Taxonomic Studies of the Genus *Tetraleurodes* (Homoptera: Aleyrodidae)

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**Abstract**: Ten new species of *Tetraleurodes* (bireliexa, callica/a, chil,ela, can,Er,sa, darsirllgosa, mexicana, perseae, pseudacacwe, querc£cola, tuberculosa) are described and four previously known species are redescribed. The acaciae group consisting of seven species is proposed, and a key to the acaciae group and 12 North American species is provided. In addition, her8erti Penny is synonymized with acaciae (Quaintance), nudus Sampson and Drews is synonymized with fici Quaintance and Baker, and stanford; (Bemis) is synonymized with liei Quaintanse and Baker, and T. papil/iterus Sampson and Drews is reassigned to Auleurotrachelus. A provisional key treats 19 species including the 14 described species and five North American species which were researched but not redescribed here. Of the 20 North American *Tetraleurodes* species in Mound and Halsey (1978), nine species are included in the key, three species are synonymized, one is reassigned to another genus, five are probably synonymous but require further study, and two species must be studied further.

**Key Words**: Aleyrodidae, *Tetraleurodes*, new species, synonyms, new combinations, key, whitefly, North America.

*Tetraleurodes* is one of the larger genera in the whitefly family Aleyrodidae. In a catalog of the world species, Mound and Halsey (1978) included 50 species in the genus of which 20 were listed for North America. Eleven species were described from the United States, seven from Mexico, and one each from Jamaica and Panama. Sampson and Drews (1941) treated 10 *Tetraleurodes* species, including four new species, in their review of the Mexican whiteflies. Since then, no new species has been described from North America and only a few, minor taxonomic works have been published. In this initial review of the New World species, the acaciae group consisting of six new and one nominal species is proposed. Descriptions of seven other North American species, of which four are new, and notes on three nominal North American species and one South American species are also presented to provide scientific names and taxonomic information for systematic and control studies now in progress. Although several species in this study are assignable to at least two other species groups, the definition of these groups is left to future work when studies of undescribed species are completed. A provisional key treats 19 species including the 14 described species and five North American species which were researched but not redescribed here. Of the 20 North American *Tetraleurodes* species in Mound and Halsey (1978), nine species are included in the key, three species are synonymized, one is reassigned to another genus, five are probably synonymous but require further study, and two species must be studied further.

The immatures of most species are found on the undersurfaces of leaves. *Tetraleurodes caulicola* and *T. tuberculosa*, new species, are found on the stem, and *T. melanops* (Quaintance) and *T. perileuca* (Cockerell) are found on the upper surfaces of Quercus spp. leaves. Species are known only from one plant genus, a few plant families or are polyphagous such as *T. mori* (Quaintance). Most members of the acaciae group infest plants of the legume family Fabaceae. According to Hamon (1978), *Tetraleurodes acaciae* (Quaintance) damaged Calliandra haematocephala Hassk. in Florida. *Tetraleurodes perseae*, new species, is a pest in avocado orchards in Uruapan, Mexico (Rose and Woolley 1984).

**Terminology**

The terminology for most morphological structures will be found in Russell (1947) and Bink-Moennen (1983).

*Apparent margin* (Fig. 10B): The true margin of species with a reflected margin is beneath the body. The margin observed is the apparent margin, which is part of the submargin.

*Depressions* (Figs. 6B, 15E, 36F, 38E): Normally elongate, oval or subcircular small, scarlike areas located submedially on abdominal tergites I-VIII and in median, submedian and subdorsal areas of the cephalothorax. It is often lighter in color than surrounding derm, and its margins are smooth, irregular or bordered with small teeth.

*Gland tubercle* (Fig. 4B): Circular or oval raised tubercle with rather flat dorsum and with a median pore on the submargin of species in the acaciae group.
Microtubercular band (Figs. 4E, 12B): Microtubercles on submarginal transverse ridges form a band around body. Referred to as spinules in some publications.

Pale glandular area (Figs. 4D, 12C, 18E, 57A): Located proximal of the bases of marginal teeth on transverse ridges. Normally, it is oval, V- or U-shaped, but may have other shapes. In other publications, it is referred to as membranous area or pale spot.

Transverse ridges and transverse furrows (Figs. 4E, 12B, 60C, 61F, 61G): Raised transverse ridges between narrow furrows on the submargin extend to bases of marginal teeth or taper distally and do not reach margin. Furrows normally extend to margin between marginal teeth.

Most dorsal structures are indicated on figures 1, 2, 3, 6, 13, 25, 38, and 66. Submarginal structures are indicated on figures 4, 12, 18, 57, 60, 62, and 66. Structures of the vasiform orifice and operculum are indicated on figures 2, 37, 41, 62, 63, and 67. Ventral structures are indicated on figures 23, 24, 42, 45, and 46.

Methods

Measurements are given in microns (µm). The measurements for new species are based on the type series and those for nominal species are based on the types and identified material. The margins of several species are broadly reflected and measurements of the length and width represent the apparent margin. Setae are measured from the extreme base in the setal socket.

In the key to species, the distribution is given if the species is not treated in the text. The host is mentioned if the species is host specific.

Postal abbreviations of states and provinces are used for distribution in the United States and Canada.


Acronyms for depositories of examined materials are: FSCA = Florida State Collection of Arthropods, Gainesville; CDFA = California Dept. of Food and Agriculture, Sacramento; NHM = Natural History Museum, London; UCD = University of California, Davis; USNM = National Museum of Natural History, Smithsonian Institution, Washington D.C.

**Tetraleurodes Cockerell**

Aleyrodes (Tetraleurodes) Cockerell 1902:283. Type species: Aleyrodes perleuca Cockerell, by original designation.

Pupal cases sclerotized, black, suboval to broadly oval. Margin and submargin: margin dentate. Thoracic and abdominal tracheal pore area with teeth undifferentiated from marginal teeth. Anterior and posterior marginal setae present. Submargin vertical, separated from dorsal disc by fold; sculptured with ridges, furrows and band of microtubercules. Pale glandular areas near bases of marginal teeth. Disc pores with associated porettes present. Caudal setae present. Dorsal Disc: Median molting suture reaching submarginal fold or margin, transverse molting suture extending to submarginal fold or terminating before fold. Submedian cephalothoracic setae and eighth abdominal setae normally present, first abdominal setae absent. Disc pores with or without associated porettes and micropores in definite pattern or randomly distributed. Vasiform orifice subcordate, normally elevated, often protruding over submarginal fold. Operculum subcordate, almost filling vasiform orifice. Lingula short, hidden by operculum. Caudal furrow absent. Venier membranous or slightly sclerotized. All spiracles present. Antennae stout, reaching first abdominal spiracle. Legs stout, curved marginally. Thoracic and abdominal tracheal folds well defined or indicated.

**Key to acaciæ group and North American species based on pupal cases**

1. Submarginal gland tubercles present (Fig. 1C); usually on legume trees and shrubs ....................

P. acaciæ Group 2

Submarginal gland tubercles absent; on various host plants .................................................. 8
2(1) Cephalothorax with 4 pairs of setae (Fig. 32) ........................................ pseu dacacae Nakahara
Cephalothorax with 3 pairs of setae ........................................ 3

2(2) Abdominal segment VIII not separated from anterior segments (Fig. 15), intersegmental line
between VII-VIII not extending to submarginal fold; pupal cases elongate oval (Fig. 15) .......... 4

3(2) Abdominal segment VIII not separated from anterior segments (Fig. 33A); pupal cases oval (Fig. 1) ... 6

3(3) Caudal seta poorly developed, shorter than operculum (Fig. 26A); dorsum of abdomen sculptured,
derm irregular (Fig. 25) ........................................................................ dorirugosa Nakahara

4(3) Submarginal microtubercular band narrow, between margin and submarginal gland tubercles
(Fig. 38C); 11-15 submarginal gland tubercles, present laterally ........................................ 5

4(4) Submarginal microtubercular band wide, extends mesad of gland tubercles to about apparent
margin; 0-8 submarginal gland tubercles on head and 0-6 on caudal area of abdomen, absent
laterally (Fig. 9) .......................................... biireflexa Nakahara

5(4) Submargin of thorax with 2 short setae on each side (Fig. 36E); head with eyespot (Fig. 36A);
conical teeth on mesothorax and along abdominal intersegmental lines (Figs. 36, 38); disc pores
2.0-3.5 μm in diameter ..................................................... tuberculosa Nakahara

5(5) Submargin of thorax without setae (Fig. 15); head without eyespot; conical teeth confined to
submedian depressions on abdomen (Fig. 15F), absent from mesothorax; disc pores 5-7 μm in
diameter ..................................................... cauticola Nakahara

6(3) Caudal seta poorly developed, shorter than operculum (Fig. 26A); dorsum of abdomen sculptured,
derm irregular (Fig. 25) ........................................................................ dorirugosa Nakahara
Caudal seta well developed, longer than operculum (Fig. 29A); median-submedian dorsal derm
of abdomen relatively smooth except for band of small, conical teeth ........................................ 7

7(6) Vasiform orifice on slightly elevated segment VIII (Fig. 29); orifice anterior to apparent caudal
margin by 3-4 times its length; submedian depressions not indicated on abdomen (Fig. 27)
.......................................................................................................... mexicaca (Quaintance)

7(7) Vasiform orifice on protruding U-shaped elevation of segment VIII (Fig. 2); orifice anterior to
apparent caudal margin by slightly more than its length; submedian depressions well developed
on abdominal segments (Figs. 1, 6) ........................................................................ acaciae (Quaintance)

8(1) Cephalothorax without submedian setae (Figs. 59, 65); eighth abdominal seta absent or on
postrolateral part of rim of vasiform orifice ..................................................... 9
Cephalothorax with 1-3 pairs of submedian setae; eighth abdominal sete anterior or anterolateral
of vasiform orifice (cf. Fig. 51B) ........................................ 11

9(8) Vasiform orifice with cell-like structures (Figs. 63A, 67A); small tubercle with pale gland on
postrolateral part of rim of vasiform orifice (Figs. 62C, 67B); eighth abdominal seta apparently
absent ........................................................................................................ 10
Vasiform orifice without cell-like structures; eighth abdominal seta on a small postrolateral
lobe of rim of vasiform orifice, occasionally absent, setal base indicated by pale spot; Mexico,
Central America, South America ................................................................. quadratus Sampson and Drews

10(9) Vasiform orifice with a row of 3-4 cells on each side (Fig. 67A); caudal setae on distal 1/4 of
submargin well developed (Fig. 65B); on various hosts ........................................... urisorum (Cockerell)
Vasiform orifice with 15-16 cells, in 2 lateral rows and 1 posterior row (Fig. 63A); caudal seta
indistinct, thin, on median part of submargin (Fig. 62A); on Quercus ........................................... quercicola Nakahara

11(8) Cephalic setae present (Fig. 42); submargin with oval, subtriangular or elongate, pale, glandular
areas at bases of marginal teeth (Fig. 40); 12 (Cephalic setae absent (Fig. 47); submargin with
V- or U-shaped pale, glandular areas at bases of marginal tooth (Fig. 49C) ........................................ 15

12(11) Spinules absent from mesal bases of thoracic legs; large disc pores, 5-7 μm in diameter, aligned
in regular row on proximal 1/3 of submargin; abdominal segments with median tubercles; eyespot
present or absent; on Quercus ................................................................. 13
Band of spinules along mesal bases of thoracic legs (Figs. 39D, 45B); minute disc pores, 2-3 μm
in diameter, irregularly spaced and aligned on proximal 1/3 of submargin; abdomen without
median tubercles; eyespot, small oval (Figs. 39A, 42A); various host ........................................... 14

13(12) Eyespot with diffused margin; submarginal pale glandular areas oval, about as long as marginal
teeth; 2 tubercles anterior of vasiform orifice; vasiform orifice not elevated; Mexico, southern
United States ..................................................... perilellca (Cockerell)
Eyespot absent; submarginal pale glandular areas elongate, between 1.5 to twice as long as
marginal teeth; tubercles absent anterior to vasiform orifice; vasiform orifice greatly elevated;
southern California ................................................................. melanops (Cockerell)
14(12) Subventral area of abdomen with spinules (Fig. 42D); ventral submargin with irregular or oval raised areas (Fig. 46B); bottom of vasiform orifice with 1 open area. chivela Nakahara Subventral area of abdomen lacking spinules (Fig. 39); ventral submargin without irregular or oval raised areas; bottom of vasiform orifice with anterior open area and 2 smaller posterior open areas separated by thin sclerite (Fig. 41). bidentatus Sampson and Drews

15(11) Operculum with small, posterior median notch (Fig. 51A); abdomen with oval submedial depressions (Fig. 47). Operculum without posterior median notch; abdomen without well defined, oval submedial depressions

16(15) Submarginal disc pores in 1 or 2 rows between microtubercular band and submarginal fold (Fig. 49A); 7-9 marginal teeth per 100 μm. confusa Nakahara Submarginal disc pores in microtubercular band and in irregular row between band and submarginal fold (Fig. 52); 9-11 marginal teeth per 100 μm. persac Nakahara

17(15) Median area of abdomen delineated by submedial, longitudinal furrow on each side (Fig. 56B); cluster of subdorsal disc pores absent from abdominal segment IV; broad band of ventral spinules on both sides of legs and extends into abdomen. Margin and submargin (Figs. 1, 4): Marginal teeth 6-9 per 100 μm on lateral margin, each tooth usually broader than long with apex broadly rounded or subtruncated (Fig. 4A). Anterior setae on 6-9 teeth from midline, 12-24 μm long; 14-18 teeth between posterior setae, 20-50 μm long. Submargin differentiated from dorsal disc by fold except on anterior part of head (Fig. 1H). Transverse ridges on distal 1/2 of submargin well defined by narrow transverse furrows, extending to marginal teeth. V-shaped, pale glandular area at base of each tooth, distal ends of glandular area extending marginally, terminating at transverse furrows, not joined to adjacent glandular areas (Fig. 4D). Band of microtubercles on ridges mesad of pale glandular area to about midwidth of submargin (Fig. 4E), distal margin of band clearly defined, usually a micropore with sclerotized rim at margin (Fig. 4B); smaller microtubercles on ridges along transverse furrows, larger microtubercles more medially on ridges, or microtubercles about same size; median area of ridges with few microtubercles or relatively bare. Area between microtubercular band and submarginal fold without microtubercles, with 4-59 oval or circular gland tubercles (Fig. 4C), 12-14 μm in diameter, in irregularly spaced row, usually absent from head and area posterior of vasiform orifice.

**Acacia Group**

Submarginal gland tubercles present; cephalothorax with 3 or 4 pairs of submedian setae, eighth abdominal setae anterior or anterolateral of vasiform orifice; margin of vasiform orifice without cell-like structures; dorsal disc not granulose; submarginal, pale glandular areas of various shapes.

**Tetraleurodes acacae (Quaintance)**

(Figs. 1-8)

*Aleurodes acacae* Quaintance 1900:19

*Aleyrodes acacae* Bemis 1904:530


**New Synonymy.**

**Pupal case:** oval, submargin strongly elevated, forming broad rim around case, dorsal disc strongly elevated, higher than submargin, lateral part of subdorsum rising almost vertically to sharply defined ridge on abdomen; or submargin elevated into ridge around case; dorsal disc with elevated, subdorsal longitudinal ridge, then depressed and gradually elevated into longitudinal, median area. Length 782-1146 μm, width 531-798 μm. Shiny black; dorsum with or without wax along subdorsal ridge, fringe of white wax subequal in width throughout, about 1/6 as wide as pupal case.

