

## Aphids (Hemiptera: Aphididae) in the agricultural habitat in Indonesia

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### Abstract

A considerable number of aphid species has been reported from the agricultural habitat in Indonesia by many authors, including those that regarded as important pests or even vectoring viruses. However, a complete record of all reported species is yet to be found. We conducted a literature study to determine aphid species that are associated with and become pests in the agricultural habitat in Indonesia. A total of 112 species are compiled, 24 of them are found on food crops, 50 on horticultural crops, 18 on estate crops, and 62 on weeds. Twenty-three species are reported as major pests of agricultural crops while 21 of them vector viruses. Two other species, *Chaetosiphon fragaefolii* Cockerell and *Macrosiphum euphorbiae* (Thomas) are currently listed as the quarantine pests in Indonesia. These results suggest that holistic and detail studies on Indonesian aphids are necessary to provide the information to be considered in their management.

**Keywords:** Plant disease, Plant viruses, Sucking insect, Virus vector

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## Introduction

A total of 5,000 species and more than 500 genera of aphids have been identified worldwide (Favret and Eades, 2017). There are 386 species of aphid known from Sesilia region (Maslowksi et al., 2017), and 764 species reported from Poland (Wojciechowski et al., 2015). About 450 species are reported as plant pests on agricultural crops, 100 of them are important pests on various crops (Blackman and Eastop 2007). For example, a total of five (*Aphis spiraecola*, *A. gossypii*, *A. aurantii*, *A. craccivora* and *Myzus persicae*) of the nine Aphid species that have been recorded on citrus in Greece (Kalaitzaki et al., 2019). Indonesia however, most of the aphids found are described as the pests of food crops, horticultural, and estate crops (Kalshoven, 1981). Besides their significance as sucking insects

that infest leaves, fruits, twigs, stems and roots, aphids play an important role as viruses' transmitter, causing up to 90% production loss that even lead to the death of the crops (Sutarya et al., 2009).

There are limited publications on Indonesian aphids, among them are those authored by van der Goot (1917) and Noordam and Hille (1985). In 1986, Noordam reported a new species of *Sinomegoura* on coffee in Java. Noordam (1991) reported 56 species from 18 genera of Hormaphidinae in Java. The identification of Greenideinae was also conducted by Noordam (1994) which obtained 10 genera and 33 species. Furthermore, using his previous specimens, Noordam (2004) discovered 92 species of Subfamily Aphidinae, Lachninae, Neophyllaphidinae, and Pemphiginae. In 1997, Irsan reported 22 species on Solanaceae in West Java, while recently, Maharani



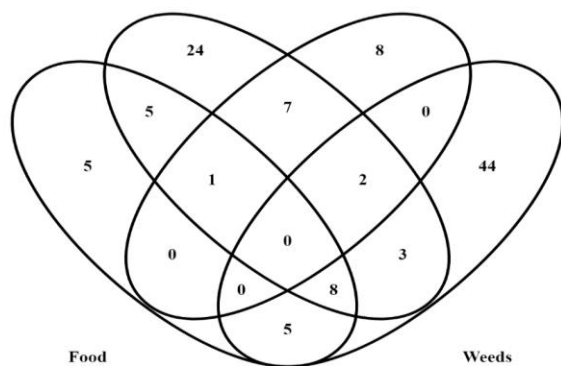
(2018) found 25 species that have not been reported from Indonesia.

Considering the impacts of aphids that might resulted in a consider amount of loss due to direct feeding and the viruses transmitted to their host plants, combined with the limited number of available references, we realized the importance of a comprehensive record of aphids that ever been found in Indonesia. Therefore, we conducted this study to determine the species of aphid found in Indonesian agricultural habitat, particularly those that function as major pests of crops. This is the first compilation on the whole reports of aphids ever been found in Indonesia that might shed some lights in planning the mitigation of the resulted loss.

All published papers and books on Indonesian aphids, i.e. van der Goot (1917), Noordam and Hille (1985), Noordam (1986, 1991, 1994 and 2004), Irsan (1997), Nasruddin (2013), Maharani (2018), and Maharani et al. (2018), were reviewed. Every reported aphid species was further reviewed regarding their roles as pests and their host plants. They were grouped according to their host plant categories. i.e. food crops, estate crops, horticultural crops, and weeds. Species that were considered as major pests in Indonesia based on aphid status and host plant economic value were tabulated and their significance was further discussed.

