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A Checklist of Whiteflies (Hemiptera: Aleyrodidae) Intercepted on Imported Plants in Korea 2005–2013

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A Checklist of Whiteflies (Hemiptera: Aleyrodidae) Intercepted on Imported Plants in Korea 2005–2013

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Abstract. An updated checklist is provided of 26 species of whiteflies intercepted on plants imported into Korea from 2005 to 2013. Brief diagnostic criteria and photographs of the intercepted species are given to assist in identifying intercepted specimens of whiteflies.

Key words. Intercepted whiteflies; invasive species; plant trade; quarantine; Korea.

Introduction

Whiteflies (Aleyrodidae) are a family of small (usually 1–3mm in length), prolific insects that feed on plants. The amount of plant material imported from other countries has increased significantly and many of these plants serve as hosts for whiteflies. As a result, the number of insects intercepted at various ports of entry in Korea has also increased and may pose a threat to Korean agriculture if they escape detection and become established. Whiteflies present a special challenge to regulatory efforts since they are of economic importance as direct feeders and/or vectors of plant viruses and are often difficult to detect. Of the over 1,625 known species of whiteflies (Martin and Mound 2007), only 26 species (1.6%) are known to occur in the Republic of Korea (Suh and Evans 2012), leaving 1,599 exotic species that could pose a threat to Korean agriculture if introduced. The invasive whiteflies *Bemisia tabaci* (Gennadius) and *Trialeurodes vaporariorum* (Westwood) are now major pests in Korea and cause severe damage to crops in glasshouses and are the most commonly reported whiteflies in Korea.

This paper includes a checklist and figures of 26 species of whiteflies in 18 genera intercepted on plants imported into Korea (Table 1) and is aimed at facilitating the identifications of whitefly species by port identifiers at the various stations of the Korea Animal and Plant Quarantine Agency (QIA).

Materials and Methods

Data for whiteflies intercepted at Korean ports of entry from 2005 to 2013 are from the Pest Information System (PIS) (2013). This list contains the identification of specimens to the level of species or genus depending upon the quality of the sample and the life stage and a summary of distribution and host information based on (Evans 2008; Dubey and Ko 2010; Suh and Evans 2012). Slide-mounted specimens examined are deposited in the Collection of Plant Quarantine Technology Center (PQTC), QIA. The table of species and illustrations are organized into two groups, based on the color of the puparia - black and light yellow to brown. Terminology for morphological structures follows Martin (1987). Codes for the zoogeographic regions recognized are as follows: Nearctic (NE), Neotropical (NT), Afrotropical (AF), Palaearctic (PA), Oriental (OR), Australasian (AU) and Antarctica (AN). Photographs were taken using an AxioCam MRc5 camera through ZEISS Axio Imager M2 Microscope and a Leica M165C microscope with Delta pix camera. The taxonomy used follows Evans (2008).

Results and Discussion

Black puparia

Aleurocanthus spiniferus (Quaintance) (Figure 1A)

Aleurodes spinifera Quaintance 1903.

Korea Port Interception. Taiwan: 1 puparium, 7 third instar on *Thea sinensis* (Theaceae) leaf, 14-i-2011.

Diagnosis. Puparial margin covered with wax secretion. Margin toothed; at least 6 teeth occupying 0.1mm of margin (Martin 1987). Dorsal disc spines acute; submargin normally with 11 pairs of stout spines in a row, all similar in length.

Hosts. Nineteen plant families.

Distribution. NT: Jamaica. AF: Kenya, Mauritius, Tanzania. PA: Greece, Iran, Japan. OR: China, Hong Kong, Taiwan, Philippines, Andaman Islands, India, Malaysia, Nicobar Islands, Thailand, Sri Lanka. AU: Java, New Guinea, Sumatra, Caroline Islands, New Caledonia, Hawaii.

Aleurocanthus woglumi Ashby (Figure 1B)

Aleurocanthus woglumi Ashby 1915.

Korea Port Interception. Thailand: 5 puparia, on *Citrus aurantifolia* (Rutaceae) leaf, 5-vii-2011.

Diagnosis. Puparial margin covered with wax secretion. Margin toothed; 3.5–5 teeth per 0.1mm of margin (Martin 1987). Dorsal disc spines acute; submargin usually with 11 pairs of stout spines in a row with cephalothoracic and caudal pairs alternately longer than adjacent ones.

Hosts. Polyphagous.

Distribution. Worldwide.

Aleuroduplidens eucalyptifolia Martin (Figure 1C)

Aleuroduplidens eucalyptifolia Martin 1999.

Korea Port Interception. Australia: 1 puparium, on *Eucalyptus* sp. (Myrtaceae) leaf, 26-iv-2006.

Diagnosis. Puparium covered with translucent waxy secretion. Teeth along lateral margin apically notched. Eyespots present, however, not clearly defined in the specimen examined. Abdominal segmentation distinct, slightly rhachis-like in form. Caudal tracheal comb absent.

Hosts. Myrtaceae: *Eucalyptus nortonii*, *Eucalyptus* spp.

Distribution. AU: Australia.

Aleurolobus marlatti (Quaintance) (Figure 1D)

Aleurodes marlatti Quaintance 1903.

Korea Port Interceptions. Japan: 2 puparia, on *Euonymus japonicus* (Celastraceae) leaf, 21-iii-2008. Vietnam: 4 puparia, on *Musa* sp. (Musaceae) leaf, 6-ii-2013.

