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BEMISIA AND *ACANTHOBEMISIA* OF JAPAN (Aleyrodidae, Homoptera)

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Genus **Bemisia** Quaintance and Baker

In 1927 the late I. Kuwana described 3 species of *Bemisia* from Japan. Since that time *B. yanagicola* Takahashi and a species under the name of *B. tabaci* Gennadius have been recorded from our country, and *B. myricae* Kuwana has been assigned to *Parabemisia* Takahashi.

The writer has been able to collect another species, and at present 5 species of the genus are known to occur in Japan, which are here dealt with.

Key to subgenera and species

Pupa case

(1) Caudal setae wanting, caudal ridges and furrow not developed (subgenus *Neobemisia* Visnya); body broad, blackish brown, with lateral ridges of tergites on the abdomen. ..... *B. yanagicola* Takahashi

— Caudal setae present, caudal ridges and furrow usually distinct (subgenus *Bemisia*); body elliptical, ovate or elongated, pale in colour, without lateral ridges of tergites on the abdomen. ..... (2)

(2) Body elongated and narrow, with a pair of prominent longitudinal ridges; thoracic tracheal combs well defined, semicircular, distinctly sclerotized. ..... *B. giffardi* Kotinsky

— Body elliptical or ovate, without a pair of longitudinal ridges, thoracic tracheal combs not distinct. ..... (3)

(3) Caudal furrow as long as, or longer than, the vasiform orifice. ..... (4)

— Caudal furrow distinctly shorter than the vasiform orifice. ..... *B. gossypiperda* Misra and Lamba

(4) Operculum occupying slightly less than half the vasiform orifice, lingula with the knobbed part rather abruptly tapering from near the base. ..... *B. puerariae* n. sp.

— Operculum occupying distinctly less than half the vasiform orifice, lingula with the knobbed part being longer, slightly convex or nearly parallel on the sides, and gradually tapering distally. ..... *B. shinanoensis* Kuwana

Bemisia (**Bemisia**) **giffardi** Kotinsky

Aleyrodes giffardi Kotinsky, Board Comm. Agr. and Forestry, Hawaii, Div. Ent. Bull., 2, p. 94 (1907); Kuwana, Pomona Coll. Jl. Ent., III, p. 620 (1911).

Bemisia giffardi Quaintance and Baker, U. S. Dept. Agric., Bur. Ent., Tech. Ser. 27, pt. II, p. 100 (1914); Silvestri, Boll. Lab. Zool., Portici, XXI, p. 15 (1927); Kuwana, Ann. Zool. Japon., XI, p. 245 (1927); Minist. Agr. Forestry, Japan, Dept. Agr., Sc. Bull., 1, p. 61 (1928); Singh, Mem. Dept. Agr. India, Ent. Ser., XII, 1-2, p. 80 (1931); Takahashi, Dept. Agr., Govt. Research Inst., Formosa, Rept. 59, p. 32 (1932); Corbett, Jl. Federated Malay St. Mus., XVII, p. 785 (1935); Takahashi, Trans. Nat. Hist. Soc. Formosa, XXXII, p. 173 (1942); Zimmerman, Insects of Hawaii, V, p. 47 (1948); Kuwana, Icon. Insect. Japon., p. 334 (1950).

Host plant: Citrus.

This species seems to be widely distributed in the southern half of Japan, but the writer has examined the material from Shizuoka only. Not detected near Tokyo.

Bemisia (Bemisia) gossypiperda Misra and Lamba

Bemisia gossypiperda Misra and Lamba, Agr. Research Inst India, Bull., 196, p. 5 (1929); Takahashi, Trans. Nat. Hist. Soc. Formosa, XXI, p. 203 (1931); Dept. Agr., Govt. Research Inst. Formosa, Rept. 59, p. 33 (1932); Corbett, Jl. Federated Malay St. Mus., XVII, p. 783 (1935).

Bemisia achyranthes Singh, Mem. Dept. Agr. India, Ent. Ser., XII, p. 82 (1931); Takahashi, Dept. Agr., Govt. Research Inst. Formosa, Rept. 59, p. 33 (1932).

Bemisia hibisci Takahashi, Dept. Agr., Govt. Research Inst. Formosa, Rept. 60, p. 17 (1933).

Bemisia tabaci Takahashi (nec. Gennadius), Tenthredo, I, p. 110 (1936); Insecta Matsumurana, XIV, p. 5 (1939); Trans. Nat. Hist. Soc. Formosa, XXXI, p. 357 (1941); Icon. Insect. Japon., p. 334 (1950); Miscel. Rept. Research Inst. for Nat. Resources, Tokyo, 25, p. 21, foot note (1952).

Pupa case : Dorsal setae excepting the caudal setae variable in length, being long or minute, and not constant also in number, a pair of them sometimes wanting on the metathorax and on the 4th abdominal segment; eighth abdominal seta not stable in position, located a little posterior to the level of the anterior margin of vasiform orifice when it is minute, but laterad of the anterior margin of the orifice when long. These variations are found among individuals in the same colonies.

Host plants: Soy bean, egg plant, *Callicarpa* sp., *Clerodendron* sp., *Stephania japonica*.

