

## Short Communication: New records of aphid species Subfamily Aphidinae (Hemiptera: Aphididae) in West Java, Indonesia

YANI MAHARANI<sup>1</sup>, PURNAMA HIDAYAT<sup>2,\*</sup>, AUNU RAUF<sup>2</sup>, NINA MARYANA<sup>2</sup>

<sup>1</sup>Program of Entomology, Institut Pertanian Bogor. Bogor 16680, West Java, Indonesia.

<sup>2</sup>Department of Plant Protection, Faculty of Agriculture, Institut Pertanian Bogor. Jl. Meranti, Darmaga, Bogor 16680, West Java, Indonesia.  
Tel.: +62-251-8622642, \*email: phidayat@apps.ipb.ac.id

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**Abstract.** Maharani Y, Hidayat P, Rauf A, Maryana N. 2018. Short Communication: New records of aphid species Subfamily Aphidinae (Hemiptera: Aphididae) in West Java, Indonesia. *Biodiversitas* 19: 460-465. Aphids (Hemiptera: Aphididae) are an economically important group of insects. Their feeding not only damages crops directly but also transmits viruses that cause plant disease. The total number of aphid species recorded in West Java, Indonesia between 1917 and 2013 was 184 species. The aim of the study reported here was to identify and record any aphid species and their host plants in West Java Province, Indonesia that had not previously been recorded. The study was conducted in thirteen districts in West Java. Fourteen species of aphid were newly recorded as found in West Java; five species from the tribe Aphidini, and nine species from the tribe Macrosiphini.

**Keywords:** Aphidini, Macrosiphini, biodiversity, exploration, new records

### INTRODUCTION

Aphids are plant-sucking insects that can cause direct damage to plants by feeding on their sap and indirect damage by transmitting plant virus diseases. Many aphid species have become pests of agricultural crops and forestry plants (Basilova 2010). More than 5,000 species are known (Favret 2017), 250 of which have been recorded as pests in agriculture (Blackman and Eastop 2006). Many aphid species also play an important role as vectors for plant viruses such as *Aphis craccivora* is vector of Bean Common Mosaic Virus strain Blackeye (BCMV-BIC) and Cucumber Mosaic Virus (CMV) on yard long bean (*Vigna unguiculata* subsp. *Sesquipedalis*) in Bogor, West Java (Damayanti et al. 2009).

The study of aphids taxonomy in Indonesia began in the 1900s. The first publication by van der Goot (1917) reported 83 species of aphid in Java, of which 54 species are new species. Other researchers, Noordam and Hille (1985) reported five new species of the Genus *Taiwanaphis* in Java. In 1986, Noordam reported a new species of *Sinomegoura* on a coffee plants in Java. The taxonomy study and identification key of Subfamily Hormaphidinae in Java was published by Noordam in 1991. Noordam (1994) published the taxonomy and identification key of 33 species of Greenideinae that he found in Java. In 2004, Noordam reported the identification results of 92 species Subfamily Aphidinae, Lachninae, Neophyllaphidinae, and Pemphiginae, six of them are new species in Java.

Taxonomic researchers who studied aphids in Indonesia were mostly foreigners, so direct information such as the aphid holotype specimen is not available in Indonesia.

Holotype specimens are needed as a reference and clarification in describing a species, especially a new species which identity is still in doubt. Irsan (1997) reported that as many as 22 species of aphids are associated with Solanaceae in West Java. Most of the aphids found in West Java have roles as horticulture pests (Irsan 1997). Research on the field of aphid taxonomy in Indonesia has been slowly updated. The latest information that can provide taxonomic data and aphid host plants is important mainly for agriculture.

The availability of updated information on aphid diversity and taxonomy in Indonesia is limited. Information of aphid taxonomy is very important in relation to diversity of aphids and control of plant pests in Indonesia. Global climate change which is happening as well as the development of global market system can affect the distribution of aphids both horizontally and vertically. The aim of this research was to provide information related to species diversity, morphological characters, distribution and plant hosts for the newly recorded aphids of the Subfamily Aphidinae in West Java, Indonesia.

