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University of Kentucky research demonstrates that the most successful strategy to convert perennial ryegrass fairways to seeded bermudagrass requires the use of glyphosate.

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PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 215 projects at a cost of $21 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf***.

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Renovation of Perennial Ryegrass Fairways with Seeded Bermudagrasses

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SUMMARY

Research was conducted at the University of Kentucky to investigate renovation of perennial ryegrass fairways to seeded bermudagrass. Their findings include:

- Renovation from perennial ryegrass to seeded-bermudagrass was most successful using glyphosate.
- Pronamide also provided for significantly more bermudagrass transition compared to the untreated control, but significantly less than glyphosate.
- None of the plant growth regulators tested resulted in significant transition to seeded bermudagrass.
- Timing of seeding after chemical applications was not a factor in bermudagrass transition.
- 'Yukon' bermudagrass survived Kentucky winters significantly better than 'Mirage' under the conditions of this study.

Perennial ryegrass (*Lolium perenne*) is a popular choice for golf course fairways in the transition zone. There are many cultivars of perennial ryegrass that exhibit excellent turf quality. Perennial ryegrass provides dark green color, high shoot densities, acceptable heat and drought tolerance, and is well adapted to low mowing heights.

Fungal diseases may cause major problems with perennial ryegrass. Perennial ryegrass is highly susceptible to brown patch (*Rhizoctonia solani*), pythium (*Pythium spp.*), and gray leaf spot (*Pyricularia grisea*). Each of these diseases can cause great damage to perennial ryegrass fairways and may require regular fungicide treatments.

Bermudagrass (*Cynodon dactylon* and hybrids) is also a desirable species for low maintenance fairways in the transition zone due mainly to reduced pest problems. Bermudagrass is at the peak of its growth during the peak of the golf season. Bermudagrass also allows cost-efficient and effective weed control strategies due to winter dormancy.

Much progress has been made improving turf quality and cold-temperature hardiness of seeded bermudagrass, and using seeded bermudagrass has become a viable option for transition zone turf managers wishing to renovate perennial ryegrass fairways. However, the best methods of renovating existing perennial ryegrass fairways with seeded bermudagrass have not been investigated.

Renovation of turf often requires application of herbicides to reduce or remove competition, thus allowing new seedlings to become established. Roundup (glyphosate) for this pur-

Survival of Yukon bermudagrass in glyphosate treated plots in the spring following the first year of the study.

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Chemical name	Formulation	Rate (oz product/1000 ft^2)
Roundup (glyphosate)	4SC	1.10
Kerb (pronamide)	50WP	0.75
Primo (trinexapac-ethyl)	1.5SC	0.50
Proxy (ethephon)	2SL	5.0
Trimmit (paclobutrazol)	2SC	0.75
Cutless (flurprimidol)	50WP	0.55
Control: no chemicals applied.		

Table 1. Chemical treatments, formulations, and rates of products applied per 1000 ft^2 in experiments to renovate perennial ryegrass fairways to seeded bermudagrass.

pose is very desirable for two reasons. The effects of glyphosate are generally not visible until five to seven days after application, allowing time for overseeded seed to germinate before the effects of glyphosate become apparent. Secondly, glyphosate applications have little effect on germination or establishment, even when seeded soon after application.

Kerb (pronamide) is often used to selectively remove perennial ryegrass from existing stands of bermudagrass following winter overseeding. However, pronamide is known to persist in soils for long periods of time and may have detrimental effects on seedling bermudagrass. As with glyphosate, however, the effects of pronamide on perennial ryegrass are not immediately visible, and could allow bermudagrass germination and establishment before perennial ryegrass color and playability becomes unacceptable.

Seedling bermudgrass emerging from vertical mowing slits in glyposate-treated plots.

Several plant growth regulators are known to have activity on perennial ryegrass. Application of these products may reduce competition from perennial ryegrass during bermudagrass germination and establishment. It is important to test a range of plant growth regulators as they have different modes of action and sites of entry into plant tissues.