**Margin and submargin (Figs. 1, 4):** Marginal teeth 6-9 per 100 μm on lateral margin, each tooth usually broader than long with apex broadly rounded or subtruncated (Fig. 4A). Anterior setae on 6-9 teeth from midline, 12-24 μm long; 14-18 teeth between posterior setae, 20-50 μm long. Submargin differentiated from dorsal disc by fold except on anterior part of head (Fig. 1H). Transverse ridges on distal 1/2 of submargin well defined by narrow transverse furrows, extending to marginal teeth. V-shaped, pale glandular area at base of each tooth, distal ends of glandular area extending marginally, terminating at transverse furrows, not joined to adjacent glandular areas (Fig. 4D). Band of microtubercles on ridges mesad of pale glandular area to about midwidth of submargin (Fig. 4E), distal margin of band clearly defined, usually a micropore with sclerotized rim at margin (Fig. 4B); smaller microtubercles on ridges along transverse furrows, larger microtubercles more medially on ridges, or microtubercles about same size; median area of ridges with few microtubercles or relatively bare. Area between microtubercular band and submarginal fold without microtubercles, with 4-59 oval or circular gland tubercles (Fig. 4C), 12-14 μm in diameter, in irregularly spaced row, usually absent from head and area posterior of vasiform orifice.

**Tetraleurodes acacae** Group
orifice. Micropores, irregularly spaced, between gland tubercles and submarginal fold. Irregular pale area present or absent distal of gland tubercles on each side of cephalic region (Fig. 1K). Caudal setae 54-109 μm long, baso tuberculated, on inner 1/2 of submargin, separated by distance equal to about 2 times width of vasiform orifice (Fig. 1G).

**Dorsal disc** (Figs. 1-3, 5, 6): Median molting suture extending to anterior margin; transverse molting suture terminating in submarginal fold at level of meso-metathoracic suture; margins of molting sutures smooth. Meso-metathoracic suture well defined in median to subdorsal areas, not reaching submarginal fold; small tubercles in submedian furrow on metathorax (Fig. 1J), along suture on both sides of furrow, or occasionally along almost entire length of suture. Eyespots absent. Cephalic setae 12-79 μm long (Fig.1B), extremely longer than thoracic setae in some populations (Fig. 3A, B); mesothoracic setae 12-62 μm long (Fig. 1C); metathoracic setae 12-54 μm long (Fig. 1D); eighth abdominal setae anterolaterad to vasiform orifice, 19-65 μm long (Fig. 1E). Depressions on head anterior of seta and between seta and molting suture; submedially on prothorax; lateral of seta and between seta and molting suture on mesothorax; metathorax with shallow furrow extending obliquely from meso-metathoracic suture lateral of seta (Fig. 1J): 1 each submedially on abdominal segments I-VIII (Fig. 6R), bordered by microtubercules confined to area around depressions or more numerous and extending medially across segments along segmental lines and into subdorsum. Disc pores about 5μm in diameter and associated porettes distributed as follows on each side: 2-4 subdorsally on head; prothorax with 0-2 submedially posterior to cephalic seta, and 2-4 close together subdorsally; mesothorax with 1 submedially between seta and molting suture, 1-3 lateral of seta; 2 subdorsally on metathorax along meso-metathoracic suture; abdominal segment I with 1 in submedial-subdorsal area near transverse molting suture; 1 posterior of each submedian depression on II-VII, occasionally 2 on V; 2-3 lateral of vasiform orifice on VIII; 7-9 irregularly spaced along longitudinal ridge on subdorsum (Fig. 5A). Abdomen slightly elevated, intersegmental lines well developed, extending into subdorsum, line between segments VII and VIII extending to longitudinal ridge and submarginal fold, completely separating VIII from anterior segments; median area of I-VII subequal in length. Subdorsum with longitudinal ridge extending from thorax to intersegmental line of VII-VIII (Fig. 1I), lateral part of ridge darker than mesal part and speckled with paler spots (Fig. 5). Large median tubercle centrally on I (Fig. 6A), also 1 each medially near posterior margin on III-VII, occasionally on II, or completely absent. Vasiform orifice subcordate, 35-52 μm long, 42-52 μm wide, on strongly elevated part of segment VIII, appearing as a wide, U-shaped rim of orifice, not or slightly protruding over submarginal fold (Fig. 2A). Operculum subcordate, 33-52 μm long, 38-52 μm wide, completely filing orifice, apex entire, occasional lateral margin broadly emarginate (Fig. 2B). Langula hidden by operculum; distal 1/2 spinulose, gradually enlarged, widest just before apex.

**Venter** (Fig. 1): Derm slightly sclerotized, generally finely granulose; submargin without distinct dermal pattern Antennae almost extending to anterior spiracle. Thoracic and abdominal spiracles well developed. Thoracic and abdominal tracheal folds evident. Cephalothorax with numerous spinules in band mesial of legs and bordering mouthparts, those by mouthparts larger than by legs. Legs with 1 distal microseta and 1 micro pore; meso- and metathoracic legs each with basal microseta on lateral margin of spinicle band. Adhesive sacks well developed, mesad of microtubercular band. Pair of setae on segment VIII short, anterior and closer to each other than spiracles.

**Third instar larva** (Fig. 7): Similar in shape to pupal case but smaller: Length 504-651 μm, width 390-489 μm; dorsum sclerotized, dark reddish black. Margin with fringe of white wax subequal in width throughout, 1/5 to 1/4 as broad as width of body.

**Margin and submargin**: Margin with about 18 teeth in 100 μm on lateral margin; anterior setae on 6-7 teeth from midline, 12-17 teeth between posterior setae. Submargin differentiated from dorsal disc by broad fold. Submarginal transverse ridges and furrows in lateral 1/2 of submargin. V-shaped pale glandular area on ridge at base of each tooth. Microtubercular band present, microtubercles on ridges along furrows. Area between microtubercular band and submarginal fold with 0-32 irregularly spaced, oval or circular gland tubercles (Fig. 7E), 9-12 μm in diameter, usually absent from head and posterior of vasiform orifice; 3-6 micropores mesad of gland tubercles on each side. Caudal setae about
2 times longer than vasiform orifice. separated by more than width of vasiform orifice.

**Dorsal disc:** Cephalic, mesothoracic, and metathoracic setae fine, 7-12 µm long (Fig. 7A-C); eighth abdominal setae longer than thoracic setae. Submedial depressions on segments I-VIII with 1-2 teeth on border. Disc pores and associated porettes (Fig. 7D) distributed as follows on each side: 1, occasionally 2, subdorsally on head anterior to cephalic seta; 1 posterior of cephalic seta; 2 laterad of mesothoracic seta; 1 mesad and 1 lateral of metathoracic seta. Each submedially on abdominal segments I-VII subequal in lengths. Segment I with or without median, oval tubercle, II or II-VI with posteromedial tubercles. Vasiform orifice subcordate, about as long as broad, on strongly elevated part of VIII appearing as thick U-shaped rim of orifice. Operculum subcordate, about as long as broad, apical margin entire, completely filling orifice.

**Second instar larva** (Fig. 8): Similar in shape to third larvae but smaller; length 358-440 µm, width 245-390 µm; dorsum sclerotized, black.

**Margin and submargin:** Marginal teeth normally reflected beneath submargin, apices subtruncate, rounded, bilobed or irregular. Anterior marginal setae present, posterior marginal setae separated by 10-13 teeth, longer than length of vasiform orifice. Submargin differentiated from dorsal disc by fold; distal part of submargin dissected by transverse ridges and narrow furrows; total of 3-19 gland tubercles between ridges and submarginal fold. Caudal setae separated by distance greater than width of vasiform orifice, longer than length of orifice.

**Dorsal disc:** Minute cephalic, mesothoracic, metathoracic and eighth abdominal setae, bases of setae on cephalothorax smaller than diameter of disc pores. Disc pores and associated porettes distributed on each side as follows: 1 lateral of each cephalic, mesothoracic and metathoracic setae, 1 each subdorsally on abdominal segments IV-V and 1 lateral of vasiform orifice on VIII. Abdominal segments III-V or II-VI each with median tubercles in posteromarginal area. Vasiform orifice subcordate, broader than long. Operculum subcordate, broader than long, apical margin entire.

**First instar larva:** Elongate oval, smaller than second larva. Cephalothorax with 7 pairs of setae on margin; abdomen with 2 pairs of setae caudal of vasiform orifice. Antennae and legs not observed.

**Material examined:** Lectotype pupal case of *acaciae* on slide (cover glass cracked) with following paralectotype; 32 whole or damaged (parts missing) pupal cases, 4 third instar larvae and 1 first instar larva: Chilhuahua, Mexico, Dr. Vasey Coll., Jan. 27, 1886, USNM Type No. 3863. Lectotype designated here is indicated by arrow between two closely associated specimens. Other paralectotypes on two slides with same data as lectotype; 28 whole or damaged pupal cases plus parts of damaged cases. 7 third instar larvae and 5 second instar larvae (USNM). *Tetraleurodes herberti* Penny, 5 pupal cases mounted from type material, Pleasanton, Alameda Co., California, *Robinia pseudoacacia* L., Oct. 1918, P.W. Herbert (USNM). Other material examined: Many specimens from countries listed in distribution (FSAC, USNM).

**Distribution.** Belize, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Jamaica, Mexico (Baja California Norte, Baja California Sur, Coahuila, Colima, D.F., Durango, Jalisco, Morelos, Nuevo Leon, Puebla, Sinaloa, Sonora, Tamaulipas), Nicaragua, Panama, Puerto Rico, Trinidad, United States (AZ, CA, FL, TX), Venezuela.

The specimens from Puerto Rico and Jamaica normally have longer and thicker cephalic setae with larger setal bases than the mesothoracic and metasthathoracic setae. Material from California generally have short and fine cephalothoracic setae.

Another variable character is the total number of submarginal tubercles. Specimens on *Centrosema* always have fewer submarginal gland tubercles in the pupal cases (4-17) and either lack or have only 1 or 2 in the third instar larvae in contrast to specimens on other host plants that vary from 10-59 in the pupal cases and 19-30 in the third instar larvae. The reduced number of gland tubercles may indicate that the populations on *Centrosema* represent another species. However, no other differentiating characters were found and the difference in the number of gland tubercles is probably a host induced variation.

*Tetraleurodes acaciae* closely resembles *T. pseudacaciae*. It is readily differentiated by having three pairs of submedial setae on the cephalothorax instead of four pairs on *T. pseudacaciae*.

Hamon (1978) reported *T. acaciæ* damaging *Calliandra haematocephala* in Florida.

**Tetraleurodes bireflexa** Nakahara

*new species (Figs. 9-14)*

**Pupal case:** elongate oval, widest at anterior abdominal segments, anterior margin with slight median projection with subtruncated apex. Dorsum elevated, dorsal disc margined with slight ridge, median longitudinal area slightly elevated; subdorsum reflected, with reflected part upright and slanted outward or depressed and overlying submarginal, distal part of submarginal and margin reflected, with reflected part upright and slanted outward. Measurements of apparent margin: Length 1032-1062 µm, width 586-651 µm. Black; wax amorphous, white, on median area of abdomen to segment VIII, in a band along margin of dorsal disc, in a band on reflected distal part of submargin and along margin on surface of leaf.

**Margin and submargin** (Figs. 9, 10, 12)): True margin (Fig. 10A) and distal part of submargin reflected, each reflected part 1/6-1/5 as wide as distance between apparent margin, true marginal teeth 13-15 per 100 µm at lateral margin, each broader than long, apically subtruncated, bilobed or irregular, often poorly developed (Fig. 12A). Apparent margin appears dentate (Figs. 9, 10B); nar-
row lines extending from apparent margin into microtubercular band. Anterior setae about 9 µm long, on sixth tooth from midline, posterior setae about 19 µm long, about 15 teeth between setae. Submargin differentiated from dorsal disc by submarginal fold except fold absent on head and caudal of vasiform orifice. Submargin with transverse ridges defined by narrow transverse furrows; each ridge terminating distally in a marginal tooth. Small, pale, oval or semihemispherical glandular areas of varying sizes at base of each tooth (Fig. 12C). Small pores mesad of pale, glandular areas, 1 usually on or near distal margin of close-set, narrow band of minute microtubercles. Larger microtubercules on ridges forming wider band around body (Fig. 12B), irregularly distributed or in short longitudinal lines, extending almost to apparent margin. Gland tubercles oval or rotund, 9-14 µm in diameter, total of 0-8 on head, 0-6 on caudal part of abdomen, absent laterally, in microtubercular band about midway between true margin and apparent margin (Fig. 9A). Reflected part of submargin about equal to or wider than non-reflected part. Caudal setae not seen.

**Dorsal disc** (Figs. 9, 14): Subdorsum reflected laterally, partially or completely overlapping submargin (Figs. 9, 10). Median molting suture extending to anterior margin; transverse suture extending beneath reflected subdorsum to submarginal fold anterior to position of meso-metathoracic suture; margins of molting sutures smooth. Meso-metathoracic suture well developed, extending into subdorsum, not reaching submarginal fold. Eyepots represented by a short, longitudinal slit on subdorsum anterolaterad or laterad of cephalic setae (Fig. 11). Cephalic, meso- and metathoracic setae present submedially, bases tuberculate; cephalic setae about 19 µm long; mesothoracic seta curved, about 14-20 µm long; metathoracic setae about 17 µm long, setal base midway between anterior and posterior margin of segment; eighth abdominal setae 24-28 µm long, anterior to vasiform orifice, either closer to orifice or about equidistant between orifice and anterior margin of segment VIII, slightly farther apart than width of orifice. Depressions on head between setae and molting suture, submedially on prothorax and mesothorax; lateral of seta in oblique furrow on metathorax; abdomen with 1 submedially on each side of segments I-VI or -VII. Disc pores 2-3 µm in diameter and associated porrectae distributed on each side as follows: 3-6 subdorsally on head, 2-4 aligned posterior of cephalic setae, prothorax with 1-4 subdorsally, mesothorax with 2-4 submedially, 1-2 subdorsally; metathorax with 2 submedially, 1-3 subdorsally; abdomen normally with 1 each submedially on segments I-VI, 0-1 on VII, occasionally 2 on VI and VII, subdorsally 3-5 on segment III, 2-3 on segment IV, 2-4 on V, 2-5 on VI, 2-4 on VII, on segment VIII, 1 near eighth abdominal seta, 1-2 near lateral rim of vasiform orifice. Dorsum almost completely tuberculated (Fig. 13); small conical tubercles submedially on cephalothorax and along anterior and posterior margins of medio-submedian areas of abdominal segments I-VII. Abdomen: slightly elevated, intersegmental lines well defined, extending into subdorsum, absent from reflected part of subdorsum; segment VIII not separated from anterior segments, intersegmental line between VII and VIII not extending to submarginal furrow. Median tubercle on abdominal segment I, 1 median tubercle each posteriorly on segments IV-VI or II-VI, absent on VII. Vasiform orifice subcordate, 47-52 µm long, 50-52 µm wide, with apparent wide subrotund rim 1/4-1/3 as wide as orifice, anterior to apparent caudal margin by less than its length (Fig. 14). Operculum subcordate, 40 µm long, 40(42) µm wide, completely filling orifice. Lingula included in orifice, hidden by operculum, apically knobbed, spinulose.

**Venter** (Fig. 9). Without distinct dermal pattern. Antennae short, reaching anterior spiracle. Thoracic tracheal folds with spinules, abdominal tracheal fold indistinct. Legs developed; meso- and metathoracic legs each with 1 basal microseta in spinule band, 1 distal microseta and micropore; prolegs with 1 distal micropore. Minute spinules mesad of legs, and laterad of mouthparts. Adhesive sac oval, mesad of prolegs. Eighth abdominal setae anterior to position of vasiform orifice.

**Third, second and first instar larvae:** Not available.

**Type material.** Holotype pupal case second from left on slide with 4 paratype pupal cases. El Centro, Imperial Co., California, 19-VIII-74, ex mesquite, Flock and Pineda (No. 7413-75 CDA) (USNM). Other paratypes: Holtsville, Imperial Co., California, 2 pupal cases on 1 slide, 5 unmounted pupal cases on leaves, *Prosopis* sp., summer of 1991, E. Natwick and L. Osborn (CDA).

**Distribution.** United States (CA).
Host. Fabaceae: Prosopis sp. (mesquite).

Etymology. Specific epithet is a combination of Latin "bi" (twice) and "reflexus" (turned back). This species has reflected submargin and subdorsum.

