Mann pointed out that it is important to distinguish between toxicity and hazards. Toxicity, he defined as the capacity of a substance to produce injury. Hazard is the probability that the injury will result from a specific use of a toxic substance. Thus, it is necessary to know both the toxicity and use or exposure conditions to estimate possible hazard. Just because a material is toxic does not mean that it cannot be used with safety.

Herbicides might be classified, Mann said, as extremely toxic, highly toxic, slightly toxic, practically nontoxic, and harmless. In using these 6 ratings of toxicity, most herbicides now being used would fall in the 3rd and 4th categories, Mann believes. This type information is important to the ultimate user and the general public.

Trained supervision, according to Mann, is the key in safe herbicide use. Most important in this area is education, training, and supervision of persons working with or handling chemicals. Most users, he said, depend on common sense, awareness that herbicides are toxic, and on simple but regular personal hygiene habits.

Plants To Be Eradicated Dictate Special Equipment

Plant species dictate the type equipment and the chemical needed for their control. Important here, according to Chester L. Foy, plant pathologist at Virginia Polytechnic Institute, Blacksburg, Va., is the when, where, and how plants grow.

Foy pointed out that certain crops require that there be no contact between the crop plant and the weed killing herbicide. There is also a big difference, he said, in plant retention, penetration, and translocation of chemical to plant. For example, location of plants to be killed, differences in growth habit and plant makeup determine equipment needed and the type herbicide which will be the most effective.

As examples, Foy cited the need to control spray drift of brush killers by using thickeners and antidrift agents. For this purpose, special orifices and centrifugal type applicators on aerial equipment are needed to confine the treatment pattern. Aquatic weed problems, he said, call for air boats, pontoons for walking on water, and similar equipment to place granules, to spray inaccessible immersed weed stands, or to inject or meter herbicides into water. Large tree tops cannot be sprayed with standard sprayers. For these, the cherry picker or similar devices, usually with off-set nozzles, are needed.

Other examples were presented by Foy to point up the engineering achievements which have made possible the growth of the vegetation care industry.

Conference for the coming year will be held Jan. 21-23, 1969. at the Statler Hilton Hotel, Dallas, Texas.

Renovation Is Severe Method For Improving Turf

Renovation of turfgrass requires both time and money. And because of these factors, it probably should be the last step undertaken for improvement of existing turf.

This was the view expressed by Dr. Robert W. Miller to turfmen attending the 39th annual short course for vegetation care management personnel at Columbus, Ohio. Miller, OSU agronomist, also serves as executive-secretary of the Ohio Turf Foundation.

Reasons for renovating are many. The original job may have been handled improperly and the sod may be in a poor condition. Bluegrass turf may be threatened by annual grasses. Bentgrass may be mixed with bluegrass. Because these problems are difficult to handle and the mixed stands of grass may not permit selective removal, renovation may be the only solution.

If nimblewill, tall fescue, quackgrass, or Johnsongrass are present in a lawn, it may be best to dig out the individual areas and reseed or resod rather than renovating the entire lawn. Miller also said herbicides may be excellent for spot treatments. However, in the case of quackgrass and similar weed grasses, up to 3 treatments may be needed.

If renovation is to be the solution, the kill of existing turfgrass should start in early June for the mid-west area, according to Miller. Then the area can be ready for fall seeding in September. However, this ties up the lawn and it becomes a problem area for most of the summer and fall, or until the new seeding is established.

Because renovation does create problems, Miller believes lawn problem areas need to be carefully analyzed. Many times, he said, the turf only needs an aerification. In other cases, thatching or fertilizing along with deep watering may improve the stand and produce the desired lawn.

A good disease control program is mandatory in maintaining turf. The old adage that "a pound of prevention is worth a pound of cure" applies to turfgrass management, Miller believes. He emphasized that renovation is a drastic step and demands extreme measures to produce a desirable turf.

The Ohio short course is annually sponsored by the University, Ohio Nurserymen's Association, the Ohio chapter of the International Shade Tree Conference, and the Ohio Turf Grass Council.

Use Thickeners

For Improved Spray Drift Control

By EVAN SWARTZ

Director, Noxious Weed Department
Shawnee County, Kansas

WEED and brush control has long been a problem for the people in Kansas. The first chemical used on weeds in Kansas was salt-applied at one pound per square foot. This removed all vegetation, but topsoil was blown away or eroded.

With the discovery of 2,4-D and 2,4-5T, a new era of weed control started. When properly applied, these chemicals killed broad leafed weeds but did not harm the grasses. We could spray our roadsides and kill the weeds and brush and not our grass.

But for the past few years, drift of these 2,4-D sprays has been a problem. You can spot damage on many susceptible plants. For this reason, when I saw a representative of Hercules Incorporated demonstrate an invert sprayer at our State Weed Meeting, I was very interested. Arrangements were made for a demonstration on our roads under typical windy conditions.

Subsequently, on May 11, 1967, three different types of herbicide sprays and techniques were demonstrated in Shawnee County.