Field Experiments

This project was designed to test chemical treatments to enhance establishment of seeded bermudagrass in existing perennial ryegrass fairway turf. The timing of seeding for successful renovation following chemical treatments also was evaluated. Experiments were conducted at the University of Kentucky's Agricultural Experiment Station in Lexington. The experiments began in 2000 and were repeated in 2001.

Existing stands of mature perennial ryegrass maintained at 5/8-inch were used. Cultivars of seeded bermudagrass included 'Mirage' and 'Yukon'. Chemical treatments consisted of the herbicides Roundup (glyphosate) and Kerb (pronamide), and well as the plant growth regulators Primo (trinexapac-ethyl), Proxy (ethephon), Trimmit (paclobutrazol), and Cutless (flurprimidol) applied at label rates along with an untreated control (Table 1).

		% Bermuda cover									
Chemical	DAA*	26 Jun	6 Jul	17 Jul	25 Jul	1 Aug	9 Aug	17 Aug	22 Aug	1 Sep	21 Jun 01
Untreated	1	0	0	0	0	0	0	1	0	0	0
Untreated	7	0	0	0	0	0	0	0	0	0	0
Roundup	1	18	24	80	80	63	76	58	87	85	3
Roundup	7	9	17	69	70	58	72	65	85	85	4
Kerb	1	1	4	4	7	11	10	18	22	21	0
Kerb	7	2	11	11	23	18	28	25	31	35	1
Primo	1	0	0	0	0	0	0	0	1	0	0
Primo	7	0	0	0	0	1	0	4	3	5	0
Proxy	1	0	0	0	0	0	0	1	1	1	0
Proxy	7	0	0	0	0	0	0	0	0	0	0
Trimmit	1	0	0	0	0	0	0	1	1	0	0
Trimmit	7	0	0	0	0	0	0	0	0	0	0
Cutless	1	0	0	0	0	0	0	0	0	0	0
Cutless	7	0	0	0	0	0	0	0	0	0	0
LSD(0.05)		2	2	5	18	11	9	14	7	9	10

*DAA indicates the days after chemical applications that plots were seeded.

Table 2. Percent bermudagrass coverage of Mirage seeded one or seven days after application of several chemical treatments in 2000.

		% Bermuda cover									
Chemical	DAA*	26 Jun	6 Jul	17 Jul	25 Jul	1 Aug	9 Aug	17 Aug	22 Aug	1 Sep	21 Jun 01
Untreated	1	0	0	0	0	0	0	0	0	0	0
Untreated	7	0	0	0	0	0	0	0	1	0	0
Roundup	1	13	14	42	32	58	80	63	79	83	42
Roundup	7	11	14	42	38	73	83	68	87	92	46
Kerb	1	1	1	4	13	6	3	13	15	13	10
Kerb	7	3	1	5	5	8	5	15	16	13	8
Primo	1	0	0	0	0	0	0	1	1	0	1
Primo	7	0	0	0	0	0	0	1	1	1	3
Proxy	1	0	0	0	0	0	0	0	0	0	0
Proxy	7	0	0	0	0	0	0	0	0	0	0
Trimmit	1	0	0	0	0	0	0	0	0	0	0
Trimmit	7	0	0	0	0	0	0	0	0	0	0
Cutless	1	0	0	0	0	0	0	0	0	0	0
Cutless	7	0	0	0	0	0	0	0	0	0	0
LSD(0.05)		2	2	5	18	11	9	14	7	9	10

*DAA indicates the days after chemical applications that plots were seeded.

Table 3. Percent bermudagrass coverage of Yukon seeded one or seven days after application of several chemical treatments in 2000.