Comments. Most of the cephalothoracic setae are missing and because of the strongly reflected submargin and subdorsum, part of the dermal features could not be observed.

This species resembles T. caulicola new species, which also occurs in the same habitat in California. Tetraleurodes bireflexa has a wide band of microtubercles of varying sizes on the submargin extending mesad of gland tubercles to about the apparent margin, total of 0-8 gland tubercles in the microtubercular band on the head and 0-6 on caudal part of the abdomen, small disc pores 2-3 μm in diameter, and the eighth abdominal setae separated by slightly more than the width of vasiiform orifice. Conversely, T. caulicola has only a narrow band of minute microtubercles on lateral one-third of the submargin distal of the gland tubercles; 11-58 gland tubercles in an irregular row in the lateral 1/3 of the submargin, disc pores 5-7 μm in diameter, and the eighth abdominal setae separated by almost 2 times the width of the vasiiform orifice.

Because of the strongly reflected submargin, T. bireflexa was previously identified as a species of Tetralicia. However, T. bireflexa has a submarginal fold and gland tubercles which are absent from Tetralicia species.

Tetraleurodes caulicola Nakahara

new species (Figs. 15-22)

Pupal case: elongate oval, anterior margin rounded, posterior margin more broadly rounded or slightly subtruncated; submargin slightly to strongly elevated; dorsal disc relatively flat, slightly higher than submargin, or strongly elevated, higher than submargin with outer subdorsum slightly overlapping submargin. Measurements of apparent margin: Length 912-1317 μm, width 537-798 μm. Black; wax absent. On twigs and leaves of desert legume shrubs.

Margin and submargin (Figs. 15, 16, 18, 19): True margin and short distal part of submargin usually reflected, reflected part rather short in contrast to distance between apparent margin; marginal teeth short, usually small, conical or lobular, or undivided and rather broad, sizes and shapes variable, 12-16 teeth per 100 μm (Figs. 18A, 19). Anterior seta slender, 14-20 μm long; posterior setae 35-47 μm long. Submargin differentiated from dorsal disc by submarginal fold, except fold absent from anterior part of head. Transverse ridges and narrow furrows dissecting submargin (Fig. 19A); short furrows extending mesally to about gland tubercles, long furrows extending mesad of gland tubercles; ridges between gland tubercles and margin, terminating in 1-3 marginal teeth, each ridge with a pale, V- or U-shaped glandular area (Fig. 18E) near margin; small, short ridge near margin between normal ridges, terminating marginally in 1 or 2 conical or lobelike teeth. Microtubercles on ridges in a short band between pale glandular area and gland tubercles (Fig. 18C). Micropores in irregularly spaced row near pale glandular areas (Fig. 18B). Irregularly spaced row of 11-58 oval or rotund gland tubercles (Fig. 18D), 8-12 μm in diameter, in about distal 1/3 of submargin, usually absent between positions of caudal setae. About 2/3 of submargin normally covered by overlapping subdorsum. Caudal setae 31-45 μm long, anterior to microtubercular band, separated by distance equal to 5-6 times width of vasiiform orifice (Fig. 17).

Dorsal disc (Figs. 15, 17): Subdorsum normally reflected (Fig. 16C), overlapping as much as 2/3 of submargin. Median molting suture extending to anterior margin; transverse molting suture extending to submarginal fold, terminating at level of or anterior to level of meso-metathoracic suture; margins of molting sutures smooth. Meso-metathoracic suture extending to subdorsum, not reaching submarginal fold. Eyespot absent. Cephalic setae 24-33 μm long, mesothoracic setae 12-24 μm long, and metathoracic setae 14-35 μm long; eighth abdominal setae hairlike, 26-45 μm long, usually shorter than length of operculum, anterolateral of vasiiform orifice, nearer to anterior margin of segment VIII than to orifice. Depressions on head anterior to seta and between seta and molting suture, and submedially on prothorax and mesothorax; metathorax with shallow furrow arising from meso-metathoracic suture anterior to seta and extending obliquely posteriorly; abdominal segments I-VIII each with U-shaped depression submedially on each side of anterior marginal area; area between depressions often delineated posteriorly by shallow groove. Disc pores 5-7 μm in diameter distributed on each side as follows: 4-12 subdorsally and submedially on head anterior or
laterad of cephalic seta; prothorax with 2-4 submedially and subdorsally, 2-6 along submarginal fold; mesothorax with 1-2 submedially, 3-5 aligned subdorsally laterad of seta in anterior 1/2 of segment, 1 occasionally subdorsally in posterior 1/2 of segment, 2-7 along submarginal fold; metathorax with 0-4 submedially, 3-6 aligned subdorsally laterad of seta; abdominal segments I-VII each with 1 submedially posterior of or slightly posterior laterad of depression; subdorsally 3-4 on III, 2-5 on IV, 0-4 on V, 1-3 on VI, 1-3 on VII, 3-5 laterad of vasiform orifice on VIII, 12-21 along submarginal fold. Small conical teeth in and bordering depression on metathorax, bordering submedial depressions on abdominal segments. Medial-submedial derm relatively smooth, subdorsal and part of submedial derm of abdomen and often cephlothorax tuberculated (Fig. 20). Abdomen elevated in submedial-medial areas, without median tubercle; intersegmental lines well defined, extending into subdorsum, not reaching submarginal fold, segments I-VII not separated from VIII; median area of VII slightly shorter than median area of anterior segments. Vasiform orifice subcordate or suboval, 45-57 μm long, 42-57 μm wide, anterior rim thick, on slightly elevated oval or U-shaped area of segment VIII, not protruding caudally over submarginal fold (Fig. 17); orifice anterior to apparent margin by about 2 times its length. Operculum subcordate, 40-52 μm long, 40-57 μm wide, completely filling orifice. Lingula hidden by operculum, apical half enlarged into oval knob, spinulose.

Venter (Fig. 15): Without distinct dermal pattern. Antennae extending to anterior spiracle. Thoracic and abdominal tracheal folds distinct, thoracic folds with minute spinules. Legs developed; mesothoracic and metathoracic legs each with 1 basal microseta; all legs each with 1 distal microseta and 1 microspine. Minute spinules on mesal bases of legs. Adhesive sac well developed. Eighth abdominal setae hairlike, anterior to position of vasiform orifice.

Third instar larva (Fig. 21): Similar in shape to pupal case except smaller; length 635-781 μm, width 355-489 μm. Submargin elevated into ridgelike rim around body, dorsal disc elevated in median area. Black or dark reddish brown. Wax absent.

Margin and submargin: Marginal teeth short, usually conical or lobelike, variable in size. 14-17 per 100 μm. Anterior setae slender, shorter than posterior setae; posterior setae about as long as or longer than operculum. Submargin differentiated from dorsal disc by fold. Ridges and furrows in distal 1/3 of submargin; each ridge terminating marginally in 1-3 conical or lobelike teeth, with a pale, V- or U-shaped glandular area near margin; usually with short conical lobe between marginal teeth; microtubercules absent. Total of 5-19 oval or circular gland tubercles, about 7 μm in diameter, medially of pale glandular areas, absent from head and caudal area between caudal setae. Caudal setae shorter than operculum, base tuberculated, separated by about 3 times width of vasiform orifice.

Dorsal disc: Cephalic, mesothoracic, and metathoracic setae missing, represented by setal bases, eighth abdominal setae anterolateral to vasiform orifice, shorter than operculum. Cephalothorax and abdomen with depressions, submedial depressions on abdominal segments I-VII, with 1-2 short, conical teeth on margin. Disc pores about 5 μm in diameter distributed as follows on each side: 2-4 submedially and subdorsally on head anterior to cephalic seta; prothorax with 1-2 submedially, 1 subdorsally; mesothorax with 1 submedially just laterad of seta, 1-2 subdorsally; metathorax with 1 submedially just laterad of seta, 1-2 subdorsally; abdominal segments I and IV-V each with 1 submedially, occasionally with 2 or absent from one side of IV or V, 1 subdorsally on VI-VII, usually 2 laterad of vasiform orifice on VIII, 2-7 subdorsally along submarginal fold. Abdomen slightly elevated in medial area, rachis well developed, extending into subdorsum; segment VIII not separated from anterior segments, anteromedial margin broadly lobed; median areas of VI and VII subequal in lengths. Vasiform orifice subcordate, about as broad as long, on oval or U-shaped and slightly elevated area of segment VIII, anterior to apparent caudal margin by about its length; operculum subcordate, about as broad as long, completely filling orifice.

Second instar larva (Fig. 22): Similar in shape to third larva except smaller; length at apparent margin about 451 μm, width 264 μm. Dorsum relatively flat; sclerotized, dark reddish brown. Wax absent.

Margin and submargin: Margin irregularly lobed, usually reflected ventrally. Anterior and
posterior setae not seen. Submargin differentiated from dorsal disc by fold; 1-2 oval or circular gland tubercles about 8 μm in diameter on each side of abdomen. Setal base of caudal setae separated by 2.5 times width of vasiform orifice.

**Dorsal disc:** Setal bases of cephalic, mesothoracic, metathoracic and eighth abdominal setae present. Disc pores, about 5 μm in diameter and associated porettes distributed on each side as follows: 1 on head lateral of cephalic seta; mesothorax with 1 subdorsally; metathorax with 1 subdorsally; abdominal segments IV and V each with 1 subdorsally, occasionally 1 subdorsally on II; 1 lateral of vasiform orifice on VIII. Vasiform orifice subcordate, about as broad as long, on slightly elevated, oval or U-shaped part of segment VIII, anterior to apparent caudal margin by about its length. Operculum subcordate, about as broad as long, completely filling orifice, posterior margin entire.

**First instar larva:** Not available.


**Rocky Pt., Sonora, 1 pupal case, twig of *Psorothamnus spinosus*, 11-III-56, Alexander & Kaiser (Nogales 75123, 56-14415) Paratypes deposited in CDFA, FSCA and USNM.

**Distribution.** Mexico (Baja California, Sonora), United States (AZ, CA).

**Hosts.** Fabaceae: *Cassia armata* S. Wats., *Cassia* sp. near armata, *Dalea* sp., *Psorothamnus emoryi* (Gray) Rydb. (=*Dalea* emoryi), *Psorothamnus spinosus* (Gray) Barneby (=*D. spinosa*).

**Etymology.** Specific epithet is a combination of Latin "caulis" (stem) and "cola" (inhabitant). This species is found usually on stems.

**Comments.** Whiteflies usually infest leaves of plants and are rarely found on the stems. *Tetraleurodes caulicola* is known from the green wood of *Psorothamnus spinosus* inhabiting the Colorado and Mojave Deserts of southern California, Arizona and Sonora, and *Cassia armata*, which inhabits the Colorado and Mojave Deserts of Arizona, southern California and Nevada. Both legumes are leafless during most of the year which is apparently the reason for the adaptation of *T. caulicola* to living on the stems. This species is similar in shape to *T. tuberculosa*, which also infests stems, and *T. bireflexa*. The irregularly lobed margin (12-16 teeth per 100 μm), large disc pores 5-7 μm in diameter, small, conical teeth confined to area around submedian depressions on the abdomen and absent from mesothorax, caudal setae separated by 4-5 times the width of the vasiform orifice, and the absence of submarginal thoracic setae differentiates the pupal cases of *T. caulicola* from *T. tuberculosa*. The latter species has 8-9 marginal teeth per 100 μm, disc pores 3.5 μm or less in diameter, numerous small, conical teeth completely across abdominal segments and on the mesothorax, caudal setae separated by about 2 times the width of the vasiform orifice, and 2 submarginal setae on each side of the thorax. The differences between *T. caulicola* and *bireflexa* are discussed under *T. bireflexa*. 
Tetraleurodes dorsirugosa Nakahara
new species (Figs. 23-26)

Pupal case: oval, anterior and posterior margins with similar shapes. Outer submargin almost vertically elevated, forming ridge around body, ridge occasionally overhangs and extends outside margin; inner submargin sharply depressed into submarginal fold; lateral part of subdorsum almost vertical; dorsal disc higher than submargin, somewhat level, except low ridges formed along molting sutures and on abdominal segments. Length 809-840 μm, width 517-576 μm. Black, dorsum with thin white wax cover; fringe of white, crystalline wax rods of subequal lengths, about 1/5 to 1/4 width of case.

Margin and submargin (Figs. 23, 25, 26): Marginal teeth subtruncate, broadly rounded or bilobed apically, 8-10 teeth per 100 μm on lateral margin. Anterior setae 24-28 μm long, on 8-12th tooth from midline, posterior setae 26-31 μm long, longer than caudal setae, 21-23 teeth between setae. Submargin differentiated from dorsal disc by submarginal fold. Transverse ridges and narrow furrows dissecting distal 1/2 of submargin; ridges of varying lengths terminating marginally into a single tooth or bilobed tooth. Pale glandular area at base of each marginal tooth. Band of microtubercles on ridges mesad of pale glandular areas, extending to about mid-width of submargin; microtubercles along transverse furrows smaller than ones more dorsally on ridge, absent from medial parts of longer ridges. Microspores with pale halo in irregularly spaced row mesad of V- or U-shaped pale glandular areas on distal margin of microtubercular band. Total of 23-30 oval or circular gland tubercles, 7-12 μm in diameter, in irregularly spaced row in medial area of submargin, about twice their diameter from microtubercular band. Irregular, pale area on each side of head between gland tubercles and microtubercular band (Fig. 23A). Caudal setae small, 9-12 μm long, shorter than operculum, in submarginal microtubercular band, separated by about 2 times width of vasiform orifice (Fig. 26A).

Dorsal disc (Figs. 23, 25, 26): Median molting suture extending to anterior margin; transverse molting suture not reaching submarginal fold, terminating laterally posterior to level of meso-metathoracic suture; margins of molting sutures smooth. Meso-metathoracic suture extending to subdorsum, not reaching submarginal fold. Eyespot absent or indicated by pale, along subdorsal spot lateral of cephalic seta. Cephalic, mesothoracic and metathoracic acetab poorly developed, about 9 μm long; eighth abdominal setae 9-12 μm long, anterolaterad to vasiform orifice and closer to anterior margin of segment VIII than orifice. Depressions submedially on head, prothorax, mesothorax, in submedial furrow on metathorax; submedial depressions on abdominal segments poorly defined or represented by oval areas on anterior marginal areas of I-VII. Disc pores about 2.5 μm in diameter and associated porets distributed on each side as follows: 2-3 subdorsally on head along submarginal fold; prothorax, mesothorax and metathorax each with 2 submedially; abdominal segments I-VII each with 1 submedially, VIII with 2 lateral of orifice subdorsum; subdorsally 2-3 on combined I-III (Fig. 25B), 2 on IV, 1-2 on V, 1-2 on VI and 0-1 on VII. Numerous, small, conical teeth submedially on abdominal segments I-VIII, extending mesad and laterad into subdorsum along anterior and posterior marginal areas of most segments; in submedial furrow on metathorax and along meso-metathoracic suture. Dorsum with sculpture lines, derm irregular, rugose (Fig. 25). Abdominal segments slightly elevated medially, intersegmental lines well developed, extending to subdorsum, not reaching submarginal fold on I-VI, intersegmental line between VII-VIII extending to fold, separating VIII from anterior segments; medial part of segment VI subequal to longer than that of VII. Vasiform orifice subcordate, 35 μm long, 38-45 μm wide, on slightly elevated oval area of VIII, anterior to caudal margin by 2-3 times its length (Fig. 26). Operculum subcordate, 28-33 μm long, 35-42 μm wide, sculpture lines dorsally, apically entire, almost completely filling orifice. Lingula hidden by operculum, spatulate, apical 1/2 enlarged into knob, spinulose.

Venter (Figs. 23, 24): Without distinct dermal pattern. Thoracic and abdominal tracheal fold distinct, thoracic tracheal fold with spinules (Fig. 24F). Antennae reaching anterior spiracles (Fig. 24E). Legs with microseta at base of mesothoracic and metathoracic legs in lateral margin of spinule band (Fig. 24D), each leg with 1 distal microseta and usually 1 distal microseta base (Fig. 24H). Adhesive sac well developed (Fig. 24B). Band of spinules (Fig. 24C) mesad of legs and laterad of mouthparts (Fig. 24A). Eighth abdominal acetab anterior to position of vasiform orifice (Fig. 23C).
First, second and third instar larvae: Not available.