(a) One was Visko-Rhap invert herbicide emulsion using a sprayer manufactured by Minnesota Wanner Company . . . the water and herbicide are forced into a thick viscous emulsion that forms droplets too heavy to drift under normal spraying conditions.

(b) A standard thickening agent was added to the herbicide used in the Shawnee County sprayer . . . to reduce drift.

(c) Water alone was employed in the Kansas Noxious Weeds Division sprayer—to demonstrate the difference in drift between conventional sprays and those with a thickening agent added.

These three spray systems were demonstrated just east of U.S. 75 on a Shawnee County road leading to Richland. The sprays used appeared to have an effective kill of elm, wildrose, cottonwood, and weeds, but the grass was not killed.

Test for drift of the spray was made using tomatoes in the right-of-way fence line and at 2 feet, 4 feet, and 6 feet beyond the fence line on the downwind side with 30 mph wind gusts. The area from the pavement edge to near the fence line was first sprayed with invert emulsion. None of the 4 plants used in this test have shown any signs of wilting or stunted growth. All 4 plants with 80 days of growth after spraying are healthy and produced small green tomatoes.

The second spraying of the section was made with a thickened herbicide solution. Tomato plants were placed at two-foot intervals beyond the fence at increments of 0, 2, 4, 6, 8, and 10 feet. Within 24 hours the plant under the fence and the plant 2 feet beyond the fence were wilting badly. Plants at 4 feet and 6 feet were in the first stages of wilt within 24 hours and the plants at 8 and 10 feet showed no signs of wilting. After 5 days, the plants at 6 feet began recovering, while the 0, 2, and 4 foot plants were badly wilted with yellow leaves. After 8 days, the plants were removed from the laboratory and planted outdoors. At this time, the 0, 2, 4, and 6 foot plants showed signs of wilting, although the 2 foot and 6 foot plants seemed to be recovering. Seven days later, or 16 days after spraying the plant under the fence died. At the end of 80 days after spraying, the plant under the fence was dead, the 2 foot and 4 foot plants were stunted and will die without producing tomatoes, and the 6, 8, and 10 foot plants are healthy and have produced small green tomatoes.

Spraying with water, without use of thickener or invert emulsion was demonstrated. Spray fog could be observed drifting with the wind for a distance of 30 feet or more, beyond the fence line.

Soon after our roadside demonstration, with the help of Hercules personnel, we converted our hydraulic boom-controlled roadside sprayer. This was a simple operation. We added the mechanical mixer and used a 55-gallon, 2,4-D barrel.

Our sprayer is equipped so we can spray conventional thickener, or invert. However, after the first day of invert spraying, we were satisfied with the drift control and finished our roadside spraying (300 miles on both sides) with invert material.

With good drift control, our crew sprayed on days we wouldn't have thought about spraying with conventional 2,4-D formulation. This enables us to do more roadside spraying during the period that weeds are small and easily killed. The invert material resists wash-off.

Eron foam generator will handle controlled volume of foamy herbicide in 12 mph wind according to the developer, Robert Eron. Unit can be used to spray minute amounts of foam on a single plant, or to deliver large quantities.

Florida Weed Specialist Develops Foam Generator

Robert Eron, pest control operator and weed control specialist, St. Petersburg, Fla., is working on a new method for foamy herbicides.

Eron describes his system as a positive-pressure foam generator. The idea, he says, is to carefully target herbicides on pest type vegetation. Eron's unit is still in the developmental stage. He is now using it in his own business in Florida and has made patent application. Eron reports the foam generator has been used to treat cattails, hyacinths and similar weeds. The foamy herbicide produced by his generator clings to leaves and stems. Especially important to the weed control operator, he said, is the fact that the new unit foams herbicides onto plants so that the chemical clings to leaves and stems rather than running or blowing off. At the same time, the foam produces the desired extended wetting period.

Biggest problem in development of the new system, Eron says, has been in developing a formula for each type control which would foam properly. None is on the market at the present time.

Eron's hope is to further develop the system, complete patent clearance, and then fabricate the unit for sale.

WSSA Meeting

(from page 28)

loram at a cost which compares favorably with the cost of mechanical mowing.

Officers for WSSA are elected by mail balloting prior to the formal meeting. New officers for 1968 are: Dr. Boysie E. Day, chairman of the Department of Horticultural Science, University of California, Riverside, Calif., president; Dr. Glenn C. Klingman, director of plant science research, Eli Lilly and Co., Indianapolis, Ind., secretary; Dr. Fred W. Slife, agronomist, University of Illinois, Urbana, Ill., treasurer and business manager; Dr. Earl G. Rodgers, department of Agronomy, University of Florida, Gainesville, Fla., editor of the Society's technical journal, Weed Science, reelected as editor; and Dr. Loran L. Danielson, ARS, USDA, Beltsville, Md., secretary-elect.

