How to protect your turf from the world's toughest critic: the golfer.

With this formidable array of armament on your side, you have a broad spectrum turf management program that can ward off just about any attack from weeds or fungi or golfers.

And you can manage it all with surprising economy. Chipco® products protect the green of your turf without straining the green in your budget.

Just try any one of them, and you'll want the entire arsenal. Because once you use a Chipco anything, you'll soon be using Chipco everything else.

Chipco Buctril® gives early control of broadleaf weeds in newly planted grasses for sod or seed production.

Chipco Turf Herbicide MCPP controls clover, chickweed, knotweed and other surface creeping weeds and is safe and effective for use on most bent grasses.

Chipco Turf Kleen is a broad spectrum herbicide that controls broadleaf and surface creeping weeds with a wide margin of safety around trees and shrubs.

Chipco Spot Kleen is a systemic fungicide for control of dollar spot, Fusarium blight, stripe smut, large brown patch and copper spot.

Chipco Thiram 75 prevents and controls snow mold, large brown patch and dollar spot. Used with Spot Kleen, it offers a complete disease control program.

Chipco Microgreen Liquid prevents chlorosis which results in long lasting deep green color, more root growth and less desiccation.

Chipco Turf Herbicide D is a general purpose broadleaf herbicide ideally suited where economical control is desired.

Chipco Spreader Activator is a quality adjuvant to increase the efficiency and effectiveness of turf chemicals.

Chipco Crab Kleen gives economical and selective post-emergence control of crab grass, chickweed and other grassy weeds in established turf.

Rhodia

Rhodia Inc., Agricultural Division, Monmouth Junction, New Jersey 08852

Industry News

Purdue receives NASA grant

Purdue University's Department of Horticulture has received a $28,476 National Aeronautics and Space Administration research grant to study plant reaction to mechanical stress.

Dr. Cary A. Mitchell, assistant professor of plant physiology at Purdue, will serve as principal investigator for the project.

The research is funded for a single year with possible renewal. Mitchell's earlier research which subjected plants to vibrational and contact stress drew world-wide interest, including that of NASA officials who expect plants may one day have a place in space flights.

The project seeks the answer to a number of specific questions regarding plant behavior under stress conditions.

Velsicol merges

Velsicol Chemical Corp. has announced a merger between Velsicol and Michigan Chemical Corp. effective Jan. 1, 1977. The newly formed corporation will be known as Velsicol Chemical Corp.

Freeport proceeds on uranium project

Freeport Minerals announced that it is proceeding with a $32 million project to recover uranium oxide as a by-product from phosphate rock processed into fertilizer material by Freeport in Louisiana.

The recovery facilities will be installed by Freeport Uranium Recovery Co., a wholly owned subsidiary of Freeport, at Freeport's phosphoric acid plant at Uncle Sam on the Mississippi River. The project is scheduled for physical completion and intitial start-up in the last half of 1978.

PBI/Gordon markets Exhalt 800 extender

Marketing of Exhalt 800 Sticker-Extender to the professional turf market was assumed by PBI/Gordon Corp., Kansas City, as of Dec. 15, 1976.

The announcement was made by Kay Fries Chemicals, Inc., Stony Pt. N.Y., the firm which developed the product and which previously handled its marketing.

Exhalt 800 is efficaceous in lengthening the effective time period of pesticides, or permitting the use of lower recommended dosages.

Root dip tested as Crown Gall control

A crown gall related bacterium, called isolate 84, has successfully been used as a root dip on several fruit crops to control Crown Gall. This material is now under test with Euonymus "Sarcoxie" and results of initial tests are favorable. This research is sponsored in part by the Ohio Nurserymen's Association.

U.C. gets $2100 for turfgrass study

Continued financial support by California Turfgrass Council of ongoing turfgrass research at the University of California's South Coast Field Station in Santa Ana, was confirmed in mid-November when the organization turned over its check for $2100 to the University to help fund further work.

The payment represented half the Council's commitment to the research program for the 1976-77 year with the other half scheduled for presentation early in 1977.

