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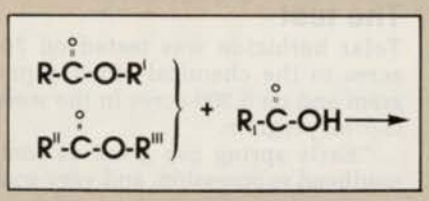
The next big improvement came in our discovery of the eutectic principle, which causes the unique complex to resist crystallization and penetrate into the circulatory system of a weed much more rapidly.



And then came the little jewel you see above. It is a unique means of combining different esters with dicamba to form a new and unusual Trimec Complex.

How we do this is, of course, a trade secret, but the activity of the complex is nothing short of amazing! It controls tough weeds like Ground Ivy, Oxalis and Spurge as easily as shooting fish in a barrel . . . It delivers fast, visible response in early-season or late-season cool weather . . . and yet it poses a minimum hazard to flowers and ornamentals.

Turf Professionals Named it Super Trimec

We decided to call it Trimec Turf Ester, and in our advertising we offered a free sample. To our amazement and sheer delight, some 9,000 turf professionals took us up on the offer . . . and soon the bouquets started flooding in to our headquarters in Kansas City.

If there was one word that stood out in the comments from users, it was *Super . . .*
"The control of Spurge was super."
"The low volatility is really super."
"The quick response was really super."
"The efficiency was super."

Well, if our friends in the turf community insist that it is Super, who are we to argue? Super it is! So the name has been changed from Trimec Turf Ester to Super Trimec.

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If you are one of those who received a sample last year, we want to thank you for being part of the group that gave us this Super name . . . and so we're sending you a $5.00 coupon to redeem on a gallon of Super Trimec.

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Circle No. 147 on Reader Inquiry Card

LANDSCAPE MANAGEMENT

The Chemical Connection

The Indiana Highway Department proves in some cases chemicals can be more productive and cost effective than mowing.

by Art Edwards

John Burkhardt, *landscape supervisor.*

A new weed control program tested in Indiana may help reduce highway mowing in that state—and keep more cash in the maintenance budget.

"We find we can spray and get good weed control at $12 to $13 per acre, says John P. Burkhardt, landscape supervisor for the state's Division of Maintenance. "This is weed control only—but it wipes out wild carrot, a most showy weed problem, and sweet clover which also is a noticeable, up-front type. Canadian thistle is another problem weed showing control at this low per-acre cost."

The compound being tested is Du Pont's new Telar herbicide, a dry flowable formulation recently labeled for use on highway rights-of-way. Indiana's highway maintenance group has been one of the leaders in extensive field work with the product, both for weed control and in chemical mowing.

The present program in Indiana is a combination of mowing and spraying.

Two-pronged attack

The present program in Indiana is a combination of mowing and spraying. Spraying is done in the spring for annual broadleaves and in the fall for the hardy perennials.

Spraying for the last 12 years has been on a three-year cycle: interstate highways one year; half the two-lane roads the next year; and the second half the third year.

Indiana highway maintenance has begun to phase in a two-year spray cycle: interstate one year and other highways the next. With an effective chemical spray program and two to three limited mowings per year, Burkhardt believes the new cycle will prove feasible.

With the new spray program Indiana's Division of Maintenance may be able to eliminate one mechanical mowing per year on the acreage it maintains. This could produce big savings in any given season. The system totals 100,000 acres, although not all of the acreage is mowed each season.

"We want weed control ... wild carrot, sweet clover, and canadian thistle are our key problems."
—Burkhardt

The test

Telar herbicide was tested on 700 acres in the chemical mowing program and on 5,500 acres in the weed control program.

"Early spring use gives us some seedhead suppression, and very good suppression with Embark added," Burkhardt says.

Embark is a growth regulator marketed by 3M.

But he points out that these extra benefits aren't the primary reason for using Telar.

Art Edwards is the former publisher of WEEDS TREES & TURF.