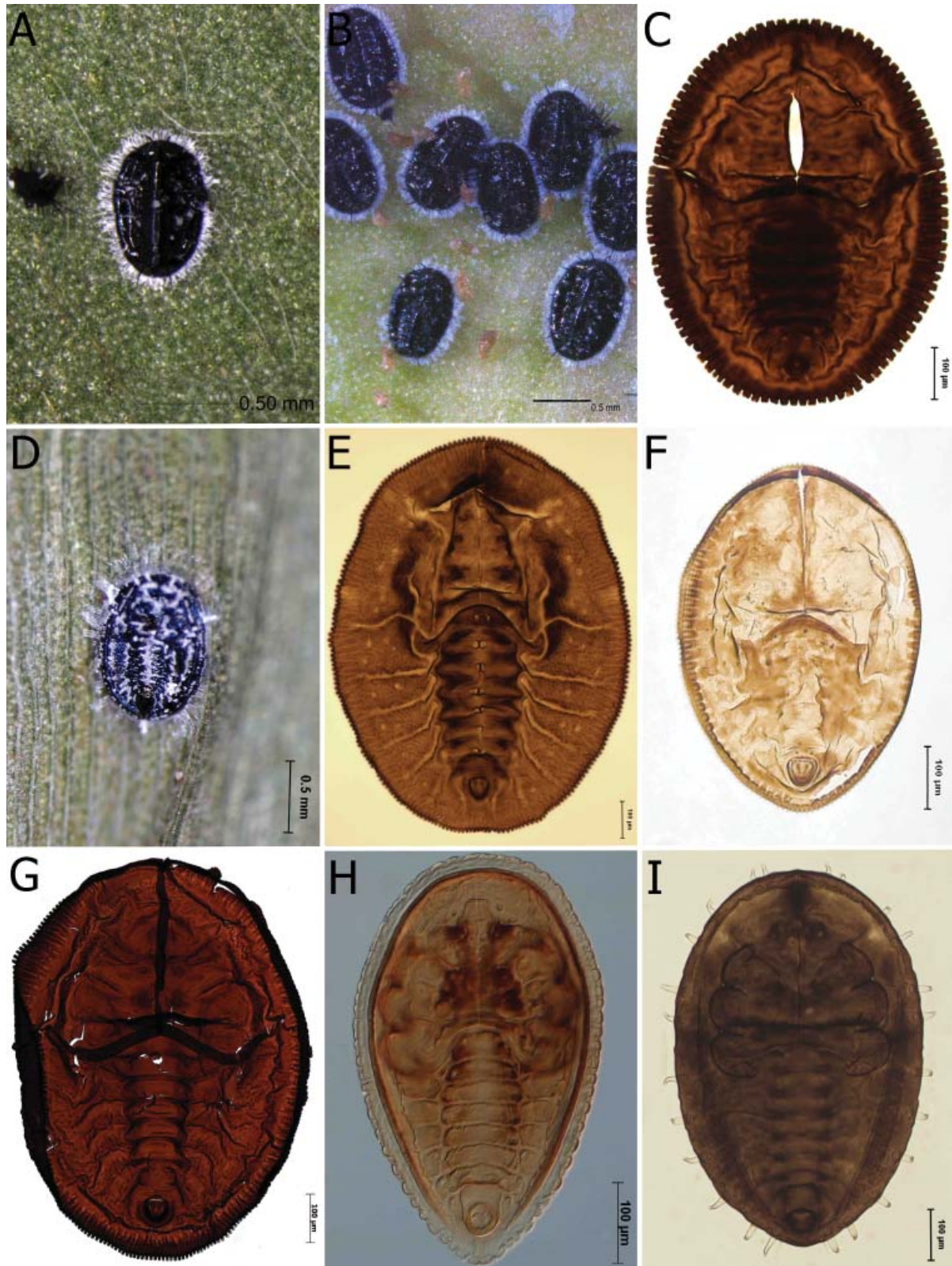


Figure 1. Nine species of whiteflies. **A)** *Aleurocanthus spiniferus* (Quaintance), habitus. **B)** *Aleurocanthus woglumi* Ashby, habitus. **C)** *Aleuroduplidens eucalyptifolia* Martin, puparium. **D)** *Aleurolobus marlatti* (Quaintance), habitus. **E)** *Aleurotrachelus dryandrae* Solomon, puparium. **F)** *Aleurotrachelus* sp., puparium. **G)** *Tetrалеurodes ursorum* (Cockerell), puparium. **H)** *Tetrалеurodes* sp., puparium. **I)** *Xenaleyrodes eucalypti* (Dumbleton), puparium.

Diagnosis. Puparial margin covered with waxy secretion, also with fine waxy sculpturing delineating segmentation and folds. Dorsal disc separated from submarginal region by suture. Eyespots present. Thoracic and caudal tracheal combs present, three thoracic and three caudal tracheal teeth. Vasiform orifice surrounded by a trilobed figure. Abdominal segmentation distinct, rhachis present.

Hosts. Twenty eight plant families.

Distribution. AF: Chad. PA: Egypt, Iran, Israel, Jordan, Saudi Arabia, Japan, Korea. OR: China, Taiwan, Philippines, India, Malaysia, Vietnam (intercepted at Incheon International Airport, Korea). AU: Java.

***Aleurotrachelus dryandrae* Solomon** (Figure 1E)

Aleurotrachelus dryandrae Solomon 1935.

Korea Port Interception. Australia: 9 puparia, on *Persoonia longifolia* (Proteaceae) leaf, 22-v-2006.

Diagnosis. Puparial margin covered with wax secretion. Margin toothed. Dorsal disc with a pair of longitudinal cephalothoracic folds, with many subcircular papillae, rhachis present.

Distribution. AU: Australia.

Host plants. Myrtaceae: *Leptospermum laevigatum*. Proteaceae: *Banksia attenuata*, *Banksia grandis*, *Banksia nivea*, *Banksia sessilis*, *Grevillea bipinnatifida*, *Hakea prostrate*, *Hakea varia*.

***Aleurotrachelus* sp.** (Figure 1F)

Korea Port Interceptions. Thailand: 1 puparium, on *Citrus aurantifolia* (Rutaceae) leaf, 25-xi-2008; same data, 1-iv-2009.

Diagnosis. Puparial margin covered with narrow wax secretion. Margin toothed. Dorsal disc with a pair of longitudinal cephalothoracic folds, rhachis present. Thoracic tracheal and caudal pores or notches absent. Vasiform orifice subcordate, situated on an elevated posterior end of the rhachis.

