

being spelled out on product labels and in product literature.

A 13-state area was directly involved in numerous studies leading to the new "1-2-3" turf program. One of the striking new elements established in these studies was the importance of proper timing—as suggested by the yearly disease cycle of *Helminthosporium* spp. (See drawing on page 16.)

By using specific-type fungicides and timing applications to fit disease activity, it has been possible to get more effective disease control with lighter rates and fewer applications of a compound. New systemic-type compounds such as Tersan 1991 have been of special value here. They can be used at low rates and with longer intervals between applications.

In addition, this new compound is not washed away and lost by a rain. With older compounds, much of the effectiveness of the treatment could be lost through a rain following closely after application.

Results with the "1-2-3" turf disease control program have been excellent. Superintendents have reported they used fewer applications of fungicides, at lower rates with better disease control, better turf color and more ease of mind.

This is an encouraging response—and one that may stimulate others to consider the program for their own needs. It is hoped that more turf managers will be interested in applying the program to their own needs in the coming year.

Incorporate Herbicide— Brochure Tells How

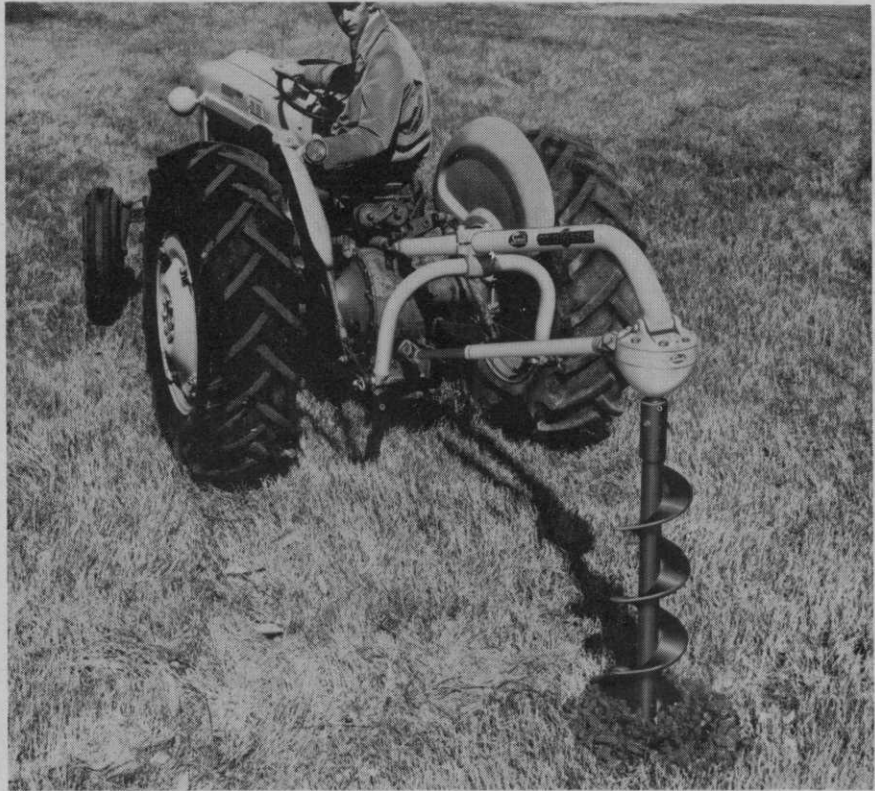
A brochure that describes how to construct a simple rig on tractor or tillage equipment for herbicide soil incorporation is available from Stauffer Chemical Company.

It provides illustrations and instructions for tooling up for both small and large acreage rigs and details various ways to mount tanks and nozzle systems. The rigs adapt for either liquid or granular herbicides. Design suggestions range from relatively simple rigs that suit small acreages and cost as little as \$100, to more elaborate units with bigger tanks, pump and spray boom that can fit any tractor or disc.

Copies of the brochure **Ways To Mix Stauffer's Selective Herbicides In the Soil for Weed Control**, A-10316, are available from Stauffer Chemical Company, Dept. F. L., Agricultural Chemical Division, 299 Park Avenue, New York, N.Y. 10017.