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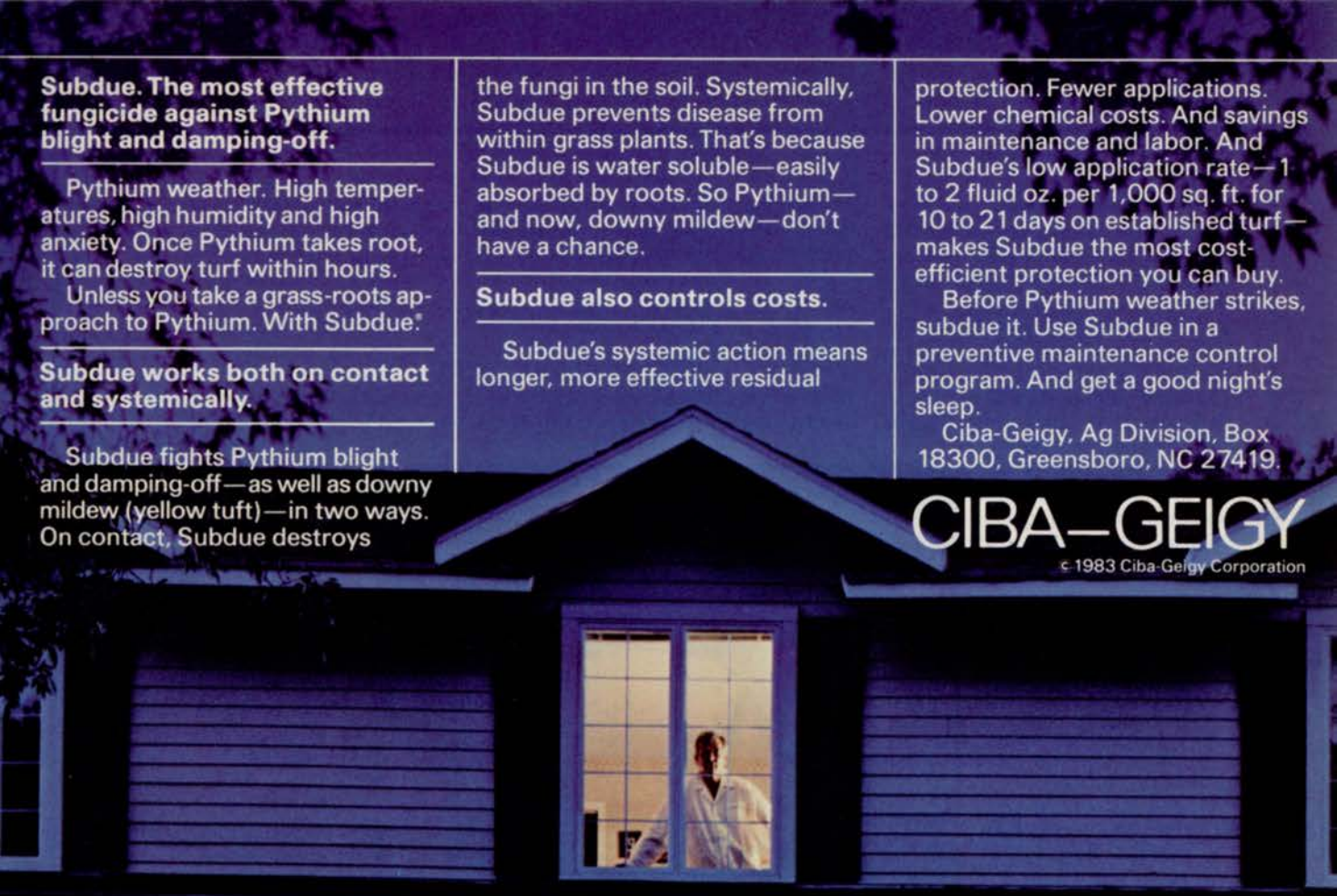


HOW TO AVOID SLEEPLESS NIGHTS DURING PYTHIUM WEATHER.

SUBDUE

Circle No. 274 on Reader Inquiry Card

"We want weed control," he says. "Wild carrot is our key problem, since it grows to about three feet. We are getting almost total control with Telar."

Burhardt says this control holds for other problem weeds like sweet clover and Canadian thistle as well.

The new compound has proven to be very selective. Used alone, it gives good control on those weeds for which it is labeled. If used with 2,4-D, the experience in Indiana is that the spectrum of control is broadened considerably."