Tokyo, Asakawa near Tokyo, Ōme near Tokyo, Osaka, Kimitoge (Wakayama Prefecture), Muroto (Shikoku, coll. by S. Kanda, 8. VIII. 1942).

Distributed at least in Formosa, Malaya, Sumatra, India, Mauritius, and Micronesia besides Japan. Some related species briefly described from various parts of the world may prove to be identical with this species.

Differs from *B. shinanoensis* Kuwana in the following characters: Body smaller, measuring about 0.8 mm. in length and narrower posteriorly. Vasiform orifice shorter, with about 4-6 lateral ridges. Operculum occupying half the vasiform orifice. Lingula stouter and more abruptly knobbed on the distal part. Caudal furrow shorter than the vasiform orifice.

Readily distinguished from *B. tabaci* Gennadius in the shorter caudal furrow.

Bemisia (Bemisia) puerariae n. sp.

Pupa case: White. Body elliptical, but narrowed posteriorly, slightly constricted across the thoracic tracheal folds, scarcely indented at the hind end. Transverse moulting suture not reaching the margin, median segmented area of abdomen wider than the lateral unsegmented area, 7th tergite very short at the median part, the 8th longer than the 6th, pockets distinct, separated from each other. Dorsum provided with numerous small granules rather densely on the unsegmented area except along the margin; basal 6 abdominal tergites each with a rounded median tubercle near the hind margin, 2nd-6th tergites each with 2 similar tubercles at the lateral part; 3 pairs of setae present on the cephalothorax, the last pair of which is on the mesonotum, a pair of similar setae on the basal tergite; a similar seta laterad of the 4th tergite on each side, which is sometimes wanting; eighth abdominal seta laterad of the anterior margin of vasiform orifice, caudal setae close to the hind end; these dorsal setae excepting the caudal ones variable in length, sometimes very long. Marginal teeth minute, very short, much wider than long, rounded, irregular in shape and size, not distinct at some parts; tracheal combs not differentiated. Thoracic tracheal folds rather wide, with many dots. Vasiform orifice as usual, truncated at the tip, nearly as long as the caudal furrow, with about 4 lateral marginal ridges; a small rounded sculpture present just behind the apex of the orifice; anterior marginal area of vasiform orifice not defined. Operculum occupying slightly less than half the orifice, normal in shape. Lingula rather gradually knobbed, the knobbed part exposed, but not reaching the hind end of the vasiform orifice, broadest near the basal part, tapering from near the base, not constricted, rather stout, with a pair of long setae. Caudal furrow without markings. Caudal ridges nearly as wide as the basal part of caudal furrow, reaching the hind end of body, with some rough sculptures. Body about 1.0 - 1.1 mm. long, 0.75 mm. wide.

Host plants; *Pueraria hirsuta*, *Desmodium* sp.

Tokyo (16. IX. 1949), Hikawa near Tokyo (9. VIII. 1949). Described from material taken on *Pueraria* at Tokyo. Rather scarce.

Closely related to *B. gossypiperda* Misra and Lamba, but differs from that species in the vasiform orifice being as long as the caudal furrow, with fewer lateral ridges, the caudal furrow a little longer, and in the lingula more gradually knobbed.

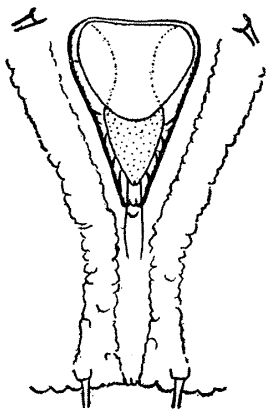

Fig. 1. *Bemisia puerariae* n. sp. Pupa case. Vasiform orifice and caudal furrow.

Bemisia (Bemisia) shinanoensis Kuwana

Bemisia shinanoensis Kuwana, Jl. Plant Protect., IX, p. 464 (1922); Ann. Zool. Japon., XI, p. 247 (1927); Icon. Insect. Japon., p. 334 (1950).

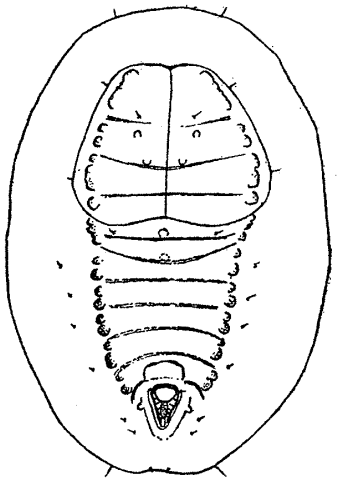

Fig. 2. *Bemisia shinanoensis* Kuwana. Pupa case.
Form with minute dorsal setae, median area of cephalothorax separated from submarginal area, and caudal furrow not developed.

