Kaupke: "More helicopters in use tomorrow."

droplets which in turn will help reduce drift, weed controllers have, in recent years, turned to the possibility of increasing viscosity; first and most familiar were the invert emulsions; now science has given us the "particulate" spray, such as Dow's Norbac. Kaupke defined particulate sprays as mixtures composed of many "swollen discreet particles," in which there are theoretically no free spray mixture, and consequently no fine droplets to drift.

Kaupke too joined his voice to the chorus which predicts greater use of helicopters. He said most of those manufacturers who formulate invert emulsions do not recommend application by fixed-wing aircraft. While helicopters and inverts won't completely eliminate drift, it is substantially reduced, he added.

Invert emulsions and particulate sprays are currently in wider use in noncrop areas such as rights-of-way, Kaupke concluded.

Bring Equipment Mfg. In

The third of the engineering trio to share his know-how with the gathered Californians and their out-of-state guests was Iowan Walter G. Lovely who's with the U.S. Department of Agriculture in Ames.

Lovely believes that agricultural engineers and equipment producers should be admitted early to the processes attending the tests, experiments, and other development procedures strewing the path to ultimate registration. Frequently the critical factors which decide what effects, good or bad, a herbicide will have are irrevocably intertwined with the application method.

"We will in the future be making much more accurate applications," the USDA man opined. He said in the weedkilling world of tomorrow we shall probably have "prescription type" compounds, chemicals so specific and so suitable to the particular species that it will take a trained professional to prescribe them.

This view of the future has been voiced elsewhere, of course.

What Happens to Residues?

Another USDA researcher, Dr. T. J. Sheets from Beltsville, Md., detailed for the avid conventioneers the paths taken by herbicide residues in soils.

First he stated unequivocably that soil residues are not necessarily undesirable, and that the accumulation of residues is not always to be termed a problem.

There are many factors at work on chemical traces in the earth, which Dr. Sheets listed as: microbial action, volatilization, adsorption, leaching, photodecomposition, dilution, and chemical reaction.

"The longer a herbicide persists, the greater the number of these processes which come into play," the Beltsville technician mused.

He cautioned his audience to remember that not all herbicides are acted upon by soil microorganisms. Fenac, for example, is not, he said.

Removal of undesired vegetation from crops and from noncropland by flame is not really a new process, having been in use for some 25 years. But it is a technique which receives scant attention, compared to chemical methods, so the entire half day devoted by Californians to flame weed control and cultivation elicited hearty enthusiasm from the group.

Whether one endorses the process or not, it was obvious that delegates wanted to learn what weedkilling by fire is all about.

Program planners had scheduled an address by J. W. Gotcher, president of Gotcher Engineering and Manufacturing Company in Clarksdale, Miss.

Gotcher, whose firm manufactures weed flaming equipment, is considered the "father of flame cultivation." Unfortunately he could not attend, and his address was presented by John C. Taylor of California Liquid Gas Company.

"Flame cultivation in its true sense is selective weed control," Taylor read. "The difference in resistance to heat among various plants enables this selectivity."

What occurs is not the literal consummation of a plant in flames, but an altering, through heat, of the plant's cell structure so that it does not survive.

In his prepared paper Gotcher advised applicators that it may be necessary to increase fuel pressure and velocity of flame in denser growths of vegetation; and the same adjustments may be necessary to drive heat through the protective coatings of hardier plants.

To discuss equipment for flame weed control, conference leaders brought Darrel Reifschneider to

Proud of past, hopeful for future of the California Weed Conference, outgoing president James Devlin of Amchem (left) exchanged ideas for future growth with Dr. Norman Akesson, new prexy. He's from the U of Cal's Davis campus.

Student and teacher. Flame weed control expert Howard Rhoads (right) paused with one of his students from Cal Poly during the afternoon exhibit of available flaming equipment. Student is Paul Lasker.

the podium. He's sales manager for Manchester Tank & Equipment Company in Lynwood.