Remarks. This specimen was difficult to identify to species because the current taxonomic knowledge of *Aleurotrachelus* from Southern Asia is limited.

***Tetraleurodes ursorum* (Cockerell)** (Figure 1G)

Aleyrodes ursorum Cockerell 1910.

Korea Port Interceptions. USA: 2 puparia, on *Gaultheria shallon* (Ericaceae) leaf, 8-x-2009; same data, 4-ii-2010; same data, 29-v-2012.

Diagnosis. Margin toothed with pale glandular area. Dorsal disc separated from submarginal region by suture. Submargin strongly elevated, almost vertical, forming ridge-like rim around body. Dorsal disc with disc pores and porettes. Subdorsal disc with longitudinal ridge elevated on thorax and anterior abdominal segments. Rhachis present and slightly elevated. Vasiform orifice subcordate; with 2 cell-like structures on lateral part of rim of vasiform orifice.

Distribution. NE: Canada, USA. NT: Costa Rica, Jamaica, Mexico, Puerto Rico.

Host plants. Thirty four plant families.

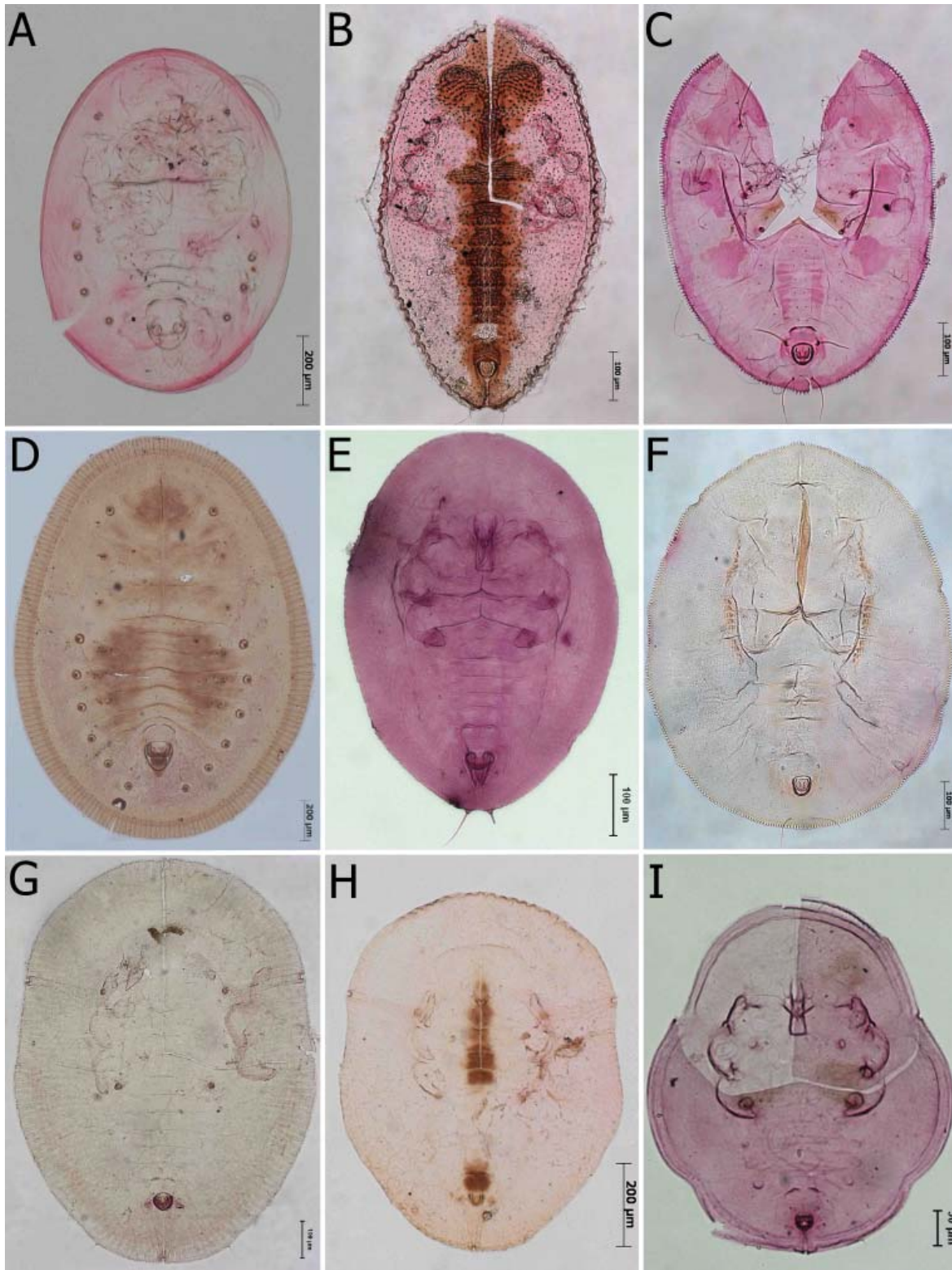


Figure 2. Nine species of whiteflies. **A)** *Aleurodicus dispersus* Russell, puparium. **B)** *Aleuroclava psidii* (Singh), puparium. **C)** *Aleurotrachelus anonae* Corbett, puparium. **D)** *Austroaleurodicus pigeanus* (Baker and Moles), puparium. **E)** *Bemisia tabaci* (Gennadius), puparium. **F)** *Crenidorsum turpiniae* (Takahashi), puparium. **G)** *Dialeurodes citri* (Ashmead), puparium. **H)** *Dialeurodes kirkaldyi* (Kotinsky), puparium. **I)** *Minutaleyrodes minuta* (Singh), puparium.

***Tetraleurodes* sp.** (Figure 1H)

Korea Port Interception. Australia: 2 puparia, on *Banksia* sp. (Proteaceae) leaf, 17-iv-2010.

Diagnosis. Puparial margin covered with narrow wax secretion, also with fine waxy sculpturing delineating segmentation and folds. Dorsal disc separated from submarginal region by suture. Thoracic tracheal and caudal pores or notches absent. Rhachis present. Vasiform orifice subcordate.

