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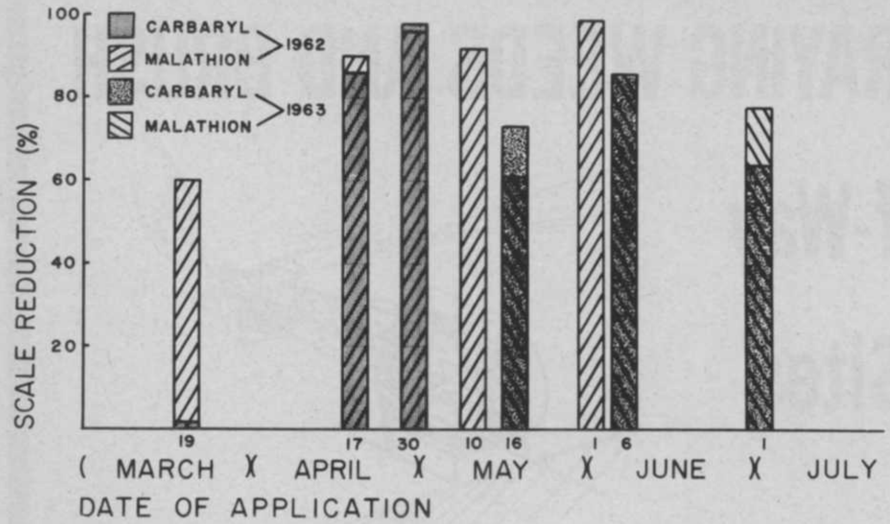

Figure 2. Number of pit scale crawlers trapped per day on 17 sticky bands placed on oak twigs.

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)

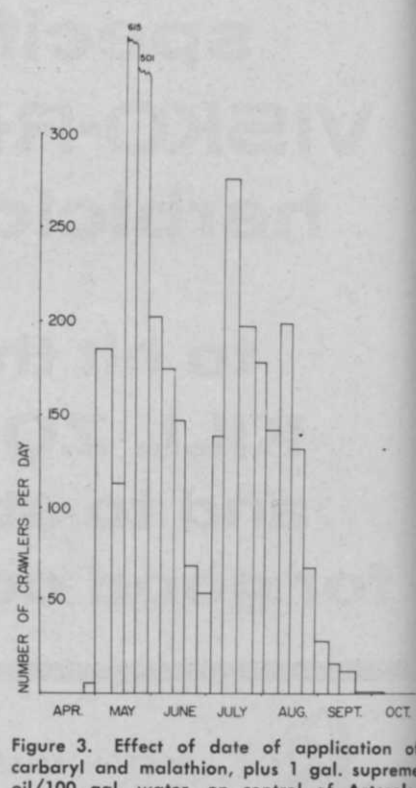

Figure 3. Effect of date of application of carbaryl and malathion, plus 1 gal. supreme oil/100 gal. water, on control of Asterolecanium pit scales in 1962-63. Carbaryl was not applied on May 10 or June 1, 1962.

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The gavel is passed. Dr. Richard Behrens, outgoing WSSA president, University of Minnesota, St. Paul, Minn., left, turns over duties to newly elected president, Dr. Boysie E. Day, University of California, Riverside, Calif.

Scientists discuss experience with surfactants, Dr. J. Robert Barry, Louisiana State University, Chase, La., left, and Dr. George E. Barrier, DuPont Co., Wilmington, Del.

Weed Science Society of America Meets at New Orleans, Feb. 5-8

Herbicides are still in the public eye. With more being used every year, citizen groups continue to debate the right of the industry to push chemical control. Thus, it becomes mandatory that weed scientists inform the citizenry as to the toxicity and residual effect of all types of application.

This need for public judgements on herbicide use to be made with all facts in hand was cited by Richard Behrens, weed scientist at the University of Minnesota, St. Paul, Minn., and president of the Weed Science Society of America. Behrens, speaking at the 8th annual Weed Science Society of America session at New Orleans, La., Feb. 5-8, said that herbicide use had increased 25% yearly in each of the past 4 years. He pointed out that a liaison committee of WSSA is now working closely with groups concerned with pesticide use. Behrens stressed that weed scientists have a responsibility to develop herbicides which involve minimum risks to man and his environment. He pointed out that much of the erroneous information about toxicity and residue problems stem from failure to provide the public with available facts. Benefits to mankind far in excess of risks must be assured if the industry is to move ahead, Behrens said.