Telar is used on contract acreage—that acreage sprayed by private contractors on a bid basis—at one-third ounce per acre along with one-half gallon of 2,4-D amine. Telar costs about $12 per ounce.

"We can kill wild carrot with other chemicals but not at this low cost," Burkhardt says.

He also notes that a lesser rate, one-fourth ounce per acre in combination with 2,4-D, has also proven effective in some instances.

Other rates tried by the department's own crew have ranged up to one ounce per acre. At the higher rates, Burkhardt says the new chemical also displays some growth regulation which is commendable, but that this is not the present goal of the program. The primary goals, he stresses, are control of weeds and reduced costs—which means eliminating some mowing.

Heavy rates, three-fourth to one ounce per acre, caused some phytotoxicity which appeared as a yellowing of turf, says Ed Edwards, landscape supervisor at the Fort Wayne District of the Department of Highways. This experience was on some plots tested in cooperation with Purdue University.

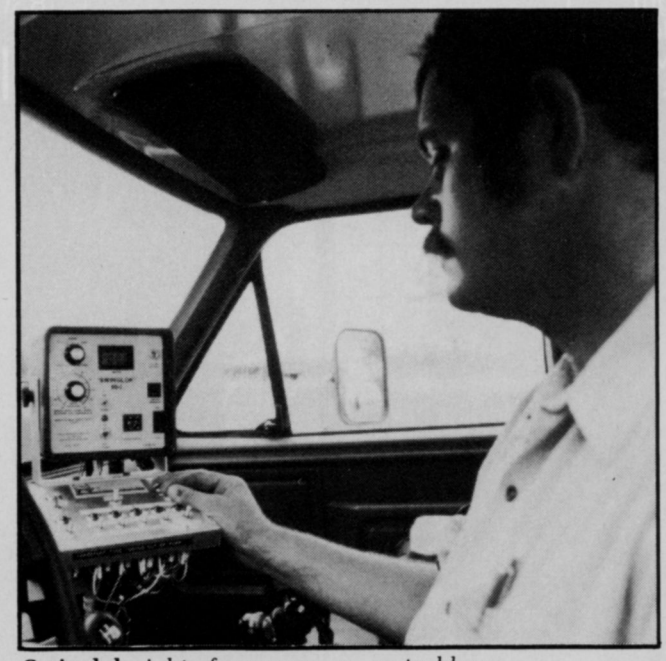
"Our key goal was to kill wild carrot without damage to grass which we have been able to do at the low, one-fourth to one-third rates," Edwards says.

Timing

Timing of spray is always a factor, regardless of the kind of spray combination being used.

Burkhardt says a late, wet spring can upset timing, and is especially critical where contact work is involved. A late spring, he has found, can delay leafing of brush and germination of annual weeds, thus reducing control.

Telar has proven compatible in tank mixtures with most other non-crop chemicals. Even so, the company strongly recommends that small quantities be tested for compatibility before mixing field scale tank mixes. At Indiana, Telar mixed well with Embark. Not only is Telar compatible, Burkhardt believes it may even have some synergistic effect, although he points out that this is not documented.



Swinglok *right-of-way sprayer control box.*

Timing of spray is always a factor, regardless of the kind of spray combination being used.

Embark is used at the pint per acre rate with Telar at one-fourth ounce per acre—plus one-half gallon 2,4-D amine and one-fourth percent nonionic surfactant to the area to be treated.

Indiana is using the new Swinglok right-of-way sprayer. Telar is mixed as a slurry in water and dumped into a 50-gallon side tank with the other chemicals. Total spray volume mix is 25 to 40 gallons per acre.

Major acreage for weed control is handled by private contract. However, the department is budgeted for spot work—primarily for brush, thistle and Johnsongrass control.

With good weed control Burkhardt says the public does not object to greater turf height. Typically, the program is to mow the full median and 18 inches to 20 inches on each side on the interstates—plus full widths on cycle 2.

Burkhardt says this is true for the entire state. "We operate the entire system on a single plan—not by district," he says, "and this is a strong advantage." Allowances are made for local situations within the statewide plan.

