New record of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Coccomorpha: Pseudococcidae) in Indonesia

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ABSTRACT

T~~In this study, t~~he occurrence of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) ~~in Indonesia is~~ was 1st reported in Indonesia. It was found on *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum*

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Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae) at some regencies in Bengkulu Province, Southern Sumatra, Indonesia.

Key words: Biodiversity, host plant, ~~insect pests,~~ mealybugs, Sumatera, Indonesia~~taxonomy~~

INTRODUCTION

Ferrisia Fullaway is one of the genera in Pseudococcidae (Hemiptera: Coccomorpha: Pseudococcidae) which is a group of sap-feeding insects, tapping into the phloem via a stylet or piercing, a straw-like mouthpart (Williams 2004; Gullan & Martin 2009). In nature, t~~T~~his genus ~~in life~~ can easily be recognized by long glassy filaments with typical dorsal patterns formed by the dark areas of cuticle that are bare of powdery white mum wax (Gullan et al. 2010; Kaydan & Gullan 2012). It is a genus with huge dorsal tubular ducts surrounded by a flat sclerotized area containing one or more setae situated either within the border or adjacent to rim and also have a couple of cerarii on anal lobust (Gullan et al. 2003, 2010).

~~When it was a~~The New World genus, *Ferrisia* consists of *Ferrisia virgata* (Cockerell, 1893) and *Ferrisia malvastra* (McDaniel, 1962) ~~which~~ was known to have been spread to southern Asia and other parts of the world as insect pests of cultivated plants (Williams & Watson 1988; Williams 1996, 2004). To date, the combination of ~~based on~~ morphological and molecular data gathered this genus comprised at least ~~there are~~ 18 species of *Ferrisia* i.e *Ferrisia claviseta* (Lobdell, 1930); *Ferrisia colombiana* Kaydan and Gullan, 2012; *Ferrisia cristinae* Kaydan

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and Gullan, 2012; *Ferrisia dasylirii* (Cockerell, 1896); *Ferrisia ecuadorensis* Kaydan and Gullan, 2012; *Ferrisia gilli* Gullan, 2003; *Ferrisia kondoi* Kaydan and Gullan, 2012; *Ferrisia malvastra* (McDaniel, 1962), *Ferrisia meridionalis* Williams, 1985; *Ferrisia milleri* Kaydan and Gullan, 2012; *Ferrisia multiformis* Granara de Willink, 1991; *Ferrisia pitcairnia* Kaydan and Gullan, 2012; *Ferrisia quaintancii* (Tinsley, 1898); *Ferrisia setosa* (Lobdell, 1930); *Ferrisia terani* Williams and Granara de Willink, 1992; *Ferrisia uzinuri* Kaydan and Gullan, 2012; *Ferrisia virgata* (Cockerell, 1893); and *Ferrisia williamsi* Kaydan and Gullan, 2012 (Kaydan & Gullan 2012). These 18 species were the results of Kaydan & Gullan (2012) revision on a group of eight species that ~~have been~~were described ~~before~~ by Williams (1996).

In Indonesia, there has been only striped mealybug, *F. virgata*, ~~is~~ was presented by (Williams (2004). This species was firstly recorded as intercepted species on *Zingiber officinale* Roscoe (Zingiberaceae) by quarantine inspections of San Pedro, USA in 1992. Then, the species was reported found in Java, Sulawesi, Sumba as polyphagous pests species on *Azadiractha indica* A. Juss (Meliaceae), *Durio kutejensis* Becc. (Bombacaceae), *Ficus* sp. (Moraceae), *Gossypium* sp. (Malvaceae), *Indigofera* sp., (Fabaceae), *Ipomoea* sp. (Convolvulacea) (Williams 1996, 2004). Recently, *F. virgata* predictably becomes a cosmopolitan group insect pest within a broad range of host plants around Indonesia which has been commonly introduced across the globe through trade or other human-migrated movements (Sartiami et al. 2016). The information on the widespread of *F. virgata* could be

confused by other species since recent taxonomic revision of the genus *Ferrisia* was published and there is no more study about those species in Indonesia. Recently, Pacheco da Silva et al. (2019) re-identified some species in North-East Brazil and recorded *F. dasylirii* as a new country record.

Here we report *Ferrisia dasylirii* (Cockerell, 1896), a native species of arid zones in northern Mexico, that has not been recorded from Indonesia before. This report includes new information on the host range and distribution of the species in Indonesia.

MATERIALS AND METHODS

The specimens were collected ~~in~~ from several host plant species growing around the site of Agricultural Faculty, University of Bengkulu, Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.). ~~The host plants were monitored b~~from ~~the beginning of August to November 2019 for gaining the different instars of the mealybug species~~. Similarly, sampling were also conducted ~~Further investigations were carried out~~ from the same host plants species in Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.) and Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.), a part of municipals in Bengkulu Province. ~~All specimens were obtained from several localities in Southern Sumatra—Indonesia as were shown in Figure 1.A—C.~~

The specimens were preserved in 70% ethanol and slide-mountings were prepared with methods refers to Kosztarab & Kozár (1988). Species identification

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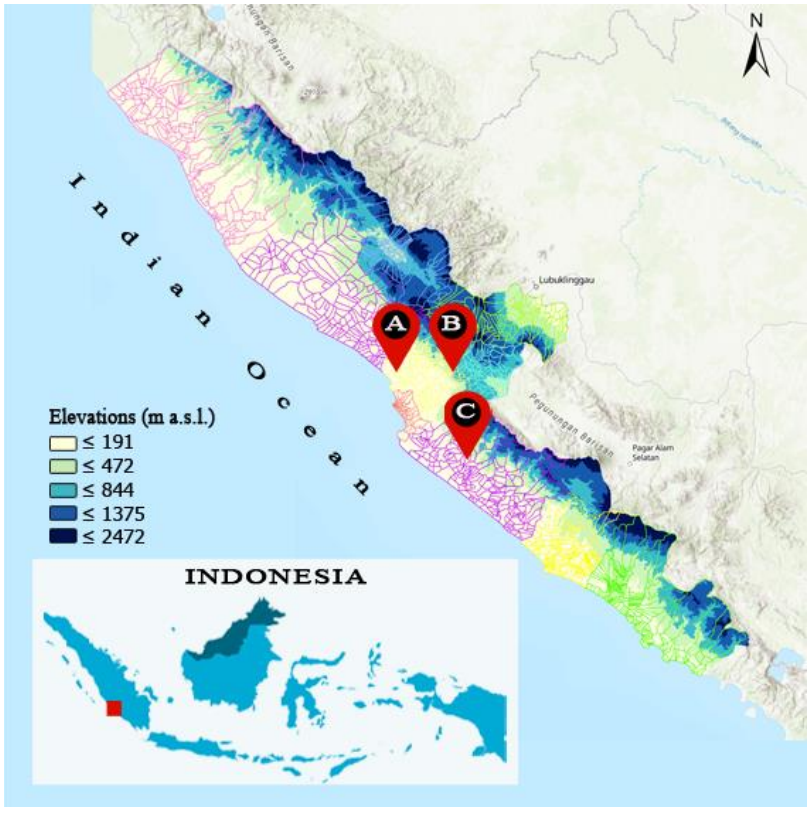
was performed under light microscope and with the guide of keys mentioned in Kaydan & Gullan (2012). The slide-mounted of *Ferrisia dasylirii* adult females and nymphs are deposited in the mini Insect Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia). Slide numbers: 300-305/1/2020. All specimens obtained ~~from several localities in Southern Sumatra—Indonesia~~ were shown in Figure 1.A－C.



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RESULTS AND DISCUSSION

Ferrisia dasylirii was collected on the following host plants: *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae). ~~The same species in similar host plants were also found in Seluma and Bengkulu Tengah regencyalreday~~. ~~It shows that the species was established in some locations in Bengkulu Province.~~ ~~In these areas~~Result found that the~~,~~ *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living supporting tree" for *Piper nigrum* (Piperaceae) ~~growth and was found~~ bearing more abundant population of *F. dasylirii* than the other trees where the insect were collected (Figure 2). ~~In this case,~~As such, *G. sepium* should be further evaluated to ascertain whether the plant serve~~s~~ as a reservoir or an alternative host plant for such a scale pest.

