

Notes on Phytophagous and Predatory Mites of Arizona¹

F. F. BIBBY, *Arizona Fertilizers, Inc., Phoenix*
and

D. M. TUTTLE,² *University of Arizona Agricultural
Experiment Station, Yuma*

ABSTRACT

This paper is an annotated list of 38 Arizona species of phytophagous mites, 2 of which are probably undescribed, and of 13 species of predatory mites, 3 of which are probably undescribed. The list is based upon collections made by the writers and associates during the past 6 years and upon collections of others in the meantime and previously. The host(s), place(s) and date(s) of collection, an occasional notation as to degree of infestation and other information, considered pertinent and timely, are included.

Of the phytophagous mites, the records indicate that *Tetranychus cinnabarinus* (Bois.) is the dominant species, with *T. desertorum* Banks, *T. telarius* (L.), *Petrobia latens* (Müll.) and *Bryobia praetiosa* Koch following in the order given. Of economic importance to crops in Arizona, the data contained in the paper indicate that the above named species rank in the same order as their dominance, with *Oligonychus pratensis* (Banks) probably coming next, in either category.

In the annotated list of mites given below, there are 38 phytophagous species (2 probably undescribed) and 13 predatory species (3 probably undescribed) collected in Arizona during the past 6 years by the writers and associates and by other collectors in the meantime and previously. General references to the economic species are given under "References Cited" at the end of this paper.

Of the phytophagous mites, the records indicate that *Tetranychus cinnabarinus* (Bois.) was probably the most prevalent species, with *T. desertorum* Banks, *T. telarius* (L.), *Petrobia latens* (Müll.) and *Bryobia praetiosa* Koch following in the order given. As a pest of cotton and cantaloupe, *Tetranychus cinnabarinus* (Bois.) seemed to be the worst. On grain sorghum, *Oligonychus pratensis* (Banks) dominated, with *O. stickneyi* (McG.) next. Three species were abundant on alfalfa: namely, *Tetranychus cinnabarinus* (Bois.), *T. telarius* (L.) and *Bryobia praetiosa* Koch. *Petrobia latens* (Müll.) usually dominated on onions and occasionally on other truck and garden crops and on alfalfa.

PHYTOPHAGOUS MITES:

Aceria fixus (Cotte), fig. mite (Eriophyidae)

Fig.: Tucson (Reid Ranch) X-10-46.

Aceria sp. (prob. undescribed) (Eriophyidae)

Franseria ambrosiodes: Black Canyon Highway (Maricopa Co.), X-20-57, possibly causing leaf galls on host.

Brevipalpus aeoloides Pritchard and Baker
(Tenuipalpidae)

Encelia farinosa: Glendale, X-18-53.

Franseria deltoidea: Papago Park, Tempe, VIII-9-53.

Brevipalpus californicus (Banks) (Tenuipalpidae)

Pittosporum: Mesa, VIII-6-54, severe.

Brevipalpus cardinalis (Banks) (Tenuipalpidae)

Ash: Phoenix, III-7-51 (M. H. Frost).

Cucumber: Phoenix, I-24-1927 (Comm. Agric. Hort.) (?)

Brevipalpus lewisi McGregor (Tenuipalpidae)

Citrus: Tempe, X-9-53 (L. Hopkins), common.

Bryobia drummondi (Ewing) (Tetranychidae)

Larrea tridentata (creosotebush): Picacho, October 1953 (J. Warren).

Prosopis juliflora (mesquite): Toltec (Pinal Co.), IX-21-53 (J. Warren).

Bryobia praetiosa Koch, clover mite
(Tetranychidae)

Alfalfa: Buckeye, III-22-43 and Chandler, IV-6-49 (E. E. Russell); Phoenix, April, 1929; Yuma, II-10-54 (D. C. McCain), III-31-48 (M. H. Frost), II-15-, II-20- and II-24-52, II-2-, III-2-, III-13- and III-21-53.

Almond: Scottsdale, 1923 (Comm. Agric. Hort.), causing the leaves of several trees to shed.

