

A Report of Two Root Mealybugs (Hemiptera: Rhizoecidae) on Non-native Ornamental Plants in Korea

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우리나라 비자생 관엽식물에서 발견된 뿌리가루각지벌레 2종 (노린재목, 뿌리가루각지벌레과)의 보고

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ABSTRACT: Two root mealybugs, *Ripersiella multiporifera* Jansen and *Rhizoecus albidus* Goux, were collected on imported *Dracaena* plants (Dracaenaceae) and *Schlumbergera truncata* (Haw.) Moran (Cactaceae) grown in greenhouses in Korea. Both species were probably introduced into greenhouses via the plant trade. Therefore, it reiterates the need to focus attention on the detection of root mealybugs at the ports of entry to prevent their introduction and establishment in the Korean environment. In this paper, additional information for the two species is provided with diagnoses, photographs along with host plant and distribution data for accurate species identification.

Key words: *Ripersiella multiporifera*, *Rhizoecus albidus*, Greenhouse, Korea

초 록: 온실에서 재배되는 수입 드라세나묘목 및 계발선인장에서 채집된 뿌리가루각지벌레 2종 *Ripersiella multiporifera* Jansen 및 *Rhizoecus albidus* Goux를 우리나라에서 처음으로 보고한다. 이들은 수입된 식물을 통해 온실에 도입된 것으로 추정되며 우리나라에 추가적인 유입과 정착을 방지하기 위해 이들 종의 진단형질, 사진자료, 기주 및 분포정보를 제공하고자 한다.

검색어: *Ripersiella multiporifera*, *Rhizoecus albidus*, 온실, 한국

Root mealybugs (Rhizoecidae) have been frequently intercepted on imported plants according to records published by major importers of plant materials (Jansen, 2003; 2008; 2009). The species live hidden on root hairs and detection of small populations is difficult. As a result they could spread easily through international trade.

In Korea, various non-native ornamental plants have steadily been introduced from tropical and subtropical areas, bringing beauty and diversity to the landscape. Based on a database of

Pest Information System (PIS, 2012), 34,574 quarantine inspections of imported ornamental plants were made between 2008 and 2012; of these, dracaena plants (6.3%) were the highest number of imported ornamentals, followed by ficus plants (4.7%). Almost all of the plants originated from countries in the Oriental region. During these import inspections, at least 6 exotic species scale insects were detected on imported plant materials of these kinds (Park, 2010). Since 1980, international trade of plants has steadily increased so it is clear that the number of invasive species via imported plants has also increased considerably.

Recently, two root mealybugs were found on root hairs of

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imported *Dracaena* plants (Dracaenaceae) and *Schlumbergera truncata* (Haw.) Moran (Caryophyllaceae) grown in greenhouses of growers and suppliers. They were identified as *Ripersiella multiporifera* Jansen and *Rhizoecus albidus* Goux, respectively. It may have been overlooked previously owing to their living on roots and looking like white hyphae in appearance.

Ripersiella multiporifera was first found on roots of *Dracaena* plants imported from Vietnam by a plant inspector on 11.i.2011 at Chungcheongbukdo. This species was additionally intercepted five times on *Dracaena* plants from Vietnam, China and Malaysia at Korean ports of entry (PIS, 2012). Whereas, *Rhizoecus albidus* was first collected on roots of Christmas cactus (*Schlumbergera truncata* (Haw.) Moran) by a private owner on 6.xii.2012 at Gyeonggido; however, it was not intercepted during import inspections of imported plants at Korean ports of entry up to now.

Knowledge of the Korean fauna of the mealybugs (Pseudococcidae, Putoidae and Rhizoecidae) began in 1928 with the publication of Machida and Aoyama (cited from the publication of Paik (2000)); so far, forty four species have been reported (Paik, 2000; Kwon et al., 2003a; 2003b; Lee, 2010; Lee and Suh, 2011). Of these, only one species, *Geococcus oryzae* (Kuwana) belonging to Rhizoecidae has been recorded in Korea until now. The known most host plants of *Ripersiella multiporifera* and *Rhizoecus albidus* are Korean non-native species. Therefore, these species should be considered non-native species based on available bibliographic sources and records of interceptions.

In this paper, further information on root mealybugs, *Ripersiella multiporifera* Jansen and *Rhizoecus albidus* Goux, collected on non-native ornamentals being grown in greenhouses via the plant trade is provided with diagnoses, photographs, along with host plant and distribution data for accurate species identification.