### MATERIALS AND METHODS

The aphid samples were taken from thirteen districts in West Java, Indonesia. The sampling locations covered areas of Bogor, Sukabumi, Cianjur, Karawang, Subang, Lembang, Pangalengan, Ciamis, Garut, Tasikmalaya, Cirebon, Indramayu, and Kuningan (Figure 1). The identification of aphids was carried out at the Laboratory of Insect Biosystematics, Department of Plant Protection,

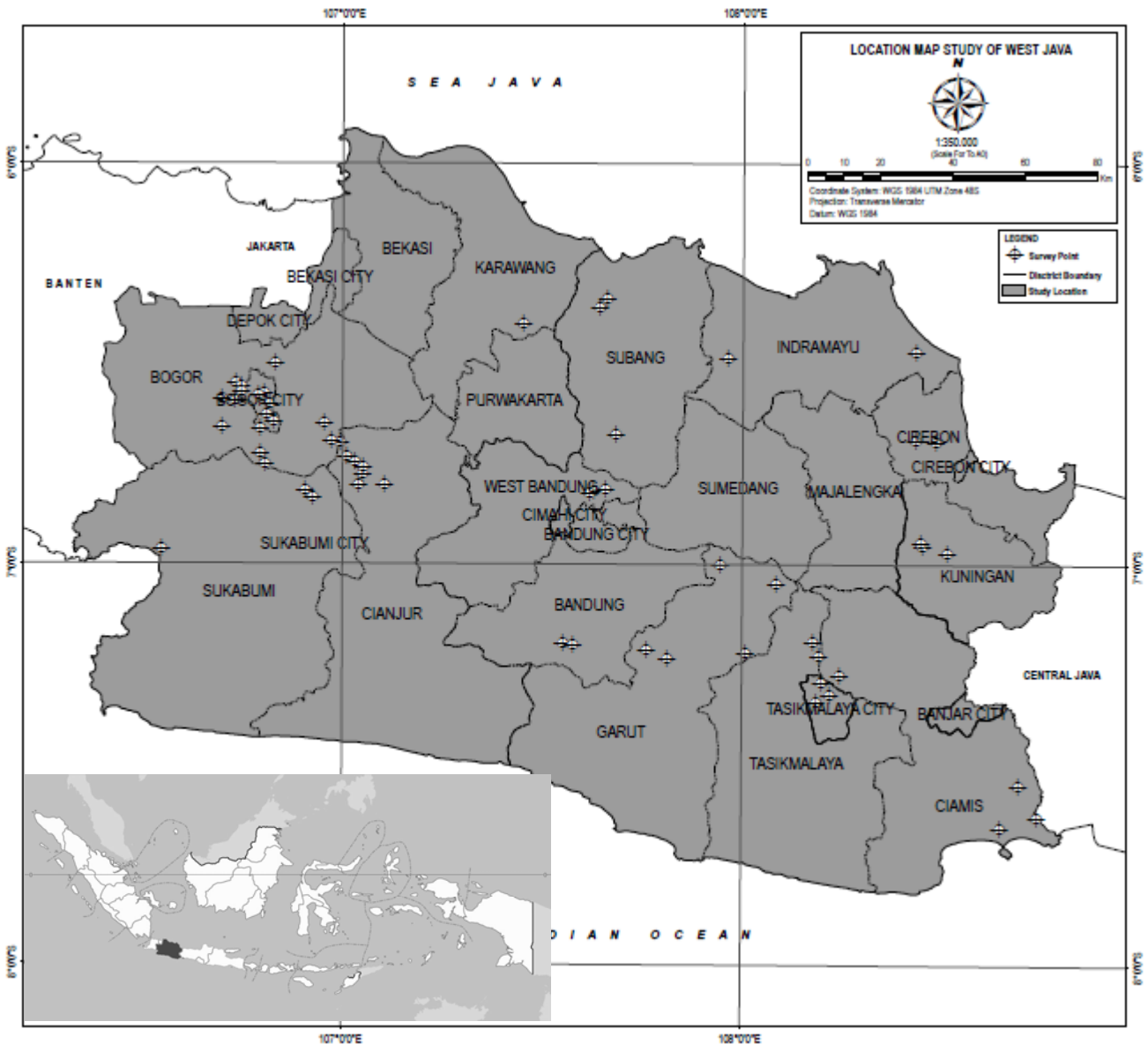
Faculty of Agriculture, Bogor Agricultural University (IPB), West Java, Indonesia.

The aphid specimens, collected on agricultural plants, secondary forest plants and weeds, were taken by brush directly from the plants. Microscope preparation of the aphids was based on the method of Blackman and Eastop (2000). Adult specimens were mounted on microscope slides in Canada Balsam. Identification of aphids was carried out under an Olympus CX21 stereo microscope with images captured using Dino Capture software, and also under LEICA M205C microscopes. The species were identified based on morphological features. The identity of the specimens was discussed with Roger Blackman (pers. comm.). Microscope slides of the studied specimens were deposited in the insect museum of Bogor Agricultural University, Bogor (West Java, Indonesia).