Remarks. The specimens were carefully examined and Martin's (1999) key to Australian *Tetraleurodes* was used. However, it was hard to determine the specific level. This species might be included in the 7 other *Tetraleurodes* spp. that were not described in his book.

***Xenaleyrodes eucalypti* (Dumbleton)** (Figure 1I)

Neomaskellia eucalypti Dumbleton 1956.

Korea Port Interception. Australia: 8 puparia, 1 third instar, on *Eucalyptus* sp. (Myrtaceae) leaf, 26-iv-2006; same data, 6-vii-2006.

Diagnosis. Submarginal spines tubiform and curved; 2nd cephalothoracic pair of submargin tubiform spines set closer to 1st pair than to 3rd pair. Thoracic tracheal combs each with about 8 teeth.

Distribution. AU: Australia.

Host plants. Myrtaceae: *Eucalyptus ficifolia*, *Eucalyptus* spp.

Light yellow to brown puparia***Aleurodicus dispersus* Russell** (Figure 2A)

Aleurodicus dispersus Russell 1965.

Korea Port Interception. Vietnam: 2 puparia, on *Phrynium placentarium* (Marantaceae) leaf, 16-i-2013.

Diagnosis. Subdorsum with wax producing compound pores similar in size; compound pores with central process; one cephalic pair and 4 abdominal pairs. Vasiform orifice subcordate wider than long; lingula large, tongue-shaped, extending beyond posterior margin of vasiform orifice, with 2 pairs of setae at apex.

Distribution. NE: USA. NT: Bahamas, Barbados, Bermuda, Brazil, Colombia, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, Guadeloupe, Haiti, Honduras, Jamaica, Martinique, Mexico, Panama, Peru, Puerto Rico, Venezuela, Virgin Islands. PA: Canary Islands, Iran, Italy. AF: Benin, Cameroun, Congo, Ghana, Kenya, Madeira, Mauritius, Nigeria, Sao Tome, Tanzania, Togo. OR: Philippines, Bangladesh, India, Maldives, Mauritius, Singapore, Sri Lanka, Thailand, Vietnam. AU: Australia, Java, American Samoa, Fiji, Guam, Marshall Islands, Palau, Saipan, Hawaii.

Host plants. Polyphagous.

***Aleuroclava psidii* (Singh)** (Figure 2B)

Aleurotrachelus psidii Singh 1931.

Korea Port Interception. Taiwan: 5 puparia, on *Dimocarpus longan* (Sapindaceae), 2-v-2012.

