University of Minnesota Research Updates

Submitted by Bob Mugaas

Suppression of Dollar Spot by the Growth Regulator Paclobutrazol

By JULIEN MERCIER and WARD STIENSTRA
Dept. of Plant Pathology—University of Minnesota

The possible advantage of controlling dollar spot by using the growth regulator paclobutrazol (Turf Enhancer) was tested on a creeping bentgrass/annual bluegrass turf area at the University of Minnesota in 1997. Plots sprayed with paclobutrazol were compared with plots sprayed with no growth regulator or sprayed with trinexapac-ethyl (Primo). From June to September, plots were sprayed every three weeks with growth regulators, staggered by about 10 days with fungicide treatments, chlorothalonil (Daconil Weatherstick) or propiconazole (Banner), also applied every three weeks at full and reduced rates. Paclobutrazol alone significantly reduced the number of dollar spots by 75% to 97% at times of low disease incidence (about 45 infections/m² in untreated control), to a level comparable to the fungicide treatments in untreated plots. Under high disease pressure (more than 200 infections/m² in untreated plots), disease control by paclobutrazol alone (44%) was not sufficient and turf quality declined. However, under these conditions, paclobutrazol improved the control obtained with low rates of chlorothalonil treatments by up to 68%. No reduction in dollar spot resulted from applications of the growth regulator trinexapac-ethyl. It can be concluded from this study that paclobutrazol can help control dollar spot but will not replace fungicide treatments when infection is severe.

Population Dynamic of Introduced Biological Control Agents Of Dollar Spot on Turf

The biological control of plant diseases is the inhibition of pathogens on plants by antagonistic microorganisms which are applied as protective agents. High populations of introduced anatagonists must be maintained on turf in order to achieve maximum disease control and to minimize the number of applications during the growing season. The population dynamic of three antagonists considered for the biological control of dollar spot was studied after their applciation to a bentgrass/annual bluegrass turf. The antagonists, a fungus *(Epicoccum nigrum)*, a bacterium *(Pseudomonas fluorescens)* and an actinomycete *(Streptomycete* sp.), were chosen for their ability to colonize turf and their potential to inhibit *Sclerotinia homoeocarpa*, the casual agent of dollar spot on turf. Regardless of the antagonist or the method of application (suspension in water or solid top dressing), the population of antagonists did not increase after their introduction to turf. At best the populations remained stable for a few days or started declining gradually, depending upon the antagonist. One possible reason for the difficulty of these antagonists to establish and grow on turf leaves and thatch may be the very high population of indigenous bacteria and fungi, which were about 1 x 10^8 and 1 x 10^6 propagules per gram, respectively. By contrast, *Pseudomonas fluorescens,* the antagonist which reached the highest populations on turf, never occurred at populations higher than 3 x 10^6 propagules per gram of turf. Populations of the biocontrol agents were higher and persisted longer (up to 22 days) when they were applied as a solid top dressing to the turf. Spraying antagonists in cell or spore suspension was not as effective in establishing and maintaining high populations on turf. The effectiveness of top dressing may be due to the higher amount of inoculum applied and the nutritional base it provides to the antagonists. Studies are being carried out in 1998 in order to determine whether the establishment of antagonist populations is a function of the amount or type of inoculum applied.

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A Growing Concern

A Golf Course Architect's View of Tree Placement on the Course

By TAMARA HORVATH
with Craig Schreiner

Americans love golf because it's fun and because it provides exercise in the open air for souls who live in the city. At least we love it when we're at our best. But what if the ball lands behind a tree? What if you can't take a full swing with your iron because of hanging limbs where you've sliced it into the rough? What if the ball lands under a thick evergreen planted close to the fairway and you can't find it under the lower boughs?

Trees are a vital part of the golf course environment. They produce oxygen, filter air, shelter wildlife and reduce noise, temperature and glare. Trees also provide obvious safety benefits. Many times trees are added to compensate for inadequately designed golf holes. Although they offer many benefits, trees can also cause problems when they are not properly selected or when their purpose and placement are not considered.

