, identification, and control of aphids associated with chrysanthemums in the United States.

MATERIALS AND METHODS

In the synonymy section, one asterisk (*) represents the name used by Palmer (1952) and two asterisks (**) represent the name appearing in Blackman & Eastop (1984). Common names are those approved by the Entomological Society of America (Stoetzel 1989).

Information on distribution and hosts is taken from labels on slides in the National Collection of Insects, Beltsville, Maryland, and from records in Palmer (1952), Smith & Parron (1978), and Blackman & Eastop (1984).

Identifications can be made of live aphids, alcohol preserved specimens, or cleared and slide mounted specimens. In the illustrated keys, the species are grouped by morphological differences in antennae, antennal tubercles, cornicles, and caudal setae. Characters used in the keys are apparent with a dissecting microscope with a power of at least 16X. Relative body size of aphid species is after Blackman & Eastop (1984): body length <2.0 mm are “small,” 2.0 - 3.0 mm are “medium,” and >3.0 mm = “large.” Body length is measured dorsally from the center of the frons to the end of the abdomen, excluding the cauda (see generalized aphid, Fig. 1). Length of the antennal “terminal process” is measured as the distance from the large primary sensorium to the tip. Length of the “base” of the antenna is measured from the basal portion of the last antennal segment to the apex of the primary sensorium. The keys are not intended for identification of single, errant aphids but should be used for individuals fully colonizing chrysanthemums.

APHIDS ON CHRYSANTHEMUMS IN THE UNITED STATES

Aphis fabae Scopoli 1763
Figs. 1, 2, 3

Synonymy:

* & **Aphis fabae Scopoli
ESA approved common name: bean aphid
Other common name: black bean aphid

Taxonomic characters: Wingless adult female.—In life, body dull black. Small to medium sized, body length 1.8-2.6 mm, rounded. Antenna 6 segmented; tubercles not developed; terminal process approximately 2½-3 times length of base of antennal segment VI; no secondary sensoria on antennal segment III; setae on antennal segment III longer than diameter of segment. Cornicle dark, cylindrical, 3-3½ times as long as wide. Cauda dark, elongate with 8-12 lateral setae and 2-5 dorsolateral setae.

Winged adult female.—In life, body dull black, usually with dark lateral areas and bands on dorsum of abdomen; immatures often covered with wax; alataid nymphs with tesselated abdomen. Small to medium sized, body length 1.9-2.4 mm, rounded. Antenna 6 segmented; tubercles not developed; terminal process approximately 2½-
Fig. 1. Pictorial key to fifteen aphid species that colonize chrysanthemums in the United States.
Fig. 2. Pictorial key to wingless adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles not developed.
Fig. 3. Pictorial key to winged adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles not developed.
3¼ times length of base of antennal segment VI; 6-16 secondary sensoria of variable size on antennal segment III; 0-7 secondary sensoria on antennal segment IV; setae on antennal segment III longer than diameter of segment. Cornicle dark, cylindrical, 3¼-4½ times as long as wide. Cauda dark, elongate with 8-12 lateral setae and 0-4 dorso-lateral setae.

Hosts: Principal hosts are species of Euonymus and Viburnum, however, A. fabae is polyphagous on many additional plants.

U.S. distribution: Throughout.

World distribution: Widely distributed throughout the world.

Comments: Aphis fabae transmits 42 plant viruses but is not a known vector of the chrysanthemum viruses (Chan et al. 1991).

Aphis gossypi Glover 1877

Figs. 1, 2, 3

Synonymy:

* & **Aphis gossypi Glover

ESA approved common name: cotton or melon aphid

Other common names: none

Taxonomic characters: Wingless adult female.—In life, body color varying from dark green to pale yellow or nearly white. Small sized, body length 1.4-1.7 mm, rounded. Antenna 6 segmented; tubercles not developed; length variable, terminal process approximately 2-3¼ times length of base of antennal segment VI; antennal segment III without secondary sensoria; setae on antennal segment III shorter than diameter of segment. Cornicle dark, cylindrical, slightly tapering to apical flange, approximately 3-4 times as long as wide. Cauda pale to dusky, elongate with 4-6 (usually 6) lateral setae.

Winged adult female.—In life, body shape and coloration similar to wingless adult female. Small sized, body length 1.4-2.0 mm, rounded. Antenna 6 segmented; tubercles not developed; terminal process approximately 2-3 times length of base of antennal segment VI; antennal segment III with 4-9 secondary sensoria; antennal segment IV with 0-1 secondary sensorium; setae on antennal segment III shorter than diameter of segment. Cornicle dark, cylindrical with apical flange, approximately 3-5 times as long as wide. Cauda pale to dusky, elongate with 4-6 (usually 6) lateral setae.