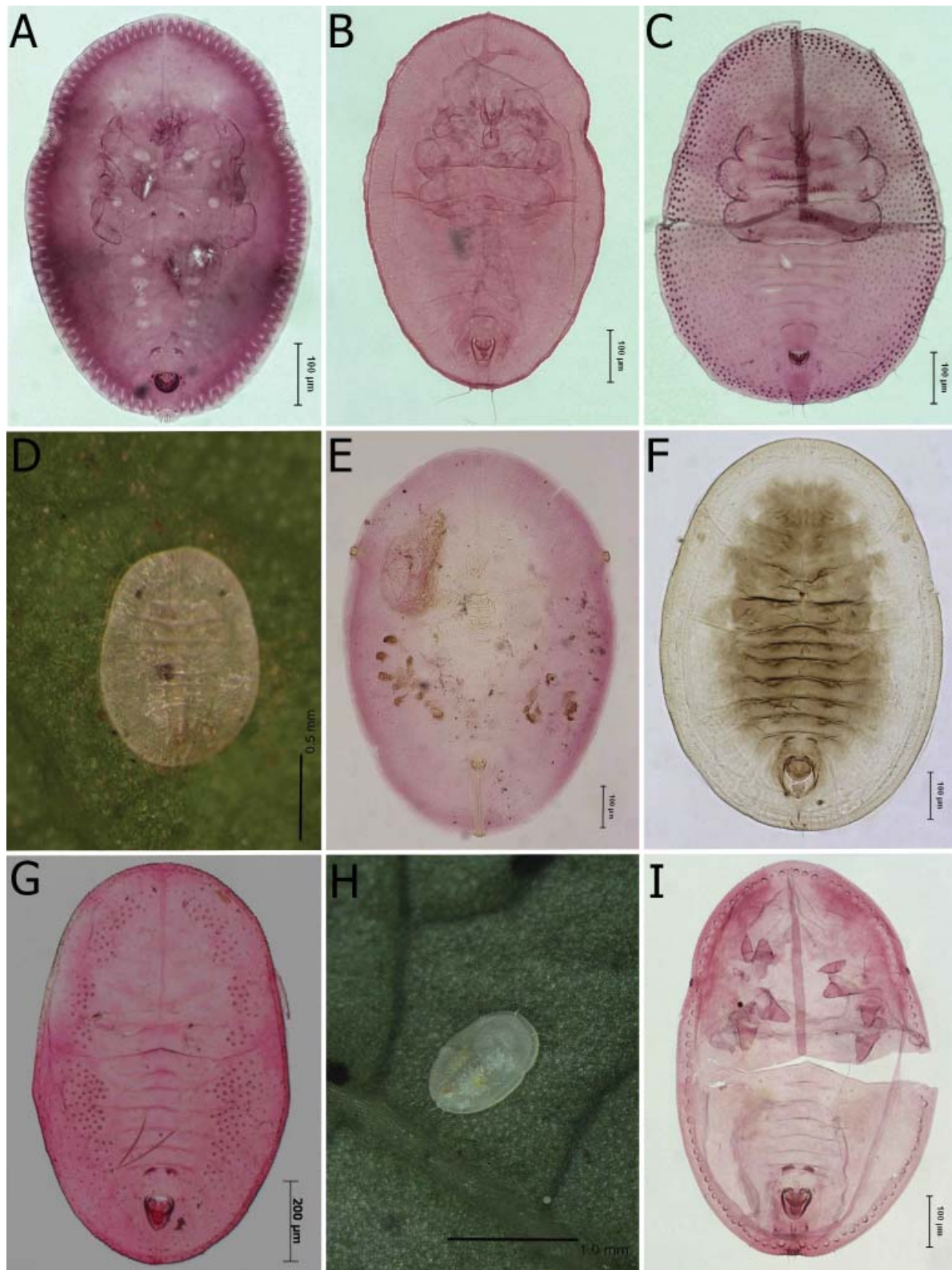


Figure 3. Eight species of whiteflies. **A)** *Orhamoplatus mammaeferus* (Quaintance and Baker), puparium. **B)** *Pealius azaleae* (Baker and Moles), puparium. **C)** *Pealius mori* (Takahashi), puparium. **D)** *Pealius* sp., habitus. **E)** *Singhiella simplex* (Singh), puparium. **F)** *Trialeurodes fernaldi* (Morrill), puparium. **G-H)** *Trialeurodes glacialis* (Bemis), puparium and habitus. **I)** *Trialeurodes vaporariorum* (Westwood), puparium.

Diagnosis. Dorsal disc separated from submarginal region by a suture. With thoracic tracheal clefts at the margin of cephalothorax; parallel to the mesal wavy margin. Abdomen without a sclerotised median rhachis, usually with a slightly elevated median area. Caudal furrow distinct, slightly narrowed towards the hind end. Vasiform orifice rather large and circular; anterior marginal area of the vasiform orifice expanded.

Distribution. OR: China, Taiwan, Andaman and Nicobar Islands, India.

Host plants. Moraceae: *Streblus asper*. Myrtaceae: *Psidium guajava*.

***Aleurotrachelus anonae* Corbett (Figure 2C)**

Aleurotrachelus anonae Corbett 1935.

Korea Port Interception. Thailand: 2 puparia, on *Annona* sp. (Annonaceae), 22-vii-2011.

Diagnosis. Margin toothed, marginal teeth square-shaped and broadly separated with incision. Rhachisform abdominal segments. With a longitudinal row of pores and pores along lateral longitudinal fold. Ligula exposed.

Distribution. OR: Bangladesh, Malaya, Malaysia, Taiwan, Thailand (intercepted at Incheon International Airport, Korea).

Host plants. Annonaceae: *Annona squamosa*. Moraceae: *Morus indica*. Zingiberaceae: *Zingiber* sp.

***Austroaleurodicus pigeanus* (Baker and Moles) (Figure 2D)**

Aleurodicus (Metaleurodicus) pigeanus Baker and Moles 1923.

Korea Port Interception. Chile: 2 puparia, on *Gevuina* sp. (Proteaceae) leaf, 27-vii-2009.

Diagnosis. Pupal case brown and oval. Dorsal disc separated from submarginal region by a suture; with dark patches on median area of cephalic region and submedian area of abdomen. Cephalic pair and 6 abdominal pairs of compound pores, all subequal in size, with a central rod. With a cluster of wide-rimmed pores on the submedial area of abdominal segments III-V. Vasiform orifice subcordate; lingula large, tongue-shaped, extending beyond posterior margin of vasiform orifice.

Distribution. NT: Chile, Puerto Rico.

Host plants. Rosaceae: *Quillaja saponaria*.

***Bemisia tabaci* (Gennadius) (Figure 2E)**

Aleurodes tabaci Gennadius 1889.

Korea Port Interceptions. Intercepted 171 times at Korean ports of entry from Japan, China, Indonesia, Thailand, Spain, Israel, New Zealand, USA and Mexico and on a wide variety of host plants.

Diagnosis. Vasiform orifice elongate triangular, caudal furrow well defined by a pair of ridges. Thoracic tracheal openings with subtle combs. Caudal setae long and stout, longer than vasiform orifice.

Distribution. Worldwide.

Host plants. Polyphagous.

***Crenidorsum turpiniae* (Takahashi)** (Figure 2F)

Aleurotrachelus turpiniae Takahashi 1932.

Korea Port Interceptions. Vietnam: 8 puparia, on *Ixora* sp. (Rubiaceae) leaf, 10-iii-2010; China: 9 puparia, on *Osmanthus* sp. (Oleaceae) leaf, 16-iii-2010.

Diagnosis. Margin toothed. Puparial submedian and subdorsal area with a pair of lateral longitudinal folds of crescent-shaped scallops on cephalothorax and on anterior abdomen. Pores and associated porettes distributed on dorsum. Submedian area of abdominal segment II-V with one pair of pores and associated porettes. Rhachis present.

Distribution. OR: Taiwan, India, China (intercepted at Jeju International Airport, Korea), Vietnam (intercepted at Incheon International Airport, Korea).

Host plants. Ebenaceae: *Diospyros kaki*. Oleaceae: *Ligustrum pricei*. Proteaceae: *Helicia formosana*. Rubiaceae: *Tricalysia dubia*, *Wendlandia formosana*. Staphyleaceae: *Turpinia formosana*.

***Dialeurodes citri* (Ashmead)** (Figure 2G)

Aleyrodes citri Ashmead 1885.

Korea Port Interceptions. Vietnam: 2 puparia, on *Citrus* sp. (Rutaceae) leaf, 11-v-2007.

Diagnosis. Ventral caudal and thoracic tracheal folds distinct, covered with spinules; thoracic and caudal tracheal openings marked by invaginated pores; with smooth teeth internally.

Distribution. NE: USA. NT: Bahamas, Bermuda, Cuba, Dominican Republic, El Salvador, Haiti, Honduras, Mexico, Panama, Puerto Rico. PA: Afghanistan, France, Greece, Iran, Italy, Portugal, Sicily, Turkey, Korea, Japan. OR: China, Hong Kong, Macau, Taiwan, India, Pakistan, Philippines, Thailand, Vietnam (intercepted at Incheon International Airport, Korea). AU: Guam, Hawaii.