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Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In nature~~life~~, *F. dasylirii* (Figure 3.A) is mostly similar with *F. virgata* in form and size. The species has 8 segments antennae with ≥595 µm long; body elongate oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B) observed~~. As~~ the bodies of females ~~are~~ cleared of soft contents and the cuticles stained and mounted on microscope slides. They ~~are~~ could be easily distinguished ~~easily~~ from

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other taxa by their discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular ducts on abdomen. They are situated on outer margin of sclerotised area and often with pore and its surrounding sclerotisation projecting out from margin (Figure 3.C, D).

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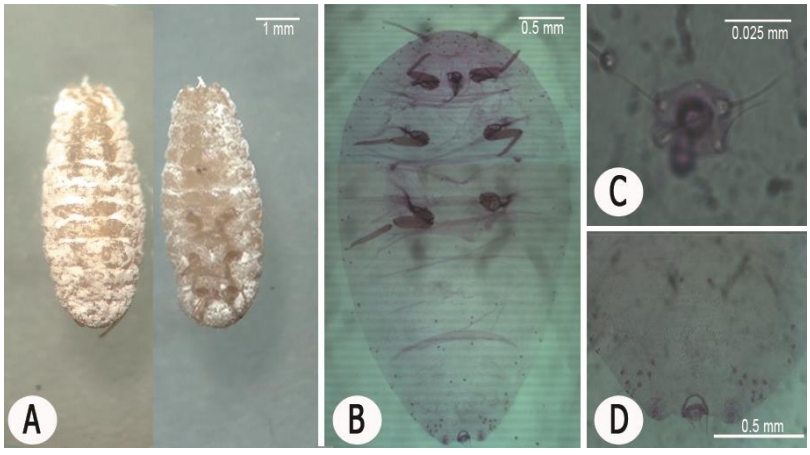

Figure 3. Female of *Ferrisa dasylirii* (Cockerell, 1896): A. In life speciments; B. Slide-mounted speciment; C. Tubular duct with a minute discoidal pore touching the outer margin of sclerotised area; D. Multilocular disc pores in row on abdominal segment VI-VIII.

Ferrisia dasylirii is already spread into 22 countries in the world ~~which~~ where Indonesia is now the second southeast Asia country reported to have *R dasylirii* after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in

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Indonesia is not known but it probably ~~be brought~~ unintentionally introduced here by international transportation and trade from Malaysia to Indonesia. However, t~~T~~he ~~wide distribution~~abundance of *F. dasylirii* in some plants in the different territories with various outbreak levels of the infestation indicates that the species was probably introduced some years before its report. Besides, the species probably also have already existed for a long time ago since the species is confused by *F. virgata*.

The economic losses of *F. dasylirii* has not clearly stated, but the species was reported currently as a potential pest of *Salicornia bigelovii* (Torr.) (Chenopodiaceae) fed and reproduced in 10% of commercial plantations at Baja California Sur, Mexico (Magallón-Servín et al. 2019). It should be aware that the mealybug species are known as the most common invaders of new geographical areas and capable~~potent~~ to become a significant pest as well as virus transmission vectors in many cropping systems (Hodgson 1994), and as such, further study is urgently needed.

The slide-mounted adult females of *Ferrisia* species in southern Asia can be distinguished from each other according to the following key (after Williams 2004):

1. Multilocular disc pores either absent from abdominal segment VI, or occasionally numbering 1-3. Dorsal duct each with rim about same size as a multilocular disc pore or smaller, with setae situated either adjacent to rim or just outside it ..... ***malvastra*** (McDaniel, 1962)

- Multilocular disc pores present in row on abdominal segment VI numbering at least 8. Dorsal duct each with rim larger than a multilocular disc pore, containing setae situated within border of rim ..... (2)

2. Most discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular duct with a minute discoidal pore just touching outer margin of sclerotised area, to projecting outside of margin (Figure 3.C)..... ..... ***dasylirii*** (Cockerell, 1896)

- Enlarged tubular duct with a minute discoidal pore not touching sclerotised rim of duct opening; pore position varies from fully within sclerotised area .... ***virgata*** (Cockerell, 1893)

ACKNOWLEDGMENT

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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ABSTRACT

In this study, the occurrence of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) in Indonesia is reported. It was found on *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae) at some regencies in Bengkulu Province, Southern Sumatra.

Key words: Biodiversity, host plant, insect pests, mealybugs, taxonomy

INTRODUCTION

Ferrisia Fullaway is one of the genera in Pseudococcidae (Hemiptera: Coccomorpha: Pseudococcidae) which is a group of sap-feeding insects, tapping into the phloem via a stylet or piercing, a straw-like mouthpart (Williams 2004; Gullan & Martin 2009). This genus in life can easily be recognized by long glassy filaments with typical dorsal patterns formed by the dark areas of cuticle that are bare of powdery white mum wax (Gullan et al. 2010; Kaydan & Gullan 2012). It is a genus with huge dorsal tubular ducts surrounded by a flat sclerotized area containing one or more setae situated either within the border or adjacent to rim and also have a couple of cerarii on anal lobust (Gullan et al. 2003, 2010).

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In Indonesia, the only striped mealybug, *F. virgata*, is presented (Sartiami et al. 1999; Williams 2004). This species was firstly recorded as intercepted species on *Zingiber officinale* Roscoe (Zingiberaceae) by quarantine inspections of San Pedro, USA in 1992. Then, the species was reported found in Java, Sulawesi, Sumba as polyphagous pests species on *Azadiractha indica* A. Juss (Meliaceae), *Durio kutejensis* Becc. (Bombacaceae), *Ficus* sp. (Moraceae), *Gossypium* sp. (Malvaceae), *Indigofera* sp., (Fabaceae), *Ipomoea* sp. (Convolvulacea) (Williams 1996, 2004). Recently, *F. virgata* predictably becomes a cosmopolitan group insect pest within a broad range of host plants around Indonesia which has been commonly introduced across the globe through trade or other human-migrated movements (Sartiami et al. 2016). The information on the widespread of *F. virgata* could be confused by other species since recent taxonomic revision of the genus *Ferrisia* was published and there is no more study about those species in Indonesia. Recently, Pacheco da Silva et al. (2019) re-identified some species in North-East Brazil and recorded *F. dasylirii* as a new country record.

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63 report includes new information on the host range and distribution of the species in
64 Indonesia.

65 **MATERIALS AND METHODS**

66 The specimens were collected in several plant species growing around the site
67 of Agricultural Faculty, University of Bengkulu, Bengkulu city (3°45'33.0"S,
68 102°16'10.1"E, 50 m a.s.l.). The host plants were monitored from the beginning of
69 August to November 2019 for gaining the different instars of the mealybug species.
70 Further investigations were carried out from the same plants in Bengkulu Tengah
71 regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.) and Seluma regency
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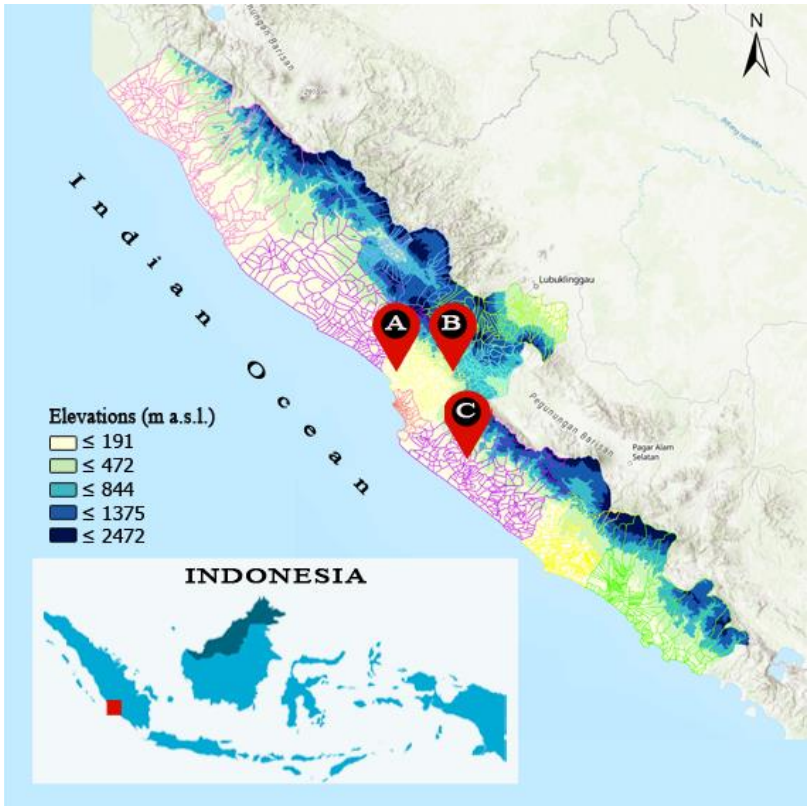


Figure 1. Distribution records of *Ferrisa dasylirii* (Cockerell, 1896): A. Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.); B. Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.); C. Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.).