Hosts: Polyphagous and very damaging to many plants of economic importance, including species of Chrysanthemum.

U.S. distribution: Throughout.

World distribution: Widespread.

Comments: Aphis gossypi transmits 76 plant viruses but is not a known vector of the chrysanthemum viruses (Chan et al. 1991).

Aulacorthum circumflexum (Buckton 1876)

Figs. 1, 6, 7

Synonymy:

*Myzus circumflexum (Buckton)

**Aulacorthum (Neomyzus) circumflexum (Buckton)

ESA approved common name: crescent marked lily aphid
Other common names: mottled arum aphid

Taxonomic characters: Wingless adult female.—In life, body color varying from nearly white to yellow or green, abdomen with dark U-shaped dorsal patch, thorax with a pair of dorsolateral patches or transverse bars. Small to medium sized, body length 1.7-2.2 mm, spindle shaped. Antennae 6 segmented; tubercles well developed with inner faces parallel; terminal process approximately 4-5 times length of base of antennal segment VI; antennal segment III with 0-3 (usually 1) secondary sensoria, antennal segment IV without secondary sensoria. Cornicle pale, cylindrical, flaring slightly apically, approximately 3¾-6 times as long as wide. Cauda pale, elongate with 4-6 (usually 4) lateral setae and occasionally a single dorsal preapical seta.

Winged adult female.—In life, head and thorax black, abdomen yellow to green with dark bands often coalescing to form a single patch; body shape similar to wingless adult female. Small to medium sized, body length 1.4-2.2 mm. Antennae 6 segmented; tubercles well developed with inner faces parallel; terminal process approximately 4½-7½ times length of base of antennal segment VI; antennal segment III with 10-17 secondary sensoria; antennal segment IV with 0-1 secondary sensoria. Cornicle pale cylindrical, approximately 4-7 times as long as wide. Cauda pale, elongate with 4 lateral setae and 1-2 dorsal preapical setae.

Hosts: Extremely polyphagous, occurring on many greenhouse and house plants, including Chrysanthemum.

U.S. distribution: Throughout.

World distribution: Widespread.

Comments: Aulacorthum circumflexum transmits 31 plant viruses but is not a known vector of the chrysanthemum viruses (Chan et al. 1991).

Aulacorthum solani (Kaltenbach 1843)
Figs. 1, 4, 5

Synonymy:

*Myzus solani (Kaltenbach)
**Aulacorthum solani (Kaltenbach)
ESA approved common name: foxglove aphid
Other common names: glasshouse-potato aphid

Taxonomic characters: Wingless adult female.—In life, body color varying from pale green to yellow. Small to large sized, body length 1.8-3.0 mm, ovoid. Antennae 6 segmented, apices dark; tubercles well developed with inner faces parallel; terminal process approximately 5-6 times length of base of antennal segment VI; antennal segment III with 1-6 secondary sensoria, antennal segment IV without secondary sensoria. Cornicle pale with dark tips, cylindrical, gradually tapering with distinct large apical flange and 2 rows of reticulations, reticulations less than ½ length; approximately 4¾-5¼ times as long as wide. Cauda pale, elongate with 4-6 (usually 6) lateral setae and a single dorsal preapical seta.

Winged adult female.—In life, yellow green with brown head, dark thorax and abdomen with pale to dark transverse bands; body shape similar to wingless adult female; medium to large sized, body length 2.0-3.0 mm. Antennae 6 segmented; tubercles well developed with inner faces parallel; terminal process approximately 5-6 times length of base of antennal segment VI; antennal segment III with 8-13 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle pale with dark tips, cylindrical, gradually tapering with distinct large apical flange and 2 rows of reticulations, reticulations less than ½ length; approximately 4¾-7¼ times as long.
Fig. 4. Pictorial key to wingless adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles well developed and cornicles reticulated.
Fig. 5. Pictorial key to winged adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles well developed and cornicles reticulated.
as wide. Cauda pale, elongate with 4-6 (usually 6) lateral setae and a single dorsal preapical seta.

Hosts: Extremely polyphagous, occurring on many greenhouse and house plants, including Chrysanthemum.

U.S. distribution: Throughout.

World distribution: Widespread.

Comments: Aulacorthum solani transmits 45 plant viruses, including three viruses affecting chrysanthemums: chrysanthemum good news mosaic virus; chrysanthemum virus B; and tomato aspermy virus (Chan et al. 1991).