Host plants. Thirty four plant families including Moraceae, Rutaceae and Theaceae.

***Dialeurodes kirkaldyi* (Kotinsky)** (Figure 2H)

Aleyrodes kirkaldyi Kotinsky 1907.

Korea Port Interception. Vietnam: 2 puparia, on *Jasminum* sp. (Oleaceae) leaf, 3-xii-2008.

Diagnosis. Ventral caudal and thoracic tracheal folds distinct, covered with spinules. Median line of pupal case with some pigment from mouth parts to abdominal segment I.

Distribution. NE: USA. NT: Bahamas, Barbados, Costa Rica, Cuba, Guyana, Jamaica, Mexico, Guyana, Puerto Rico, Trinidad, Virgin Islands. PA: Azores, Egypt, Iran, Israel, Greece, Lebanon, Syria, Turkey, UK. OR: Ghana, China, Hong Kong, Japan, Taiwan, Andaman and Nicobar Islands, Burma, India, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam (intercepted at Incheon International Airport, Korea). AU: Australia, Caroline Islands, Cook Islands, Fiji, Guam, Samoa, Tahiti, Hawaii.

Host plants. Thirty four plant families.

***Minutaleyrodes minuta* (Singh)** (Figure 2I)

Dialeurodes minuta Singh 1931.

Korea Port Interceptions. Thailand: 7 puparia, on *Ixora* sp. (Rubiaceae) leaf, 20-iii-2007; Vietnam: 2 puparia, same host, 10-iii-2010.

Diagnosis. Puparium minute; less than 0.5mm in length. Transverse moulting suture reaching posteriorly to the subdorsal area. Submargin distinct on the ventral surface. Thoracic tracheal fold absent, while caudal furrow distinct.

Distribution. NE: USA. NT: Dominican Republic, Guyana, Mexico, Puerto Rico. OR: Andaman and Nicobar Islands, Burma, India, Philippines, Singapore, Thailand (intercepted at Incheon International Seaport, Korea), Vietnam (intercepted at Incheon International Seaport, Korea). AU: Guam, Hawaii.

Host plants. Fagaceae: *Quercus virginiana*. Myrtaceae: *Eugenia uniflora*. Oleaceae: *Jasminum* sp. Rubiaceae: *Gardenia augusta*. *Ixora coccinea*. Rutaceae: *Murraya paniculata*.

***Orchamoplatus mammaeferus* (Quaintance and Baker) (Figure 3A)**

Aleuroplatus (*Orchamus*) *mammaeferus* Quaintance and Baker 1917.

Korea Port Interceptions. Sri Lanka: 31 puparia, on *Codiaeum* sp. (Euphorbiaceae) leaf, 29-iii-2007; 2 puparia, same host, 9-vi-2011.

Diagnosis. Submargin with a single row of dentate glands. Thoracic and caudal tracheal openings with distinct combs of teeth.

Distribution. NT: Bahamas. PA: Iran, Japan. OR: Malaysia, Singapore, Sri Lanka (intercepted at Incheon International Airport, Korea). AU: Australia, Java, New Guinea, Sulawesi, Fiji, Samoa, Marques Islands, Tahiti, Hawaii.

Host plants. Convolvulaceae: *Convolvulus arvensis*, *Ipomoea purpurea*. Euphorbiaceae: *Codiaeum variegatum*, *Codiaeum* sp. Myrtaceae: *Pimenta caryophylla*, *Pimenta officinalis*. Rutaceae: *Citrus aurantifolia*, *Citrus medica*, *Citrus paradisi*, *Citrus sinensis*.

***Pealius azaleae* (Baker and Moles) (Figure 3B)**

Aleyrodes azaleae Baker and Moles 1920.

Korea Port Interception. Japan: 1 adult female, 12 puparia, on *Rhododendron* sp. (Ericaceae) leaf, 1-vii-2005.

Diagnosis. Vasiform orifice situated in a pit. Marginal crenulations at thoracic tracheal openings modified to form distinct, but short, combs of teeth.

Distribution. NE: USA. PA: Belgium, England, Iran, Netherlands, Scotland, Russia, Japan, Korea. OR: India. AU: Australia, New Zealand.

Host plants. Ericaceae: *Azalea pontica*, *Rhododendron indicum*, *Rhododendron mucronatum*, *Rhododendron schippenbachii*.

***Pealius mori* (Takahashi) (Figure 3C)**

Trialeurodes mori Takahashi, 1932.

Korea Port Interceptions. China: 5 puparia, on *Ficus* sp. (Moraceae) leaf, 20-v-2008; same data, 18-vii-2008.

Table 1. Collection details of species of whiteflies intercepted on imported plants.