The Indiana Department of Maintenance staff believes that a long-time testing program is now paying big div-idends for the state. "Our test work and evaluation which began in the early 1970s now points to a workable mixture of chemicals. These provide acceptable results and may even help us reduce both chemical spray use and mowing," Burkhardt says.

The evaluation will continue even as the new program is implemented.

Telar promises to be basic in Indiana highway weed control. The new product, labeled in 1983, can be used both for selective and non-selective weed control. Bluegrass, fescue and smooth brome all show good tolerance at the lower rates.

The same is true for bahiagrass and bermudagrass in southern areas where these grasses are common. At higher rates, non-selective weed control is feasible. A surfactant in all postemergence applications enhances activity and is recommended.

Telar inhibits weed growth very quickly after treatment. However, dying weeds may not be noticeable for one to three weeks following spraying.

"This is acceptable. We know that if we can get timely application, we'll have good weed control," he says. **WT&T**

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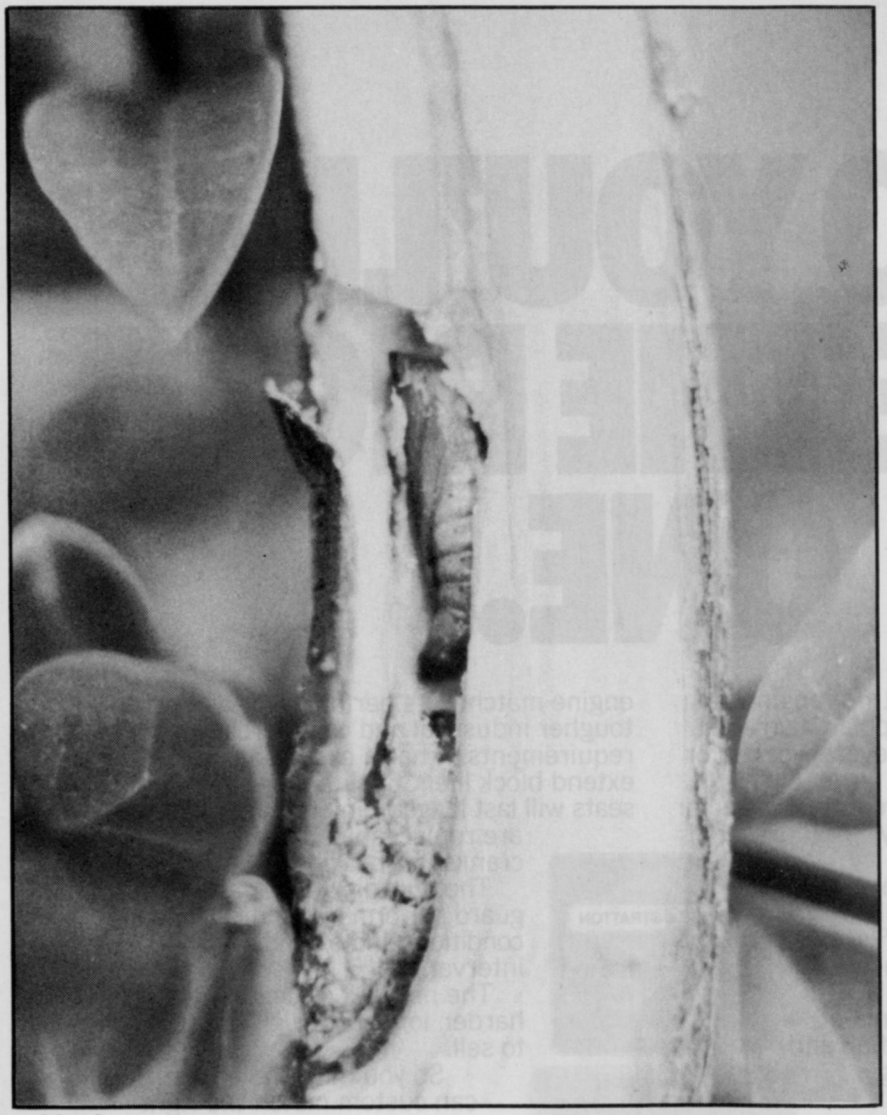

A lilac borer *pupa.*

The Hidden Enemy

Often doing most of their damage undetected, borers are distructive plant pests. Knowing the early signs and symptoms of borer infestation can help save many trees and shrubs.

by David G. Nielsen, Ph.D

Insects that bore beneath cortical tissues of their host constitute one of the most damaging groups of plant pests.

