University of California, Riverside Turfgrass Research Program

Better Turf Thru Agronomics

UCRTRAC Newsletter, April 2001

Management Study of Annual Bluegrass Putting Greens Yields Beneficial Results

Preliminary results from the first GCSAA Chapter Cooperative Research Program in California on management of annual bluegrass putting greens have shown that the better nitrogen (N) and potassium (K) fertilization rates, in terms of turf performance, are 6.5 lb N/1000 ft^2/yr and 4.0 lb K_2O/1000 ft^2/yr, respectively.

The field phase of this three-year study, conducted on an in-use annual bluegrass practice putting green constructed to USGA specifications at Industry Hills Golf Courses, City of Industry, was concluded in October 2000.

"We found that fertilizer applications of nitrogen, phosphorus, and potassium in the approximate ratio of 3:1:2, equating to 6.5 lb N:2.0 lb P_2O_5:4.0 lb K_2O/1000 ft^2/yr provided good annual bluegrass performance on this practice putting green, which was constructed on a modified sand root zone, said **Robert Green**, UCR Turfgrass Research Agronomist.

Nitrogen (N). The N rate of 6.5 lb may be considered a high level, Green said. Rates higher than 6.5 lb N can stress the grass and have negative consequences for turf performance, as illustrated herein.

"The excessive N fertilization rate of 11.5 lb N/1000 ft^2/yr resulted in an expended, unhealthy grass that grew its shoots out to the detriment of its overall health: Visual quality of the turf was significantly reduced, particularly in the summer (Fig. 1); percent coverage of seedheads significantly increased (Fig. 2); root mass density decreased (Fig. 3); and puffiness and mottling significantly increased (Fig. 4)," Green said.

Figures are presented on pages 4 and 5 in this issue. Not shown in the figures is the fact that the higher N rate also caused more wilting and rolling during the summer.

The effluent water used to irrigate the putting green at Industry Hills contributed about 1.5 lb N/1000 ft^2/yr, Green said. Nitrogen treatments reported in Figures 1 through 4 are the sum of the N supplied by the effluent irrigation water added to the applied rates, 5.0 lb N/1000 ft^2/yr and 10.0 lb N/1000 ft^2/yr, respectively, which together equal a total of 6.5 lb N/1000 ft^2/yr and 11.5 lb N/1000 ft^2/yr, he said.

The N fertilization rate of 6.5 lb may need to be adjusted up or down for other golf courses, depending on putting green conditions, such as soil type, infiltration rates, salinity and leaching requirements, amount of rainfall, rounds of golf, N application schedule, N source, and iron (Fe) applications, Green said.

"Research is needed to define the minimum annual N rate in terms of annual bluegrass performance during the warm and cool season and total N content in clippings," Green said.

Please see **PUTTING GREEN MANAGEMENT**, *page 4*

UCRTRAC Participates in National On-Site Test on Overseeded Bermudagrass Fairways

Jointly sponsored, on-site turf performance evaluations are a new strategy to address end-user needs.

Robert Green, UCR Turfgrass Research Agronomist, is participating in the first coordinated effort to evaluate turfgrass varieties, blends, and mixtures under actual golf course conditions in the United States. Green has completed the first year of a two-year study to test the on-site performance of 42 overseed grasses for bermudagrass fairways in Southern California (Table 1, page 3).

The UCRTRAC study is part of the National Turfgrass Evaluation Program's (NTEP) On-site Overseeding of Bermudagrass Fairways Test. The two-year study is sponsored jointly by the NTEP, the U.S. Golf Association (USGA), and the Golf Course Superintendents Association of America (GCSAA).

Nationwide first-year results (collected fall 1999-spring 2000) from this study are available on the NTEP website **(www.ntep.org/onsite/ost.htm)** and in NTEP Report No. 00-13. Summarized results for Palm Desert by Green and his colleagues are reported in Table 1 on page 3.

Superintendents have long asked for information that bridged the gap between small-plot university trials and their end-use needs, Green said. Although on-site cultivar testing is not a new concept, joint sponsorship of on-site tests on fairways is new.

The UCRTRAC study at Mountain Vista Golf Course in Palm Desert is one of 10 projects nationwide on in-use bermudagrass fairways in the southern tier of the U.S. where overseeding is a common practice.