Apple: Willcox, VI-1-49 and Holbrook, VIII-30-50 (L. P. Wehrle) and Sedona, V-23-44 (J. N. Roney).

Bachelor button: Tucson, I-31-54 (G. D. Butler, Jr.).

Bur clover: Tucson, IV-13-54 (G. D. Butler, Jr.).

Calendula: Tucson, IV-4-54 (G. D. Butler, Jr.).

Clover: Flagstaff, IV-24-38 and XII-24-38 (L. P. Wehrle) and Tucson, III-20- and 21-52 (G. D. Butler, Jr.).

Cucumber: Tucson, IV-6-45 (L. P. Wehrle).

Dwarf marigold: Phoenix, II-28-54 (M. F. Wharton, Jr.).

Malva sp.: Arrowhead Ranch (Maricopa Co.), III-26-48 (M. H. Frost).

Morning-glory (Convolvulaceae): Tucson, IV-4-33 (L. P. Wehrle).

Mustard: Tucson, IV-1-39 (R. B. Streets).

Pear: Warren, VII-2-45 and Safford, IX-13-50 (L. P. Wehrle).

Radish: Tucson, IV-6-45 (L. P. Wehrle), causing leaves to appear grayish.

Rye: Phoenix, IV-3-38 (K. B. McKinney), and on ornamentals and weeds, and indoors.

¹ Accepted for publication January 22, 1959. Partial cost of publication of this paper was met by Arizona Fertilizers, Inc., Phoenix, Ariz.

² Authors' names listed in alphabetical order, neither seniority nor precedence being implied.

The authors are grateful to the following specialists for identification of mite specimens: E. W. Baker, Insect Identification and Parasite Introduction Laboratories, U. S. Department of Agriculture, Washington, D. C.; A. E. Pritchard, Division of Entomology, University of California, Berkeley, California; E. A. McGregor, Entomology Research Division, Agricultural Research Service, U.S.D.A.; and H. H. Keifer, California State Department of Agriculture, Sacramento, California, and to C. T. Mason, University of Arizona Tucson, Arizona, for identifying many of the host plants.

Rye grass: Tucson II-19-52 (G. D. Butler, Jr.), abundant in lawn.

Squash: Tucson, IV-6-45 (L. P. Wehrle); Yuma, I-10-54, causing noticeable damage to leaves.

Eotetranychus frosti (McGregor) (Tetranychidae)

Rose: Tempe (type locality, McGregor 1952) V-12-49 (M. H. Frost), specimens from which species was described, not reported on any other host in Arizona, but recorded from raspberry in California by Pritchard and Baker (1955).

Eotetranychus malvastris (McGregor) (Tetranychidae)

Cassia sp.: Tucson, XI-26-1953 (L. A. Carruth).

Sphaeralcea sp.: Luke Field (Maricopa Co.), III-10-57 and V-12-57, and from other mallows in Arizona and California, according to Pritchard and Baker (1955).

Eotetranychus sexmaculatus (Riley), six-spotted mite (Tetranychidae)

Citrus: Yuma, 1945 federal survey crew.

Eotetranychus talisiae (Hirst) (Tetranychidae)

Sphaeralcea sp.: El Mirage, I-31-51.

Eotetranychus weldoni (Ewing) (Tetranychidae)

Cottonwood (*Populus* sp.): Yuma, X-15-53 (Czajkowski & McCain).

Eotetranychus yumensis (McGregor) (Tetranychidae)

Castorbean: Yuma (type locality, McGregor 1934), XI-6-52, very numerous on underside of leaves.

Citrus: Yuma, IV-4-53, in scattered localities on orange and grapefruit leaves, and according to Pritchard and Baker (1955), abundant on citrus in Coachella and Imperial Valleys of California.

Grain sorghum: Yuma, XI-10-53 (D. C. McCain).

Eriophyes pyri (Pgst.), pear leaf blister mite (Eriophyidae)

Pear: Bisbee, June 1945, and Phoenix, 1926 (Comm. Agric. Hort.) and VI-3-49 (L. P. Wehrle).

