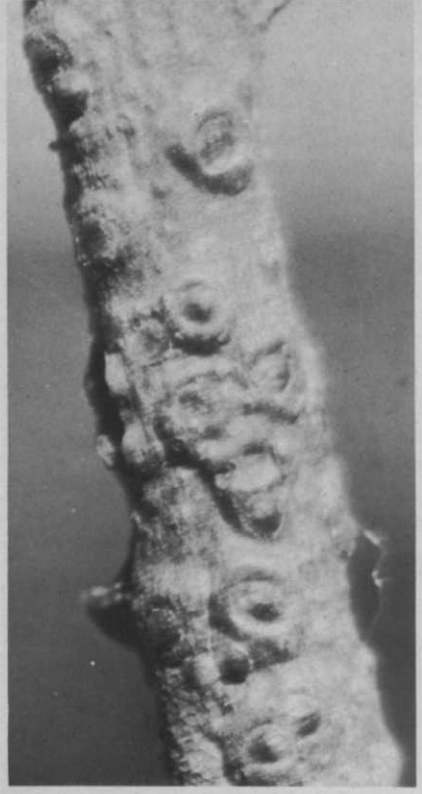

Figure 1. Pit scales on twig of Valley oak.

Research Report

Control of Pit Scales On Oak

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SEVERAL species of *Asterolecanium* pit scales attack many species of oak trees both in the eastern and western United States. These scales suck juices from the twigs and cause a dieback of that growth; this damage first becomes apparent in mid and late summer. The presence of dead twigs, the premature appearance of brown foliage, together with the persistence of dead leaves on the killed twigs during the winter, cause infested trees to assume an unsightly appearance. Young trees may be killed by pit scales when heavy attacks occur year after year.

The pitting effect is most noticeable on the bark of young twigs. Each pit is doughnut-shaped, and the insect is found in the central depression. The scale is brown or dull green in color, flattened and circular, and measures between 1/16 to ⅛-inch in diameter when mature, depending on the particular species involved. Where large numbers occur, the twig surface takes on a roughened, dimpled appearance (Figure 1).

Life Cycle

Studies on the biology of *Asterolecanium minus* Lindinger, the dominant species on Valley oak *(Quercus lobata* Née) in California, were conducted during 1962-3. The adult scales, all of which are females, produce living crawlers from April until October. These young are typically produced in two rather distinct "broods," the first of which reaches maximum proportions in May, and the second in July (Figure 2). The crawlers move about for several hours before settling on a twig, where they remain for the rest of their lives. Crawlers, except those produced very late in the season, reach maturity by the fall of the year, and the cycle begins again the following spring. There is never more than a single generation each year.

Young, current season growth is the place of settling preferred by the immature scales, but they can be found, in greatly decreased numbers, on wood up to seven years old. The lower limbs of the tree are invariably more heavily infested than the upper branches, and sprout growth always supports higher numbers than normal twig growth.

Spray Chemicals Are Evaluated

Several pit scale control trials were conducted in coastal central California during 1962-3. Each treatment was applied as a spray to the point of run-off. Applications were made in the

Table 1. Evaluation of sprays applied May 10 for control of Asterolecanium scales on valley oak. Woodside, Calif. 1962.

Material	Active toxicant in lbs./100 gals.	Gallons oil[1] per 100 gals.	Avg. no. scales per sq. cm. twig surface[2]
Carbaryl	1.0	1.0	0.3 a
Dimethoate	1.0	1.0	0.5 ab
Diazinon	0.75	1.0	0.8 ab
Malathion	1.0	1.0	1.4 abc
Diazinon	0.75	—	1.7 bc
Ethion	0.32	1.9	2.7 c
Untreated	—	—	5.8 d

[1] Supreme oil, with the exception of ethion-oil, which was a commercial mixture of ethion and light-summer oil.
[2] Means followed by the same letter are not significantly different at the 5% level.

