



1 **First Record of the Scale Insect, *Rastrococcus tropicasiaticus* Williams (Hemiptera:**
2 **Pseudococcidae) in Indonesia**

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7 **ABSTRACT**

8 The presence of *Rastrococcus tropicasiaticus* Williams (Hemiptera: Pseudococcidae) on woody plants
9 in Indonesia is recorded. It was found on *Azadirachta excelsa* (Meliaceae), *Cerbera manghas*
10 (Apocynaceae), *Dimocarpus longan* (Sapindaceae), *Ficus* sp. (Moraceae), and *Tectona grandis* L.
11 (Lamiaceae) in Bengkulu province, southern Sumatra. The highest scale incidence was found on *A.*
12 *excelsa* and *C. manghas* with 80% and 30% of attacks, respectively. This is the first report of *R.*
13 *tropicasiaticus* in Indonesia.

14 **Key words:** Biodiversity, host plant, insect pests, mealybugs, taxonomy.

15 **INTRODUCTION**

16 Pseudococcidae is the second species-rich family of Coccoidea after Diaspididae (Garcia et al., 2016).
17 This family includes many polyphagous species that are common invaders of new geographical areas
18 and potential to become pests in many cropping systems (Hodgson, 1994). They feed on plant juices
19 and many are found on greenhouse plants, house plants and trees in almost all parts of the plants from
20 roots to fruits (Williams, 2004). It is sometimes not possible to save a badly damaged plant since the
21 scales promote sooty mold and transmit plant viruses (Franco et al., 2009, Daane et al., 2012). To
22 date, two subfamilies and 256 genera within about 2,032 described species have been described in this

23 family (Garcia et al., 2016). In Indonesia, however, about 103 species of Pseudococcidae have been
24 recorded, of which *Pseudococcus* Westwood, *Paraputo* Laing, and *Rastrococcus* Ferris are the most
25 species rich genera (Garcia et al., 2016) and harmful.

26 The genus *Rastrococcus* was first described by Ferris (1954). *Rastrococcus* includes many
27 economically important species, and belongs to the so called *Phenacoccus* group (Williams, 2004). It
28 is also a spectacular genus of Pseudococcidae that appears to have no close relatives because it is the
29 only genus with unique truncate-conical cerarian setae. At present, the natural distribution of the
30 genus is southern Asia, China and the tropical Pacific region through Australia and New Zealand. In
31 total, there are 31 species of *Rastrococcus* over the world (Garcia et al., 2019). However, in Indonesia,
32 the genus *Rastrococcus* is composed of 12 species, namely *Rastrococcus balinensis* Buchner
33 (Buchner, 1957), *Rastrococcus biggeri* Williams & Watson (Williams & Watson, 1988),
34 *Rastrococcus chinensis* Williams (Williams, 1989), *Rastrococcus expeditionis* Williams (Gavrilov-
35 Zimin, 2013), *Rastrococcus invadens* Williams (Ben-Dov, 1994), *Rastrococcus jabadiu* Williams
36 (Williams, 1989), *Rastrococcus kendariensis* Gavrilov (Gavrilov-Zimin, 2013), *Rastrococcus*
37 *neoguineensis* Williams & Watson (Williams, 1989), *Rastrococcus rubellus* Williams (Williams,
38 2004), *Rastrococcus spinosus* (Robinson) (Williams, 2004), *Rastrococcus vicorum* Williams &
39 Watson (Williams, 1989), and *Rastrococcus wilsoni* Williams (Williams, 2004).

40 *Rastrococcus tropicasiatricus* Williams (Hemiptera: Pseudococcidae) known from southern Asia and
41 hitherto recorded from Malaysia (Malaya, Sabah, Sarawak), Philippines, Thailand, and Vietnam
42 (William, 2004). Known host plants are mostly woody plant trees of the Anacardiaceae (*Mangifera*
43 *indica* L.), Meliaceae (*Azadirachta indica*), Moraceae (*Ficus* sp., *Ficus grossularioides*), Rutaceae
44 (*Citrus* sp.), and Sapindaceae (*Nephelium lappaceum*), but has been also reported associated with a
45 wild grass (Poaceae) (Williams, 2004).

MATERIALS AND METHODS

The survey studies were conducted in Bengkulu province in 2019 to 2020. Specimens were collected randomly on some woody plants such as *Azadirachta excelsa* (Jack) M. Jacobs (Meliaceae), *Cerbera manghas* (Apocynaceae), *Dimocarpus longan* (Sapindaceae), *Ficus* sp. (Moraceae), and *Tectona grandis* L. (Lamiaceae) spreading in Bengkulu city, Bengkulu Tengah district, Kepahiang district and Seluma district, a part of southern Sumatra.

The specimens were preserved in 70% ethyl alcohol and slide-mounts were prepared following the method of Kosztarab and Kozár (1988). Species identification was made by using light microscopy and identified according to the keys in Williams (2004). The slide-mounted specimens of *R. tropicasiatricus* females and nymphs are deposited in the mini Insects Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia) with slide number series: AZ330-342. The incidence of *R. tropicasiatricus* was calculated by counting infested plants and dividing by the total number of plants in the quadrat.