Brachycaudus cardui (Linnaeus 1758)
Figs. 1, 2, 3

Synonymy:
* Aphis cardui Linnaeus
** Brachycaudus cardui (Linnaeus)

ESA approved common name: thistle aphid

Other common names: none

Taxonomic characters: Wingless adult female.—In life, body color varying from yellow to green or red, abdomen with large dark dorsal patch; legs yellow with tarsi and tips of tibiae dark; apices of antennal segments dusky. Small to medium sized, body length 1.9-2.5 mm, pear shaped. Ultimate rostral segment more than three times as long as wide. Antennae 6 segmented; tubercles not developed; terminal process approximately \(3\frac{1}{4}-4\frac{1}{2}\) times length of base of antennal segment VI; antennal segment III and IV without secondary sensoria. Cornicle dusky, cylindrical, slightly tapering to apical flange, approximately \(2\frac{1}{2}-4\) times as long as wide. Cauda dusky, stout, nearly as long as wide with 6 lateral setae.

Winged adult female.—In life, body shape and coloration similar to wingless adult female; antennal segments dark; small to medium sized, body length 1.7-2.5 mm. Ultimate rostral segment more than four times as long as wide. Antennae 6 segmented; tubercles not developed; terminal process approximately \(2\frac{1}{4}-4\frac{1}{2}\) times length of base of antennal segment VI; antennal segment III with 21-30 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle dusky, cylindrical, slightly tapering to apical flange, approximately \(3-4\frac{1}{4}\) times as long as wide. Cauda dusky, stout with 6 lateral setae and 1 preapical seta.

Hosts: Principal hosts are Prunus spp., however, additional hosts include species of Asteraceae and Boraginaceae.

U.S. distribution: Throughout.

World distribution: Central Asia, Europe, India, Middle East, North Africa, North America.

Comments: Brachycaudus cardui transmits seven plant viruses but is not a known vector of the chrysanthemum viruses (Chan et al. 1991).

Brachycaudus helichrysi (Kaltenbach 1843)
Figs. 1, 2, 3

Synonymy:
* Aphis helichrysi Kaltenbach
** Brachycaudus helichrysi (Kaltenbach)

ESA approved common name: none
Other common names: leaf-curl plum aphid, leaf-curling plum aphid, plum leaf-curl aphid

Taxonomic characters: Wingless adult female. In life, body color varying from green to yellow to nearly white or sometimes pink; legs pale; apex of antennal segments III-V and base of VI dusky on slide-mounted specimens. Small sized, body length 1.1-2.0 mm, pear shaped. Ultimate rostral segment less than three times as long as wide. Antennae 6 segmented; tubercles not developed; terminal process approximately 2-3½ times length of base of antennal segment VI; antennal segment III without secondary sensoria. Cornicle apically dusky, cylindrical, slightly tapering to apical flange; approximately 1½-2 times as long as wide. Cauda dusky, stout, nearly as long as wide with 4-6 lateral setae and 1 preapical seta.

Winged adult female.—In life, body shape and coloration similar to wingless adult female with the addition of dark dorsal patch; antennal segments I-VI dusky on slide-mounted specimens; small sized, body length 1.5-1.9 mm. Ultimate rostral segment less than four times as long as wide. Antennae 6 segmented; tubercles not developed; terminal process approximately 3½-4 times length of base of antennal segment VI; antennal segment III with 14-28 secondary sensoria; antennal segment IV with 1-7 secondary sensoria. Cornicle completely dark, cylindrical, slightly tapering to apical flange; approximately 2-3 times as long as wide. Cauda dusky, stout with 4-6 lateral setae and 1 preapical seta.

Hosts: Principal hosts are Prunus spp., however, B. helichrysi is polyphagous on many additional hosts.

U.S. distribution: Throughout.
World distribution: Widespread.

Comments: Brachycaudus helichrysi transmits nine plant viruses but is not a known vector of the chrysanthemum viruses (Chan et al. 1991); it is however, an important pest of greenhouse chrysanthemums.

Coloradoa rufomaculata (Wilson 1908)
Figs. 1, 2, 3

Synonymy:
*Rhopalosiphum rufomaculatum (Wilson)
**Coloradoa rufomaculata (Wilson)

ESA approved common name: none

Other common names: pale chrysanthemum aphid, green chrysanthemum aphid

Taxonomic characters: Wingless adult female. In life, body green. Small sized, body length 0.9-1.6 mm, pear shaped; dorsal body setae fan shaped. Antennae 6 segmented; tubercles not developed; terminal process approximately 1½-1¾ times length of base of antennal segment VI; antennal segment III without secondary sensoria. Cornicle dusky, cylindrical, slightly swollen apically; approximately 5-8½ times as long as wide. Cauda dusky, elongate with 4 lateral setae and a single dorsal preapical seta.

