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Mixing Turfgrasses Controls Fusarium Blight

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Appealing color, density, texture, and overall uniformity make Kentucky bluegrass *(Poa pratensis* L.) the most commonly used cool-season turfgrass species in California. It grows best along the coast but also is planted in inland areas where it is not as well adapted because of high summer temperatures. During the summer, Kentucky bluegrass can be damaged by Fusarium blight, a disease caused by the fungus *Fusarium roseum,* which bleaches the leaves and causes a severe root rot, killing the grass.

Perennial ryegrass (*Lolium perenne*) is another cool-season turfgrass adapted to the same California climatic zones as Kentucky bluegrass. Excellent turf-type perennial ryegrass cultivars have been developed recently that closely resemble Kentucky bluegrass in color, texture, and overall appearance but are not susceptible to Fusarium blight. In a study designed to find a practical, non-chemical method for controlling Fusarium blight in Kentucky bluegrass, we evaluated various mixes of Kentucky bluegrass and perennial ryegrass for Fusarium blight resistance and overall turf quality response.

The study was conducted at the University of California South Coast Field Station in Santa Ana. Eleven bluegrass/ryegrass mixes were established in September 1975 in 25-square-foot plots, and each was seeded at a rate equivalent to 3 pounds of seed per 1,000 square feet. The treatments were replicated four times and arranged in a completely randomized block design. Once established, the experimental area was cut at a 1 3/4-inch height and fertilized with a slow-release nitrogen source at a rate equivalent to 3 pounds of nitrogen per 1,000 square feet per year. Irrigation was based on water loss from an evaporative pan. No other primary or secondary maintenance was performed.

Park Kentucky bluegrass and a blend of 50 percent Manhattan and 50 percent Pennfine perennial ryegrass were used in all treatments. Table 1 shows weight and seed count percentages of the 11 treatments.

Observations were made regularly on plot appearance. At least two persons made monthly turf scores (visual appearance ratings based on color, texture, density, pest activity, and uniformity of the turfgrass treatments). The plots were rated for color intensity three times during 1976. Fusarium blight was noted in August 1978, and data were recorded as percent area affected by the disease. During the winter of 1978-79, the Kentucky bluegrass and perennial ryegrass tillers were counted in three 2-inch plugs harvested from each plot. All data were subjected to an analysis of variance, and significant differences determined by the Duncan's Multiple Range Test.

During the warm season (May to September), all bluegrass/ryegrass mixes had a somewhat better overall appearance than the 100 percent Kentucky bluegrass plots, although the differences were not great (fig. 1). In comparison, all mixes of bluegrass/ryegrass

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TABLE 1. Study Treatments

Treatment	Weight: Kentucky blue %	Weight: Perennial rye %	Seed count*: Kentucky blue %	Seed count*: Perennial rye %
1	100	—	100	—
2	95	5	98.7	1.3
3	90	10	97.2	2.8
4	85	15	95.8	4.2
5	80	20	94.1	5.9
6	75	25	92.4	7.6
7	70	30	90.4	9.6
8	65	35	88.1	11.9
9	60	40	86.0	14.0
10	55	45	82.2	16.8
11	50	50	80.2	19.8

*Based on 2,463 seeds of Kentucky blue per gram and 608 seeds of perennial rye per gram.

[1] Reprinted from California Turfgrass Culture, Vol. 30, 1980

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Comments and Opinions

Too Close for Comfort

What is the lower limit for close-cutting of the bentgrass plant on putting greens? Does the grass plant suffer from the continued practice of closer setting of the mower? A definite answer on the optimum height of grass for putting greens has never come from the golfer. Most of the best golfers and some of the high handicap golfers like the "fast" greens. While nearly everyone agrees that greens can be too slow, it seems more average golfers would say they can be too fast. On very fast greens a ball can gain speed on a moderate slope or fall out of its arc as it slows. Is this what golfers like? Although the **USGA** has set standards for green speed by establishing a technique for measuring acceptable ranges, some courses will strive for the top speed used in major tournaments.

As superintendents and turfgrass agronomists, we attempt to give golfers what they like. The question is: "Are we reaching the point where we have compounded our problems by extremely close mowing?" The ever-closer cut gives a fragile, very tiny plant that must survive with a very small root system. Does this weaken the plant and make it more vulnerable to problems that would not destroy a somewhat larger and more robust plant? If creeping bentgrasses can be cut too high for best growth, then surely they can be cut destructively close.

While some of the greens' failure may have other causes that we have overlooked, I rather expect we might find that on some courses the margin of error for acceptable growth performance of the closely mowed plant has become too narrow. I am not appealing for general return to the 1/4" or 5/16" green, because I believe the 3/16" or slightly closer cut has given excellent satisfaction; but when mowers are set below 3/16" and double-cut is used to obtain **USGA** speeds of 10 feet or more for everyday play, can we be sure turf survival is feasible given the existing climate and expertise?

Finally, we might recognize that there are occasions when greens are cut "too close for comfort" and the 1/4" cut is the most appropriate.

REE

Reflections: Summer '81

The Weather

Summertime — and the living isn't easy, at least for those of us in the turf industry. Avoiding turf loss and maintaining its good quality during summer is the big test for turfgrass managers and agronomists in our area. Reputations, businesses, and jobs are on the line during this season.

Two things stand out from this annual review. First, each summer has precarious moments when the line between turf survival and disaster is very thin, that is, there are many days when the slightest lack of adjustment to changing day to day needs can "sink the ship." Second, I become more reluctant to say "this was an easy summer." It is more appropriate to say that less turf failed than previously or normal. There are always turf sites that have some serious problems. Often we don't have answers for some of the trouble, but then I have been amazed that more serious failures don't occur.