| Scientific Name | INT | Dis. In KO | JA | CH | TA | IN | SL | TH | VI | SP | IS | NE | GE | FR | AU | NZ | US | ME | CL | CO | KE | |
|---------------------------------------|-----|---------------|----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|
| [Black puparia] | | | | | | | | | | | | | | | | | | | | | | |
| <i>Aleurocanthus spiniferus</i> | 1 | ? | | | 1 | | | | | | | | | | | | | | | | | |
| <i>Aleurocanthus woglumi</i> | 1 | no | | | | | | 1 | | | | | | | | | | | | | | |
| <i>Aleuroduplidens eucalyptifolia</i> | 1 | no | | | | | | | | | | | | | 1 | | | | | | | |
| <i>Aleuiolobus marlatti</i> | 2 | yes | 1 | | | | | | 1 | | | | | | | | | | | | | |
| <i>Aleurotrachelus dryandrae</i> | 1 | no | | | | | | | | | | | | | 1 | | | | | | | |
| <i>Aleurotrachelus</i> sp. | 2 | - | | | | | | 2 | | | | | | | | | | | | | | |
| <i>Tetraleurodes ursorum</i> | 3 | no | | | | | | | | | | | | | | | | | | 3 | | |
| <i>Tetraleurodes</i> sp. | 1 | - | | | | | | | | | | | | | 1 | | | | | | | |
| <i>Xenaleyrodes eucalypti</i> | 2 | no | | | | | | | | | | | | | 2 | | | | | | | |
| [Light yellow to brown puparia] | | | | | | | | | | | | | | | | | | | | | | |
| <i>Aleurodicus dispersus</i> | 1 | no | | | | | | | 1 | | | | | | | | | | | | | |
| <i>Aleuroclava psidii</i> | 1 | no | | | 1 | | | | | | | | | | | | | | | | | |
| <i>Aleurotrachelus anonae</i> | 1 | no | | | | | | 1 | | | | | | | | | | | | | | |
| <i>Austroaleurodicus pigeanus</i> | 1 | no | | | | | | | | | | | | | | | | | | 1 | | |
| <i>Bemisia tabaci</i> | 171 | yes | 1 | 160 | | 1 | | 1 | | 2 | 1 | | | | | 1 | 3 | 1 | | | | |
| <i>Crenidorsum turpiniae</i> | 2 | no | | 1 | | | | | 1 | | | | | | | | | | | | | |
| <i>Dialeurodes citri</i> | 1 | yes | | | | | | | 1 | | | | | | | | | | | | | |
| <i>Dialeurodes kirkaldyi</i> | 2 | no | | 2 | | | | | | | | | | | | | | | | | | |
| <i>Minutaleyrodes minuta</i> | 2 | no | | | | | | 1 | 1 | | | | | | | | | | | | | |
| <i>Orchamoplatus mammaeferus</i> | 2 | no | | | | | 2 | | | | | | | | | | | | | | | |
| <i>Pealius azaleae</i> | 1 | yes | 1 | | | | | | | | | | | | | | | | | | | |
| <i>Pealius mori</i> | 2 | no | | 2 | | | | | | | | | | | | | | | | | | |
| <i>Pealius</i> sp. | 1 | - | | | | | | 1 | | | | | | | | | | | | | | |
| <i>Singhiella simplex</i> | 2 | no | | 2 | | | | | | | | | | | | | | | | | | |
| <i>Trialeurodes fernaldi</i> | 1 | no | | | | | | | | | | | | | | | | | | 1 | | |
| <i>Trialeurodes glacialis</i> | 1 | no | | | | | | | | | | | | | | | | | | 1 | | |
| <i>Trialeurodes vaporariorum</i> | 29 | yes | | 11 | | | | | 2 | | | 7 | 1 | 1 | | | | | | 3 | 3 | 1 |

Abbreviations: INT, Number of interceptions; Dis, Distributed; KO, the republic of Korea; JA, Japan; CH, China; TA, Taiwan; IN, Indonesia; SL, Sri Lanka; TH, Thailand; VI, Vietnam; SP, Spain; IS, Israel; NE, Netherlands; GE, Germany; FR, France; AU, Australia; NZ, New Zealand; US, the United States; ME, Mexico; CL, Chile; CO, Colombia; KE, Kenya. ?: Specimens not examined even though known in Korea.

Diagnosis. Vasiform orifice situated in a pit. Dorsal disc with many small circular pores densely scattered except on the median and submarginal areas, the latter with many papillae in about 3 irregular rows, 14 pairs of short setae in a row along the whole margin.

Distribution. OR: China (intercepted at Incheon International Seaport, Korea), Taiwan, Thailand.

Host plants. Euphorbiaceae: *Glochidion phillpicum*. Moraceae: *Morus alba*, *Morus australis*. Salicaceae: *Salix* sp.

***Pealius* sp.** (Figure 3D)

Korea Port Interception. Thailand: 2 puparia, on *Annona* sp. (Annonaceae), 22-vii-2011.

Diagnosis. Vasiform orifice situated in a pit. Thoracic tracheal folds not discernible and thoracic tracheal openings with small blunt tubercles. Caudal furrow indistinct. With sixteen pairs of short setae in a row along the whole margin.

Remarks. The specific assignment of this species remains uncertain.

***Singhiella simplex* (Singh)** (Figure 3E)

Aleurocanthus simplex Singh, 1931.

Korea Port Interceptions. China: 2 puparia, on *Ficus* sp. (Moraceae) leaf, 30-viii-2007; same data, 17-iii-2008.

Diagnosis. Dorsal disc covered with circular, raised papilla-like pores and porettes, thoracic tracheal fold and caudal furrow distinct. Thoracic and caudal tracheal openings with slightly stronger with an oval pore with a rim in the specimen examined; dorsal setae with fringed apices.

Distribution. NE: USA. NT: Puerto Rico. OR: China (intercepted at Incheon International Airport and Seaport, Korea), India.

Host plants. Moraceae: *Ficus altissima*, *Ficus bengalensis*, *Ficus benjamina*, *Ficus racemosa*.

***Trialeurodes fernaldi* (Morrill)** (Figure 3F)

Aleyrodes fernaldi Morrill 1903.

Korea Port Interception. USA: 3 puparia, 1 third instar, on *Galax* sp. (Diapensiaceae) leaf, 14-xi-2005.

Diagnosis. Subdorsal area brownish and slightly sclerotized. Dorsal papillae degenerate in all specimens examined. Caudal setae short, a pair of pores present on second abdominal segment of submedian area.

Distribution. NE: USA.

Host plants. Diapensiaceae: *Galax urceolata*, Rosaceae: *Fragaria* sp, *Spiraea vanhouttei*, *Spiraea* sp. Rubiaceae: *Cephalanthus occidentalis*.

***Trialeurodes glacialis* (Bemis)** (Figures 3G-H)

Aleyrodes glacialis Bemis 1904.

Korea Port Interception. USA: 2 puparia, on *Gaultheria shallon* (Ericaceae) leaf, 11-v-2010.

Diagnosis. Marginal crenulations relatively broad. Dorsal disc with many papillae on the marginal and submarginal areas; outer papillae in a row, inner papillae scattered or irregular rows. First abdominal setae present.

Distribution. NE: USA.