Manchester manufactures flame weed control rigs.

Reifschneider said that in 1960 a new self-vaporizing liquid head burner was introduced, and this replaced the pipe burners originally used. These new flare-shaped burners are set on 12" centers, and produce a flat, high-velocity flame and operate at almost twice the pressure as the old-type burners.

There are four types of flame devices, Reifschneider said. These are the hand burner, the field burner (which may be up to 18 ft. wide), the boom-type burner (for ditches, fencerows, roadsides), and the flame cultivator (for agricultural use).

Noncrop Flaming

A partisan of weed control by fire whose bailiwick is noncrop areas is Robert Meyers, Coberly & Plumb, Bakersfield. Coberly & Plumb is an agricultural chemical supply house which also deals in flaming equipment and services.

Meyers said liquid petroleum gas has helped speed flaming along because it is self-pressurized, concentrated, and portable. Meyers said that heat from flame guns coagulates protoplasm in plant cells, killing the organism. "Green growth" flaming, he added, is more effective on young weeds which are less resistant to heat because they haven't formed the thick protective covering characteristic of older plants.

Large weeds should be mowed, stacked, and then burned, Meyers said, because if they are merely flamed, the stalks will be left standing.

He also recommended that contract applicators and others concerned with non-ag weed control burn off areas before applying a soil sterilant. This enhances chemical effectiveness.

Side benefits to weed control by fire include a certain amount of insect and disease control. Insects and eggs overwinter in weeds and crop residues, and burning of course reduces breeding and harboring areas.

While most observers feel the process is just another of many techniques in the increasingly complicated job of curbing weeds, and recognize that the method will never replace chemical modes, one researcher spoke of the flaming concept in glowing terms.

He was Jack H. Parks of the High Plains Research Foundation, Plainview, Texas, whose research has been strictly agricultural. Parks said flaming offers selective weed control with: (1) no drift during or after treatment; (2) no residue in soil or plant; (3) no special weather requirements, other than comparative dryness; (4) no problems with compatibility with pesticides or fertilizer; (5) immediate results; (6) a process which can be repeated as often as desired; (7) no need for soil incorporation; and (8) a process unaffected by soil type, sunlight.

Conducting equipment tour were farm advisor Vincent Schweers (left) of Visalia and flaming authority Robert Meyers, who explained the rigs.

But the Texan admits he sometimes favors incorporating a herbicide into the process, because it's sometimes necessary to kill weeds in certain crops while the desirable plants are themselves too small to withstand the heat.

Parade of Prestige

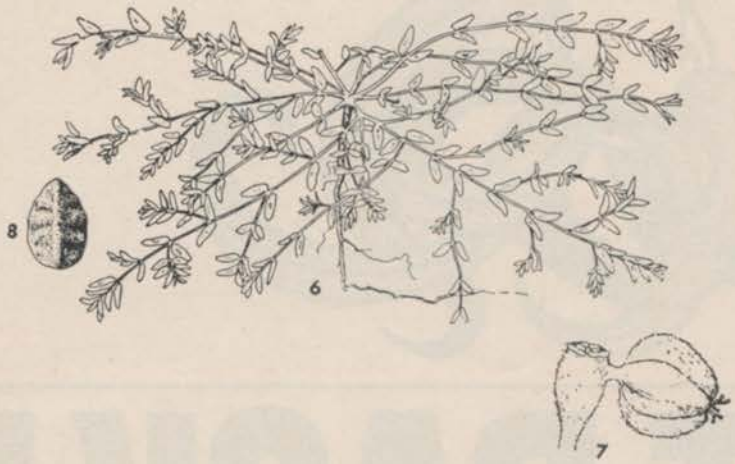
On the Conference's final day, a roster of weed experts took the assembly on a guided tour through the past and towards the future of weed control in California. Speakers included some of the best known names in the industry in the West, such as brush control expert O. A. Leonard; surfactant authority and conference publicity man Dr. Dave Bayer; and popular and genial past Conference president W. A. (Bill) Harvey, extension weed specialist. All the foregoing are from the University of California, Davis. With them was Dr. Boysie Day, a plant pathologist from the Riv-

(Continued on page 32)

Well-known westerners found time during the California conference to discuss new techniques and changing needs of control. E. J. Bowles (left), active weedman with Pennsalt, chatted with Dr. O. A. Leonard, speaker on brush control.