"Millions of pounds of seed are bought and sown each autumn on golf courses in this region. Golf course owners, managers, and superintendents seek grasses that establish quickly, exhibit exceptional playability, are aesthetically pleasing and require less inputs," writes NTEP in its progress report.

Grasses that have superior drought, cold, heat, disease, and insect resistance must be identified.

Information gleaned from the two years of on-site testing will be valuable to plant breeders, researchers, extension educators, USGA agronomists, golf course architects, and superintendents who need to select the best adapted turfgrasses for overseeding bermudagrass fairways for a particular regional climate, Green said.

In addition to the UCRTRAC trial location at Mountain Vista Golf Course in Palm Desert, the other 9 research sites are at golf courses in Tucson, AZ; Orlando, FL; Atlanta, GA; Charlottesville, VA; Starkville, MS; Myrtle Beach, SC; Garland (Dallas), TX; The Woodlands (Houston), TX; and Crescent (St. Louis), MO.

Trials are intended to receive real-world golf course conditions and stresses, NTEP said. They are maintained by each golf course superintendent in consultation with the research cooperator using management procedures common to that golf course and the geographical region.

UCRTRAC's Green and other research cooperators collected data on establishment rate (4-6 wk after seeding), turfgrass quality, genetic color, percent cover of bermuda and overseeding grass, rate (speed) of transition from bermuda to the

Please see **OVERSEEDING**, *page 3*

UCRTRAC Leads One of NTEP's On-Site Putting Green Trials

In December 2001, **Robert Green**, UCR Turfgrass Research Agronomist, and **John Martinez**, Superintendent, Southern California Golf Association (SCGA) Members' Club in Murrieta, will complete their five-year study evaluating bentgrass and bermudagrass cultivars for putting greens.

Their research is part of the National Turfgrass Evaluation Program's (NTEP) on-site performance study of 18 bentgrasses and 7 bermudagrasses for putting greens at 16 locations nationwide.

"Our members have been putting on live research since 1997," said **Thomas Pinch**, General Manager, SCGA Members' Club in Murrieta. The on-site research greens, located between the club's grill room and the ninth green, are in regular use as practice putting greens, providing applied scientific results.

We are managing and maintaining the research site so that reliable data can be collected, Martinez said.

The UCRTRAC research is one of 5 NTEP studies in transitional zones where both species (bentgrasses and bermudagrasses) are being evaluated. The study is sponsored jointly by the NTEP, the U.S. Golf Association (USGA), and the Golf Course Superintendents Association of America (GCSAA).

Green and Martinez also cooperate with **Pat Gross**, Southwest Region Director, USGA Green Section.

Interim nationwide results for 1998 and 1999 are published in NTEP reports and on their website, **(www.ntep.org/onsite/ost.htm)** Results for 2000 are in press. Final results for the UCRTRAC study will be reported in an upcoming issue of ***Better Turf Thru Agronomics***, the official newsletter of UCRTRAC, and in NTEP reports.

Table 1. Mean Visual Turfgrass Quality Ratings on an Overseeded Bermudagrass Fairway, 1999-2000

Overseed Treatment	Species[y]	Turgrass Quality[z] Palm Desert[x] California	Nationwide[w]
Professional's Select	PRb	7.3[v]	6.3
Tourstar	PRb	7.2	6.3
Charger II	PR	7.3	6.2
Leaderboard	PRb	7.1	6.2
Mt. View Blend [2]	PRb	7.0	6.2
Fiesta [3]	PR	6.9	6.2
Cebeco Blend 1	PRb	7.3	6.1
Seville II	PR	7.3	6.1
Paragon	PR	7.2	6.1
Barlennium	PR	7.1	6.1
First Cut	IR	7.0	6.1
Elfkin	PR	7.3	6.0
Brightstar II	PR	7.2	6.0
Marvelgreen Supreme	PRb	7.2	6.0
MED-007	PRb	7.1	6.0
LS-DE1	PR	7.0	6.0
Mt. View Blend 1	PRb	7.0	6.0
Pirouette	PR	7.0	6.0
Phantom	PR	7.0	6.0
Charger	PR	6.9	6.0
Essence	PR	6.9	6.0
Marvelgreen + Laser	PRb/*PT*	6.8	6.0
Allsport	PR	6.6	6.0
Citation III + Winterstar	PR/*PT*	6.5	6.0
Mt. View Blend 3	PRb	6.9	5.9
Prime	PRb	6.9	5.9
Brightstar II + Winterplay	PR/*PT*	6.6	5.9
Top Hat	PR	7.2	5.8
Citation III	PR	7.0	5.8
MP58	PR	6.7	5.8
Future 2500	PR/*IR*	6.5	5.8
Capri	PR	6.5	5.7
Pick HR A-97	IR	5.9	5.7
PST-3BK-99	PR	6.7	5.6
MP111	PR	6.1	5.5
Transist	IR	5.8	5.5
Proam	*PT*	5.4	5.4
Sabre	*PT*	5.2	5.3
Snowbird	*PT*	5.1	5.3
Bariviera	*PT*	5.0	5.1
Winterplay	*PT*	4.6	5.1
ABT-99-3.268	AR	3.9	5.1
LSD, *P*=0.05		0.5	--
Mean		6.6	5.9

