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APHIDS (HOMOPTERA: APHIDIDAE) COLONIZING COTTON IN THE UNITED STATES

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ABSTRACT

Eight aphid species known to colonize cotton in the United States are described and illustrated. A brief summary of taxonomic characteristics, usual hosts, and distribution within the United States are given for each species. Pictorial and dichotomous keys are included to aid personnel charged with detection, identification, and control of aphids associated with cotton in the United States.

Key Words: Taxonomic keys, identification, control, distribution.

RESUMEN

Se describen e ilustran ocho especies de áfidos que se sabe colonizan el algodón en los Estados Unidos. Se incluye para cada especie un resumen breve de las características taxonómicas, los hospedantes usuales, y la distribución en los Estados Unidos.

Se ofrecen claves dicotómicas y pictóricas para apoyar al personal encargado de detectar, identificar y controlar los áfidos asociados con el algodón en los Estados Unidos.

Aphids such as the cotton aphid, *Aphis gossypii* Glover, have been known as cotton pests in the United States since the mid-1800's (Slosser et al. 1989). However, prior to widespread use of insecticides for boll weevil control, aphids were not considered primary pests (Frisbie et al. 1994). Aphid outbreaks have been attributed to insecticide resistance and destruction of natural enemies (Kring et al. 1988). Recently, the cotton aphid has become problematic in southern and southwestern cotton growing regions of the United States (Kerns & Gaylor 1991). In 1991, aphids, especially the cotton aphid, were considered the most serious pests of cotton in the United States and were responsible for more than a 2% yield reduction (Head 1992). Production of honeydew by aphids can cause a condition known as "sticky cotton." The honeydew accumulates on cotton lint, lowers the grade of the cotton, and can cause production problems during fiber processing and yarn manufacturing (Carter 1992).

This paper contains a summary of taxonomic characters, cultivated or economic hosts, and distribution in the United States and throughout the world for each of the eight aphid species known to colonize on cotton in the United States: *Aphis craccivora* Koch, the cowpea aphid; *Aphis fabae* Scopoli, the bean aphid; *Aphis gossypii* Glover, the cotton or melon aphid; *Aphis maidiradicis* Forbes, the corn root aphid; *Macrosiphum euphorbiae* (Thomas), the potato aphid; *Myzus persicae* (Sulzer), the green peach aphid; *Rhopalosiphum rufiabdominalis* (Sasaki), the rice root aphid; and *Smynthurodes betae* Westwood. Descriptions, figures, and pictorial and dichotomous keys are included to aid personnel charged with detection, identification, and control of aphids associated with cotton in the United States.

MATERIALS AND METHODS

In the synonymy section, one asterisk (*) represents the name under which the aphid is treated in Palmer (1952), and two asterisks (**) represent the name under which the aphid is treated in Blackman & Eastop (1984). Common names approved by the Entomological Society of America (Stoetzel 1989) are given.

Information on distribution in the United States and the world and cultivated hosts is taken from labels on slides in the National Collection of Insects, Beltsville, Maryland, and from records published by Palmer (1952) and Blackman & Eastop (1984).

In the pictorial keys, the species are separated by the color of the cornicles and the length of the cornicles relative to their widths. Characters can be seen with a dissecting scope with a power of at least 120×. The keys are not intended for identification of single, errant aphids but should be used when examining examples from a well-developed colony.

APHIDS OF IMPORTANCE OR POTENTIAL IMPORTANCE ON COTTON

Aphis craccivora Koch 1854 (Figs. 1, 2, 4)

Synonymy:

**Aphis medicaginis* Koch 1854 (misidentification)

***Aphis craccivora* Koch

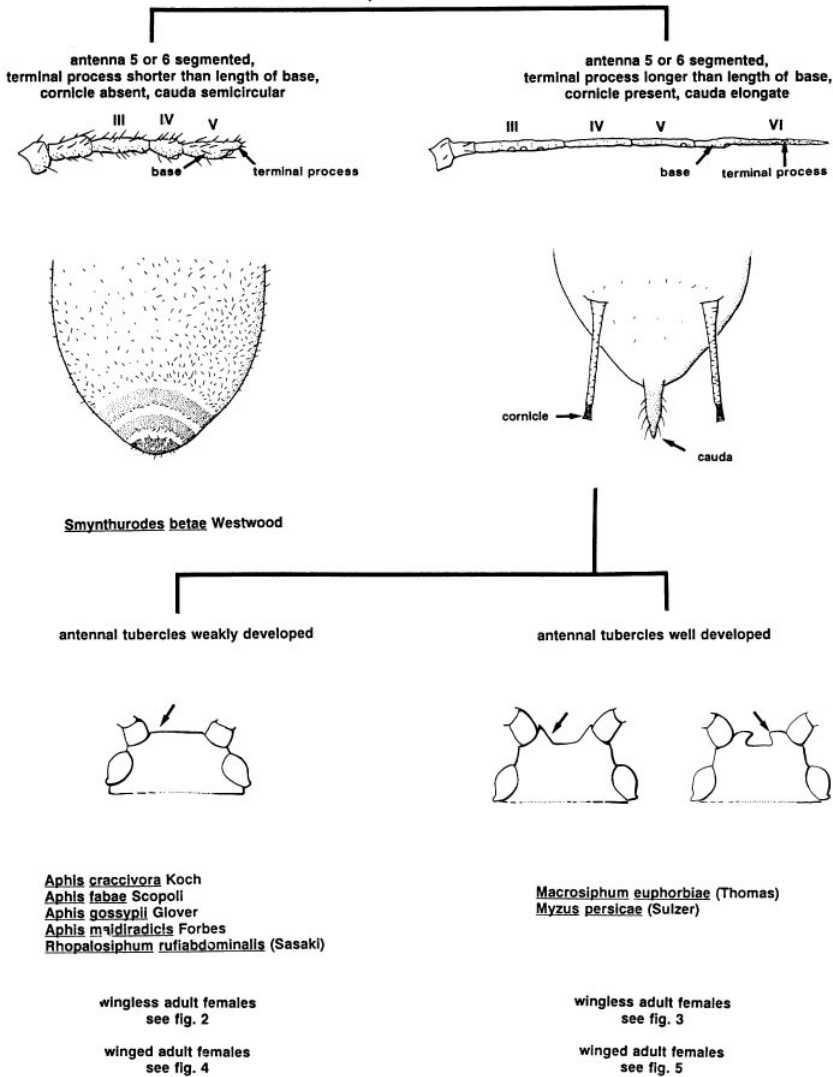


Figure 1. Pictorial key to eight aphid species that colonize on cotton in the United States.

ESA approved common name: cowpea aphid

Other common names: black legume aphid, groundnut aphid

Taxonomic characters: Wingless adult female.—In life body shiny black with large black patch on dorsum of abdomen, legs strikingly white with black “knees” and “ankles,” especially hind legs; immatures often covered with grayish wax. Small aphids (1.4-2.0 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process more than twice length of base of antennal segment VI, an-

