Host range and population density of the giant whitefly
*Aleurodicus dugesii* Cockerell (Hemiptera: Aleyrodidae) on
horticultural crops in Cipanas-Cianjur, West Java, Indonesia

P Hidayat1*, E Maryana2, Y M Kusumah1 and L Nurulaila1

1 Department of Plant Protection, Faculty of Agriculture, IPB University, Jl. Kamper, Kampus IPB Darmaga, Dramaga, Bogor 16680, West Java, Indonesia
2 Agricultural Quarantine Agency, Ministry of Agriculture, Gedung E Lantai 1,3,5,7 Jl. Harsono RM.3 Ragunan Jakarta Selatan 12550 Indonesia

*Email: phidayat@apps.ipb.ac.id*

**Abstract.** The giant whitefly, *Aleurodicus dugesii* Cockerell (Hemiptera: Aleyrodidae) is a polyphagous insect which has a wide range of host plants. The insect is relatively a new pest to Indonesian agriculture. It was reported in 2008. The whitefly sucks on plant sap, extracting important nutrients that lead to defoliation, stunting and or plant death. Study of the host range and population density of the whitefly was conducted in horticultural crops at 5 villages in the Sub-district of Cipanas (Cianjur), West Java. Observation was done directly on the selected leaf samples. Twelve leaf samples were selected from four quadrants of the sample plants. The number of horticultural crops infested by the giant whitefly was 27 species consisted of 20 plant families. The most dominant host plants of the giant whitefly were families of Fabaceae, Solanaceae, and Euphorbiaceae, respectively. The highest population density of the giant whitefly was recorded on tamarillo (*Solanum betaceum*) as much as 1,986 per leaf. The result of this research revealed that the giant whitefly was a potential important pest which had a wide range of host plants, resulted in severe damages to horticultural crops.

1. Introduction
The giant whitefly, *Aleurodicus dugesii* Cockerell (Hemiptera: Aleyrodidae) is a relatively new pest in Indonesia and was reported for the first time in March 2007 to attack hibiscus in Bogor, West Java [1, 2]. There are about 200 species from 35 plant families that have the potential to be the host of the whitefly [3]. The giant whitefly generally infests ornamental plants in nurseries, landscapes and house yards. The plants that are most attacked include begonias, hibiscus, orchids, bananas, mulberry, aralia, various kinds of vegetables, oranges and avocados [4]. The Adult and nymph of the giant whitefly become a pest on the plants by sucking plant fluids and extracting essential nutrients that cause plants to shed leaves (defoliation), dwarf and death [3]. High population of the giant whitefly will cause the leaves to dry out and fall out. In addition, the giant whitefly secretes honey dew which accumulates in the leaves and can be a medium for the growth of soothy mold. Sooty mold can inhibit the ability of leaves in photosynthesis.

The giant whitefly produces white wax filaments that are smooth and long like a beard so they can cover the entire leaf. The wax can be blown by the wind and cause problems in outdoor furniture, cars, swimming pools etc. and can reduce the value of ornamental plant beauty [5]. As a result of the infestation of the giant whitefly, nursery industry in California suffered an economic loss of around...
3.4 billion US dollars per year [3]. In Indonesia, the information on host range, population density, level of damage and yield loss due to the giant whitefly infestation is very limited. Therefore, it is necessary to conduct research to determine the range of hosts, population density, level of crop damage and yield loss due to the giant whitefly attacks including economic losses for basic information on determining the status of the quarantine pest. This research aimed to know the hosts range and the population density of the giant whitefly in horticultural crops in Cipanas Sub-District (Cianjur).

2. Methods
The field observation was conducted in Cipanas Sub-District, Cianjur. In addition to the field observation, some of works were conducted at the Insect Biosystematics Laboratory, Plant Protection Department, Faculty of Agriculture, IPB University. The study was done in 2012. The giant whitefly survey was conducted in 5 villages, i.e. Cimacan, Ciloto, Sindangjaya, Batulawang and Cipanas. The selection of 5 villages was determined by dividing the subdistrict map diagonally into 5 sample plots of observation. In each sample plot observations were carried out on scattered sample units according to the presence of a host of the giant whitefly. Components observed during the survey include host range and population density of *A. dugesi*.