PROSTRATE SPURGE

(Euphorbia supina)



Prostrate spurge (6) is an annual which reproduces by seed only. It is sometimes called milk purslane and spotted spurge. Common throughout the eastern and middle western states, it is found less frequently along the Pacific Coast.

Growth of prostrate spurge in lawns, gardens, fields, and waste places causes the plant to form dense mats of branches radiating from the central taproot. One plant can cover a square foot.

Stems are succulent, slightly reddish, and somewhat hairy. Stems have a milky sap. This sap causes a rash reaction if brought in contact with skin of sensitive persons.

Leaves are opposite on the stem, simple, and oblique (each leaf margin is not the same length). There is usually a reddish-brown spot on the leaf surface.

Small inconspicuous flowers (7) borne in the leaf axils produce many tiny black seeds (8).

The root is a taproot and can be pulled up easily when the soil is wet.

Prostrate spurge will grow well under trampling where foot traffic has destroyed other grasses. As long as there is healthy vigorous turf, prostrate spurge will not have a chance to invade.

Disodium monomethyl arsonate (DMA) and silvex applied to turf 2 to 3 times when spurge is actively growing will control it.

Prepared in cooperation with Crops Research Division, Agricultural Research Service, United States Department of Agriculture, Beltsville, Maryland.

(DRAWING FROM NORTH CENTRAL REGIONAL PUBLICATION NO. 36, USDA EXTENSION SERVICE)

Int'l Turf-Grass Conference Examines Water Needs

(from page 18)

mechanical damage to frosted turf; early spring because of melted water trapped on the surface by frozen soil layers beneath). "Frosted turf can be corrected by light irrigation before play, but when frost is bad and danger is great in fall, or when soil is waterlogged in spring, the grounds should be closed off," Dr. Skogley suggested.

A panel of superintendents who had had experience with automatic irrigation systems offered some words of advice to others who wished to develop systems of their own. Donald Wright, Camargo Club, Cincinnati, Ohio, feels irrigation equipment is a luxury for a golf course, but moneysaving in the long run.