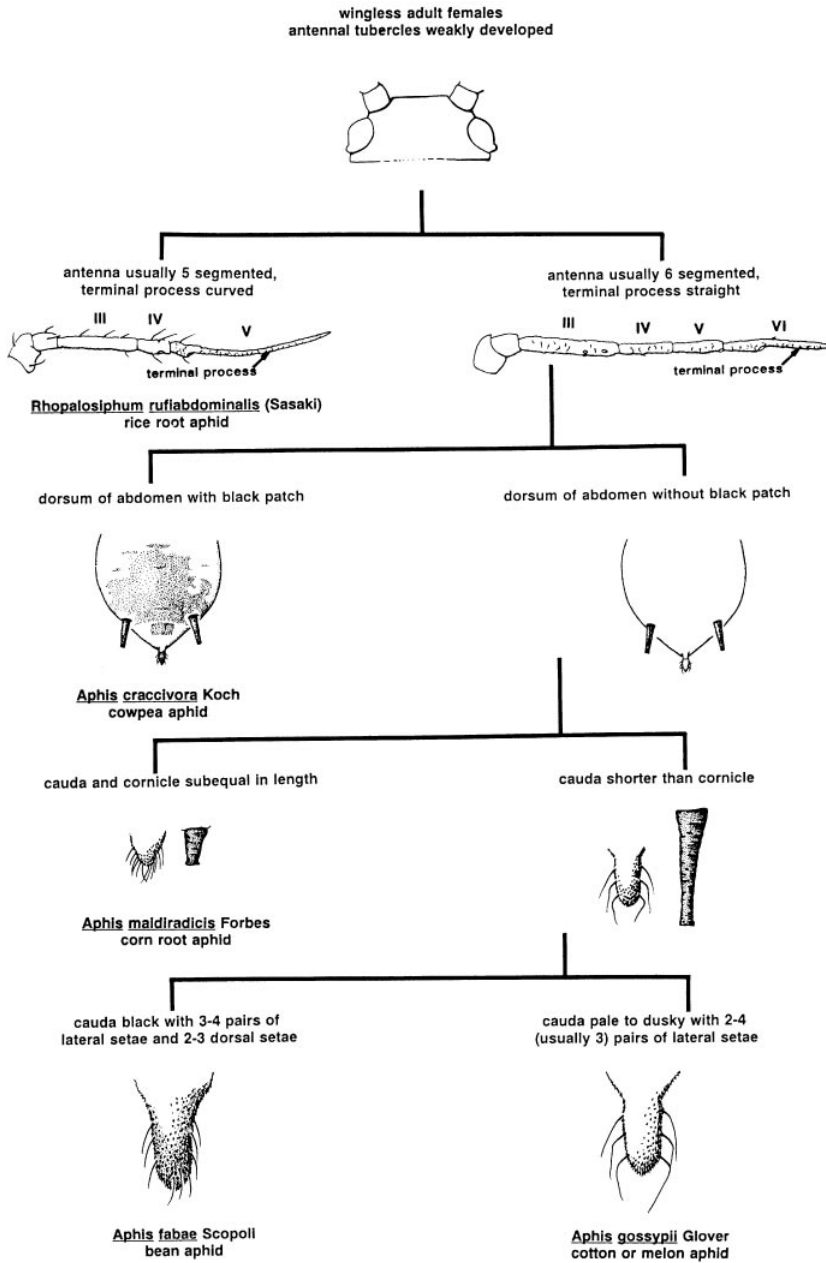


Figure 2. Pictorial key to wingless adult females of five aphid species that colonize on cotton in the United States and have weakly developed antennal tubercles.

tennal segment III without secondary sensoria. Cornicle cylindrical, more than 3 times as long as wide, black. Cauda with 2-4 (usually 3) pairs of lateral setae and 1 dorsal preapical seta, black.

Winged adult female.—In life body shiny black with black lateral areas and variable bands on dorsum of abdomen, legs strikingly white with black “knees” and “ankles,” especially hind legs. Small aphids (1.4-2.1 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented; terminal process more than twice length of base of antennal segment VI; antennal segment III with 4-7 secondary sensoria, 1 noticeably larger than the others; antennal segment IV without secondary sensoria. Cornicle cylindrical, 3 times as long as wide, black. Cauda with 2-4 (usually 3) pairs of lateral setae and 1 dorsal preapical seta, black.

Hosts: Polyphagous with a preference for the Leguminosae.

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: This species is reported to transmit nearly 30 plant viruses (Kennedy et al. 1962, Blackman & Eastop 1984), including cotton curliness virus.

Aphis fabae Scopoli 1763

(Figs. 1, 2, 4)

Synonymy:

*,***Aphis fabae* Scopoli

ESA approved common name: bean aphid

Taxonomic characters: Wingless adult female.—In life body shiny black, but may appear dull black due to waxy covering; immatures often covered with wax. Small aphids (1.5-3.1 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process 2 1/2-4 times length of base of antennal segment VI, antennal segment III without secondary sensoria. Cornicle cylindrical, 2 1/2-4 times as long as wide, black. Cauda with 3-4 pairs of lateral setae and 2-3 dorsolateral setae, black.

Winged adult female.—In life body black with black lateral areas and variable bands on dorsum of abdomen; alate nymphs with tessellated abdomen. Small aphids (1.3-2.6 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process 2 1/2-4 times length of base of antennal segment VI, antennal segment III with 12-18 secondary sensoria of variable size; 0-5 secondary sensoria on antennal segment IV. Cornicle cylindrical, 2 1/2-4 times as long as wide, black. Cauda with 3-4 pairs of lateral setae and 2-3 dorsolateral setae, black.