Heterotergum sp. (probably new) (Eriophyidae)

Frauseria ambrosioides: Black Canyon Highway (Maricopa Co.), X-20-57, in association with other mites.

Histiostoma sp. (Anoetidae)

Corn: Gilbert, VIII-18-56, hypopi, small traveling stage of mite, with larval stage of *Zeadiatreia grandiosella* (Dyar) within tunnel.

Orange: Mesa, X-9-36, hypopi stage, on navel end rot in Val-Vista Orchard.

Hystriichonychus gracilipes (Banks) (Tetranychidae)

Sida heracea: Yuma, IV-18-55, a new host record according to Pritchard and Baker (1955).

Sphaeralcea sp.: Luke Field (Maricopa Co.), III-10- and V-12-57, and El Mirage, I-31-54.

Neotetranychus siccus Pritchard & Baker (Tetranychidae)

Olneya Tesota: Papago Park, Phoenix, IX-27-53, specimens from which the species was described by Prit-

chard and Baker (1955), without the name of the host being included.

Oligonychus coniferarum (McGregor) (Tetranychidae)

Italian cypress: Mesa, III-25-55 (L. Hopkins) and IV-3-55.

Oligonychus modestus (Banks) (Tetranychidae)

Corn: Navajo and Apache Counties (Comm. Agric. Hort.).

Oligonychus platani (McGregor) (Tetranychidae)

Pyracantha: Tucson, V-9-52 (Willsey) and March 1954 (G. D. Butler, Jr.)

Oligonychus pratensis (Banks) (Tetranychidae)

Bermuda grass: Tolleson, Sept. 1954, and Yuma, X-15-53 (D. C. McCain).

Corn: Safford, IX-5-52 (R. B. Streets).

Date: Yuma, 1945 (Comm. Agric. Hort.), of economic status.

Grain sorghum: Gilbert, IX-2-53 (I. McMahon); Peoria, X-13-53; Phoenix, X-25-53; Roll, VI-25-55 (H. Brown); Scottsdale, IX-1-53 (J. Hartsig) and Yuma, X-29-53 (H. Czajkowski).

Oligonychus stickneyi (McGregor) (Tetranychidae)

Bermuda grass: Yuma, X-15-53 (D. C. McCain)

Corn: Maricopa, V-16-56 (H. Brown) and Tempe, V-18-56 (J. Hartsig).

Grain sorghum: Litchfield Park, V-29-56; Phoenix, X-12-56, and Sunnyslope, IX-21-52 (L. Hopkins).

Oligonychus ununguis (Jacobi) (Tetranychidae)

Arborvitae: Phoenix, IV-2-27 (C.D.L.); Tucson, XII-15-50 (R. Simpson).

Italian cypress: Tucson, IV-15-, V-15- and XII-2-53 (G. D. Butler, Jr.).

Pentamerismus sp. nr. *baptus* Pritchard & Baker (Tenuipalpidae)

Franseria deltoidea: Papago Park, Tempe, 1-29-54.

Petrobia latens (Müller), brown wheat mite (Tetranychidae)

Alfalfa: Beardsley, II-23-55 and Buckeye, III-23-55 (B. Zimmer); Casa Grande, II-27-56 (R. L. Dezember); Chandler, IV-6-49 (E. E. Russell); Perryville, IV-13-55; Pinal Co., IV-8-55, and Yuma, II-10-54 (D. C. McCain).

Barley: Luke Field (Maricopa Co.), IV-5-55 (L. A. Hammers).

Bermuda grass: Roll, V-12-54 (L. L. Brimhall).

Cantaloupe: Luke Field (Maricopa Co.), IV-5-55 (L. A. Hammers) and Tolleson, V-25-48 (M. H. Frost).

Carrot: Deer Valley, IV-14-48 (M. H. Frost).

Cotton: Scottsdale, May 1954, and Yuma, IV-19-55 (D. C. McCain).