Dr. R. E. Doersch, chairman of the WSSA awards committee presented the award for the outstanding paper at the 8th annual meeting to Dr. R. Prasad, Dr. C. L. Foy, Virginia Polytechnic Institue, Blacksburg, Va., and Dr. A. S. Crafts, University of California, Davis, Calif., for their paper "Effects of Relative Humidity on Absorption and Translocation of Foliarly Applied Dalapon."

Doersch also presented Dr. G. F. Warren, Purdue University, a plaque and an honorary membership in WSSA. Final registration was 744. More than 200 scientific papers were presented, plus 50 in a special Latin American section. Latin American papers were translated simultaneously during the event.

New Spray Adjuvants Now On the Market

Stull Chemical Company has developed 3 spray application adjuvants for weed, brush, and grass control with presently used herbicides.

Bivert AMX, Bivert DPN and Bivert MSMA have been developed to go hand-in-hand with Stull's Bifluid application system for invert emulsion sprays.

Bivert-AMX is a specially formulated spray adjuvant for use with Ammonium Sulfamate (Dupont "Ammage X" Weed and Brush killer). Bivert-DPN for use with Dalapon (Dow "Radapon" or "Dowpon") provides another weed killer usable in the invert system. The third, Bivert MSMA for use with Monosodiun Methanearsonate through invert spraying, makes it more effective on grasses, weeds, and some brush species.

Power sprayers now using these herbicides may be quickly converted to apply water-in-oil emulsions. This requires a simple, inexpensive device called a Stull Bi-Vac Inverter, which is connected to the regular pump suction, and an additional tank

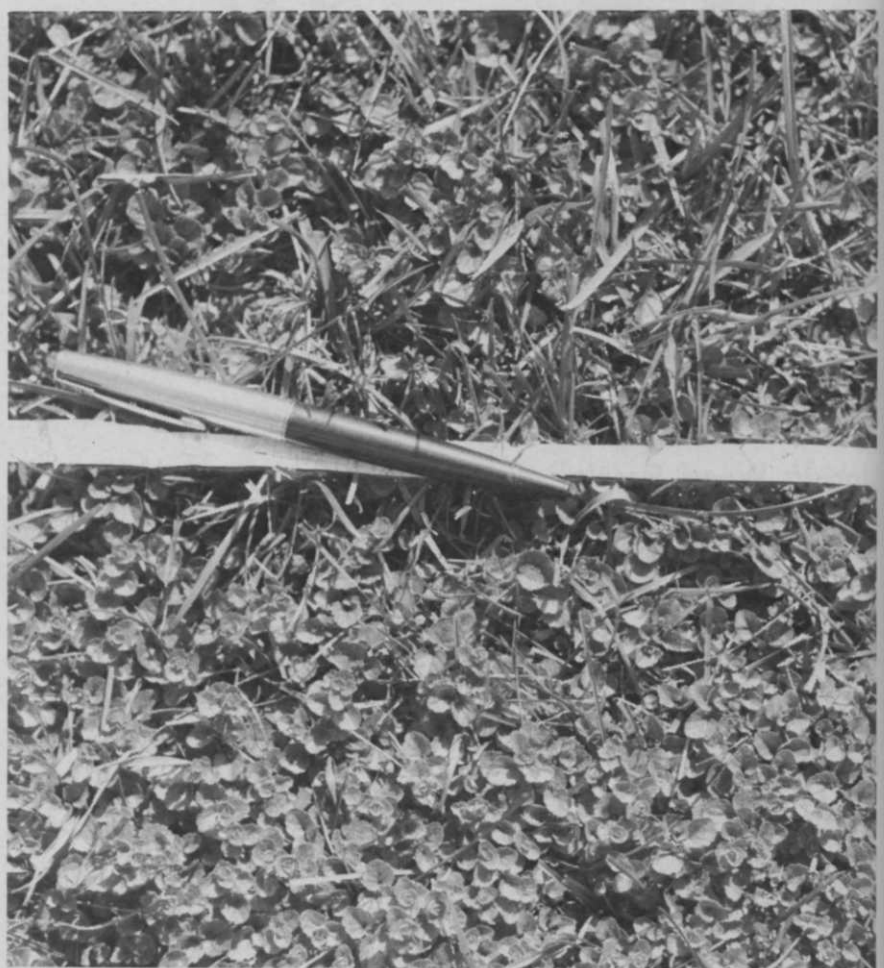
(Continued on page 44)

Washington State Finds Dacthal Effective in Postemergence Trail

Turf maintenance personnel have long battled the troublesome, persistent weed, Creeping Speedwell *(Veronica filiformis* Sm.). Now help may be on the way in the control of this broadleaved weed, which infests turfgrasses in many areas of the Northern United States and Canada. Veronica is an annual weed—sometimes perennial — a prolific spreader that's hard to control in turf without damaging desirable grasses. But tests during 1967 using Dacthal herbicide produced encouraging results in the control of this weed pest. Dacthal is a patented herbicide, developed by the Agricultural Chemical Division of Diamond Shamrock Corporation, Cleveland, Ohio.