Hosts: Polyphagous on many secondary host plants. Primary hosts are species of *Euonymus* and *Viburnum* (Stoetzel 1990).

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: This species transmits more than 30 (Blackman & Eastop 1984) to 50 plant viruses (Kennedy et al. 1962), but none linked with cotton viruses.

Aphis gossypii Glover 1877

(Figs. 1, 2, 4)

Synonymy:

*,***Aphis gossypii* Glover

ESA approved common name: cotton or melon aphid.

Taxonomic characters: Wingless adult female.—In life body color varies from blackish green to green to pale yellow to almost white. Small aphids (1.3-2.1 mm long), size apparently influenced by crowding, temperature, and host; body rounded. Frontal tubercles not well developed. Antenna 6-segmented; terminal process 3-4 times length of base of antennal segment VI; antennal segment III without secondary sensoria. Cornicle cylindrical, 4-9 times as long as wide, black. Cauda usually with 2-4 (usually 2-3) pairs of lateral setae, pale to dusky.

Winged adult female.—In life body color varies from green to almost black to pale yellow to almost white. Small aphids (1.1-2.0 mm), size apparently influenced by crowding, temperature, and host; body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process 3-4 times length of base of antennal segment VI, antennal segment III with 3-7 secondary sensoria of similar size, antennal segment IV without secondary sensoria. Cornicle cylindrical, 4-7 times as long as wide, black. Cauda usually with 2-3 pairs of lateral setae, pale to dusky.

Hosts: Polyphagous and very damaging to many plants of economic importance including cotton. See O'Brien et al. (1993) for further information on biological development on wild and cultivated hosts. For a discussion of the occurrence of *A. gossypii* sexuales in the U.S. see O'Brien et al. (1990).

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: This species transmits over 50 plant viruses (Kennedy et al. 1962, Blackman & Eastop 1984), including cotton anthocyanosis virus and cotton curliness virus (Kennedy et al. 1962.), cotton blue disease, cotton leaf roll, and purple wilt (Brown 1992).

Aphis maidiradicis Forbes 1891

(Figs. 1, 2, 4)

Synonymy:

**Aphis maidi-radicis* Forbes

***Aphis maidiradicis* Forbes

ESA approved common name: corn root aphid.

Taxonomic characters: Wingless adult female.—In life body bluish green with dark head and dusky transverse thoracic and abdominal bands. Small aphids (1.1-1.9 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process approximately twice length of base of antennal segment VI, antennal segment III without secondary sensoria III. Cornicle cylindrical, 2-3 times as long as wide, dusky. Cauda with 4-6 (usually 6) pairs of lateral setae, dusky.

Winged adult female.—In life head and thorax black, abdomen light green with dusky markings. Small aphids (1.2-1.3 mm long), body rounded. Frontal tubercles not well developed. Antenna 6-segmented, terminal process approximately twice length of base of antennal segment VI, antennal segment III with 4-8 secondary sensoria, antennal segment IV without secondary sensoria. Cornicle cylindrical, 2-3 times as long as wide, dusky. Cauda with 4-6 (usually 6) pairs of lateral setae, dusky.

Hosts: Principally known as a corn pest in the U.S., but aphids considered this species have been collected on the roots of a wide range of hosts, including cotton (Blackman & Eastop 1984).

Distribution in the United States: Throughout the United States.

Distribution in the world: Brazil, Jamaica, USA

Comments: Found on roots. Not recorded as transmitting plant viruses. *A. maidiradicis* may be a complex composed of several species.

Macrosiphum euphorbiae (Thomas 1878)
(Figs. 1, 3, 5)

Synonymy:

**Macrosiphum solanifolii* (Ashmead 1882)

***Macrosiphum euphorbiae* (Thomas)

ESA approved common name: potato aphid.