Endive: Yuma, III-15-52, small acreage unmarketable due to damage by this mite.

Lettuce: Alhambra, IV-7-49 (M. H. Frost).

Lupinus sp.: Tom Mix Monument (Pinal Co.), III-26-55.

Onion: Deer Valley (Maricopa Co.), IV-20-51 (M. H.

Frost); Phoenix, IV-12-54 and III-21-55 (W. R. Ritchie); of economic status in all instances.

Rhizoglyphus echinopus (F. & R.) (Acaridae)

Cotton: Phoenix, V-14-55 (S. Evans), on rotting seed, and VI-8-55 (B. Fehrman), at base, above ground, on recently emerged plant.

Scheloribates sp. (Oribatulidae)

Johnson grass: Phoenix, I-24-54, from frost bitten material.

Tetranychus atlanticus (McGregor), strawberry spider mite (Tetranychidae)

Alfalfa: Yuma, X-20-52 and VI-14-55.

Castorbean: Gilbert, IX-20-56 (P. D. Gerhardt).

Cotton: Buckeye, VI-13-56 and Marinette, V-31-56 (B. Zimmer); Yuma, VI-3- and 23-53 and IV-19-55.

Soybean: Coolidge, IX-28-54 and Goodyear, IX-22-55, severe.

Tetranychus canadensis (McGregor) (Tetranychidae)

Chinaberry: Tempe, IX-17-52 (L. Hopkins).

Tetranychus cinnabarinus (Boisduval) (Tetranychidae)

Alfalfa: Yuma, VII-12-51 (G. D. Butler, Jr.).

Cantaloupe: Luke Field (Maricopa Co.), IV-18-58 (D. Berry) and Phoenix, VI-10-53 (O. A. Hills).

Castorbean: Chandler, IX-20-56 (P. D. Gerhardt).

Corn: Gilbert, VII-6-56, and Yuma, VI-20-55 (D. C. McCain), severe.

Cotton: Buckeye, VII-27-56 (C. Davis); Chandler, IX-20-56 (P. D. Gerhardt); Dateland, V-9-57 (P. Segulja), on sucker cotton, severe and persistent; Eloy, V-7-56 and VIII-14-57 (Hornney & Pace); Gilbert, VIII-6-56 (Frost & McMahon); IX-20-56 (P. D. Gerhardt); Glendale, IX-3-56 (F. Corbus); Litchfield Park, VII-14- and VIII-3-55; Luke Field (Maricopa Co.), VII-18-55, VI-14-56 (B. Zimmer) and X-16-58; Maricopa, V-16-56 (H. Brown); Marinette, IV-25-26 (B. Zimmer); Mesa, VII-10-57 (R. L. Dezember); Peoria, VI-14-56; Phoenix, VI-14-55, VII-28-55 (B. Zimmer), V-10-56 (W. R. Ritchie), V-19-56 (B. Zimmer) and IX-5-56 (F. Corbus); Tolleson, VIII-3-58 and Yuma, VI-20-55.

Cauliflower: Peoria, XI-24-53 (L. A. Hammers).

Dwarf marigold: Phoenix, VI-29-58, severe with extensive webbing.

Hollyhock: Casa Grande, V-1-56 (K. Tipling), severe.

Lettuce: Maricopa Co., IX-26-55, light infestation.

Malva parviflora: Phoenix, V-14-57, heavily infested, and Tempe, IX-18-56 (J. Hartsig).

Morning-glory (Convolvulaceae): Phoenix, IX-13-57 (D. Berry).

Rose: El Mirage, VI-3-58 (C. Ash), severe, and Phoenix, V-5-56, severe.

Sapindus sp. (soapberry): Phoenix, VI-23-57.

Soybean: Maricopa Co., IX-26-55.

Sugar beet: Chandler, V-5-58 (R. L. Dezember); Litchfield Park, V-25- and 27-57 (B. Fehrman), I-31-58 (S. Evans), being devoured by larvae and adults of *Stethorus atomus* Csy. (det. W. H. Anderson), and V-29-58 (D. Berry) and Phoenix, V-30-55 (B. Zimmer) and V-24-56 (F. Corbus).