[z]Scale is 1-9 with 1=worst and 9=best quality. [y]PR=perennial ryegrass, PRb=perennial ryegrass blend, IR=intermediate ryegrass, AR=annual ryegrass, PT = Poa trivialis. [x]The study was seeded 1 October 1999 at Mountain Vista Golf Course. Each of the 42 overseed treatments had three 5.0 x 20.0-ft replicate plots. See text of article for details. [w]All 10 research sites nationwide. See article for details. [v]Mean separation by Fisher's protected LSD. To determine statistical differences among entries, subtract one entry's mean from another entry's mean. Statistical differences occur when this value is larger than the corresponding LSD value.

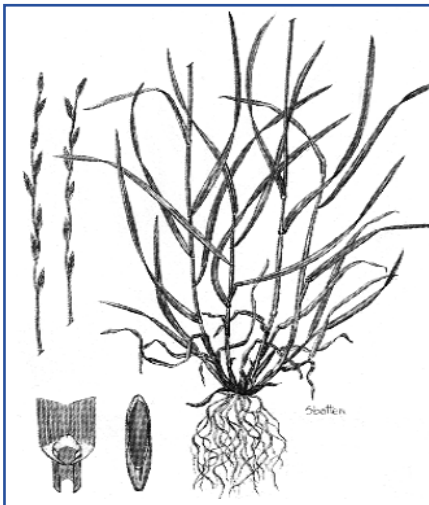
OVERSEEDING,
continued from page 2

overseeded grass in the fall and back again in the spring, among other parameters.

"Having a smooth transition from the bermudagrass entering dormancy and the overseeding grass 'taking over' in fall and then having the bermudagrass become dominant again in late spring/summer is the challenge of superintendents that overseed. Proper management practices are very important and varying weather patterns from year-to-year affect the quality of transition, but also choosing the proper overseeding variety, blend, or mixture, is essential for success," according to NTEP.

NTEP advises cautious use of the results reported in Table 1 and on its website. First-year data must be interpreted judiciously, and all studies should be repeated for accuracy, NTEP says. The 1999-2000 study is being repeated in Palm Desert and nationwide. All entries were reseeded last fall at the same golf courses with the same seed lot to ensure uniformity. Data collected from 1999-2000 will be compared with the data to be collected later this year.

Green is cooperating with **Nancy Dickens**, Superintendent, Mountain Vista Golf Course; **Mike Henry**, Environmental Horticulture Advisor, UC Cooperative Extension, Riverside and Orange Counties; **Jeff Place**, College of the Desert, Palm Desert; and UCR staff research associates **Grant Klein** and **Bill Richie.**