Taxonomic characters: Wingless adult female. —In life body color usually varying shades of green with eyes distinctly reddish. Medium-sized aphids (2.6-3.7 mm long), body pear shaped. Frontal tubercles well developed. Antenna 6-segmented, terminal process 5-6 times length of base of antennal segment VI, basal third of antennal segment III with 3-7 secondary sensoria, either entirely dark or only dark apically. Cornicle slightly swollen, reticulations in constricted area near apex, 5-8 times as long as wide; entirely pale or becoming increasingly dusky towards tip. Cauda with 4-5 pairs of lateral setae and 1-2 dorsal preapical setae, pale.

Winged adult female. —In life body color usually varying shades of green with eyes distinctly reddish. Medium-sized aphids (2.6-3.8 mm long), body pear shaped. Frontal tubercles well developed. Antenna 6-segmented, terminal process 5-8 times length of base of antennal segment VI, antennal segment III with 9-21 secondary sensoria of similar size and in a regular row, antennal segment IV without secondary sensoria, entirely dark except for segments I and II and base of III. Cornicle slightly swollen, reticulations in constricted area near apex; 7-10 times as long as wide; may be pale but usually progressively darker toward tip. Cauda with 4-5 pairs of lateral setae and 1-2 dorsal preapical setae, pale.

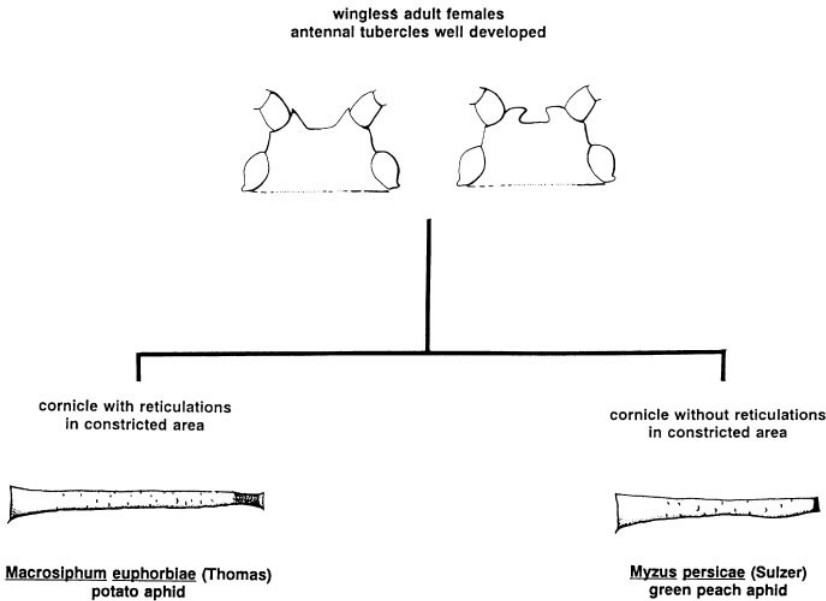


Figure 3. Pictorial key to wingless adult females of two aphid species that colonize on cotton in the United States and have well developed antennal tubercles.