RESULTS AND DISCUSSION

Rastrococcus tropicasiatricus Williams, 2004

Material examined. Bengkulu province: 21 ♀, Muara Bangkahulu, campus park of University of Bengkulu, Bengkulu city, *A. excelsa*, *C. manghas*, *D. longan*, *Ficus* sp. and *T. grandis*, 20 m a.s.l., 03°45'33"S, 102°16'10"E, 10.ii.2019 & 15.iii.2020, Coll. A. Zarkani, Djamilah, E. Depari, Nadrawati, Priyatiningsih, S. Ginting & T. Sunardi (AZ224; AZ330-335); 3 ♀, Air Periukan, Seluma district, *A. excelsa*, 10 m a.s.l., 3°59'07"S, 102°25'37"E, 10.iv.2020, Coll. A. Zarkani, (AZ336); 9 ♀, Kabawetan, Kepahiang district, *A. excelsa*, *D. longan*, and *Ficus* sp., 800 m a.s.l, 03°34'54.4"S, 102°38'33"E, 12.vi.2020, Coll. A. Zarkani (AZ337-339); 9 ♀, Taba Penanjung, Bengkulu Tengah district, *A.*

68 *excelsa*, *C. manghas* and *D. longan*, 550 m a.s.l., 03°42'22"S, 102°30'11"E, 12.vi.2020 Coll. A.
69 Zarkani (AZ340-342).

70 **Diagnosis.** In life (after Williams, 2004), the body of the adult female is covered in copious secretion
71 of white wax and resembling a species of *Icerya* (Monophlebidae). In slide-mounted specimens, the
72 body of adult female is broadly oval about 4.25 mm long and 2.75 mm wide. Antennae with 9
73 segments, legs well developed, long and slender. Claw about 45 µm long, stout, with a denticle.
74 Circulus wide with a wrinkled surface, lying on borders of abdominal segment III. Ostiole represented
75 by posterior pair only, with inner edges of lips sclerotized, each lip with a few trilocular pores. Dorsal
76 surface with short and almost conical setae whilst ventral surface with normal flagellate setae. Cerarii
77 always conspicuous, each bearing numerous truncate-conical setae, each cerarian seta flat at the apex.
78 Cerarii numbering 17 pairs, each situated on a weak sclerotized base, mostly each smaller in area than
79 the anal ring. All cerarii containing trilocular pores with rim and loculi well defined on each pore.

80 **Comments.** *Rastrococcus tropicasiatricus* is a new record for the scale insect fauna of Indonesia. In
81 mid-February 2019, the scale infestation firstly became apparent when the female insects were found
82 producing copious amounts of white powdery wax secretion which covered the leaves, tree trunk and
83 branches hanging from small trees (figure 1). In the sapling stages, leaves of plants curl, turn yellow
84 and die due to high infestation of the scales.

85 The presence of *R. tropicasiatricus* was first observed on the trunk and branches of *Cerbera manghas*
86 (*Apocynaceae*) and *Azadirachta excelsa* (*Meliaceae*), respectively. These woody plants grow closely
87 to each other in one site of the main campus park of University of Bengkulu. *C. manghas* is an
88 interesting fruit plant with aromatic flower used in gardening displays whereas *D. molissimum* is an
89 aromatic woody plant species that is most commonly used for construction wood and furniture in
90 Indonesia (Gan et al., 1999; Dewi et al., 2017). Furthermore, the species is also found growing as a
91 woody plant in different latitudes and sites in Bengkulu province.

92 The morphology of *R. tropicasiaticus* is very close to *R. biggeri*, described from the Solomon Islands,
93 in possessing marginal multilocular disc pores on the venter of the head, thorax and abdomen, and
94 dorsal large-type quinquelocular pores. However, in *R. biggeri* the multilocular disc pores are
95 numerous on the head and thorax, and extend in a zone to the margins whilst in *R. tropicasiaticus* the
96 marginal multilocular disc pores are few. The species is also related to *R. jabadiu* by having large-type
97 quinquelocular pores on dorsum but they can be easily differentiated by the presence of multilocular
98 disc pores on the ventral margin of thorax (Figure 2a-c).

99 The incidence of *R. tropicasiaticus* on some woody plants varied. Throughout the year 2020,
100 simultaneous outbreaks of *R. tropicasiaticus* were found on *A. excelsa* and *C. manghas* reaching the
101 highest point of 80% and 30%, respectively. Furthermore, other plants such as *D. longan*, *Ficus* sp.
102 and *T. grandis* were also found attacked by *R. tropicasiaticus* with about 1% to 5% incident. An
103 outbreak of *Rastrococcus* sp. was reported by Ginting et al. (2020) attacking *Dysoxylum mollissimum*
104 Blume (Meliaceae) referred to *A. excelsa* which is probably the same species as *R. tropicasiaticus*.
105 This species is a polyphagous insect widespread in southern Asia and it must be regarded as a
106 potential invasive species (Williams, 2004).