Accepting for the University was Dr. Victor B. Youngner, U.C. agronomist based at the Riverside campus. He directs the program that is testing new perennial ryegrasses and blends of other grasses to determine their adaptability to Southern California and other 'bermuda belt' conditions.

New pesticide firm formed in St. Louis

Kitten & Bear Chemicals, Inc. has been formed recently in St. Louis to manufacture, formulate and distribute pesticides for the nursery and greenhouse industry. The new firm is headed by Dick Miller, Jim Erlinger and Dottye Miller, who resigned from Crown Chemicals to start Kitten & Bear.

ALCA Crystal Ball report available

Most landscape contractors see unqualified operators as the landscape industry's most pressing current problem; government intervention as the big problem of the future; and they tend to attack their own problems by working harder — all this according to the Associated Landscape Contractors of America's (ALCA) newly-released Crystal Ball Committee Report.

The Report is an investigation of the landscape industry's present, past and future. It characterizes the landscape contractor and draws a profile of the industry as it exists today. To understand the present, the Committee frequently traced the industry's roots back several decades.

The cost of the Crystal Ball Committee Report to non-ALCA members is $7.00, and $3.00 for ALCA members. Write: ALCA, 1750 Old Meadow Road, McLean, Virginia 22101.

How to avoid paying for more than you need. Or getting less than you want.

A tractor that's too big for the job is an unnecessary waste of capital.

While one that's too small ends up wasting time and costing money.

The secret is selection. And that's why John Deere provides a range of tractors and options that lets you match the equipment to the task.

The John Deere 2040 Tractor is powered by a 40-hp diesel engine with an 8-speed constant mesh transmission and the hydraulic power to handle most any attachment.

Designed for golf-course maintenance and other similar large-acreage mowing jobs, the 2040 is probably more than you need for most residential lawn work.

So we offer the 10-hp 210 Tractor. Plus 12-, 14-, 16-, and 19.9-hp models to give you a choice and the exact power size you need.

Which means there's a John Deere Tractor just right for the job you have to do.

You also get fast parts availability, flexible financing, and the value of reliable quality that's been a tradition at John Deere for more than a century.

All reasons why "Nothing Runs Like a Deere."

In any size you need.

JOHN DEERE

Nothing Runs Like a Deere®

People on the Move

Larry Bennett has joined **Chemonics Industries** in Phoenix as an entomologist for its pesticide evaluation division. Prior to joining Chemonics, Bennett was with the University of Arizona at its Mesa Experiment Farm. He will be performing contract research to determine the efficacy of agricultural products.

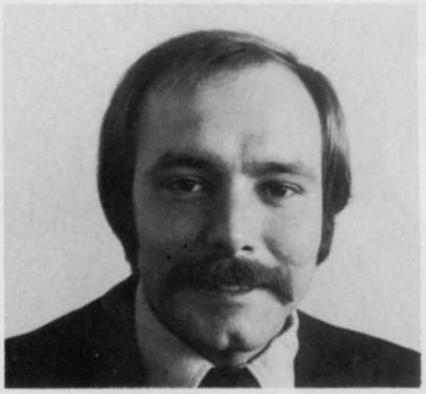
Thomas Rutledge has joined the agricultural division of **Ciba-Geigy Corp.** as field sales representative. In his new position, Rutledge will sell and promote and sell products for use in agricultural, industrial and home and garden markets. He received a B.S. in plant and soil science from Southern Illinois University at Carbondale.

David W. Johnson has been named national accounts sales manager for **Swift Agricultural Chemicals Corp.** a division of Estech, Inc.

Dave Herndon has joined **Thompson-Hayward Chemical Co.** as an agricultural sales representative. Herndon holds a B.S. in Agricultural Economics from the University of Florida at Gainesville. He is a member of the Florida Horticultural Society.

Arthur E. Schmidt has been appointed marketing manager of the sweeper division of **FMC Corp.,** of Pomona, Calif. A native of Milwaukee, Schmidt holds a B.S. in Civil Engineering from the University of Wisconsin.