Winged adult female.—In life, head and thorax dusky, abdomen green; antennae, tarsi, and tips of tibiae dark; body shape similar to wingless adult female; small sized, body length 1.1-1.6 mm; dorsal body setae fan shaped. Antennae 6 segmented; tubercles not developed; terminal process approximately 2½-2 times length of base of antennal segment VI; antennal segment III with 8-15 secondary sensoria; antennal segment IV with 4-12 secondary sensoria. Cornicle dusky, cylindrical, slightly swollen apically; approximately 5¾-7 times as long as wide. Cauda dusky, elongate with 4 lateral setae and a single dorsal preapical seta.
Hosts: Principal hosts include cultivated chrysanthemums and Artemisia spp.

U.S. distribution: Throughout.

World distribution: Canada, Central Asia, Europe, India, Middle East, North Africa, and North America.

Comments: Coloradoa rufomaculata transmits three plant viruses including one affecting chrysanthemums: chrysanthemum virus B (Chan et al. 1991). Coloradoa rufomaculata can become problematic on greenhouse chrysanthemums.

Macrosiphoniella sanborni (Gillette 1908)
Figs. 1, 4, 5

Synonymy:
*Macrosiphum sanborni* Gillette
**Macrosiphoniella sanborni** (Gillette)
ESA approved common name: chrysanthemum aphid
Other common names: none

Taxonomic characters: Wingless adult female.- In life, body color varying from light brown to nearly dark; most dorsal abdominal setae with associated basal sclerite; distal area of femur and proximal and distal areas of tibia dark. Small to medium sized, body length 1.7-2.6 mm, spindle shaped. Antennae 6 segmented, dusky (except segment III); tubercles well developed with inner faces divergent; terminal process approximately 4/5-5 times length of base of antennal segment VI; antennal segment III with 11-24 secondary sensoria; antennal segment IV with 0-2 (usually 0) secondary sensoria. Cornicle dark, subconical with polygonal reticulation nearly 1/2 its length; approximately 2-3 times as long as wide. Cauda dark, elongate with 8-10 lateral setae and 3-7 dorsal setae.

Winged adult female.—In life, body coloration and shape similar to wingless adult female; most dorsal abdominal setae with associated basal sclerite; distal area of femur and proximal and distal areas of tibia dark; small to medium sized, body length 1.8-2.8 mm. Antennae 6 segmented; tubercles well developed with inner faces divergent; terminal process approximately 41/4-51/4 times length of base of antennal segment VI; antennal segment III with 18-30 secondary sensoria; antennal segment IV with 0-13 secondary sensoria. Cornicle dark, cylindrical, gradually tapering toward apex with polygonal reticulation nearly 1/2 its length; approximately 2-5 times as long as wide. Cauda dark, elongate with 8-10 lateral setae, 3-5 dorsal setae, and occasionally 1-6 ventral setae.

Hosts: Hosts include cultivated chrysanthemums as well as Chrysanthemum leucanthemum L., Chrysanthemum maximum Ramond, and other species of Asteraceae.

U.S. distribution: Throughout.

World distribution: Of east Asian origin, not distributed throughout the world.


Macrosiphoniella subterranea (Koch 1855)
Figs. 1, 4, 5

Synonymy:
* & **not listed in Palmer (1952) or Blackman and Eastop (1984)
ESA approved common name: none
Other common names: none

Taxonomic characters: Wingless adult female.- In life, body dark brown with a darker dorsal spot; femur and proximal and distal areas of tibia dark. Medium to large sized, body length 2.8-3.2 mm, spindle shaped. Antennae 6 segmented, dusky (except segment III); tubercles well developed with inner faces divergent; terminal process approximately 4.4 times length of base of antennal segment VI; antennal segment III with 8-15 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle dark, cylindrical, gradually tapering with polygonal reticulation nearly 4/5 its length; approximately 4/5-7 times as long as wide. Cauda dark, elongate with 8-14 lateral setae and 4-9 dorsal setae.

Winged adult female.—In life, body coloration and shape similar to wingless adult female; femur and proximal and distal areas of tibia dark; medium to large sized, body length 2.7-3.2 mm. Antennae 6 segmented; tubercles well developed with inner faces divergent; terminal process approximately 5.5-8 times length of base of antennal segment VI; antennal segment III with 26-32 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle dark, cylindrical, gradually tapering with polygonal reticulation nearly 4/5 its length; approximately 5.5-8 times as long as wide. Cauda dark, elongate with 8-12 lateral setae and 2-7 dorsal setae.