RESULTS AND DISCUSSION

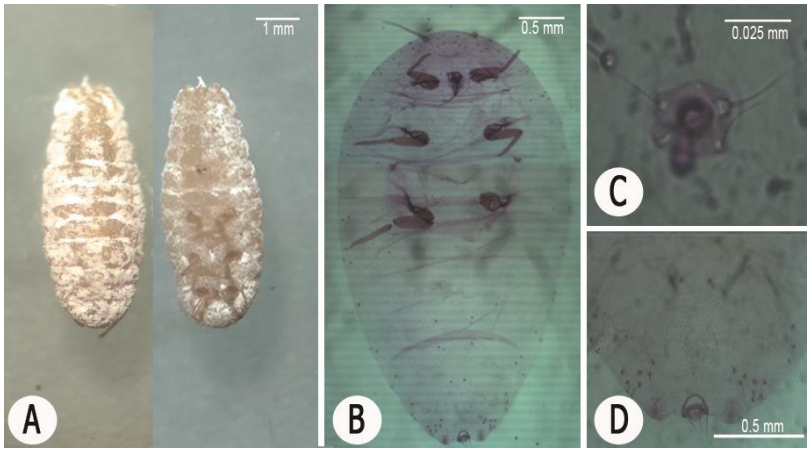
Ferrisia dasylirii was collected on the following host plants: *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp.

(Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae). The same species in similar host plants were also found in Seluma and Bengkulu Tengah regency. It shows that the species was established in some locations in Bengkulu Province. In these areas, *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living supporting tree" for *Piper nigrum* (Piperaceae) growth and was found bearing more abundant population of *F. dasylirii* (Figure 2). In this case, *G. sepium* should be evaluated whether the plant serves as a reservoir or an alternative host plant for such a scale pest.

Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In life, *F. dasylirii* (Figure 3.A) is mostly similar with *F. virgata* in form and size. The species has 8 segments antennae with ≥595 μm long; body elongate oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B). As the bodies of females are cleared of soft contents and the cuticles stained and mounted on microscope slides. They are distinguished easily from other taxa by their discoidal

pores associated with sclerotised area around rim of dorsal enlarged tubular ducts on abdomen. They are situated on outer margin of sclerotised area and often with pore and its surrounding sclerotisation projecting out from margin (Figure 3.C, D).



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on brightness and contrast

Ferrisia dasylirii is already spread in 22 countries which Indonesia is now the second ~~southeast~~Southeast Asia country reported after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in Indonesia is not known but it probably be brought unintentionally by international transportation and trade from

Malaysia to Indonesia. The wide distribution of *F. dasylirii* in some plants in the different territories with various outbreak levels of the infestation indicates that the species was probably introduced some years before its report. Besides, the species probably also have already existed for a long time ago since the species is confused by *F. virgata*.

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The slide-mounted adult females of *Ferrisia* species in southern Asia can be distinguished from each other according to the following key (after Williams 2004):

1. Multilocular disc pores either absent from abdominal segment VI, or occasionally numbering 1-3. Dorsal duct each with rim about same size as a multilocular disc pore or smaller, with setae situated either adjacent to rim or just outside it ..... ***malvastra*** (McDaniel, 1962)
- Multilocular disc pores present in row on abdominal segment VI numbering at least 8. Dorsal duct each with rim larger than a multilocular disc pore, containing setae situated within border of rim ..... (2)

2. Most discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular duct with a minute discoidal pore just touching outer margin of sclerotised area, to projecting outside of margin (Figure 3.C)..... ..... ***dasylirii*** (Cockerell, 1896)

- Enlarged tubular duct with a minute discoidal pore not touching sclerotised rim of duct opening; pore position varies from fully within sclerotised area .... ***virgata*** (Cockerell, 1893)

ACKNOWLEDGMENT

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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New record of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Coccomorpha: Pseudococcidae) in Indonesia

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ABSTRACT

The occurrence of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) was 1st reported in Indonesia. It was found on *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae) at some regencies in Bengkulu Province, Southern Sumatra, Indonesia.

Key words: Biodiversity, host plant, mealybug, Sumatera, Indonesia

ABSTRAK

Munculnya spesies kutu putih *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) pertama kali di Indonesia telah dilaporkan. Spesies ini dijumpai hidup pada tanaman *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), dan *Theobroma cacao* L. (Malvaceae) di beberapa kabupaten di Provinsi Bengkulu, Sumatera Selatan, Indonesia.

Kata Kunci: Keanekaragaman hayati, tanaman inang, kutu putih, Sumatera, Indonesia

INTRODUCTION

Ferrisia Fullaway is one of the genera in Pseudococcidae (Hemiptera: Coccomorpha: Pseudococcidae) which is a group of sap-feeding insects, tapping into the phloem via a stylet or piercing, a straw-like mouthpart (Williams 2004; Gullan & Martin 2009). In nature, this genus can easily be recognized by long glassy filaments with typical dorsal patterns formed by the dark areas of cuticle that are bare of powdery white mum wax (Gullan et al. 2010; Kaydan & Gullan 2012). It is a genus with huge dorsal tubular ducts surrounded by a flat sclerotized area containing one or more setae situated either within the border or adjacent to rim and also have a couple of cerarii on anal lobust (Gullan et al. 2003, 2010).

The New World genus, *Ferrisia* consists of *Ferrisia virgata* (Cockerell, 1893) and *Ferrisia malvastra* (McDaniel, 1962) was known to have been spread

to southern Asia and other parts of the world as insect pests of cultivated plants (Williams & Watson 1988; Williams 1996, 2004; Sartiami et al. 2017). To date, the combination of morphological and molecular data gathered this genus comprised at least 18 species of *Ferrisia* i.e *Ferrisia claviseta* (Lobdell, 1930); *Ferrisia colombiana* Kaydan and Gullan, 2012; *Ferrisia cristinae* Kaydan and Gullan, 2012; *Ferrisia dasylirii* (Cockerell, 1896); *Ferrisia ecuadorensis* Kaydan and Gullan, 2012; *Ferrisia gilli* Gullan, 2003; *Ferrisia kondoi* Kaydan and Gullan, 2012; *Ferrisia malvastra* (McDaniel, 1962), *Ferrisia meridionalis* Williams, 1985; *Ferrisia milleri* Kaydan and Gullan, 2012; *Ferrisia multiformis* Granara de Willink, 1991; *Ferrisia pitcairnia* Kaydan and Gullan, 2012; *Ferrisia quaintancii* (Tinsley, 1898); *Ferrisia setosa* (Lobdell, 1930); *Ferrisia terani* Williams and Granara de Willink, 1992; *Ferrisia uzinuri* Kaydan and Gullan, 2012; *Ferrisia virgata* (Cockerell, 1893); and *Ferrisia williamsi* Kaydan and Gullan, 2012 (Kaydan & Gullan 2012). These 18 species were the results of Kaydan & Gullan (2012) revision on a group of eight species that were described by Williams (1996).

In Indonesia, the only striped mealybug, *F. virgata*, is presented (Sartiami et al. 1999; Williams 2004). This species was firstly recorded as intercepted species on *Zingiber officinale* Roscoe (Zingiberaceae) by quarantine inspections of San Pedro, USA in 1992. Then, the species was reported found in Java, Sulawesi, Sumba as polyphagous pests species on *Annona squamosa* L. (Annonaceae), *Azadiractha indica* A. Juss (Meliaceae), *Durio kutejensis* Becc. (Bombacaceae),

Ficus sp. (Moraceae), *Gossypium* sp. (Malvaceae), *Indigofera* sp., (Fabaceae), *Ipomoea* sp. (Convolvulacea), *Nephelium lappaceum* L. (Sapindaceae), and *Psidium guajava* L. (Myrtaceae) (Sartiami et al. 1999; Williams 1996, 2004). Recently, *F. virgata* predictably becomes a cosmopolitan group insect pest within a broad range of host plants around Indonesia which has been commonly introduced across the globe through trade or other human-migrated movements (Sartiami et al. 2016). The information on the widespread of *F. virgata* could be confused by other species since recent taxonomic revision of the genus *Ferrisia* was published and there is no more study about those species in Indonesia. Recently, Pacheco da Silva et al. (2019) re-identified some species in North-East Brazil and recorded *F. dasylirii* as a new country record.