When you consider planting trees on your course, remember that golf is a sport played through the air, but on the ground. Many times people see a void and want to put a tree there. Most people don't realize how the placement of a single tree can adversely affect the golf hole — there's a price to pay for improper tree placement. Tree placement shouldn't hinder Integrated Pest Management (IPM), but rather complement the course with screening, definition, shade, majestic beauty and safety in the right places.

Tree Placement on the Course

Some locations on the course are more appropriate for trees than others. Trees left or planted in strategic locations add aesthetic value. Improperly placed trees disturb the harmony of the setting. Here are a few things to keep in mind about proper tree placement:

How it Affects the Game

The architect should give careful attention to positioning trees "through the green." Ball impact on a tree can cause permanent scarring of cambium tissue and bark. Damaged trees are more likely to be infected by insects and diseases. And it's impossible to hit out from under trees.

Placing trees behind and beside the green can enhance a player's perspective of the green's location and pin placement on a blind approach shot. Such placement can also screen distracting off-site views and frame the green.

Tree placement within the fairway should be done sparingly because trees are penal. Large trees can get in the way of a shot. Players must make shots that either clear or circumvent trees in the fairway. The architecture of the course directly correlates to the size and location of fairway trees. When trees are designed within the fairway, there must be enough area for alternate routing. The impact zone or landing area of a golf course is typically located 180 yards to 280 yards from the tee.

When thinking about fairway widths at alternate routings and when designing around specimen trees, there must be room to work outside the tree's drip line, and widths must be increased by the width of the tree's mature reach.

Also, canopy height appropriate for a fairway depends on the sequence of shots made to play the hole. It's desirable to have a tall canopy with highly pruned branching for tree placement just beyond the approach shot to the green. Trees with somewhat lower canopies may exist from 220 yards to 260 yards out, where the impact zone is typically located.

Trees within the rough are acceptable to the professional golfer, tolerated by the average player and menacing the duffer. Areas within the rough need to have turf mown higher underneath large shade trees to allow the grass more surface area for photosynthesis. Historically on seaside links, the rough areas include taller native grasses and sand dune species. Sensitive golf course architecture includes topographic contouring and shaping that allows the golf ball to be played around a tree toward the green, increasing the options of playability.

The widest variety of tree types may be planted in the out-of-play area surrounding the tee. Trees surrounding the tee should provide safety, frame the area and direct play. They are in high-focus areas on the course in close proximity to players waiting to hit their next shots. This is when shade, shape, texture and color are most apt to be noticed. Most golf courses have holes where play slows during tournaments

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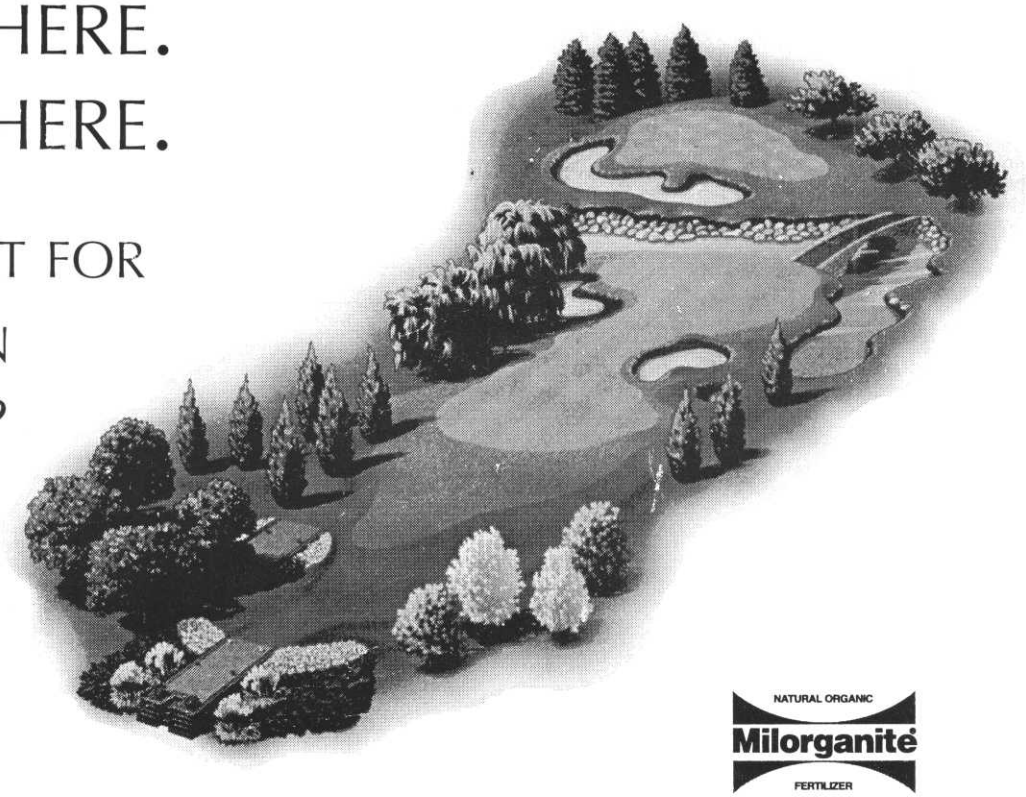