Hosts: Hosts include cultivated chrysanthemums.

U.S. distribution: PA.

World distribution: Canada (Ontario), Europe.

Comments: Macrosiphoniella subterranea is not recorded as a known vector of any plant viruses (Chan et al. 1991).

Macrosiphoniella tanacetaria (Kaltenbach 1843)
Figs. 1, 4, 5

Synonymy:

**Macrosiphoniella tanacetaria** (Kaltenbach)

ESA approved common name: none

Other common names: none

Taxonomic characters: Wingless adult female.- In life, body light grey green, covered with fine powder; legs dark. Large sized, body length 3.1-3.5 mm, spindle shaped. Antennae 6 segmented, dark; tubercles well developed with inner faces divergent; terminal process approximately 3.5-4 times length of base of antennal segment VI; antennal segment III with 10-25 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle dark, cylindrical, gradually tapering with polygonal reticulation nearly 4/5 its length; approximately 4-8 times as long as wide. Cauda dark, elongate with 18-22 lateral setae and 8-12 dorsal setae.

Winged adult female.—In life, body coloration and shape similar to wingless adult female; legs dark; medium to large sized, body length 2.9-3.6 mm. Antennae 6 segmented; tubercles well developed with inner faces divergent; terminal process approximately 3.5-4 times length of base of antennal segment VI; antennal segment III with 30-42 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle dark, cylindrical, gradually tapering with polygonal reticulation nearly 4/5 its length; approximately 3.5-6 times as long as wide. Cauda dark, elongate with 14-28 lateral setae and 5-10 dorsal setae.

Hosts: Principle hosts include Tanacetum spp., however chrysanthemums, including Chrysanthemum balsamita L., also serve as occasional hosts.

World distribution: Canada, Europe, Israel, Morocco, South America, and USA.
Comments: Macrosiphoniella tanacetaria transmits a single plant virus but is not a known vector of a chrysanthemum virus (Chan et al. 1991).

Macrosiphum euphorbiae (Thomas 1878)
Figs. 1, 4, 5

Synonymy:
*Macrosiphum solanifolii (Ashmead 1882)
**Macrosiphum euphorbiae (Thomas)
ESA approved common name: potato aphid.
Other common names: none

Taxonomic characters: Wingless adult female.- In life, body usually of varying shades of green. Medium to large sized, body length 2.7-3.5 mm, pear shaped or elongate. Antennae 6 segmented; tubercles well developed with inner faces divergent; terminal process approximately 5-8½ times length of base of antennal segment VI; 3-6 secondary sensoria on basal half of antennal segment III; either entirely dark or only dark apically. Cornicle entirely pale or becoming increasingly dusky towards tip, cylindrical with slight apical constriction, several rows of polygonal reticulations in constricted area, reticulation less than ⅓ of length; 6-7¼ times as long as wide. Cauda pale, elongate with 8-10 lateral setae and 1-2 dorsal preapical setae.

Winged adult female.—In life, body usually of varying shades of green, shape similar to wingless adult female; medium to large sized, body length 2.5-3.0 mm. Antennae 6 segmented; frontal tubercles well developed with inner faces divergent; terminal process approximately 5½-7 times length of base of antennal segment VI; 13-18 secondary sensoria of similar size on antennal segment III and in a straight row; no secondary sensoria on antennal segment IV; entirely dark except for segments I and II and base of III. Cornicle sometimes pale but usually progressively darker towards tip, cylindrical with slight apical constriction, several rows of polygonal reticulations in constricted area, reticulation less than ⅓ of length; 6½-10 times as long as wide. Cauda pale, elongate with 8-10 lateral setae and 1-2 dorsal preapical setae.

Hosts: Principle hosts Rosa spp., however, M. euphorbiae is polyphagous and very damaging to many additional host plants of economic importance.
U.S. distribution: Throughout.
World distribution: Widespread.
Comments: Macrosiphum euphorbiae transmits 67 plant viruses, including two viruses affecting chrysanthemums: chrysanthemum virus B and tomato aspermy virus (Chan et al. 1991).

Myzus ascalonicus Doncaster 1946
Figs. 1, 6, 7

Synonymy:
**Myzus ascalonicus Doncaster
ESA approved common name: shallot aphid
Other common names: none

Taxonomic characters: Wingless adult female.—In life, body varying from yellow to green brown, dorsum of abdomen without spots and bands. Small to medium sized, body length 1.5-2.1 mm, spindle shaped. Antennae 6 segmented, pale except apex of
segment V and entire segment VI dark; tubercles well developed with inner faces parallel; terminal process approximately 2½-3¼ times length of base of antennal segment VI; antennal segments III-IV without secondary sensoria. Cornicle not reticulated, dusky, swollen apically with narrow medial constriction; approximately 5½-8 times as long as wide. Cauda elongate with 4-6 (usually 4) lateral setae.