The identification of aphids was performed using several books published by van der Goot (1917), Eastop (1961), Noordam (1991, 1994, 2004), as well as Blackman and Eastop (1994, 2000, 2006). In this paper, we follow the classification of the family Aphididae used by Favret (2017).

**RESULTS AND DISCUSSION**

Sixty-five aphid species were collected in this study, we identified fourteen aphid species as new records in West Java. The aphids included five species from tribe Aphidini, and nine species from tribe Macrosiphini that are recorded for the first time in West Java province and for Indonesia as a whole. Photographs of these aphid species newly recorded in West Java are shown in Figure 2.



**Figure 1.** Aphid sampling locations in West Java, Indonesia

Of the family Aphididae, Aphidinae is the subfamily with the greatest number of species. This subfamily consists of two tribes, the Aphidini and Macrosiphini. Distinguishing characters for the Aphidinae include: (i) number of antennae segments, (ii) length of terminal process much longer than base of the antenna, (iii) secondary sensoria on antennae of alatae, (iv) siphunculi usually tubular, (v) cauda usually tongue-shaped, sometimes short and broad, never knobbed.

#### Five species of Aphidini

The common characters of aphid species from tribe Aphidini are (i) apterae usually without secondary rhinaria, (ii) antennal tubercles poorly developed or absent, (iii) alatae usually without a solid black dorsal abdominal patch (Noordam 2004).

#### *Aphis fabae* Scopoli, 1763

*Aphis fabae* (Figure 2a) has a common name i.e. black bean aphid. *Aphis fabae* has sub-species that are often regarded as separate species. Young colonies of this aphid are black, older colonies spread over most of aerial parts of plant with many individuals developing white wax markings. Almost all colonies are attended by ants. The diagnostic apterae characters are body length 1.5-3.0 mm, dorsal abdomen with dark markings on tergite VII or VIII, and cauda dark with more than 10 hairs (Blackman and Eastop 2000; 2006). *Aphis fabae* is a polyphagous insect with many host plant species and can be a vector of more than 30 plant pathogenic viruses, including non-persistent and persistent viruses (Blackman and Eastop 2000). *Aphis fabae* is widespread in temperate regions of the northern hemisphere, also in South America and Africa (Blackman and Eastop 2006). In West Java, colonies of this aphid have been observed on welsh onion, *Allium fistulosum* (Amaryllidaceae) in Cianjur district 7.xii.2013; cucumber, *Cucumis sativus* (Cucurbitaceae) in Bogor 7.viii.2013 and Lembang district 10.vii.2014; squash, *Cucurbita maxima* (Cucurbitaceae) in Lembang district 7.vii. 2014; lime, *Citrus aurantifolia* (Rutaceae) in Garut district 28.viii.2013; and on eggplant, *Solanum melongena* (Solanaceae) in Kuningan district 25.vi.2014.

#### *Aphis frangulae* Kaltenbach, 1845

*Aphis frangulae* (Figure 2b) is closely related to and virtually indistinguishable from *Aphis gossypii*. It occurs on potatoes and other herbaceous plants. The apterae are generally dark green or blue-green, sometimes mottled. The diagnostic alatae characters are abdominal sclerotic patterns are variable, alatae have 3 to 16 secondary rhinaria distributed on antennal segment III, siphunculi uniformly dark, and hairs on hind femur all shorter than diameter of femur at its base (Blackman and Eastop 2000; 2006). The aphids utilize a wide range of herbaceous plants. *Aphis frangulae* may cause feeding damage to potatoes, and is also an important potato virus vector, transmitting potato virus Y and potato virus M (Dietzgen et al. 2009). The aphids are widespread in Europe and Uzbekistan. In West

Java, aphids were recorded on potato in Garut district 4.ix.2014.

#### *Aphis kurosawai* Takahashi, 1921 (Figure 2c)

Apterae are green or yellow-green, wax powdered, with dark siphunculi and cauda. The diagnostic alatae characters are body length 1.1-2 mm, siphunculi and cauda dark and base of antennal have 6 hairs (less 10 hairs) (Blackman and Eastop 2006). This species is a common species on leaves of *Artemisia* spp. (Asteraceae) in East Asia (India, Nepal, East Siberia, China, Korea, Taiwan, Japan) (Blackman and Eastop 2000). In West Java province, the aphid was found in Garut 28.viii.2013 and in Cianjur district 7.xii.2013.