Measure More Than Greens

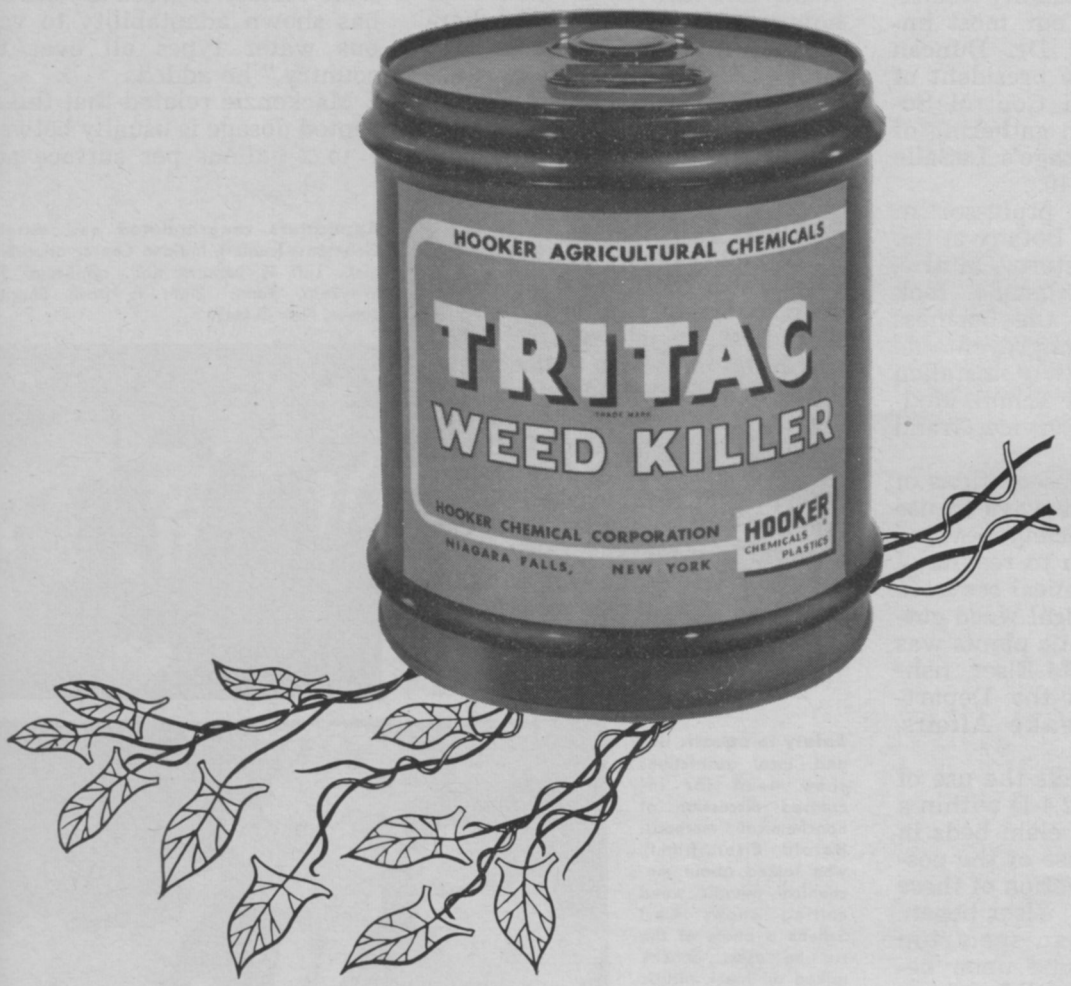
"Measure the area you want watered, not just the green surface, and be certain the irrigation heads are positioned in the center of fairways," Wright advised.

"Poor distribution has been a problem in the West," Walter Boysen, Sequoyah Country Club, Oakland, Calif., offered, "because too many sprinkler heads are attached to too few control valves. Also, we've had complaints that there were too few quick-coupler hose attachments around greens for hand watering."

"It's very important to make certain the contractor for digging the trenches is on the job when the pipe is ready to be laid," Thomas Topp, Bellevue Country Club, Syracuse, N. Y. advised. He indicated that those who let the bids should feel assured that the company which gets the contract to dig trenches is adequately equipped to fulfill the job.

"Put soil back on top of the pipe and tamp it in," Wright suggested. "It will make a bed for the electrical wire and make certain that the ground will not sink."

"We found that we interrupt some natural drainage channels underground when we dig trenches for piping," Boysen revealed, "and we've gotten some water pockets which we can't explain any other way."



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This powerful liquid herbicide sinks deep into root zones to control bindweed and other problem perennial growths such as Russian knapweed, Canada thistle and bur ragweed. Use it along fence rows, roadways, bridge abutments, on industrial sites and other noncrop land.

Tritac is not corrosive to standard equipment. It is safe to handle, as its toxicity towards mammals is low.

Choose from three. Tritac is the basic formulation. Tritac-D obtains quicker foliage top kill. Tritac-10G is a granular formulation.

Liquid Tritac is available in cartons of six 1-gal. cans; also in 5-gal. cans and 30-gal. drums. Granular Tritac is packed in 25-lb. bags.

For more information, please write Agricultural Chemicals, Hooker Chemical Corporation, 403 Buffalo Avenue, Niagara Falls, N. Y. 14302.