Robert E. Risdale has joined the regulatory affairs department of **ICI United States Inc.** as an Environmental Protection Agency registration specialist. Dr. Risdale is a graduate of Rutgers University, where he received his bachelor's degree in general agriculture, as well as a master's degree and a doctoarate in entomology.



Joe Guarise

Dave Herndon

Steve Stone

Richard Ostrowski has been promoted to senior project manager, research/commercial development, at **Velsicol Chemical Corp.** Ostrowski received his B.S. in plant pathology from the University of California at Davis, and holds a Ph.D from Oregon State University at Corvallis.

Frank Depew, executive vice president, **Jacobsen Manufacturing Co.,** has announced a restructuring of the firm's organization, resulting in the establishment of a consumer products division, a turf products division and a parts division.

Victor M. Cushing has been appointed vice president and general manager of the consumer products division. **Howard L. McPherson** is appointed vice president and general manager of the turf products division. **John C. Krug** has been appointed vice president and general manager of the parts division.

E. M. Lentz has been elected president of the **Oklahoma Plant Food Educational Society.** A fertilizer salesman with Phillips Chemical Co., Lentz holds a B.A. in agricultural economics from Kansas State University.

Gerald E. Kimmell has been appointed national field sales manager of consumer products for the **Toro Company's outdoor power equipment group.** Born in Manitowoc, Wis., he holds a B.S. in economics from the University of Wisconsin.

Joe Guarise and **Steve Stone** have joined the **Harvest Publishing Co.,** publishers of WEEDS TREES & TURF, as advertising sales representatives. Guarises was formerly associate publisher of a Chicago-based consumer magazine and has worked for Crain Communications and IPC Business Press of Great Britain. Stone, who holds a B.A. in advertising and marketing from Farleigh Dickinson University, was most recently eastern district advertising manager for Pensions & Investments. Harvest Publishing Co. is a subsidiary of Harcourt Brace Jovanovich, second largest publishing company in the world.

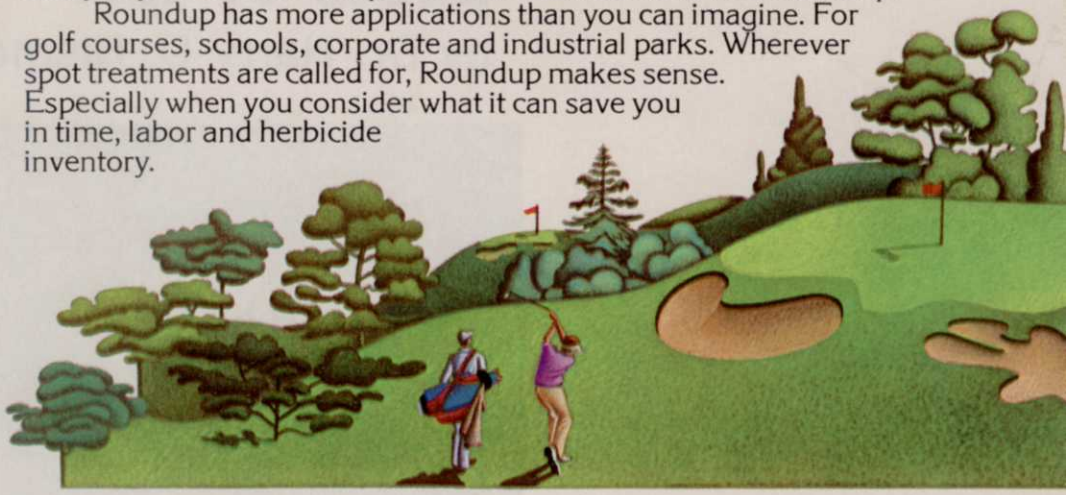
There's never been a herbicide like this before.

"Translocation" is the key.
Roundup is applied to the weed foliage, absorbed through the leaf surface, and "translocated" throughout the entire plant. In this way, Roundup effectively destroys most weeds—roots, rhizomes and all.