In most of the tests, the Dacthal required at least one month to show visible effects, but then produced 99% control or better.

Most of the research was coordinated by T. J. Neidlinger, technical service representative of Diamond Shamrock, in cooperation with the Western Washington Research and Extension Center, a branch experiment station of Washington State University, at Puyallup, Washington. Tests were supervised by Dr. Roy L. Goss, associate agronomist and extension turf specialist.



Control of Veronica filiformis Sm. by Dacthal is evident in this photograph of the edge of a test area. Check area at bottom is heavily populated with Veronica, which has choked out almost all turfgrass. Application of Dacthal on section at top has started to control the weed effectively, with turfgrass actively growing back.

T. J. Neidlinger, Diamond Shamrock Corp., Cleveland, O., delivered a paper on this study at the recent Weed Science Society of America Conference at New Orleans, La.

Early in January a greenhouse screening trial was conducted to test various chemicals on actively growing Veronica. Dacthal was applied at the rate of 12 and 24 pounds active ingredient per acre, to four 25-square-foot plots. By April visual evaluations showed 95% effective control for the 12-pound rate, with the 24-pound rate giving 100% control.

With this data in hand, Dacthal was tested at two golf courses in the Pacific Northwest and one in northeastern Ohio. Three thousand square feet of fairway turf were treated with the 12-pound-per-acre concentration on a golf course near Seattle early in June. In addition to actively growing Veronica, the plot contained Highland bentgrass, fine-leaved fescues, Kentucky bluegrass and annual bluegrass. Dur-

ing the test, the plot received about one inch of water a week and was mowed regularly.

By the end of June, the Dacthal had provided 99% control. Areas devoid of Veronica were apparent where large clumps had been growing. Continued observation showed no redevelopment of the weed.

In a similar test at a golf course in Northern Idaho, 150 square feet of fairway turf were treated with only 6 pounds per acre of active Dacthal. The ground was 95% healthy, actively growing Veronica, 4% plantain, and 1% dandelion. By October, visual observation showed 99% control of the Veronica.

At the Ohio golf course, Dacthal was applied at 9, 12, and 15 pounds active ingredient per acre to plots in the rough that were heavily populated and dominated by Veronica. Some Kentucky bluegrass and fine-leaved fescues were also present. The applications were made on August 1st.

Results of Evaluations Made on September 24

RATE (active)	PERCENT CONTROL
9 pounds per acre	40
12 pounds per acre	50
15 pounds per acre	65

Although the results of this test were not as significant as previous results, the plots may have been mowed soon after application, thus removing much Dacthal before it could be washed by irrigation water into the soil.

Tests were also conducted on Veronica-infested lawns in the State of Washington. In Yakima, a home lawn was treated with 12 pounds per acre of Dacthal on one 160-square-foot plot. A similar adjacent plot received one-pound-acid equivalent each of a 2,4-D/2,4,5-T combination. On September 15th, about two months after application, the

Visual Evaluation Results on September 6

Chemicals	Rate	Percent Control				Average
		R1	R2	R3	R4	
Dacthal (W.P.)	9	90	90	80	90	87.5
Dacthal (W.P.)	12	100	95	90	90	93.8
Dacthal (W.P.)	15	90	90	90	90	90.0
Dacthal (Granule)	12	50	60	50	40	50.0

2,4-D/2,4,5-T showed only 5% control with the Dacthal giving 85%.

A similar test was made on the state capital lawn at Olympia, Washington. On July 14th, 9, 12, and 15 pounds per acre of Dacthal were applied as a wettable powder, 12 pounds active Dacthal as a 5% granule, and several rates of picloram, picloram +2,4-D, DSMA, and MSMA. All treatments were replicated four times on 100-square-foot plots. On September 6th visual evaluations showed the following:

None of the other chemicals gave adequate control. The best of these showed an average of only 42.5% effectiveness, which really only suppressed the Veronica, rather than killing it.

According to Neidlinger, Diamond Shamrock plans further tests in 1968 to determine exactly how Dacthal affects the Veronica plant physiologically. Field tests will also be made to establish the proper rate and time of application for optimum control under a variety of conditions.

Although Veronica is not presently on the Dacthal label, it is hoped this data will be sufficient to add Veronica to the label in the near future.

Chemicals Control Weeds In Bermudagrass Stands

Herbicides can give control of weeds in new bermudagrass stands. Dr. Elwyn Deal, agronomist, University of Maryland, College Park, Md., reports no evident damage to the new grass.

Winter survival the first year after sprigging (planting small sections of the plant) proved excellent. Grass was sprayed with DMPA (Zytron). Where DCPA (Dacthal) was used, Deal reports winter survival was almost as good, but weed control was slightly poorer.

Deal said that Simazine, in the Maryland tests, severely injured sprigs, and almost all grass died out during the winter. However, this chemical did give excellent weed control. Another chemical, bensulide (Betasan or Pre-San) caused no visible damage to the plants during the first few weeks, but stolon (runner) development suffered even during the second season.