Winged adult female.—In life, head and thorax dark, dorsum of abdomen with large dark patch; body shape similar to wingless adult female; medium sized, body length 2.0-2.6 mm. Antennae 6 segmented, dark; tubercles well developed with inner faces parallel; terminal process approximately 2½-3 times length of base of antennal segment VI; number of secondary sensoria on segments III-IV bimodal, antennal segment III with 25-35 secondary sensoria and antennal segment IV with 7-24 secondary sensoria or antennal segment III with 11-13 secondary sensoria and antennal segment IV with 0-1 secondary sensoria. Cornicle not reticulated, dusky, swollen apically with narrow medial constriction; approximately 5½-8 times as long as wide. Cauda elongate with 6-8 (usually 6) lateral setae.


Comments: Myzus ascalonicus transmits 16 plant viruses but none are recorded as affecting chrysanthemums (Chan et al. 1991).

Myzus ornatus Laing 1932
Figs. 1, 6, 7

Synonymy:

**Myzus ornatus Laing
ESA approved common name: ornate aphid
Other common name: violet aphid

Taxonomic characters: Wingless adult female.—In life, body varying from light yellow to green; dorsum of abdomen with dark green or brown spots and transverse bands. Small to medium sized, body length 1.6-2.0 mm, oval shaped. Antennae 6 segmented; tubercles well developed with inner faces convergent; terminal process approximately 1½-2¼ times length of base of antennal segment VI; without secondary sensoria on antennal segment III. Cornicle not reticulated, dusky, cylindrical, constricted at tip, 4-6 times as long as wide. Cauda dusky, elongate with 6 lateral setae.

Winged adult female.—In life, dorsum of abdomen with a large dark patch; body shape similar to wingless adult female; small to medium sized, body length 1.6-2.3 mm. Antennae 6 segmented; tubercles well developed; terminal process approximately 1½-2¼ times length of base of antennal segment VI; without secondary sensoria on antennal segment III. Cornicle not reticulated, dusky, cylindrical, constricted at tip, 4-5½ times as long as wide. Cauda dusky, elongate with 6 lateral setae.

Hosts: Polyphagous on many different hosts including cultivated chrysanthemums and Chrysanthemum maximum. U.S. distribution: CA, NC, OR, PA, WA (probably found in all states). World distribution: Widespread.

Comments: Myzus ornatus transmits 18 plant viruses but none are recorded as affecting chrysanthemums (Chan et al. 1991).
Fig. 6. Pictorial key to wingless adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles well developed and cornicles not reticulated.
Fig. 7. Pictorial key to winged adult females of five aphid species that colonize chrysanthemum in the United States and have antennal tubercles well developed and cornicles not reticulated.
Myzus persicae (Sulzer 1776)  
Figs. 1, 6, 7

Synonymy:

* & **Myzus persicae (Sulzer)
ESA approved common name: green peach aphid
Other common name: peach-potato aphid

Taxonomic characters: Wingless adult female.—In life, body varying from green to pale yellow, dorsal of abdomen without dark spots and transverse bands. Small to medium sized, body length 1.5-2.2 mm, pear shaped. Antennae 6 segmented; tubercles well developed with inner faces convergent; terminal process approximately 2½-3½ times length of base of antennal segment VI; without secondary sensoria on antennal segment III. Cornicle pale, usually with dark tip; 5-7 times as long as wide. Cauda pale to dusky, elongate with 6 lateral setae. Tarsi sometimes noticeably dark.  

Winged adult female.—In life, body varies from green to pale yellow with dorsal of the abdomen with a large dark patch, body shape similar to wingless adult female; small to medium sized, body length 1.7-2.3 mm. Antennae 6 segmented; tubercles well developed with inner faces convergent; terminal process approximately 3½ times length of base of antennal segment VI; 10-13 secondary sensoria of similar size in a straight row on antennal segment III; without secondary sensoria on antennal segment IV. Cornicle pale, usually with dark tip, slight apical swelling and slight medial constriction; 4½-8 times as long as wide. Cauda pale to dusky, elongate with 6 lateral setae. Tarsi may be noticeably dark.

