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***Phenacoccus madeirensis* Green (Hemiptera: Pseudococcidae),  
a recently introduced exotic pest in Japan**

**Abstract** - Previous reports of the Mexican mealybug, *Phenacoccus gossypii* Townsend & Cockerell in Japan were confirmed to be misidentifications of the Madeira mealybug, *Phenacoccus madeirensis* Green. The Madeira mealybug is reported from the Bonin Islands, Kyushu, Shikoku, and the Ryukyu Islands where it is widespread. Distribution of the Madeira mealybug and 25 host records in Japan are given.

**Key words:** Madeira mealybug, *Phenacoccus gossypii*, *Phenacoccus madeirensis*.

#### INTRODUCTION

The Madeira mealybug, *Phenacoccus madeirensis* Green has been often misidentified for the Mexican mealybug, *P. gossypii* Townsend & Cockerell. These misidentifications have resulted from the use of descriptions and illustrations by Ferris (1950) and McKenzie (1967), a problem discussed by Williams (1987) and Williams & Granara de Willink (1992). Previous reports of the Mexican mealybug in Japan (Kawai 1990, Kinjo et al. 1996) are confirmed to be misidentifications of the Madeira mealybug. The mealybug has become an important insect pest in Japan attacking various plants of economic importance.

#### MATERIALS AND METHODS

Mealybugs were collected in the field or from plastic houses by the authors and various persons (see acknowledgements). All scale insects were slide mounted and studied under a compound microscope for identification. The mealybugs were all slide mounted according to the procedure discussed by Kawai (1980). The mealybugs were identified by using the keys of Williams (1987) and/or Williams & Granara de Willink (1992). Insects that were previously identified as *Phenacoccus gossypii* were also re-examined.

## RESULTS

The Madeira mealybug is found in the Ogasawara (Bonin) Islands, Kagoshima Prefecture (Kyushu), Kochi Prefecture (Shikoku) and in the islands of Aka, Iriomote, Ishigaki, Izena, Kume, Minna, Miyako, Okinawa and Tonaki of the Ryukyu Islands. The Madeira mealybug can cause malformation of leaves, growth stunt and damage by sooty moulds that grow on their honeydew. The Madeira mealybug is commonly collected on *Bidens pilosa* L. along road sides in the Ryukyu Islands. Other common hosts include species of Red Pepper, *Lantana* and *Hibiscus*. The Madeira mealybug also attacks fruit crops such as Mango, Soursop, and Passion fruit. Other plants of economic importance such as Soybeans, Mung beans, Myoga Ginger, Jute, and Sweet Basil are also fed upon. The hosts of the Madeira mealybug in Japan includes 25 species of plants in 15 families. These are: Anacardiaceae, Asteraceae, Brassicaceae, Euphorbiaceae, Fabaceae, Geraniaceae, Lamiaceae, Malvaceae, Menispermaceae, Passifloraceae, Ranunculaceae, Solanaceae, Tiliaceae, Verbenaceae and Zingiberaceae (Table 1.).

Table 1 - Distribution and host records of the Madeira mealybug in Japan.

Locality	Host	Family	Date
Kyushu, Kagoshima	<i>Lantana camara</i> L.	Verbenaceae	10/16/1997
Ryukyus, Okinawa Isl., Chinen	<i>Capsicum annuum</i> L.	Solanaceae	07/30/1993
Ryukyus, Okinawa Isl., Gushityan	<i>Capsicum frutescens</i> L.	Solanaceae	03/08/2001
Ryukyus, Okinawa Isl., Chinen	<i>Clematis tashiroi</i> Maxim.	Ranunculaceae	07/30/1993
Ryukyus, Okinawa Isl., Chinen	<i>Cyclea insularis</i> (Makino) Hatsushima	Menispermaceae	07/30/1993
Ryukyus, Okinawa Isl., Chinen	<i>Bidens</i> sp. ( <i>bitemata</i> or <i>pilosa</i> )	Asteraceae	07/30/1993
Ryukyus, Okinawa Isl., Chinen	<i>Bidens pilosa</i> var. <i>radiata</i> Sch. Bip.	Asteraceae	07/30/1993
Ryukyus, Okinawa Isl., Chinen	?		07/30/1993
Ryukyus, Okinawa Isl., Kitanakagusuku	<i>Salvia splendens</i> Sellow ex Roem. & Schult.	Lamiaceae	07/15/1993
Ryukyus, Okinawa Isl., Naha	<i>Bidens</i> sp. ( <i>bitemata</i> or <i>pilosa</i> )	Asteraceae	07/30/1993
Ryukyus, Okinawa Isl., Naha	<i>Lantana camara</i> L.	Verbenaceae	07/30/1993
Ryukyus, Okinawa Isl., Naha	<i>Bidens</i> sp. ( <i>bitemata</i> or <i>pilosa</i> )	Asteraceae	07/30/1993
Ryukyus, Okinawa Isl., Nago	<i>Acalypha wilkesiana</i> Müll. Arg. cv. Willincki	Euphorbiaceae	11/26/1993
Ryukyus, Okinawa Isl., Nago	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	11/25/1993
Ryukyus, Okinawa Isl., Nago	<i>Mangifera indica</i> L.	Anacardiaceae	11/26/1993
Ryukyus, Okinawa Isl., Nishihara	<i>Bidens pilosa</i> var. <i>minor</i> (Blume) Sherff	Asteraceae	06/23/1997
Ryukyus, Okinawa Isl., Ogimi	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	08/28/1996
Ryukyus, Okinawa Isl., Okinawa	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	06/20/1997
Ryukyus, Okinawa Isl., Tomigusuku	<i>Capsicum annuum</i> var. <i>grossum</i> (L.) Sendtn.	Solanaceae	07/20/2000