**Aphid in agricultural crops**

There are 112 aphid species found in the agricultural crops and weeds in Indonesia (Table 1). Most of them, viz. 62 species are found on weeds, while the rest 50, 24, and 18 species are found on horticultural, food crops, and estate crops consecutively. Five species are found exclusively on food crops, 24 species on horticultural crops, 8 species on estate crops, and 44 species on weeds (Figure 1).



**Fig-1: A total of 112 aphids species reported from various plant groups.**

The number of aphid species found on the cultivated crops all together (food crops, horticultural, and estate crops) constituted around 50% of the total recorded species, while the other 50% species are found to inhibit weeds. However, due to the value of the cultivated crops, this amount of species can create more damage in terms of economic loss. For example, in this study we recorded *Pentalonia nigronervosa* Coquerel, that has been reported to cause Banana Bunchy Top Disease (BBTD), loss due to its infestation on banana (*Musa* spp.) (Ssebuliba et al. 2005). This species has spread in several regions in Indonesia e.g South Sumatra (Suparman et al. 2017), and Java. According to Blackman and Eastop (2007), the number of aphids found as pest on agricultural crops was around 450 species, and a hundred of them were identified as economical pests. So, here we found 23 species that belong to this category (Table 2).

Aphid species that predominantly found as pests on agricultural crops habitat belongs to Aphidinae subfamily (Table 1). This subfamily is not only known to have the most diverse species, but also to contain the most important pests on herbaceous plants (Blackman and Eastop 2006).

The study conducted is basically based on host plants, that the recorded aphids are classified into those found on weeds, food crops, horticultural crops and estate crops (Figure 1, Table 1). Gibson (1971b) divided aphids’ distribution in the field into three groups; plant parts, host plants, and location. The distribution based on plant parts happens in an individual host, that is when the part of one plant like the shoots, flowers, or immature fruits are infested. This is due to certain interest and appropriateness of aphids to plant tissue. The distribution based on host plant is where a species has the tendency to feed on certain host plants and no other plants, which in turn created the monophagous, oligophage, or polyphagous aphids (Blackman and Eastop 2006). Aphids’ distribution based on location is related geography and topography and closely determined to their ability to adapt to host plants or the environment (Gibson 1971a).

Generally, aphids have a specific host, therefore the host they are associated with sometimes can be a good indication of the infesting species. However, some aphid species are generalist feeders (Blackman and Eastop 2006). Most species in our study that are considered as the important pests as well as the viruses vectors have a broad host range (Table 2). One species, viz. *A. nasturtii* Kaltenschach which is not belong to this group, is commonly found on three plant categories

(food, horticultural, and estate crops). However, none of the recorded species in this study is found in all four plant categories (food, horticultural, estate, and weeds).

### Aphids as virus vector

A total of 23 aphids species attacking the agricultural crops also spread the viruses (Table 2). The relationship between virus and its aphid vector is specific, that certain viruses can only be transmitted by certain aphid species (Hoggan, 1933). A polyphagous aphid, such as *A. gossypii* (Table 2) can act as the vector of CMV, WMV, and YMVZ on Cucurbitaceae and Solanaceae (Kishaba et al., 1992). Chatzivassiliou et al. (2016) showed that *A. spiraecola* can transmit Moroccan Watermelon Mosaic Virus (MWMV) on zucchini. This species is also known as the vector of Alfalfa Mosaic Virus, Citrus Psorosis B, Citrus Tristeza Virus, Cowpea Aphid-Borne Mosaic Virus, Cucumber Mosaic Virus, Maize Dwarf Mosaic Virus, Papaya Ringspot Virus, Peanut Virus Stunts, Plum Pox Virus, Potato Virus Y, and Yellow Mosaic Virus Zucchini (PHA & NGIA, 2011; Chatzivassiliou, 2016). Other species that also vector plant viruses are *H. setariae* (Sugarcane Mosaic Virus); *R. padi* [vector of Barley Yellow Dwarf Virus (BYDV), Cereal Yellow Rwarf Virus (RPV), Filaree Red Leaf Virus (FRLV), Leaf Yellow on Oat, and Onion Yellow Dwarf Virus]; *S. graminum* (vector of Barley Yellow Dwarf Virus, Sugarcane Mosaic Virus, Maize Dwarf Mosaic Virus and Millet Red Leaf Virus), and *A. solani* which infects more than 40 host species with relatively low damage (Gildow et al., 2000).