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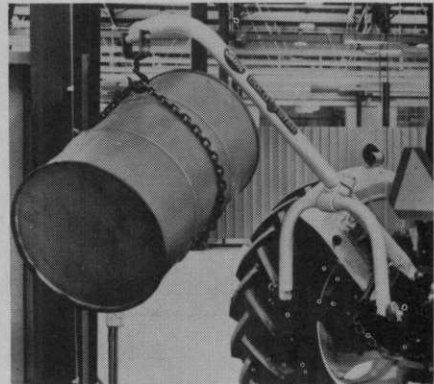


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SEARCH (from page 36)

proximately two inches in height and moved about every two weeks. At leaf fall in September, most of the entries under natural tree canopy were dead or severely thin.

A few experimental Kentucky Bluegrasses—the object of the trials—and several experimental fine fescue varieties were identified as being more tolerant to shade than varieties presently on the market. They provide the real hope for a

turf that will be even-textured from full sunlight to shade.

One of the most outstanding finds was Nugget Kentucky Bluegrass, which is ready for commercial sale this year. Nugget has shown high resistance to leaf spot (*Helminthosporium* Spp.) diseases and powdery mildew. Due to the severe conditions of the trial, Nugget plants became more upright and the sod more open, but the stand was maintained to provide reasonably good grass cover.

All other Kentucky Bluegrass varieties presently available were unsatisfactory. Here are the results. Golfrood, Highlight and Ruby Creeping Red Fescue were the only named varieties which were satisfactory. Pennlawn was killed completely. Ranier thinned severely as did Jamestown and a number of lesser well-known fescue varieties. Illahee Creeping Red Fescue was a poor fourth but did produce a reasonably satisfactory turf.

In addition to this specific shade tolerance study, the company has also conducted extensive turf trials at the Eden Prairie location. Over 1800 different plots are monitored. These plots are grown under full sunlight and are mowed at three different mowing heights. Fertility and moisture levels are also varied. When superior varieties are identified, sod from these grasses is lifted and transplanted to both the screened and natural shaded areas for further evaluations.

Northrup, King & Co. is hopeful that through this research varieties can be found that will overcome many of the problems involved in managing turf under shade conditions.

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Maryland Herbicide

Studies Are Reported

Fair to good results with chemical control of major weed pests in special situations in southern Maryland and the Eastern Shore were reported at the twenty-sixth annual meeting of the Northeastern Weed Science Society in New York City.

Dr. James V. Parochetti, assistant professor of agronomy at the University of Maryland, presented a paper on his two-year study of herbicides applied to Johnsongrass in noncropland areas.

The Johnsongrass studies were conducted in Charles and Somerset counties. Ten treatments involving formulations of sodium chlorate, Hyvar X, Dowpon, Tandex and MSMA were tested.

Best control of Johnsongrass resulted from applications of herbicides containing sodium chlorate. Carryover residual control in the following year was also good. Hyvar X and Tandex were effective against established Johnsongrass stands when applied early in the season.

meeting dates

| S | M | T | W | T | F | S |
|----|----|----|----|----|----|----|
| | | 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 27 | 28 | 29 | 30 | 31 | | |

Pennsylvania Nursery Conference, Nittany Lion Inn, State College, Pa., Feb. 1-4.

Midwestern Chapter of the International Shade Tree Conference, Pick-Congress Hotel, Chicago, Ill., Feb. 8-10.

Weed Science Society of America, 12th meeting, Sheraton-Jefferson Hotel, St. Louis, Mo., Feb. 8-10.

Southern Chapter of the International Shade Tree Conference, Marriott Motel, Atlanta, Ga., Feb. 12-16.

Golf Course Superintendents Association of America, 43rd annual International Turfgrass Conference and Show, Cincinnati, Ohio, Feb. 13-18.

Maryland Arborists' Day, University of Maryland Center of Adult Education, College Park, Md., Feb. 15.

Golf Course Builders of America, first annual meeting, Stouffer Inn, Cincinnati, Ohio, Feb. 16.

Maryland Nurserymen's Day, University of Maryland Center of Adult Education, College Park, Md., Feb. 16.

American Society of Consulting Arborists, 6th annual meeting, International Inn, Tampa, Florida, February 17-18.

American Sod Producers Assn., conference and field day, Disneyland Hotel, Anaheim, Calif., Feb. 22-24.

Maryland Arborist's Day, University of Maryland, College Park, Md., Feb. 23.

Southern Connecticut Groundskeepers Association, Grounds Maintenance Conference, Waverly Inn, Cheshire, Conn., Feb. 23.