Tomato: Litchfield Park, VI-10-56 (G. Wene), severe.

Tribulus terrestris: Phoenix, XI-28-58.

Watermelon: Eloy, VI-10-55 (J. Warren); Phoenix, VI-26-56, severe and heavily webbed, and Yuma, V-1-55.

Tetranychus desertorum (Banks) Tetranychidae

Alfalfa: Tempe, V-10-48 (M. H. Frost).

Cantaloupe: Deer Valley (Maricopa Co.), IV-3-51; Luke Field (Maricopa Co.) IV-5-55 (L. A. Hammers); Phoenix, IV-20-48 (M. H. Frost), June 1951 (E. A. Taylor), VI-10-53 (O. A. Hills), IV-18-53 (Taylor & Sheets), VI-2-54 (L. A. Hammers) and IV-5-55; Tolleson, V-25-48 (M. H. Frost) and Yuma, III-5-52 and VI-2-53, IV-11-55 (A. Bell) and V-2-55.

Celery: Luke Field (Maricopa Co.), IX-2-49, and Phoenix X-18-45 (R. B. Streets).

Corn: Eloy, V-29-56 (K. Brinkmeyer) and Maricopa V-16-56 (H. Brown).

Cotton: Avondale, VI-15-53 (L. Sheets); Avra Valley (Pima Co.), VII-10-53 (H. Karel); Buckeye, IX-1-50 (L. Sheets); Casa Grande, VII-3-56 (R. L. Dezember); Continental, V-24-50 (Stevenson & Kauffman), VI-20-51 (Kauffman & Sheets) and VI-25-51 (Kauffman); Deer Valley (Maricopa Co.), VII-12-50 (L. Sheets) and VI-29-51 (Stevenson & Sheets); Elfrida, X-2-53 (G. D. Butler, Jr.) and X-5-53 (C. Allen); Eloy, VII-5-51 (Kauffman & Sheets); Gilbert, IX-2-53 (I. McMahon); Higley VI-12-53 (L. Sheets); Litchfield Park, VII-14-55; Luke Field, VII-18-55; Marana, VIII-10-48 (Wm. Kauffman) and VIII-30-49 (L. Nickelson); Maricopa, IX-5-56 (H. Brown); Marinette, VII-1-48 (M. H. Frost), VI-16-53 (L. Sheets) and V-31-56 (B. Zimmer); Mesa, IV-23-51 and VI-29-53 and Palo Verde, IX-12-50 (L. Sheets); Phoenix, VI-14-, VI-28- and VIII-3-55; Queen Creek, VI-13-56 (I. McMahon); Safford, VIII-29-49 (M. H. Frost), VI-30-50 (Wm. Kauffman) and VI-22-51 (Kauffman & Sheets); Sahuarita, VIII-8-53 (H. Karel); Stanfield, IX-9-56 (H. Brown); Toltec, VIII-25-53 (J. Warren) and Yuma, VI-20-55.

Cressa truxillensis (Convolvulaceae); Yuma, V-2-55, severe and spreading to cantaloupe fields.

Larrea tridentata: Picacho, Oct. 1953 (J. Warren).

Lettuce: Phoenix, III-21-55.

Lupinus sp.: Tom Mix Monument (Pinal Co.), III-26-55.

Malva parviflora: Somerton, IV-7-55.

Sorghum: Tucson, II-10-43 (R. B. Streets).

Sphaeralcea sp.: Deer Valley, IV-3-51 (M. H. Frost).

Strawberry: Phoenix, I-25-50 (Hills & Taylor).

Sugar beet: Phoenix, III-15-51 (E. A. Taylor) and V-20-53 (O. A. Hills).

Sweet Pea: Maricopa Co., Dec. 1953.

Tribulus terrestris: Luke Field, X-20-53 (L. A. Hammers); Phoenix, XI-28-58, severe, being attacked by *Scolothrips sexmaculatus* (Perg.) (det. K. O'Neill).