107 The exact time of arrival of *R. tropicasiaticus* in Indonesia is not clear. Hitherto it was recorded on
108 woody plants and a wild grass in southern Asia: Malaysia (Selangor; Kedah; Sabah; Serawak),
109 Philippines (Luzon; Manila), Thailand (Rayong; Canthaburi), and Vietnam (Hanoi). In this study, the
110 distribution of the species is updated to included Bengkulu, Sumatra Island (Figure 3). It may have
111 been introduced unintentionally through the international transportation and trade from its known
112 range to Indonesia. It is also possible that it may have been carried by winds and storms from
113 Malaysia to Indonesia. The presence of *R. tropicasiaticus* on various host plants in Bengkulu and high
114 prevalence levels of the mealybug indicate that the species was probably introduced some years
115 before this report.

116 Further studies are needed to clarify the phenology, female fecundity, search for the presence of
117 males, identify predators and parasitoids, including the impact of ladybird beetle species on this newly
118 established scale insect. It would be interesting to determine its distribution, dynamics in its
119 colonization phase, reproductive biology and host plants in Indonesia.

120 CONCLUSION

121 The presence of mealybug species, *R. tropicasiatricus* as a first country recorded in Indonesia is
122 reported. It was found on woody plants such as *A. excelsa*, *C. manghas*, *D. longan*, *Ficus* sp., and *T.*
123 *grandis* in Bengkulu province, southern Sumatra. Of these, all plants except *Ficus* sp. are the new hosts
124 of *R. tropicasiatricus*.

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129 12/5/2020.

130 CONFLICT OF INTEREST

131 The authors declare no conflict of interest.

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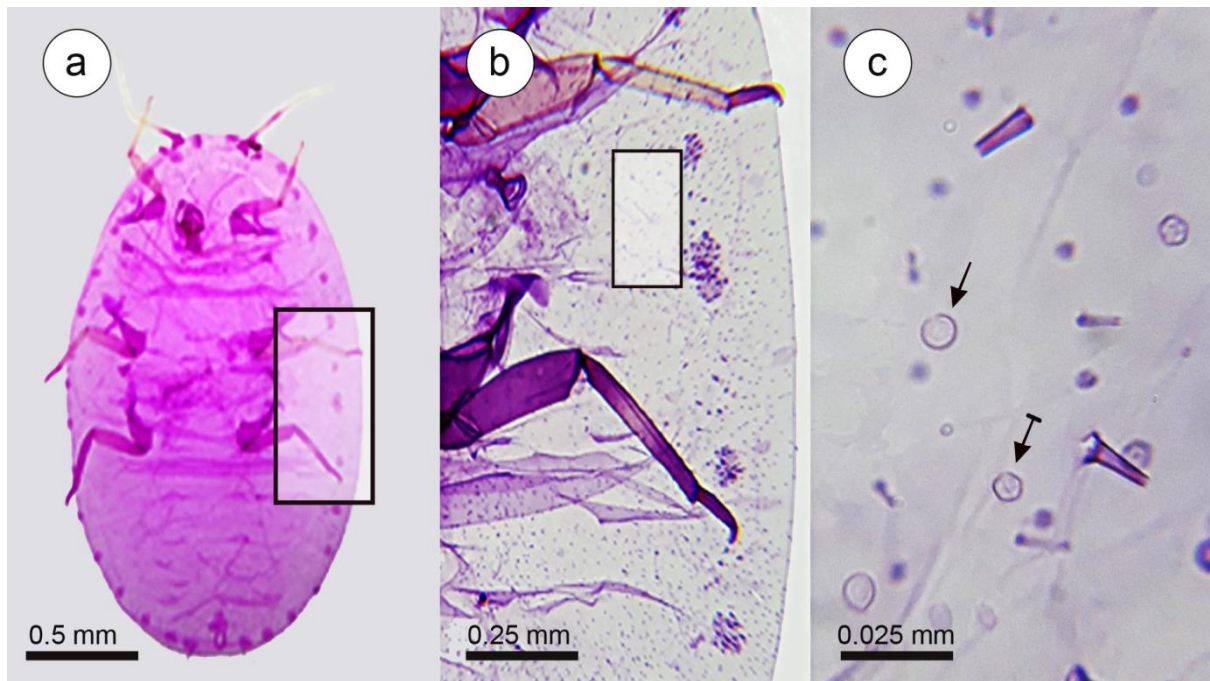
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170

171 **Figure 1.** Nymphs and adults of *Rastrococcus tropicasiaticus* Williams on a tree of *Azadirachta*
 172 *excelsa* (Jack) M. Jacobs (Meliaceae).