Type material. Holotype pupal case on same slide with 4 paratype pupal cases; Caldas, Antioquia, Colombia, on Ceasalpinaceae, II-74, R. Velaz-Angel (74-7816); 3 other paratype pupal cases on 2 slides and 1 unmounted specimen with same data (USNM).

Distribution. Colombia (Antioquia).

Host. Fabaceae. Ceasalpinaceae.

Etymology. Specific epithet is a combination of Latin “dorsa” (dorsum) with “rugose” (rugose) to indicate that the dorsum is irregularly sculptured.

Comments. This species resembles *T. acaciae* but differs by the irregularly sculptured dorsum; short, poorly developed caudal setae; submarginal micropore in with pale halo; submarginal ridges variable in length; and marginal teeth usually smaller. Whereas, *T. acaciae* has relatively smooth dorsum; caudal setae long with enlarged bases, submarginal micropore with dark sclerotized rim and without pale halo; the submarginal ridges are regularly aligned and about equal in length; and the marginal teeth are larger.

*Tetraleurodes mexicana* Nakahara

new species (Figs. 27-31)

Pupal case: broadly oval, anterior and posterior margins broadly rounded; submargin elevated forming rounded ridge encircling case, higher than somewhat flat dorsal disc; dorsal disc with raised area or ridges along cephalothoracic sutures, and abdominal segments. Measurements of apparent margin: Length 809-918 μm, width 622-689 μm. Black, fringe of white wax about 1/3 width of case, dorsal wax absent.

Margin and submargin (Figs. 27, 28): True margin dentate, usually reflected beneath submargin (Fig. 27), 5-7 teeth per 100 μm on lateral margin (Fig. 28A); teeth broader than long, rounded apically. Anterior setae short, on 3-6th, tooth from midline; posterior setae subapical on tooth, 11-14 teeth between setae. Submargin differentiated from dorsal disc by submarginal fold, except head with broader fold. Submargin with transverse ridges and narrow furrows, furrows extending to margin, ridges extending from marginal teeth mesally, coalescing with adjoining ridges before row of large, gland tubercles. Pale glandular area V-shaped (Fig. 28B), defined by strongly sclerotized margins, at base of each tooth, distal ends extending marginally, terminating at furrows. Microtubercles on ridges forming narrow band mesial of V-shaped glandular areas, band slightly wider than diameter of gland tubercles (Fig. 28C). Micropore present or absent mesial of V-shaped area (Fig. 28D). 37-62 oval or circular gland tubercles, 12-19 μm in diameter, irregularly spaced around body. Micropores, 7-14 irregularly spaced on each side of submargin between gland tubercles and fold (Fig. 28C). Caudal setae well developed (partially missing, completely missing or curved too much to measure), longer than length of opercule, partial setae about 59-83 μm long, between margin and position of gland tubercles, bases enlarged, separated by distance equal to about 3 times width of vasiform orifice (Fig. 29A).

Dorsal disc (Figs. 27, 29): Median molting suture extending to anterior margin, transverse molting suture extending to submarginal fold; margins of sutures smooth. Meson-metathoracic suture well defined, extending to subdorsum, not reaching fold; small conical teeth clustered on metathorax along suture. Eyespot absent. Cephalic, mesothoracic and metathoracic setae present (all setae partially or completely missing); eighth abdominal setae shorter than operculum, anterolateral of vasiform orifice. Depressions on head, prothorax and mesothorax, none on metathorax. Disc pores often on small, low tubercles, disc pores about 2 μm in diameter and associated porelets distributed on each side as follows: 1 on head posterior of cephalic seta, 0-1 cephalad of seta and 1-2 between seta and molting suture on mesothorax, 1 submedially on abdominal segments II-VII (Fig. 27B) or replaced by micropores on IV-VII, occasionally 1 on VIII. Smaller disc pores distributed on each side as follows: 1 subdorsally occasionally on head anterior of cephalic seta; prothorax and mesothorax each with 0-4 subdorsally near submarginal fold; 0-2 cephalad of seta and 1-2 between setae and molting suture on mesothorax; 1 subdorsally on metathorax, 1 or 2 submedially on abdominal segment I, occasionally 1 or 2 submedially on IV-VII, scattered subdorsally on abdomen as follows (Fig. 27A): III 4-7, IV 6-7, V 5-6, VI 2-6, VII 2-4, VIII 1-2. Abdomen slightly elevated medially,
intersegmental lines strongly developed, extending into subdorsum and almost reaching submarginal fold, segmental line between VII-VIII reaching fold, separating VII from other segments, occasionally segmental line of VI-VII complete, separating VII from other segments. Small, conical teeth on anterior submedial part of I, along segmental lines on submedial and subdorsal parts of II-VII, often along medial parts of posterior segments. Median tubercle centrally on I or absent, absent from other segments. Vasiform orifice subcordate (Fig. 29), 26-33 μm long, 35-40 μm wide, on slightly elevated VIII that appear relatively flat; orifice 3-4 times its length anterior of apparent caudal margin. Operculum subcordate with apex broadly rounded or subtruncate, or subtriangle, almost completely filling orifice, 21-26 μm long, 31-33 μm wide, apex entire. Lingula completely hidden by operculum; apical one-half enlarged into oval knob, spinulose.

Venter (Fig. 27): Antennae reaching anterior spiracles. Thoracic and abdominal tracheal folds distinct; thoracic ones relatively parallel sided before widening at margin, with minute spinules on proximal part; abdominal fold without spinules. Legs with basal microseta on meso- and metathorax at lateral margin of spinule band; 1 distal microseta and 1 microseta base on all legs. Spinules in band mesad of each leg, few larger ones laterad of mouthparts. Adhesive sack well developed; often oval, saclike enlargement mesad of meso- and metathoracic legs. Minute submedian setae on abdominal segment II. Eighth abdominal setae anterior to position of vasiform orifice.

Third instar larva (Fig. 30): Similar in shape or more circular than pupal cases. Measurements based on apparent margins: length 498-568 μm, width 436-482 μm. Submargin elevated, forming ridgelike rim around dorsal disc. Dorsum sclerotized, dark reddish black. Fringe of white wax broader than width of body.

Margin and submargin: Marginal teeth about 5 per 100 μm on lateral margin, each tooth broader than long, rounded apically; margin usually reflected ventrally, apparent margin broadly lobed. Anterior setae subapically on tooth; posterior setae subapically on tooth, 9-11 marginal teeth between setae. Each submarginal ridge terminating into 1-3 marginal teeth. Large, poorly defined V- or U-shaped pale glandular areas between bases of marginal teeth and sclerotized band encircling body. Microtubercles absent. Mesad of sclerotized band, irregularly spaced row of 25-29 oval or circular gland tubercles, 9-12 μm in diameter, around body. Micropores, 11 mesad of gland tubercles on each side. Caudal setae between position of gland tubercles and caudal margin, longer than vasiform orifice, separated by distance equal to about 1.5 times width of vasiform orifice.

Dorsal disc: Cephalic, mesothoracic and metathoracic setae present, bases of latter 2 larger than that of cephalic seta, eighth abdominal setae anterolateral of vasiform orifice. Dorsal disc pores and associated porrettes and micropores distributed on each side as follows: Head with micropores, 1 posterior of cephalic seta, 1 lateral of cephalic seta, occasionally 1 subdorsally anterior of cephalic seta, mesothorax with 1 disc pore and porrette just anterior or anterolateral of seta (Fig. 30B), 1 micropore just lateral of seta and another on subdorsum; metathorax with 1 disc pore and porrette just anterolateral or lateral of seta, 1 micropore lateral of seta and usually another on subdorsum; abdominal segments IV and V each with 1 submedian disc pore; micropores 1 each subdorsally on abdominal segments III-VIII (Fig. 30A), or absent from III-V, occasionally 1 each submedially on IV and V instead of disc pores. Small, conical teeth submedially on metathorax along meso-metathoracic suture, distributed along segmental lines on each side of abdomen as follows: 1-2 submedially on 1-III (Fig. 30C), 1-4 on IV, 4-5 on VI, 2-4 on VII, extending medially and into subdorsum on posterior segments. Abdomen with well developed radich, median areas of segments II-VII subequal in lengths. Median tubercle absent. Vasiform orifice broader than long, subtriangular, on slightly elevated segment VIII, about 3.5 times its length from apparent margin. Operculum completely filling orifice, subcordate, broader than long, apex entire. Lingula hidden by operculum, apical 1/2 enlarged into oval knob, spinulose. Submedial depressions absent from abdomen.

Second instar larva (Fig. 31): Similar in color and wax fringe as third larva but smaller; oval, length 334-363 μm, width 175-281 μm.

Margin and submargin: Margin dentate. Submargin sectioned into rather broad, flat, ridges in distal part, each ridge terminating marginally into a single tooth or divided into 2 or 3 teeth. Large
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V- or U-shaped pale glandular areas mesad of teeth. Microtubercles absent. Proximal 1/2 of submarginal gland tubercles with oval or circular gland tubercles, 9-12 μm in diameter; 3-5 on each side of abdomen and 1 on each side of head. Caudal setae farther apart than width off orifice.

Dorsal disc: Cephalic, mesothoracic and metathoracic setae present, eighth abdominal setae anterolateral of vasiform orifice, setal bases smaller than disc porae. Pores distributed on each side as follows: 1 disc pore and porette occasionally laterad of cephalic seta, 1 disc pore and porette laterad of each mesothoracic and metathoracic setae, 1 disc pore or 1 micropore subdorsally on abdominal segments IV-V, 1 disc pore and porette laterad of vasiform orifice on VIII. Submedial, small conical tooth, 1 each on abdominal segments I-VII on each side or absent from II-VII. Vasiform orifice subtriangular, broader than long, about 2 times its length from caudal margin, not elevated; operculum subcordate, filling orifice, apex entire.

Type material. Holotype pupal case circled on slide with 5 paratypes (2 pupal cases, 3 third instar larvae) and 2 third instar larvae of T. acaciae; Hermosillo, Sonora, Mexico, Inga sp., 19-V-1951, Gunderson (Nogales 91340, 51-3310) (USNM). Other paratypes: MEXICO: 7 pupal cases, 3 third instar larvae, 1 second instar larva (3 slides) with same data as holotype; 1 third instar larva, unknown host, 30-I-1956, Alexander (56-4913); 2 pupal cases, 1 third instar larva, 2 second instar larvae (3 slides), Ruta sp., 11-VIII-1951, M. Segall (Houston 010093, 84-09682); 1 pupal case, unknown host, 25-II-1956, T. Giles (88-04728); Cuernavaca, Morelos, 4 pupal cases, 3 third instar larvae (1 slide), unknown host, 10-IV-1955, N.L.H. Krauss (45-10483); 7 pupal cases (2 slides). Pithecellobium dulce (Roxb.) Benth., VII, 1955, N.L.H. Krauss (5320, 55-9146). Uruapan, Michoacan, 5 pupal cases, 1 third instar larva, 2 second instar larvae (3 slides), Citrus sp., 14-IV-1956, Kodama (Brownsville 78623, 57-9305). Alamos, Sonora, 1 pupal case, 1 third instar larva (with 1 T. acaciae pupal case) (1 slide), unknown host, 19-XI-1953, Alexander (Nogales 73217, 54-76). Sinaloa, 1 pupal case, 1 third instar larva (1 slide). Tamarindus indica L., 7-X-1955, A.D. Wood (Nogales 4074, 75-12936) (USNM).

Distribution. Mexico (Michoacan, Morelos, Sinaloa, Sonora).


Etymology. This species is named after the country of Mexico.

Comments. Although this species has large submarginal gland tubercles, it differs from the other members of the acaciae group by lacking the elevated, U-shaped process with broad apparent rim around the vasiform orifice on abdominal segment VIII; minute pores on the subdorsum of the abdomen instead of large disc pores and associated porettes; and abdominal segment I without pores or with minute pores instead of disc pores and associated porettes.

The margins are mostly reflected ventrally and the true margin is difficult to study; the length and width are based on the apparent margin. The length or relative lengths of most setae are not given because the setae were partially or completely missing.

Tetraleurodes pseudacaciae Nakahara new species (Figs. 32-35)

Pupal case: oval, widest at metathorax; submarginal gland tubercles, 6-8 teeth per 100 μm on lateral margin (Fig. 34); teeth usually broader than long, tapering slightly to subtruncate apices. Anterior setae on 6-11th tooth from midline, 14-24 μm long (42 μm long on 1 specimen), 14-19 teeth between setae. Submarginal fold, except on head. Transverse ridges narrow, well defined, extending mesad from marginal tooth, separated by narrow, sharply defined furrows, coalesced with enjoining ridges before row of large, gland tubercles. Pale glandular area near base of each tooth (Fig. 34) (shape uncer-
tain because of reflected margin and submargin). Band of microtubercles mesod of pale glandular areas on ridges extending to about mid-width of submargin, median area of ridges with few microtubercles or relatively bare, distal margin of band clearly defined, usually with micropores with sclerotized rim. Between microtubercular band and submarginal fold with total of 17-47 oval or circular gland tubercles, 9-12 μm in diameter, irregularly spaced in row, usually absent from head on both sides of midline and from between positions of caudal setae. Micropores sparse, about 8 between row of gland tubercles and submarginal fold. Irregular pale area present or absent distal of gland tubercles on each side of head region. Caudal setae usually on apparent margin, curved, 45-87 long, bases tuberculated, separated by 1.75-2.50 times width of vasiform orifice.

**Dorsal disc** (Figs. 32, 33): Median molting suture extending to anterior margin; transverse molting suture terminating in submarginal fold at level posterior of meso-metathoracic suture; margins of molting sutures smooth. Meso-metathoracic suture extending to subdorsum, not reaching fold; teeth occasionally present along almost entire length of suture, also in submedian furrow on metathorax arising from suture. Eyespot usually represented by small, oval, pale or dark spot or tubercle on subdorsum just anterior to cephalic line (Fig. 32A), or absent. Cephalic, prothoracic, mesothoracic and metathoracic setae with well defined bases, missing or partially missing (Figs. 32B, C, D, E); mesothoracic seta (1 seta) hairlike, length about 35 μm long; eighth abdominal setae anterolaterad of vasiform orifice, 17-35 μm long. Depressions, oval, submedially on head and thoracic segments; 1 on each side of abdominal segments I-VIII bordered by teeth confined to area of depressions (Fig. 32F) or teeth extending across segment to subdorsum along segmental lines. Disc pores about 2.5 μm in diameter and associated poretes distributed as follows on each side: 2-3 subdorsally on head near submarginal fold, 2 or 3 posterior of cephalic seta; prothorax with 0-2 submedially, 2 subdorsally near submarginal fold; mesothorax with 1 or 2 submedially, 2 subdorsally laterad of seta; metathorax with 2 subdorsally along meso-metathoracic suture; abdominal segments I-VII each with 1 submedially, occasionally 2, 5-6 subdorsally, and VIII with 2 laterad of elevated area. Dorsal disc of abdomen elevated; intersegmental lines well developed, extending into subdorsum, intersegmental line of VII-VIII extending to submarginal fold, separating VIII from anterior segments (Fig. 33A); median area of II-VII subequal in lengths. Median tubercle centrally on 1, posteriorly on III-IV or V, or absent. Vasiform orifice subcordate, 38-50 μm long, 40-50 μm wide, on strongly elevated, U-shaped section of segment VIII posterior of eighth abdominal setae that protrudes slightly over fold (Fig. 33); orifice about its length from caudal margin; bottom of orifice open in anterior 2/3. Operculum subcordate, anterior margin truncate, apex entire, 33-42 μm long, 35-45 μm wide, completely or almost completely filling orifice. Lingula hidden by operculum, distal 1/2 spinulose, enlarged.

