

A New Generation of Golf Course Weed Management

David L. Wienecke, United States Golf Association, Green Section, Southwest Region

The last several years have shown tremendous innovation and change in golf course weed management. Some highpoints of recent developments include the following:

Management of *Poa annua* encroachment on putting greens has experienced a revolution over the last several years due to the use of turf growth regulators such as Primo (trinexapac-ethyl) and Proxy (ethephon).

Kikuyugrass (*Pennisetum clandestinum*) has gone from being a noxious weed to being a highly desirable grass on many coastal influenced golf courses. In addition, the spring of 2002 brought the new registration in California of Drive (quinclorac). As a result we now have a very effective and safe selective herbicide for removing kikuyugrass from bermudagrass.

Overseeding of cool season grasses including as Roughstalk bluegrass (*Poa trivialis*) and Perennial ryegrass (*Lolium perenne*) into warm season bermudagrass (*Cynodon dactylon*) continues to present unique weed and turf management challenges for golf course managers. New research is providing us with new uses for selective herbicide especially for the sulfonyleurea herbicides.

Poa annua putting green management using turf growth regulators

Poa annua is one of the most prevalent grass species in the world. In golf course management, if the turf is fertilized and irrigated, the question is not if but when *Poa annua* encroachment will occur. Historically research focused on finding selective herbicides for managing *Poa annua* encroachment. Selective herbicide use has not proven successful due to the stressed condition of the extremely low mowed putting surface turfgrasses. Every selective herbicide attempt has resulted in phytotoxic results to all monocot species growing on the putting green. In addition the disruptive cultivation practices of vertical mowing, core aeration, and sand topdressing required for producing firm smooth putting surfaces has proven ideal for spreading *Poa annua* seeds.

Over the past 20 years many herbicides, fungicides, and even bacteria have been used with little success. Most recently ethofumesate (Prograss), mefluidide (Embark), paclobutrazol (Trimmit), endothal, and Rubigan (fenarimol) were used. With the registration in California of the turf growth regulators trinexapac-ethyl (June, 2002), and ethephon (November, 2000), the tools are now available for eliminating the texture and smoothness degradation problems of *Poa annua* encroachment and have allowed turf managers for the first time to grow the former weed grass as an outstanding turf.

Primo (trinexapac-ethyl) is a turf growth regulator (TGR) first researched as a tool for roadside bermudagrass vegetation management. While the research results were promising, it has not been used for roadside vegetation management. Historically turfgrass TGR use has focused on

labor savings achieved from reduced mowing frequency in golf course management. Trinexapac-ethyl has shown dramatic results for many turfgrasses including *Poa annua* by significantly increasing turf density and decreasing leaf texture. This combination is ideal for producing a smooth even textured putting surface thus reducing the negative effects of creeping bentgrass and *Poa annua* polystands. Frequent application at low rates (1/16 oz/1,000 square feet every two weeks or 1/8 oz/1,000 square feet every four weeks) has resulted in TGR effects lasting from two to eight weeks depending on local growing conditions.

Proxy (ethephon) is TGR that significantly reduces seed initiation and growth of the *Poa annua* plant. Application of this product eliminates a major symptom of this plants weed encroachment by eliminating putting surface irregularity caused by the seed heads. Application of ethephon at 5 oz/1,000 square feet will stop seed head initiation and development when applied prior to seedhead development and will stop development if application follows seed initiation. Seed head suppression will last from three to four weeks depending on local growing conditions.

Kikuyugrass Management

Kikuyugrass (*Pennisetum clandestinum*) once regulated as a noxious weed is now a highly desirable grass on many coastal influenced golf courses. Fine tuning management procedures to optimize kikuyugrass competitiveness including the use of manganese sulfate to manage Take All Patch disease (*Gaeumannomyces graminis* var. *avenae*), TGR such as Primo, and proper cultural procedures have resulted in good quality golf turf.

For those who want to selectively remove kikuyugrass from bermudagrass, the spring of 2002 brought the new registration in California of the dinitroaniline herbicide Drive (quinclorac). As a result we now have a very effective and safe selective herbicide for removing kikuyugrass. Results spring and summer, 2002 showed very good kikuyugrass suppression within ten days of quinclorac application and bermudagrass regrowing into kikuyugrass suppressed areas within two to four weeks of quinclorac application. Quinclorac is absorbed by the foliage and roots and translocated throughout the plant. Use of methylated seed oil adjuvant is recommended to aid in plant absorption of the herbicide.

Effective selective preemergence control of goosegrass (*Eleusine indica*) and early postemergence control of crabgrass (*Digitaria sanguinalis*) have also been shown with quinclorac. Best results are achieved by tank mixes with other dinitroaniline products for residual control such as pendimethalin (Pendulum) or prodiamine (Barricade).

Sulfonylurea Herbicides Used for Selective Grass Management

Overseeding of cool season grasses including as Roughstalk bluegrass (*Poa trivialis*) and Perennial ryegrass (*Lolium perenne*) into warm season bermudagrass (*Cynodon dactylon*) continues to present unique weed and turf management challenges for golf course managers. Recent research with sulfonylurea herbicides including TranXit (rimsulfuron), Corsair and Telar (chlorsulfuron), and Manor (metsulfuron-methyl) are providing some promise as future weed management options in overseeded golf course conditions.

Successful overseeding of golf courses requires growing two crops of turfgrass each year since the overseeded grass is a cool season species and the base grass is a warm season species. Cool autumn temperatures cause the warm season grass to go dormant thus allowing the overseeded cool season grass to be competitive during winter months. In spring and summer, many golf courses find the perennial ryegrass persists during spring and summer creating objectionable polystands and reducing bermudagrass competitive vigor throughout the summer months. Cultural practices to encourage bermudagrass competitiveness have not been successful. Research in Arizona and California is being done with sulfonylurea herbicides to provide selective removal of the perennial ryegrass.

These sulfonylurea herbicides have extremely low animal toxicity, but are highly phytotoxic to susceptible weeds at low rates. The mode of action of these herbicides is to inhibit the production of valine, leucine, and isoleucine. These amino acids are used by plants to make proteins of which many serve as enzymes that catalyze various biochemical reactions in plants. When amino acid synthesis is prevented, key enzymes are not produced and the weed slowly dies over a one to three week period. This slow phytotoxic reaction is ideal for minimizing perennial ryegrass turf death during the summer bermudagrass transition minimizing visible sign of the herbicide activity.

Experimentation is now attempting to define optimal application timing and rates for successful selective herbicidal use of these products.