Materials and Methods

All slide mounted specimens used for this paper are deposited in the Collection of Yeongnam Regional Office, Animal and Plant Quarantine and Inspection Agency in Busan, Korea. Terminology for morphological structures used in diagnoses follows that of Williams (2004). Photographs were taken using an AxioCam MRc5 camera through ZEISS Axio Imager M2

Microscope and a Leica M165C microscope with Delta pix camera. An asterisk(*) is used to indicate a new host and distribution records.

Results and Discussion

Species Account

Ripersiella multiporifera Jansen

Diagnosis. Field characters (Fig. 1A-B): Adults and nymphs oval elongate, white, 1-1.2 mm long. Slide-mounted characters (Fig. 1C-F): Anal lobes sclerotized on dorsum, each lobe bearing 1 long ventral seta and 2-3 long dorsal apical setae. Antennae 5-segmented. Eyes not present. Circuli present on abdominal segments II and III, shape truncate-conical, about same length as basal diameter. Multilocular disc pores numerous, present on dorsum in two rows at posterior edges of thoracic and abdominal segments and on venter at posterior edges of prothoracic and abdominal segments; a few present on venter of thorax; also distributed on dorsum and venter of head. Bitubular cerores of 2 distinct sizes present, each with wide truncate tubes. A large type present on dorsum only, usually distributed singly on margins, on midline and submarginal areas; a similar but smaller type of bitubular ceroris present on venter only, distributed in single transverse rows, mainly in middle of abdominal segments. Oral collar tubular ducts absent.

Material examined. Korea. Chungcheongbukdo: 296-16 Hakcheon-ri, Gangnae-myeon, Cheongwon-gun, 10 adult females and 5 nymphs, on the roots of *Dracaena* (greenhouse), import Vietnam, 11.i.2011 (Y.J. Gim); same data, except for 2 adult females and 14.v.2011. Gyeonggido: 182 Siheng-dong, Suseong-gu, Seongnam-si, 2 adult females, on the roots of *Dracaena* (greenhouse), import Indonesia, 29-xi-2011 (T.J. Gang). 3 adult females, on the roots of *Dracaena*, China, intercepted at Incheon sea-port, 27-ii-2012 (Y.M. Park). 3 adult females, on the roots of *Dracaena surculosa*, Malaysia, intercepted at Incheon sea-port, 22-iii-2012 (Y.M. Park). 2 adult females, on the roots of *Dracaena angustifolia*, Indonesia, intercepted at Incheon sea-port, 27-iii-2012 (Y.M. Park). 2 adult females, on the roots of *Dracaena* sp., Indonesia, intercepted at Incheon sea-port, 28-iii-2012 (Y.M. Park). 5 adult females, on the roots of *Dracaena* sp., Indonesia, intercepted at Incheon sea-port, 9-iv-2012 (Y.M. Park).