Perennial Ryegrass (Lolium perenne L.)
Illustration by Steve Batten
Previously published in a Par Ex brochure
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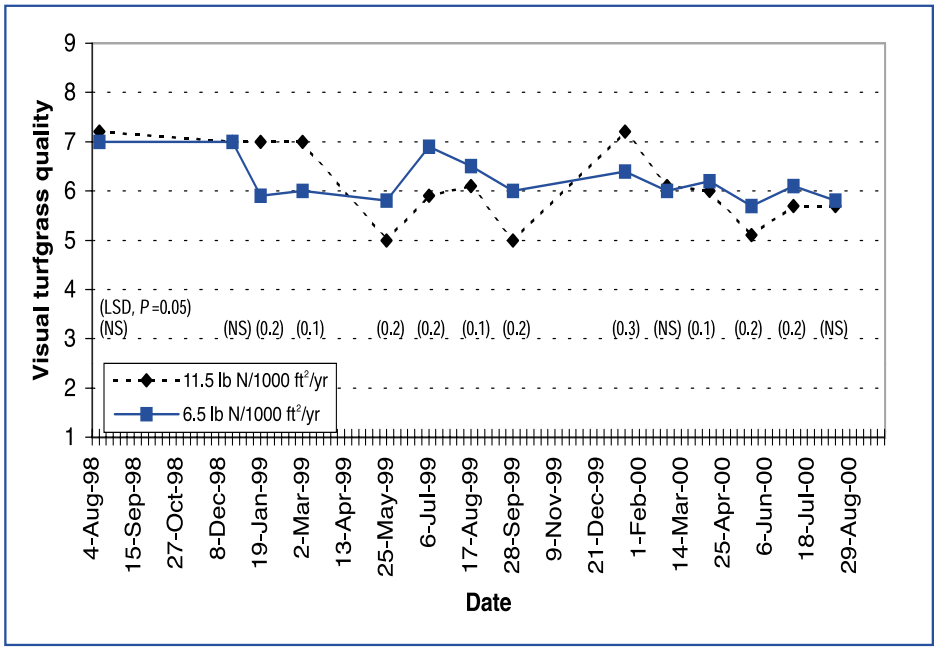


Fig. 1

Effect of N treatments on turfgrass visual quality on an annual bluegrass putting green.
(Rating scale is 1 to 9 with 1 = worst, 5 = minimally acceptable, and 9 = best quality. Mean comparisons were conducted by a Fishers protected LSD test. Note: Nitrogen treatments were the sum of the applied rates, 5.0 lb N/1000 ft²/yr and 10.0 lb N/1000 ft²/yr, respectively, added to the N supplied by the effluent irrigation water, 1.5 lb N/1000 ft²/yr. Cultivation, K, and Fe treatments basically did not affect visual turfgrass quality.)

PUTTING GREEN MANAGEMENT, *continued from page 1*

Potassium (K). "Whether we used 4 lb or 12 lb K_2O, we found no difference in turf performance in cool and warm seasons. At the higher rate of 12 lb K_2O, more K was found in turf tissues, but performance, visual turf quality, and color did not improve," Green said.

Because many superintendents apply higher rates of K to increase stress resistance, Green and his colleagues wondered if higher rates of K would yield a positive effect on performance. Above 4 lb, they did not.

"Our data are in spite of the fact that the low K treatment resulted in relatively low exchangeable K levels in the soil; average exchangeable K levels in the soil for three sampling dates in 1999 and 2000 were 105 and 59 parts per million (ppm) for the high and low K treatments, respectively," Green said.

Potassium treatments also did not affect shoot and root mass densities, percent coverage of seedheads, mottling/puffiness, and wilting and rolling during the summer.

Iron (Fe). "When a successful Fe fertilization program is used to improve visual turfgrass color, N fertilization rates can be reduced. Not irrigating after a $FeSO_4$ application maximized foliar Fe absorption," Green said. Foliar applications of 2 oz $FeSO_4$/1000 ft²/3 wk provided an increase in visual turfgrass color, he said.

"An application of $FeSO_4$ every 2 weeks would provide additional color improvement because our observations indicate the turfgrass color response to $FeSO_4$ lasts for about 2 weeks," Green said.

Iron treatments did not affect visual turfgrass quality, shoot and root mass densities, percent coverage of seedheads, mottling/puffiness, and wilting and rolling during the summer.

Summer Cultivation.
"The summer cultivation treatment significantly reduced leaf wilting and rolling during two of the four rating dates, which may be related to our previous findings. In an earlier study on the same site, summer cultivation treatments significantly increased soil water infiltration rates and lowered soil electrical conductivity compared to check plots," Green said. (Please see the April 1999 issue of ***Better Turf Thru Agronomics*** (page 2) for a summary of the results of the prior study.)

Summer cultivation treatments in this study and in the prior study basically did not affect root mass density: Rooting was neither harmed nor enhanced.