Population density was determined by counting the number of nymphs, pupae and the adults of the giant whitefly. Observation of nymph, pupae and imago populations on tree-shaped plants was carried out by taking 12 leaves on each plant, the top, middle and bottom, and each part was taken 4 leaves in the direction of the compass. Whereas on vines such as chayote and long beans. Leaf samples were taken as many as 5 leaves diagonally on each propagation. Sampling leaves on plants with special conditions such as the number of leaves attacked a little, the tree has thorns so it is difficult to do climbing so the number of leaf samples observed is adjusted. The leaves to be taken for observation are cut and then put into transparent plastic [6]. In large estates, the determination of sample plants was done diagonally by taking 5 plants, while in the yard or small estate the observation was made directly on the affected plants. Nymphs, pupae and imago populations were counted in the laboratory using hand counters under a stereo microscope or loupe. Identification of the whiteflies referred to Watson (7).

![Figure 1](image1.png)  
**Figure 1.** Symptoms of infestation by the giant whitefly, *A. dugesi* on the plant leaves; (a) white wax filament; (b) soothy mold; (c) dead leaves.

3. Results and discussion
Cipanas Sub-district is located at the altitudes of 800-1,400 m asl. The climatic conditions and the average temperature in Cipanas were strongly influenced by rainfall. According to the Cipanas BPP (Agricultural Extension Agency) report, the average rainfall per year is 2,967.84 mm, with a temperature of 12-30 °C and 71% humidity. The type of rainfall according to Schmidt-Ferguson climate classification is the type B. While the rainfall during the study ranged from 0 - 49.5 mm/day, the average temperature was 22 °C and the average humidity was 84.2% (BMKG). Horticultural crop conditions in Cipanas is quite diverse. Vegetables that dominantly cultivated were onions, carrots and mustard greens, while fruit plants only become yard plants.
The adult giant whitefly collected from Cipanas has the characteristic of black mosaic pattern on its wings. The giant whitefly ‘pupa’ (4th instar nymph) are transparent in color and mostly were found on the below surface of leaves. Observation on the microscope slide preparation shows that the outer shape was rather oval and, in the abdomen, there are 6 pairs of pores with two pairs of reduced pores. Dorsal circles are existing in the sub-median region and most of them are thick and rather large. Pore rows in the sub marginal region are not interrupted by vasiform orifice. Two pairs of posterior pores are reduced and shaped like a bell (bell-shaped). The lingula extends and sometimes overlaps the posterior margin [7].