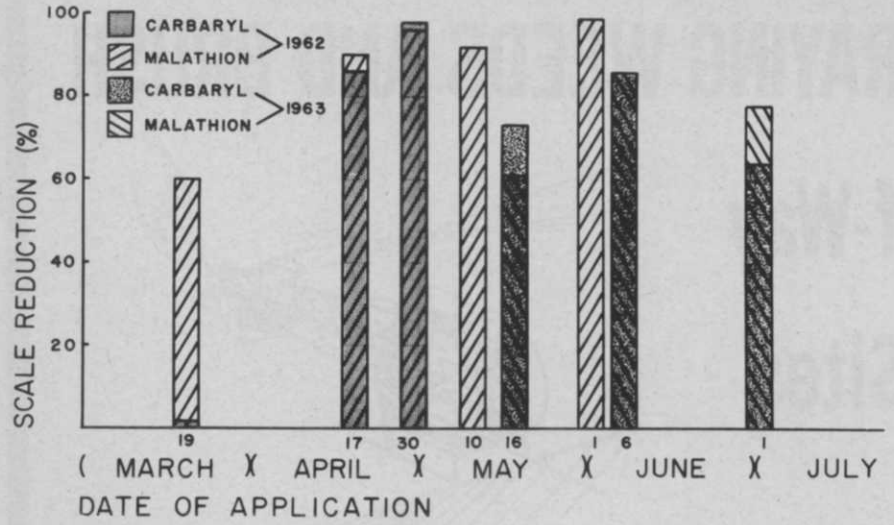

Figure 2. Number of pit scale crawlers trapped per day on 17 sticky bands placed on oak twigs.

spring and the effectiveness of the various treatments was determined by counting the number of living scales on ten current season twigs taken from each plot the following winter.

Table 1 shows that sprays of carbaryl (Sevin), dimethoate (Cygon), diazinon, and malathion, all with oil, resulted in effective control of pit scales when applied on May 10, 1962. Diazinon without oil, and ethion-oil, gave significantly poorer control than carbaryl plus oil. All insecticide treatments, however, were significantly different from the untreated check. An application of oil, or of an oil-carbaryl mixture, in the dormant period (Table 2), resulted in less effective control than certain oil-insecticide combinations applied during the period of early crawler emergence (Table 1). Four different oils evaluated did not differ significantly from one another in their ability to control pit scales, although all resulted in scale counts which were significantly lower than the untreated check.

A further trial was conducted to establish the optimum time for the application of sprays for control of *Asterolecanium minus*. Treatments of carbaryl, and malathion plus oil, were made periodically to different groups of Valley oak trees beginning in mid-March. The effectiveness of the treatments was determined as described earlier.

Applications of oil-insecticide mixtures made in late April through early June appeared to give more consistently effective control of pit scales than applications made earlier or later (Figure 3). Although carbaryl and malathion were the only insecticides used in this timing of application study, there is no reason to expect that the other materials which showed usefulness when applied on May 10 (Table 1), would not be effective if applied during this same late April to early June period.

Table 2. Effect of sprays applied March 5, in the late dormant period, on Asterolecanium scales. Woodside, Calif. 1963.

Material,[1] and mfr.	Viscosity SUS/100° F	U.R. %	Avg. no. scales per sq. cm. twig surface[2]
WSX-5494 (Humble)	57.6	96.1	1.7 a
Supreme oil (Chevron)	142	95	1.8 a
Canadian heavy dormant emul (Shell)	205	75	2.2 a
WSX-5494 (Humble) + carbaryl[3]	57.6	96.1	2.4 a
Dormant quik-mix (Niagara)	110	75	2.6 a
Untreated	—	—	6.5 b

[1] All oils used at a rate of 3 gals./100 gals. water.
[2] Means followed by the same letter are not significantly different at the 5% level.
[3] Used at a rate of 1.0 lb. active toxicant/100 gals. water.

Dormant and Growing Season Control Compared

Applications made for the control of pit scales during the dormant season would have several distinct advantages over treatments made to foliated trees. Firstly, spray coverage is much improved without the interference of leaves. Secondly, the possibility of foliage injury is always present whenever foliated oaks are treated with a spray chemical. In conjunction with these studies a certain few trees were found to display foliage injury regardless of the chemical used. Adjacent trees treated with the same insecticides were total-

(Continued on page 44)

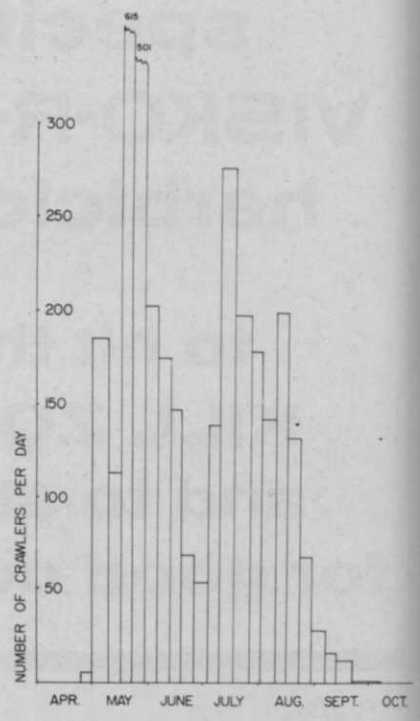

Figure 3. Effect of date of application of carbaryl and malathion, plus 1 gal. supreme oil/100 gal. water, on control of Asterolecanium pit scales in 1962-63. Carbaryl was not applied on May 10 or June 1, 1962.

