UNIVERSITY OF CALIFORNIA, RIVERSIDE TURFGRASS RESEARCH PROGRAM

Better Turf Thru Agronomics

UCRTRAC Newsletter, January 2001

Herbicide Resistance in California Turf: Not Yet, But Worldwide Trends Give Warning

The appearance of herbicide resistance in plants worldwide is increasing at an exponential rate, mirroring the trends previously seen with insecticide and fungicide resistance, warned UC Riverside weed scientist **Jodie Holt** at a recent UCR conference (Fig. 1). To date, weeds commonly found in turf have not shown resistance to herbicides in California, but the turf industries must take proactive measures to prevent herbicide resistance in turf before it happens.

The first case of herbicide resistance in California was observed in the 1980s in common groundsel resistant to triazine herbicides. In the 1990s, aquatic weeds were found to be resistant to sulfonylurea herbicides. By 1999, ryegrass (*Lolium perenne*) resistant to Roundup (glyphosate) was found at UC Davis. Herbicide resistance in a population is an example of rapid weed evolution, Holt said.

Herbicides do not cause resistance, Holt said. When the same herbicide is applied repeatedly, it selects for the survival of those individuals in a population that exhibit mutations which confer resistance. Herbicide traits that contribute to resistance are long soil residual activity, single target site and specific mode of action, and high effective kill of a wide range of weed species, Holt said.

"As a turfgrass manager, one should control the selection pressure being put on weeds to reduce the chance for resistance to evolve," Holt said. She recommended mixing control techniques and learning enough about herbicide chemistry to rotate herbicides with different target sites and modes of action to reduce pressure for resistance.

If Holt's warnings about mixing control strategies are ignored and the same herbicides continue to be used repeatedly, then susceptible plants will die, but resistant ones will thrive and reproduce, increasing the population of resistance genes until herbicide resistance could one day become a significant problem in California. It has not happened yet in turf, but the warning trends worldwide are present (Fig 1). Pest control decisions today will influence the options available in the future.

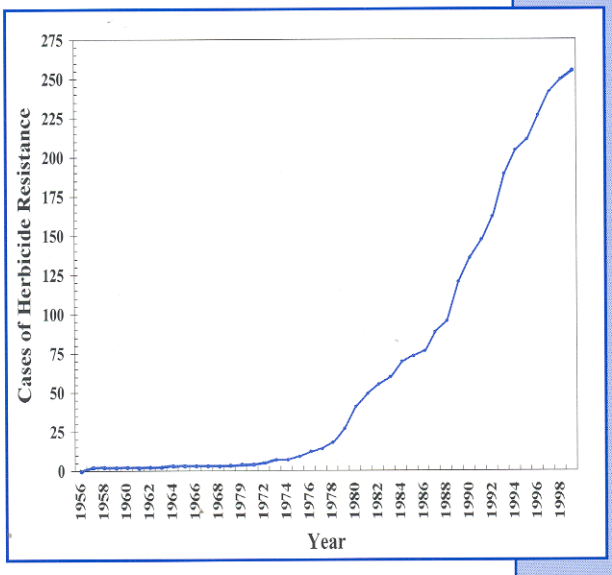


Fig. 1. Chronological increase in herbicide resistance cases worldwide by year.

May 3, 2001 — First UCRTRAC Research Golf Tournament

UCRTRAC will sponsor its first Research Golf Tournament on May 3, 2001 at the **PGA of Southern California Golf Club at Oak Valley**, 36211 Champions Drive in Calimesa. Registration begins at 7:30 a.m. The shotgun start is at 10 a.m.

The entry fee is $150 per player, which includes golf, lunch, hors-d'oeuvres, and tournament prizes. Sponsorships at several levels are also available.

The golf tournament will benefit turf research and education at the University of California, Riverside (UCR), said **Bert Spivey**, tournament chairman, golf course superintendent, Industry Hills Golf Courses, and UCRTRAC delegate representing the Golf Course Superintendents Association of Southern California (GCSASC).