| No | Species                      | Local name | Family       | Frequency of findings |
|----|------------------------------|------------|--------------|-----------------------|
| 1  | Codiaeum variegatum          | Puring     | Euphorbiaceae| 1                     |
| 2  | Acalypha hispida             | Ekor kucing| Euphorbiaceae| 1                     |
| 3  | Jasminum sambac              | Melati putih| Oleaceae    | 2                     |
| 4  | Nyctanthes arbor-tristis     | Sri gading  | Oleaceae    | 1                     |
| 5  | Solanum aculeatisissimum     | Terong Kori| Solanaceae  | 1                     |
| 6  | Solanum betaceum             | Terong Belanda| Solanaceae| 1                     |
| 7  | Solanum nigrum              | Leunca     | Solanaceae  | 1                     |
| 8  | Eugenia uniflora             | Dewandaru  | Myrtaceae   | 4                     |
| 9  | Psidium guajava              | Jambu Biji | Myrtaceae   | 2                     |
| 10 | Phaseolus lunatus            | Kacang Roway| Fabaceae    | 2                     |
| 11 | Erythrina fusca              | Dadap cangkring| Fabaceae | 2                     |
| 12 | Clytostoma callis'tegiioides | Bunga trompet| Bignoniaceae| 1                     |
| 13 | Begonia maculata             | Bunga begonia| Begoniaceae| 1                     |
| 14 | Hibiscus sabdariffa          | Rosela     | Malvaceae   | 1                     |
| 15 | Canna indica                 | Kana       | Cannaceae   | 4                     |
| 16 | Mikania micrantha           | Mikania    | Compositae  | 1                     |
| 17 | Argyreia nervosa            | Elephant climber| Convolulace| 2                     |
| 18 | Secium edule                 | Labu siam  | Cucurbitaceae| 20                    |
| 19 | Bougainvillea spectabilis    | Bunga Kertas| Nyctaginace| 2                     |
| 20 | Mucuna bennetti              | Bunga tionghoa| Leguminosae| 1                     |
| 21 | Neomarica longifolia        | Apostle    | Iridaceae   | 3                     |
| 22 | Pachystachys lutea           | Bunga lolipop| Acanthaceae| 1                     |
| 23 | Allamanda cathartica        | Bunga alamanda| Apocynaceae| 1                     |
| 24 | Hibiscus rosa-sinensis       | Kembang sepatu | Malvaceae | 10                    |
| 25 | Musa paradisiaca            | Pisang     | Musaceae    | 1                     |
| 26 | Persea americana            | Alpukat    | Lauraceae   | 10                    |
| 27 | Citrus aurantifolia         | Jeruk nipsis| Rutaceae    | 3                     |

The giant whitefly in Cipanas was found in 27 species of 20 families of horticultural plants (Table 1). The plant family that the most affected by the giant whitefly was Solanaceae. It is known that each village in Cipanas has different superior commodities, including Cimacan Village and Ciloto Village which are more dominant in ornamental plant cultivation. Furthermore, in Batulawang Village, tea and scallion plantations are the dominant plants, while in Sindangjaya Village, carrot and leek plantations are the dominant plantations. However, observations in Cipanas Village found 3 conjoined pumpkin
that were intentionally cultivated with the infestation of the giant whitefly very low. This was presumably due to the fairly routine application of pesticides by garden owners. Avocados, hibiscus and chayote are plants that are always infested by the giant whitefly at each observation site. Lasalle stated that A. dugesii is an important pest in the genus Hibiscus [8]. A. dugesii is a polyphagous species originating from Central America and prefers woody dicotyledonous plants including fruit and hibiscus plants [9,10].

The result of this research shows that the giant whitefly A. dugesii has a broad range of host plants. This giant whitefly is polyphagous insect and allow their population to exist throughout the year. Murgianto reported that cananga, canna, mikania, croton, long bean, avocado, guava, lime, banana, hibiscus, cayenne pepper, winged chili, leunca (Solanum nigrum), begonias and cat tails were found attacked by the giant whitefly [11]. The lowland is described as the area at altitudes of 0-500 m asl, the medium at the altitudes of 500-1,000 m asl and the highland at the altitudes of >1,000 m asl [12]. The waxy layer of A. dugesii is thicker and longer than other giant whitefly so that it is able to protect A. dugesii from cold temperature [10]. The giant whitefly A. dugesii in Cipanas were predominantly found in the yards compared to the agricultural lands. This is due to the fact that plants grow in the yards was never been sprayed with pesticides as those in agricultural lands.

The highest number of A. dugesii was found on tamarillo (terong belanda: local name), Solanum betaceum (Solanaceae) (Figure 2). Certain insect such as the giant whitefly has its own orientation in choosing a host and is attracted to a certain colour of the plant leaves, especially plants that have yellow or yellow-green leaf colour (10).