Iowa Shade Tree Disease and Insect Short Course, 15th annual, Memorial Union, Iowa State University Campus, Ames, Ia., Feb. 23-25.

Illinois Landscape Contractors Association, Arlington Park Convention & Exposition Center, Arlington Heights, Ill., Feb. 24-25.

Colorado Agricultural Aviation Assn., 24th Annual Meeting, Continental Motor-Hotel, Valley Highway and Speer Blvd., Denver, Colo. Feb. 28-29.

Midwest Turf Conference, Memorial Center, Purdue University, West Lafayette, Ind., Mar. 6-8.

Williamsburg Garden Symposium, Colonial Williamsburg Gardens, Va., Apr. 9-15.

Canadian Chapter of the International Shade Tree Conference, Holiday Inn, Hamilton, Ont., Canada, Apr. 14-15.

Florida Nurserymen & Growers Association, Walt Disneyworld, Orlando, Fla., May 25-27.

American Association of Nurserymen, Statler Hilton, Washington, D.C., July 15-19.

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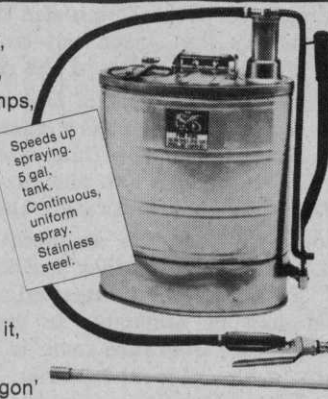
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Lab Seeks Solutions To Tree Problems

By Dr. CHARLES L. WILSON

Plant Pathologist, Plant Research
Division, Agricultural Research Service
U.S. Department of Agriculture
Delaware, Ohio

Dutch elm disease has been the main concern at the Agricultural Research Service Shade Tree and Ornamental Plants Lab in Delaware, Ohio, for a number of years. After 40 years of research we appear to be near a solution to this menacing problem.

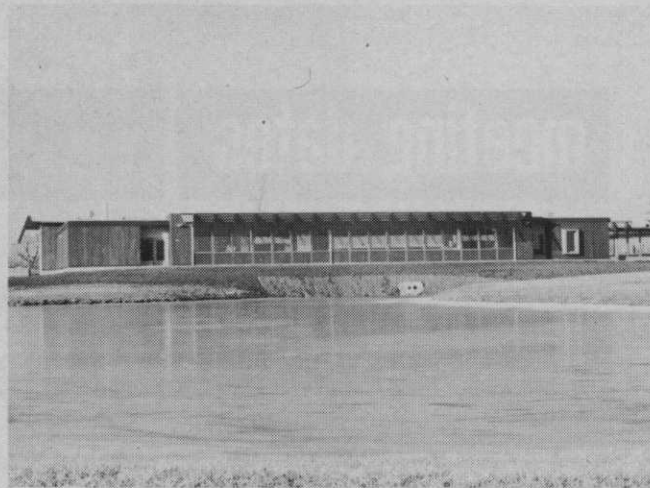
The first hybrid elms developed in this country that are resistant to Dutch elm disease will be tested and increased this year. American elms that are resistant to Dutch elm disease have also been found and will be increased after further testing. A systemic fungicide has been shown to be highly toxic to the Dutch elm disease fungus. If the problems concerning the application of this chemical can be worked out, arborists will have a way of protecting trees from Dutch elm disease. There is even the possibility that trees can be "cured" if they are treated in the early stages of the disease.

Because of the severity of Dutch elm disease, another killing disease, elm phloem necrosis, has been overlooked. Scientists at the Delaware laboratory have recently discovered that elm phloem necrosis is apparently caused by a mycoplasma rather than a virus.

Mycoplasmas are the smallest living cells that are known. Unlike viruses they are killed by certain antibiotics. Preliminary findings indicate that elm phloem necrosis may be amenable to control by tetracycline antibiotics. The Delaware team is also looking for trees resistant to elm phloem necrosis.

An extensive breeding and selection program has been initiated at Delaware to develop trees that are better adapted for urban areas. In addition to a large collection of elms resistant to Dutch elm disease, this program includes an extensive collection of red maples from throughout their natural range, a green ash that is apparently resistant to borer attack, mimosas resistant to *Fusarium* wilt, and a number of cold-hardy shade tree selections.