Although damage symptoms eventually become obvious, a borer's activity is often undetected until after significant damage has been done to the tree or shrub. Borers are unique in that they directly destroy vascular tissues and structural integrity while operating beneath bark in a secluded and protected environment.

Their feeding location complicates efforts to control them. The subcortical environment inhabited by borers is an apparent haven, but must be a hostile challenge to colonization.

The larva is small when it invades this center of plant activity, and internal vascular pressures force many larvae to retreat and perhaps die. Toxic chemicals in these tissues may repel or kill larvae. These factors have limited exploitation of sub-cortical tissues of healthy trees by insects. However, protection offered by tree bark must be a powerful evolutionary incentive for colonization by these prolific and adaptive animals.

Boring insects thought to be primary invaders, capable of reproducing in so-called healthy trees, are far outnumbered by those considered to be secondary, capable of reproducing only in weakened trees. If healthy trees are not susceptible to primary borer attack, then trees harboring larvae must be stressed or in an altered state of vitality. This fact should always be kept in mind when designing a borer control program, or a tree management program designed to reduce insect problems. This topic will be covered later in this article.

Two very different kinds of insect borers will be discussed to present principles associated with controlling the most common and important kinds of borers that attack landscape trees. Much of the information presented can be extrapolated to other kinds of borers.

Clearwing moth borers

Clearwing moths (see table for important species) in the order *Lepidoptera* and Family Sesiidae comprise one of the most homogeneous groups of insects known.

In other words, they are more alike, as a group, than are most other families of insects. This fact is important for us to know when defining re-

Dr. David G. Nielsen is professor and project leader in the Department of Entomology, The Ohio State University, The Ohio Agricultural Research and Development Center, Wooster, OH.

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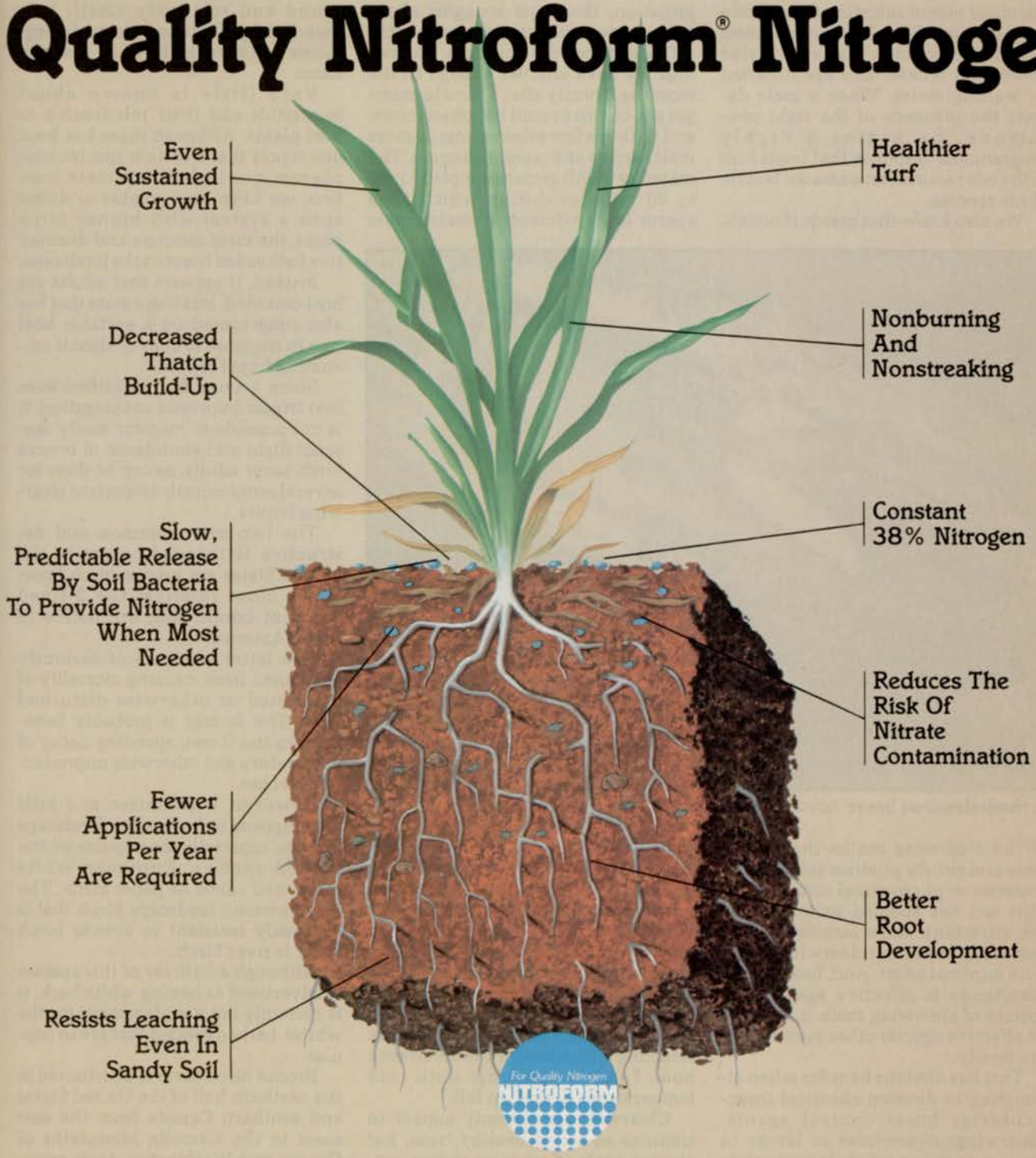