Watermelon: Coyote Mts. (Pima Co.), VII-13-42 (R. J. Moody) and Mesa, VI-4-55.

Zinnia: Casa Grande, X-28-53 (J. Warren).

Tetranychus mcDanieli (McGregor) (Tetranychidae)

Leguminous weed: Christopher Creek (Gila Co.), VII-20-58 (C. R. Ash).

Mulberry: Tucson, IV-14-54 (G. D. Butler, Jr.).

Tetranychus telarius (Linnaeus), two-spotted spider mite

Alfalfa: Mesa, VIII-13-51 and Somerton, VII-2-51 (G. D. Butler, Jr.); Tempe, V-18-56 (J. Hartsig) and Yuma, VI-8-50, VI-9-50 (R. Simpson), VI-18-51 (L. A. Carruth), VII-4-, 10- and 12-51 (G. D. Butler, Jr.) and III-21-53.

Aralia sp.: Tucson, III-20-52.

Banana: Phoenix, V-23-53 (Brantlinger), infesting trees in nursery.

Cantaloupe: Deer Valley, V-24-53 (L. A. Carruth); Phoenix, VII-11-51 (E. A. Taylor) and VI-2- and 17-54 (L. A. Hammers); Pinal Co., V-5-54 (J. Warren); Yuma, IV-18-53 (G. D. Butler, Jr.) and V-27- and 28-53.

Castorbean: Tolleson, VII-7-54.

Celery: Phoenix, X-7-53 (W. R. Ritchie).

Citrus: Mesa, III-25-55 (L. Hopkins).

Cotton: Litchfield Park, VII-14-54 (B. Zimmer), economic infestation; Peoria, VII-8-48 (Sheets & Breazeale) and VI-21-48 (L. Sheets); Phoenix, IX-14-53 (B. Fehrman), VI-28-54 (S. Evans) and VII-20-54 (L. A. Hammers); Safford, VIII-19-49, VI-30- and IX-8-50 and Sept. 1952 (Wm. Kauffman); Scottsdale, VII-26-52 (M. H. Frost), IV-25-53 (J. N. Roney) and IX-1-53 (J. Hartsig); Sunnyslope, IX-21-52 (L. Hopkins); Thatcher, VI-22-51 (Kauffman & Sheets); Tucson, V-17-48 (M. H. Frost); Waddell, VI-16-53 (L. Sheets) and Yuma, VII-5-51 (Kauffman & Sheets), IV-14- and 21-53, XII-1-53 (H. Czajkowski) and V-25-54.

Cottonwood (*Populus* sp.): Eloy, VII-5-54 (J. Warren).

Honeysuckle: Phoenix, V-16-53 (Brantlinger).

Ivy: Phoenix, II-17-55 (F. Schiller).

Lettuce: Deer Valley, XI-10-52 (L. Hopkins); Phoenix, X-23-53 (L. A. Hammers) and III-21-55 (S. Evans) and Yuma, VI-3-53, XI-30-53 (H. Czajkowski) and IV-7-55 (McCain & Evans).

Pear: Safford, IX-13-50 (L. P. Wehrle).

Philodendron: Tucson, III-30-52 (G. D. Butler, Jr.).

Pyracantha: Tucson, VI-1-44 (L. P. Wehrle).

Romaine lettuce: Yuma, III-7-53.

Soybean: Goodyear, IX-23-55, of economic status, and Phoenix, X-9-55.

Strawberry: Deer Valley, I-22- and III-14-52 (E. A. Taylor).

Sugar beet: Phoenix, IV-25-51 (E. A. Taylor) and V-15-53 (O. A. Hills).

Tobacco, wild: Phoenix, VII-20-51 (M. H. Frost).

Violet: Phoenix, XII-30-53 (B. Fehrman).

Watermelon: Pinal Co., V-15-54 (J. Warren); Tolleson, X-23-53 (B. Zimmer) and Yuma, VII-12-53 and V-25-54.