Plant families mostly infested by the important aphid pests are from the Poaceae (the grasses) which constitute 39% of all of the hosts (Table 2). Other plant

families recorded as the hosts are the Rosaceae, Fabaceae, and Araceae each of them by 2 aphid species, and Brassicaceae, Musaceae, and Zingiberaceae (Table 2). Aphids' association with the host plant can be seen through the formation of the colony (Dixon 1987), where large colonies and solid populations are formed if they are on actual or primary host plant (Gibson 1971a), while their existence is mainly influenced by plant morphology and its chemical compounds (Pettersson et al. 2007).

Two aphid species, *C. fragaefolii* and *M. euphorbiae* (Table 2) are currently listed as the quarantine pests in Indonesia based on the Decree of the Indonesian Ministry of Agriculture No. 31, 2018 (Kementan, 2018). *C. fragaefolii* is listed in the A1 quarantine pest category, meaning this species which is distributed in America, Europe, Asia, United Kingdom, Australia and New Zealand has yet to be found in Indonesia. *M. euphorbiae* however, is listed in the A2 quarantine pest category and distributed restrictedly in West Java (Kementan, 2018). There is a contradiction on the status of *C. fragaefolii* between the record of Noordam (2004) and the report of the Quarantine institution. This leads to one consequence that is to carefully reinvestigate and re-identify the species infesting strawberries and roses in Indonesia. The monitoring of the species and the number of aphid populations is required to avoid the entry foreign species and to prevent internal the outbreak. Similar task can be conducted to prevent the spreading of *M. euphorbiae* outside West Java. However, both tasks will require a serious commitment from related stake holders since almost all of the data that we compiled in this study belong to the aphids found in Java, while very few reports have been made for those of the other islands in Indonesia.

**Table-1: Aphid species on agricultural habitat in Indonesia**

Aphid species	Subfamily	Host plants	Distribution
<i>Acyrthosiphon malvae</i> (Harris)	Aphidinae	Araceae	West Java
<i>Acyrthosiphon pisum</i> (Harris)	Aphidinae	Leguminoceae	West Java
<i>Anoecia fulviabdominalis</i>	Anoeciinae	Poaceae	West Java
<i>Aphis (Toxoptera) citricidus</i> (Kirkaldy)	Aphidinae	Polyphagous	Cosmopolite
<i>Aphis craccivora</i> Koch	Aphidinae	Polyphagous	Cosmopolite
<i>Aphis eugeniae</i> van der Goot	Aphidinae	Euphorbiaceae, Phyllanthaceae	West Java, Central Java
<i>Aphis fabae</i> Scopoli	Aphidinae	Alliaceae, Cucurbitaceae, Leguminoceae, Orchidaceae, Poaceae, Rutaceae, Solanaceae	West Java
<i>Aphis frangulae</i> Kaltenbach	Aphidinae	Solanaceae	West Java
<i>Aphis glycines</i> Matsumura	Aphidinae	Leguminoceae	West Java, Central Java