#### *Aphis nasturtii* Kaltenbach, 1843

Buckthorn-potato aphid is the common name of *A. nasturtii* (Figure 2d). Their imagoes are light green-yellowish. The diagnostic apterae characters are cauda pale sometimes dusky but then clearly paler than siphunculi, siphunculi usually rather pale, darker at apex, and hairs on hind femur mainly longer, same of or longer than diameter of femur at its base (Blackman and Eastop 2000; 2006). Primary host of *A. nasturtii* is buckthorn, *Rhamnus cathartica* and *R. alnifolia* (Rhamnaceae). Secondary host plants have been reported in several families including Solanaceae, Cruciferae, and Polygonaceae (Blackman and Eastop 2000). This aphid is an efficient vector for the non-persistent potato A *Potyvirus*, potato Y *Potyvirus*, and aucuba mosaic *Potexvirus*, but a poor vector of potato leafroll *Luteovirus* (Dietzgen et al. 2009). This aphid is found throughout Europe, Middle East, Northern India, Pakistan and Japan, and has been introduced into North America, Chile, Ethiopia, Kenya and South Africa. In Indonesia, aphids were found on chayote, *Sechium edule* (Cucurbitaceae) in Karawang district 12.vi.2014; pumpkin, *Cucurbita pepo* (Cucurbitaceae) in Garut district 28.viii.2013; cucumber (*Cucumis sativus*) in Bogor district 25.vii.2013; chenille plant, *Acalypha hispida* (Euphorbiaceae) in Karawang district 12.vi.2014; and on avocado, *Persea americana* (Lauraceae) in Karawang district 12.vi.2014.

#### *Aphis solanella* Theobald, 1914 (Figure 2e)

Aptera is dull black, sometimes with white wax markings. On a wide range of herbaceous plants, including many colonized by its close relative *A. fabae*. The diagnostic apterae characters are body length 1.2-2.6 mm, siphunculi of slightly longer, shorter cauda, and shorter lateral abdominal hairs than *A. fabae* (Blackman and Eastop 2006). *Aphis solanella* is heteroecious holocyclic with a sexual phase on *Euonymus europaeus* (Celastraceae) as the primary host in Europe, and is anholocyclic on secondary hosts in other parts of the world (Africa, the Middle East, India, Pakistan, and South America) (Blackman and Eastop 2000). In West Java, this aphid was found on the orchid *Epidendrum ibaguense* (Orchidaceae) in Cianjur 30.iii.2013 and Cibodas district 4.vii.2013; and on common bean, *Phaseolus vulgaris* (Fabaceae) in Garut 4.ix.2014.

### Nine species of Macrosiphini

Distinguishing characters of the Macrosiphini include: (i) lateral abdominal tubercles usually absent from segments I and VII, (ii) spiracles on abdominal segments I and II usually placed closed to each other, with their pigmented areas sometimes touching, (iii) apterae frequently having rhinaria on the third antennal segment, (iv) antennal tubercles often well developed, (v) alatae often having a solid black dorsal abdominal patch (Noordam 2004).

*Acyrtosiphon pisum* (Harris, 1776)

Pea aphid is the common name of *A. pisum* (Figure 2f). Apterous adult pea aphids are rather large, green, or pink aphids with slender appendages forming colonies on the young growth and developing pods of some herbaceous and some shrubby Leguminosae. The diagnostic apterae characters are head smooth, antennal tubercles divergent in dorsal view, siphunculi mainly pale or only distally dark without any subapical polygonal reticulation (Blackman and Eastop 2000). The pea aphid is a vector for more than 30 virus disease, including non-persistent viruses of beans, peas, beet, clover, cucurbits, and Cruciferae. They are transmitters of the persistent forms of the viruses, pea enation mosaic *Enamovirus* and bean leaf roll *Luteovirus* (Blackman and Eastop 2000; 2006). In the wider world, populations of *A. pisum* are mostly recorded on Leguminosae tribes Genisteae, Trifoleae, Fabae, Hedysareae, Loteae, Galegeae, and Phaseoleae. These aphids originated from the Palearctic realm, but are now almost world-wide. In West Java province, pea aphids have been recorded on soybean, *Glycine max* (Fabaceae), in Garut district 28.viii.2013.