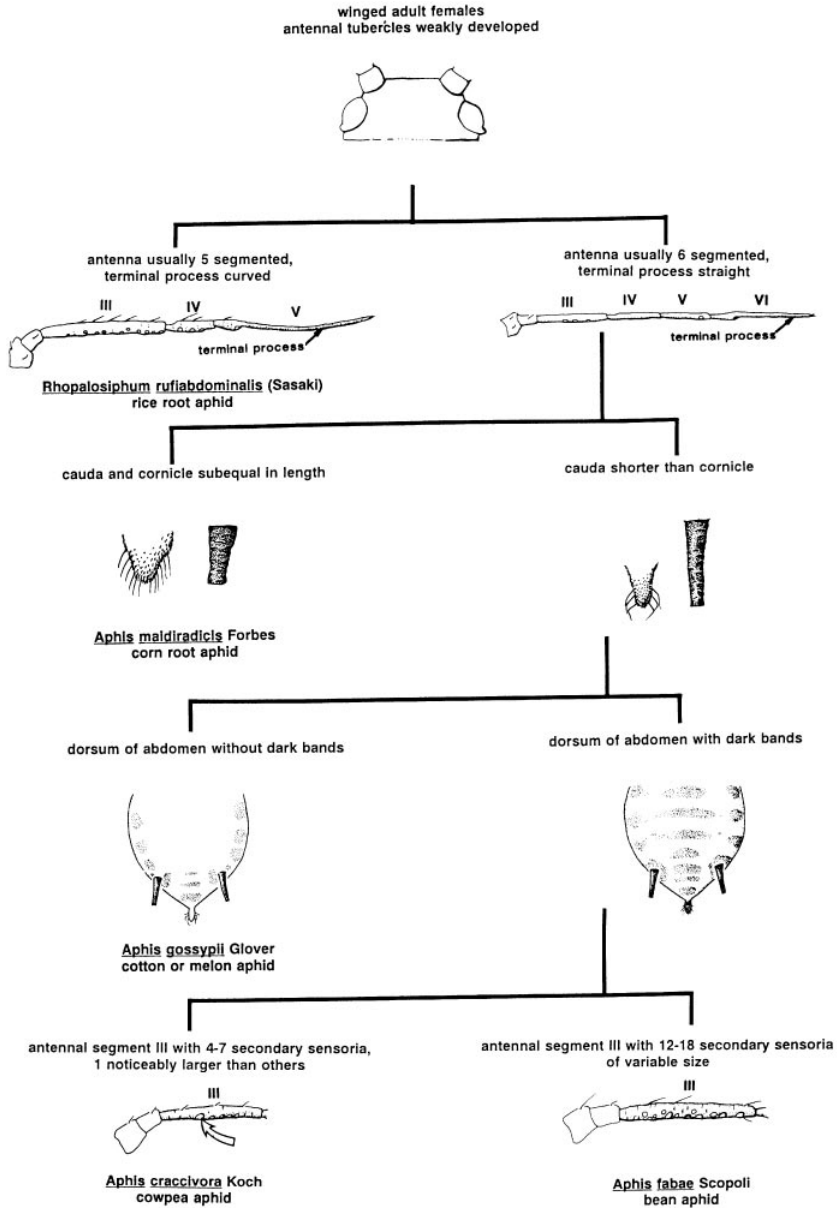


Figure 4. Pictorial key to winged adult females of five aphid species that colonize on cotton in the United States and have weakly developed antennal tubercles.

Hosts: Polyphagous and very damaging to many secondary host plants of economic importance. Primary hosts are several species of *Rosa*.

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: This species transmits from 50 (Blackman & Eastop 1984) to 70 plant viruses (Kennedy et al. 1962), but has not been linked with cotton viruses.

Myzus persicae (Sulzer 1776)
(Figs. 1, 3, 5)

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 color varies from dark green to grey-green to pale yellow. Small aphids (1.9-2.3 mm long), body pear shaped. Frontal tubercles well developed. Antenna 6-segmented, terminal process 3-4 times length of base of antennal segment VI, antennal segment III without secondary sen-