<i>Aphis gossypii</i> Glover	Aphidinae	Polyphagous	Cosmopolite
<i>Aphis maidiradicis</i>	Aphidinae	Poaceae	West Java
<i>Aphis nasturtii</i> Kaltenbach	Aphidinae	Leguminoceae, Cucurbitaceae, Solanaceae	West Java
<i>Aphis nerii</i> Boyer de Fonscolombe	Aphidinae	Asteraceae, Apocynaceae, Apocynaceae	Java
<i>Aphis punicae</i> Passerini	Aphidinae	Lythraceae	West Java
<i>Aphis solanella</i> Theobald	Aphidinae	Alliaceae	West Java
<i>Aphis spiraecola</i> Patch	Aphidinae	Polyphagous	West Java, Central Java
<i>Astegopteryx muiri</i> (van der Goot)	Hormaphidinae	Zingiberaceae, Poaceae	Java
<i>Astegopteryx nipae</i> (van der Goot)	Hormaphidinae	Calameae, Arecaceae	Java
<i>Astegopteryx rappardi</i> Hille Ris Lambers	Hormaphidinae	Arecaceae	Java
<i>Astegopteryx rhapsidis</i> (van der Goot)	Hormaphidinae	Arecaceae	Java
<i>Astegopteryx unimaculata</i> Noordam	Hormaphidinae	Poaceae	Java
<i>Aulacorthum solani</i> (Kaltenbach)	Aphidinae	Asteraceae, Brassicaceae, Cannaceae, Convolvulaceae, Malvaceae	West Java
<i>Brachycaudus helichrysi</i> (Kaltenbach)	Aphidinae	Menispermaceae	West Java
<i>Brachysiphoniella montana</i> (van der Goot)	Aphidinae	Poaceae	Java
<i>Capitophorus hippophaes</i> (Walker)	Aphidinae	Polygonaceae	Java
<i>Carolinaia javanica</i> Noordam	Aphidinae	Cyperaceae	West Java
<i>Carolinaia scirpi</i> (van der Goot)	Aphidinae	Cyperaceae	West Java
<i>Cavariella araliae</i> Takahashi	Aphidinae	Araliaceae	West Java
<i>Cerataphis brasiliensis</i>	Hormaphidinae	Arecaceae	Java
<i>Cerataphis freycinetiae</i> van der Goot	Hormaphidinae	Pandanaceae	West Java
<i>Ceratoglyphina bambusae</i> van der Goot	Hormaphidinae	Poaceae	Java
<i>Cervaphis schouteniae</i> van der Goot	Greenideinae	Malvaceae	Java
<i>Chaetosiphon fragaefolii</i> (Cockerell)	Aphidinae	Rosaceae	Central Java
<i>Chaetosiphon tetrarhodum</i> (Walker)	Aphidinae	Rosaceae	West Java
<i>Euthoracaphis heterotricha</i> Ghosh & Raychaudhuri	Hormaphidinae	Lauraceae	Java
<i>Geoica lucifuga</i> (Zehntner)	Eriosomatinae	Poaceae	Java
<i>Greenidea anonae</i> (Pergande)	Greenideinae	Annonaceae	Java
<i>Greenidea psidii</i> van der Goot	Greenideinae	Lythraceae, Myrtaceae, Myrtaceae	Java
<i>Greenideoida elongata</i>	Greenideinae	Euphorbiaceae	West Java
<i>Hyadaphis foeniculi</i> (Passerini)	Aphidinae	Apiaceae	West Java
<i>Hyperomyzus carduellinus</i>	Aphidinae	Asteraceae	Java
<i>Hysteroneura setariae</i> (Thomas)	Aphidinae	Poaceae	West Java
<i>Indomegoura indica</i> (van der Goot)	Aphidinae	Xanthorrhoeaceae	West Java
<i>Ipuka dispersa</i> (van der Goot)	Aphidinae	Asteraceae	Java
<i>Lachnus tropicalis</i> (van der Goot)	Aphidinae	Asteraceae	Java
<i>Liosomaphis himalayensis</i> Basu	Aphidinae	Berberidaceae	Central Java
<i>Lipaphis pseudobrassicae</i> (Davis)	Aphidinae	Cruciferae	West Java
<i>Macromyzella polypodicola</i> (Takahashi)	Aphidinae	Athyriaceae	West Java, Central Java
<i>Macrosiphoniella pseudoartemisiae</i> Shinji	Aphidinae	Asteraceae	Java
<i>Macrosiphoniella sanborni</i> (Gillette)	Aphidinae	Asteraceae	West Java, Central Java





