

Biological Control Quarantine

Albany unit handles importation of insects to be tested against agricultural pests of central, northern California

R. L. Doult

A quarantine unit to handle the safe importation of beneficial insects was completed at Albany in May 1951.

The imported insects feed on agricultural pests which have reached California from foreign countries, having left behind their natural enemies.

The introduction of these enemies from their native lands has rendered insignificant many pests which once were at tremendously destructive levels in California. Among them are the cottony cushion scale, citrophilus mealybug, alfalfa weevil and, recently, Klamath weed.

For nearly 30 years the Division of Biological Control has maintained its quarantine quarters at Riverside. The addition of the Albany unit provides increased opportunities to test insects that may control agricultural pests in central and northern California. The location is favorable since Albany is close to major international air terminals and to the port of San Francisco. Also in Albany is a modern insectary in which beneficial

species passing out of quarantine may be mass-cultured for large-scale release in the agricultural areas.

During the first month of its operation, in June, the Albany quarantine laboratory received 16 shipments from abroad.

From India and Pakistan came collections of the olive scale, *Parlatoria oleae*, which is known to attack about 200 different plants including olives, pome and many stone fruits. Its presence in the San Joaquin and Sacramento valleys is of concern to growers. The search for natural enemies of the olive scale has centered in northern India where the olive scale and many of its close relatives are known to exist. From the shipments of scale-infested twigs and leaves, received at Albany, three species of parasites have been reared and are now being tested in the quarantine laboratory.

Shipments from France contained material from which three species of parasites of the elm scale, *Gossyparia spuria*, are being reared. Although the elm scale



Shipment from France containing parasites that are being tested in the control of oyster shell scale.

Photographs by J. K. Holloway

Scale infested pear twigs, bark and leaves from Pakistan being held under quarantine for emergence of parasites.



is not an agricultural pest, it is an annual nuisance on these valuable shade trees. The excretion of honeydew by the scales often covers automobiles, streets, and sidewalks beneath the infested trees.

Also from France came material that produced parasites of the oyster shell scale, *Lepidosaphes ulmi*; the fig scale, *Lepidosaphes ficus*; and of the omnivorous leaf tier, *Cnephasia longana*.

From Australia came a shipment of *Stethorus vagans*, a small ladybird beetle which is predaceous on mites. The beetles already have been released from quarantine, and together with many of the parasitic species mentioned may eventually form an important segment of the natural enemies which work on agricultural pests in California.

The privilege of handling imported insect material in quarantine in California is granted the College of Agriculture as a result of an agreement between the United States Department of Agriculture, the California State Department of Agriculture, and the University of California. The College of Agriculture is the only state institution in the United States which is granted quarantine privileges, because of its core of trained personnel and its especially designed and approved facilities for quarantine work.

The first requirement of a quarantine unit is that it be absolutely insect-tight. The building at Albany is constructed with double, fixed windows, smooth and tight walls and ceiling; doors with gasket

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QUARANTINE

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sealing, and an entry system through an anteroom. The heating, cooling, air circulating, and sterilizing units are all self-contained within the quarantine wing. The laboratory equipment is assigned permanently to these quarters. The quarantine wing is kept locked at all times, and access to the wing is restricted.

The characteristic habits of insects are taken into consideration. A trap light device is incorporated into the entry system. Utilizing the phototropic responses of insects, this device operates as an additional precaution to prevent the escape of any individual insect.

As all material in the laboratory is caged in some manner, it is unlikely that an insect would ever be free in the quarantine room. Even if it were, it would have no opportunity to escape to the outside.

The second requirement of a quarantine unit is that it be functional. The facilities at Albany are designed to speed up or retard the rate of development of the insects by individual temperature controls in each room. This is at times a factor in the handling of insects from the southern hemisphere which are conditioned to seasons just the opposite of those existing in California upon their arrival. Temperature controls for growth regulating are also useful in the breeding of insects with complex life histories.

Since the testing of weed insects is becoming increasingly important to California agriculture, the quarantine rooms are designed for this type of work, offering conditions favorable for plant growth.