Plots fumigated with methyl-bromide, before sprigging showed good weed control and the bermudagrass survived well through the winter. Trifluralin (Treflan) worked lightly into the soil with a rototiller after planting gave good weed control but caused some stunting and retarded grass root growth.

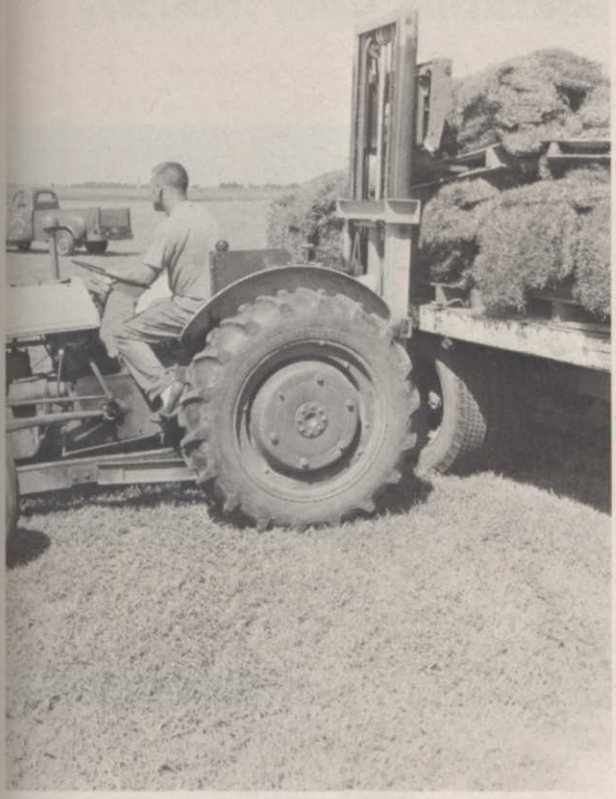
Deal says that all the chemicals except methyl-bromide and trifluralin were applied to Tufcote bermudagrass plots seven days after planting.

Quality of Water Important In Irrigation

Turf specialists in greater numbers are beginning to check the quality of water used on turf areas. This can help eliminate many of the so-called grass problems, according to Dr. Robert W. Miller, agronomist at the Ohio State University, Columbus, O.

Miller says that excessive concentrations of inorganic salts, boron which is toxic to plant growth in many instances, organic toxic compounds, and high sodium concentrations may prove troublesome.

All water used for irrigation contains inorganic salts derived from rock, soil, or other solid phase materials through which water percolates, according to Miller. The concentration of these will determine the suitability of any water supply for irrigation purposes on turf. Thus, the need for a laboratory check is evident before turf problems arise.



Century forklift is used to handle cut sod, "green side up," on Simmons Turf Grass Farm, Topeka, Kan.

Sod Carried "Green Side Up" On Simmons Farm

Handling of cut sod using a forklift with a pellet for loading trucks rather than rolling sod is finding favor on some turf farms. Simmons Turf Grass Farm, Topeka, Kan. has been using a Century rear mounted forklift tractor attachment and finds it requires less labor and effort than lifting sod by hand to the truck bed.

Century Forklifts, both 7 and 10-foot models, can lift from 1500 to 2500 pounds. They offer 3 types of tractor mountings, 3-point, axle, and underframe. With a shortage of field labor, Simmons has found their method reduces time and labor in loading, transporting and unloading sod.

Meeting Dates

Midwest Regional Conference, Midwest Regional Turf Foundation, Purdue University, Lafayette, Ind., March 4-6.

Maryland Sod Conference, University of Maryland, College Park, Md., March 6.

Massachusetts Fine Turf Conference, White House Inn, Chicopee, Mass., March 6-8.

Western Agricultural Chemicals Association, Spring Meeting, Hilton Inn, San Diego, Calif., March 11-13.

Western Society of Weed Science, formerly Western Weed Control Conference, Owyhee Hotel, Boise, Idaho, March 19-21.

SCOPIC, Sun Country Operators Professional Improvement Conference, Short Course, Rodeway Inn, El Paso, Tex., March 19-21.

Michigan Turfgrass Conference Annual Meeting, Kellogg Center, Michigan State University, East Lansing, Mich., March 20-21.

Northern California Turfgrass Exposition, Northern California Turfgrass Council, Hall of Flowers, Golden Gate Park, San Francisco, Calif., March 20-21.

Turfgrass Grower's Seminar, Annual Meeting, Memorial Union, University of Rhode Island, Kingston, R.I., March 21.

Northeastern Aerial Applicators, 4th Annual Conference, Alice Statler Auditorium, Cornell University, Ithaca, N. Y., March 13-15.