173

174 **Figure 2.** A stained slide-mounted specimen of *Rastrococcus tropicasiaticus* Williams: a. Female
 175 specimen with 17 pairs of cerarii; b. Ventral margin of thorax; c. Multilocular disc pores (↓) on ventral
 176 margin of thorax with quinquelocular pores (↯) present on dorsum.



177

178 **Figure 3.** Updated distribution of *Rastrococcus tropicasiaticus* Williams in southeast Asia.

179

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15 **ABSTRAK**

16 **INTRODUCTION**

17 Pseudococcidae is the second species-rich family of Coccoidea after Diaspididae (Garcia et al., 2016).
18 This family includes many polyphagous species that are common invaders of new geographical areas
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scales promote sooty mold and transmit plant viruses (Franco et al., 2009, Daane et al., 2012). To date, two subfamilies and 256 genera within about 2,032 described species have been described in this family (Garcia et al., 2016). In Indonesia, however, about 103 species of Pseudococcidae have been recorded, of which *Pseudococcus* Westwood, *Paraputo* Laing, and *Rastrococcus* Ferris are the most species rich genera (Garcia et al., 2016) and harmful.

The genus *Rastrococcus* was first described by Ferris (1954). *Rastrococcus* includes many economically important species, and belongs to the so called *Phenacoccus* group (Williams, 2004). It is also a spectacular genus of Pseudococcidae that appears to have no close relatives because it is the only genus with unique truncate-conical cerarian setae. At present, the natural distribution of the genus is southern Asia, China and the tropical Pacific region through Australia and New Zealand. In total, there are 31 species of *Rastrococcus* over the world (Garcia et al., 2019). However, in Indonesia, the genus *Rastrococcus* is composed of 12 species, namely *Rastrococcus balinensis* Buchner (Buchner, 1957), *Rastrococcus biggeri* Williams & Watson (Williams & Watson, 1988), *Rastrococcus chinensis* Williams (Williams, 1989), *Rastrococcus expeditionis* Williams (Gavrilov-Zimin, 2013), *Rastrococcus invadens* Williams (Ben-Dov, 1994), *Rastrococcus jabadiu* Williams (Williams, 1989), *Rastrococcus kendariensis* Gavrilov (Gavrilov-Zimin, 2013), *Rastrococcus neoguineensis* Williams & Watson (Williams, 1989), *Rastrococcus rubellus* Williams (Williams, 2004), *Rastrococcus spinosus* (Robinson) (Williams, 2004), *Rastrococcus vicorum* Williams & Watson (Williams, 1989), and *Rastrococcus wilsoni* Williams (Williams, 2004).

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R. balinensis

And as well the rest of the species

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RESULTS AND DISCUSSION

Rastrococcus tropicasiatricus Williams, 2004

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92 growing as a woody plant in different latitudes and sites in Bengkulu province.

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108 The exact time of arrival of *R. tropicasiaticus* in Indonesia is not ~~clear~~precise. Hitherto it was recorded
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121 **CONCLUSION**

122 The presence of mealybug species, *R. tropicasiatricus* as a first country recorded in Indonesia is
123 reported. It was found on woody plants such as *A. excelsa*, *C. manghas*, *D. longan*, *Ficus* sp., and *T.*
124 *grandis* in Bengkulu province, southern Sumatra. Of these, all plants except *Ficus* sp. are the new hosts
125 of *R. tropicasiatricus*.

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What do you mean by, as a first
country ?
The sentence seems confusing

126 **ACKNOWLEDGEMENTS**

127 The authors are grateful to Dr. Takumasa Kondo (Corporación Colombiana de Investigación
128 Agropecuaria - Agrosavia, Colombia), for critical reading of the manuscript. This project was made
129 possible by the Faculty of Agriculture, University of Bengkulu. Cooperative Agreement No.
130 12/5/2020.

131 **CONFLICT OF INTEREST**

132 The authors declare no conflict of interest.

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133 **REFERENCES**

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135 *Coccoidea: Pseudococcidae and Putoidae) with Data on Geographical Distribution, Host Plants,*
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140 *Phyllanthus* spp. in agroforestry system. *Biodiversitas* 18(2): 494-499.
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158 Pseudococcidae) on *Dysoxylum mollissimum* Blume in campus forest of Bengkulu University.
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Figure 1. Nymphs and adults of *Rastrococcus tropicasiaticus* Williams on a tree of *Azadirachta excelsa* (Jack) M. Jacobs (Meliaceae).