When tests are completed, all the imported material that has not been proved to be completely beneficial is sterilized and destroyed within the quarantine unit. Sterilization is accomplished by autoclaving which not only disposes of insect material but plant diseases as well. A small stock of each beneficial species is retained for breeding and for ultimate release against pests in agricultural areas.

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BRUSH

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of 30¢ per acre for burning and a total cost of \$2.95 per acre where seed and seeding were necessary.

San Diego County Project

An extensive wildfire burned over many thousands of acres above El Capitan Reservoir in the late summer of 1950.

A co-operative range improvement project was started in this area in the fall on a small ranch and adjacent Cleveland National Forest land in co-operation with the landowner, the Farm Advisor and the United States Forest Service.

Brush on the demonstration area was primarily chamise with lesser amounts of ceanothus and manzanita. Light sandy soils of granitic parent material prevail.

An area of about 400 acres was broadcast seeded in early December to a mixture of grasses and legumes. Half of the area was railed before seeding and the remainder railed following seeding. In general railing not only pulled out many chamise burls but also improved the seedbed for establishment of forage plants. Railing after seeding was much superior to railing before seeding.

The effect of seed coverage upon establishment of forage plants was investigated further by the Farm Advisor. Railing, disking and sheepfoot rolling were used to cover the seed following broadcast seeding. Observations indicate that on the sandy soils of this region and with the poorly distributed rainfall and drying winds of 1950-51 some type of seed coverage was usually necessary to produce a satisfactory stand of forage plants.

First year results indicate orchardgrass, Hardinggrass, smilo, rose clover and annual ryegrass to be among the most promising species. A small plot of veldtgrass looked good. Seed of this species is in limited supply and rather difficult to obtain.

Cattle were grazed in the demonstration seeding during the summer after the grasses became dry. Forage seed is being trampled into the soil and the cattle are browsing to some extent upon the chamise sprouts and brush seedlings.

New Demonstration Areas

In addition to the two demonstration areas started in 1950 in Shasta and San Diego counties four additional ones are to be started in the fall of 1951. These areas represent four brush types and climatic zones not thus far represented:

1. Southern Humboldt County, representing chaparral of tan-oak, madrone, huckleberry and associated species in a high rainfall region.

2. Ventura County, representing the coastal sage type.

3. Tulare County, representing dense chaparral consisting of ceanothus, live oak and blue oak.

4. Modoc County, representing the Great Basin sage brush type.

It will take four to six additional ranges to adequately represent the major brush types throughout the state.

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HIGH-YIELD

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of salt—expressed on a pounds per acre basis—was very low. However, in the deeper regions of the Porterville clay adobe soil high salt concentration was indicated. It is probable that in this exceedingly heavy soil the roots are confined largely to the surface, and hence the salt in the lower layers is not affecting the vigor of the tree.

Relatively high amounts of water-soluble potassium were found in the surface layer—apparently the result of the past and continued use of manures. Sodium tended to increase with depth but seldom accounted for 50% of the total bases. The amount of chloride was very low in all the orchards to even the four-foot depth. The amount of nitrate was rather uniform throughout the soil profile, reflecting the generally heavy nitrogen applications in these orchards.

Soil Fungi and Nematodes

There was no significant difference in the fungal population of the soils of these top orchards as compared with old citrus soils generally. This implies that the mere presence of unfavorable organisms does not prevent excellent yields, though tree condition and yield might be better if fungi were absent.

No orchards were free of citrus root nematodes; substantial numbers were present in most cases.

The elements nitrogen, phosphorus, sulfur, chlorine, calcium, magnesium, potassium, and sodium were determined on leaf samples from these high performance orchards. The range of values found checked in most instances with the standards indicating ample but not excessive supplies.

From this preliminary report it is apparent that there is a low soil salinity condition in nearly all the high-yielding orchards, but a rather wide range of soil pH, free lime, texture, depth, and origin characteristics. Work is continuing on all phases of this project and will include an evaluation of the physical condition of the soil profiles. In addition, a comparison is being made with the soil conditions and management practices in a group of orchards where sizes and yields are poor. This study will in due course include lemon orchards.

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