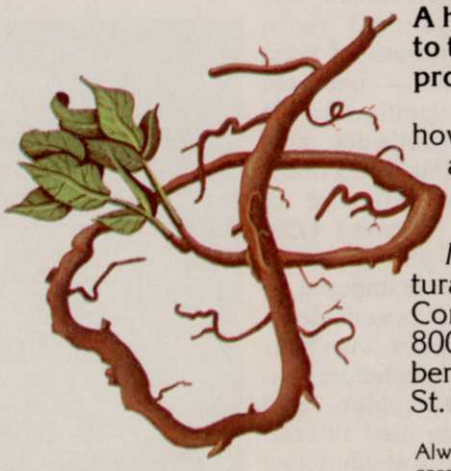
Roundup® herbicide by Monsanto is powerful enough to control many of the toughest annual and perennial weeds in one application.

Once, several different herbicides and frequent repeat treatments were needed. Now, one man with a backpack or tank sprayer can handle many of your weed cleanup chores in one treatment with Roundup.

Roundup has more applications than you can imagine. For golf courses, schools, corporate and industrial parks. Wherever spot treatments are called for, Roundup makes sense. Especially when you consider what it can save you in time, labor and herbicide inventory.



Roundup destroys most emerged annual and perennial grasses and weeds.
Including bluegrass, bermudagrass, quackgrass, bindweed, johnsongrass, fescues, and vaseygrass.



Roundup.
A herbicide that gets to the root of the problem.
To find out how to put Roundup at the root of your weed problems, write: Roundup, Monsanto Agricultural Products Company, C3NJ, 800 North Lindbergh Blvd., St. Louis, Mo. 63166.

Always read and carefully follow the Roundup label directions. RI 2/7

Roundup has no residual soil activity.
And you know what that can mean for your landscaping program. However, for seedling weed control, simply follow your Roundup treatment with an effective residual herbicide.

Monsanto

THATCH:

a barrier to control of soil inhabiting insect pests of turf

by Dr. Harry D. Niemczyk

Thatch is a major factor limiting the effectiveness of insecticides in controlling soil inhabiting insect pests of turf.

Timely irrigation is the key to obtaining the maximum control of grubs and other insects that feed on turf roots. Irrigate before spray dries.

Thatch—the tightly bound layer of living and dead roots, stems, leaves, and stolons of grass that forms under turf — has been found to decrease significantly the effectiveness of insecticides now used to control soil inhabiting insect pests of turf. The influence of thatch, discovered in recent Ohio studies, came to light only after federal restrictions were imposed on the use of traditional insecticides.

For the past 25 years, the chlorinated cyclodiene insecticides, aldrin, dieldrin, heptachlor, and chlordane, have been used successfully to control the soil-inhabiting insect pests of turf. Generally, a single application of one of these insecticides provided control for several years. However, actions taken by the Environmental Protection Agency (EPA) over the past few years have eliminated heptachlor, aldrin, and dieldrin for this purpose. Current hearings concerning chlordane indicate that it may meet the same fate.

If, in fact, this use of chlordane is cancelled, how can the turfgrass manager control soil-inhabiting insect pests of turf? The obvious answer is a shift to the organophosphate (O-p) insecticides which are

Insect pests such as Japanese beetle grubs, below, top, and bluegrass billbug larvae feed in and under thatch. Some inecticides are bound to the thatch before they reach the target.

currently labeled for this purpose, diazinon, chlorpyrifos (Dursban), and trichlorfon (Dylox or Proxol). This sounds easy. however, there is more to it than a mere shift to another material.

High water requirements

First, when the chlorinated cyclodiene insecticides were used, there was no great urgency to water the treatments in; eventually, they worked their way into the turf and soil. With the O-P and new carbamate insecticides there is a distinct urgency to move these materials to the target pest immediately.

These insecticides have characteristically short residual activity (a month or less). The most important medium through which the insecticide reaches the target pest is water; either irrigation or rainfall. This immediately presents a problem on golf courses and other turf areas without irrigation systems.

The thatch barrier

A second and major factor related to the effectiveness of the O-P insecticides currently registered is that *they do not move freely through thatch.* This layer, which is tightly intermingled between the layer of green vegetation and the soil surface, is common in golf course or home lawn turfgrass.