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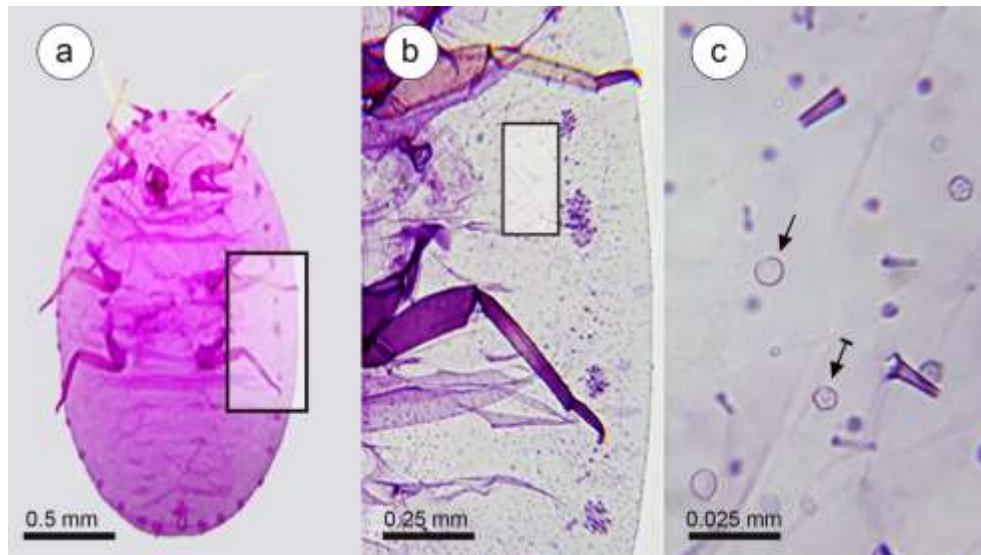


Figure 2. A stained slide-mounted specimen of *Rastrococcus tropicasiaticus* Williams: a. Female specimen with 17 pairs of cerarii; b. Ventral margin of thorax; c. Multilocular disc pores (↓) on ventral margin of thorax with quinquelocular pores (↓) present on dorsum.



Figure 3. Updated distribution of *Rastrococcus tropiciasiaticus* Williams in southeast Asia.

FIRST RECORD OF THE MEALYBUG, *Rastrococcus tropicasiaticus* WILLIAMS (HEMIPTERA: PSEUDOCOCCIDAE) IN INDONESIA

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ABSTRACT

Rastrococcus is a spectacular genus with no close relatives of the family Pseudococcidae that have unique truncate-conical cerarian setae. The survey studies were conducted through random observation on some woody plants in Bengkulu province, southern Sumatra island from 2019 to 2020. The study recorded a presence of *Rastrococcus tropicasiaticus* Williams (Hemiptera: Pseudococcidae) in Indonesia for the first time. It was found on *Azadirachta excelsa* (Meliaceae), *Cerbera manghas* (Apocynaceae), *Dimocarpus longan* (Sapindaceae), *Ficus* sp. (Moraceae), and *Tectona grandis* L. (Lamiaceae). The highest mealybug incidence was found on *A. excelsa* and *C. manghas* with 80% and 30% of attacks, respectively.

Keywords: Biodiversity, host plant, insect pests, mealybugs, taxonomy

ABSTRAK

Rastrococcus adalah genus tanpa hubungan terdekat dari famili Pseudococcidae yang memiliki duri serari unik yang tumpul dan pendek. Kajian tinjauan dilakukan melalui pemerhatian secara rawak terhadap beberapa tanaman berkayu di provinsi Bengkulu, wilayah selatan pulau Sumatera dari tahun 2019 hingga 2020. Kajian ini pertama kali merekodkan kehadiran spesies koya *Rastrococcus tropicasiaticus* Williams (Hemiptera: Pseudococcidae) di Indonesia. Spesies ini dijumpai hidup pada tanaman *Azadirachta excelsa* (Meliaceae), *Cerbera manghas* (Apocynaceae), *Dimocarpus longan* (Sapindaceae), *Ficus* sp. (Moraceae), dan *Tectona grandis* L. (Lamiaceae). Kejadian serangan koya tertinggi dijumpai pada *A. excelsa* dan *C. manghas* dengan masing-masing 80% dan 30% tingkat serangan.

Kata kunci: Kepelbagaian biologi, tumbuhan perumah, serangga perosak, koya, taksonomi

INTRODUCTION (I SUGGEST ADD N CITE STUDIES OF DEWI AS THE LATEST RECORD OF HIS FAMILIES FROM INDONESIA. OTHERWISE WHAT THEY SAID AS 1ST RECORD IS NOT VALID -- COMMENT FROM THE EDITORIAL BOARD)

Pseudococcidae is the second species-rich family of Coccoidea after Diaspididae (García et al. 2016). This family includes many polyphagous species that are common invaders of new geographical areas and potential to become pests in many cropping systems (Hodgson 1994; Nurkomar et al. 2021). They feed on plant juices and many are found on greenhouse plants, house plants and trees in almost all parts of the plants from roots to fruits (Williams 2004). It is sometimes not possible to save a badly damaged plant since the mealybugs promote sooty mold and transmit plant viruses (Daane et al. 2012; Franco et al. 2009). To date, two subfamilies and 256 genera within about 2,032 species have been described in this family (García et al. 2016). In Indonesia about 103 species of Pseudococcidae have been recorded, of which *Pseudococcus* Westwood, *Paraputo* Laing, and *Rastrococcus* Ferris are the most species-rich and harmful genera (García et al. 2016).