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search protocols and formulating control strategies.

For example, we have learned that all clearwing moths use long-range chemical communication to facilitate mate location. Females emit perfumes called pheromones that are carried downwind where they are detected by waiting males. When a male detects the presence of the right pheromone, he begins a highly programmed response that leads him to the odor source, an unmated female of his species.

We also know that many, if not all, of the clearwing moths that attack trees and shrubs produce similar pheromones or pheromonal components. This fact has enabled us to develop sex attractants for a number of economically important clearwing borers with minimal effort. And, finally, if an insecticide is effective against one species of clearwing moth it will also be effective against other members of the family.

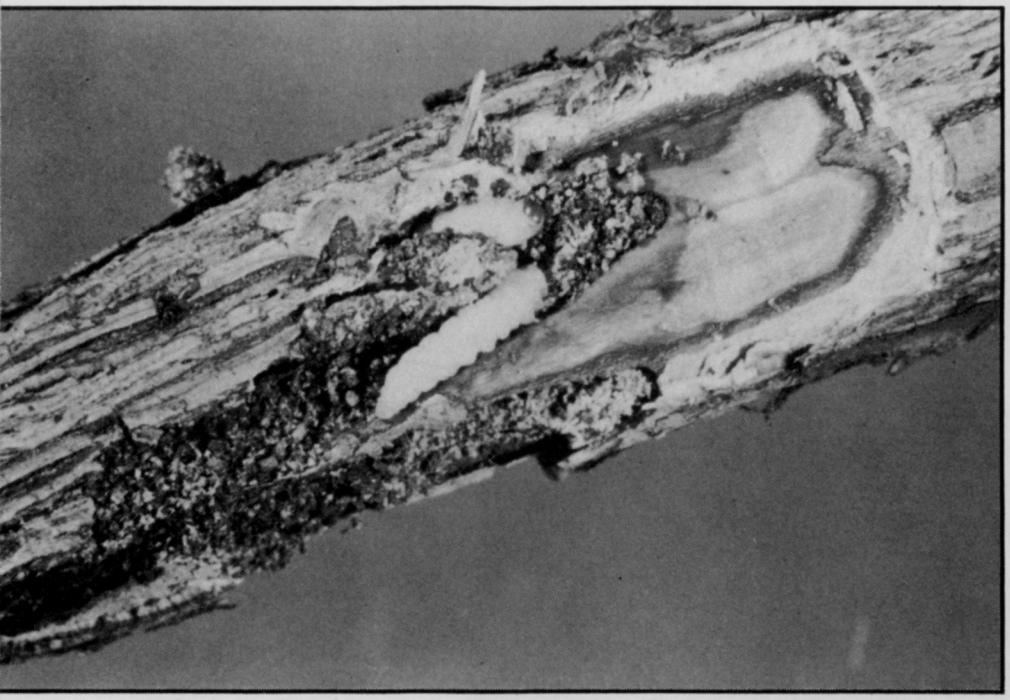
This has obvious benefits when attempting to develop chemical insecticides as borer control agents. Clearwings overwinter as larvae in the woody tissues of their hosts; they are relatively host specific.