Many of these trees are also being selected and bred for resistance to air pollution and other environmental stresses. Red maples are being screened for resistance to *Verticillium* wilt, moisture stress, air pollution, and high and low temperature extremes, and for such horticulturally desirable traits as rapid growth, symmetrical shape, and brilliant fall coloration.



The Shade Tree and Ornamental Plants Laboratory at Delaware, Ohio has a staff of three plant pathologists, a plant physiologist and a plant geneticist.

Claims are constantly being made concerning the ability of trees to purify the air. Yet we find very little scientific evidence to support these claims. Delaware scientists have initiated research to determine the impact that urban trees are having on our air quality. Preliminary findings are exciting in that they indicate that trees may take up and recycle certain pollutants.

Scientists are also studying the effects of pollutants on the cells of trees. It has been found that the main damage that sulfur dioxide causes to the cell is destruction of chloroplasts where photosynthesis occurs. It is hoped that through these studies, diagnosis of the type and extent of pollution damage can be made by examining affected cells.

Are tree wound dressings beneficial? It is interesting to note that we really don't know. The main reason that we treat wounds is to protect the tree against invasion by rot fungi. Yet we have not looked behind tree wounds after they are treated to see what has happened.

A cooperative study with the U.S. Forest Service has been initiated to increase the level of knowledge on this subject. Trees have been artificially wounded and the wounds treated with various wound dressings. Over a five year period these trees will be analyzed and the extent of decay and discoloration behind the wound studied.

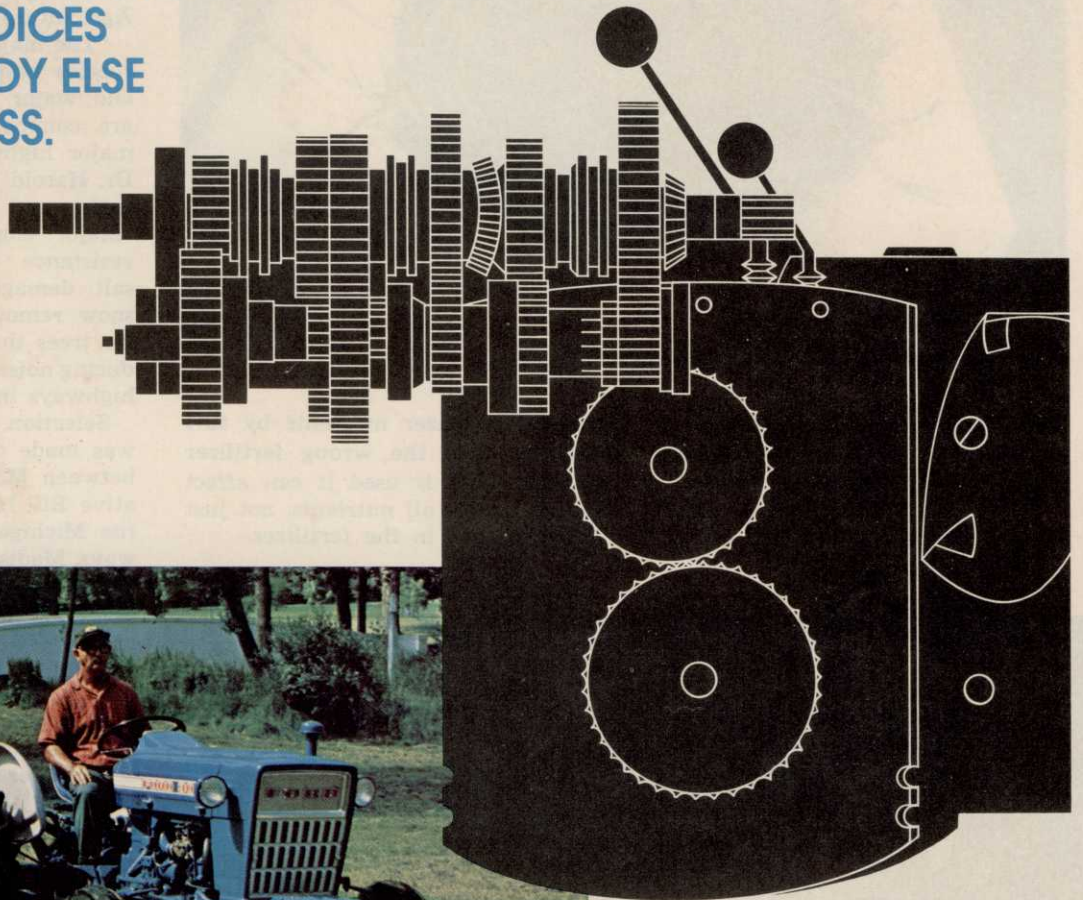
The Delaware group has also initiated a study to see whether different types of mulches around trees might protect them from salt damage.