The genus *Rastrococcus* was first described by Ferris (1954). It is a spectacular genus of Pseudococcidae that appears to have no close relatives because it is the only genus with unique truncate-conical cerarian setae (García et al. 2016). At present, the natural distribution of the genus is southern Asia, China and the tropical Pacific region through Australia and New Zealand. In total, there are 31 species of *Rastrococcus* over the world (García et al. 2016). In Indonesia, the genus *Rastrococcus* is composed of 14 species, namely *R. balinensis* Buchner (Buchner 1957), *R. biggeri* Williams & Watson (Williams & Watson 1988), *R. chinensis* Williams (Williams 1989), *R. expeditionis* Williams (Gavrilov-Zimin 2013), *R. franssenii* Buchner (Buchner, 1957), *R. invadens* Williams (Ben-Dov 1994), *R. jabadiu* Williams (Williams 1989), *R. kendariensis* Gavrilov (Gavrilov-Zimin 2013), *R. neoguineensis* Williams & Watson (Williams 1989), *R. pseudospinosus* Buchner (Buchner, 1957), *R. rubellus* Williams (Williams 2004), *R. spinosus* (Robinson) (Williams 2004), *R. vicorum* Williams & Watson (Williams 1989), and *R. wilsoni* Williams (Williams 2004).

Rastrococcus tropicasiatricus Williams (Hemiptera: Pseudococcidae) is known from southern Asia and hitherto recorded from Malaysia (Kedah, Pahang, Sabah, Sarawak, Selangor), Philippines, Thailand, and Vietnam (William 2004). Known host plants are mostly woody plant trees of the Anacardiaceae (*Mangifera indica* L.), Meliaceae (*Azadirachta indica*), Moraceae (*Ficus* sp., *Ficus grossularioides*), Rutaceae (*Citrus* sp.), and Sapindaceae (*Nephelium lappaceum*), but has been also reported associated with a wild grass (Poaceae) (Williams 2004).

MATERIALS AND METHODS

The survey studies were conducted in Bengkulu province from 2019 to 2020. Specimens were collected through random observation on some woody plants such as *Azadirachta excelsa* (Jack) M. Jacobs (Meliaceae), *Cerbera manghas* (Apocynaceae), *Dimocarpus longan* (Sapindaceae), *Ficus* sp. (Moraceae), and *Tectona grandis* L. (Lamiaceae) spreading in Bengkulu city, Bengkulu Tengah district, Kepahiang district and Seluma district, a part of southern Sumatra.

The specimens were preserved in 70% ethyl alcohol and slide-mounts were prepared following the method of Kosztarab and Kozár (1988). Species identification was made using light microscopy and identified according to the keys in Williams (2004). The slide-mounted specimens of *R. tropicasiatricus* females and nymphs were deposited in the mini Insects

Museum, Plant Protection Department, Faculty of Agriculture, University of Bengkulu (Sumatra-Indonesia) with slide number series: AZ330-342. The incidence of *R. tropicasiatricus* was calculated by counting total infested plants divided by the total number of plants in the size of a quadrant.

RESULTS AND DISCUSSION

Rastrococcus tropicasiatricus Williams, 2004

Material examined

Bengkulu province: 21 ♀, Muara Bangkahulu, campus park of University of Bengkulu, Bengkulu city, *A. excelsa*, *C. manghas*, *D. longan*, *Ficus* sp. and *T. grandis*, 20 m a.s.l., 03°45'33"S, 102°16'10"E, 10.ii.2019 & 15.iii.2020, Coll. A. Zarkani, Djamilah, E. Depari, Nadrawati, Priyatiningsih, S. Ginting & T. Sunardi (AZ224; AZ330-335); 3 ♀, Air Periukan, Seluma district, *A. excelsa*, 10 m a.s.l., 3°59'07"S, 102°25'37"E, 10.iv.2020, Coll. A. Zarkani, (AZ336); 9 ♀, Kabawetan, Kepahiang district, *A. excelsa*, *D. longan*, and *Ficus* sp., 800 m a.s.l., 03°34'54.4"S, 102°38'33"E, 12.vi.2020, Coll. A. Zarkani (AZ337-339); 9 ♀, Taba Penanjung, Bengkulu Tengah district, *A. excelsa*, *C. manghas* and *D. longan*, 550 m a.s.l., 03°42'22"S, 102°30'11"E, 12.vi.2020 Coll. A. Zarkani (AZ340-342).

Diagnosis

Alive specimen (after Williams 2004), the body of the adult female is covered in the copious secretion of white wax and resembling a species of *Icerya* (Monophlebidae). In slide-mounted specimens, the body of the adult female is broadly oval, about 4.25 mm long and 2.75 mm wide. Antennae with 9 segments, legs well developed, long and slender. Claw about 45 µm long, stout, with a denticle. Circulus wide with a wrinkled surface, lying on borders of abdominal segment III. Ostiole represented by posterior pair only, with inner edges of lips sclerotized, each lip with a few trilocular pores. Dorsal surface with short and almost conical setae whilst ventral surface with normal flagellate setae. Cerarii always conspicuous, each bearing numerous truncate-conical setae, each cerarian seta flat at the apex. Cerarii numbering 17 pairs, each situated on a weak sclerotized base, mostly each smaller in area than the anal ring. All cerarii containing trilocular pores with rim and loculi well defined on each pore.