**Venter** (Fig. 32): Without distinct dermal pattern. Thoracic and abdominal tracheal folds distinct, widened mesally on subventer, narrowed on submargin, thoracic ones with spinules. Antennae almost extending to anterior spiracles. Legs with microseta on mesal base of mesothoracic and metathoracic legs in lateral margin of spinule band; 1 distal microseta and 1 micropore on all legs. Band of spinules mesad of legs and laterad of mouthparts. Adhesive sac well developed. Abdominal spiracle laterad and aligned with anterior part of vasiform orifice. Eighth abdominal setae anterior to position of vasiform orifice.

**Third instar larva** (Fig. 35): Similar in shape to pupal case but smaller. Length 451-603 μm, width 315-428 μm; dorsum sclerotized, black.

**Margin and submargin:** Marginal teeth 9-11 per 100 μm on lateral margin, usually broader than long, slightly tapering to subtruncate apices. Anterior setae slender, slightly longer than teeth; posterior setae slightly shorter than length of operculum, 12-17 teeth between setae. Submarginal transverse ridges and furrows in distal 1/2 of submargin; microtubercles on ridges in narrow band; pale glandular areas at bases of marginal teeth; submargin usually without gland tubercles, occasionally with 1 and rarely with 2. Micropore in each furrow between pale glandular areas; 1 micropore each on several ridges in microtubercular band. Caudal setae usually well developed, slightly longer to 2 times longer than length of operculum, separated by distance greater than width of vasiform orifice.

**Dorsal disc:** Cephalic, prothoracic, mesothoracic and metathoracic setae short, occasionally bases of 1 or 2 setae not sclerotized; eighth abdominal setae
antrolateral of vasiform orifice. Disc pores 2.0-3.5 μm in diameter and associated porettes distributed on each side as follows: 1, rarely 2, subdorsally; 1 posterior of cephalic seta on head; mesothorax with 1 cephalad or lateral of seta, 0 subdorsally; metathorax with 1 lateral of seta, 1 subdorsally; abdominal segments I and IV-V each with 1 submedially, rarely on III, VI-VIII each with 1 subdorsally. Abdominal rachis well developed, median areas of II-VI subequal in lengths. Median tubercles on III-IV or absent. Vasiform orifice subcordate, slightly wider than long, on U-shaped posterior elevation of VIII, apparent rim of orifice wide, rather broad; orifice anterior to caudal margin by less than its length. Operculum completely filling orifice, subcordate, slightly wider than long. Lingula hidden by operculum; distal half spinulose, forming oval knob.

Second instar larva (based on poor specimen): Similar in shape as third larva but smaller. Dorsum sclerotized, black.

Margin and submargin: Marginal teeth associated with submarginal ridges. Anterior setae not seen; posterior setae separated by 12 teeth. Distal part of submargin dissected by transverse ridges and narrow furrows. Gland tubercles absent. Caudal setae on submargin, with tuberculated bases, wider apart than width of vasiform orifice.

Dorsal disc: Cephalic, prothoracic, mesothoracic, metathoracic and eighth abdominal setae short; bases of setae on cephalothorax less distinct than disc pores. Disc pores and associated porettes distributed as follows on each side: 1 lateral of each cephalic, mesothoracic and metathoracic setae, 1 each subdorsally on abdominal segments IV-V and 1 lateral of vasiform orifice. Vasiform orifice subcordate, on U-shaped elevation of VIII. Operculum subcordate, wider than long, apex entire, completely filling orifice.

First instar larva: Not seen.

Type material. Holotype pupal case with 22 paratypes (7 pupal cases, 13 third instar larvae, 1 second instar larva) on slide labeled; Port-Au-Prince, Haiti, on leaves of Cassia mexicana, 20-X-77, A.I. Mercado (77-723) (USNM). JAMAICA: Kingston, 5 pupal cases (1 slide), Brya leaves, 27-VII-70, K. Heinze (Heinze 209) (NHM); 3 pupal cases (3 slides), Brya ebenus (L.) DC., 18-V-70, K. Heinze (Heinze 206) (NHM).

Distribution. Dominican Republic, Jamaica, Puerto Rico.

Hosts. Fabaceae: Brya ebenus (L.) DC., Brya sp., Cassia mexicana. Zygophyllaceae: Guaiacum officinale L.

Etymology. Specific epithet is a combination of Greek prefix “Pseudo” (false) and specific name acaciae. This new species is almost identical to T. acaciae and is often mistaken for it.

Comments. Of the seven species in the acaciae group, this is closest to T. acaciae. It differs principally by having a pair of submedial setae on the prothorax which is lacking in T. acaciae and other members of the group.

Tetraleurodes tuberculosa Nakahara

New species (Figs. 36-38)

Pupal case: elongate oval, anterior and posterior margins broadly rounded; dorsum elevated, subdorsum partially overlapping submargin. Measurements of apparent margin: Length about 809 μm, width about 521 μm. Slide mounted specimen black.

Margin and submargin (Figs. 37, 38): True margin usually reflected beneath submargin; marginal teeth 6-9 per 100 μm at lateral margin, broader than long, apically subtruncate or rounded. Margins denticulate (Fig. 38A); minute tooth or narrow membranous area between teeth; apparent margin lobed or dentate. Anterior and posterior setae missing. Submargin differentiated from dorsal disc by fold, except absent from anterior part of head. Submargin with transverse ridges and narrow furrows; each ridge usually associated with a marginal tooth, coalescing with enjoining ridges medially (Fig. 38C). V- or U-shaped, pale glandular area at base of each tooth, distal ends towards margin, not terminating in furrows (Fig. 38D). Micropores present or absent near bases of pale glandular areas. Band of microtubercles on transverse ridges.
about 1/4 width of submargin. Mesad of pale glandular areas, not extending to row of gland tubercles (Fig. 38C). Total of 51-56 oval or circular gland tubercles, 9-12 μm in diameter, in irregularly spaced row around body. 2 small setae on each side of thorax between gland tubercles and microtubercular band (Fig. 36E). Caudal setae on proximal 1/2 of submargin, hairlike, length 14-17 μm long, shorter than operculum, separated by about 2.4 times width of vasiform orifice (Fig. 37). Proximal 1/2 of submargin partially covered by reflected subdorsum.

**Dorsal disc** (Figs. 36, 38): Subdorsum reflected laterally and folded over proximal 1/2 of submargin. Median molting suture extending to anterior margin; transverse suture extending to submarginal fold; margins of molting sutures smooth. Mesothoracic suture extending into subdorsum, not reaching submarginal fold. Eyespot on subdorsum, small, elongate oval longitudinally (Fig. 36A). Cephalic, mesothoracic and metathoracic submedial setae missing, represented by their non-tuberculated bases (Fig. 36B-D); eighth abdominal seta anterolaterad of vasiform orifice. Depressions on head, prothorax (Fig. 36F) and mesothorax; submedial depressions on abdomen poorly indicated (Figs. 36F, 38E). Disc pores 2.3-3.5 μm in diameter or smaller and associated porettes distributed on each side as follows: 4-6 submedially and subdorsally on head; prothorax with 1 submedially or subdorsally; mesothorax with 2 subdorsally; 1 submedially; metathorax with 2 subdorsally; abdominal segments I-VII each with 1 submedially, 2-3 subdorsally on III-VII (Fig. 36G), 2 laterad of vasiform orifice on VIII. Numerous small, conical teeth distributed as follows: On mesothorax in area of submedial depressions and setal base and extending to subdorsum; on margins of submedial depressions and from midline to subdorsally on metathorax; in medial-subdorsal bands along anterior 1/3 and along posterior 1/4 of abdominal segments I-VII (Fig. 38F). Subdorsal areas of cephalothorax and abdomen tuberculated (Fig. 38I). Abdomen slightly elevated, intersegmental lines well defined, extending into subdorsum, not reaching submarginal fold; segment VIII not separated from anterior segments by complete intersegmental lines; median area of VII slightly shorter than VI. Median tubercle absent. Vasiform orifice subcordate, 35-38 μm long, 35 μm wide, on oval, elevated area on VII, with apparent wide rim about 1/3 as wide as orifice, anterior of caudal margin by about its length (Fig. 37B). Operculum subcordate, 31-33 μm long, 33 μm wide, almost completely filling orifice (Fig. 37A). Lingula hidden by operculum, spatulate; apical 1/2 enlarged into oval knob, spinulose.

**Venter** (Fig. 36): Without distinct dermal pattern. Antennae reaching anterior spiracle. Thoracic and abdominal tracheal folds indistinct. Mesothoracic and metathoracic legs each with 1 basal microseta; each leg with distal microseta and micropore. Minute spinules mesad of legs. Adhesive sac well developed. Eighth abdominal setae short, hairlike, anterior to position of vasiform orifice.

**Third, second and first instar larvae:** Not available.

**Type Material.** Holotype pupal case on slide with 1 paratype pupal case; stem of unidet. plant, El Paso Co., Texas, 27-VI-56, J.W. Green (El Paso 55091, 56-7602) (USNM).

**Distribution and host:** Same as type material.

**Etymology.** Specific epithet derived from Latin 'tuberculum' (lumpy) for the tuberculated appearance of the dorsum.

**Comments.** This species and *caulicola* new species, which inhabit the arid areas of southwestern United States and adjoining areas of Mexico, infest the stems. The morphological characters to differentiate these two species are discussed under *T. caulicola*.

**Descriptions of Miscellaneous Species**

**Tetraleurodes bidentatus** Sampson and Drews (Figs. 39-41)

*Tetraleurodes bidentatus* Sampson and Drews 1941:172; Mound and Halacy 1978:196.

**Pupal case:** oval, broadly rounded on head, widest at metathorax and narrowed caudally. Length 807 μm, width 617 μm. Slide mounted specimen brown (natural color unknown).

**Margin and submargin** (Figs. 39, 40): Marginal teeth 9 per 100 μm on lateral margin, broader than long. Apices usually bidentate and slightly concave.
between denticles, subtruncate or blunt without denticulation, sides converging distally (Fig. 40A). Anterior marginal setae short, about 7 teeth from midline; posterior marginal setae not seen. Submargin differentiated from dorsal disc by fold. Distal 1/4-1/3 of submargin with transverse ridges extending from base of marginal teeth (Fig. 40C), and narrow transverse furrows separating ridges extending to margin between marginal teeth. Small, oval, pale glandular areas outlined by darker rims at base of each marginal tooth (Fig. 40B). Micropores sparse, a pore occasional in transverse furrow between pale glandular areas. Rather coarse microtubercules in about distal 1/2 of submargin (Fig. 40C), forming a band around body. Disc pores and associated porettes in a row between microtubercular band and submarginal fold, porettes usually proximal of disc pores (Fig. 40D). Submarginal or caudal setae not seen.

**Dorsal disc** (Fig. 39): Subdorsal ridge, irregular in outline, extending from head to near vasiform orifice. Median molting suture terminus uncertain; transverse molting suture terminating in subdorsal ridge, slightly anterior of meso-metathoracic suture; margins of sutures smooth. Meso-metathoracic suture well defined, not extending to subdorsal ridge, without teeth or tubercles. Eyespot small, oval, about 9 μm wide, longer transversely, on edge of subdorsal ridge (Fig. 39A). Cephalic setae about 14 μm long, closer to each other than distance between the other pairs of setae; mesothoracic setae about 14 μm long; metathoracic setae missing (Fig. 39B), bases further apart than those of other two pairs; eighth abdominal setal bases anterolateral of vasiform orifice (Fig. 39C), seta missing. Depressions on cephalothorax apparently obliterated by macerating treatment; submedian depressions indicated on anterior area of abdominal segments II-VII, associated with 1-2 teeth. Disc pores minute, about 2 μm or less in diameter, and associated porettes distributed on each side as follows: 2 submedially, 1 sublaterally on head; mesothorax with 1 submedially, 2 anterolateral of setae; metathorax with 2 anterolateral of setae; 1 each submedially on abdominal segments I-V, those on II-V posterior of submedian depressions; 1 laterad of eighth abdominal setae; subdorsally 2 on abdominal segment III, 1 each on IV-V. Abdominal intersegmental lines poorly indicated, extending to subdorsal ridge. Vasiform orifice subcordate, about 1.5 times its length from posterior margin; rim completely around orifice; bottom open in anterior part, divided from caudal part by transverse sclerotized bar, caudal part with 2 pale areas divided by longitudinal sclerotized line (Fig. 41A and B). Operculum subrectangle, 35 μm long, 42 μm wide, apical margin membraneous, filling 2/3 of orifice. Lingula hidden by operculum.

**Venter** (Fig. 39): Thoracic and abdominal tracheal folds present. Submargin without defined marks. Antenna short, not extending to anterior spiracle. Bases of mesothoracic and metathoracic legs with two rows of conical spines; largest about 5 μm long, and short band of minute spines mesad of conical ones (Fig. 39D), prothoracic legs with few conical spines. Adhesive sac oval, between pro- and mesothoracic legs. Minute submedial seta on each side of abdominal segment II, eighth abdominal setae about 19 long, anterolaterad of vasiform orifice.

**Material examined.** Holotype pupal case; Chivela, Oaxaca, Mexico, undetermined tree, April, 1926, G.F. Ferris (UCD 833) (UCD).

**Distribution and hosts:** Same as material examined.

**Comments.** This species is known only from the holotype. Two other specimens collected on the same day and locality as the holotype and previously labeled as paratypes are described here as *T. chivela,* new species. The difference between these two species are discussed in the comments for *T. chivela.*

The subdorsal ridge, especially on the abdomen and the intersegmental line between the abdominal tergites I and II as shown in the illustration, probably are artifacts caused by the overtreatment of the specimen.

**Tetraleurodes chivela** Nakahara

*new species* (Figs. 42-46)

**Pupal case:** broadly oval. Measurements of apparent margin: Length 710 μm, width 553 μm. Slide mounted specimen dark brown (natural color unknown).

**Margin and submargin** (Figs. 42-44): Margin and part of submargin reflected (Fig. 42). Marginal
teeth 10-11 per 100 μm on lateral margin, as wide as long or slightly wider than long, apices truncate, slightly concave or denticulate, sides parallel, slightly convex or medially concave (Fig. 43A). Anterior marginal setae on 9 10th tooth from mid line (broken or missing); posterior marginal setae on 14-15 teeth from midline (broken or missing). Submargin completely differentiated from dorsal disc by submarginal fold. Transverse ridges separated by narrow furrows, each ridge extending medially from base of marginal tooth (Fig. 43D), may be subdivided into two ridges with microtubercles. Small, oval, pale glandular area on transverse ridge near base of each marginal tooth (Fig 43B), often a median, low, broad microtubercle between glandular area and base of marginal tooth. Band of microtubercules on transverse ridge, distal margin of band well defined with numerous microtubercles, fewer proximally. Micropore in each transverse furrow aligned with distal margin of microtubercular band (Fig. 43C). Proximal area of submargin without microtubercles, with single row of disc pores, about 2 μm in diameter, and associated porettes around body along fold (Fig. 43E). Caudal setae (partially missing or completely missing) closer to each other than width of vasiform orifice (Fig. 44A), on proximal part.

Dorsal disc (Figs. 42, 44): Derm relatively smooth. Median molting suture extending to anterior margin; transverse molting suture extending to submarginal fold near level of meso-metathoracic suture; margins of molting sutures smooth. Meso- and metathoracic suture extending to subdorsal areas, not reaching submarginal fold, without teeth; submedian furrow on metathorax absent. Eyespot small, oval, about 7 μm wide, longer longitudinally, on transverse fold between positions of submarginal fold and cephalic seta (Fig. 42A). Cephalic, mesothoracic and metathoracic setae on small tuberculated bases; cephalic setae about 19.5 μm long, closer to each other than distance between other two setae: meso- and metathoracic setae partially or completely missing; eighth abdominal setae about 19 μm long, anterolaterad and close to vasiform orifice, on small tuberculated base. Depressions on head and mesothorax (Fig. 42B); absent or poorly defined submedially on abdominal segments I-VII, indicated by 3-5 teeth of various sizes on anterior part of segment (Fig. 42C). Disc pores in pairs, 1.5 μm or less in size, distributed on each side as follows: 3 submedially or subdorsally on head, 1 posterior of eyespot; mesothorax with 1 submedially; metathorax with 2 subdorsally along meso-metathoracic suture; abdominal segments I-VII each with 1 submedially or absent from IV and VI, 1 laterad of eighth abdominal seta, 1 each subdorsally on III V. Abdomen slightly elevated medially, with well defined segmental lines not extending to submarginal fold, median area of segments II-VII subequal in length. Vasiform orifice subcordate, about 33 μm long, 28 μm wide, on slightly elevated caudal part of segment VIII, not protruding over submarginal fold, about 4 times its length from apparent caudal margin; rim not complete anteriorly (Fig. 44); bottom almost completely open. Operculum subcordate, apex entire, about 33 μm long, 28 μm wide, completely filling orifice. Langula hidden by operculum.