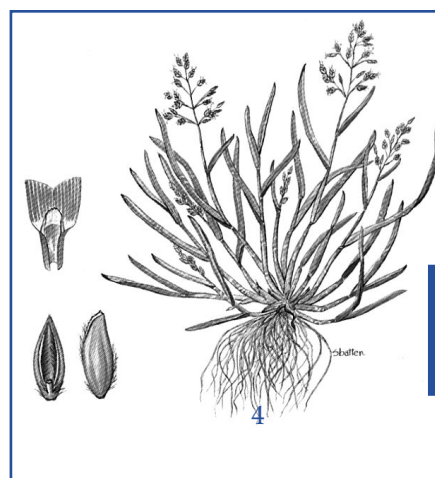
"I was encouraged by the rooting results because the roots were not harmed in either study, despite the summer cultivation treatments, which allowed for increasing water infiltration and reducing salinity," Green said.

Cultivation did not affect visual quality, color, percent coverage of seedheads and mottling/puffiness, he said.

Other measurements included clipping yields (shoot growth) and clipping nutrient analysis. Clippings were analyzed for key nutrients once every 6 weeks using standard laboratory and near infrared reflectance spectroscopy (NIRS) methodologies, Green said. The higher rate of N fertilization increased clipping yields, as was expected. The K and Fe treatments did not affect clipping yield.

Green's cooperators included **Bert Spivey**, Superintendent, Industry Hills Golf Courses; **Grant Klein** and **Bill Richie**, UCR staff research associates; **Janet Hartin**, UC Cooperative Extension Environmental Horticulture Advisor, Los Angeles and San Bernardino Counties; **Van Cline**, The Toro Company; and **Vic Gibeault**, UCR Extension Environmental Horticulturist.

The Golf Course Superintendents Association of America (GCSAA) Foundation matched resources with the California Golf Course Superintendents Association (CGCSA) to underwrite the three-year UCRTRAC study. The CGCSA is composed of six chapters (Hi-Lo Desert; Southern; Northern; and Central California; San Diego; and Sierra Nevada), which all contributed to this study.



Annual Bluegrass (Poa annua)
Illustration by Steve Batten
Previously published in a Par Ex brochure
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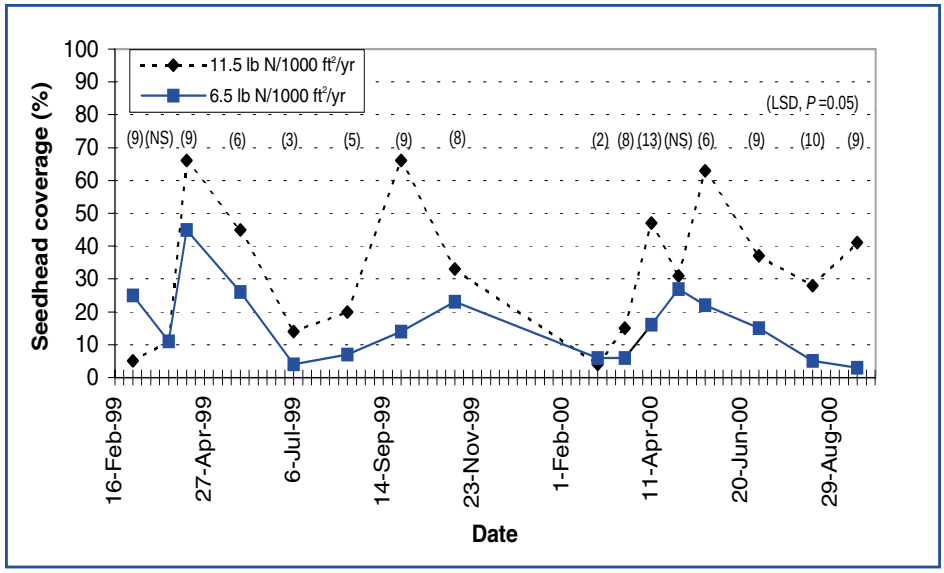

Fig. 2.

Effect of N treatments on percent seedhead coverage on an annual bluegrass putting green.

(Mean comparisons were conducted by a Fishers protected LSD test. Nitrogen treatments were the sum of the applied rates, 5.0 lb N/1000 ft^2/yr and 10.0 lb N/1000 ft^2/yr, respectively, added to the N supplied by the effluent irrigation water, 1.5 lb N/1000 ft^2/yr. Cultivation, K, and Fe treatments basically did not affect percent coverage of seedheads.)