Comments

Rastrococcus tropicasiatricus is a new record for the mealybug fauna of Indonesia. In mid-February 2019, the mealybug infestation firstly became apparent when the female insects were found producing copious amounts of white powdery wax secretion which covered the leaves, tree trunk and branches hanging from small trees (Figure 1). In the sapling stages, leaves of plants curl, turn yellow and die due to high infestation of the scales.

The presence of *R. tropicasiatricus* was first observed on the trunk and branches of *Cerbera manghas* and *Azadirachta excelsa*, respectively. These woody plants grow close to each other in one of the main campus parks of the University of Bengkulu. *Cerbera manghas* is an interesting fruit plant with aromatic flower used in gardening displays, whereas *D. molissimum* is an aromatic woody plant species that is most commonly used for the construction of wood and furniture in Indonesia (Dewi et al. 2017; Gan et al. 1999). Furthermore, the species is also found growing as a woody plant in different latitudes and sites in Bengkulu province.



Figure 1. Nymphs and adults of *Rastrococcus tropicasiaticus* Williams on a tree of *Azadirachta excelsa* (Jack) M. Jacobs (Meliaceae)

The morphology of *R. tropicasiaticus* is very close to *R. biggeri*, described from the Solomon Islands, in possessing marginal multilocular disc pores on the venter of the head, thorax and abdomen, and dorsal large-type quinquelocular pores (Williams 2004). However, in *R. biggeri* the multilocular disc pores are numerous on the head and thorax, and extend in a zone to the margins whilst in *R. tropicasiaticus* the marginal multilocular disc pores are few. The species is also similar to *R. jabadiu* by having large-type quinquelocular pores on the dorsum but they can be easily differentiated by the presence of multilocular disc pores on the ventral margin of the thorax (Figures 2a-c).

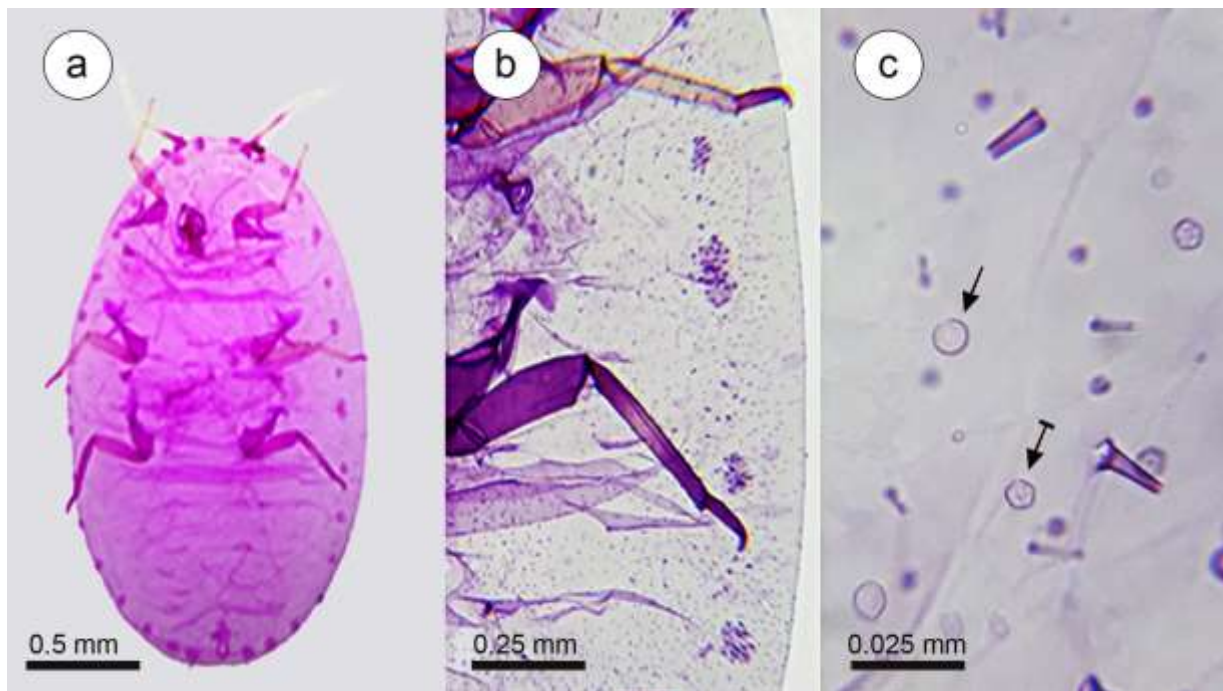


Figure 2. A stained slide-mounted specimen of *Rastrococcus tropicasiaticus* Williams: a. Female specimen with 17 pairs of cerarii; b. Ventral margin of thorax; c. Multilocular disc pores (↓) on ventral margin of thorax with quinquelocular pores (↯) present on dorsum