Venter (Figs. 42, 45, 46): Thoracic and abdominal tracheal folds well defined (Figs. 42E, 45A). Submargin completely sculptured with irregular or oval raised areas (Fig. 46B). Numerous spinules completely around body in subventral-submedial band, bordering mouthparts, ones medial of legs fewer and larger than those lateral of legs (Figs. 42D, 45B). Adhesive sac oval, mesad of prothoracic legs. Mesothoracic and metathoracic legs each with basal microseta along border of mediod lateral spinules, and 1 subdistal and 1 distal microseta. Antenna extending to anterior spiracle. Eighth abdominal setae about 24 μm long, anterolaterad of vasiform orifice.

First to third instar larvae: not available.

Type material. Holotype pupal case and 1 paratype pupal case; Chivela, Oaxaca, Mexico, April, 1926, G.F. Ferris (USNM). Paratypes. MEXICO. 2 paratype pupal cases (1 slide), Chamaedorea sp., 16-XI-76, D. Johnston (San Antonio 9749; 77-6938) (USNM).

Distribution. Mexico (Oaxaca).

Hosts. Areceae: Chamaedorea sp.; unknown host.

Etymology. Species is named after Chivela, Mexico, the type locality.

Comments. The types from Chivela were originally labeled paratypes of T. bidentatus Sampson and Drews, a species also collected at Chivela on the same date. Both species have cephalic, meso-
racic and metathoracic setae. *Tetraleurodes chivela* has a subventral band of spinules completely around the body and irregular or oval raised areas on the venter of the submargin; whereas, *T. bidentatus* has only a narrow band of spinules on the mesal base of the legs and the irregular or oval raised areas are absent from the venter of the submargin.

*Tetraleurodes confusa* Nakahara

new species (Figs. 47-50, 54)

**Pupal case:** oval, broadly rounded anteriorly and posteriorly, widest at transverse molting suture; submargin almost vertical. Dorsal disc elevated. Length 946-1103 μm, width 678-848 μm. Black, broad fringe of white, flocculent, filamentous wax, narrower to wider than width of case; dorsum with dusting and patches of white, flocculent wax (Fig. 54).

**Margin and submargin** (Figs. 47, 49): Marginal teeth 8-9 in each 100 μm; teeth about as broad as long, sides converging to arched apex; with close-set series of short ridges and alternating paler marginal areas, giving striped or dentate appearance. Anterior marginal setae 17-26 μm long, usually 24-26 μm long, on 6-12th tooth from midline; posterior marginal setae 38-50 μm long, separated usually by 20-29 teeth. Submargin differentiated entirely from dorsal disc by fold. Submarginal transverse ridges separated usually by indistinct furrows (Fig. 49B); each ridge extending mesad from base of a marginal tooth; furrows 1/2 as wide to about as wide as ridges, narrowed distally between membranous pale areas and to margin between teeth. A narrow, V-shaped glandular pale area on each ridge at base of each marginal tooth, distal arms of glandular pale area terminating before transverse furrow (Fig. 49C). Micropore in transverse furrow between or near distal ends of membranous pale areas. Numerous microtubercules in a wide band completely around body mesad of V-shaped membranous pale area (Fig. 49B), microtubercules in transverse furrows subequal in size to those on ridges. Area between microtubercular band and submarginal fold without microtubercules, narrower than microtubercular band; with disc pores subequal to microtubercules, in 1 or 2, occasionally 3 rows, occasional disc pores near or in microtubercular band (Fig. 49A). Caudal setae in microtubercular band, 90-118 μm long.

**Dorsal disc** (Fig. 47): Median molting suture extending from transverse molting suture to anterior margin. Transverse molting suture extending obliquely from midpoint caudally, and broadly recurved anterolaterally to slightly developed subdorsal longitudinal ridge at about level of metathoracic setae. Minute notches along longitudinal molting suture on head to metathorax (Fig. 48) and on transverse suture. Meso-metathorax suture not extending to submarginal fold; margins of suture strongly sclerotized, without small tubercles. Eyespots oval, near or touching submarginal fold. Cephalic setae absent, meso- and metathoracic setae 35-59 μm long, on enlarged, tuberculate bases; eighth abdominal setae 94-136 μm long, on lateral part of oval tubercles anterolateral of vasiform orifice (cf. Fig. 51B). Depressions submedially on head and mesothorax, 1 submedian depression on each side of abdominal segments I-VIII with irregular margins outlined by small teeth, 1 on anterior margin of abdominal segment I often less defined than those on posterior segments. Disc pores and associated pores distributed as follows on each side of body: 2-3 subdorsally on head; prothorax with 5-6 extending from near median molting suture to near eyespot; mesothorax with 1-2 submedially, 2-4 subdorsally laterad of setae; metathorax with 1 laterad of metathoracic seta, 2-4 along meso-metathoracic suture, often 1 near distal end of transverse molting suture on or near subdorsal, longitudinal ridge. Abdominal segments I-VIII each with 1 posterior of each submedian depression, occasionally segment with 2 on one side; submedian subdorsal area of segments II-V each with 1 or 2, VI-VIII each with 1 subdorsally. Median area of abdomen between submedian depressions on segments I-VII and median area of segment VIII elevated. Segmental lines well defined in median and submedian areas, weaker laterally on subdorsum; segments subequal in length medially; elevated part of segment VIII with 2 tubercles anterior to vasiform orifice (cf. Fig. 51B). Vasiform orifice subcuculate, on posterior part of segment VIII, elevated, often protruding over submarginal fold, anterior to caudal margin by 2 to 3 times its length; orifice 31-35 μm long, 33-45 μm wide, encircled by rim, anterior part of rim 5-7 μm wide; inner walls vertical, smooth or with few short lines lining posterior 1/2 to 1/3 of orifice. Lingula hidden by operculum; distal 1/2 slightly wider than basal part, spinulose, spinules longer in apical part. Operculum subcuculate, completely filling orifice; 26-31 μm long, 31-33 μm wide; usually patterned
with short, longitudinal and diagonal marks; with one apical, median notch 2.5-3.5 µm deep (cf. Fig. 51A), and 1 to 2 minute indentations in form of short lines on each side of notch.

Venter (Fig. 47): Antenna short, reaching or almost reaching anterior thoracic spiracles; apically narrowed with minute spinules; setae and spines absent. Each leg with 3 minute setae at base; 2 close-set median setae by anterior margin of mouthparts; eighth abdominal setae, 33-47 µm long. Thoracic and abdominal spiracles well developed. Thoracic and abdominal tracheal folds indicated. Adhesive sacs indistinct.

Third instar larva: Similar to pupa, except smaller.

Margin and submargin (Fig. 50): Margin dentate, teeth rounded apically, about as long as wide, 13-14 teeth in 100 µm. Submargin with transverse ridges and furrows. V-shaped pale glandular areas on ridges at bases of marginal teeth. Submarginal microtubercular band on transverse ridges and furrows, completely around body. A row of 7-11 irregularly spaced disc pores between submarginal microtubercular band and submarginal fold. Caudal setae between submarginal fold and margin.

Dorsal disc: Eyespot oval, mesad of submarginal fold by about its longest diameter to less than its diameter. Cephalic and first abdominal setae absent; meso- and metathoracic setae on enlarged, tuberculated bases; eighth abdominal setae on tubercles. Submedial depressions on abdomen poorly developed. Disc pores and associated porettes distributed on each side as follows: 1 submedially occasionally on head; 1 in submedian area of prothorax; 1 anterolaterad of mesothoracic setae; 1 lateral of metathoracic setae; 1 lateral of submedial depression on abdominal segment III; 1 caudal of submedial depression on IV and VII; 1 occasionally lateral to pores on IV. Abdominal segment VII shorter than VI in median part. Operculum subcoraldate, sclerotized except for spinulose apical part.

Second, and first instar larvae: Similar to those of T. perseae.

Adult not seen.

Type material. Holotype pupal case with 2 paratype pupal cases on one slide: Palm City, FL, Persea sp., 9-V-79. E.W. Campbell (FS. C). Paratypes: FLORIDA: 1 pupal case, 2 third instar larvae (3 slides) with same collection data as holotype; 2 pupal cases (1 slide), oak, 4-1-18, Magnette and Sanford (Q 12221), Brandon, 3 pupal cases (3 slides), Persea sp., 19-II-81, J. Felty. Cocoa, 3 pupal cases (3 slides), Persea borbonia (L.) Spre., 1-VIII-80, R.E. Burns and W.P. Henderson; 1 pupal case (1 slide), Persea borbonia, 13-V-82, F.A. Smith, Fellsmere, 1 pupal case, 1 third instar larva (2 slides), Persea palustris (Raf.) Sarg., 24 II 83, E.W. Campbell and K. Hibbard. Ft. Pierce, 2 pupal cases (2 slides), Persea sp., 14-IV-80, E.W. Campbell. Gainesville, 1 pupal case, Persea borbonia, 27-IV-78, C. Lieberman. Lake Hamilton, 2 pupal cases (1 slide), hammock bay, 8 XI-18, Nanny and Baoson. Longwood, 5 pupal cases (1 slide), Cinnamomum sp., 16-VI-60, C. Youtsey. Miami, 2 third instar larvae (1 slide), Persea palustris, 26-II-61, D. Palmer; 1 pupal case, Persea sp., 8-XI-82, L. Kornfeind. orchid Island, 1 pupal case, Persea borbonia, 6-VI-80, S.P. Beidler. Ormond Beach, 3 pupal cases (1 slide), Magnolia virginiana (L.), 7-VIII-59, Smith and Roberts; 2 pupal cases, 1 third instar larva (2 slides), Gordonia lasianthus (L.) Ellis. 11-III-80, J. N. Pott; 6 pupal cases, 1 third instar larva (7 slides), Gordonia lasianthus, 4-VIII-80, J. N. Pott. Ochopee, 6 pupal cases, 1 third, 7 second and 8 first instar larvae (3 slides), unknown host, 17 XII 40, L.M. Russell. Port St. Lucie, 3 pupal cases (3 slides), Persea sp., 6-III-79, E.W. Campbell. 4 third instar larvae (4 slides), Persea sp., 7-III-79, E.W. Campbell; 3 pupal cases (3 slides), Persea borbonia, 20-II-80, E.W. Campbell. St. Cloud, 1 pupal case, Persea sp., 22-XI-82, V.G. Brown. Steinhardt, 3 pupal cases (3 slides), Magnolia sp., 19-III-79, Q. Anglin. Stuart, 1 pupal case, 1 third instar larva (2 slides), Persea sp., 25-IV-61, F. Campbell; 5 pupal cases (5 slides), Persea borbonia, 30-I-78, E.W. Campbell; 2 pupal cases (2 slides), Persea borbonia, 4-XII-78; 3 pupal cases (3 slides), Persea borbonia, 14-V-83, C. Wheeler. vero Beach, 1 pupal case, Persea sp., 24-IV-80. R. Kendrick. White City, 2 pupal cases, Persea borbonia, 30-V-80, E.W. Campbell. MISSISSIPPI: Bay St. Louis, 8 pupal cases (2 slides), Persea palustris, 27-1-44, Mayer (44-5186). PUERTO RICO: Sabana Grande San German Rd., 2 pupal cases (1 slide), Nectandra coriacea (Sw.) Griseb., 14-III-52, Martorell & Russell. Paratypes in CDFA, FSCA, NHM, USNM. Other specimens examined on various hosts in FSCA.
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Distribution. Puerto Rico, United States (FL, MS).

Hosts. Fagaceae: Quercus sp. Lauraceae: Cinnamomum sp., Noctandra coriacea (Sw.) Griseb., Persea borbonia (L) Spreng., P. palustris (Raf.) Sarg., Persea sp. Magnoliaceae: Magnolia virginiana L. Theaceae: Gordonia lasianthus (L.) Ellis

Etymology. Specific epithet derived from Latin "confusus" to indicate that the species can be easily confused with T. perseae.

Comments. The pupal case of this species is difficult to differentiate from that of its allopatric congener, T. perseae. It differs by having 7-9 marginal teeth in each 100 μm, distal ends of V-shaped pale glandular areas are separated from enjoining pale area, and submarginal area between microtubercular band and submarginal fold narrower than the band and with 1 or 2 rows of disc pores as large as the microtubercules. Conversely, T. perseae has 9-11 marginal teeth in each 100 μm, distal ends of V-shaped pale glandular areas almost touching enjoining pale areas; submarginal disc pores minute, smaller than microtubercules, in an irregular row about proximal 1/3 of the microtubercular band, and in another irregular row between the microtubercular band and submarginal fold. Tetraleurodes mori also has V-shaped, pale glandular areas at the bases of marginal teeth, submarginal microtubercular band, and well developed meso- and metathoracic setae with tuberculated base; however, the operculum does not have an apical, median notch, which is present in the other 2 species, and a cluster of submedial disc pores is present on each side of abdominal segment IV, which is lacking from the other two.

The third instar larva of T. confusa does not have cephalic setae, but has 1 submedian disc pore and porette caudad of submedial depression on each side of abdominal segment IV, and submarginal disc pores between the submarginal microtubercular band and submarginal fold; whereas, T. perseae has cephalic setae, 1 submedian pore and porette posterior of the submedial depression on each side of segments III and V, occasionally absent from III or V, and submarginal disc pores and porettes are in the proximal part of the microtubercular band.

Pupal case: oval, broadly rounded anteriorly and posteriorly, widest at transverse molting suture; submargin almost vertical, dorsal disc elevated; exuviae of larval stages often found adhering to dorsum (Fig. 55). Length 803-1158 μm, width 597-930 μm. Black, band of white, close-set, parallel strands of crystalline wax that curls over submargin to subdorsum from base of marginal teeth; dorsal disc bare except for patches of white wax on thorax.

Margin and submargin (Fig. 52). Marginal teeth 9-11 in each 100 μm; teeth about as broad as long or longer than broad, sides converging to arched apex; with closely set series of short ridges and alternating paler marginal areas. Anterior marginal setae usually on 10-11th (9-14th) tooth from midline; posterior marginal setae 31-42 μm long, separated by 21-30 teeth. Submargin differentiated entirely from dorsal disc by fold. Submarginal transverse ridges separated by transverse furrows (Fig. 52A), extending mesad from marginal teeth; furrows usually 1/4, occasionally 1/2, as wide as ridges, narrowed between V-shaped glandular pale areas to margin between teeth. V-shaped, pale glandular areas on ridges at bases of marginal teeth, their distal ends terminating at transverse furrow, almost meeting distal ends of enjoining glandular area. Micropore usually in transverse furrow between distal ends of glandular pale areas. Numerous microtubercules in wide band mesad of V-shaped glandular pale areas (Fig. 52A), those in furrows sparse, usually smaller than those on ridges. Area between microtubercular band and submarginal fold without microtubercules, as wide or wider than band. Irregular row of disc pores in proximal part of microtubercular band (Fig. 52A), another irregular row of disc pores and associated porettes between microtubercular band and submarginal fold. Caudal setae in microtubercular band, 83-130 μm long.