Here we report *Ferrisia dasylirii* (Cockerell, 1896), a native species of arid zones in northern Mexico, that has not been recorded from Indonesia before. This report includes new information on the host range and distribution of the species in Indonesia.

MATERIALS AND METHODS

The specimens were collected from several host plant species growing around the site of Agricultural Faculty, University of Bengkulu, Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.). Sampling of different instars were done from Aug to Nov 2019. Similarly, sampling were also conducted from the same

host plants species in Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.) and Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.), a part of municipals in Bengkulu Province. The species of *Ferrisia dasylirii* was collected on the following host plants: *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae).

The specimens were preserved in 70% ethanol and slide-mountings were prepared with methods refers to Kosztarab & Kozár (1988). Species identification was performed under light microscope and with the guide of keys mentioned in Kaydan & Gullan (2012). The slide-mounted of *Ferrisia dasylirii* adult females and nymphs are deposited in the mini Insect Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia). Slide numbers: 300-305/1/2020. All specimens obtained were shown in Figure 1.A－C.

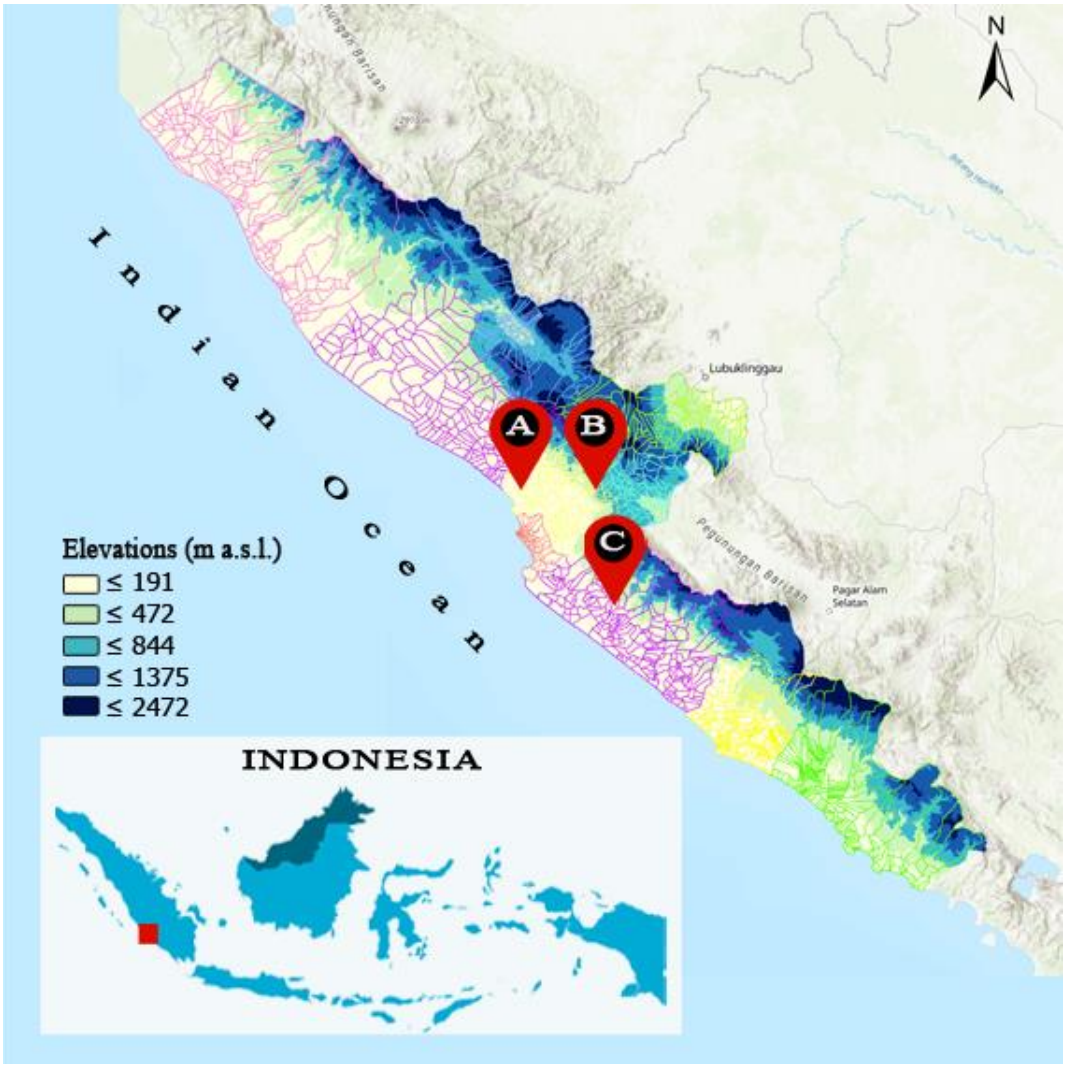

Figure 1. Sampling locations of *Ferrisa dasylirii* (Cockerell, 1896): A. Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.); B. Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.); C. Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.).

RESULTS AND DISCUSSION

Result found that the *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living

supporting tree" for *Piper nigrum* (Piperaceae) bearing more abundant population of *F. dasylirii* than the other trees where the insect were collected (Figure 2). As such, *G. sepium* should be further evaluated to ascertain whether the plant serves as a reservoir or an alternative host plant for such a scale pest.

Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In nature, *F. dasylirii* (Figure 3.A) is mostly similar with *F. virgata* in form and size. The species has 8 segments antennae with ≥595 μm long; body elongate oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B) observed the bodies of females cleared of soft contents and the cuticles stained and mounted on microscope slides. They could be easily distinguished from other taxa by their discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular ducts on abdomen. Discodial pores are situated on outer margin of sclerotised area and often with pore and its surrounding sclerotisation projecting out from margin (Figure 3.C, D).

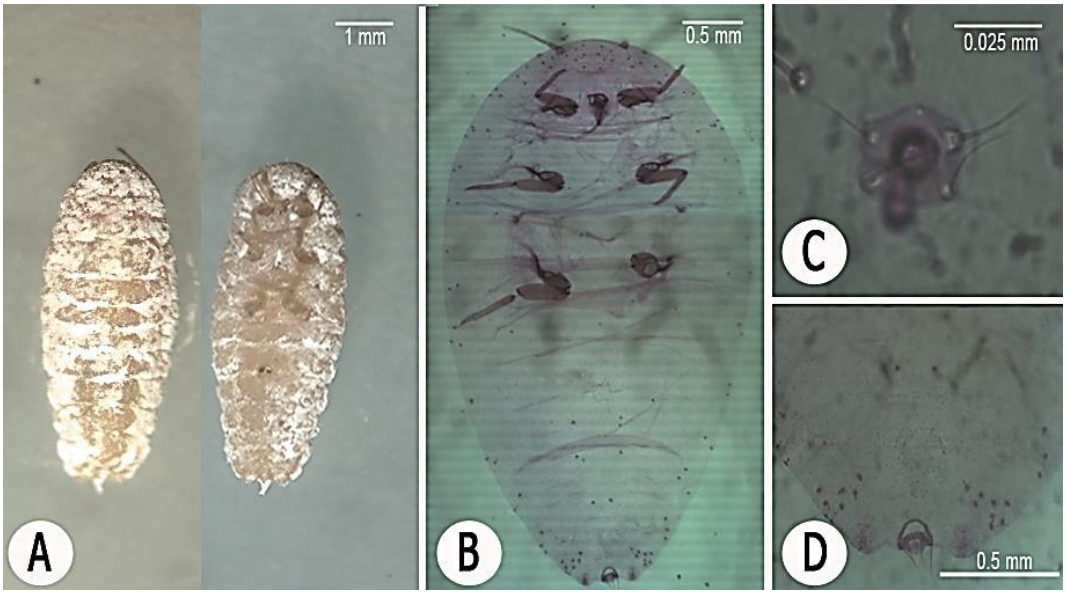

Figure 3. Female of *Ferrisa dasylirii* (Cockerell, 1896): A. In life speciments; B. Slide-mounted speciment; C. Tubular duct with a minute discoidal pore touching the outer margin of sclerotised area; D. Multilocular disc pores in row on abdominal segment VI-VIII.