Tetranychus tumidus (Banks) (Tetranychidae)

Cotton: Safford, IX-1-50 (Wm. Kauffman).

Tyrophagus sp. (Acaridae)

Cantaloupe: Deer Valley (Maricopa Co.), III-27-47 (M. H. Frost).

Cotton: Buckeye, XI-7-57 (L. W. Sheets).

Vasates lycopersici (Masse), tomato russet mite (Eriophyidae)

Tomato: Tucson, VII-14-47 (L. P. Wehrle) and Yuma, IX-27-54, plants dying.

PREDATORY MITES:

Amblyseius n. sp. (Phytoseiidae)

Bermuda grass: Roll, V-27-50, an enemy of the tetranychid mites.

Balaustium aonidaphagus (Ebeling) (Erythraeidae)

Alfalfa: Yuma, IV-26-52.

Balaustium sp. (Erythraeidae)

Alfalfa: Buckeye, IV-28-49 (E. E. Russell).

Cantaloupe: Yuma, IV-19-53.

Franseria ambrosiodes: Black Canyon Highway (Maricopa Co.), X-20-57, a larva along with other mites.

Hollyhock: Phoenix, IV-23-55.

Lycium sp.: Mesa, IV-3-55; Pinal Co., III-4-54 (J. Warren).

Mustard: Litchfield Park, III-25-55 and Salome, III-10-57.

Phacelia sp.: Peralta Canyon (Pinal Co.), III-31-57.

Sphaeralcea sp.: Tempe, III-30-57.

Cheyletia sp. (Cheyletidae)

Bermuda grass: Yuma, X-15-53 (D. C. McCain), probably a free-living predator.

Erythraeus sp. (Erythraeidae)

Alfalfa: Buckeye, IV-11-43 (E. E. Russell).

Garmania n. sp. (Acoesejidae)

Alfalfa: Queen Creek, III-26-51 (M. H. Frost), on roots, probably a predatory species.

Hemisarcoptes malus (Shimer) (Hemisarcoptidae)

Jasminum revolutum: Tucson, XII-22-36 (L. P. Wehrle), under *Parlatoria oleae* (Colvée) on leaves of the *Jasminum*.

Leptus sp. (Erythraeidae)

Alfalfa: Yuma, IV-20-52 (G. D. Butler, Jr.), larvae predaceous on insects.

Parasitus sp. (Parasitidae)

Sidewalk: Tucson, III-20-54 (G. D. Butler, Jr.)

Pronematus californicus (McGregor) (Tydeidae)

Citrus: Mesa, VIII-28-53 (L. Hopkins), a predator of citrus bud mite, *Aceria sheldoni* (Ewing).

Raphignathus sp. undescribed (Raphignathidae)

Barley: Roll, IX-22-54 (D. Cox), abundant on surface of stored barley and walls of storage shed, and Tucson, X-4-54 (J. R. Carter), abundant in stored grain.

Tydeus sp. (Tydeidae)

Alfalfa: Roll, III-15-57 (P. Segulja) and Yuma, VI-14-56.

Bermuda grass: Yuma, V-20-55 (D. C. McCain).
This mite may be predatory on other mites and their eggs.

Typhlodromus sp. (Phytoseiidae)

Bermuda grass: Yuma, V-20-55 (D. C. McCain).
Corn: Gilbert, VIII-18-56, with larval stage of *Zediatrea grandiosella* (Dyar) within tunnel, and Yuma, VI-20-55 (D. McCain).
Cotton: Buckeye, XI-7-57 (L. W. Sheets), in association with another mite.

REFERENCES

- McGregor, E. A. 1934. A new spinning mite on citrus at Yuma, Arizona. *Proc. Ent. Soc. Wash.*, 36(8-9): 256-9.
McGregor, E. A. 1952. A new spider mite (Acarina, Tetranychidae). *Proc. Ent. Soc. Wash.*, 54(3): 142-4.
Pritchard, A. E., and E. W. Baker. 1955. A revision of the spider mite Family Tetranychidae. *Memoirs Series*, Vol. 2. Pacific Coast Entomological Society, 472 pp.
Pritchard, A. E., and E. W. Baker. 1958. The false spider mites (Acarina: Tenuipalpidae). *Univ. California Publ. Ent.* 14(3): 175-274.