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Abies concolor	White fir
Abies fraseri	Fraser fir
Abies procera	Noble fir
Abies veitchii	Veitch fir
Cedrus atlantica 'Glauca'	Atlas blue cedar
Cedrus deodara	Cedar
Cedrus libani	Cedar of Lebanon
Chamaecyparis sp.	Cypress
Cryptomeria japonica	Japanese cryptomeria
Cunninghamia lanceolata	Common China fir
Cupressus arizonica	Arizona cypress
Cupressus sempervirens 'Glauca'	Blue Italian cypress
Fagus sylvatica sanguinea	European beech
Fagus sylvatica 'Tricolor'	Tricolor beech
Juniperus spp.	Upright junipers
Magnolia grandiflora	Southern magnolia
Picea abies	White spruce
Picea glauca 'Caerulea'	Spruce
Picea glauca 'Densata'	Black Hills spruce
Picea likiagensis purpurea	Likiagensis spruce
Picea pungens glauca	Colorado blue spruce
Pinus banksiana	Banksiana pine
Pinus densiflora	Japanese red pine
Pinus densiflora 'Umbraculifera'	Japanese umbrella pine
Pinus elliottii	Slash pine
Pinus flexilis	Pine
Pinus ponderosa	Ponderosa pine
Pinus sylvestris	Scots pine
Pinus thunbergii	Japanese black pine
Pinus strobus	Eastern white pine
Pseudotsuga menziesii	Douglas fir
Taxus baccata	Engish yew
Taxus cuspidata 'Capitata'	Japanese yew
Taxus cuspidata 'Densiformis'	Densiformis yew
Thuga occidentalis 'Techny'	Mission arborvitae
Thuga orientalis 'Aurea Nana'	Berkman's golden arborvitae
Tsuga canadensis	Canadian hemlock

Trees—

(Continued from Page 23)

or high-traffic days. A nicely landscaped tee with partial shade for players waiting to hit their balls will be appreciated.

How It Affects the Turf

Allowing the turf to receive more sunlight by removing improperly placed trees and thinning selected tree canopies improves the overall vigor of the turfgrass. Also, competition from tree roots for water and essential nutrients reduces the turf's ability to counter stress during peak play periods.

Air circulation plays a major role in turfgrass health. Turfgrass that must endure stale air is subject to common diseases that cause headaches for superintendents. Ideally (for turf health), trees shouldn't be planted closer than 60 or 70 feet from the green. Creating better air circulation is especially necessary when the green is at or near the bottom of a hill. Removing, thinning and pruning trees can improve air circulation and thus reduce the chemicals (and

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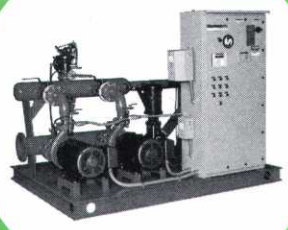

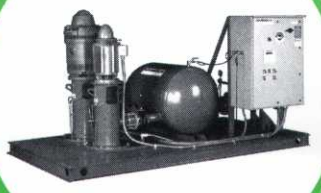

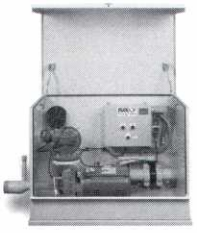

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Trees—

(Continued from Page 25)

amount of money) necessary to combat diseases. On the other hand, trees on elevated points of the golf course can create a windbreak that keeps a green from drying out too rapidly.