Hosts: Principal hosts are Prunus spp., however, M. persicae is polyphagous and very damaging to many other host plants of economic importance.  
U.S. distribution: Throughout.  
World distribution: Widespread.  
Comments: Myzus persicae transmits 182 plant viruses, including three viruses affecting chrysanthemums: chrysanthemum good news mosaic virus; chrysanthemum virus B; and tomato aspermy virus (Chan et al. 1991).

Pleotrichophorus chrysanthemi (Theobald 1920)  
Figs. 1, 6, 7

Synonymy:

**Pleotrichophorus chrysanthemi (Theobald)
ESA approved common name: none
Other common names: none

Taxonomic characters: Wingless adult female.—In life, body varying from light green to yellow with widely spaced dusky segmental markings. Medium sized, body length 2.1-2.9 mm, spindle shaped; dorsal body setae fan shaped. Antennae 6 segmented; tubercles well developed with inner faces divergent; terminal process approximately 5½-6 times length of base of antennal segment VI; antennal segment III with 1-4 secondary sensoria, antennal segment IV without secondary sensoria. Cornicle not reticulated, pale, cylindrical, flaring apically; approximately 7-10 times as long as wide. Cauda pale, elongate with 4 lateral and a single (occasionally 2) dorsal preapical seta.  

Winged adult female.—In life, abdomen green to yellow with widely spaced dusky segmental markings. Medium sized, body length 2.0-2.6 mm, spindle shaped; dorsal body setae fan shaped. Antennae 6 segmented; terminal process approximately 5½-6
times length of base of antennal segment VI; antennal segment III with 12-17 secondary sensoria; antennal segment IV without secondary sensoria. Cornicle pale, cylindrical, flaring apically, approximately 8-11½ times as long as wide. Cauda pale, elongate with 4 lateral and a single dorsal preapical seta.

Hosts: Principal hosts include Chrysanthemum spp.

U.S. distribution: CA, DC, NC, WA.

World distribution: Widespread.

Comments: Pleothrichophorus chrysanthemi is not recorded as a vector of any plant viruses (Chan et al. 1991).

KEY TO THE WINGLESS FEMALE APHID SPECIES COLONIZING CHRYSANTHEMUMS IN THE UNITED STATES

1. Antennal tubercles well developed ................................................................. 6
   Antennal tubercles not developed ............................................................... 2

2. Terminal process ≤2 times the base, cornicles slightly swollen apically
   .................................................................................................................. 3
   Terminal process ≥2 times the base, cornicles tapered or parallel sided, not
   swollen ............................................................................................................. 3

3. Cauda stout in dorsal view, approximately as long as wide ..................... 4
   Cauda elongate in dorsal view, obviously longer than wide ...................... 5

4. Abdomen without large dorsal patch; cornicle 1½-2 times as long as wide
   ultimate rostral segment <3 times as long as wide ...................................... Brachycaudus helichrysi (Kaltenbach)
   Abdomen with large dorsal patch; cornicle 2½-4 times as long as wide; ultimate
   rostral segment ≥3 times as long as wide .............................................. Brachycaudus cardui (L.)

5. Cauda with 10 or more total setae; cornicle and cauda both dark
   .................................................................................................................... 12
   Cauda with fewer than 10 total setae; cauda lighter colored than cornicles
   .................................................................................................................... 13

6. Antennal segment III without secondary sensoria ....................................... 7
   Antennal segment III with secondary sensoria, or if without secondary senso-
   ria, then terminal process of antenna ≥4 times length of the base ............. 9

7. Cornicle constricted apically; dorsum of abdomen with dark spots and trans-
   verse bands ........................................................................................................... Myzus ornatus Laing
   Cornicle swollen apically with medial constriction; dorsum of abdomen without
   dark spots and transverse bands ........................................................................ 8

8. Cornicle with distinct apical swelling and narrow medial constriction; inner
   faces of antennal tubercles parallel .............................................................. Myzus ascalonicus Doncaster
   Cornicle with slight apical swelling and slight medial constriction; inner faces
   of antennal tubercles convergent ................................................................. Myzus persicae (Sulzer)

9. Dorsum of abdomen with distinct, dark, U-shaped marking
   .......................................................................................................................... Aulacorthum circumflexum (Buckton)
   Dorsum of abdomen without distinct, dark, U-shaped marking ................... 10

10. Cornicle subconical, approximately 2-3 times as long as wide at its base, with
   polygonal reticulation nearly ½ its length ....................................................... Macrosiphoniella sanborni (Gillette)
   Cornicle cylindrical, >3 times the width at its base and without polygonal reti-
   culation or polygonal reticulation less than ½ its length ............................ 11