*Lipaphis pseudobrassicae* (Davis, 1914)

*Lipaphis pseudobrassicae* (turnip aphid or mustard aphid) (Figure 2g) apterae are small to medium-sized, yellowish green, gray green, or olive-green, with a white wax bloom. Alatae have a dusky green abdomen with conspicuous dark lateral sclerites, and dusky wing veins. Sometimes, *L. pseudobrassicae* occur in large numbers on the undersides of leaves which may curl and turn yellow, or in the inflorescence of host plants. The diagnostic apterae characters are antennal segment III 1.2-1.7 times longer than siphunculus, Siphunculi dusky and slightly swollen. Abdominal segments 1 and 7 without lateral tubercles (Blackman and Eastop 2000; 2006). This aphid can be a vector of about ten non-persistent plant viruses, including turnip mosaic *Potyvirus*, cauliflower mosaic *Caulimovirus* and radish mosaic. The aphid faound in Japan, India, China, New Zealand, and world-wide (Blackman and Eastop 2000). This aphid is found on many genera and species of Cruciferae. In West Java, aphids of this species were found on radish, *Raphanus sativus* (Brassicaceae), in Megamendung and Cisarua 14.v.3014.

*Macrosiphoniella sanborni* (Gillete, 1908)

Chrysanthemum aphid is the common name of *M. sanborni* (Figure 2h). Apteratae are shiny, dark red-brown, broadly spindle shaped, with back, relatively short and thick siphunculi, shorter than the back cauda (Ortego et al.

2006). Alatae are similarly pigmented. The diagnostic apterae characters are body hairs much less conspicuous with pointed apices, siphunculi less than 1.5 times longer than cauda with polygonal reticulation extending over distal 0.4-0.7 of length, wholly dark and little shorter than cauda, and antennal segment III proximal half of femur and middle section of tibia pale (Blackman and Eastop 2000; 2006). The aphids are able to transmit chrysanthemum B *Carlavirus*. Chrysanthemum aphids originate from Eastern Asian, but are now distributed worldwide. Aphid populations were found in Cipanas, 3.ix.2014, usually on the undersides of cultivated chrysanthemum leaves.

*Macrosiphum euphorbiae* (Thomas, 1878)

Potato aphid is the common name of *M. euphorbiae* (Figure 2i). Wingless adults are medium-sized to rather large, spindle shaped or pear shaped. The diagnostic apterae characters are eyes distinctly reddish, legs, siphunculi and cauda are mainly the same color as the body but siphunculi are often darker towards apices and have polygonal reticulation, antennae are usually only dark apically, but sometimes almost entirely dark (Blackman and Eastop 2000; 2006). The potato aphid was originally a North American species, but is now virtually cosmopolitan. In West Java, the aphids were recorded on soybean (*Glycine max*) in Garut district 28.viii.2013; on potato (*Solanum tuberosum*) in Garut district 28.viii.2013 and Pangalengan district 12.vii.2014; and on white eggplant (*Solanum melongena*) in Cianjur district 7.xii.2013.

*Macrosiphum impatientis* (Williams, 1911) (Figure 2j)

Apterae are shiny green to dark green with black siphunculi. Body length 1.6-3.8 mm. Siphunculi with a distinct sub-apical zone of polygonal reticulation, wholly darker than body color. Tibia are usually pale in the middle. Antennal segment III are pale except for the rhinariated part and extreme tip (Blackman and Eastop 2000; 2006). They are found on Rosaceae, especially on wild species almost everywhere in the world, except South-East Asia. *Macrosiphum impatientis* originated in North-Eastern and Mid-Western USA on *Rosa multiflora* and *R. carolina* (Rosaceae); alternative hosts are other *Rosa* spp. and also *Impatiens* spp. (Balsaminaceae). Populations of aphids were found on the underside of younger leaves of *Rosa* spp. in Lembang 11.vii.2014.

*Metopolophium dirhodum* (Walker, 1849)

*Metopolophium dirhodum* (Figure 2k) (common name is rose or grain aphid) is a pest on cultivated and wild *Rosa* spp.. Secondary hosts are some species of grasses and cereals (*Aira*, *Agrostis*, *Avena*, *Bromus*, *Dactylis*, *Festuca*, *Glyceria*, *Hordeum*, *Lolium*, *Poa*, *Triticum*, *Zea*) (Poaceae). Apteratae are elongate spindle-shape, green or yellowish green, with a distinct brighter green longitudinal mid-dorsal stripe. Antennae are mainly pale except for the apices of segments III-V, and parts of segment VI which are dusky to black. Legs, siphunculi and cauda are pale. Alatae have a green abdomen without dorsal abdominal markings (Blackman and Eastop 2000; 2006). This aphid can be a vector of barley yellow dwarf *Luteovirus*. The aphid

originated in the western Palaearctic region, but is now widely distributed except in the tropics (Middle East, Central Asia, Africa, North and South America, Japan, Australia, and New Zealand) (CABI 2017). In West Java,

the aphids found on maize (*Zea mays*) in Megamendung, 24.viii.2013; paddy (*Oryza sativa*) in Kuningan, 25.vi.2014; *Cynodon dactylon* in Subang, 13.vi.2014.