(Table 1. continued)

Locality	Host	Family	Date
Ryukyus, Okinawa Isl., Tomigusuku	<i>Ocimum basilicum</i> L.	Lamiaceae	
Ryukyus, Okinawa Isl., Yomitan	<i>Mangifera indica</i> L.	Anacardiaceae	04/17/1996
Ryukyus, Aka Isl.	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	08/09/1999
Ryukyus, Iriomote Isl.	<i>Bidens pilosa</i> L.	Asteraceae	10/04/1999
Ryukyus, Ishigaki Isl., Takeda	<i>Bidens</i> sp. ( <i>bitemata</i> or <i>pilosa</i> )	Asteraceae	08/01/1993
Ryukyus, Ishigaki Isl.	<i>Bidens pilosa</i> L.	Asteraceae	10/22/1999
Ryukyus, Ishigaki Isl., Takeda	?		08/01/1993
Ryukyus, Ishigaki Isl.	<i>Brassica oleracea</i> var. <i>capitata</i> L.	Brassicaceae	05/16/1997
Ryukyus, Ishigaki Isl.	<i>Capsicum annuum</i> var. <i>grossum</i> (L.) Sendtn.	Solanaceae	01/09/2001
Ryukyus, Izena Isl.	<i>Bidens pilosa</i> L.	Asteraceae	10/09/1999
Ryukyus, Kume Isl.	<i>Bidens pilosa</i> L.	Asteraceae	04/12/2000
Ryukyus, Kume Isl.	<i>Lantana camara</i> var. <i>aculeata</i> (L.) Moldenke	Verbenaceae	04/12/2000
Ryukyus, Minna Isl.	<i>Bidens pilosa</i> L.	Asteraceae	11/08/1999
Ryukyus, Miyako Isl., Gusukube	<i>Annona montana</i> Macfad.	Annonaceae	08/03/1993
Ryukyus, Miyako Isl.	<i>Bidens pilosa</i> L.	Asteraceae	09/12/1999
Ryukyus, Miyako Isl., Gusukube	<i>Bidens pilosa</i> var. <i>radiata</i> Sch.Bip.	Asteraceae	05/19/1999
Ryukyus, Miyako Isl.	<i>Bidens pilosa</i> var. <i>radiata</i> Sch. Bip.	Asteraceae	11/30/1993
Ryukyus, Miyako Isl., Gusukube	<i>Brassica campestris</i> subsp. <i>rapifera</i> Metzg.	Brassicaceae	06/11/1999
Ryukyus, Miyako Isl., Gasukube	<i>Corchorus olitorius</i> L.	Tiliaceae	07/21/1999
Ryukyus, Miyako Isl., Hirara	<i>Curcuma longa</i> L.	Zingiberaceae	08/03/1993
Ryukyus, Miyako Isl.	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	06/16/1998
Ryukyus, Miyako Isl.	<i>Pelargonium zonale</i> (L.) L'Hér. ex Aiton	Geraniaceae	06/16/1997
Ryukyus, Miyako Isl., Hirara	<i>Phyllanthus debilis</i> Klein ex Willd.	Euphorbiaceae	11/30/1993
Ryukyus, Tonaki Isl.	<i>Bidens pilosa</i> L.	Asteraceae	08/17/1999
Shikoku, Kochi, Aki	<i>Capsicum annuum</i> L.	Solanaceae	04/13/2000
Shikoku, Kochi, Aki	<i>Solanum integrifolium</i> Poir.	Solanaceae	12/11/2000
Shikoku, Kochi, Aki	<i>Zingiber mioga</i> (Thunb.) Roscoe	Zingiberaceae	04/12/2000
Tokyo, Ogasawara Is., Chichi Isl.	<i>Glycine max</i> (L.) Merr.	Fabaceae	08/19/1987
Tokyo, Ogasawara Is., Chichi Isl.	<i>Hibiscus</i> sp.	Malvaceae	05/15/1990
Tokyo, Ogasawara Is., Chichi Isl.	<i>Hibiscus</i> sp. or <i>Malvastrum arboreus</i> Cav.	Malvaceae	03/15/1995
Tokyo, Ogasawara Is., Chichi Isl.	<i>Passiflora edulis</i> Sims	Passifloraceae	08/19/1987
Tokyo, Ogasawara Is., Chichi Isl.	<i>Phaseolus aureus</i> Zuccagni	Fabaceae	08/19/1987
Tokyo, Ogasawara Is., Chichi Isl.	<i>Solanum nigrum</i> L.	Solanaceae	07/20/1990

## DISCUSSION

*Phenacoccus madeirensis* was first reported from the Bonin islands as *P. gossypii* in 1990 (Kawai 1990). It was probably about this time when the insect was introduced since the record of this species does not appear in previous scale insect studies in the islands (Beardsley 1966, Kawai 1973, 1980, Kawai *et al.*, 1971, Kuwana 1909). The distribution of the Mexican mealybug appears to be restricted to California and Mexico. The Madeira mealybug was recorded on mango seedlings in Naha, Okinawa in 1993 (Kinjo *et al.* 1996, Kondo 1996). The mealybug was probably introduced around this time since it was not recorded in previous studies (Kawai, 1980) and collecting trips of the scale insect fauna of Okinawa conducted by the first author during 1991. In the present, the Madeira mealybug is found in 9 of the Ryukyu Islands and all the main islands of Japan except for Honshu and Hokkaido.

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