

Citrus Mealybug

four new parasites studied in biological control experiments

S. E. Flanders

The citrus mealybug—*Pseudococcus citri* (Risso)—is one of the most damaging mealybugs in the citrus groves of California.

It is injurious in localized areas in San Diego, Los Angeles, Ventura, and Santa Barbara counties.

Nine parasites have been introduced into California in an attempt to control the citrus mealybug in the same manner the citrophilus mealybug—California's most destructive mealybug prior to 1928—was controlled by two parasites introduced from Australia.

Five of these parasites of the citrus mealybug were introduced before 1950: 1. *Leptomastidea abnormis* (Gir.), from Sicily in 1914. It is established in all favorable habitats and does a great deal of good.

2. *Leptomastix dactylopii* How., from Brazil in 1934. It is being used to suppress outbreaks of citrus mealybug by a citrus growers' co-operative at Santa Paula. In spite of the millions released annually it is not permanently established.

3. *Anagyrus pseudococci* (Gir.), from Argentina in 1934. Although colonized in numbers it did not become established.

4. *Anagyrus kivuensis* Comp., from Africa in 1948. It has been used effectively in northern California as a control for the citrus mealybug in greenhouses. Although recovered in the field, its establishment is uncertain.

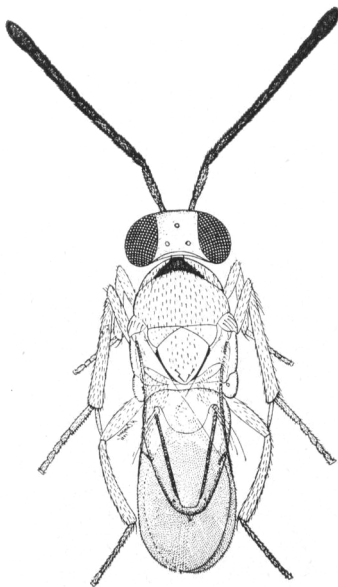
5. *Tropidophyrne melvillei* Comp., from Africa in 1948. Although colonized in numbers it failed to become established.

Four new species of parasitic wasps were introduced from south China and Formosa in 1950. These parasites may be credited with keeping the citrus mealybug from being a pest in their native areas.

The new introductions are a uniparental species of *Pauridea* and a biparental species of *Allotropia* from Canton; a biparental species of *Pseudaphycus* from Formosa; and biparental species of *Coccophagus* from Hong Kong.

A single unmated female of *Pauridea* was received at Riverside. This female produced female offspring. The stock increased rapidly, and in four generations thousands of females were being produced.

The males of *Pauridea* occur occasionally but play no part in the reproduction.



A parasite of citrus mealybug—*Leptomastix dactylopii* How.—which is being produced by an insectary at Santa Paula at the rate of over 10 millions annually.

The females deposit their eggs in newly hatched mealybugs. The life cycle is about 28 days at 80° F.

Insectaries at Los Angeles, Oxnard and Santa Paula were supplied with large breeding stocks. The species is readily propagated in large numbers under insectary conditions. Field releases began in July in San Diego County, and in September in Ventura County.

The culture of *Allotropia* was initiated with a shipment of three females, one an adult, the others as pupae. In the quarantine insectary one of the females was allowed to oviposit for several days in newly hatched mealybugs. Then this female, and the other females newly emerged from their hosts, were held at cool temperatures until their male progeny matured and emerged 26 days later.

The sexes were mated and three females were placed in a cage containing 20 potatoes infested with citrus mealybug. The progeny consisted largely of males but several females were obtained.

At the end of six generations on the citrus mealybug the production consisted of 300 females and 1,000 males.

When the life cycle is 26 days, the egg-larval period is 18 days and the pupal period eight days. Males predominate in the cultures, presumably because of the

rapid rate of oviposition by mated females. Under culture conditions the adult female is short-lived—less than a week at 80° F.

Field releases of *Allotropia* began September 15 in San Diego and Ventura counties.

Coccophagus n. sp. attacks small to medium size nymphs of the citrus mealybug. Only females develop on the mealybug itself. The males develop only as hyperparasites of hymenopterous larvae such as *Pauridea* which also inhabit the mealybug. The development of the male appears to be like that of *C. gurneyi* Comp.

A single unmated female of *Pseudaphycus* sp. was received. It readily oviposited in young citrus mealybug. The life cycle was 14 days at 85° F. The progeny were all males, and further shipments of this species from Formosa are expected.

S. E. Flanders is Entomologist, University of California College of Agriculture, Riverside.

The above progress report is based on Research Project No. 1319.

CHEMICAL

Continued from page 5

on this heavy brush. No conclusive results can be determined as yet but there are indications that some of these materials may be highly successful.

Cost

San Mateo County has the highest index of erosion in the nation. Brush is the real cause of bad land use practices in this area. Chemical control of brush is at present the best conservation practice for these agricultural lands.

The carrying capacity of dryland pasture varies from five acres per animal unit along the immediate coast to 10 acres in the higher elevations. Carrying capacity of land now in brush would be about one animal unit per 10 acres. Pasture land rents for \$3.50 to \$5 per acre and the gross returns to the operators can be two to three times that amount.

The total cost of spraying Type I and Type III areas is about \$5.50 to \$8 per acre. The chemical costs between \$2.50 to \$3 per acre and the helicopter application \$3 to \$5. Fourteen co-operators sprayed 1,000 acres in May and June of 1951 at these costs.

J. J. McNamara is Farm Advisor, San Mateo County, University of California College of Agriculture.

H. R. Offord, Senior Pathologist, Division of Plant Disease Control, United States Department of Agriculture; Gerald Haet, Secretary, Production and Marketing Administration, San Mateo County; and Ian J. Campbell, Chief Deputy Agricultural Commissioner, San Mateo County, co-operated in the investigations reported above.