For example, lilac borer may inhabit lilac, ash, and privet, but not oaks, maples, pines, etc. The most common scenario for clearwings in trees and shrubs is to complete one developmental cycle or generation each year. After overwintering successfully, the larva either resumes feeding to complete development or becomes a pupa, the transitional stage between the damaging larval stage and the adult.

Approximately 10-14 days after pupation, the pupa wriggles about half way out of the tree, the pupal skin splits, and the adult emerges. Clearwings we have studied emerge in the morning. Shortly after a female emerges she begins to emit her pheromone, and within a few minutes one or more males arrive and coupling occurs. The mated pair will remain coupled for 60 to 90 minutes during which time sperm is transferred. Females mate only once; males will mate several times.

Soon after the pair separates, the female begins laying eggs on the tree where she mated. If disturbed, she may fly to another area resulting in oviposition on a nearby host tree. Eggs are laid singly and require 10-14 days to hatch. Larvae hatch and crawl over the bark surface for some time before selecting a location for their entrance hole. Feeding continues until cold temperatures prevail in fall.

Clearwings commonly appear to colonize so-called healthy trees, but are not pests of trees on native, undisturbed sites. So, they are probably secondary pests, but appear to be infesting otherwise healthy trees.



A rhododendron borer *larvae is shown above with resulting larval damage.*

Metallic wood borers

Metallic wood borers (see table for important species) in the order *Coleoptra* and family *Buprestidae* are some of the most beautifully irridescent organisms on earth, but their larvae, known by the misnomer flatheaded borers, are destructive pests of landscape trees.

Actually, the head of the larva is round and relatively small. It is dwarfed by flattened thoracic segments that give the larva its common name.

Very little is known about buprestids and their relationship to host plants. Although there has been one report that a certain species uses pheromones to facilitate mate location, we have been unable to detect such a system with bronze birch borer, the most common and destructive flatheaded borer in the landscape.

Instead, it appears that adults are host-oriented, locating a mate that has also congregated on a suitable host tree in response to cues or signals emanating from the tree.

Since no one has identified cues that trigger buprestid congregation, it is not possible to monitor easily seasonal flight and abundance of bronze birch borer adults, as can be done for several economically important clearwing borers.

The two most common and destructive flatheaded borers in the United States are bronze birch borer and a close relative, the 2-lined chestnut borer. Both are native to North America.

The latter is a pest of seriously weakened trees, causing mortality of defoliated or otherwise disturbed oaks. The former is probably beneficial in the forest, speeding decay of overmature and otherwise unproductive birches.

However, it colonizes and kills what appear to be healthy landscape birches, especially the popular white-barked species, European white birch, and canoe or paper birch. The only common landscape birch that is obviously resistant to bronze birch borer is river birch.

Although a cultivar of this species is advertised as having white bark, it is certainly not a replacement for the whiter-barked species that are so popular.

Bronze birch borer is distributed in the northern half of the United States and southern Canada from the east coast to the Cascade Mountains of Oregon and Washington. Most populations complete one generation each year; throughout its range larvae overwinter.

If the larva is in a part of the tree with thick bark it may overwinter in the phloem or inner bark. Otherwise, larvae construct an overwintering chamber within xylem (wood).

In any case, it appears that larvae

continued on page 54