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AGRICULTURAL CHEMICALS

Aquatic Weed Controllers Review Herbicides, Examine Nonchemical Methods at Fifth Annual Affair in Chicago

"People are gradually realizing that water is our most important resource," Dr. Duncan McLarty, first vice president of the Aquatic Weed Control Society, told the fifth gathering of that group in Chicago's LaSalle Hotel February 9-10.

Dr. McLarty, a professor in the Department of Botany at the University of Western Ontario, London, Ontario, Canada, took over the gavel at the business meeting in the unpreventable absence of the newly installed president, E. Victor Scholl, Modern Weed Control Service, Grand Rapids, Mich.

In addition to presentations of new chemicals and ways to use older ones, the Society devoted part of its program to results of work with nonchemical controls.

Use of a mechanical weed cutter to harvest aquatic plants was examined by Harold Elser, fishery biologist with the Department of Chesapeake Affairs, Annapolis, Md.

"Maryland restricts the use of herbicides such as 2,4-D within a mile of oyster and clam beds in the Bay area because of the possibility of contamination of these aquatic organisms," Elser began. Also, use of broad-spectrum herbicides is frowned upon because certain susceptible plants are considered desirable as food for waterfowl which use the Bay, it was pointed out.

Since Maryland has a serious watermilfoil problem and ways are needed to keep lakes and bays open, the Department of Chesapeake Affairs purchased a weed cutter and harvester, Elser revealed.

Elser showed a film produced by his department which illustrated the cutter-harvester in action. The machine is produced by Aquatic Controls Corporation, Hartland, Wis.

Cutter Harvests Weeds

Elser's film showed the large amphibious barge equipped with sideboard paddle wheels moving through infested areas to remove 4-5 tons of vegetation per hour from the water. Close-up shots showed how the continuous saw cutter severed plants from their roots and directed them onto a chain link conveyor, then to a hopper on the rear of the harvesting machine. The model which Elser's department purchased also came with a tender barge which removes cut material from the harvesting barge and transfers it to shore.

Diquat Is Control Tool

"Diquat is an aquatic herbicide which most operators have been aware of as a tool since it was first registered in 1962," according to John Mackenzie, aquatic herbicide technical specialist, California Chemical Co., Ortho Div., Richmond, Calif.

"What advantages does Diquat offer?" Mackenzie asked in his address. "It is versatile; it can be used in a high-capacity spray gun for coverage of floating weeds or can be poured or injected directly into water in concentrated form.

"Secondly, it is effective on a wide variety of weed species and has shown adaptability to various water types all over the country," he added.

Mackenzie related that the accepted dosage is usually between 1 to 2 gallons per surface acre

Applicators congratulated new secretary, Gene Bass (center), Indiana Conservation Biologist. Left is Bernard Koll, applicator from Wayzata, Minn. Right is Dave Sheridan, Dover, New Jersey.

Safety to aquatic life and local restrictions show need for increased discussion of nonchemical methods. Harold Elser (right), who talked about mechanical aquatic weed cutting shows Carl Schenk a photo of the rig he uses. Schenk talked on black plastic sheets to control weeds. (A special feature on Schenk's work will appear later in the year in *Weeds Trees and Turf.*)

"Troika" representation of members in the Society is a strong point. Three groups included are applicators, research and regulatory, and manufacturers. Seen here are leaders (l to r) James Flanagan, Geigy; Director Roy Younger, Pennsalt Applicating Service; and Dr. Duncan McLarty, Univ. of Western Ontario, an active researcher.

or 1 to 2 ppm if the dosage is figured on a volume basis.

The Ortho specialist further disclosed that tests in the Midwest have shown Diquat is effective as a shoreline spot treatment when applied as a concentrate to small areas at a calculated rate of 1 gallon per surface acre.

Following Mackenzie on the short but varied formal program was Dr. Robert C. Hiltibran, biochemist with the Illinois Natural History Survey, Urbana, Ill.