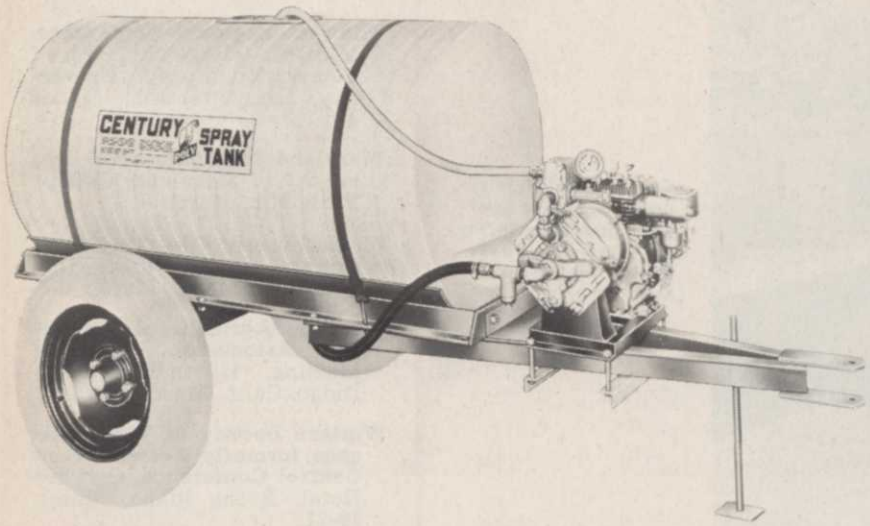
National Pollution Control Exposition and Conference Houston Chamber of Commerce, Astrohall, Houston, Tex., April 3-5.

Florida Turfgrass Trade Show, Florida Turfgrass Foundation, Jack Tar Harrison and Belleview - Biltmore Hotels, Clearwater, Fla., April 24-26.

Tri-County Chapter, California Landscape Contractors' Association, 17th Annual Convention, Ojai Valley Inn and Country Club, Ojai, Calif., June 25-29.

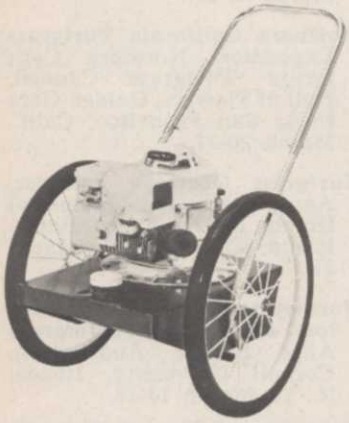
American Society of Agronomy, 1968 Annual National Meeting, Jung and Roosevelt Hotels, New Orleans, La., Nov. 10-15.

New Products . . . Designed for the Vegetation Care Industry

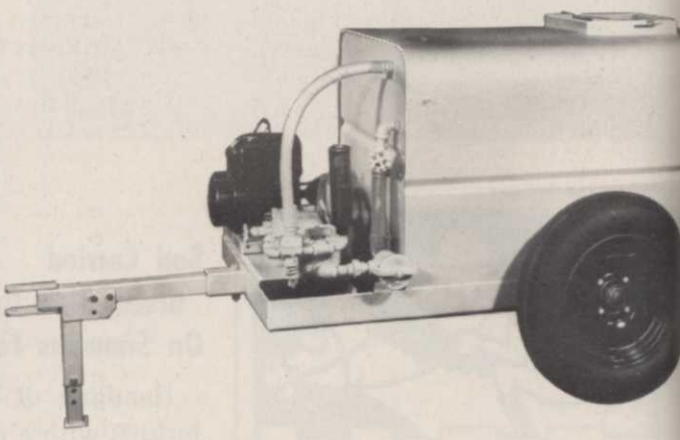


Narrow, pull-type trailer with low center of gravity sprayer introduced by Century Engineering Corporation, Cedar Rapids, Ia. 52401. No. 1260-V Century Low Trailer safely maneuvers along roadsides or fences, between pens or bins and beneath low hanging trees where clearance is a problem. A full length saddle and straps are included to accommodate a 125 or 200 gallon Century "Poly" spray tank. The No. 1260-V Low Trailer can be used with an engine unit, PTO mounted pump or trailer mounted pump driven from PTO by a telescoping drive shaft. Hand gun can be added or Jet (boomless) sprayer. Or 6 or 8 row boom can be mounted at the rear.

New Thermo-Fogger F-2107 offers 7 gallons per hour output for golf courses, small estates, parks. Manufactured by Burgess Vibrocrafters, Inc., of Grayslake, Ill. Precision metering valve controls fog density and output.