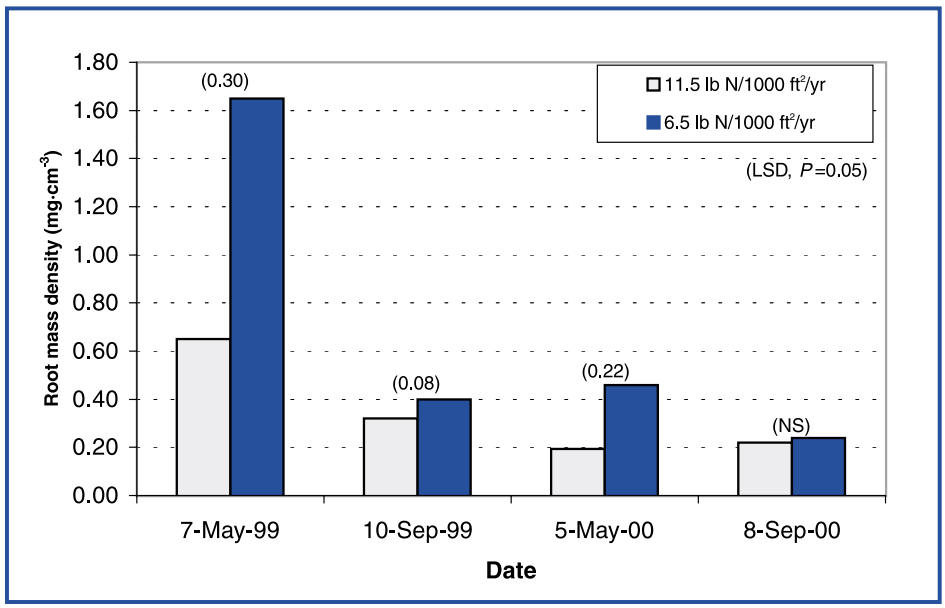

Fig. 3.

Effect of N treatments on root mass density on an annual bluegrass putting green.

(Mean comparisons were conducted by a Fishers protected LSD test. Nitrogen treatments were the sum of the applied rates, 5.0 lb N/1000 ft2/yr and 10.0 lb N/1000 ft2/yr, respectively, added to the N supplied by the effluent irrigation water, 1.5 lb N/1000 ft2/yr. Potassium and Fe treatments basically did not affect root mass density.)

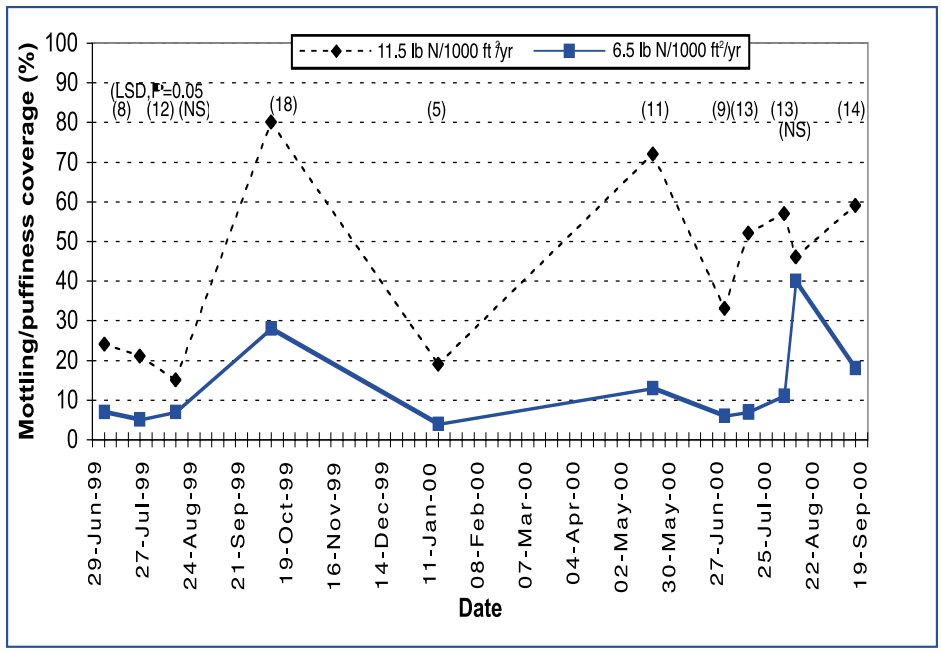

Fig. 4.