With the removal of certain pesticides from the market we need new materials for such diseases as sycamore anthracnose and crown gall. Screening is going on at the Delaware lab for compounds to control these two diseases and some very effective compounds have been found.

The nursery industry and arborists are encouraged to become familiar with the work of the Shade Tree and Ornamental Plants Laboratory at Delaware, Ohio. The scientific team including three plant pathologists, a plant physiologist and a plant geneticist are determined to stay tuned into the needs of nurserymen and arborists. You are encouraged to bring particular problems on trees and woody ornamentals to our attention.

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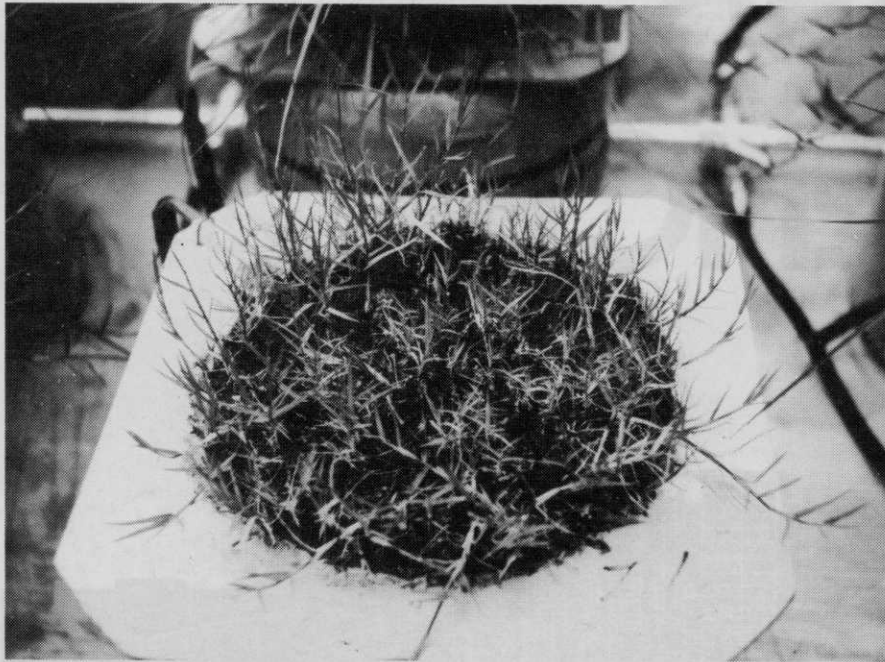


Figure 5, minus nitrogen, phosphorus and potassium.

NUTRITION (from page 38)

(2.80%-N). Phosphorus levels were also higher (0.19%-P vs. 0.32%-P).

These results indicate the important interactions involved in the up-

take of fertilizer nutrients by turf plants. When the wrong fertilizer ratio or rate is used it can affect the uptake of all nutrients, not just those present in the fertilizer.

Michigan To Study Highway Environment

Urban and suburban Detroit areas have been chosen as initial sites for research in improving the environment along Michigan highways.

The project on highway tree ecology was proposed by Michigan State University scientists and has been funded through a grant from the state legislature to the Michigan Agricultural Experiment Station.

"The major aim is to find the tree species best adapted to survive air and water pollution problems that are common to many stretches of major highways in Michigan," says Dr. Harold Davidson, MSU horticulturist and landscape tree expert. "Major emphasis will be on tree resistance to pollution, especially salt damage that can arise from snow removal. We will also look for trees that have potential for reducing noise and dust problems along highways in residential areas."

Selection of the first research site was made during a recent meeting between MSU scientists, Representative Bill Huffman, Jack Burton of the Michigan Department of Highways, Madison Heights City Manager Estol Swem, and Hazel Park City Manager Vance Fouts.

Selection of an appropriate site for experimental tree plantings in the City of Detroit is expected in the near future.

On a long-term basis, other research sites are planned for stretches of other major highways in both rural and urban locations.