He added his own remarks to Mackenzie's on the use of Diquat, then discussed some of the newer compounds he is testing. For the sake of brevity, we will interject those comments of interest to *WTT* readers which were presented by suppliers in a "new products from industry" program the previous day, when these comments can expand Dr. Hiltibran's remarks.

"We've also found spot treatments along pond banks with Diquat to be effective," the active Midwest researcher began. "We've had success in small 20-foot plots with a 1-ppm concentration, but we find we can distribute material better if we make a 2:1 dilution."

Fenac Registered For Soil

Amchem's Fenac, designed to be applied to bottom soil, is registered for use on exposed soil during a drawdown; it is not labelled for application to water yet.

"We tested Fenac applied to water in a 2½-acre lake at 20 lbs. per acre; we estimate this application gave a concentration of Fenac of 1½ ppm," Dr. Hiltibran said of his tests with this material. "This treatment removed both small and leafy pondweeds (*Potomogeton* spp.)."

For registered treatments of soil bottoms, according to the manufacturer, the effect of treatment is not seen immediately because Fenac is not a contact herbicide; instead, it acts through the soil and roots of aquatic plants.

Most terrestrial herbicides, if applied to an exposed pond bottom, would be washed away when water is reintroduced.

The manufacturer also reveals that the effect of Fenac is not seen until the next season, but then control is claimed for 2 complete seasons or roughly 22 months thereafter.

"We tested Casoron (dichlobenil) in 20′ x 20′ plots of pond soil bottom," Dr. Hiltibran continued. "Casoron is a root-absorbed material. We've seen effects at 10 lbs. per acre and we're going to try to go to lower rates."

During the previous day's program, Dr. C. Allan Shadbolt, Field Research Director for Thompson-Hayward Chemical Co., Kansas City, Mo., informed delegates, "Casoron is designed to be applied before germination of submersed weeds. It will not work if applied after weed growth."

Dr. Shadbolt said recommended rates for Casoron, when it is registered, will be 5-15 lbs. per acre. Rates will vary with conditions, according to the research director.

"Most effective test results have come from a 5-lbs.-per-acre application to exposed soil during a lake drawdown," Dr. Shadbolt revealed. "Higher dosages of 10-15 lbs. per acre have been applied in tests with granules dispersed onto water. These sink to the bottom and act through the soil.

"We've achieved good control of chara with a 4-lbs.-per-acre experimental rate on exposed bottom soil," Dr. Shadbolt concluded.

