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TURF

restricted by excess moisture or compacted soils.

Soil applied — long term residual — selective and nonselective herbicides will provide total vegetation control for several months. They are used primarily for rights-of-way and peripheral weed control along fences and buildings. They last too long for turf renovation and may move laterally in the soil to various degrees.

Bromacil (Hyvar) and borate compounds are just a few examples. Several mixtures of these and other compounds for quick foliage kill, such as amitrole, are available.

Extreme care should be taken when applying these herbicides near desirable plants.

Conditions are key to herbicide effectiveness

Most herbicidal failures aren't failures of the herbicide. They are the result of using herbicides without full consideration of the conditions which make them most effective. These conditions include temperature, moisture, timing, application method, and characteristics of the target weed.

To be most effective, herbicides must be applied at the appropriate time in relation to germination or growth of the target weed species and in the right place.

In turf, postemergence herbicides are applied directly on the target weed and preemergence herbicides are applied to the soil.

Since most herbicide applications are made on established turf, it may appear preemergence herbicides are applied to the foliage. In fact, they must be washed off the foliage and down to the soil to be effective, either by supplemental irrigation or rainfall.

With postemergence herbicide applications, irrigation or rainfall is detrimental since the herbicide needs to cling to and be absorbed by the weed foliage.

Preemergence applications should be made before weed seed germinates and should last throughout the germination period to be effective. They do not have any effect on established weeds. Their action is exerted only after the seed germinates and growth commences.

Theoretically, preemergence herbicides form a chemical barrier between the weed seed and the soil surface. Therefore, they must be applied uniformly to the soil prior to germination to be effective. A critical threshold concentration of preemergence herbicide must be maintained in the soil throughout the germination period. Preemergence herbicides with short soil residual may require split applications to maintain the critical concentration.

Dry soil severely reduces the effectiveness of preemergence herbicides unless moisture is added soon after treatment.

Postemergence applications are applied to the weed foliage following germination and emergence. They act either as contact or systemic (absorbed and translocated) herbicides.

Contact herbicides act rapidly while systemic herbicides usually require several days to produce visible results. Systemic herbicides usually kill the entire plant while contact types only kill the foliage contacted by the herbicide.

Postemergence herbicides are most effective when applied to young, actively growing plants when the temperature is above 70 degrees F. Follar applied herbicides are also less effective if soil is dry.

Surfactants are frequently recommended for use with postemergence herbicides. For consistent results use nonionic agricultural surfactants, sold specifically for use with herbicides.
What do you want?  
The most effective disease control?  
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CHIPCO 26019 EVERYTHING’S UNDER CONTROL.

Please read label carefully and use only as directed.
Herbicide selection
Since the growth of the professional lawn care industry, the choice of turf herbicides and formulations has increased. Two or more herbicides may be equally effective in a given weed situation. Also, the same chemical may be available in a variety of commercial formulation trade names.

Selection of a herbicide and formulation is determined by:
- the weed species involved
- the availability of the herbicide
- type of equipment at your disposal
- time of application
- your budget for weed control
- precautions needed to limit exposure to desirable plants, humans, and animals, and
- residual of the product.

All recommended rates of application are based on either active ingredient or acid equivalent. Commercial products may have the same herbicides but have different percentages of active ingredients. The label will provide the exact amount of herbicide in the container. It is wise to figure the price of a product on the basis of its active ingredient or acid equivalent.

For example, a herbicide is available in liquid formulations varying from six to less than one pound acid equivalent per gallon. Usually, the more concentrated products are more economical on a per pound basis.

Granular formulations of many herbicides are also available. In comparison to sprays, granular herbicides have both advantages and disadvantages.

The advantages are simpler application—no water or mixing required, less drift, and a tendency toward longer activity in the soil.

Disadvantages of granular herbicides are difficult calibration of application equipment and slightly higher cost.

The range of concentration, particle size of product, and varying rates of application complicate calibration. More concentrated materials are usually more economical but calibration errors are more critical. Calibration charts are supplied by manufacturers of granular applicators. Application equipment should be calibrated prior to initial use each season and periodically checked during the season. This will ensure safe, effective and economical control.

Weed control strategy for warm season turf
Bermudagrass is the dominant turf species in warmer climates. In general, herbicides that can be used on bermudagrass can be used safely on zoysiagrass.

continued on page 58
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easier handling. Raise the cutting deck to cut high grass
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Circle No. 181 on Reader Inquiry Card
MARCH 1984/WEEDS TREES & TURF 55
Dr. Ron Wilson and Dr. Roger Cahoy, of PBI/Gordon, show George Toma a lab experiment dealing with the eutectic characteristic of Trimec®. Toma is the groundskeeper at the Truman Sports Complex in Kansas City, which visiting media people have said is one of the most beautiful in the world. He uses Trimec in his weed control program and calls it the most efficient weapon in his arsenal.