Toro Dealers Go Back To School

Good service, the key to consumer satisfaction is the theme stressed by The Toro Company in a series of Dealer Service Schools.

The annual training program for Toro dealer personnel began Dec. 15 and will continue through April 1. The schools are being sponsored in cooperation with Toro distributors.

According to Ross E. Nelson, Toro's manager of customer service, each school will consist of three sessions running simultaneously for 2 to 2½ hours. Sessions will cover maintenance of riders/tractors, mowers, snowthrowers (where applicable), the Whirlwind Rider and the Shredder-Bagger, both new products for 1972; and policy and dealer operations, warranty programs; engine diagnostics, and gear-box teardowns.



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Streams Can Clean Up Organic Pollution

All organic pollution need not be eliminated from streams to keep them clean enough to support trout and other clean-water life.

This is the findings of a study conducted by Dr. Kenneth W. Cummins, fresh-water ecologist from Michigan State University's Kellogg Biological Station. He conducted a stream leaf-litter study to determine how fast a stream decomposes organic matter.

Cummins worked closely with systems scientists and engineers. They "enriched" experimental and control streams with large quantities of water-soluble organic matter made from leaves to see what materials the stream could clean up.

"We really loaded the stream with dissolved organic material at quantities of about 1 part of the organic matter for every 25,000 parts of stream water," said Dr. Cummins. That is 10 times the natural levels of organic matter from leaves in a typical trout stream.

"Some pretty resistant stuff comes out of such natural leaf litter. This was very complex organic material with substances including organic acids, cellulose, phenolic compounds and tannic acids," he continued.

Bacterial count per milliliter went from several thousand to six million and then back to several thousand. This explosion of bacterial population turned the experimental stream dark brown. Oxygen levels fell before the bacterial growth reached its peak.

Oxygen depletion was probably mainly due to the organic matter shielding light from the algae growing on the rocks, determined Dr. Cummins.

There was enough mixing and turbulence in the stream to provide oxygen for the bacteria. The little additional oxygen previously manufactured by algae was no longer generated. Instead the tiny plants burned the stream's oxygen as did the bacteria.

Even when the oxygen levels sagged, the water was still 60 to 65 percent saturated with oxygen, said the researcher.

Turbulence is a device pollution fighters have used for a long time to increase oxygen levels in waterways.

The ecologist pointed out that water plants and animals did their clean-up jobs without massive mortality to either the animals or other

components of the stream. After the first week and a half, except for minor variations, the experimental stream had pretty well returned to normal, the scientist reported.

Dr. Robert H. Boling, MSU engineer and systems scientist worked with Dr. Cummins and other ecologists in this test. "By assembling such data from this stream model system we can analyze similar streams," he said.

The research team expect that some of their findings will apply to other types of organic pollution, such as sewage and farm run-off of organic matter, but that many other controlled studies are needed before accurate predictions can be made.

Scientist Advocates Tailoring Plants To Soil

Tailoring plants to fit the soil may be more effective and economical in many cases than changing the soil to fit a particular plant, said a USDA soil scientist.

Dr. Charles D. Foy of Agricultural Research Service was speaking about strongly acid surface soils, subsoils, and mine spoils laced with toxic levels of aluminum and other mineral elements. The acidity makes the minerals more available to plants and limits their growth.

Dr. Foy, stationed at the U.S. Soils Laboratory, Beltsville, Md., said that mineral element toxicities cannot always be corrected economically by conventional liming and fertilization practices that neutralize the acidity. A promising approach is the selection or breeding of plants more specifically adapted to the growth-limiting factors present.

"A plant breeding approach has a tremendous potential for solving some of the more difficult soil management and mineral nutrition problems," the soil scientist said.

"In some cases," he said, "plant breeding may mean greatly increased yields of the crop species presently grown through the use of more tolerant varieties; in others, the increased food production may result from the introduction of more desirable crop species not previously adapted to a region."

He said any plant breeding program should include the identification of plant form, structure, function and chemical processes associated with tolerance to a given soil factor. These plant characteristics may be useful to plant breeders as

screening tools for large plant populations.

"Plant varieties differing in tolerance to excess mineral elements are also valuable as indicators of metal toxicities in soils and as tools for studying the mechanisms of mineral element toxicity or tolerance in plants," Dr. Foy said.

"The understanding of such fundamental plant processes will almost certainly lead to improved soil fertilization and management practices," he concluded.