The incidence of *R. tropicasiaticus* on some woody plants varied. Throughout the year 2020, simultaneous outbreaks of *R. tropicasiaticus* were found on *A. excelsa* and *C. manghas* reaching the highest point of 80% and 30%, respectively. Furthermore, other plants such as *D. longan*, *Ficus* sp. and *T. grandis* were also found attacked by *R. tropicasiaticus* with about 1% to 5% incident. An outbreak of *Rastrococcus* sp. was reported by Ginting et al. (2020) attacking *Dysoxylum mollissimum* Blume (Meliaceae) which is probably the same species as *R. tropicasiaticus*. This species is a polyphagous insect widespread in southern Asia and it must be regarded as a potentially invasive species (García et al. 2016; Williams 2004).

The exact time of arrival of *R. tropicasiaticus* in Indonesia is not precise. Hitherto it was recorded on woody plants and wild grass in southern Asia: Malaysia (Selangor; Kedah; Sabah; Sarawak), Philippines (Luzon; Manila), Thailand (Rayong; Chanthaburi), and Vietnam (Hanoi) (García et al. 2016). In this study, the distribution of the species is updated to include Bengkulu, Sumatra Island (Figure 3). It may have been introduced unintentionally through the international transportation and trade from its known range to Indonesia. It is also possible that winds and storms may have carried it from Malaysia to Indonesia. The presence of *R. tropicasiaticus* on various host plants in Bengkulu and its high prevalence levels of the mealybug indicate that the species was very probably introduced some years before this report. This mealybug incidence is quite similar to the presence of *Ferrisa dasyliirii* (Cockerell) (Hemiptera: Pseudococcidae) reported a year before (Zarkani et al. 2020). Further studies are needed to clarify the phenology, female fecundity, search for the presence of males as well as identify predators and parasitoids on this newly established mealybug. It would be interesting to determine its distribution, dynamics in its colonization phase, reproductive biology and host plants in Indonesia.



Figure 3. Updated distribution of *Rastrococcus tropicasiaticus* Williams in Southeast Asia. Sources? and year.

CONCLUSION

A newly recorded mealybug species, *R. tropicasiaticus* has been reported from Indonesia. It was found on woody plants such as *A. excelsa*, *C. manghas*, *D. longan*, *Ficus* sp., and *T. grandis* in Bengkulu province, southern Sumatra. Of these, all plants except *Ficus* sp. are the new hosts of *R. tropicasiaticus*.

ACKNOWLEDGEMENTS

The authors are grateful to Dr. Takumasa Kondo (Corporación Colombiana de Investigación Agropecuaria - Agrosavia, Colombia), for critical reading of the manuscript. This project was made possible by the Faculty of Agriculture, University of Bengkulu. Cooperative Agreement No. 12/5/2020.

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Comment by Reviewer I	Action taken
Abstract	We increased the abstract and abstrak as well.
The second time mentioned, you can just shortened it, <i>R. balinensis</i>, And as well the rest of the species	We did, but in this paragraph <i>Rastrococcus balinensis</i> Buchner (Buchner, 1957) and the rest of species are first mentioned. So we tend to write completely.
Through random observation ? Please state it if it does	We fixed it, thanks.
What do you mean by this ? in life ? Alive specimen ?	Yes, It is Alive specimen. We fixed it.
Whenever it is the beginning of statement, genus need to be write in full.	We fixed it, thanks.
Please restructure, What do you mean by, as a	Done. A newly recorded mealybug species, <i>R. tropicasiaticus</i> has been reported from Indonesia.
Delete this part, CONFLICT OF INTEREST	We are wondering this is a compulsory in the Jurnal, so we are agree if it is not.
Please refer to SERANGGA format of reference writing	We did. Also two citations from <i>J. Serangga</i> are added.

Comment by Reviewer II	Action taken
My suggestion is to change scale insect into mealybugs (to make it easier for general reader), as this genus and family is fall under classification of mealybugs (common name).	We did, many thanks.
Revise some sentences in MS	Done.
Rastrococcus and Phenococcus are two different genera. Please explain what it is meant by Rastrococcus belongs to Phenococcus group?	We deleted this sentence.
Please specify Malaya?	We added Kedah, Pahang, Selangor.
The author never once mention about ladybird. So, what it is about ladybird and <i>R. tropicasiaticus</i>?	It is a missing sentence. We deleted this sentence.
The presence of mealybug species, <i>R. tropicasiaticus</i> as a first country recorded	REVISE: A newly recorded mealybug species, <i>R. tropicasiaticus</i> has been reported

in Indonesia is reported.	from Indonesia.
Figure 2. B: what is the function of rectangular box?	To emphasis the figures beside. Here, we deleted such rectangular boxes.