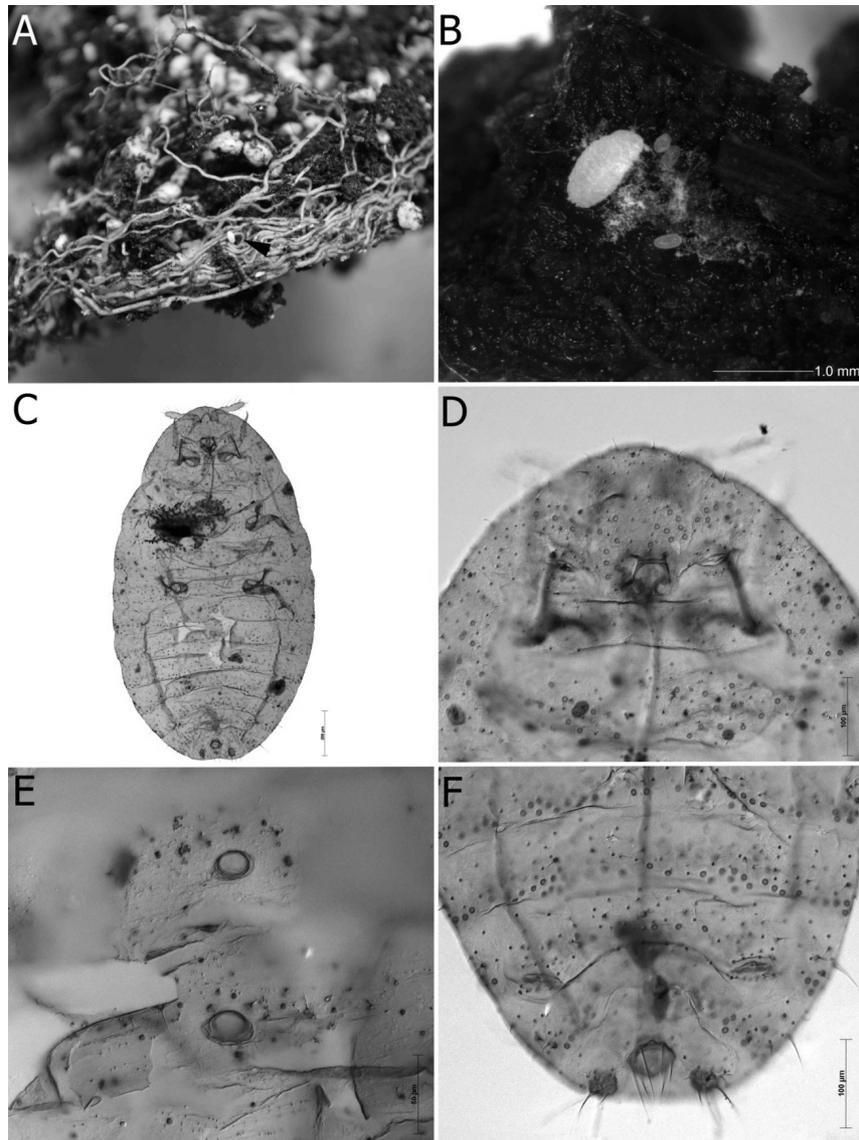


Fig. 1. *Ripersiella multiporifera* Jansen; A-B. habitus, C. female, D. head, E. circuli, F. abdomen.

Hosts. Asclepiadaceae: *Hoya kerrii*. Dracaenaceae: **Dracaena angustifolia*, **Dracaena surculosa*, **Dracaena* sp., *Sansevieria* sp. (Jansen, 2008).

Distribution. Oriental: *China, Indonesia, *Malaysia, Thailand (Jansen, 2008).

Biology. This mealybug develops on roots of its host plants (Jansen, 2008). It has not been reported as a pest (Ben-Dov et al., 2012).

Quarantine notes. This species was intercepted at Korean port-of-entry 5 times between 2011 and 2012.

Remarks. This species is similar to *R. saintpauliae* (Williams), but differs by presence of multilocular disc pores on dorsum

and venter of head.

***Rhizoecus albidus* Goux**

Rhizoecus (Pararhizoecus) albidus Goux, 1942. *Rhizoecus uniporus* Borchsenius and Tereznikova, 1959. *Rhizoecus gentianae* Panis, 1968.

Diagnosis. Field characters (Fig. 2A): Adults and nymphs oval elongate, white, 1.2-1.5 mm long. Slide-mounted characters (Fig. 2B-F): Anal lobes poorly developed on dorsum, each lobe bearing 1(2) long ventral seta and 1(2) long dorsal apical setae. Antennae 6-segmented. Circulus present on abdominal segment III; sclerotized truncate-cone shaped, with distal circular plate

containing 7 circular cells. Eye small. Cephalic plate present at anterior to clypeus; a quadrate sclerotized area containing 4 marginal setae. Multilocular disc pores absent. Tritubular cereres present each with truncate-conical tubes; on dorsum, not numerous, less than 3 on abdominal and thoracic segments; a few scattered on head; on venter, a single marginal pore on some of posterior abdominal segments; one on thorax and one between antennal base. Anal ring pores with numerous spiculae, tritubular cereres situated on margins somewhat larger than other areas and length of labium about 72-83 μm in the specimen examined.

Material examined. Korea. Gyeonggido: 2677 Duchang-ri, Wonsam-dong, Cheoin-gu, Yongin-si, 7 adult females and 3

nymphs, on the roots of *Schlumbergera truncata* (greenhouse), 6-xii-2012 (B.S. Ryu).