<i>Macrosiphum euphorbiae</i> (Thomas)	Aphidinae	Solanaceae	West Java
<i>Macrosiphum impatientis</i> (Williams)	Aphidinae	Rosaceae	West Java
<i>Macrosiphum pallidum</i> (Oestlund)	Aphidinae	Rosaceae	West Java
<i>Melanaphis sacchari</i> (Zehntner)	Aphidinae	Poaceae	West Java, East Java
<i>Melanaphis sorghi</i>	Aphidinae	Leguminoceae	West Java
<i>Mesothoracaphis rappardi</i> (Hille Ris Lambers & Takahashi)	Hormaphidinae	Malvaceae	Java
<i>Metopolophium dirhodum</i> (Walker)	Aphidinae	Poaceae	West Java
<i>Micromyzella filicis</i> (van der Goot)	Aphidinae	Pteridaceae, Thelypteridaceae, Lindsaeaceae	Java
<i>Micromyzus katoi</i> (Takahashi)	Aphidinae	Polypodiaceae	Java
<i>Micromyzus niger</i> van der Goot	Aphidinae	Pteridaceae	West Java, Bali
<i>Micromyzus vandergooti</i> Noordam	Aphidinae	Polypodiaceae	Java
<i>Mollitrichosiphum tenuicorpus</i> (Okajima)	Greenideinae	Fagaceae	Java
<i>Myzaphis bucktoni</i> Jacob	Aphidinae	Rosaceae	West Java
<i>Myzaphis turanica</i> Nevsky	Aphidinae	Rosaceae	West Java
<i>Myzus ascalonicus</i> Doncaster	Aphidinae	Polyphagous	West Java
<i>Myzus antirrhinii</i> (Macchiati)	Aphidinae	Myrtaceae	West Java
<i>Myzus debregeasiae</i> Noordam	Aphidinae	Urticaceae	West Java
<i>Myzus duriatae</i> Noordam	Aphidinae	Gesneriaceae	West Java
<i>Myzus hemerocallis</i> Takahashi	Aphidinae	Liliaceae	West Java
<i>Myzus ornatus</i> Laing	Aphidinae	Polyphagous	Cosmopolite
<i>Myzus persicae</i> (Sulzer)	Aphidinae	Polyphagous	Cosmopolite
<i>Neomyzus circumflexus</i> (Buckton)	Aphidinae	Araceae, Amaranthaceae, Solanaceae	Java
<i>Neotoxoptera formosana</i> (Takahashi)	Aphidinae	Liliaceae	West Java
<i>Neotoxoptera oliveri</i> (Essig)	Aphidinae	Brassicaceae, Caryophyllaceae	Central Java
<i>Oedisiphum compositarum</i> van der Goot	Aphidinae	Asteraceae	Central Java
<i>Ovatus minutus</i> (van der Goot)	Aphidinae	Lamiaceae	East Java
<i>Pentalonia caladii</i> van der Goot	Aphidinae	Araceae, Zingiberaceae	West Java
<i>Pentalonia nigronervosa</i> Coquerel	Aphidinae	Araceae, Musaceae, Zingiberaceae	Java
<i>Pentatrichosiphum luteum</i>	Greenideinae	Lauraceae	West Java
<i>Pseudaphis sijui</i> (Eastop)	Aphidinae	Poaceae	West Java
<i>Pseudoregma sundanica</i> (van der Goot)	Hormaphidinae	Zingiberaceae, Costaceae, Malvaceae	Java
<i>Rhodobium porosum</i> (Sanderson)	Aphidinae	Rosaceae	Java
<i>Rhopalosiphum maidis</i> (Fitch)	Aphidinae	Poaceae	Java
<i>Rhopalosiphum padi</i> (Linnaeus)	Aphidinae	Poaceae	Java
<i>Rhopalosiphum rufiabdominale</i> (Sasaki)	Aphidinae	Poaceae, Araceae	Java
<i>Schizaphis graminum</i> (Rondani)	Aphidinae	Poaceae	West Java
<i>Schizaphis hypersiphonata</i> Basu	Aphidinae	Poaceae	Java
<i>Schizaphis minuta</i> (van der Goot)	Aphidinae	Poaceae	Java
<i>Schizaphis rotundiventris</i>	Aphidinae	Poaceae	Java
<i>Schoutedenia ralumensis</i> Rübssaamen	Aphidinae	Poaceae	Java
<i>Semiaphis dauci</i> (Fabricius)	Aphidinae	Apiceae	West Java
<i>Shinjia orientalis</i>	Aphidinae	Dennstaedtiaceae	Central Java
<i>Sinomegoura citricola</i> (van der Goot)	Aphidinae	Polyphagous	West Java
<i>Sipha flava</i> (Forbes)	Aphidinae	Asteraceae, Poaceae	West Java
<i>Sitobion avenae</i> (Fabricius)	Aphidinae	Poaceae	West Java