More Weeds Becoming Resistant to 2,4-D

Field bindweed has become another pest weed which is

WSSA officer slate for the coming year, left to right: Drs. Glenn C. Klingman, Eli Lilly & Co., secretary; Boysie E. Day, University of California, Riverside, president; L. L. Danielson, USDA secretary elect; Fred W. Slife, University of Illinois, treasurer-business manager; and Earl G. Rodgers, University of Florida, editor.

showing resistance to control chemicals. Some bindweed strains can now absorb 2,4-D and survive. Dr. Thomas J. Mizik, Washington State University researcher, Pullman, Wash., reported that the lower the hormone supply, the higher a plant's resistance to hormone-type chemicals such as 2,4-D.

New information on Johnsongrass which is a perennial weed pest in many areas was presented by Jerry Caulder, University of Missouri, Columbia, Mo. Because Johnsongrass does not grow well in shade, tests were made using shade as a means of eradicating the plant. The theory was that perhaps seeds might germinate and seedlings die if a shady nurse crop was provided. However, Caulder said the theory proved to be a failure. Rather, it merely slowed development of Johnsongrass and postponed the problem, rather than solving it.

Spraymen still have problems of spray loss by drift and evaporation. With more low volume applications and higher toxicity in chemicals, losses are even more critical. At the WSSA session, two University of Missouri engineers, L. E. Bode and M. R. Gebhardt, reported on such losses when using fan-type spray nozzles.

They measured the amount of spray lost between the nozzle orifice and the target area. Losses with low volumes of herbicides ranged from ½ to 5 gallons per acre. Generally, more than ¼ of the spray was lost when discharge rates were under 2 gallons per acre. But when 10 gallons or more per acre were used, loss dropped to less than 10%.

An increase in spray pressure, Bode and Gebhardt said, caused an increase in losses for nozzles discharging more than one-tenth gallon per minute; but for nozzles discharging less than one-tenth gallon per minute, an increase in pressure caused a decrease in spray loss. Spray distribution patterns for all the nozzles tested were similar. The most uniform patterns occurred when operating at higher pressures.

Atrazine With Oils Is More Effective

Atrazine mixed with emulsifiable oils for postemergence control of annual grassy and broadleaf weeds is more effective. An Ohio research study, reported by Dr. Glover B. Triplett, Jr., Wooster, O., showed that once absorbed by a plant, atrazine moves outward from the stem to the tips of the leaves. When atrazine is mixed with oil, the activity at the leaf tip is up to 5 times as great as when atrazine-water combinations are used.

Atrazine with 0.1% to 1.0% oil produced about twice as much activity as the atrazine-water combination. With the 10% oil mix, the atrazine proved to be 5 times more effective.

Residue is a problem when

Regulatory agency personnel who served as program and technical consultants during a discussion of licensing problems which affect spraymen are, left to right: Dr. Ellsworth Carlson, Lincoln, Neb.; Freeman E. Biery, Topeka, Kan.; Albert E. Thomas, Oklahoma City, Okla.; Robert F. Odem, Baton Rouge, La.; and Edward H. Hansen, USDA, Washington, D. C.

pesticides are used in surface waters. Research by William K. Averitt, University of Southwestern Louisiana, Lafayette, La., showed a high concentration for 3 days following spraying. But, he said, there is a drastic decrease on the 4th day, and a gradual decrease thereafter.

Averitt said that when methyl amine salt of 2,4-D was applied to control water hyacinth, residue was higher the 2nd day after application than the first. A sharp drop occurred on the 3rd day, and a severe drop on the 4th day. No 2,4-D could be detected after 102 days. Use of Kuron and Esteron 99 showed results similar to 2,4-D.

Laser beams and sonic energy are being studied by army engineers as a means of controlling weeds in waterways. Laser or light energy beams and sound energy have been used to destroy underwater weed growth. Sound energy has been used to temporarily and harmlessly repel fish from an area while it is being treated for weed control.

These novel approaches to aquatic weed control were presented by Dr. Ralph A. Scott, Jr., Washington, D.C. Studies are continuing, he said, on such aquatic plant pests as water hyacinth, watermilfoil, and alligatorweed. These weeds, he said, threaten to choke many of the nation's essential navigation channels. Dr. Scott also pointed to biological agents such as Argentine flea beetle which has produced excellent results in control of alligatorweed. In the long run, he stated, such agents may prove to be our most effective weapons against weed infestation.

Field tests with acrolein and copper sulfate as the control agents have proved effective in suppressing rooted forms of aquatic weeds. Bureau of Reclamation researchers report that acrolein used over a 5-year period in the Pacific Northwest showed that the liquid herbicide controlled pondweed, elodea, water buttercup, and filamentous green algae.