Host plants. Caprifoliaceae: *Lonicera interrupta*, *Symphoricarpos racemosus*. Fagaceae: *Quercus densiflora*. Labiatae: *Salvia mellifera*. Ranunculaceae: *Clematis ligusticifolia*. Rhamnaceae: *Ceanothus californicus*, *Ceanothus* sp., *Rhamnus californica*. Rosaceae: *Opulaster capitatus*, *Rubus vitifolius*.

***Trialeurodes vaporariorum* (Westwood)** (Figure 3I)*Aleyrodes glacialis* Bemis 1904.

Korea Port Interceptions. Intercepted 29 times at Korean ports of entry from China, Japan, Vietnam, Netherlands, Germany, France, Kenya, USA and Colombia on cut flowers, trees and Brassicaceae.

Diagnosis. A single submarginal row of papillae present; lateral margin with relatively broad crenulations. Eighth abdominal setae located anterior to widest part of operculum.

Distribution. Worldwide.

Host plants. Polyphagous.

Discussion

Of the 26 species collected from 2005 to 2013, *Bemisia tabaci* (Gennadius) and *Trialeurodes vaporariorum* (Westwood), represented 85% (200 interceptions) of the total number of specimens. Many whiteflies, including the 26 species discussed, are of quarantine significance because they are highly prolific, phytophagous, and some are vectors of plant viruses. The amount of plant material imported into Korea has increased and many of the species are known hosts for whiteflies. It is inevitable that an increase in the international trade of plants will lead to an increase in the number of potentially invasive species encountered during inspection and preventive measures are required to overcome this challenge. One such measure is to regularly update the list of pests intercepted on imported plants and make the list and diagnostic information available to others possible users, such as inspectors and researchers.

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Literature Cited

- Ashby, S. F. 1915. Notes on diseases of cultivated crops observed in 1913–1914. *Bulletin of the Department of Agriculture Jamaica* 2: 299–327.
- Ashmead, W. H. 1885. The orange *Aleurodes* (*Aleurodes citri* n. sp.). *Florida Dispatch* 2: 704.
- Baker, A. C., and M. L. Moles. 1920. A new species of Aleyrodidae found on *Azalea* (Hom.). *Proceedings of the Entomological Society of Washington* 22: 81–83.
- Baker, A. C., and M. L. Moles. 1923. The Aleyrodidae of South America with descriptions of four new Chilean species. *Revista Chilena de Historia Natural* 25: 609–648.
- Bemis, F. E. 1904. The aleyrodids or mealy-winged flies of California with reference to other American species. *Proceedings of the U. S. National Museum* 27: 471–537.
- Cockerell, T. D. A. 1910. A new *Aleyrodes* on bearberry. *Canadian Entomologist* 42: 171–172.
- Corbett, G. H. 1935. Three new aleurodids (Hem.). *Stylops* 4: 8–10.
- Dubey, A. K., and C. C. Ko. 2010. *Aleurotrachelus* Quaintance and Baker (Hemiptera: Aleyrodidae) and allied genera from Taiwan. *Zootaxa* 2685: 1–29.
- Dumbleton, L. J. 1956. The Australian Aleyrodidae (Hemiptera: Homoptera). *Proceedings of the Linnean Society of New South Wales* 81: 159–183.

- Evans, G. A. 2008.** The whiteflies (Hemiptera: Aleyrodidae) of the world and their host plants and natural enemies. Available from: <http://www.sel.barc.usda.gov/whitefly/wfframe.htm> (Accessed December 2013).
- Gennadius, P. 1889.** Disease of tobacco plantations in the Trikonía. The aleurodid of tobacco. *Ellenike Georgia* 5: 1–3.
- Kotinsky, J. 1907.** Aleyrodidae of Hawaii and Fiji with descriptions of new species. *Bulletin, Board of Commissioners of Agriculture and Forestry Hawaii, Division of Entomology* 2: 93–102.
- Martin, J. H. 1987.** An identification guide to common whitefly pest species of the world (Homoptera, Aleyrodidae). *Tropical Pest Management* 33: 298–322.
- Martin, J. H. 1999.** The whitefly fauna of Australia (Sternorrhyncha: Aleyrodidae). A taxonomic account and identification guide. *Technical Paper, Division of Entomology, Commonwealth Scientific and Industrial Research Organization, Canberra* 38: 1–197.
- Martin, J. H., and L. A. Mound. 2007.** An annotated check list of the world's whiteflies (Insecta: Hemiptera: Aleyrodidae). *Zootaxa* 1492: 1–84.
- Morrill, A. W. 1903.** Notes on some *Aleyrodes* from Massachusetts with description of new species. *Psyche Cambridge* 10: 80–85.
- PIS [Pest Information System]. 2013.** Available from: <http://10.110.128.100/> (Accessed December 2013).
- Russell, L. M. 1965.** A new species of *Aleurodicus* Douglas and two close relatives (Homoptera: Aleyrodidae). *Florida Entomologist* 48: 47–55.
- Singh, K. 1931.** A contribution towards our knowledge of the Aleyrodidae (Whiteflies) of India. *Memoirs of the Department of Agriculture in India* 12: 1–98.
- Solomon, M. E. 1935.** On a new genus and two new species of Western Australian Aleyrodidae. *Proceedings of the Royal Society of Western Australia* 21: 75–91.
- Suh, S. J., and G. Evans. 2012.** Additions to the Whitefly Fauna of Korea with a Key to Species (Hemiptera: Aleyrodidae). *Korean Journal of Applied Entomology* 51: 163–170.
- Takahashi, R. 1932.** Aleyrodidae of Formosa, Part I. Report. Department of Agriculture. Government Research Institute. *Formosa* 59: 1–57.
- Quaintance, A. L. 1903.** New oriental Aleurodicidae. *Canadian Entomologist* 35: 61–64.
- Quaintance, A. L., and A. C. Baker. 1917.** A contribution to our knowledge of the whiteflies of the sub-family Aleurodicinae (Aleyrodidae). *Proceedings of the U. S. National Museum* 51: 335–445.

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