Many experiments on control of various species of grubs (Japanese beetle, northern masked chafer, billbug, *Ataenius*) conducted in Ohio from 1971 to 1976 have shown that when liquid or granular formulations of diazinon are applied to turf at 5.5 to 6 pounds AI/acre (active ingredient per acre), 90 percent or greater control is achieved. Appli-

cations of liquid chlorpyrifos (Dursban®) at 2 and 4 pounds AI/acre gave an average of 69 and 74 percent control, respectively. However, when these two insecticides, in either liquid or granular form, were applied at the same rates to turf with 0.5 inch or more thatch, the percent control achieved was sharply reduced. Granular diazinon at 5.5 to 6 pounds AI/acre gave 69 to 74 percent control and chlorpyrifos at 2 and 4 pounds AI/acre, 21 and 26 percent, respectively. Liquid formulations of diazinon at the same rate gave 52 to 60 percent control and chlorpyrifos 51 to 63 percent. The experiments and general field experience have shown that granular diazinon, in low concentration formulations, provides better control than the liquids.

The reason for this reduced effectiveness was investigated through laboratory experiments conducted at the Ohio Agricultural Research and Development Center, Wooster. The results confirmed that most of the insecticide was being adsorbed (bound) to thatch and thus, did not reach the target. Of the two insecticides, diazinon and chlorpyrifos, the latter was the most readily absorbed. Indications are that this is a physical-chemical binding which is not reduced by extensive aerification.

Though the tendency for trichlorfon (Proxol® or Dylox®) to be adsorbed is much less than that of diazinon and chlorpyrifos, its performance in controlling soil inhabiting pests has ranged from poor to excellent. The reasons for this variability are not known.

Our knowledge concerning the specifics of insecticide movement through this dense mat of organic matter called thatch is almost nonexistent. Much is known about the factors related to movement of insecticides through soil, but not through thatch. The intricacies and characteristics of insecticide movement through thatch must be better understood if we are to continue having controls in the future for pests that live under it.

Key: timely irrigation

While the performance of O-P insecticides is reduced by thatch, proper and timely use of water increases the probability of obtaining the most control possible from

Table 1. A summary of grub control tests in Ohio — 1971-6.

			Thatch		No Thatch	
Insecticide	Formulation	Rate lb AI/A	No. Tests	Avg. Percent Control	No. Tests	Avg. Percent Control
Diazinon	2G	5.5-6	(7)	74	(5)	93
"	5G	5.5-6	(4)	69		
"	50 WP	5.5-6	(2)	60		
"	4 EC	5.5-6	(11)	52	(2)	90
Chlorpyrifos (Dursban®)	0.5 G	2.0	(2)	21		
"	0.5 G	4.0	(3)	26		
"	2 EC	2.0	(4)	53	(3)	69
"	2 EC	4.0	(4)	63	(2)	74
"	4 EC	2.0	(4)	51		
"	4 EC	4.0	(2)	58		
Trichlorfon (Dylox-Proxol®)	80 SP	8.0	(4)	68	(1)	78

the treatment. This is reflected on the labels of liquid products currently registered for grub control in turf. Most labels recommend using 15-30 gallons of spray per 1,000 square feet. This volume may be impractical for the turf manager or operator of a lawn care firm, but it is required for optimum performance.

If less than the recommended volume of spray is applied, the treatment should be irrigated with ½-inch or more of water immediately after application. Sprays of these relatively short-lived insecticides should not be allowed to dry before irrigation is applied. A good time to make applications is when the turf is still wet. Some golf course superintendents have achieved fairly good control by applying the insecticide sprays during a rain.Granular formulations must also be watered in but the need is not as immediate as it is for the spray treatments.