W. Dean Boyle and Thomas R. Bartley, at the Bureau's Denver, Colo., Center, said that pondweed suppression was excellent along a 15- to 20-mile reach, when acrolein was added at channels at a concentration of 0.10 ppm over a 48-hour period on a 2- to 4-week schedule. Flows ranged from 700 to 2000 cubic feet per second during the treatment schedule. Where streams carry less than 700 cubic feet per second of flow, this treatment is not sufficient. Concentrations of 0.6 to 15 ppm of acrolein are needed in the smaller streams. Another finding was that acrolein failed to control horned pondweed in these field tests.

Copper sulfate, dispensed by a screw-type volumetric feeder with a timing device, effectively controlled leafy pondweed and sago pondweed on a 9-mile reach on unlined channel or irrigation canal near Loveland, Colo., the researchers stated. Tests began in June, 1966, and the first leafy pondweed injury downstream was apparent 34 days later. Tests a year later, in 1967, were more readily apparent, likely due to the effects of residual copper in the ditch bottom soil and cooler water temperatures in early season, according to Boyle and Bartley.

Dr. T. F. Hall, Jr., botanist with the Tennessee Valley Authority, Muscle Shoals, reported that picloram (Tordon) is a promising chemical control for a stubborn aquatic weed, *Cephalanthus occidentalis* L. — or buttonball, as it is commonly known. This aquatic weed has posed problems on TVA lakes and elsewhere for years.

In TVA's tests with picloram, the phase of buttonball resprouting apparently had no bearing on the effectiveness of the chemical, but time of applications was important. Excellent control was obtained from a mixture of picloram and 2,4-D applied at the rate of ½ pound picloram and 2 pounds of 2,4-D per acre. This mixture was diluted with parts of water and applied to first-year buttonball coppice in three reservoirs in mid-August and mid-September, 1966. Thus, the results indicate a potential for controlling buttonball with pic-

(Continued on page 33)

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Southern Weed Conference officers elected at the Miami Beach session are: front row, left to right, Paul Santlemann, Oklahoma State University, secretary-treasurer elect; Leonard Lett, Colloidal Products Corp., president for 1969; Doug Worsham, North Carolina State University, editor elect; Henry Andrews, University of Tennessee, executive board; and back row, left to right, Robert Mann, Tennessee Valley Authority, president for 1968; Hanley Funderburk, Auburn University, secretary-treasurer; William Lewis, North Carolina State University, executive board; William Westmoreland, Geigy Chemical Corp., executive board; and Phil Upchurch, Monsanto Chemical Co., editor.

Southern Weed Conference At Miami Beach January 16-18

Weed control innovations in both chemicals and equipment were presented at the Southern Weed Control Conference at Miami Beach, Fla., in mid-January. Public relations chairman, Henry Andrews, University of Tennessee agronomist, reports that 117 papers were presented.

Droplet size of spray chemicals is getting more attention among scientists as the demand to control drift has become a public concern. R. W. Tate, research director for Delavan Manufacturing Company, West Des Moines, Ia., discussed the many factors affecting nozzle design today. He cited the need for manufacturers to adopt a standard code for marking orifice capacity and pattern. Each nozzle company, he said, now has its own system. Tate suggested that Weed Society scientists set up an impartial standards committee to discuss the problem. Their goal would be to recommend a unified system for rating and marking nozzles. The Delavan firm, Tate said, would certainly support such an endeavor.

Tate stressed proper care of equipment. Nozzles need to be cleaned carefully. Plugged or damaged orifices can produce a distorted spray. Tate urged spraymen to be alert for nozzle wear. Nozzle wear, he said, can drastically increase flow rate and cause uneven patterns. Because wettable powders and other abrasive formulations create excessive wear on orifices, Tate suggested buying hardened stainless steel nozzles. Though they may cost 3 times as much money, Tate said that Delavan's tests showed that the useful life of hardened stainless steel nozzles may be 10 times as long as brass or aluminum.

Sprayers also need to be calibrated often. Tate recommended that procedures developed by universities be followed. His one precaution was to check all nozzles rather than a single unit. In multiple-nozzle systems, any one might be the wrong size, worn, or possibly plugged.

Common Sense Needed For Safe Herbicide Use

Safe use of herbicides does not involve mystic. All that is required are some basic facts, common sense, and a will to be safe. This is the belief of Robert A. Mann, Tennessee Valley Authority, Chattanooga, Tenn. He told members of the Southern Weed Conference that the industry needs to exchange all types of information on herbicide use and its effect on both plants and animals, as well as its residual effects in all types of circumstances.

Mann called for education of the public on the safe use of herbicides and their benefical effect on the population. He said careful labeling of all herbicides appears to be the most important single measure for promoting safe use. Next, such materials must be safely stored, in areas inaccessible to children. Education is necessary to achieve this, he said.