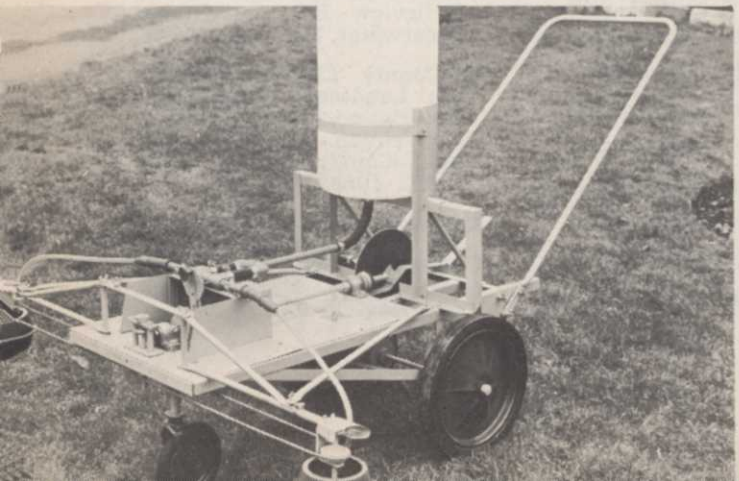


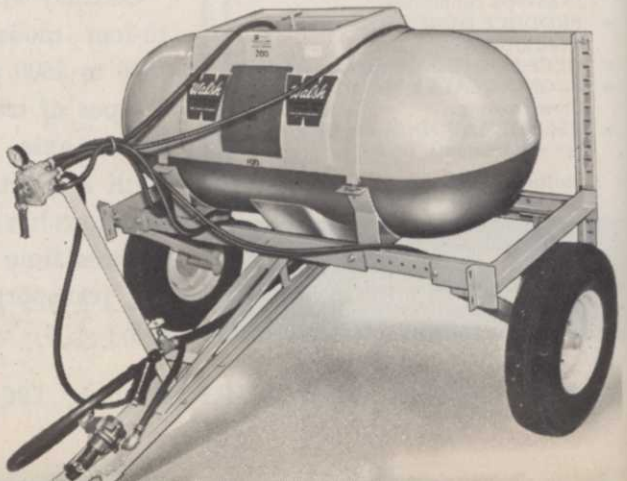
High pressure sprayer designed for general purpose spraying by Hardie Sprayers, Division of Universal American Corp., 4200 Wissahickon Avenue, Philadelphia, Penna. 19129. Features enclosed pump, pressure up to 400 P.S.I. Available in 10 and 20 G.P.M. pump capacities.



Vortex centrifugal sprayer for use on lawns and paths has no engine or pump. Machine can be used for weed killing, foliar feeding and fertilizing. Available in three models, of 4', 8' and 12'. Write: Richmond Gibson, Ltd., 43b Bells Hill, Bishop's Stratford, Herefordshire, England.

New sprayer featuring all fiberglass, non-corrosive tank, designed around a revolutionary sump-trap bottom is being manufactured by the Walsh Manufacturing Company, Box 351, Charles City, Ia. 50616. Tank has a 2-gallon sump trap outlet which completely empties each fill. Walsh "Posi-Sump" trap sprayer tanks are available in 110, 165, 200, 300 and 500 gallons capacity.





Mosquitoes 10¢ an acre

Just one or two dime's worth of DIBROM 14 Concentrate will buy an acre of mosquito control.

DIBROM 14 is your best buy in adult mosquito control because it takes only a few ounces to get quick, thorough kill. Dilute it with oil for ground or air application. Or apply it by air at full strength with ultra-low volume equipment. (The plane might run out of gas before it runs out of DIBROM 14!)

For large-scale mosquito control programs, ULV application is the greatest thing that's happened in years. Cuts insecticide costs way down. And ULV kit conversion for aircraft is quick and economical, too. (For maximum savings, check with your ORTHO man on bulk handling of DIBROM.)

And all this with the other advantages of DIBROM. Breaks down on contact with soil, plants or water. No record of loss to fish or wild life when used at recommended rates. Registered for use over pastures, barnyards and feedlots, and for use on many crops up close to harvest, so there's minimum hazard of residues on food and livestock products.

DIBROM is available also as DIBROM 8 Emulsive, for application in water by ground equipment, where fogging or aircraft application isn't practical. (For either formulation, be sure to read and follow product label directions.)

And where every penny counts, use DIBROM 14 Concentrate ULV for quick kill of adult mosquitoes. And make every ounce count.