Ferrisia dasylirii is already spread into 22 countries in the world where Indonesia is now the second Southeast Asia country reported to have *F. dasylirii* after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in Indonesia is not known but it probably unintentionally introduced here by international transportation and trade from Malaysia to Indonesia. However, the abundance of *F. dasylirii* in some plants in the different territories with various outbreak levels of the infestation indicates that the species was probably introduced some years before its report. Besides, the species probably also have already existed for a long time ago since the species is confused by *F. virgata*.

The economic losses of *F. dasylirii* has not clearly stated, but the species was reported currently as a potential pest of *Salicornia bigelovii* (Torr.) (Chenopodiaceae) feed and reproduced in 10% of commercial plantations at Baja California Sur, Mexico (Magallón-Servín et al. 2019). It should be aware that the mealybug species are known as the most common invaders of new geographical areas and capable to become a significant pest as well as virus transmission vectors in many cropping systems (Hodgson 1994), and as such, further study is urgently needed.

The slide-mounted adult females of *Ferrisia* species in southern Asia can be distinguished from each other according to the following key (after Williams 2004):

1. Multilocular disc pores either absent from abdominal segment VI, or occasionally numbering 1-3. Dorsal duct each with rim about same size as a multilocular disc pore or smaller, with setae situated either adjacent to rim or just outside it ..... ***malvastra*** (McDaniel, 1962)

- Multilocular disc pores present in row on abdominal segment VI numbering at least 8. Dorsal duct each with rim larger than a multilocular disc pore, containing setae situated within border of rim ..... (2)

2. Most discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular duct with a minute discoidal pore just touching outer margin of sclerotised area, to projecting outside of margin (Figure 3.C)..... ..... ***dasylirii*** (Cockerell, 1896)

- Enlarged tubular duct with a minute discoidal pore not touching sclerotised rim of duct opening; pore position varies from fully within sclerotised area .... ***virgata*** (Cockerell, 1893)

ACKNOWLEDGMENT

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ABSTRACT

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Key words: Biodiversity, host plant, mealybugs, Sumatera, Indonesia

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Slide numbers: 300-305/1/2020. All specimens obtained were shown in Figure 1.A－C.

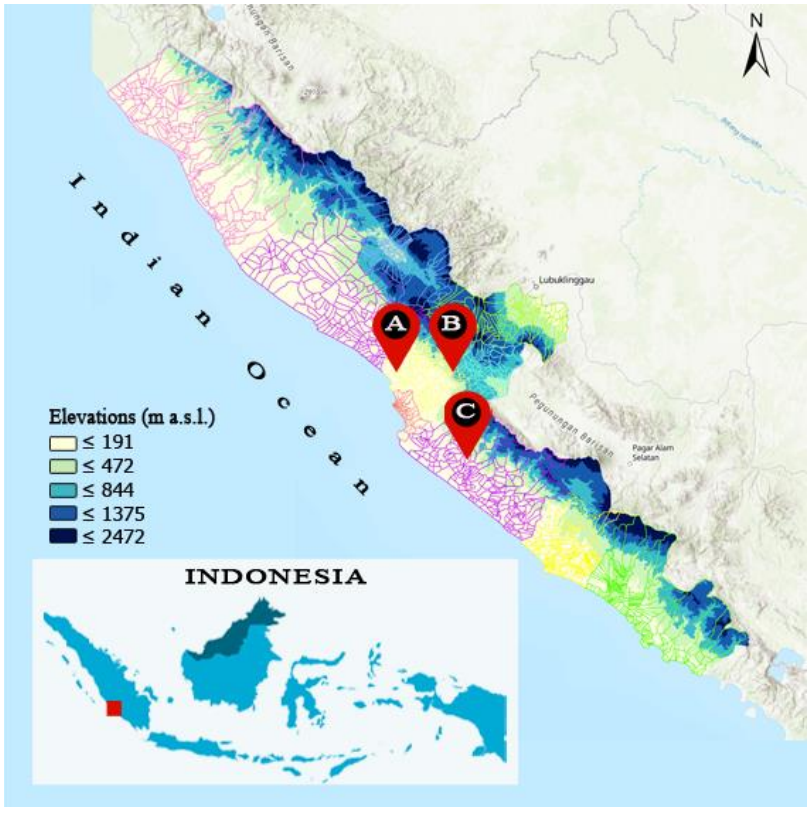

Figure 1. Sampling locations of *Ferrisa dasylirii* (Cockerell, 1896): A. Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.); B. Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.); C. Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.).

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RESULTS AND DISCUSSION

Result found that the *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living supporting tree" for *Piper nigrum* (Piperaceae) bearing more abundant population of *F. dasylirii* than the other trees where the insect were collected (Figure 2). As such, *G. sepium* should be further evaluated to ascertain whether the plant serves as a reservoir or an alternative host plant for such a scale pest.

Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In nature, *F. dasylirii* (Figure 3.A) is mostly similar with *F. virgata* in form and size. The species has 8 segments antennae with ≥595 µm long; body elongate oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B) observed the bodies of females cleared of soft contents and the cuticles stained and mounted on microscope slides. They could be easily distinguished from other taxa by their

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discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular ducts on abdomen. Discodial pores are situated on outer margin of sclerotised area and often with pore and its surrounding sclerotisation projecting out from margin (Figure 3.C, D).

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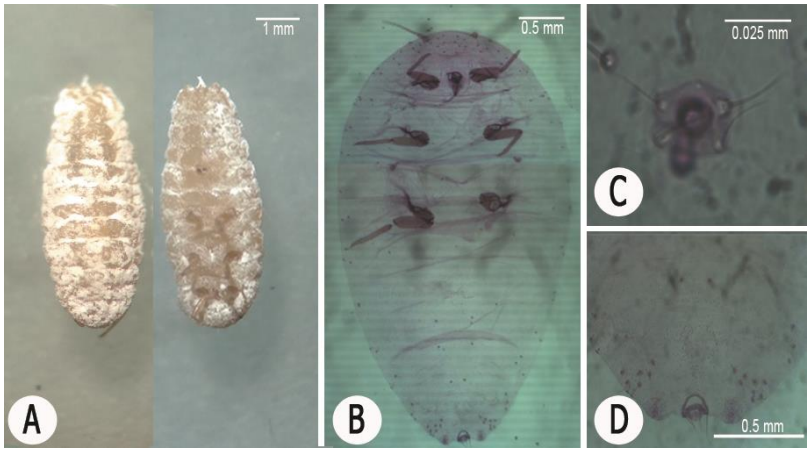

Figure 3. Female of *Ferrisa dasylirii* (Cockerell, 1896): A. In life speciments; B. Slide-mounted speciment; C. Tubular duct with a minute discoidal pore touching the outer margin of sclerotised area; D. Multilocular disc pores in row on abdominal segment VI-VIII.

Ferrisia dasylirii is already spread into 22 countries in the world where Indonesia is now the second Southeast Asia country reported to have *R dasylirii* after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in

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The slide-mounted adult females of *Ferrisia* species in southern Asia can be distinguished from each other according to the following key (after Williams 2004):

1. Multilocular disc pores either absent from abdominal segment VI, or occasionally numbering 1-3. Dorsal duct each with rim about same size as a multilocular disc pore or smaller, with setae situated either adjacent to rim or just outside it ..... ***malvastra*** (McDaniel, 1962)

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- Enlarged tubular duct with a minute discoidal pore not touching sclerotised rim of duct opening; pore position varies from fully within sclerotised area .... ***virgata*** (Cockerell, 1893)

ACKNOWLEDGMENT

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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New record of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Coccomorpha: Pseudococcidae) in Indonesia

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ABSTRACT

In this study, the occurrence of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) in Indonesia is reported. It was found on *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae) at some regencies in Bengkulu Province, Southern Sumatra.

Key words: Biodiversity, host plant, insect pests, mealybugs, taxonomy

INTRODUCTION

Ferrisia Fullaway is one of the genera in Pseudococcidae (Hemiptera: Coccomorpha: Pseudococcidae) which is a group of sap-feeding insects, tapping into the phloem via a stylet or piercing, a straw-like mouthpart (Williams 2004; Gullan & Martin 2009). This genus in life can easily be recognized by long glassy filaments with typical dorsal patterns formed by the dark areas of cuticle that are bare of powdery white mum wax (Gullan et al. 2010; Kaydan & Gullan 2012). It is a genus with huge dorsal tubular ducts surrounded by a flat sclerotized area containing one or more setae situated either within the border or adjacent to rim and also have a couple of cerarii on anal lobust (Gullan et al. 2003, 2010).