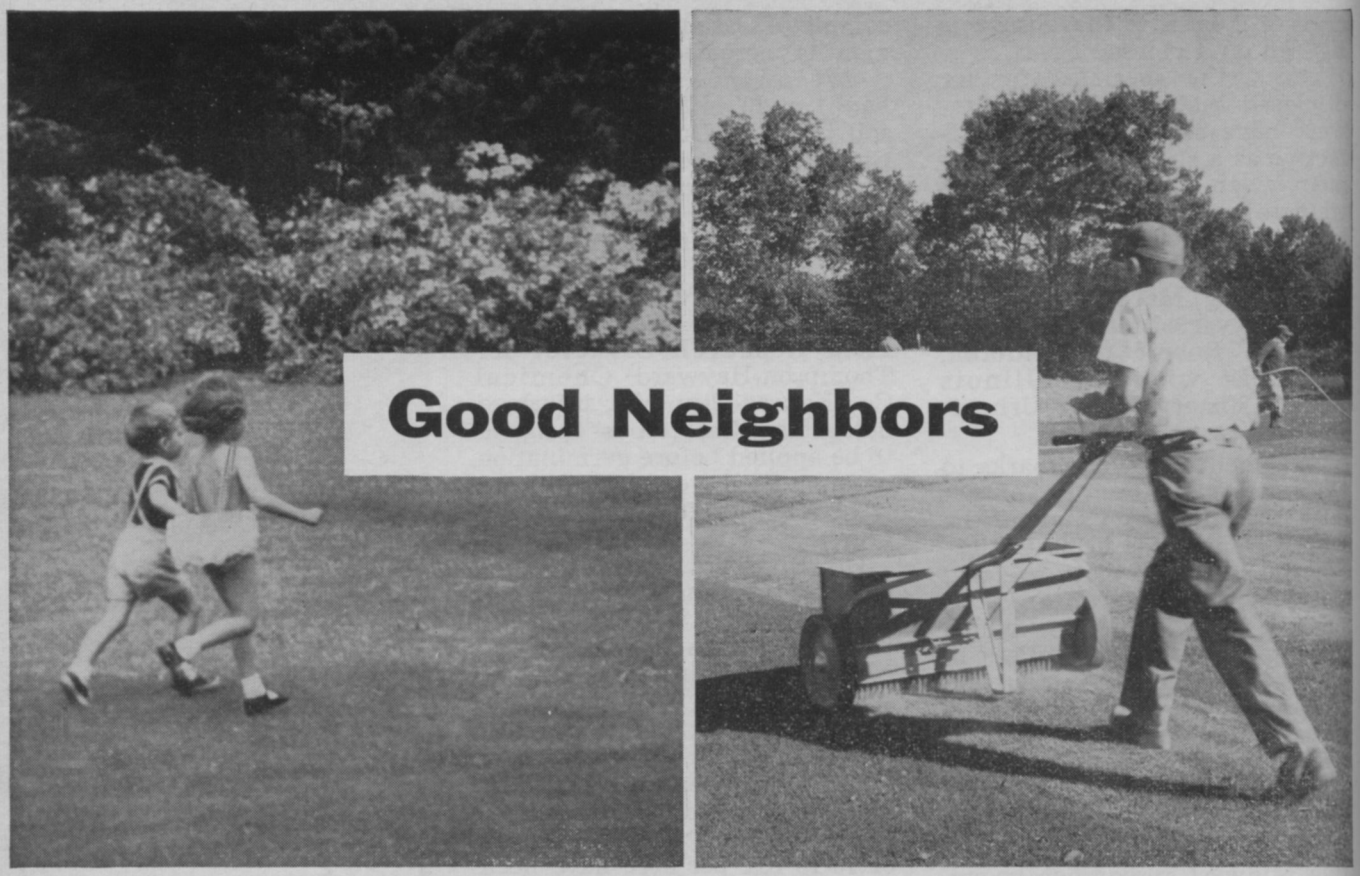
Dr. Hiltibran said tests with Simazine for algae show that operators can achieve good control by applying a total amount of only 0.6 ppm spread over 4 applications in a 2-month period.

This information corroborated what James Flanagan, researcher for Geigy Agricultural Chemicals, Ardsley, N. Y., related in the "new products" session. He described Simazine as "the most promising of the triazine compounds we have screened for aquatic weed control."

"Simazine is classed as not toxic since its LD_{50} to rats is 5000 mg. per kg.," Flanagan explained. "It is not like any other herbicide, since it is used as a preemergence material which is absorbed into plants and blocks photosynthesis.

"Simazine's use in water will depend on its rate of solution," the Geigy researcher continued. He showed how Simazine will dissolve in water only up to 5

(Continued on page 35)



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UNION CARBIDE **AGRICULTURAL CHEMICALS**

Present and Future Uses of Herbicides in Ornamentals

(from page 14)

name is also Solan, and it comes in emulsifiable form.

Herbicides for Problem Weeds

Mugwort *(Artemesia vulgaris)* and quackgrass are two of the most serious perennial weeds of ornamentals. Where high value crops are to be grown in soil infested by these weeds, eradication with soil fumigants such as methyl bromide, SMDC (Vapam or VPM, [sodium-N-methyldithiocarbamate]), DMTT (Mylone [3,5-dimethyltetrahydro-1,3,5,2*H*-thiadiazine-2-thione]), or methyl isothiocyanate (Vorlex) should be considered. However, many infestations are in established plantings where this is not feasible. Directed sprays of amitrole at 6 to 8 lbs. per acre repeated after 2 or more months have been somewhat effective against mugwort. More recent work indicates that EPTC (ethyl N,N-di-n-propylthiolcarbamate) at 4 to 6 lbs. per acre incorporated into the soil and reapplied after 2 months also can be effective against both species. EPTC is safe for use on many of the ornamentals not tolerating simazine and also controls nutsedge, another problem weed in some areas. Known as Eptam, EPTC comes in granular or emulsifiable form.