Pupa case: Median segmented area of cephalothorax sometimes defined by a thin suture from the submarginal area. Cephalothorax with some pairs of rounded tubercles; abdomen with about 13 similar tubercles at the lateral part of median segmented area on each side and a median tubercle on the basal 4-6 tergites each, these tubercles roughly corrugated and some of them sometimes absent. Dorsum with numerous small granules on the unsegmented area like *B. puerariae* n. sp., 6 minute setae in a row on each side of abdomen; other dorsal setae variable in length, very long or minute; eighth abdominal seta laterad of, or slightly posterior to the level of, the anterior margin of vasiform orifice; caudal setae close to the hind margin. Tracheal folds long, not well defined, sometimes much expanded at the distal end, with small dots in many small clusters, the dots wanting at the distal parts of thoracic folds. Vasiform orifice with 3-5 lateral ridges. Caudal furrow not distinct in some individuals. Caudal ridges sometimes present only around the vasiform orifice, not reaching the hind margin of body. Other characters given in the original diagnosis.

Host plants: *Aphananthe aspera*, *Benzoin umbellatum*, *Berberis thunbergii*, *Callicarpa japonica*, *Desmodium fallax* var. *mandsuricum*, *Morus alba*, *Pueraria hirsuta*, *Rhododendron* sp., *Rubus palmatus*, *Pertya scandens*.

Tokyo; Asakawa, Hikawa, Ōme, Mt. Mitake, and Mt. Takao near Tokyo. Recorded from Nagano, Gunma and Yamanashi by I. Kuwana. Very common near Tokyo, but occurring in small colonies.

Related to *B. lampangensis* Takahashi. (Trans. Nat. Hist. Soc. Formosa, XXXII, 1942, p. 171), differing, however, in the caudal furrow nearly as long as the vasiform orifice, the vasiform orifice with 3 or more lateral ridges, and in the lingula more distinctly knobbed.

Bemisia (**Neobemisia**) **yanagicola** Takahashi

Bemisia yanagicola Takahashi, Lingnan Sc. Jl., XIII, p. 137 (1934).

Bemisia (*Neobemisia*) *yanagicola* Visnya, Frag. fauna. hungar., IV, Suppl., p. 8 (1941).

Host plant: *Salix* sp.

Gifu (20. IX. 1949), Kyoto (26. IX. 1949).

Known to occur in Formosa and China too.

Genus **Acanthobemisia** Takahashi

One species is known.

Acanthobemisia distylii Takahashi

Acanthobemisia distylii Takahashi, Kontyû, IX, p. 25 (1935); Watanabe, Jl. Plant Protect., XXIII, p. 115 (1936); Takahashi, Icon. Insect. Japon., p. 333 (1950).

Pupa case: Seventh tergite short, pockets contiguous. Dorsum sometimes slightly sclerotized, with numerous small granules over the unsegmented area, these granules much smaller than the bases of dorsal spine-like setae; about 15 longer submarginal setae arranged in a row on each side in some specimens, these setae pointed apically, usually a little curved, reaching beyond the body margin; other spine-like dorsal setae bluntly pointed or truncated at the tip. Caudal furrow broad, scarcely broadened anteriorly, not well defined.

Host plant: *Distylium racemosum.*

Nagasaki, Kagoshima (III. 1953, coll. by K. Sato); Nakijin, Okinawa, Loochoo (2. VII. 1952, coll. by K. Sato).

Previously recorded from Nagasaki. Not found near Tokyo.

In specimens taken in Loochoo dorsal spine-like setae more distinctly truncated at the tlp.

All the materials upon which this paper is based were collected by the writer unless otherwise stated, and are preserved in his collection. The host plants mentioned in this paper are only those observed by the writer in Japan alone.

The writer is much indebted to Dr. L. M. Russell for her examination of some of the species, and also to Messrs. K. Sato and S. Kanda for the specimens.

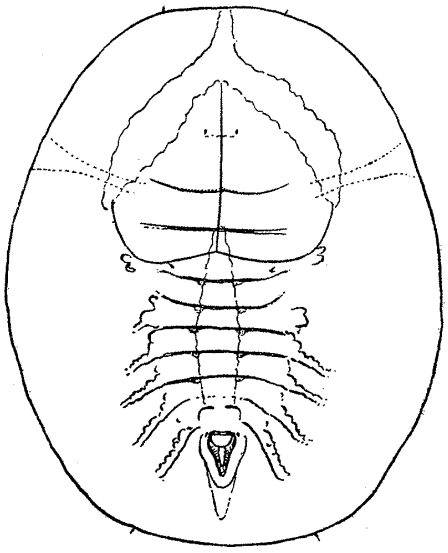

Fig. 3. *Bemisia yanagicola* Takahashi. Pupa case.

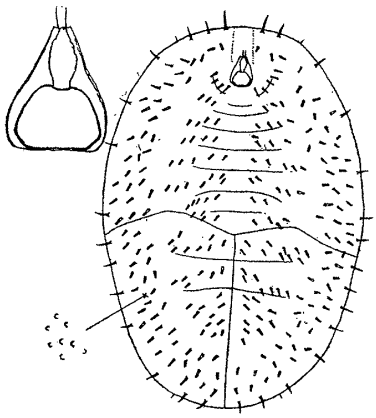

Fig. 4. *Acanthobemisia distylii* Takahashi from Loochoo. Pupa case, its dorsal granules and vasiform orifice.