Dorsal disc (cf. Fig. 47): Median molting suture extending from transverse molting suture to anterior margin. Transverse molting suture extending obliquely from midpoint caudally, broadly recurved anterolaterally to subdorsal longitudinal ridge at about level of metathoracic setae. Minute notches along suture partially on head to metathorax, and on transverse suture (cf. Fig. 48). Meso-metatho-
racic suture not reaching subdorsal longitudinal
ridge, with small tubercles on both margins of
suture. Eyespots oval, near submarginal fold.
Cephalic setae absent; meso- and metathoracic
setae well developed, usually apically expanded
and frayed, 52-86 μm long, about 5 μm thick, on
enlarged tuberculate bases; eighth abdominal setae
69-111 μm long, on lateral part of oval tubercles
(Fig. 51B), anterolateral of vasiform orifice.
Depressions distributed as follows on each half of
body: 2 submedian paired depressions on head,
another paired depression anteromedial of me­
sothoracic seta, submedian depressions on abdo­
men with irregular margins outlined by small tu­
berciles, 1 on anterior margin of abdominal segment
1 often less defined than on posterior segments, 1
each between segmental lines on II-VIII. Disc
pores and porettes distributed on each side as
follows: 1-3 subdorsally on head; prothorax with 5­
7 extending diagonally from near median molting
suture to near eyespot; mesothorax with 1-2 mesad
of setae, 3-4 anterolateral of setae; metathorax
with 2-4 laterad of setae, 1 2 near distal end of
transverse molting suture on subdorsal longitudinal
ridge: abdominal segments I-II and VI-VIII
each with 1 posterior of submedian depression, III­
V each with 1-3 posterior of depression. Median
area of abdomen between submedian depressions
on segments I-VII and median area on segment
VIII elevated. Segmental lines well defined in
median and submedial areas, weaker laterally on
subdorsum; segments subequal in length medi­ally;
median area of segment VIII with 2 tubercles
anterior to vasiform orifice (Fig. 51B). Vasiform
orifice subcordate, 31-35 μm long, 33-40 μm wide,
on posterior part of eighth abdominal segment,
elevated, often protruding over submedian fold,
anterior to caudal margin by 2-3 times its length;
encircled by rim, anterior part of rim 5-7 μm wide;
inner walls vertical, smooth or with few short lines
on posterior 1/2 to 2/3 of orifice. Operculum sub­
cordate (Fig. 51), completely filling orifice; 26-33 μm
long, 31-35 wide; usually with pattern of longitudinal
and diagonal marks; with median, apical notch
(Fig. 51A), 2.5-3.5 μm deep, and 1-2 minute in­
dentations in form of short lines on each side of notch.
Lingula hidden by operculum; distal half slightly
wider than basal part, spinulose, spinules on apical
part longer.

Venter (cf. Fig. 47): Antenna short, apically nar­
rrowed with minute spinules, setae and spines ab­
sent, reaching anterior thoracic spiracles. Each leg
with 3 minute setae on base; 2 close-set median
setae by anterior margin of rostrum; eighth ab­
dominal setae 24-38 μm long. Thoracic and ab­
dominal spiracles well developed. Thoracic and ab­
dominal tracheal folds indicated. Adhesive sac indi­
tinct.

Third instar larva: Black; fringed with white wax.
Similar to pupa, except smaller.

Margin and submargin (Fig. 53): Margin den­
tate, teeth curved apically, about as long as wide,
10-15 teeth in 100 μm. Anterior marginal setae on
9-12th tooth from midline; posterior marginal setae
separated by 22-24 marginal teeth. Submargin
with transverse ridges and furrows. V-shaped pale
glandular areas, shorter than teeth, on transverse
ridges at bases of teeth. Submarginal microtubercular
band on transverse ridges and in
furrows, completely around body. A row of 11-12
disc pores and associated porettes, occasionally 13,
irregularly spaced in proximal 1/3 of microtubercular
band. Caudal setae between submarginal fold and
margin.

Dorsal disc: Eyespot oval, mesad of submarginal
fold by more than its longest diameter. Cephalic
setae long; meso- and metathoracic setae appar­
ently well developed (all setae broken); eighth ab­
dominal setae on tubercles, anterolateral to
vasiform orifice. Abdominal segments II-VI
subequal in length, VII shorter than VI. Submar­
ginal depressions on each side as follows; 1 on
mesothorax, 1 each on anterior margin of abdomi­
nal segments I-VIII. Disc pores and associated
porettes distributed on each side as follows: 1 pos­
terior and 1 posterolateral to cephalic setae, 1
laterad of each meso- and metathoracic setae; 1
posterolateral to each submedian depression on abdomi­
nal segments III-V and VII, occasionally absent
from III or V, 1 present or absent subdorsally on II,
III and VI. Abdominal segment VII shorter than VI
in median part. Operculum subcordate, sclerized
except for spinulose apical part.

Second instar larva: Light yellow. Similar to
third instar except smaller.

Margin and submargin: Margin dentate, apices
teeth curved. Glandular pale areas at bases of
teeth small, oval. Submargin without microtubercu­
les or disc pores. Caudal setae, thinner than
eighth abdominal setae.
Dorsal disc: Cephalic setae not observed; meso- and metathoracic setae extremely long, apices expanded and frayed; eighth abdominal setae laterad and in line with anterior margin of vasiform orifice. Disc pores and associated porettes distributed as follows on each side: 1 subdorsally on head and prothorax; meso- and metathorax each with 1 subdorsal and 1 submedian just laterad of setae; 1 each submedially on abdominal segments II, IV–VI, and 1 laterad of eighth abdominal seta. Vasiform orifice subcordate, less than its length from body margin. Operculum subcordate, completely filling orifice.

First instar larva: Light yellow. Smaller than second instar, oval.

Margin and submargin: Margin finely dentate; marginal and submarginal setae well developed, 6 pairs on cephalothorax, 1 pair on anterior abdominal segment and 2 pairs on caudal part of abdomen; anterior 2 pairs longest.

Dorsal disc: Cephalic, meso- and metathoracic setae extremely long, tapering apically; metathoracic setae reaching or surpassing posterior margin of body. Eighth abdominal setae anterolateral of vasiform orifice, arising from tubercules. Vasiform orifice subtriangular, on triangular platelike elevation of eighth segment, protruding over submargin and reaching or almost reaching body margin. Operculum subquadrate or subcordate, filling 3/4 of vasiform orifice; with or without short, posteromedian suture about 1/3 length of operculum.

Venter: Antenna segmented, almost as long as mouthparts. Legs developed, segmented. Ventral setae: pair of close-set, short, median setae at anterior margin of mouthparts; 2 short setae at bases of meso- and metathoracic legs; eighth abdominal seta short, anterior to position of vasiform orifice.

Type material. Holotype pupal case and 3 paratype pupal cases on one slide; San Diego, San Diego Co., California, VIII-5-82, avocado, Ginsky & Blocker (no. 8238-24 CDFA) (USNM). Paratypes: EL SALVADOR: 2 pupal cases (1 slide), 3 third instar larvae (2 slides), Persea americana Miller, III-31-71, J.R. Davidson (Los Angeles 007232). MEXICO: 3 pupal cases, 5 third instar larvae (1 slide). Persea americana, VI-26-76, D. Walters (JFKIA 023284, 76-10872); 1 pupa, 3 third instar larvae (1 slide), Persea americana, VI-24-78, P. Gomes (San Diego 5169); 2 pupal cases, Persea sp., 21-VIII-80, G. Kluzik (Nogales 587); 1 pupal case, 1 third instar larva (1 slide), Laurus nobilis L., VI-1-82, D. Yeutter (Los Angeles 31183); 5 pupal cases, 2 third instar larvae (1 slide), Persea americana, IX-10-83, D. DeWeese (Miami 043612); 1 pupal case, 1 third instar larva (1 slide), Persea americana, 13-IX-83, J. Mintz (Miami 43002); 1 pupal case, 4 third instar larvae, Persea americana, 27-VIII-86, K. Bryan (Chicago 11520, 86-10351); 5 pupal cases (1 slide), Persea sp., 17-V-88, W. Carlo (Miami 76979, 88-09189); 6 pupal cases (1 slide), Persea sp., 26-11-92, H. Grieb (El Paso 041204, 92-04171). Mexico City, 5 pupal cases (1 slide), Persea sp., II-17-75, S. Kendall (Laredo 005753). Durango, 1 pupal case, Persea sp., 17-I-80, Y. Medrano (El Paso 10820). Puebla, 3 pupal cases (1 slide), 3 third instar larvae (1 slide), Persea sp., II-6-69, C.R. Kodama (Laredo 69703, 69-2947). San Luis Potosi, 4 pupal cases, 1 third instar larva (1 slide), Persea americana, 23-I-67, Main (Eagle Pass 13843, 67-4506). Uruapan, Michoacan, 7 pupal cases (2 slides), avocado, VIII-13-82, M. Rose. Vera Cruz, 4 pupal cases, 1 third instar larva (1 slide), Litsea sp., VI-12-72, D.W. Gutierrez (Laredo 004559, 72-17765). UNITED STATES: CALIFORNIA: 17 pupal cases on 8 slides, 6 third instar larvae on 2 of the 8 slides, with same collection data as holotype; Bonita, San Diego Co., 2 third, 7 second, and 4 first instar larvae (2 slides), avocado, XII-8-82, Hinton. Paratypes deposited in CDFA, FSCA, NHM, USNM.

Distribution. El Salvador, Mexico (D.F., Durango, Michoacan, Puebla, San Luis Potosi, Vera Cruz), United States (CA).


Etymology. Specific epithet derived from generic name of its common host, Persea americana.
San Diego Co., California, it has dispersed northward to Santa Barbara and Ventura Counties in California and is infesting commercial avocado orchards. According to Rose and Woolley (1984), *Cotes noacki* Howard, a hymenopterous parasitoid previously introduced into California to control *Aleurothrixus floccosus* (Maskell), the woolly whitefly, effectively controlled *T. perseae*. When a pesticide used to control another pest in avocado orchards eliminated its natural enemies in Uruapan, Mexico, it became a pest (Rose and Woolley, 1984).

**Tetraleurodes pringlei** Quaintance and Baker (Figs. 56-58)

*Tetraleurodes pringlei* Quaintance and Baker 1937:617; Sampson and Drews 1941:176; Mound and Halsey 1978:202

**Pupal case**: elliptical in shape, rounded apically and caudally; submargin almost vertically elevated from margin into submarginal ridge around case; dorsal disc elevated along molting sutures and a rounded, median longitudinal ridge on abdomen. Length 912 (1156) μm, width 645 (884) μm. Dorsum black; "...appears as a shiny black object surrounded by a lateral fringe of white wax. The fringe consists of white waxy filaments as long as the width of the case and overlaid with flocculent white wax" (Quaintance and Baker 1937).

**Margin and submargin** (Figs. 56, 57): True margin slightly reflected; marginal teeth 12 (11-12) per 100 μm on lateral margin, slightly wider than long to slightly longer than wide, apically subtruncate or convex, close act. Anterior setae 14 (19) μm long on 9th (8-10) tooth from midline; posterior setae about 42 μm long, about 32 teeth between setae. Submargin differentiated completely from disc by fold. Transverse ridges extending mesad from base of marginal teeth, separated by narrow transverse furrows, terminating in proximal 1/5 of submargin into close-set transverse striae. V or U-shaped pale glandular area with similarly shaped darker margins on each ridge mesad of marginal tooth, distal arms of pale area separated from neighboring pale areas by transverse furrow (Fig. 57A). Microtubercles on ridges forming wide band extending from base of pale areas to near submarginal fold; microtubercles just mesad of each pale area minute, closely set (Fig. 57B), remainder of band with larger microtubercles (Fig. 57C). A pore occasionally in transverse furrow aligned between distal arms of pale glandular areas; other pores sparse, irregularly spaced, on transverse ridges located on or near border between minute and larger microtubercles; an irregular row of pores in proximal 1/3 of submargin (Fig. 57D). Caudal setae 52 (40-47) μm long, on proximal part of microtubercular band, separated by about the width of vasiform orifice (Fig. 58).

**Dorsal disc** (Figs. 56, 58): Median molting suture extending to anterior margin, margins of suture with series of short lines on head to mesothoracic-metathoracic segmental line; transverse suture terminating subdorsally at about level of meso-metathoracic segmental line, margins of suture smooth. Meso-metathorax suture terminating laterally at slightly developed subdorsal ridges. Eyespot on head subcircular or longitudinally oval (Fig. 56A), 1-3 times its diameter from submarginal fold. Cephalic setae absent, meso- and metathoracic setae on tuberculated bases (setae completely or partially missing); eighth abdominal setae about 90 μm long, on two oval tubercles anterior to vasiform orifice, setae laterad of anterior rim of orifice, separated by about twice width of vasiform orifice. Depressions submedially on head; submedial depressions on abdomen part of submedian, longitudinal furrow running from anterior part of segment I into segment VII, depressions indicated by few small, conical teeth. Disc pores about 2 μm in diameter and associated porettes few, distributed on each side as follows: 2-3 subdorsally on head; prothorax with 2 submedially and 1 further laterad; mesothorax 2-3 submedially, 1 further laterad; metathorax with 2 laterad of seta; abdominal segments I, III, V and VII each with 1 submedially, 0-1 on IV, absent from II and VI; 1 each subdorsally on segments III-VIII; 7-10 minute pores laterad of vasiform orifice usually in two rows. Dorsal derm smooth, not tuberculated or granulated. Abdomen: median part elevated into longitudinal ridge, strongly delineated by submedian, longitudinal furrows (Fig. 56B); intersegmental lines dissecting longitudinal furrows, extending into subdorsum; segment VIII with median, elevated subtriangular plate-like area containing eighth abdominal setae and vasiform orifice; median part of segment VII slightly shorter than that of VI. Median tubercles absent. Vasiform orifice subtriangular, 35 μm long, 42 (45) μm wide, on posterior part of subtriangular elevated plate of segment VIII, about 2.5 times its length from posterior margin (Fig. 58). Operculum subcordate, completely filling orifice, 33 μm long 38
(40) μm wide. Lingula hidden by operculum, distal part spinulose, enlarged.

**Venter** (Fig. 56): Without distinct dermal pattern; fine spinules submedially and on subventer of cephalothorax, extending from mouthparts to submedial parts of anterior abdominal segments. Antenna extending to anterior spiracles. Thoracic and abdominal tracheal folds evident. Prolegs with 1 distal microseta; mesothoracic and metathoracic legs each with 1 microseta and 1 microspine distally; 1 minute seta each at mesal bases of meso- and metathoracic legs in spinule band; 1 pair of minute setae submedially on abdominal segment II; pair of setae about 24 μm long anterior to position of vasiform orifice on abdominal segment VIII.

**Third, second and first instar larvae.** Not available.

**Material examined.** Holotype pupal case, on *Caulanthus hispites*, (collection date not given), Oaxaca, Mexico, G.O.G. Pringle (Q-8884) (USNM). Other material: Mexico, Oaxaca, 2 pupal cases (1 slide), unknown host, 3-I-64, Kaiser (Nogales 89115; 64-5458) (USNM).

**Distribution.** Mexico (Oaxaca).

**Hosts.** Cruciferae: *Caulanthus hispites*.

**Comments.** Only one slide mounted type specimen was found in the Aleurodidae collection of the USNM. A holotype was not designated by Quaintance and Baker nor is there any indication in the original description of the number of type specimens. For these reasons, I have designated here the single slide mounted type specimen as the holotype.

The holotype has been overtreated and many morphological structures cannot be seen clearly; thus most of the redescription is based on the two identified specimens.

This species is similar to *T. fici* which also has a wide submarginal band of microtubercles, submarginal ridges extending from bases of marginal teeth to almost the submarginal fold, meso- and metathoracic submedian setae present, dorsal disc rather smooth, abdomen with median part elevated and delineated by longitudinal submedian furrows, subcordate vasiform orifice and operculum, and and tracheal folds present. It differs by lacking minute notches on the molting sutures, marginal teeth about as long or slightly longer than wide, and ventral spinules only submedially on anterior to intermediate abdominal segments; whereas, *fici* has minute notches on the molting sutures, marginal teeth are about twice as long as wide, and spinules are present on the subventral and submedial parts of the abdomen.