Calibrate Sprayers

(from page 10)

determine manpower distribution for spraying programs. This formula calculates the number of acres sprayed in one hour. The formula to determine this factor is as follows:

$$\frac{Y \times MPH}{8.25 \text{ (constant)}} = APH$$

With the symbol Y, representing the boom width in feet, we multiply the ground speed (MPH), divided by the constant 8.25. The product is the APH, or acres sprayed in one hour.

As an example, let us say you are using a Model 308 John Bean Duo-Flex Boom which has 13 nozzles spaced at 20 inches and provides a spray swath of 21 ft. 8 inches or 21.67 ft. You have decided on a spray program which requires a ground speed of 4 MPH. This would be your calculations:

$$APH = \frac{21.67 \times 4}{8.25}$$

$$= \frac{86.68}{8.25}$$

$$= 10.5 \text{ acres per hour}$$

Calibrating sprayer equipment is important in your overall operation. Experiment stations and turf advisors should be consulted for their recommendations before a spraying program is started. If their recommendations are followed faithfully, your spraying program will be successful. If not, the best sprayer made cannot do the job for which it was intended.

Another important point to consider is the choice of spraying equipment. Be sure the sprayer has sufficient capacity to carry out your full program. Make sure it has a tank and piping system which are protected against the ravages of modern day chemicals. Be certain it has a good filter or ample capacity; plugged nozzles will upset your rate of application. Be doubly sure it has a pump that can withstand abrasive and corrosive chemicals you will be using. It should have an accurate and reliable pressure gauge and pressure regulator or relief valve. Make sure also that the boom is protected inside against rust and corrosion.

Buy your sprayer from a reliable source, preferably your turf equipment supplier. He has access to factory warranty and service programs which can be very helpful. Take good care of your spraying equipment; keep it in good condition. Periodically check nozzle capacities. Follow closely the recommendations of your turf advisors, and your spraying program will be successful.

Pit Scale Control

(from page 22)

ly free from phytotoxcity. Apparently certain environmental stresses on trees such as excess or deficient soil moisture, or root disease, have an important bearing on the likelihood of foliage injury following the application of a spray chemical. None of the trees, however, showed subsequent symptoms of leaf injury when the treatments were made before bud break. Unfortunately, these California trials indicate that applications made between late April to early June, when trees are in a foliated condition, result in more effective pit scale control than applications made in the late dormant stage. As is the case with many scales, maximum control apparently is contingent on application of the insecticide when the insect is in the vulnerable immature stage.

New Adjuvants

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which may be a 30 or 55 gallon drum.

Development of these application adjuvants when used with the Bi-Vac Inverter have many advantages over straight solutions or conventional emulsion applications. Through the Stull system, the spray mixture becomes a water-in-oil emulsion. The advantages over oil-in-water emulsions include less evaporation, more uniform droplet size, ease of control, and greater leaf penetration. Users also report reductions in run-off, spray drift and application costs.

Trimmings

Plaudits to John Gallagher. Special thanks are due John Gallagher for his time and effort in seeing that technical conference material is made available to the industry. We've attended two major meetings within the last few weeks, the Northeastern Weed Control Conference and the Weed Science Society of America. In both sessions, John, as president of NWCC and public relations committee chairman of WSSA was busy lining up officers and participants for the benefit of the press. Previously, in addition to his duties at Amchem Products, Inc., he, along with his committee members, had spent months in getting technical papers produced for press use. We appreciate this kind of help.

* * *

The When of Preemerge For Crabgrass. We've heard a number of of opinions on the best time to use preemergence treatment for crabgrass control. Because of the difference in climates and the variation in seasons, we believe the practical approach is that advanced by Dr. L. J. King in his book, "Weeds of the World." The chemical according King is best applied just before or just as the crabgrass begins to germinate. This will be the time between the withering of the flowers of Forsythia and the beginning of the flowering of dogwood. These are both easily recognized events for the sprayman.

* * *

Lots of Room For Better Golf Courses. We are amazed at the recent National Golf Foundation report on golf course irrigation. Of 7880 courses surveyed, only 42 percent had irrigated fairways. So, we can expect lots of business for irrigation contractors during the next few years. Another surprising statistic was that Kansas has 116 of 500 sand greens still in use across the country.

* * *

DED Now In Idaho. Dutch elm disease continues its trek westward. Dr. Arthur D. Partridge, forestry professor at the University of Idaho, reports that recent laboratory tests confirm findings of the Boise City forestry department. Citizens are being asked to report symptoms to get a further check on the extent of DED in the state.

* * *

Welcome to the Club. Delaware turf interests have just organized a new group, the Delaware Turf Grass Association. Purpose, like those in many other states, is to get turfmen together for management sessions and to further and review research. Walter Petroll, Winterthur Gardens, heads up the bylaws committee, and Edgar Downs, Rehoboth Country Club, is the new president.