For a registration form, contact the Golf Tournament Office by mail at 7100 Sunnyslope Ave., Valley Glen, CA 91405 or by phone (800-500-7282) or email, golf@turfcouncil.org. Refunds are not offered after April 27, 2001.

Since 1996 UCRTRAC has linked UCR turf researchers with industry clientele; provided resources for a turf research agronomist at UCR; published a newsletter, ***Better Turf Thru Agronomics***; and supported the educational and research needs of the Southern California turfgrass industries. Member organizations are listed on page 4.

Financial Backing and Employee Training Needed for BMP Implementation Say Turf Managers in Response to Survey

More than 300 professional turf managers, educators, consultants, and personnel involved in the turfgrass industries in Southern California participated in a two-year survey regarding the following 8 best management practices (BMPs):

- Water conservation
- Fertility program development
- Turfgrass selection
- Mowing program development
- Integrated pest management (IPM)
- Protecting water sources from chemicals
- Protecting non-target plants, animals, and humans from chemicals
- Protecting native habitats during construction and maintenance

"The more than 300 survey respondents considered BMPs to be important; however, the survey revealed the need for greater commitment by the turfgrass industry as a whole to provide the financial backing, employee training, and necessary time which has previously limited the adoption of important BMPs," said **Robert Green**, UCR Turfgrass Research Agronomist, survey designer.

Survey respondents said the single most common factor which limited their ability to adopt BMPs was cost or financial limitations (58%). About a third of the respondents said employee skill level (37%) and time (35%) were important limitations.

For analysis purposes, the "turfgrass manager" category included managers of public and private turf sites, golf courses, and sports turf facilities. Turfgrass managers, especially sports turf managers, were the most likely to be committed to the 8 BMPs listed in the survey. Sports turf managers were also more likely to consider fertility program development and protecting native habitats during construction and maintenance to be highly important.

Managers were more likely than "advisors" to consider mowing program development and protecting non-target plants, animals, and humans from chemicals highly important or to be implementing or likely to start implementing these two BMPs. (For analysis purposes, the "advisor" category included manufacturers and sales representatives of turfgrass-related products, professional consultants, horticultural advisors, and turf researchers.) Only 53% of advisors considered mowing program development to be highly important as compared to 82% of managers.

This survey, conducted by Green and Staff Research Associate **Grant Klein**, was cosponsored by UCR and the California Department of Food and Agriculture Fertilizer Research and Education Program (CDFA-FREP).

Resources for Turf Disease Diagnosis

James Downer, Extension Environmental Horticulturist, Ventura County, has compiled resources for turf disease diagnosis and management.

- The American Phytopathological Society (APS) has slide sets with excellent pictorial descriptions of various diseases. The APS offers an interactive CD program, ***Turfgrass Diseases Diagnosis and Management*** (Schumann and MacDonald, 1997) featuring pathogen lists, diagnostic keys, management recommendations, disease cycles, and turf information guides. The APS website is **http://www.scisoc.org**. The APS toll-free telephone number for publication sales, including the CD, is 1-800-328-7560.

- The internet offers other useful resources. The plant pathology guidebook page at **http://www.ifgb.uni-hannover.de/extern/ppigb/ppigb.htm** offers a comprehensive list of turf plant pathology websites. The University of California, Purdue, and North Carolina State have useful turf plant pathology web sites at **http://www.ipm.ucdavis.edu**, **http://www.btny.purdue.edu/turfcast.fcgi**, and **http://www.ces.ncsu.edu/TurfFiles/pubs/index.html**, respectively.