Hosts. Asteraceae: *Achillea* sp., *Bellis* sp., *Gazania* sp., *Helichrysum arenarium*. Cactaceae: **Schlumbergera truncata*. Caryophyllaceae: *Silene dioica*. Crassulaceae: *Crassula arborescens*. Cyperaceae: *Carex* sp. Ericaceae: *Calluna vulgaris*. Gentianaceae: *Gentiana*. Geraniaceae: *Pelargonium odoratissimum*. Lamiaceae: *Ballota nigra*. Plantaginaceae: *Plantago alpina*. Poaceae: *Agrostis vulgaris*, *Arrhenatherum elatius*, *Atropis* sp., *Corynephorus canescens*, *Cynodon dactylon*, *Deschampsia flexuosa*, *Deschampsia* sp., *Festuca ovina*, *Festuca sulcata*, *Festuca* sp., *Holcus lanatus*, *Stipa lessingiana* (Jansen, 2009;

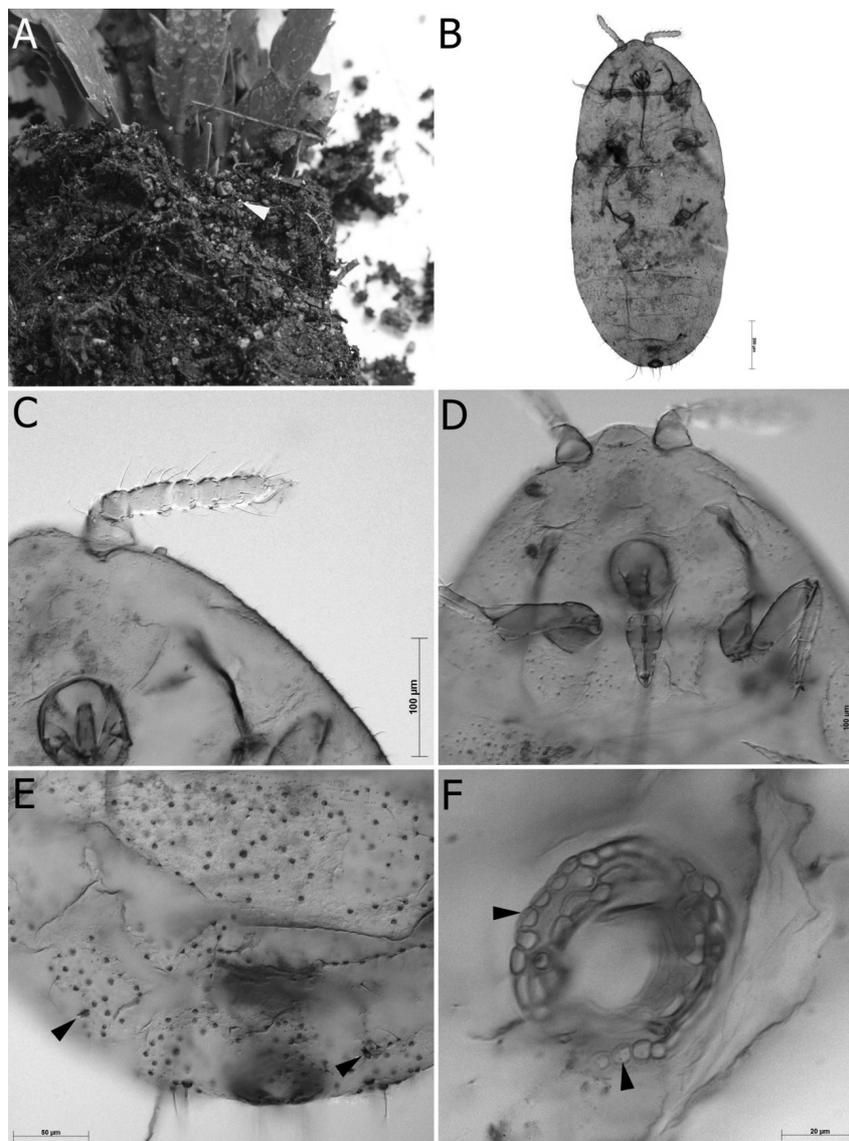


Fig. 2. *Rhizoecus albidus* Goux; A. habitus, B. female, C. antennae, D. labium, E. tritubular cereres, F. anal ring pores with spiculae.

Ben-Dov et al., 2012).

Distribution. Palaearctic: China, Armenia, Crete, France, Germany, Hungary, Iran, Italy, Kazakhstan, Netherlands, Romania, Russia, Sweden, Ukraine, United Kingdom (Tang, 1992; Ben-Dov et al., 2012).

Biology. Females are ovoviviparous and all stages overwinter, except first instars; males do occur in this species. There are two generations per year (Jansen, 2009). It has been reported as an occasional pest (Kozár and Konczné Benedicty, 2007).

Remarks. This species has spiculae on the anal ring and tritubular ceres which are 3-4 times longer than wide.