Would you like to join George Toma in satisfying his curiosity about Trimec®?

Every turf professional who has ever asked why... or why not... will enjoy eavesdropping on this visit with George.

Anyone who spends any time around George Toma becomes aware of his insatiable curiosity. He's never satisfied to just know what a product will do. Rather, he wants to get inside of it and find out why and how it does it.

It was this type of curiosity that led him into a study of pre-germination of rye grass, which in turn makes it possible to reseed damaged turf and play football on it 10 days later.

And it was this same curiosity that enabled him to envision a plan which involves putting turf over an artificial surface on Saturday; playing soccer on it Sunday; and then returning the field to artificial surface on Monday.

So none of us at PBI/Gordon was surprised when George Toma asked if we would let him get inside of a Trimec molecule so he could see "what makes Trimec tick."

"I guess just about every herbicide salesman in the world has brought us samples," grins Toma. "We've tried them all, and it's obvious that you folks at Trimec know something the others don't. As a matter of fact, we have never found a broadleaf weed that Trimec won't control."

"Certainly the active ingredients in Trimec are no secret," Toma continued. "But can you tell me what in the world happens, and why it happens when..."
these ingredients become Trimec?"

(Gosh, George, you might as well ask us if we have any pictures of our grandchildren.)

In two words, it's synergism and eutectics:

Here is the Trimec formula

As you can see, it is a formulation of Phenoxy Acetic, Phenoxy Propionic and Benzoic Acid herbicides. At PBI/Gordon, the three acids are reacted to form a new compound. The resulting Trimec product is synergistic in that it has more power than the sum of the three acids individually.

Use of the eutectic principle causes the total complex to resist crystallization for a longer period of time than any of the components individually. Of course, the longer a herbicide can resist crystallization the better chance it has to penetrate the cuticle of the weed and translocate throughout the entire root system to result in total kill.

An explanation of eutectics

Perhaps the clearest demonstration of the eutectic principle can be found in common solder alloys, which consist primarily of tin and lead. Notice that 100% tin melts at 239 degrees Celsius. 100% lead melts at 327 degrees. But an alloy of 63% tin and 37% lead melts at 183 degrees. And note that by adding 2% silver the solder alloy will melt at 179 degrees.

In our laboratory we learned that we could utilize the principles of eutectics to delay crystallization of the Trimec complex in much the same way that eutectics can change the melting point of solder.

Visible proof of eutectics in Trimec

The drops on these two petri dishes were 5 hours old when photographed. Notice that the 2, 4-D on the right has started to crystallize, while the Trimec on the left has not.

Here is the dramatic effect of the eutectic principle. After a full week, the dishes are tilted and the Trimec is still in a liquid state and will actually flow down the dish while the 2, 4-D has crystalized into a solid state.

"Okay, for a long time I've known what Trimec will do. And now I know why Trimec does it," said Toma. "Now I want to know how you do it."

(We're all set to reveal that secret the day after Coke® tells Pepsi®, or vice versa.)

George Toma at Arrowhead with an experimental model of palletized turf, which would be the basic building block of removable turf that could be laid over an artificial surface; played on; and then removed. Even turf grown in a pallet contains weeds, so Toma sprays it with Trimec.

Beware of substitutes. Look for the Trimec Seal on broadleaf herbicides, brush killers, and weed-and-feed fertilizers.

TRIMEC® is a registered trademark of PBI/Gordon Corporation. U.S. Patent No. 3,284,186

PBI/GORDON CORPORATION

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KANSAS CITY, MISSOURI 64101
(816) 421-4070

TRIMEC® TURF HERBICIDE

Circle No. 154 on Reader Inquiry Card
However, special attention should be paid to herbicide labels regarding applications to centipedegrass and St. Augustine, which are similar to each other in their tolerance to herbicides.

**Winter grass weeds** Annual bluegrass is by far the most severe grassy weed infesting southern turf areas during the late growing season, through the dormancy period, and into the early growing season.

Beside decreasing the aesthetic value of turf, the primary objection to annual bluegrass is its rapid dieback in late spring. Bermudagrass coverage is usually slow following fade out of annual bluegrass leaving large sections of bare ground exposed. Other weeds, such as goosegrass, tend to move into bare areas.

Annual bluegrass control with preemergence herbicides is usually accomplished with either benefin (Balan), bensulide (Betasan), DCPA (Dacthal), Pronamide (Kerb), simazine (Princep) or oxidiazon (Ronstar). Two applications may be necessary during the dormant season for acceptable control except with Pronamide or simazine.

Pronamide and simazine provide either preemergence or postemergence control of annual bluegrass in bermudagrass.

There are two choices for annual bluegrass control on bermudagrass greens overseeded with perennial ryegrasses. Bensulide may be applied prior to overseeding. Ethofumesate (Prograss) may be applied 15 to 30 days after overseeding. Check both labels for timing to avoid delaying spring transition back to bermudagrass.