When it was a New World genus, *Ferrisia* consists of *Ferrisia virgata* (Cockerell, 1893) and *Ferrisia malvastra* (McDaniel, 1962) which have been spread to southern Asia and other parts of the world as insect pests of cultivated plants (Williams & Watson 1988; Williams 1996, 2004). To date, based on morphological and molecular data there are 18 species of *Ferrisia* i.e *Ferrisia claviseta* (Lobdell, 1930); *Ferrisia colombiana* Kaydan and Gullan, 2012; *Ferrisia cristinae* Kaydan and Gullan, 2012; *Ferrisia dasylirii* (Cockerell, 1896); *Ferrisia ecuadorensis* Kaydan and Gullan, 2012; *Ferrisia gilli* Gullan, 2003; *Ferrisia kondoi* Kaydan and Gullan, 2012; *Ferrisia malvastra* (McDaniel, 1962), *Ferrisia meridionalis* Williams, 1985; *Ferrisia milleri* Kaydan and Gullan, 2012; *Ferrisia multiformis* Granara de Willink, 1991; *Ferrisia pitcairnia* Kaydan and Gullan, 2012; *Ferrisia quaintancii* (Tinsley, 1898); *Ferrisia setosa* (Lobdell,

1930); *Ferrisia terani* Williams and Granara de Willink, 1992; *Ferrisia uzinuri* Kaydan and Gullan, 2012; *Ferrisia virgata* (Cockerell, 1893); and *Ferrisia williamsi* Kaydan and Gullan, 2012 (Kaydan & Gullan 2012). These 18 species were the results of Kaydan & Gullan (2012) revision on a group of eight species that have been described before by Williams (1996).

In Indonesia, the only striped mealybug, *F. virgata*, is presented (Sartiami et al. 1999; Williams 2004). This species was firstly recorded as intercepted species on *Zingiber officinale* Roscoe (Zingiberaceae) by quarantine inspections of San Pedro, USA in 1992. Then, the species was reported found in Java, Sulawesi, Sumba as polyphagous pests species on *Annona squamosa* Linn. (Annonaceae), *Azadiractha indica* A. Juss (Meliaceae), *Durio kutejensis* Becc. (Bombacaceae), *Ficus* sp. (Moraceae), *Gossypium* sp. (Malvaceae), *Indigofera* sp., (Fabaceae), *Ipomoea* sp. (Convolvulacea), *Nephelium lappaceum* Linn. (Sapindaceae), and *Psidium guajava* (Myrtaceae) (Sartiami et al. 1999; Williams 1996, 2004). Recently, *F. virgata* predictably becomes a cosmopolitan group insect pest within a broad range of host plants around Indonesia which has been commonly introduced across the globe through trade or other human-migrated movements (Sartiami et al. 2016). The information on the widespread of *F. virgata* could be confused by other species since recent taxonomic revision of the genus *Ferrisia* was published and there is no more study about those species in Indonesia. Recently, Pacheco da Silva et al. (2019) re-identified some species in North-East Brazil and recorded *F. dasylirii* as a new country record.

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Here we report *Ferrisia dasylirii* (Cockerell, 1896), a native species of arid zones in northern Mexico, that has not been recorded from Indonesia before. This report includes new information on the host range and distribution of the species in Indonesia.

MATERIALS AND METHODS

The specimens were collected in several plant species growing around the site of Agricultural Faculty, University of Bengkulu, Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.). The host plants were monitored from the beginning of August to November 2019 for gaining the different instars of the mealybug species. Further investigations were carried out from the same plants in Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.) and Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.), a part of municipals in Bengkulu Province. All specimens were obtained from several localities in Southern Sumatra－Indonesia as shown in Figure 1.A－C.

The specimens were preserved in 70% ethanol and slide-mountings were prepared with methods refers to Kosztarab & Kozár (1988). Species identification was performed under light microscope and with the guide of keys mentioned in Kaydan & Gullan (2012). The slide-mounted of *Ferrisia dasylirii* adult females and nymphs are deposited in the mini Insect Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia). Slide numbers: 300-305/1/2020.

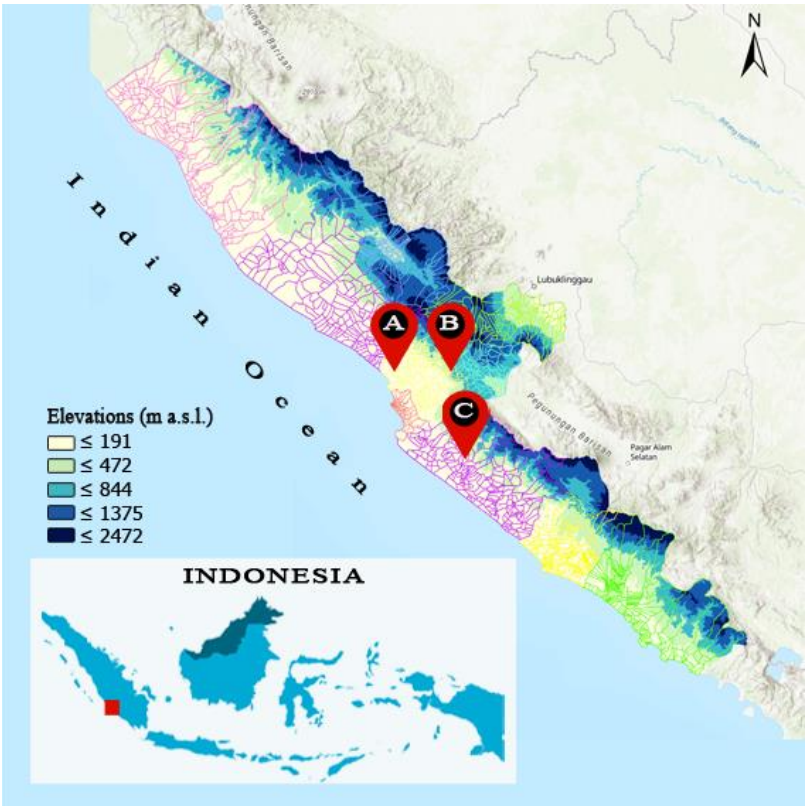

Figure 1. Distribution records of *Ferrisa dasylirii* (Cockerell, 1896): A. Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.); B. Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.); C. Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.).

RESULTS AND DISCUSSION

Ferrisia dasylirii was collected on the following host plants: *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp.

(Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae). The same species in similar host plants were also found in Seluma and Bengkulu Tengah regency. It shows that the species was established in some locations in Bengkulu Province. In these areas, *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living supporting tree" for *Piper nigrum* (Piperaceae) growth and was found bearing more abundant population of *F. dasylirii* (Figure 2). In this case, *G. sepium* should be evaluated whether the plant serves as a reservoir or an alternative host plant for such a scale pest.

Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In life, *F. dasylirii* (Figure 3.A) is mostly similar with *F. virgata* in form and size. The species has 8 segments antennae with ≥595 μm long; body elongate oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B). As the bodies of females are cleared of soft contents and the cuticles stained and mounted on microscope slides. They are distinguished easily from other taxa by their discoidal

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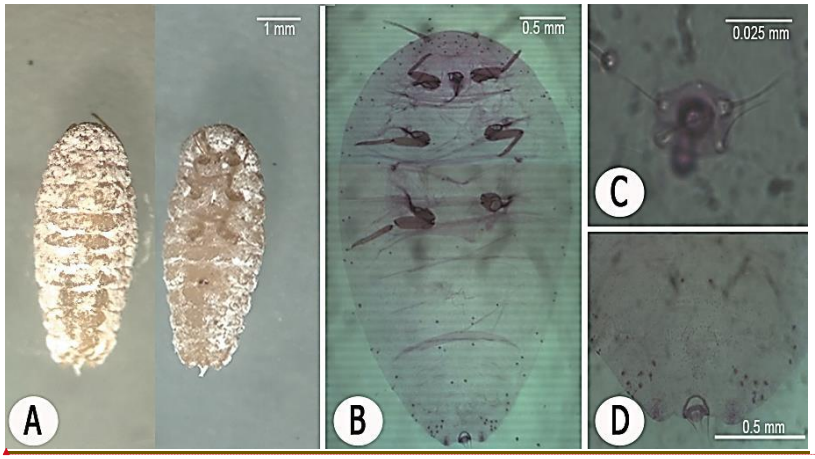

Figure 3. Female of *Ferrisa dasylirii* (Cockerell, 1896): A. In life speciments; B. Slide-mounted speciment; C. Tubular duct with a minute discoidal pore touching the outer margin of sclerotised area; D. Multilocular disc pores in row on abdominal segment VI-VIII.