Discussion

Root mealybugs, *Ripersiella multiporifera* Jansen and *Rhizoecus albidus* Goux were found on imported ornamental plants grown in greenhouses in Korea. *Ripersiella multiporifera*, an Oriental species, has a restricted host range occurring on *Hoya*, *Dracaena* and *Sansevieria*. This species is likely to cause damage to these host plants grown in greenhouse in Korea if it is introduced and established in Korea. Whereas, *Rhizoecus albidus*, a Palaearctic species, is present on various species of host plants, including *Achillea*, *Bellis* and *Helichrysum* that can grow outdoors in Korea. Therefore, this species requires much attention because it may be able to overwinter on plants found in Korea in the outdoors.

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Literature Cited

Ben-Dov, Y., Miller, D.R., Gibson, G.A.P., 2012. ScaleNet(webpage) <http://www.sel.barc.usda.gov/scalenet/scalenet.htm> (Accessed

February 2013).

- Borchsenius, N.S., Tereznikova, E.M. 1959. Two new species of mealy bugs of the genus *Rhizoecus* Kunkel d'Herculais (Coccoidea, Pseudococcidae) of the Ukrainian fauna. *Dopovidi Akademii Nauk Ukrainskoi SSR* 3, 322-325.
- Goux, L. 1942. Notes sur les coccides (Hem. Coccoidea) de la France: Description d'un *Phenacoccus* et d'un *Rhizoecus* nouveaux. *Bulletin du Muséum d'Histoire Naturelle de Marseille* 2, 33-45.
- Jansen, M.G.M., 2003. A new species of *Rhizoecus* Kunkel d'Herculais (Hemiptera, Coccoidea, Pseudococcidae) on bonsai trees. *Tijdschrift voor Entomologie*. 146, 297-300.
- Jansen, M.G.M., 2008. A new species of the genus *Ripersiella* Tinsley (Hemiptera: Coccoidea: Pseudococcidae) from import interceptions in the Netherlands, in: Franco, J.C., Hodgson, C.J. (Eds.), *Proceedings of the XI International Symposium on Scale Insect Studies* Branco. ISA Press, Lisbon, Portugal, pp. 39-49.
- Jansen, M.G.M., 2009. New and less observed scale insect species for the Dutch fauna (Hemiptera: Coccoidea). *Entomologische Berichten*. 69(5), 162-168.
- Kozár, F., Konczné Benedicty, Z., 2007. *Rhizoecinae of the world*, Plant Protection Institute, Hungarian Academy of Sciences, Budapest.
- Kwon, G.M., Danzig, E., Park, K.T., 2003a. Taxonomic notes of the family Pseudococcidae (Sternorrhyncha) in Korea: I. Tribes Phenacoccini, Rhizoecini, and Sphaerococcini. *Insecta Koreana* 20(1): 103-124.
- Kwon, G.M., Danzig, E., Park, K.T., 2003b. Taxonomic notes of the family Pseudococcidae (Sternorrhyncha) in Korea: II. Tribe Pseudococcini. *Insecta Koreana* 20, 393-424.
- Lee, Y.J., 2010. Family Pseudococcidae, in: Paek, M.K. (Ed.), *Checklist of Korean insects*. Nature and Ecology, Seoul, pp. 78-79.
- Lee, Y.H., Suh, S.J., 2011. Notes on *Antonina* mealybug of Korea (Hemiptera: Pseudococcidae). *Kor. J. Appl. Entomol.* 50, 71-73.
- Paik, J.C., 2000. Economic Insects of Korea 6, Homoptera (Coccinea), *Insecta Koreana* Suppl. 13, National Institute of Agricultural Science and Technology, Suwon.
- Panis, A. 1968. Les *Rhizoecus* (Hom. Coccoidea Pseudococcidae) Européens et Méditerranéens d'intérêt économique: Description d'une nouvelle espèce. *Annales de la Société Entomologique de France* 4, 549-554.
- Park, J.S., 2010. Compendium of exotic plant pests and weeds, National Plant Quarantine Service, Anyang.
- Pest Information System (PIS). <http://10.110.128.100> (Accessed February 2013).
- Tang, F.T., 1992. The Pseudococcidae of China, Shanxi Agricultural University, Taigu, Shanxi.
- Williams, D.J., 2004. *Mealybugs of Southern Asia*, The Natural History Museum and Southdene SDN. BHD, Kuala Lumpur.