11. Cornicle either completely pale, pale with dark tips, or completely dusky; cauda
   pale .................................................................................................................. 12
    Cornicle dark; cauda dark or dusky .............................................................. 14
12. Dorsal abdominal setae pointed; cornicle with some rows of reticulations anterior to apical flange .......................................................... 13
Dorsal abdominal setae fan shaped; cornicle without rows of striations anterior to apical flange ........................................... Pletrichophorus chrysanthemi (Theobald)

13. Cornicle tapering gradually to a distinct large apical flange with 2 rows of reticulations anterior to flange .................... Aulacorthum solani (Kaltenbach)
Cornicle cylindrical with slight apical constriction and several rows of polygonal reticulations in constricted area, no large flange
...................................................................................................... Macrosiphum euphorbiae (Thomas)

14. Tibiae with dark distal and proximal regions ..................................... Macrosiphoniella subterranea (Koch)
Tibiae completely dark ............... Macrosiphoniella tanacetaria (Kaltenbach)

KEY TO THE WINGED FEMALE APHID SPECIES COLONIZING CHRYSANTHEMUMS IN THE UNITED STATES

1. Antennal tubercles well developed .......................................................... 6
   Antennal tubercles not developed .......................................................... 2

2. Terminal process ≤ 2 times the base, cornicles slightly swollen apically
   ............................................................................................ Coloradoa rufomaculata (Wilson)
   Terminal process ≥ 2 times the base, cornicles tapered or cylindrical .......... 3

3. Cauda stout, nearly as long as wide ....................................................... 4
   Cauda elongate, obviously longer than wide ........................................... 5

4. Cornicle 2-3 times as long as wide; antennal segment IV with secondary sensoria; ultimate rostral segment < 4 times as long as wide
   ........................................................................... Brachycaudus helichrysi (Kaltenbach)
   Cornicle 3-4½ times as long as wide; antennal segment IV without secondary sensoria; ultimate rostral segment > 4 times as long as wide
   ........................................................................... Brachycaudus cardui (L.)

5. Abdomen usually with dark lateral areas and bands on dorsum; cornicle and cauda both dark; setae on antennal segment III longer than diameter of segment
   ............................................................................................ Aphis fabae Scopoli
   Abdomen usually without dark lateral areas and bands on dorsum; cauda lighter colored than cornicle; setae on antennal segment III shorter than diameter of segment
   ............................................................................................ Aphis gossypii Glover

6. Apical region of cornicle with several rows of polygonal reticulations; cauda usually with > 10 setae ................................................................. 7
   Apical region of cornicle with 3 or fewer rows of polygonal reticulations; cauda usually with < 10 setae ................................................................. 10

7. Cornicle entirely pale or becoming darker toward tip, slightly constricted in region of apical reticulation ...................... Macrosiphum euphorbiae (Thomas)
   Cornicle completely dark, region of apical reticulation not constricted .......... 8

8. Terminal process of antenna ≤ 4 times length of the base; antennae and legs completely dark ........................................... Macrosiphoniella tanacetaria (Kaltenbach)
   Terminal process of antenna > 4 times length of the base; antennae and legs with light and dark regions ......................................................... 9

9. Cornicle ≤ 5 times as long as wide; most dorsal abdominal setae associated with basal sclerite ........................................... Macrosiphoniella sanbornii (Gillette)
   Cornicle > 5 times as long as wide; dorsal abdominal setae without associated basal sclerite ........................................... Macrosiphoniella subterranea (Koch)
10. Dorsal body setae fan shaped; cornicle ≥8 times as long as wide

.......................................................................................... Plectrichophorus chrysanthemi (Theobald)

Dorsal body setae pointed; cornicle ≤8 times as long as wide ......... 11

11. Cornicle with apical swelling and medial constriction .................. 12

Cornicle without apical swelling and medial constriction ............ 13

12. Inner faces of antennal tubercles convergent; terminal process ≥3 times length of the base ......................................................... Myzus persicae (Sulzer)

Inner faces of antennal tubercles nearly parallel; terminal process ≤3 times length of the base ................................................. Myzus ascalonicus Doncaster

............................................................................................. Myzus ornatus Laing

13. Terminal process ≤4 times length of the base; cornicle and cauda dusky

............................................................................................. Myzus ornatus Laing

Terminal process >4 times length of the base; cornicle entirely pale or pale with dusky tip and cauda pale ................................................................. 14

14. Dorsum with single large dark patch

.............................................................................. Aulacorthum circumflexum (Buckton)

Dorsum with several transverse pale to dark bands

.............................................................................. Aulacorthum solani (Kaltenbach)

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