Ferrisia dasylirii is already spread in 22 countries which Indonesia is now the second Southeast Asia country reported after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in Indonesia is not known but it probably be

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- Multilocular disc pores present in row on abdominal segment VI numbering at least 8. Dorsal duct each with rim larger than a multilocular disc pore, containing setae situated within border of rim ..... (2)

2. Most discoidal pores associated with sclerotised area around rim of dorsal enlarged tubular duct with a minute discoidal pore just touching outer margin of sclerotised area, to projecting outside of margin (Figure 3.C)..... ..... ***dasylirii*** (Cockerell, 1896)

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New record of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Coccomorpha: Pseudococcidae) in Indonesia

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ABSTRACT

The occurrence of *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) was first reported in Indonesia. It was found on *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae) at some regencies in Bengkulu Province, Southern Sumatra, Indonesia.

Key words: Biodiversity, host plant, mealybug, Sumatera, Indonesia

ABSTRAK

Kehadiran spesies koya *Ferrisa dasylirii* (Cockerell, 1896) (Hemiptera: Pseudococcidae) telah direkodkan untuk pertama kali di Indonesia. Spesies ini dijumpai hidup pada tanaman *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), dan *Theobroma cacao* L. (Malvaceae) di beberapa kabupaten di Provinsi Bengkulu, Sumatera Selatan, Indonesia.

Kata Kunci: Kepelbagaian biologi, tumbuhan perumah, koya, Sumatera, Indonesia

INTRODUCTION

Ferrisia Fullaway is one of the genera in Pseudococcidae (Hemiptera: Coccomorpha: Pseudococcidae) which is a group of sap-feeding insects, tapping into the phloem via a stylet or piercing, a straw-like mouthpart (Williams 2004; Gullan & Martin 2009). In nature, this genus can easily be recognized by long glassy filaments with typical dorsal patterns formed by the dark areas of cuticle bare of powdery white mum wax (Gullan et al. 2010; Kaydan & Gullan 2012). It is a genus with huge dorsal tubular ducts surrounded by a flat sclerotized area containing one or more setae situated either within the border or adjacent to the rim and has a couple of cerarii anal lobust (Gullan et al. 2003, 2010).

The New World genus, *Ferrisia* consists of *Ferrisia virgata* (Cockerell, 1893) and *Ferrisia malvastra* (McDaniel, 1962) was known to have been spread to southern Asia and other parts of the world as insect pests of cultivated plants (Williams & Watson 1988; Williams 1996, 2004; Sartiami et al. 2017). To date, the combination of morphological and molecular data gathered this genus comprised at least 18 species of *Ferrisia* i.e *Ferrisia claviseta* (Lobdell, 1930); *Ferrisia colombiana* Kaydan and Gullan, 2012; *Ferrisia cristinae* Kaydan and Gullan, 2012; *Ferrisia dasylirii* (Cockerell, 1896); *Ferrisia ecuadorensis* Kaydan and Gullan, 2012; *Ferrisia gilli* Gullan, 2003; *Ferrisia kondoi* Kaydan and Gullan, 2012; *Ferrisia malvastra* (McDaniel, 1962), *Ferrisia meridionalis* Williams, 1985; *Ferrisia milleri* Kaydan and Gullan, 2012; *Ferrisia multiformis* Granara de Willink, 1991; *Ferrisia pitcairnia* Kaydan and Gullan, 2012; *Ferrisia quaintancii* (Tinsley, 1898); *Ferrisia setosa* (Lobdell, 1930); *Ferrisia terani* Williams and Granara de Willink, 1992; *Ferrisia uzinuri* Kaydan and Gullan, 2012; *Ferrisia virgata* (Cockerell, 1893); and *Ferrisia williamsi* Kaydan and Gullan, 2012 (Kaydan & Gullan 2012). These 18 species were the results of Kaydan & Gullan (2012) revision on a group of eight species described by Williams (1996).

In Indonesia, the only striped mealybug, *F. virgata*, is presented (Sartiami et al. 1999; Williams 2004). This species was first recorded as intercepted species on *Zingiber officinale* Roscoe (Zingiberaceae) by quarantine inspections of San Pedro, the USA in 1992. Then, the species was reported found in Java, Sulawesi,

Sumba as polyphagous pests species on *Annona squamosa* L. (Annonaceae), *Azadiractha indica* A. Juss (Meliaceae), *Durio kutejensis* Becc. (Bombacaceae), *Ficus* sp. (Moraceae), *Gossypium* sp. (Malvaceae), *Indigofera* sp., (Fabaceae), *Ipomoea* sp. (Convolvulacea), *Nephelium lappaceum* L. (Sapindaceae), and *Psidium guajava* L. (Myrtaceae) (Sartiami et al. 1999; Williams 1996, 2004). Recently, *F. virgata* predictably becomes a cosmopolitan group insect pest within a broad range of host plants around Indonesia, commonly introduced across the globe through trade or other human-migrated movements (Sartiami et al. 2016). The information on the widespread of *F. virgata* could be confused by other species since recent taxonomic revision of the genus *Ferrisia* was published and there is no more study about those species in Indonesia. Recently, Pacheco da Silva et al. (2019) re-identified some species in North-East Brazil and recorded *F. dasylirii* as a new country record.

Here we report *Ferrisia dasylirii* (Cockerell, 1896), a native species of arid zones in northern Mexico, that has not been recorded from Indonesia before. This report includes new information on the host range and distribution of the species in Indonesia.

MATERIALS AND METHODS

The specimens were collected from several host plant species growing around the site of Agricultural Faculty, the University of Bengkulu, Bengkulu city

(3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.). A sampling of different instars was done from Aug to Nov 2019. Similarly, sampling was also conducted from the same host plants species in Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.) and Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.), a part of municipals in Bengkulu Province. The species of *Ferrisia dasylirii* was collected on the following host plants: *Durio zibethinus* Murray (Malvaceae), *Gliricidia sepium* (Jacq.) (Fabaceae), *Hibiscus* spp. (Malvaceae), *Psidium guajava* L. (Myrtaceae), *Solanum torvum* Swartz (Solanaceae), and *Theobroma cacao* L. (Malvaceae).

The specimens were preserved in 70% ethanol and slide-mountings were prepared with methods refers to Kosztarab & Kozár (1988). Species identification was performed under a light microscope and with the guide of keys mentioned in Kaydan & Gullan (2012). The slide-mounted of *Ferrisia dasylirii* adult females and nymphs are deposited in the mini Insect Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia). Slide numbers: 300-305/1/2020. All specimens obtained were shown in Figure 1.A－C.