Dormant application of granular dichlobenil also has appeared promising for the control of quackgrass and mugwort in nursery plantings.

On simazine-tolerant species, quackgrass can be controlled by increasing the rates of simazine application to 4 to 6 lbs. per acre and cultivating occasionally. Dormant applications of simazine appear to be more effective against quackgrass than applications during the growing season.

Several preplanting herbicide treatments have been very promising in Connecticut tests and could be used in fields infested with quackgrass where the expense of fumigation is not justified. In fields to be planted to narrow-leaved evergreens or other simazine-tolerant plants, excellent results have been obtained with fall applications of atrazine at 2 lbs. per acre or simazine at 3 lbs. per acre, followed by spring plowing and planting and a subsequent application of 2 to 3 lbs. of granular simazine. This treatment provides excellent control of annual weeds as well as quackgrass.

Some Considerations in Using Herbicides in Ornamentals

More than with fungicides and insecticides, it is important with herbicides to obtain uniform and accurate applications. This is so mainly because dosages of herbi-

An application of simazine at 3 lbs. per acre in March kept the area in the foreground weed free well into June.

cides are more critical for satisfactory weed control without injury to valued plants. Weed seeds do not move in the soil, and the correct dosage of herbicide must contact the roots of a seedling as it germinates; a severe overdosage may kill or injure the ornamental plant. Calibration of equipment, therefore, is a must. Using nozzles equipped with a check valve also can prevent injury to plants when the sprayer is stopped in the field or moving across a lawn area.

It is impossible to state accurately the herbicide dosage that will be needed to control weeds at all locations. However, instructions on the herbicide label usually indicate the range of dosages for given conditions. Soil organic matter and clay colloids that adsorb herbicides and render them nontoxic to weeds vary greatly from one area to another. Therefore, lighter soils low in organic matter generally require lower rates of herbicides than heavier soils higher in organic matter. On light sandy soils, the danger of herbicides leaching to the root zone of ornamental plants also is greater; therefore, herbicide dosages should be lower.

Erosion can sometimes be a problem where herbicides are used to control weeds on slopes. This can result in rundown of the herbicide and injury to turf and other plantings downhill. One of the ways to prevent erosion, of course, is to use a mulch. The use of preemergence herbicides under light mulches looks very promising and may be quite valuable in the establishment of ground covers, for example. Weed control often is improved when mulches are used over preemergence herbicides. In one experiment in 1-year-old apple whips, growth also was increased up to 75% by using a combination of a hay or plastic mulch and simazine at 3 lbs. per acre.

Mulches also have their place in the sales yard or under container-grown stock. Simazine has been used with good success to control weeds under container-grown stock, although an occasional branch is discolored when a root grows down into simazine treated soil. Placing a light organic mulch over the simazine prevents splash erosion of the herbicide and slows contact between plant roots and the herbicide. Using mulches over preemergence herbicides still is in the experimental stage, however, and some caution is advised. Some organic mulches can bind up herbicides and actually decrease effectiveness.

Several questions arise where herbicides are used year in and year out in ornamental plantings. One is obvious—will the soil eventually be sterilized? To answer this we must look at the individual herbicide. Except for simazine, and to a lesser extent trifluralin and neburon, none of the other herbicides widely used in ornamental plantings last for more than a few months in the

Chickweed control in the spring. Control results at right of plot could be obtained with neburon, CIPC, Solan, or the wettable-powder form of simazine.