		% Bermuda cover								
Chemical	DAA*	29 Jun	18 Jul	30 Jul	9 Aug	22 Aug	5 Sep	17 Sep	3 Oct	8 May 02
Untreated	1	0	0	0	12	21	24	39	49	0
Untreated	7	0	0	6	23	33	40	72	87	1
Roundup	1	29	12	25	43	85	88	100	100	51
Roundup	7	23	13	30	52	88	98	100	100	56
Kerb	1	0	5	11	14	42	63	90	92	15
Kerb	7	0	3	26	46	78	90	95	100	20
Primo	1	0	0	2	18	35	37	62	71	0
Primo	7	0	0	4	22	43	38	70	73	0
Proxy	1	0	0	12	19	25	29	58	68	0
Proxy	7	0	0	9	20	34	24	51	70	0
Trimmit	1	0	0	2	12	22	19	38	45	0
Trimmit	7	0	0	4	15	26	25	55	47	0
Cutless	1	0	0	0	3	11	13	19	26	0
Cutless	7	0	0	0	4	10	14	20	22	0
LSD(0.05)		3	2	5	9	15	17	21	25	14

*DAA indicates the days after chemical applications that plots were seeded.

Table 4. Percent bermudagrass coverage of Mirage seeded one or seven days after application of several chemical treatments in 2001.

		% Bermuda cover								
Chemical	DAA*	29 Jun	18 Jul	30 Jul	9 Aug	22 Aug	5 Sep	17 Sep	3 Oct	8 May 02
Untreated	1	0	0	0	14	23	22	38	27	9
Untreated	7	0	0	0	12	22	19	35	19	2
Roundup	1	40	10	11	16	42	73	87	96	97
Roundup	7	28	5	10	18	30	62	80	88	86
Kerb	1	0	0	9	12	27	45	47	56	37
Kerb	7	0	0	9	15	35	46	53	65	50
Primo	1	0	0	1	11	14	16	23	15	8
Primo	7	0	0	0	11	10	20	28	15	6
Proxy	1	0	0	0	11	12	16	21	21	6
Proxy	7	0	0	0	9	11	12	21	19	8
Trimmit	1	0	0	0	5	3	9	12	9	4
Trimmit	7	0	0	0	4	6	8	17	12	3
Cutless	1	0	0	0	1	1	2	5	4	0
Cutless	7	0	0	0	0	1	3	6	2	0
LSD(0.05)		3	2	5	9	15	17	21	25	14

*DAA indicates the days after chemical applications that plots were seeded.

Table 5. Percent bermudagrass coverage of Yukon seeded one or seven days after application of several chemical treatments in 2001.

Glyphosate-treated plots seven days after application showing total necrosis of perennial ryegrass prior to seeded-bermudagrass germination.

Seeding was accomplished by aeration, vertical mowing, application of chemicals, and broadcasting seed by hand. Plots were then dragged with a steel mat. Timing treatments consisted of seeding one day or seven days following applications of chemical treatments. Seeding rates were 0.50 pounds of pure live seed per 1000 ft^2. Nitrogen was applied as urea at a rate of one pound N per 1000 ft^2 once at seeding, and once every two weeks following seeding until August 15 each year.

Bermudagrass establishment was evaluated weekly following treatments. Plots were rated for percent bermudagrass cover until the end of each growing season. Bermudagrass survival within each treatment combination was also rated the following spring of each year.

Results

In both years of the study, Roundup was the most successful treatment in renovating perennial ryegrass to seeded bermudagrass. Plots treated with Kerb resulted in significantly more bermudagrass cover than the untreated control and all plant growth regulator treatments in 2001. However, the percent bermudagrass cover in Kerb treated plots was significantly less than the cover recorded in Roundup plots. None of the plant growth regulator treatments were effective in enhancing bermudagrass cover more than the untreated. There were no consistent differences comparing the days after chemical applications that plot were seeded for any of the chemicals tested. It is also very clear from the data that Yukon survived the winter following renovation significantly better than Mirage.

Results indicate that applications of Roundup will result in very acceptable renovation of perennial ryegrass fairways to seeded bermudagrass. However, plots treated with Roundup did not result in a smooth color transition. Kerb applied at label rates also resulted in significant bermudagrass establishment with a much smoother transition of color, but was not as successful in total renovation as Roundup-treated plots. Roundup plots were totally (100%) necrotic before bermudagrass germination.

Significant bermudagrass coverage (20-40%) was noted in 20-25 days following applications of Roundup in both years of the study, with 58-88% bermudagrass coverage by mid-August. Turf managers may expect successful renovation using Roundup, but should also expect a significant reduction in turf quality (mainly color) for up to 60 days following application.

Related Literature

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