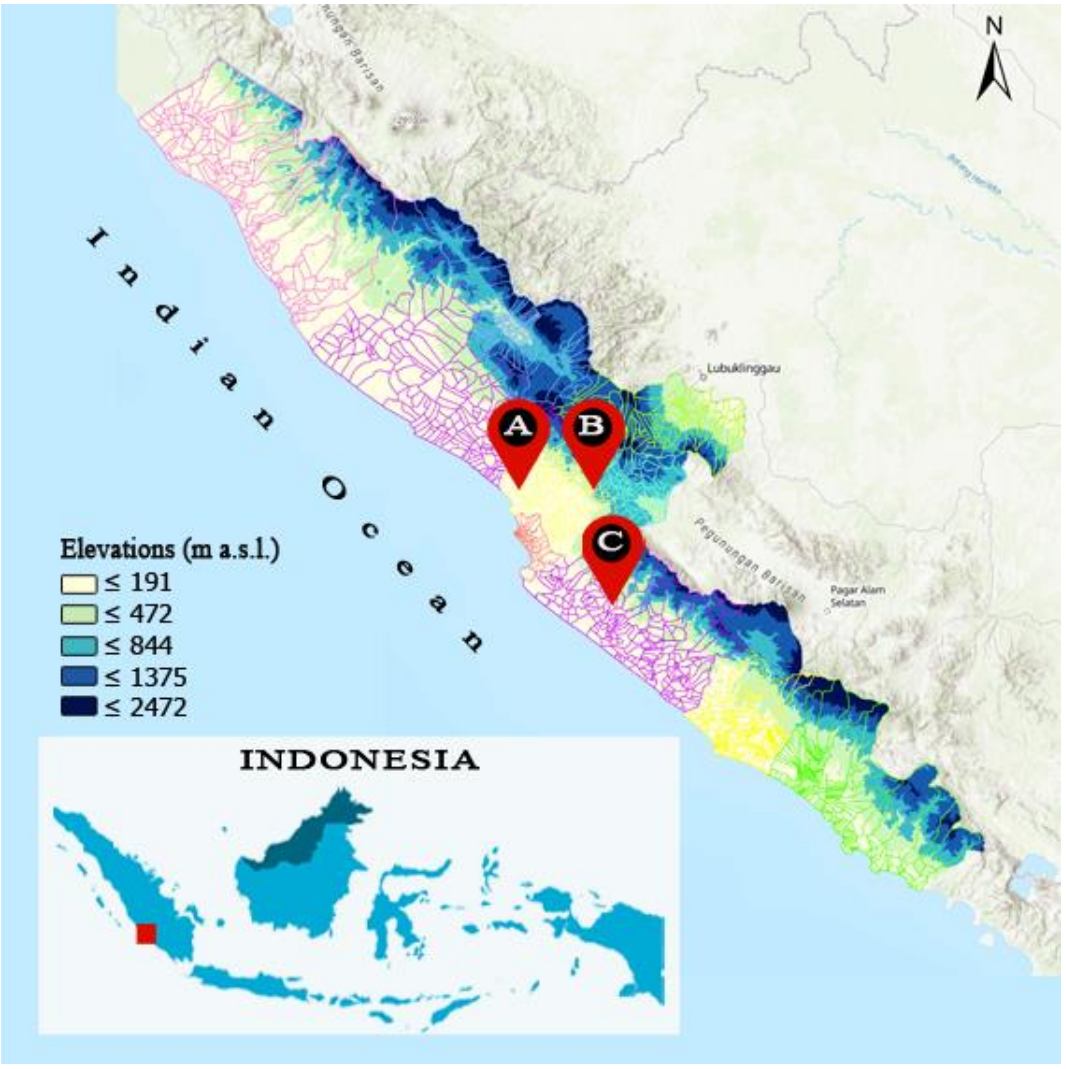

Figure 1. Sampling locations of *Ferrisa dasylirii* (Cockerell, 1896): A. Bengkulu city (3°45'33.0"S, 102°16'10.1"E, 50 m a.s.l.); B. Bengkulu Tengah regency (3°42'22.7"S 102°30'11.8"E, 550 m a.s.l.); C. Seluma regency (3°59'07.1"S 102°25'37.4"E, 60 m a.s.l.).

RESULTS AND DISCUSSION

Result found that the *G. sepium* grown as a shade tree for some cultivated plants such as *T. cacao* and *Coffea canephora* (Rubiaceae) as well as "living

supporting tree" for *Piper nigrum* (Piperaceae) bearing a more abundant population of *F. dasylirii* than the other trees where the insect was collected (Figure 2). As such, *G. sepium* should be further evaluated to ascertain whether the plant serves as a reservoir or an alternative host plant for such a scale pest.

Figure 2. Nymphs and adults of *Ferrisa dasylirii* (Cockerell, 1896) on the leaf lower surface of *Gliricidia sepium* (Jacq.) (Fabaceae).

In nature, *F. dasylirii* (Figure 3.A) is mostly similar to *F. virgata* in form and size. The species has eight segments antennae with ≥595 μm long; elongate body oval with 3.10–5.30 mm long and 1.30–2.86 mm wide (Figure 3.B) observed the bodies of females cleared of soft contents and the cuticles stained and mounted on microscope slides. They could be easily distinguished from other taxa by their discoidal pores associated with the sclerotized area around the rim of dorsal enlarged tubular ducts on the abdomen. Discoidal pores are situated on the sclerotized area's outer margin and often with pore and its surrounding sclerotization projecting out from the margin (Figure 3.C, D).

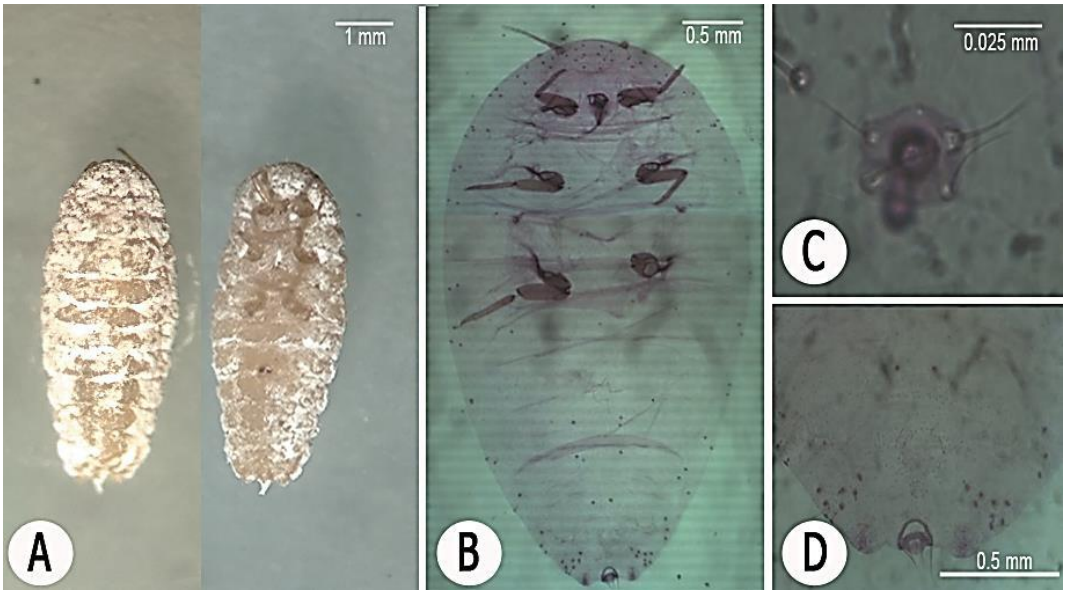

Figure 3. Female of *Ferrisa dasylirii* (Cockerell, 1896): A. In life specimens; B. Slide-mounted specimens; C. Tubular duct with a minute discoidal pore touching the outer margin of the sclerotised area; D. Multilocular disc pores in a row on abdominal segment VI-VIII.

Ferrisia dasylirii is already spread into 22 countries where Indonesia is now the second Southeast Asia country reported to have *F. dasylirii* after Malaysia. Sartiami et al. (2016) firstly reported the species as an invasive species attacking *Hibiscus rosasisnensis* L. and *Hibiscus* spp. (Malvaceae) in Selangor and Kuala Lumpur, Malaysia. The exact time of arrival of *F. dasylirii* in Indonesia is unknown, but it is probably unintentionally introduced here by international transportation and trade from Malaysia to Indonesia. However, the abundance of *F. dasylirii* in some plants in the different territories with various infestation outbreak levels indicates that the species was probably introduced some years before its report. Besides, the species probably have already existed for a long time ago since they are confused by *F. virgata*.

The economic losses of *F. dasylirii* have not clearly stated, but the species was reported currently as a potential pest of *Salicornia bigelovii* (Torr.) (Chenopodiaceae) feed and reproduced in 10% of commercial plantations at Baja California Sur, Mexico (Magallón-Servín et al. 2019). It should be aware that the mealybug species are known as the most common invaders of new geographical areas and capable of becoming a significant pest and virus transmission vectors in many cropping systems (Hodgson 1994), and as such, further study is urgently needed.

The slide-mounted adult females of *Ferrisia* species in southern Asia can be distinguished from each other according to the following key (after Williams 2004):

1. Multilocular disc pores either absent from abdominal segment VI, or occasionally numbering 1-3. Dorsal duct each with a rim about the same size as a multilocular disc pore or smaller, with setae situated either adjacent to the rim or just outside it..... ***malvastra*** (McDaniel, 1962)

- Multilocular disc pores present in a row on abdominal segment VI numberings at least 8. Dorsal duct each with rim larger than a multilocular disc pore, containing setae situated within border of the rim ..... (2)

2. Most discoidal pores associated with the sclerotized area around rim of a dorsal enlarged tubular duct with a minute discoidal pore just touching outer margin of sclerotized area, to projecting outside of margin (Figure 3.C).... .... ***dasylirii*** (Cockerell, 1896)

- Enlarged tubular duct with a minute discoidal pore not touching the sclerotized rim of duct opening; pore position varies from entirely within the sclerotized area ... . ***virgata*** (Cockerell, 1893)

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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