- Web images are not of sufficient quality for diagnostic purposes. Lists of consultants and labs in Southern California providing turf plant pathology services are available from Downer by email, ajdowner@ucdavis.edu, or on the Ventura County Cooperative Extension website, **http://ucceventura.xlrn.ucsb.edu**

Poa annua: Desired Species or Aggressive, Weedy Winter Invader

Annual bluegrass (*Poa annua*, Fig. 1) is commonly found on a wide range of turfgrass sites, including putting green turf in Southern California, but it is also one of the most widespread, invasive weeds in turf because of its aggressive growth habit. Invasion is a problem in winter months because of *Poa annua's* cool-season growth habit which outcompetes warm-season grasses, such as bermudagrass, and slower-growing cool-season grasses, such as creeping bentgrass, at this time of year.

In the cool season, annual bluegrass grows faster than other grasses, giving infested turf an undulating or irregular surface in as little as 2 days after mowing. Annual bluegrass is particularly troublesome because it can survive low mowing heights and still reseed.

Unsightly seed heads of annual bluegrass reduce the aesthetic quality of a turf sward intended for another species. Once a few plants become established, spread can be rapid because of prolific, rapid seed production. Seeds are spread by mowing, foot traffic, birds, and cultivation. As a weedy invader, *Poa annua* can form a weak sod that provides poor footing for golf courses and athletic fields.

Management of Unwanted *Poa annua*

No single control procedure is successful in controlling annual bluegrass in turf. Early removal of solitary infestations is effective if practiced diligently. Removal of grass clippings can help to reduce the number of weed seed that contact the soil.

Overwatering in shady areas will predispose a turf to annual bluegrass invasion. Deep, infrequent irrigations are preferred. Avoid fertilization, cultivation, and aerification programs during the peak of annual bluegrass germination.

HERBICIDES. **Pest Notes**, a University of California Division of Agriculture and Natural Resources integrated pest management publication on the Internet at http://www.ipm.ucdavis.edu, summarizes the pre- and postemergent herbicides available in California for annual bluegrass control (**Pest Notes, Annual Bluegrass**, August 1999, by **Dave Cudney** and **Clyde Elmore**, Extension Weed Specialists at Riverside and Davis, respectively; and **Vic Gibeault**, Extension Environmental Horticulturist).

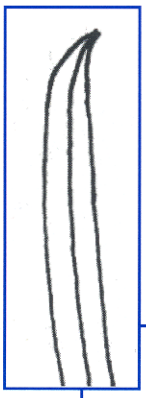


Fig. 1. Annual bluegrass has "boat-shaped" leaf tips that curve up like the bow of a boat, a distinguishing characteristic of the Poa genus.

When the perennial type is a large component of the bluegrass population (see box at right for identification and life cycle), preemergent herbicides will be of little or no benefit. If the annual type predominates, preemergent herbicides should be applied in late summer or early fall when soil temperature drops below 70°F. Postemergent herbicides can limit growth of annual bluegrass but have been of little benefit when used as the sole method of control. See **Pest Notes** for specific chemicals.

RENOVATION. Annual bluegrass infestations can become so severe that complete renovation is necessary. Planting and establishment of the desired species should occur during late spring and summer so that a solid cover of new turf is obtained before the annual bluegrass germination period (see life cycle box at right).

Identification and Life Cycle of *Poa annua*

Annual bluegrass is a misnomer because there are numerous plant types of annual bluegrass that range from a true annual (*P. annua* var. *annua*), which produces more seed and is more upright in its growth habit, to a true perennial type (*P. annua* var. *reptans*), which is lower-growing and more compact.

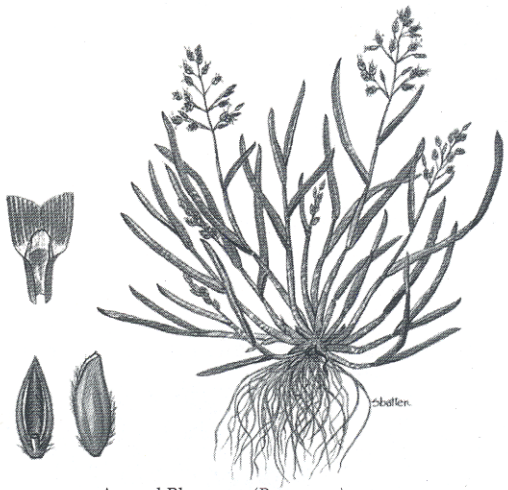
Depending on the site, one type may be predominant or a mixture of various types may occur. The perennial type is favored in golf course greens. The annual type tends to produce a higher percentage of dormant seed.