The golf course tee should receive about six to eight hours of sunlight daily to support healthy turf. The tee should receive morning sun to allow leaf blades to dry and afternoon shade to cool the grass and soil. Trees should be located on the west or north sides of the tee. Trees to the east and south of the tee area should be at least 50 to 60 feet away.

Planting Too Close

Trees inhibit air circulation, which leads to fungal and disease problems during the summer heat because the grass blades can't properly dry out from overnight moisture or high humidity. Problems will arise if the green doesn't receive sunlight before 10 a.m. Also, excessive heat builds in the late morning and early afternoon, when prevailing air movement is blocked by trees. More irrigation and chemicals are necessary to compensate for this lack of natural air movement.

To completely avoid such problems, trees shouldn't be planted less than 60 or 70 feet from the edge of the green. This will prevent limbs from hanging over the green, prevent feeder roots from competing with the turfgrass when the tree reaches maturity and prevent the mature tree from blocking air circulation and sunlight. Of course, few golf courses maintain this ideal distance between trees and greens.

Tree Selection by Type

It's important to select trees according to desired shape and appropriate size for the location. Improper placement of certain tree types can adversely affect playability. The best choices for areas of play are large deciduous shade trees with upright branching habits. These tree types facilitate play more than lower-branched trees by allowing adequate room to play the ball around and under the canopy.

Trees that can adversely affect play include evergreens and small ornamentals. Evergreens' density and low-branching habit can hinder playability. Evergreen trees should be planted in locations where marking boundaries or screening is either necessary or beneficial. Hanging limbs can impede the golfer's swing and clean execution of a stroke. However, there's no penalty if a player's club touches the limb of a tree. Most ornamental trees are too small and delicate to survive in areas of play. These tree types should be planted in locations well away from the centerline of play to ensure longevity.

The course should have a planting design that allows trees to grow free from the impetuous pounding of golf balls. During master planning, each

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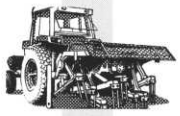

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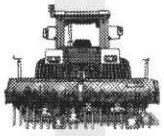

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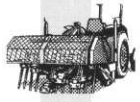

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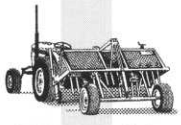

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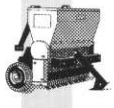

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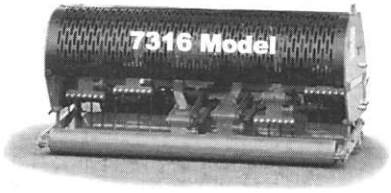

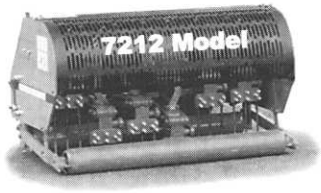

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Trees—

(Continued from Page 27)

hole should be carefully studied in terms of the angle of the tee, topography of the course, locations of greens, solar orientation and prevailing wind. The practice facility or driving range should be built at such an angle that landscape plants won't suffer damage from frequent golf-ball impact.

Basic Tree Selection

Besides obvious aesthetic value, trees should always be hardy enough for the area. Hardiness can be determined by the USDA Hardiness Zone Map of climatic variations. Local nurseries and garden centers should carry plants that will survive winters in your area.

For large-scale planting, order trees wholesale through brokers and nurseries. Your local Extension Service should have information that will verify whether a particular tree type will perform within your climate zone.

The rate of growth is particularly important. In some cases, a fast-growing species may be chosen for quick establishment to impede high wind and develop definition. These types serve a temporary function in the landscape, but because they are short-lived, they must be replaced eventually by slower-maturing varieties. The planting of slower-growing trees is more common in areas where longevity has importance. Such areas on the golf course include the high-visibility areas around the clubhouse, tees, greens and landing areas.