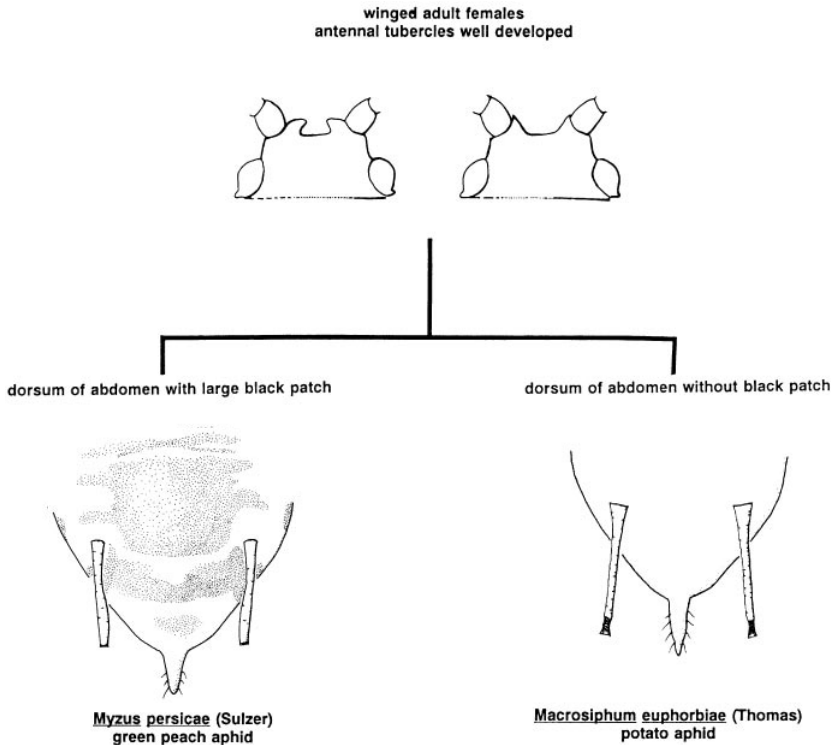


Figure 5. Pictorial key to winged adult females of two aphid species that colonize on cotton in the United States and have well developed antennal tubercles.

soria. Cornicle slightly swollen, 6-8 times as long as wide, pale but tip may be dusky. Cauda with 3 pairs of lateral setae, pale to dusky. Tarsi may be noticeably dark.

Winged adult female.—In life body color varies from dark green to grey-green with a large black patch on the dorsum of the abdomen. Small aphids (1.8-2.5 mm long), body pear shaped. Frontal tubercles well developed. Antenna 6-segmented, terminal process 3-6 times length of base of antennal segment VI, antennal segment III with 8-15 secondary sensoria of similar size and in a regular row; antennal segment IV without secondary sensoria. Cornicle slightly swollen, 6-8 times as long as wide, dusky. Cauda with 3 pairs of lateral setae, pale to dusky. Tarsi may be noticeably dark.

Hosts: Polyphagous and very damaging to many secondary host plants of economic importance. Primary host is usually *Prunus persica* (L.), but sometimes includes other species of *Prunus*.

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: This species can transmit over 100 plant viruses (Kennedy et al. 1962), including cotton curliness virus.

Rhopalosiphum rufiabdominalis (Sasaki 1899)

(Figs. 1, 2, 4)

Synonymy:

**Rhopalosiphum subterraneum* Mason 1937

***Rhopalosiphum rufiabdominalis* (Sasaki)

ESA approved common name: rice root aphid

Taxonomic characters: Wingless adult female.—In life body color dark green to olive, often with reddish area near cornicles. Small aphids (1.6-2.2 mm long), body rounded. Antenna 5-segmented with long setae; terminal process curved, 5-6 times length of base of terminal antennal segment; antennal segment III without secondary sensoria. Cornicle slightly swollen with apical constriction proximal to flange, 2-3 times as long as wide, dusky. Cauda with 2 pairs of lateral setae, dusky.

Winged adult female.—In life body color dark green to olive, often with reddish area near cornicles. Medium-sized aphids (1.5-2.1 mm long), body pear shaped. Antenna 5-segmented with long setae, occasionally 6-segmented; terminal process curved, 3-6 times length of base of terminal antennal segment; antennal segment III with 13-19 secondary sensoria of similar size; 1-8 secondary sensoria on antennal segment IV; dusky. Cornicle slightly swollen with apical constriction proximal to flange, 3-4 times as long as wide, dusky. Cauda with 2 pairs of lateral setae, dusky.

Hosts: Polyphagous and very damaging to many secondary host plants of economic importance. Primary hosts are *Prunus* spp.

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: Found on roots. This species is a vector of barley yellow dwarf virus (Blackman & Eastop 1984), but has not been linked with cotton viruses.

Smynturoides betae Westwood 1849

(Fig. 1)

Synonymy:

**Trifidaphis phaseoli* (Passerini 1860)

***Smynturoides betae* Westwood

ESA approved common name: none

Other common names: bean root aphid

Taxonomic characters: Wingless adult female.—In life body color pinkish-yellow to flesh tone with light brown head, thorax, and tip of abdomen; lightly covered with wax. Small aphids (1.6-2.0 mm long), body rounded. Antenna 5-segmented, terminal process 1/4 length of base of antennal segment VI, antennal segment III without secondary sensoria. Cornicle absent. Cauda semicircular with numerous setae.