Annual bluegrass starts germinating as soon as soil temperatures drop below 70°F in late summer or early fall and continues to germinate throughout the winter,with several flushes of growth.

Each plant of the annual form of annual bluegrass can produce about 100 seeds in as few as 8 weeks. Viable seed can be produced in as little as 24 hr after pollination, which allows the plant to reseed, even in frequently mowed turf. The seed is amber in color and about 1/16 inch in length.

Annual bluegrass has a fairly weak, shallow root system and needs available moisture from rainfall or frequent irrigation to survive. It grows well in moist areas in full sun but can also do well in semi-shaded conditions and in compacted soil.

In coastal regions or in areas with moderate temperatures, where turf is irrigated frequently, annual bluegrass can persist all year. In hot areas, such as the Coachella Valley, it usually dies in summer months, especially if stressed for moisture.



Annual Bluegrass (*Poa annua*)
Illustration by Steve Batten Used by permission
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Topdressing Compost on Turf Improves Turf Quality, Reduces Weeds

Consistently higher turfgrass quality ratings and lower weed populations were observed with one-fourth inch compost topdressed quarterly on municipal turf say University of California researchers who recently completed a three-year field study to evaluate the efficacy of composted green waste as a topdressing for bermudagrass turf on school grounds, golf courses, community recreation fields, and parks.

Thousands of tons of compost are available from the green waste pick-up programs implemented by municipalities all across the state to comply with the solid waste reduction requirements of AB 939, California's Integrated Waste Management Act. The Act mandates a 50 percent reduction in solid waste that each county and city send to landfills by the end of this year, using 1990 as the base year, and further specifies that the solid waste reduction be accomplished by (i) composting, (ii) recycling, and (iii) source reduction.

The goal was to compare compost topdressing with conventional fertilizer applications, determine optimum depth and timing of compost applications, and evaluate the benefits and risks of compost topdressing from cultural and financial perspectives. The project was conducted by **Michelle Le Strange**, UC Cooperative Extension Farm Advisor for Tulare and Kings Counties, and **Pamela Geisel**, UC Cooperative Extension Environmental Horticulture Advisor, Fresno County.

At the compost topdressing rate of one inch on an annual basis, applied quarterly, turf quality and color ratings were excellent (Fig. 1). The 1/4 inch compost application topdressed quarterly was equal to 8 lb N/1000 ft^2/yr.

The one-inch compost treatments averaged half the number of weeds compared to all other treatments over the three-year period with major reductions in crabgrass in summer.

Thatch did not develop as a result of compost applications, but a high clipping yield occurred, and a layer of organic matter accumulated in the soil profile, which resulted in an undesired mounding effect.

"In future research, we will determine if it is optimal to topdress with 1/4 inch compost only two or three times a year, rather than quarterly. Based on the results of this three-year study, we would expect reducing application frequency would lower costs and decrease clipping yields, yet still provide the same positive cultural effect on bermudagrass turf. We are also interested in decreasing the excess layer of organic matter that gave rise to the undesirable mounding effect," they said.