Effect of N treatments on percent coverage of mottling/puffiness on an annual bluegrass putting green.

(Mean comparisons were conducted by a Fishers protected LSD test. Nitrogen treatments were the sum of the applied rates, 5.0 lb N/1000 ft^2/yr and 10.0 lb N/1000 ft^2/yr, respectively, added to the N supplied by the effluent irrigation water, 1.5 lb N/1000 ft^2/yr. Cultivation, K, and Fe treatments basically did not affect percent coverage of mottling/puffiness.)

UCRTRAC 2000 Annual Research Summary Report

The UCRTRAC Annual Research Summary Report for 2000 is available now. The projects included are summarized in Table 1. **Robert Green**, UCR Turfgrass Research Agronomist, is a principal investigator on all 14 UCRTRAC research projects listed.

UCRTRAC member organizations (see the blue box at the bottom of this page) support research to improve turf performance; preserve the environment; increase the efficient use of inputs; develop unbiased information on cultivars and products; decrease operating costs; and stay abreast of innovation. UCRTRAC periodically disseminates special reports on issues of interest to the green industries.

The Annual Report apprises UCRTRAC member organizations and clientele of progress on UCRTRAC research studies in a brief format. More detailed information is disseminated in other venues. Depending on the nature of the study, some research projects are completed when a final report is prepared; others are completed when a technical article is submitted to a scientific journal, Green said. Regarding research information flow to the turfgrass industries, popular and semitechnical articles are prepared for trade journals when results are newsworthy, he said.

"Support from the UCRTRAC member organizations continues to provide new growth opportunities for the Turfgrass Research Program at UCR. ***Better Turf Thru Agronomics***, the UCRTRAC newsletter, has broadened communication about turf research projects and issues of interest with clientele, government agencies, UC researchers, Extension specialists, and farm advisors," said **Vic Gibeault**, Extension Environmental Horticulturist and UCRTRAC delegate.

A printed copy of the 2000 Annual Research Summary Report can be obtained by calling Robert Green at (909) 787-2107.

Table 1. Research Projects in the 2000 UCRTRAC Annual Research Summary Report

I. Two UCRTRAC Research Projects Completed and Final Report or Technical Article Prepared in 2000

The Evaluation of Slow-Release N Fertilizers Applied on Arizona Common Bermudagrass during the Warm Season ● ■

The Effect of Fall Renovation Treatments on PM_{10} Emissions during Raking of Debris following Scalping of Common Bermudagrass Fairways prior to Overseeding ● ■

II. Four UCRTRAC Research Projects Completed and Preparation of Technical Article Planned

Improvement of the Spring Transition of Overseeded Bermudagrass Putting Greens in the Coachella Valley ●

Influence of Primo on the Water Stress Relations of Tall Fescue during the Warm Season ■ ●

Nitrogen Leaching and Best Management Practices for Overseeded Bermudagrass Fairways ● ■

Characterization of Markers for Leaf Firing Resistance among Turf-Type Bermudagrasses ■ ●

III. Six UCRTRAC Research Projects In Progress in 2000

The Development of Irrigation and N Fertilization Programs on Tall Fescue to Facilitate Irrigation-Water Savings and Fertilizer-Use Efficiency ■

Management of Annual Bluegrass Putting Greens in California ●

GCSAA, USGA, and NTEP On-Site Testing Program for Bentgrass and Bermudagrass Cultivars on USGA Specification Golf Course Putting Greens ●

GCSAA, USGA, and NTEP On-Site Testing of Grasses for Overseeding of Bermudagrass Fairways ● ■

Further Evaluation and Modeling of Pesticide Partitioning Data from the UCR Putting Green Lysimeters ● ■

The Effect of endoROOTS and ROOTS 2 on Creeping Bentgrass Establishment and Maintenance on a Newly Constructed Sand Rootzone ● ■

IV. Two New UCRTRAC Research Projects on the Books

BMP 5 Implementation Training Workshops ■ ●

Evaluation of Drought Resistance among Tall Fescue Cultivars in the 2001 NTEP Tall Fescue Test ■ ●

● Golf Course Turfgrass ■ General Turfgrass and Sod Production

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.