Rapid Desiccation of Drywood Termites with Inert Sorptive Dusts and Other Substances¹

WALTER EBELING and ROBERT E. WAGNER, *University of California, Los Angeles*

ABSTRACT

Previous efforts to control insects by means of desiccating dusts have been directed primarily against granary weevils and with abrasive materials. Drywood termites were found to be more susceptible to sorptive than to abrasive dusts. By means of a staining technique it was shown that sorptive dusts can remove the lipid protective layer covering the epicuticle, causing the termites to lose water rapidly. The insects needed only to crawl about on a thin film of the dust. They died after losing about 30% of their body weight in water. Certain silica aerogels were particularly effective. Other insects, including cockroaches, fleas, bedbugs, bees, ants, vinegar flies, mosquitoes, house flies, thrips, ticks and mites, likewise succumbed rapidly to desiccation initiated by the disruption or removal of the lipid protective layer by sorptive dusts. Although some conventional insecticides might cause more rapid knockdown, they never resulted in death of the insects tested as rapidly as the more effective desiccating dusts.

Certain water-soluble fluorides have been incorporated into the silica aerogels in the process of manufacture. These fluorides greatly increase the effectiveness of the impregnated aerogels, even at low relative humidities, but the advantage obtained from

the impregnation increases with increasing relative humidities and consequently increases the versatility of the silicas.

The presence of fluorides as monomolecular layers in the porous silica aerogel particles does not decrease the ability of these particles to adsorb wax. After the wax is adsorbed or disrupted, the water-soluble fluorides can act as contact insecticides. In addition, the strong positive charge they impart to the particles greatly increases their ability to adhere to the dusted surfaces.

The addition of surface-active solutes to petroleum oil will cause increased rate of water loss, the water appearing in the form of many small droplets. Desiccation is greatly enhanced when the applied oil is later removed and the insect cuticle is thereby directly exposed to air. Death may result more rapidly than by the toxicity or suffocation that takes place when the insects are completely immersed in oil.

Desiccation of drywood termites was caused by treatment with parathion, sodium fluoride, and anhydrous magnesium perchlorate. When the treated insects, as well as those shaken in a sorptive dust, were immersed in oil, water droplets appeared on the body surfaces.

In southern California the incidence of drywood termites, *Kaloterms minor* (Hagen), is about as great as that of the subterranean termite, *Reticulitermes hesperus* (Banks). Control of drywood termites, particularly when it involves fumigation of the infested dwelling with methyl bromide, is an expensive treatment. The fumigation, while highly effective against the existing infestations, leaves no residual protection against subsequent attacks. If it were possible to apply an effective, long-lasting residual insecticide to the rough frame of a house during or immediately following construction, or to the inside of the attic and other vulnerable areas after a fumigation or other type of treatment, this would be an important advance in the control of drywood termites. The residue should be effective for 5 to 10 years, or, ideally, for the life of the dwelling.

Ebeling & Pence (1956) applied dusts, mists and vapors of lindane, chlordane, dieldrin, DDT and toxaphene to

blocks of wood and drywood termites were allowed to crawl over them. The relative effectiveness of the insecticides, and of the three formulations, was recorded. Dust was found to be the most effective formulation per unit of insecticide applied, in contrast to the usual experience in pest control.

The blocks of treated wood were placed in an attic for 17 months. Drywood termites were again placed on these blocks in July, 1957. By that time only the dusts were effective, indicating that the toxicants known to be effective initially in all formulations had lost their effectiveness, during the 17 months that the blocks had remained in the attic, except when formulated as dusts. Thus the only formulation remaining effective was the one leaving a residue of chemically inert diluents.

Inert diluents were then lightly dusted onto new blocks

¹ Accepted for publication July 21, 1958.