<i>Sitobion breymiae</i> Noordam	Aphidinae	Dennstaedtiaceae	Central Java
<i>Sitobion graminis</i> Takahashi	Aphidinae	Poaceae	West Java
<i>Sitobion javanicum</i> Noordam	Aphidinae	Poaceae	East Java
<i>Sitobion leelamaniae</i> David	Aphidinae	Poaceae	West Java
<i>Sitobion miscanthi</i> (Takahashi)	Aphidinae	Polyphagous	Java
<i>Sitobion orchidacearum</i>	Aphidinae	Orchidaceae	Java
<i>Sitobion pauliani</i> Remaudière	Aphidinae	Poaceae	West Java
<i>Tetraneura nigriabdominalis</i>	Aphidinae	Poaceae	West Java, Central Java
<i>Toxoptera auranti</i> Boyer de Fonscolombe	Aphidinae	Polyphagous	Java
<i>Toxoptera odinae</i> (van der Goot)	Aphidinae	Polyphagous	Java
<i>Trichosiphonaphis polygona</i> (van der Goot)	Aphidinae	Polygonaceae	Central Java
<i>Tuberaphis cerina</i> (Noordam)	Hormaphidinae	Styracaceae	Java
<i>Tuberolachnus salignus</i> (Gmelin)	Aphidinae	Salicaceae	Central Java
<i>Tuberolachnus scleratus</i> Hille Ris Lambers & Basu	Aphidinae	Rosaceae	West Java
<i>Uroleucon orientale</i> (van der Goot)	Aphidinae	Asteraceae	Central Java
<i>Uroleucon picridis</i> (Fabricius)	Aphidinae	Asteraceae	Java
<i>Uroleucon vernoniae</i>	Aphidinae	Asteraceae	Java

**Table-2: Host plants, distribution, and pest status of the important aphid pests on the agricultural crops in Indonesia.**

Species	Host plant	Distribution	Reference	Pest status
<i>Acrythosiphon pisum</i> (Harris)	Fabaceae	West Java	Maharani et al., (2018), Maharani (2018)	Vector of more than 30 plant viruses (Blackman and Eastop, 1997)
<i>Aphis craccivora</i> Koch	Polyphagous	Cosmopolite	Kalshoven and Vech (1950), Irsan (1997), Noordam (2004), Maharani (2018)	Vector of more than 30 plant viruses (Blackman and Eastop, 1997). Vector of <i>Bean Common Mosaic Virus strain Blackeye</i> (BCMV-BIC) and <i>Cucumber Mosaic Virus</i> (CMV) (Damayanti et al., 2009)
<i>Aphis fabae</i> Scopoli	Polyphagous	Java	Maharani et al., (2018), Maharani (2018)	Virus vector on sugarbeet (Blackman and Eastop, 1997)
<i>Aphis glycines</i> Matsumura	Soybean ( <i>Glycine max</i> )		Noordam (2004), Maharani (2018)	Vector of <i>Soybean mosaic virus</i> and <i>Alfalfa mosaic virus</i> (Tilmon et al., 2011)
<i>Aphis gossypii</i> Glover	Polyphagous	Cosmopolite	van der Goot (1917), Kalshoven and Vech (1950), Irsan (1997), Noordam (2004), Maharani (2018)	Vector of more than 50 plant viruses (Blackman and Eastop, 1997)
<i>Aphis spiraecola</i> Patch	Polyphagous	Java	Noordam (2004), Maharani (2018)	Vector of <i>Cucumber mosaic virus</i> (CMV), <i>Plum pox virus</i> , an isolate of <i>Alfalfa mosaic virus</i> from <i>Viburnum</i> , <i>Water melon mosaic virus 2</i> , and <i>Zucchini yellow mosaic virus</i> (ZYMV) (Blackman and Eastop, 1997)
<i>Aphis (Toxoptera) citricidus</i> (Kirkaldy)	Polyphagous	Cosmopolite	van der Goot (1917), Kalshoven and Vech (1950), Irsan (1997),	Vector of <i>Citrus tristeza virus</i> (CTV) (Atta et al., 2017)