Shade on the Golf Course

The next time you pass a sod farm that has beautiful, dense swards of turfgrass, count the trees growing in the field. Golf course superintendents know only too well that trees with dense canopies cause too much shade and prohibit healthy turfgrass. The grass plant should receive enough sunlight to adequately photosynthesize, especially in the morning.

Trees' leaf size and composition affect the amount of light that dapples through their canopies and reaches the grass below. The ideal trees for golf courses produce filtered light, letting some degree of sunlight through its canopy.

Selection of the grass species appropriate for certain areas on the golf course is very important. Fine fescue has been a standard cool-season grass grown under shady conditions. Warm-season grasses must have a great deal of sun to thrive.

Relatively few grasses bred for shade tolerance can withstand wear. The turfgrass on the course must also withstand the stress caused by golf cars, mowing equpimenet and players. Above all, grass needs sunlight to promote healthy, vigorous roots, crowns, stolons or rhizomes for growth.

Balance is the key to success, however, since shade may be beneficial in other areas. For example, tres that produce shade in non-irrigated roughs keep the soil cooler.

How many times has a golf course superintendent left a green committee meeting after another veto of tree

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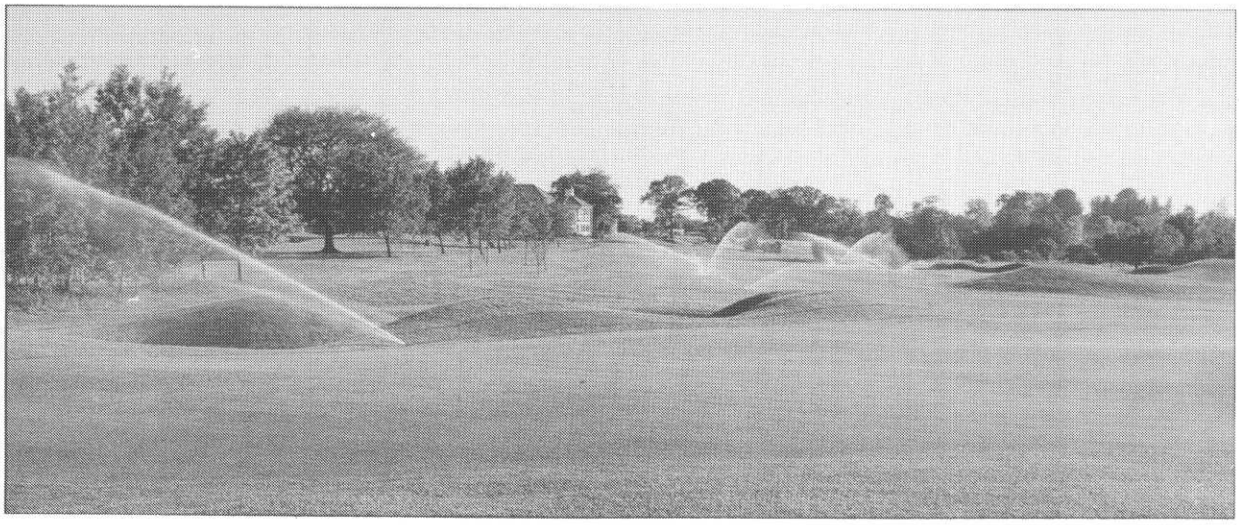

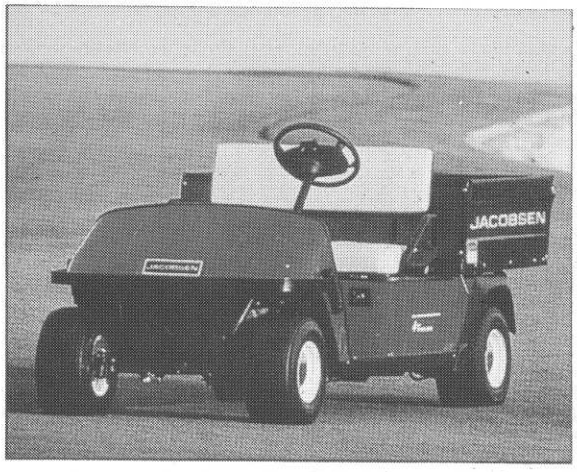

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