New insecticides

In view of adsorption and problems of in-consistent control with some currently registered products, what does the future hold for control of soil inhabitating insect pests? Our best answer rests with the two experimental insecticides, one an O-P and the other a carbamate, which control grubs in spite of thatch. The former is a product of the CIBA-GEIGY Corporation and the latter of Fisons Corporation. Extensive field tests have shown both to be very effective against grubs under thatch. Laboratory tests indicate their effectiveness is due to the fact that they are not adsorbed onto thatch. These compounds are short residual insecticides and will also require the timely irrigation or rain very soon after application. Early projections indicate that one or both of these materials may be available for commercial use by the spring of 1978. □

Dr. Niemczyk is professor of turfgrass entomology at the Ohio Agricultural Research and Development Center, Wooster, Ohio.

Table 2. Binding characteristics of insecticides on turfgrass thatch.

Insecticide	Units (mg) thatch required to bind 50% of insecticide applied
Chlorpyrifos (Dursban®)	4
Diazinon	75
CGA-12223	300
Trichlorfon (Dylox® - Proxol®)	500+
Bendiocarb	640+

Table 3. Summary of tests with the new experimental insecticides for control of grubs under a turfgrass thatch - OHIO - 1973-76.

Insecticide	Formulation	Rate lb AI/A	No. Tests	Avg. Percent Control
CGA-12223	1 G	1.0	(4)	88
"	1 G	2.0	(3)	96
"	5 G	1.0	(3)	76
"	5 G	2.0	(2)	99
"	4 EC	1.0	(3)	81
"	4 EC	2.0	(1)	98
"	2 EC	1.0	(4)	56
"	2 EC	2.0	(3)	87
Bendiocarb	76 WP	1.0	(6)	78
"	76 WP	2.0	(4)	81
"	5 G	1.0	(2)	66
"	5 G	2.0	(3)	84

The largest tree in the world

Did you ever hear of a tree with 3,350 trunks? That's right—Just one tree with more than 3,000 trunks. It looks more like a forest than a tree.

It's the largest known tree in the world, but by no means the tallest. It grows in Ceylon, an island a little larger than West Virginia, about fifty-five miles from the southeast coast of India. According to the latest information available, this tree has 350 large trunks and 3,000 small ones.

It's a Banyan tree (Ficus bengalensis, L.) and is one of nature's wonders. The name BANYAN is derived from the word BANYAS, or Hindu traders, who found the natural shelter of the large branches an idea market place. So thick is the foliage that the sun does not penetrate the dense shade of some of these large trees.

The Banyan tree is a native species of India. The lower branches, growing out from the main trunk, are so long that they would sag to the ground if not propped up. The tree itself provides these props in the form of secondary trunks, which develop from aerial roots growing downward at irregular intervals along the underside of the branches. When these roots reach the ground, they take root and grow into the earth.

Although the largest Banyan trees may reach a height of only about one hundred feet, their growth horizontally is virtually unlimited under favorable conditions.

A Banyan tree may start from a seed-bearing fig, dropped into the top of a palm tree by a bird. When the seed inside the fig sprouts, it is at first nourished by the substance of the fig, as it grows downward. After reaching the ground and taking root, the nourishment provided by the soil causes the young tree to develop its main trunk and branches rapidly. As it grows, eventually the host tree is enveloped and being deprived of light, air and moisture, it withers away.

This Banyan tree at Edison Botanical Gardens, Fort Myers, Fla., has over 100 aerial roots with a 352-foot circumference.

The Banyan tree, which belongs to the Mulberry family MORACEAE, produces figs about one-half to three-quarters of an inch in diameter. They grow in pairs, and ripen between February and May, becoming red. They are not edible. An average tree may produce thousands of figs each year.

The leaves are large — sometimes reaching a length of eleven inches and a width of five or six inches. Medium to dark green, shiny on the front and dull on the back, they have large, light green veins about one-half to one inch apart. There are many smaller veins closer together. When a leaf is pulled or broken from a branch, a white, milky, sticky substance (latex) comes out.

The tree has no flowers that are visible. There are small flowers, however, inside the figs. The blossoms are of both sexes. Wasps gain entrance through holes in the tips of the figs and lay eggs inside. Pollination occurs when the "fig insects" which hatch and mature, leave one fig and enter another.

The wood of the main trunk and of other well-developed secondary trunks is of little or no value commercially. The strong aerial roots,

Continued on page 22