![Figure 2. Population of A. dugesii on some of horticulture plants in Sub-district of Cipanas.](image)

The giant whitefly A. dugesii is economically very important pest. The adults and nymph suck plant fluids and extract important nutrients that cause plants to experience leaf loss (defoliation), dwarf and plant death. In addition, this giant whitefly emits honey dew when attacking plants so that it supports the growth of soothy mold [3]. Plant death will result in the declining of production significantly. dugesii is a relatively new pest that is still limited in distribution, has a broad range of hosts and cause significant damages on the plants. Based on these facts, to prevent more serious economic damage and wider distribution, it is necessary to have control measures. One way of spread this pest between regions is to be carried through the carrier media (plants) which is passed between regions. One of the efforts to prevent the spread of pests is to carry out health checks for host plants of
A. dugesii that can be done by Quarantine officer. It is recommended to the relevant agencies to conduct a survey of A. dugesii to determine the distribution area of A. dugesii.

4. Conclusion

The giant whitefly A. dugesii is considered as a relatively new pest which has a wide range of host plant, especially horticulture plants. Horticultural plants that were attacked by A. dugesii in Cipanas consisted of 27 species of 20 families of plants. It is necessary to develop environmentally friendly control measure of this pest by exploring its natural enemies.

References

[1] Hidayat P, Watson G W 2007 Recognition of giant whitefly, Aleurodicus dugesii Cockerell (Hemiptera: Aleyrodidae), a potential pest newly introduced to Indonesia (PEI-entry Workshop in Cibinong, 2007)
[2] Muniappan R, Shepard B M, Watson G W, Carner G R, Rauf A, Sartiami D, Hidayat P, Afun J V K, Goergen G and Ziaur Rahman A K M 2009 J. Agric. Urban Entomol. Vol. 26 No. 4, 167-174
[3] Bellows T and Hoddle M 2010 Giant Whitefly: Aleurodicus dugesii (California (US): University of California, Riverside) Available at http://ciser.ucr.edu/giant_whitefly.html
[4] Bellows T, Kabashima J N and Robb K L 2002 How to manage pest, pest in gardens and landscapes, giant whitefly (California: University of California Agriculture and Natural Resources) Available at http://www.ipm.ucdavis.edu/PMG/pestnotes/ pn7400.html
[5] Gill R J 1992 Giant whitefly. In Gill RJ, editor California Plant Pest and Disease Report. 11 Eds (California: California Department of Food and Agriculture) pp 78-81
[6] Andadari L 2009 Identifikasi parasitoid dan predator the giant whitefly pada tanaman murbei (Morus sp.) (Bogor: IPB University)
[7] Watson G W 2007 Identification of Whiteflies (Hemiptera: Aleyrodidae) (APECRe-entry Workshop on Whiteflies and Mealybugs in Malaysia, 16th to 26th April 2007)
[8] Lasalle J, Polaszek A, Noyes J S, Zolnerowich G 1997 Systematic Entomology 22 131-150
[9] Dooley J and Evans G 2006 Whiteflies known to occur on bananas (USDA/APHIS/PPQ) Available at http://www.lucidcentral.org/keys/v3/whitefly/PDF_pwPETC/BananaAleyrodid.pdf
[10] Evans G A 2008 The whitefly (Hemiptera: Aleyrodidae) of the world and the host plants and natural enemies (USA: Animal Plant Health Inspection Service [APHIS]) [downloaded 2012 Mei 3] Available at http://www.sel.barc.usda.gov:8080/1WF/World-Whitefly-Catalog.pdf
[11] Murgiarto F 2010 Kisaran inang kutu kebul Aleurodicus destructor, Aleurodicus dispersus, Aleurodicus dugesii (Hemiptera: Aleyrodidae) di Kecamatan Dramaga, Kabupaten Bogor dan daerah lain di sekitarnya (Bogor: IPB University)
[12] Barchia F S 2009 Kesesuaian lahan tanaman kentang merah pada dataran sedang dan tinggi di Kabupaten Kepahiang, Provinsi Bengkulu (Bengkulu: Universitas Bengkulu)