			Noordam (2004), Maharani (2018)	
<i>Chaetosiphon fragaefolii</i> Cockerell	Stawberry ( <i>Fragaria</i> sp.) and rose ( <i>Rosa</i> sp.)	Central Java	Noordam (2004)	Included in A1 Quarantine plant pest list (Kementan, 2018).
<i>Hysteronura setariae</i> (Thomas)	Poaceae	Java, South Sulawesi	Noordam (2004), Nasruddin (2013)	Vector of <i>Sugarcane yellow leaf virus</i> (ScYLV) (Schenck and Lehrer, 2000)
<i>Lipaphis pseudobrassicae</i> (Davis)	Brassicaceae	West Java	Maharani et al., (2018), Maharani (2018)	Vector of 10 non-persistent plant viruses (Blackman dan Eastop, 2007)
<i>Myzus ascalonicus</i> Doncaster	Polyphagous	West Java	Maharani (2018)	Causing Witches' Broom syndrome on cauliflower, stawberry and tobacco (Kementan, 2015)
<i>Metopolophium dirhodum</i> (Walker)	Rosaceae, Poaceae	West Java	Maharani et al., (2018), Maharani (2018)	Vector of <i>Potato Virus Y</i> (PVY) and <i>Potato Leafroll Virus</i> (PLRV) (Potatoes South Africa, 2016).
<i>Macrosiphum euphorbiae</i> (Thomas)	Polyphagous	West Java	Maharani et al., (2018), Maharani (2018)	Included in A2 quarantine pests list (Kementan, 2018). Vector of 40 non persistent and 5 persistent plant viruses (Blackman dan Eastop, 2007)
<i>Myzus persicae</i> (Sulzer)	Polyphagous	Cosmopolite	van der Goot (1917), Kalshoven and Vech (1950), Irsan (1997), Noordam (2004), Maharani (2018)	Vector of more than 100 plant viruses (Blackman and Eastop, 1997)
<i>Melanaphis sacchari</i> (Zehntner)	Poaceae	Java	van der Goot (1917), Noordam (2004), Maharani (2018)	Vector of <i>Sugarcane yellow leaf virus</i> (ScYLV) (Schenck and Lehrer, 2000)
<i>Neomyzus circumflexus</i> (Buckton)	Polyphagous	Java	Noordam (2004), Maharani (2018)	Vector of <i>Barley yellow dwarf luteovirus</i> (BYDV) (Kementan, 2015)
<i>Pentalonia nigronervosa</i> Coquerel	Musaceae, Zingiberaceae, Araceae	Java	van der Goot (1917), Noordam (2004), Maharani (2018)	Vector of <i>Banana bunchy top virus</i> (BBTV) (Imelda et al., 2000; Suparman et al., 2017)
<i>Rhopalosiphum maidis</i> (Fitch)	Poaceae	Java	Irsan (1997), Noordam (2004), Maharani (2018)	Vector of <i>Sugarcane yellow leaf virus</i> (ScYLV) (Schenck and Lehrer, 2000)
<i>Rhopalosiphum padi</i> (Linnaeus)	Poaceae	Java	Irsan (1997), Noordam (2004), Maharani (2018)	Vector of <i>Plum Pox Virus</i> (PPV) and <i>Tobacco Etch Virus</i> (TEV) (PHA and NGIA 2011)
<i>Rhopalosiphum rufiabdominale</i> (Sasaki)	Poaceae, Araceae	Java	Irsan (1997), Noordam (2004), Maharani (2018)	Vector of <i>Sugarcane yellow leaf virus</i> (ScYLV) (Schenck and Lehrer, 2000)
<i>Schizaphis graminum</i> (Rondani)	Poaceae	West Java	Maharani (2018)	Vector of BYDV (especially strain BYDV-SGV), MRLV, SCMV, and MDMV (Blackman and Eastop, 1997)
<i>Sipha flava</i> (Forbes)	Asteraceae, Poaceae	West Java	Maharani (2018)	Vector of <i>Sugarcane yellow leaf virus</i> (ScYLV) (Schenck and Lehrer, 2000)
<i>Sitobion avenae</i> (Fabricius)	Poaceae	West Java	Maharani (2018)	Vektor of <i>Potato Virus Y</i> (PVY) and <i>Potato Leafroll Virus</i> (PLRV) (Potatoes South Africa, 2016).



## Conclusion

There are 112 aphid species found from agricultural habitat in Indonesia. Twenty-three of aphid species are

## Contribution of Authors

Maharani Y: Conceived idea, conducted study and write up of article

Hidayat P: Helped in study and article write up

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- considered as important plant pests, 21 of them are virus vectors, transmitting plant viruses. Two aphid species found in Java, *C. fragaefolii* and *M. euphorbiae* are listed as the quarantine pests in Indonesia.
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