**Figure 2.** Photographs of aphid species recorded in West Java. A. *Aphis fabae* Scopoli, B. *A. frangulae* Kaltenbach, C. *A. kurosawai* Takahashi, D. *A. nasturtii* Kaltenbach, E. *A. solanella* Theobald, F. *A. pisum* (Harris), G. *Lipaphis pseudobrassicae* (Davis), H. *Macrosiphoniella sanborni* (Gillette), I. *Macrosiphum euphorbiae* (Thomas), J. *Macrosiphum impatientis* (Williams), K. *Metopolophium dirhodum* (Walker), L. *Myzaphis turanica* Nevsky, M. *Myzus ascalonicus* Doncaster, N. *Sitobion leelamaniae* (David)

*Myzaphis turanica* Nevsky, 1929

*Myzaphis turanica* (Figure 2l) is small aphid found on wild and cultivated *Rosa* spp.. The aphid closely resembles *M. rosarum* but with a rounded median frontal projection bearing longer hairs. Alatae have a paler and more irregularly shaped dorsal abdominal patch than *M. rosarum*. The diagnostic apterae characters are antennal and legs pale brown, siphunculi dark and tapering, and longer than cauda (Blackman and Eastop 2000; 2006). Populations of this aphid have been recorded from Central Asia, Middle East, India, Mongolia, Sweden, and Brazil. In Indonesia, the aphid found in Cibodas, 4.vii.2013 and Garut, 28.viii.2013 on *Rosa* spp..

*Myzus ascalonicus* Doncaster, 1946

Shallot aphid is the common name of *M. ascalonicus* (Figure 2m). Apteræ are shiny pale-greenish brown, straw-colored or dirty yellow, with dorsum strongly convex in comparison with related species, and with the inner faces of the antennal tubercles almost parallel, rather than convergent as in typical *Myzus*. Appendages are mainly pale, except that the apex of antennal segment V, the whole of VI, and the apices of the tibiae and the tarsi are all quite black. Alatae have a black dorsal abdominal patch, dark siphunculi and cauda and a remarkably bimodal variation in the number of secondary sensoria on the antenna – either a few near the base of segment III or large numbers covering III, IV and V (Blackman and Eastop 2000; 2006). The aphid is a vector of about 20 plant viruses in Europe, India, Pakistan, Japan, Australia, New Zealand, Antipodes, Auckland Isles, North and South America (CABI 2017). This aphid is polyphagous in over 20 plant families, particularly Amaryllidaceae (*Allium ascalonicum*, *A. cepa*), Caryophyllaceae (*Cerastium*, *Stellaria*), Asteraceae (*Lactuca*, *Chrysanthemum*, *Taraxacum*, *Crepis*), Cruciferae (*Brassica* sp.), Liliaceae (*Tulipa* sp.), and Rosaceae (*Fragaria*, *Dasiphora*). Samples examined were from Cisarua, on *Brassica oleraceae* 14.v.2014; from Kuningan on *Brassica oleraceae* 25.vi.2014; and from Lembang on *Capsicum annum* 10.vii.2014.

*Sitobion leelamaniae* (David, 1958)

*Sitobion leelamaniae* (Figure 2n) is synonym of *S. howlande* and *S. chanikiwiti* (Eastop and Blackman 2005). The aphids are rather small (1.7-2.2 mm), bright-yellow, with dark apices to the antennal segments and siphunculi which are basally pale and apically dark or dusky. The diagnostic apterae characters are body hairs are short, the legs and cauda are pale, alatae have a pale green abdomen and dark brown antennae and siphunculi (Blackman and Eastop 2000; 2006). The aphid lives on the undersides of the leaves and can severely damage seedling plants. Aphid populations have been recorded on *Zea mays* and *Sorghum arundinaceum* (Poaceae) in Africa (Cameroun, Kenya, Malawi, Nigeria, South Africa, and Zimbabwe) (Blackman

and Eastop 2000). In West Java, aphids were found in Lembang, on *Z. mays* 10.vii.2014.

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