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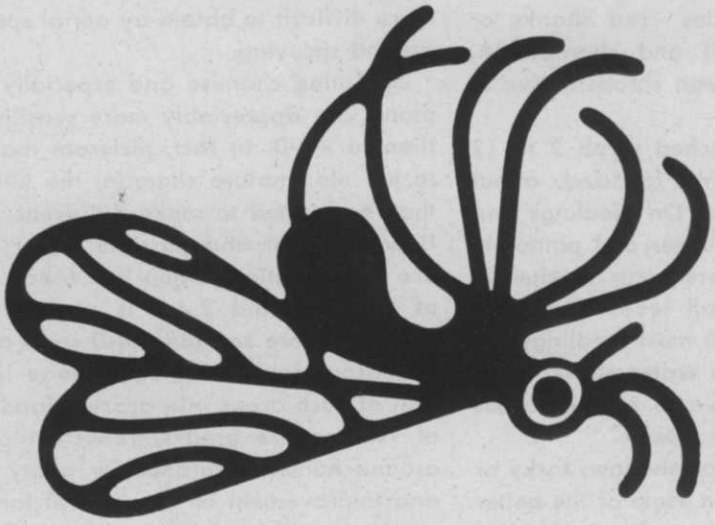
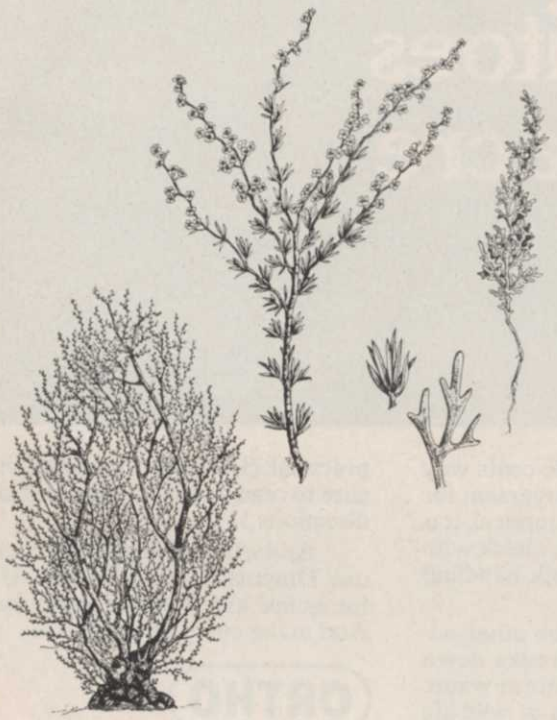


DIBROM 14

CHAMISE

(Adenostoma fasciculatum)



Drawing from: California Range Brushlands and Browse Plants by Arthur W. Sampson and Beryl S. Jespersen. Calif. Agric. Expt. Sta. — Ext. Ser. Manual 33.

Prepared by: O. A. Leonard, Botanist, Assisted by B. J. McCaskill Senior Herbarium Botanist, Botany Department, University of California, Davis, California

The genus **Adenostoma** belongs to the Rose family and consists of two species — red shanks or ribbon bush (**A. sparsifolium**) and chamise (**A. fasciculatum**). Both are evergreen shrubs native to California.

Chamise is a diffusely branched shrub 2 to 12 feet tall. Its leaves are mainly fascicled, about ¼ inch long and sharp pointed. On seedlings and stump sprouts the leaves are larger and pinnately lobed. The small, white flowers occur in clusters 1½ to 4 inches long. The small seeds germinate profusely following a fire, with most seedlings not surviving the first year due to water stress; however, sufficient numbers survive to recover areas not already filled by sprouting species.

Commonly this shrub grows on shallow, rocky or poor soils, but is also present on some of the better sites. Because of its inflammable nature it is sometimes called greasewood. Chamise-covered areas are subject to periodic fires, and following such fires this plant develops numerous sprouts from its enlarged basal burl. These sprouts may be eaten to some extent by livestock or big game for 2 or 3 years following a fire; the brush then usually gains the upper hand, crowding out perennial grasses and reverting again to dense stands of brush. In general, associated with chamise are other species of sprouting and non-sprouting evergreen shrubs. These belong mainly to the **Quercus** (oak), **Ceanothus** (wild-lilac) and **Arctostaphylos** (manzanita) genera. When controlling chamise, one is confronted with controlling these other plants as well.

Chemical control of chamise should normally be initiated following a fire. Reasons for so doing include: 1) accessibility of the area is greatly increased; 2) fire hazard is greatly reduced over that existing in either living or chemically-killed unburned chamise; 3) grasses become established best following a fire, which helps to prevent the reestablishment of chamise from seedlings; and 4) chamise sprouts are far more easily killed by 2,4-D than are old unburned plants. It is important to plant grass because it competes successfully against chamise and other brush seedlings. Further, following chemical control of sprouts, grass maintains such areas as grasslands, since it tends to kill brush seedlings which germinate later by removing soil moisture.

Sprouting chamise can be controlled by broadcast applications of 2,4-D or brushkiller mixtures of 2,4-D and 2,4,5-T applied at yearly intervals. Two or more applications may be required to achieve complete control. Some of the woody species associated with chamise, such as scrub oak (**Quercus dumosa**), require repeated individual plant treatment to kill. It is usually desirable to start with spraying of chamise in the spring following a fire, especially when helicopters are used. Control is more difficult to obtain by aerial spraying than by ground spraying.

Sprouting chamise and especially old unburned plants are appreciably more sensitive to picloram than to 2,4-D. In fact, picloram makes it possible to kill old, mature chamise; the killed plants can then be burned to make the areas accessible, etc. However, cost and possible water contamination are considerations when it is used. A combination of picloram and 2,4-D is also effective against chamise, more so than 2,4-D used alone.

Reasons for controlling chamise include conversion of such areas into grazing land, development of fuel or fire breaks, reduction of fire hazard around homes, clearance for utility rights-of-way, and improvement of the natural landscape. Some shrubs should be left but these should not be too closely spaced in order to minimize competition for water between the shrubs. With prudence, beautiful shrub-covered areas can be developed.