Miracle of the Land Stauffer Presentation

The role of crop-protection chemicals in raising our standard of living are examined at length in an audiovisual show, "Miracle on the Land," produced by Stauffer Chemical Company.

A battery of synchroized, tape-programmed projectors, multiple screens, hundreds of color slides, and an original musical score are used to trace the history of American agriculture, from the earliest settlers to the present, in this unique 20-minute show.

The basic message of the presentation is agriculture's importance to our national economy.

Before the 1860's, the American farmer produced enough to feed and clothe himself and three other persons. By World War II that figure had increased to himself and 11 others. In just the past quarter century the figure has grown to himself and 45 others.

With an exciting sound track and a whirlwind projection of slides, panoramas of agricultural America unfold across the five projection screens. The story reminds viewers that it was not easy to achieve our modern power to produce food for millions of city dwellers who are free of the need to go out and hunt for game or grow their own crops.

Without the technology of today's agriculture we would all be back on the land with a hoe, trying to grow our food, instead of having "the time to become scientists, doctors, artists, or put a man on the moon," "Miracle on the Land" points out.

Man has had to use his intelligence over thousands of years to adapt things to his needs. The same intelligence that brought him this far must continue to expand our modern miracle of agricultural production while working out problems of our environment, the show concludes.

SULFUR (from page 22)

to turfgrasses. One big advantage of potassium sulfate is that the potash has less of a tendency to burn turf. It is somewhat less soluble and thus releases more slowly and lasts longer. The big plus is the presence of sulfur, a major plant food element that frequently is neglected and, without which, no living plant can thrive.

Why is sulfur important? In the absence of sulfur, a turfgrass exhibits a chlorosis that frequently oc-

curs as an intense yellow color. In mild cases one may think of nitrogen deficiency or even iron deficiency.

On the positive side, we find that sulfur enhances color, density and growth. There seems to be a direct relationship with nitrogen. The turfgrass fertilized with the higher quantities of nitrogen show increased response to sulfur. It has been reported that when 12 pounds of nitrogen are used, there is a requirement for 8 pounds of potassium ox-

ide and 3.45 pounds of sulfur. This is remarkably close to the proportions of potassium and sulfur in potassium sulfate. This example alone explains why potassium sulfate costs a bit more than potassium chloride and is worth much more.

Is the chlorine in potassium chloride bad? Chlorine is a plant food only in very small quantities. Beyond that it is a strong plant poison. It adds to the salt index which often is highly undesirable. With potassium chloride, the turf is more likely to be burned, whereas potassium sulfate has a high safety factor. Potassium chloride is more soluble and is more hygroscopic (attracts water) which creates caking in the bag.

In potassium sulfate, the sulfur is carried as the sulfate ion which can be taken directly into the plant. Sulfate ions are helpful when soils are compacted.

There are several additional advantages in having sulfur built into a potassium system which is used in balance with nitrogen and phosphorus. These include:

1. Sulfur aids in production of chlorophyll (green color) but it does not occur in this substance.
2. Sulfur is necessary for formation of several amino acids that are components of protein.
3. Sulfur activates several important enzymes.
4. Sulfur is important in the production of Vitamin B₁ (thiamin), biotin, coenzyme A, and glutathione.
5. Sulfur is associated with the building of protoplasm and is related to increased cold and drought resistance in some plants.
6. Sulfur is involved with an enzyme that is necessary to nitrogen fixation by microorganisms.

There are other vital functions in plant nutrition for which sulfur is required, some too technical to include here.

Remember, the need for sulfur fertilization is closely related to the amount of nitrogen fertilizer being applied.

The net effects of adequate sulfur in combination with N, P and K are several:

1. Better decomposition of residues (thatch)
2. Stimulation of soil microorganisms
3. improved color, density and composition of turfgrass
4. greater drought tolerance
5. improved winter hardiness

(continued on page 54)



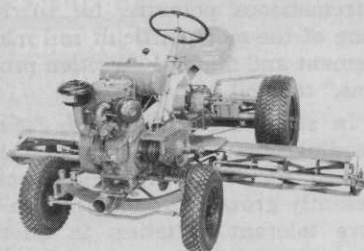
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WEEDS TREES and TURF

industry people on the move



Herbert H. Lyon, named to board of directors, The Dow Chemical Company, Midland, Mich. Prior to appointment, he was vice president. He has served Dow for 25 years.