Another approach employed particularly on golf courses, is to use a postemergence application of a nonselective herbicide such as paraquat, glyphosate, or cacodylic acid prior to the warm-season turf breaking dormancy. This usually does an excellent job on annual bluegrass as well as annual broadleaf weeds present. Injury is often encountered if application is delayed until the bermudagrass starts breaking dormancy. The degree of injury is dependent on the amount of green foliage at the time of application.

**Winter broadleaf weeds** Important warm-season winter broadleaf weeds include common chickweed, henbit, clovers, spurweed, mouse-ear chickweed, lawn burweed, common dandelion, wild onion, wild garlic, plantains, and speedwells.

Preemergence control of some species can be obtained with benefin, bensulide, DCPA, simazine and other herbicides.

Henbit, chickweed, and clovers usually require something other than 2,4-D for postemergence control. In dormant bermudagrass and zoysiagrass, dicamba or combinations with dicamba are used often for postemergence control.

The phenoxyes are safe on completely dormant turfs. Actively growing turfs vary considerably in tolerance to phenoxy materials. St. Augustine will usually tolerate a .5 lb/A of 2,4-D with only minimal injury. At rates above .5 lb/A, St. Augustine is usually injured. This may be unimportant when using phenoxyes on dormant warm-season turfs, but invariably application is made during spring transition. All turfgrasses are more susceptible to phenoxy injury during this transition period. The combination of mecoprop plus chlorfurecol is often used, especially by the homeowner on St. Augustine.

**Summer grass weeds** Large continued on page 62

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### Broadleaf weed susceptibility to herbicides

<table>
<thead>
<tr>
<th>Weed</th>
<th>2,4-D</th>
<th>Mecoprop</th>
<th>Dichlamba</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustards</td>
<td>S</td>
<td>I</td>
<td>I-R</td>
</tr>
<tr>
<td>Nutsedge</td>
<td>I</td>
<td>R</td>
<td>R</td>
</tr>
<tr>
<td>Onion, wild</td>
<td>I</td>
<td>R</td>
<td>S-I</td>
</tr>
<tr>
<td>Ornamental plants</td>
<td>S-I</td>
<td>S-I</td>
<td>S</td>
</tr>
<tr>
<td>Oxalis (wood sorrel)</td>
<td>R</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>Pawsyress</td>
<td>S</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>Pepperweed</td>
<td>S</td>
<td>S-I</td>
<td>S</td>
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<tr>
<td>Pigweed</td>
<td>S</td>
<td>I-R</td>
<td>S-I</td>
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<tr>
<td>Plantains</td>
<td>S</td>
<td>I-R</td>
<td>S-I</td>
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<tr>
<td>Poison ivy</td>
<td>I</td>
<td>R</td>
<td>S-I</td>
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<tr>
<td>Ponyfoot (dichondra)</td>
<td>S</td>
<td>I</td>
<td>S-I</td>
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<tr>
<td>Purslane</td>
<td>I</td>
<td>R</td>
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<tr>
<td>Red sorrel</td>
<td>R</td>
<td>R</td>
<td>S</td>
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<tr>
<td>Shepherdspur</td>
<td>S</td>
<td>S-I</td>
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<tr>
<td>Speedwell</td>
<td>I-R</td>
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<td>I-R</td>
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<tr>
<td>Spurge, prostrate</td>
<td>I</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>Spurge, spotted</td>
<td>I-R</td>
<td>S-I</td>
<td>S-I</td>
</tr>
<tr>
<td>Spurweed</td>
<td>S-I</td>
<td>I-R</td>
<td>S</td>
</tr>
<tr>
<td>Thistle, musk, curl</td>
<td>I</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>Thistle, Canada</td>
<td>I</td>
<td>I</td>
<td>S</td>
</tr>
<tr>
<td>Vegetables</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Wild carrot</td>
<td>S</td>
<td>S-I</td>
<td>S</td>
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<tr>
<td>Wild strawberry</td>
<td>R</td>
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<tr>
<td>Wild violet</td>
<td>I-R</td>
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<tr>
<td>Yarrow</td>
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<tr>
<td>Yellow rocket</td>
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<td>I</td>
<td>S-I</td>
</tr>
</tbody>
</table>

S = weed susceptible; R = resistant weeds; I = intermediate, good control at time with high rates, sometimes poor, usually require more than one treatment.
Driven by the conviction that performance is the ultimate justification for owning a mower, Locke makes the best mowers for lawn-care professionals who demand performance, quality, and value. In a time when some manufacturing standards are questionable, Locke has made no cost-cutting changes in the manufacture of its mowing machines since their introduction in 1928. From cast iron Briggs & Stratton engines to forged steel frames and spring-loaded reels, Locke mowers are built to endure.

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To find out more about Locke's 1984 line visit your dealer or write for additional information.

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