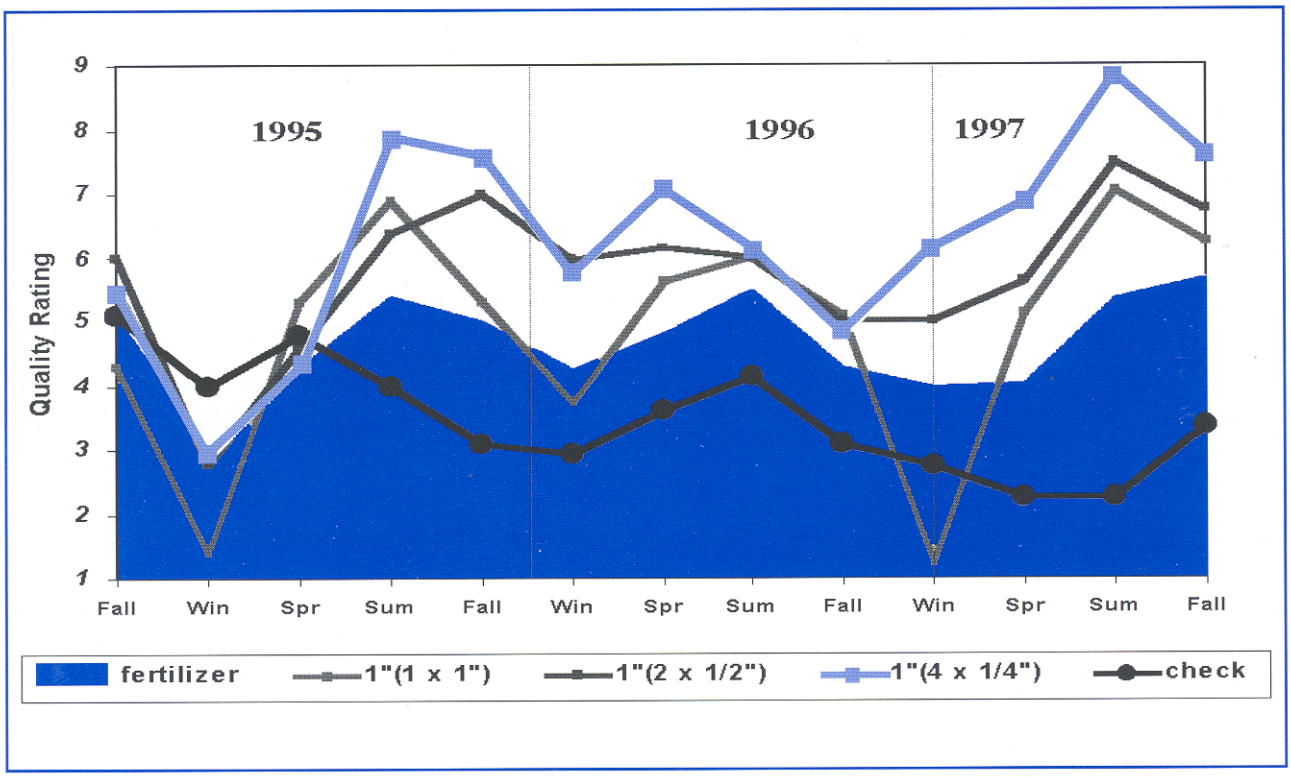

Fig. 1. Effect of compost topdressing treatments on turf quality ratings.

Better Turf Thru Agronomics is prepared for the delegates and membership of the University of California, Riverside Turfgrass Research Advisory Committee (UCRTRAC). Member organizations are the Southern California Golf Association; California Golf Course Superintendents Association (GCSA); GCSA of Southern California; San Diego GCSA; Hi-Lo Desert GCSA; California Sod Producers Association; Southern California Section, Professional Golfers' Association; Southern California Turfgrass Council; Southern California Turfgrass Foundation; United States Golf Association; and UCR. The intent is to present summaries of turfgrass research results and topical information of interest to the Southern California turfgrass industries. The newsletter is written by Deborah Silva and edited by Dr. Vic Gibeault, Extension Environmental Horticulturist, and Dr. Robert Green,UCR Turfgrass Research Agronomist, and designed by Jack Van Hise, UCR Printing and Reprographics.