**Tetraleurodes quadrivincula Nakahara**

**new species** (Figs. 59-63)

**Pupal case:** oval. Length from apparent margin 745(625-722) μm, true margin 638(691-803) μm; width from apparent margin 528(431-532) μm, true margin 617(516-644) μm. Slide mounted specimens black. Field characters unknown.

**Margin and submargin** (Figs. 60, 61): Margin normally reflected ventrally; marginal teeth 8-11 per 100 μm, wider than long, variable in shape, often truncate or subtruncate at apex, laterally constricted and with or without dendrites, separated from enjoining teeth by space less than width of tooth (Fig. 60A). Anteromarginal setae on 7-10 teeth from midline (setae absent or broken), posteromarginal setae thin, about 12 long, on 10-12 teeth from midline. Submarginal fold differentiating submargin from dorsal disc, except fold indistinct on head. Transverse ridges and furrows on distal 1/2 of submargin; ridges irregular in length, ridges extending to bases of marginal teeth (Fig. 61F) or tapering distally to a point and not reaching margin (Figs. 61G). Small, oval, pale glandular areas on ridges at bases of marginal teeth (Fig. 60B). Band of microtubercles on ridges, extending from oval, pale glandular areas to about midpoint of submargin, microtubercules often in longitudinal rows (Fig. 60C). Row of micropores in distal 1/4, often with additional (Fig. 60D), irregularly spaced pores just mesad of row. Disc pores 4.5 μm in diameter and associated porettes (duplex pores) in median row around submargin (Fig. 60E). Other disc pores about same size or smaller, closely associated with duplex pores or scattered between row of duplex pores and row of micropores (Fig. 60D). Often with 1-5 disc pores along submarginal fold caudad of eyespot usually in a cluster, or occasionally absent. Thoracic microsetae 2, thin, indistinct, 9-12 μm long, aligned with row of duplex disc pores (Fig. 60A). Caudal setae indistinct, thin, about 5 μm long, in microtubercular band on submargin,
slightly distal to row of duplex pores, separated by about width of vasiform orifice (Fig. 62A).

Dorsal disc (Figs. 59, 62): Subdorsal ridge extends from prothorax to anterior abdominal segments. Median molting suture extends to anterior margin, transverse molting suture extends diagonally towards subdorsal ridge, then recurved anterolaterally, terminating at about level of meso-metathoracic suture; margins of sutures smooth. Meso-metathoracic suture extends almost to subdorsal ridge, then recurved anterolaterally, terminating at about level of meso-tubercle with pale gland on posterior part of rim of abdominal segment VIII, 1.5 to 2.5 times its length from caudal margin; small tubercle with pale gland on posterolateral part of rim apparently representing base of eighth abdominal seta; margin of orifice with two rows of cell-like structures, outer row with 15-16 cells laterally and caudally, inner row with 4 cells laterally (Fig. 63A); 3/4 of bottom of orifice open. Operculum subcordate, about same size as orifice, sculptured with vermiform striae (Fig. 62B). Lingula enlarged apically, clublike, spinulose, completely hidden by operculum.

Venter (Fig. 59): Thoracic and abdominal tracheal folds evident; minute spinules in small cluster laterad of anterior thoracic spiracle. Venter without distinct sculpture or spinules. Antenna narrowed into spinelike tip, extending to anterior spiracle. Legs each with 1 microseta and 1 micropore distally, and 1 microseta on base. Adhesive sac oval. Eighth abdominal setae laterad of anterior part of vasiform orifice.

First, second and third instar larvae and adults. Not seen.


Distribution. Mexico (Sonora), United States (AZ, CA, NM, UT).

Etymology. Specific epithet is a combination of generic name of oak, *Quercus*, and Latin "cola" (inhabitant). This species is known only from *Quercus* spp.

Comments. This species differs from *T. ursorum* by the 2 rows of cell-like structures in the vasiform orifice, the outer row with 15-16 cells, inner row with 4 cells, dorsal derm with fine but distinct granules, margins of median molting suture smooth, and caudal setae indistinct, about 5 long, on about median part of submargin. In contrast, *T. ursorum* has only 4 cell-like structures laterally in the vasiform orifice, dorsal derm with fine but faintly indicated granules, margins of median molting suture with series of short lines, and caudal setae well developed, 14-54 long, in the distal 1/4 of the submargin.

*Tetraleurodes ursorum* (Cockerell) (Figs. 64-71)

Aleyrodes ursorum Cockerell 1910:171.  

Pupal case: oval, usually narrower at caudal end than head to almost rotund; submargin strongly elevated, almost vertical, forming ridge-like rim around body; dorsal disc with subdorsal, longitudinal ridge elevated on thorax and anterior abdominal segments; transverse ridge following transverse molting suture, extending to subdorsal ridge; longitudinal median ridge on abdomen extending posteriorly from transverse ridge: rachis slightly elevated. Length of slide mounted specimens (flattened) from *Arctostaphylos* 741-920 µm long, 586-741 µm wide, slide specimens from other hosts variously mounted, 000-876 µm long, 400 700 µm wide. Shiny black or shiny dark reddish brown; marginal fringe of white wax, less than width of submargin; dorsal wax absent.

Margin and submargin (Figs. 65, 66): Marginal teeth 9-12 per 100 µm on lateral margin, longer than wide, apices subtruncated to truncate, distal 3/5 of sides straight, widest in basal 2/5 with usually 1-2 denticles; distance between teeth 1/3-1/2 width of teeth (Fig. 66A). Anterior marginal setae slender, 12-21 µm long, on 10-12th tooth from midline; posterior marginal setae 17-28 µm long, 21-33 teeth between setae. Transverse ridges and narrow furrows on submargin; ridges irregular in lengths and width, each ridge extending from marginal tooth or extending from 2 marginal teeth and joined into one ridge or tapering distally to a point and not reaching margin (Fig. 66C, D). Small, oval pale glandular areas at bases of teeth on transverse ridges (Fig. 66B). Microtubercles finer, considerably smaller than disc pores, in a band on 1/2 to 3/5 of submargin: in 7-10 longitudinal rows on ridges, and few scattered on ridges (Fig. 66E). Row of micropores in distal 1/10-1/5 of submargin, aligned with 3rd or 4th distal rows of microtubercules. Disc pores, about 3 µm in diameter, and closely associated poreettes in a median row around submargin (Fig. 66G), other disc pores usually without poreettes distal of row on head, thorax and anterior abdominal segments (Fig. 66F); occasional pores between row and submarginal fold; 1 or cluster of 2-4 disc pores in submarginal fold on prothorax or mesothorax. Submarginal setae on each side of thorax, variable in length, 5-31 µm long (Fig. 65A). Caudal setae in distal 1/4 of submargin, variable in lengths and positions depending on hosts, 14-54 µm long, separated by about width to 2 times width of vasiform orifice (Fig. 65B).

Dorsal disc (Fig. 65): Median molting suture extending to anterior margin, margins of suture with series of short lines on head to mesothorax; transverse molting suture extending laterad of subdorsal ridge but not reaching submarginal fold or level of meso-metathoracic suture, margins of suture smooth. Subdorsal ridge extending from head to anterior abdominal segments of meso-metathoracic suture not extending to subdorsal ridges, without tooth, a submedian furrow extending caudally on metathorax from suture. Submedial setae absent from cephalothorax, eighth abdominal setae apparently represented only by setal base in pale, oval protrusion on posterior 1/4 of vasiform orifice rim. Eyespot absent. Depressions submedially on head and prothorax; 3 on mesothorax; 1 near submedian furrow on metathorax; 1 submedian depression each on abdominal segments I-VII, usually with conical teeth on margin. Disc pores and associated poreettes distributed on each side as follows: 1 submedially and 2-3 subdorsally on head; 1-2 submedially and 1-2 subdorsally on prothorax;
mesothorax with 1 submedially and 2 subdorsally; metathorax with 1-2 submedially and 3 subdorsally; 1-2 submedially on abdominal segment I, 0-1 submedially on II; 1 submedially and 5-7 subdorsally on III; 1 submedially and 1-4 subdorsally on IV; 1 submedially and 3 subdorsally on V; 0-1 submedially and 1-4 subdorsally on VI; 1-2 submedially and 1-2 subdorsally on VII; 1 submedially and 1-2 subdorsally on VIII. Derm smooth or with fine, faint granules. Abdomen: medially elevated longitudinally, rachis present; median part of segment VII 1/4 to about 1/2 as long as VI; anteromedian part of VIII with 2 low tubercles, vasiform orifice on U-shaped elevation of VIII. Vasiform orifice subcordate, 37-47 µm long, 33-42 µm wide, about 2 times its length from caudal margin, with 3-4 cell-like structures on each side (Fig. 67A); rim undeveloped anteriorly, small conical tubercle with pale gland on posterior 1/4 of rim apparently representing base of eighth abdominal seta, seta absent (Fig. 67B); bottom of orifice almost completely open. Operculum subcordate, 35-42 µm long, 33-40 µm wide, completely filling orifice. Lingula included in orifice, spinulose, apical 1/3 knobbed.

**Venter** (Fig. 65): Thoracic tracheal fold indicated, abdominal tracheal fold obscure. Submargin without distinct marks or spinules. Subventer with fine, faint spinules on head, in thoracic tracheal fold just laterad of anterior spiracle, and from metathoracic spiracle to caudal area. Antenna narrowed into spine-like tip, extending to anterior spiracle. Adhesive sac oval, distinct. Legs well developed; prothoracic leg distally with 1 microseta and 1 micropore, and 3 basal microsetae; mesothoracic and metathoracic legs each with 1 distal microseta and 2 micropores, basally with 5 microsetae. Eighth abdominal setae 14-24 µm long. Posterior spiracle laterad of orifice.

**Third instar larva** (Fig. 68): Narrow fringe of white wax, dorsum bare. Similar in shape as pupa but smaller: submargin elevated, forming ridge around body, dorsal disc broadly elevated; length 417-582 µm, width 303-504 µm.

**Margin and submargin** (Fig. 68): Marginal teeth similar to pupa, 15-17 teeth per 100 µm. Anteromarginal setae 12-14 µm long, on 12-16 teeth from midline; posteromarginal setae 12-21 µm long, 28-33 teeth between setae. Submargin with transverse ridges and narrow furrows. Small, oval pale glandular areas on transverse ridges at bases of marginal teeth. Microtubercles fine, in band on ridges along furrows and in 4-5 longitudinal rows on ridges. Row of 13-18 disc pores about 3 µm in diameter and associated porpores on each 1/2. A microseta 5.7 long on each side of prothorax (Fig. 68A). Caudal setae with tuberculate bases near caudal margin, 42-85 µm long, usually farther apart than width of vasiform orifice.

**Dorsal disc** (Fig. 68): Submedian cephalothoracic setae absent; eighth abdominal setae represented by apparent setal base in pale, oval protrusion on rim of vasiform orifice. Disc pores and associated porpores distributed on each side as follows: 1 submedially and 1-2 subdorsally on head; 0-2 subdorsally on prothorax; 1 submedially and 0-1 subdorsally on mesothorax; 1 submedially and 1-2 subdorsally on metathorax; 1 submedially on abdominal segments I and IV, occasionally 1 submedially on III and V; subdorsally 2 on III, 1-2 on IV, 0-2 on V, 0-1 on VI, 1 on VII and 1-2 on VIII. Vasiform orifice on U-shaped elevation of segment VIII, subcordate, about its length anterior of caudal margin, without cell-like structures (Fig. 69); rim undeveloped anteriorly, small, conical tubercle with pale gland on posterior 1/4.

**Second instar larva** (Fig. 70): Similar in field characters but smaller than third larva; length 330-372 µm, width 208-256 µm.

**Margin and submargin** (Figs. 70, 71): Teeth (Fig. 69) 20-27 per 100 µm on margin. Anteromarginal setae 7-12 µm long, 14-22 teeth between setae; posteromarginal setae 9-14 µm long, 19-25 teeth between setae. Submargin with short transverse ridges, each ridge extending mesad from a marginal tooth (Fig. 71). Small, oval pale glandular areas on ridges at bases of marginal teeth. Few microtubercles on ridges and along furrows, at least 1 indistinct longitudinal row on ridges. Disc pores absent. A microseta present on thorax on each side (Fig. 70A). Caudal setae near caudal margin, 37-64 µm long.

**Dorsal disc** (Fig. 70): Cephalothoracic setae absent; eighth abdominal setae apparently represented by small, pale spot on midlength of rim of vasiform orifice. Disc pores distributed on each side as follows: 4 subdorsally on cephalothorax, 1 each subdorsally on abdominal segments III-VI and VIII. Vasiform orifice on U-shaped elevation of abdomi-
nal segment VIII, subcordate, slightly less than its length from caudal margin.

First instar larva (Fig. 64): Smaller than second instar; elongate oval, length 229-260 μm, width 125-168 μm.

Margin and submargin: Margin finely dentate. 10 pairs of setae on margin; 7 pairs on cephalothorax, lengths of setae from anterior-most about 14 μm, 19 24 μm, 24 26 μm, about 19 μm, about 24 μm, 12-17 μm, 12-14 μm and 5-9 μm; 1 pair on anterior abdominal segments 5-9 μm long, caudal alea with longer setae 35-35 μm long, caudal-most setae 28-38 μm long.


Distribution based on examined material. Canada (NS), Jamaica, Mexico (Chihuahua, Coahuila, Colima, DF, Durango, Jalisco, Michoacan, Nuevo Leon, Tamaulipas), Puerto Rico, United States (AL, CC, CT, FL, GA, LA, MA, MS, MT, NJ, SC, TX, VA, WA, WI).


Comments. There are only 2 slide mounted third instar larvae from Cockerell's type material in the USNM collection. According to Cockerell (1910), the type material included pupae and adults. The measurements of the pupae in Cockerell's description indicate that he did examine pupae and not the third instar larvae.

This species is commonly found on plants in the Ericaceae, Rosaceae and Rutaceae. It closely resembles T. quercicola. The differences are discussed under T. quercicola.

Notes on Miscellaneous Species

Aleurotrachelus cacaorum Bondar 1923:154 = Tetraleurodes cacaorum (Bondar), New Combination. This species is known from several countries in South America.

Aleyrodes stanfordi Bemis 1904:508; Tetraleurodes stanfordi: Quaintance and Baker 1914:108 = Tetraleurodes perileuca (Cockerell), New Synonymy. This species occurs on Quercus in southern United States and Mexico.

Tetraleurodes nudus Sampson and Drews 1941:174 = Tetraleurodes fici Quaintance and Baker, New Synonymy. This species occurs in Mexico,
Central America, several Caribbean Islands and Florida.

*Tetraleurodes papilliferus* Sampson and Drews 1941:176 – *Aleurotrachelus papilliferus* (Sampson and Drews), New Combination. This species is known only from Panama.

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**References**


Figs. 32-35: *Tetraleurodes pseudacaciae*. 32. Habitus of pupal case; A. eyespot, B. cephalic seta, C. prothoracic seta, D. mesothoracic seta, E. metathoracic seta, F. submedium depression with small conical teeth, G. small conical tooth. 33. Abdominal segment VIII and caudal part; with vasiform orifice and operculum on U-shaped rimlike elevated part of VIII; A. intersegmental division of segments VII-VIII extending to submarginal fold, separating VIII from anterior segments. 34. Margin and sub_margin. 35. Third instar larva.
Figs. 42-46: *Tetraurodes chivela*. 42. Habitus of pupal case; A. eyespot, B. depression, C. submedian depression with conical tooth, D. spinulose, E. abdominal tracheal fold. 43. Submargin; A. marginal tooth, B. pale glandular area, C. micro pore, D. transverse ridge with micro tubercles, E. disc pore and porette. 44. Abdominal segment VIII and caudal part; A. caudal seta. 45. Legs and ventral part of thorax; A. thoracic tracheal fold, B. spinules. 46. Margin, submargin and subventer of abdomen; A. spinulose subventer, B. irregular raised areas.
Fig. 54: *Tetraleurodes confusa.* Insitu photographs of pupal instar with wax formation. Fig. 55. *Tetraleurodes persae.* Insitu photograph of pupal instar with wax formation.