Winged adult female.—In life body color dark green to olive, often with reddish abdominal area. Medium-sized aphids (2.1-2.4 mm long), body pear shaped. Antenna 6-segmented, terminal process 1/4 length of base of antennal segment VI, 5-8 secondary sensoria of similar size on antennal segment III, 2-3 secondary sensoria on antennal segment IV, dusky. Cornicle absent. Cauda semicircular with numerous setae.

Hosts: Polyphagous, including several secondary host plants of economic importance. Primary hosts are *Pistacia* spp.

Distribution in the United States: Throughout the United States.

Distribution in the world: Virtually worldwide.

Comments: Found on roots. Recorded as transmitting one plant virus (Kennedy et al. 1962), but has not been linked with cotton viruses.

KEY TO THE WINGLESS ADULT FEMALES OF APHID SPECIES COLONIZING ON COTTON IN THE UNITED STATES

1. Cornicle absent; cauda semicircular; antenna 5-segmented; last antennal segment with terminal process shorter than length of base (Fig. 1) *Smynthuroides betae* Westwood
- Cornicle present; cauda elongate; antenna 5- or 6-segmented, terminal process longer than length of base of last antennal segment 2
- 2(1). Antennal tubercles weakly developed (Fig. 2) 3
- Antennal tubercles well developed (Fig. 3) 7
- 3(2). Antenna usually 5-segmented with long setae, terminal process curved rice root aphid, *Rhopalosiphum rufiabdominalis* (Sasaki)
- Antenna usually 6-segmented with short setae, terminal process straight 4
- 4(3). Dorsum of abdomen with black patch cowpea aphid, *Aphis craccivora* Koch
- Dorsum of abdomen without black patch, but may have transverse bands 5
- 5(4). Cauda and cornicle subequal in length corn root aphid, *Aphis maidiradicis* Forbes
- Cauda shorter than cornicle 6
- 6(5). Cauda black with 3-4 pairs of lateral setae and 2-3 dorsal setae bean aphid, *Aphis fabae* Scopoli
- Cauda pale to dusky with 2-4 (usually 2-3) pairs of lateral setae cotton or melon aphid, *Aphis gossypii* Glover
- 7(2). Cornicle gradually tapering with reticulations in constricted area near apex potato aphid, *Macrosiphum euphorbiae* (Thomas)
- Cornicle medially constricted without reticulations near apex green peach aphid, *Myzus persicae* (Sulzer)

KEY TO THE WINGED ADULT FEMALES OF APHID SPECIES COLONIZING ON COTTON IN THE UNITED STATES

1. Cornicle absent; cauda semicircular; antenna 6-segmented, last segment with terminal process shorter than length of base

- (Fig. 1) *Smynthuroides betae* Westwood
 Cornicle present; cauda elongate; antenna 5- or 6-segmented, last segment
 with terminal process longer than length of base 2
- 2(1). Antennal tubercles weakly developed (Fig. 4) 3
 Antennal tubercles well developed (Fig. 5) 7
- 3(2). Antenna usually 5-segmented with long setae, terminal process curved
 rice root aphid, *Rhopalosiphum rufiabdominalis* (Sasaki)
- Antenna usually 6-segmented with short setae, terminal process straight . . 4
- 4(3). Cauda and cornicle subequal in length
 corn root aphid, *Aphis maidiradicis* Forbes
- Cauda shorter than cornicle 5
- 5(4). Dorsum of abdomen without dark bands; cauda pale to dusky
 cotton or melon aphid, *Aphis gossypii* Glover
- Dorsum of abdomen with dark bands; cauda black 6
- 6(5). Antennal segment III with 4-7 secondary sensoria, 1-2 noticeably larger than
 others; cauda with 3 pairs of lateral setae and 1 dorsal preapical seta
 cowpea aphid, *Aphis craccivora* Koch
- Antennal segment III with 12-18 secondary sensoria of variable size; cauda
 with 3-4 pairs of lateral and 2-3 dorsolateral setae
 bean aphid, *Aphis fabae* Scopoli
- 7(2). Dorsum of abdomen with large black patch, cornicle constricted medially . . .
 green peach aphid, *Myzus persicae* (Sulzer)
- Dorsum of abdomen without large black patch, cornicle gradually tapered to
 constricted apex potato aphid, *Macrosiphum euphorbiae* (Thomas)

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