* * *

Maurice Rosner, appointed general manager of Warren's Turf Nursery, Palos Park, Ill. Formerly manager of Warren's Sullivan, Wisc. operation. He will devote time to the continuing research program in developing new and better grasses.

* * *

Dr. Joseph G. Bower, to assistant product manager, chemical products, Marketing Dept., U.S. Borax, from senior technical representative, new product development department of U.S. Borax Research Corp., a subsidiary. Will move to the Corporation headquarters in Los Angeles.

* * *

James H. Powell, named sales manager for Frost Co., Arlington, Mass. Has led company sales every year since 1954, covering Maine and the east half of Massachusetts.

* * *

Charles L. Milles, Jr., joined Nor-Am Agricultural Products, Inc. as materials manager. Will manage traffic, purchasing and sales order for company's Chicago headquarters.

* * *

Robert W. Bennett, appointed assistant manager of FMC Corporation's Niagara Chemical Division at Middleport, N.Y. Heads Niagara's seed, planning, international development, manufacturing and administrative departments and Canadian operation.

* * *

Harold B. Kothe, named manager - quality assurance by Jacobsen Manufacturing Company, Racine, Wisc. Replaces the late Riley Chambers. Will handle quality control for all Jacobsen products produced in Racine, Wisc., Brookhaven, Miss., Olathe, Kans., and Minneapolis, Minn.

* * *

Dale Kennedy, promoted to branch manager, Thompson-Hayward's Thomasville chemical distribution center, N.C. Formerly was plant and operations manager at the N.C. center. He has been with Thompson-Hayward for three years.

* * *

Dr. Richard A. Schwartzbeck, promoted to section supervisor for Gulf Research & Development Company, Kansas City Laboratory. Will head up pesticide screening and development section for the agricultural chemicals division.

* * *

John M. Beattie, appointed as director of engineering and manufacturing in the turf products division of The Toro Company, Minneapolis, Minn. Named last year as a principal design engineer, a title given to engineers performing in a creative technical manner beyond Toro's normal high standards.

* * *

Philip S. Nathan, promoted to director of marketing, agricultural business group, Velsicol Chemical Corporation, Chicago. New responsibilities include advertising and promotion, merchandising, market planning and market research for company's agricultural, brush and pest control and lawn and garden markets.

Electric Tree Surgeon



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TREE INJECTION RESPONSE

Enjoyed and benefitted from Del Kennedy's article on tree injection in the November 1971 issue. However, a letter addressed to him at San Jose was not specific enough to reach him. Will you please put his correct . . . address on the enclosed letter and send it to him. We find much of professional interest in your . . . magazine. Thanks for your help.

I would add that we frequently use the Reader Service Card that comes with each issue. JOHN H. NEBELSICK, Acme Tree Service, Lincoln, Neb.

GLADLY

Upon returning from vacation, my copy of the December 1971 issue of WEEDS TREES and TURF, page 80, impressed me very much.

You are to be congratulated for the nice article on our "Walk in and Talk" program. It is very well presented. . . . Your fine article definitely gives us a well known shot in the arm.

If you possibly can spare about 6 copies of page 80, we will appreciate your forwarding to us. . . . JAMES R. BURDETT, president, Burdett's Inc., Lombard, Ill.

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Not quite a farm tractor



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**Chlevin Resigns
As GCSAA Director**

Ben J. Chlevin resigned as Executive Director of the Golf Course Superintendents Association of America, effective January 31, 1972.

The resignation was accepted with regret by the GCSAA Executive Committee, according to Association President Richard C. Blake, who noted that Chlevin's seven years with the Association covered an important period of growth and development in the organization's 45-year history.

During this period, Blake said, the Association membership increased from 2,000 to over 3,000 members; the Association's annual budget doubled from \$275,000 to over \$550,000; the Annual Conference attendance swelled from 2,500 to 3,500, while the Equipment Show exhibit space increased from 175 to nearly 400 booths.

Blake said that Chlevin indicated a desire to return to public relations activity within the golf industry with which he has been so closely identified during his entire business career. Blake added that the January 31 effective date of Chlevin's resignation was set by mutual agreement in order to permit him to conclude final arrangements for the 1972 GCSAA conference scheduled next month in Cincinnati, Ohio, and to complete other current projects. In the meantime, Blake said, the GCSAA Executive Committee is conducting a search for Chlevin's replacement.

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