Even if you had what you would call a good year, it hasn't been a fun year. Sparse, scattered rainfall, water shortage, and poor turf recovery in the fall of 1980 made it a difficult, long, tiresome summer. In spite of the lower rainfall, crabgrass was worse. The turf may have been more playable or usable because it was seldom too wet and massive failures seemed to be less common. It was a frustrating season, however, because many turf areas never quite reached prime conditions.

Comparing rainfall and temperatures does not always give a precise picture of summer stress potential. The 90 - 100°F temperatures are the back breakers. Yet several days of this weather might be no worse than two or three weeks of 80 - 85°F with hot, humid nights. Rainfall was below average and sporadic. Some areas missed all rains for a period of weeks, while other areas nearby received two or three large rains. Neither condition, of course, is satisfying.

Mixing Turfgrasses

perennial ryegrass, which has excellent vigor during those months, obviously exerted a positive response in the mix. When the turf scores were combined and analyzed for the two-year period, we found that all mixes were given significantly higher appearance ratings than the straight bluegrass (table 2).

TABLE 2. Turf Scores for 1977 to 1979 for Bluegrass/Ryegrass Mixes at Santa Ana

Mix (by weight) Kentucky bluegrass	Perennial ryegrass	Turf score*
%	%	
100	—	6.8Z*
95	5	7.3Y
90	10	7.5XY
85	15	7.4XY
80	20	7.7X
75	25	7.7X
70	30	7.7X
65	35	7.6XY
60	40	7.7X
55	45	7.8X
50	50	7.8X

*Score is on a scale of 0 to 10, where 0 is dead turf, and 10 is an ideal turfgrass stand. Values followed by the same letter are not significantly different at the 5 percent level (Duncan's Multiple Range Test).

Even a small amount of ryegrass added to the Park Kentucky bluegrass improved turf color (fig. 2). Five percent perennial ryegrass gave significantly better color than 100 percent bluegrass, and the treatment with 10 percent ryegrass was significantly better than either the 5 percent or no ryegrass treatments. There were no further significant increases in color ratings when 15 percent or more ryegrass was used as part of the mix.

After the experimental area was subjected to moisture stress in the summer of 1978, Fusarium blight occurred that August. Fusarium blight on the 100 percent Park Kentucky bluegrass plot was devastating: about 30 percent of the plot area was killed (fig. 3). The amount of affected area decreased markedly in plots with only 5 percent ryegrass in the mix. The disease symptoms, in essence, were eliminated in all treatments containing 10 percent ryegrass or more, and there was no significant difference in Fusarium blight incidence among any treatment above 10 percent ryegrass. These

Fig. 1. Average scores of Kentucky bluegrass (KB) and perennial ryegrass (PR) mixes in warm (May-September) and cool (October-April) seasons. Scale from 0 to 10; 10 is best turf.

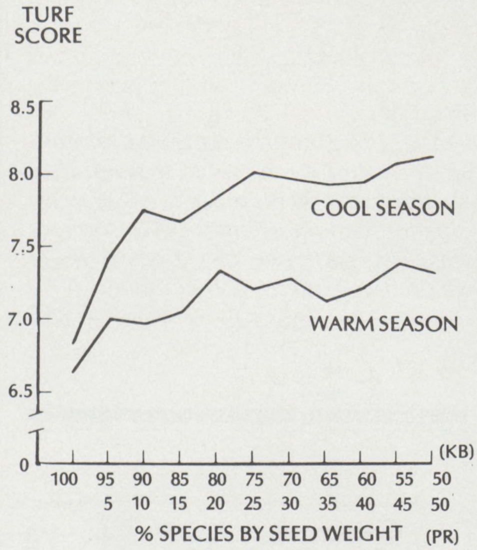
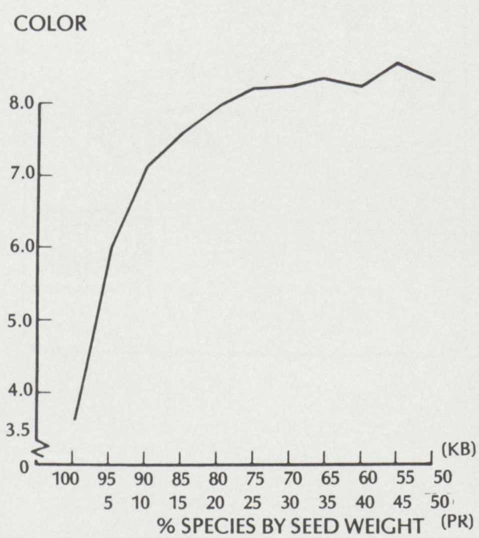


Fig. 2. Color intensity visual ratings for Kentucky bluegrass/perennial ryegrass mixes. Scale from 0 to 10; 0 is turf sward without green color; 10 is deepest green.



results definitely show that mixing even small amounts of perennial ryegrass with Kentucky bluegrass can mask or control the disease symptoms. The amount of perennial ryegrass needed falls in the 10 to 15 percent range on a seed weight basis.

The count of bluegrass and ryegrass tillers in the 2-inch plugs showed that Kentucky bluegrass decreased very rapidly and perennial ryegrass increased when even a small percentage of ryegrass on a seed-weight basis was added to the mix (fig. 4). There was no significant difference in bluegrass/ryegrass plant counts in mixes containing more than 15 percent

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ryegrass on a seed-weight basis (85 percent or less bluegrass). The bluegrass/ryegrass balance assumed approximately a 50/50 plant count relationship with 15 percent ryegrass or more in the seed mix.

These results tend to support and explain the results on turf scores, color, and Fusarium blight activity. Evidently, the quick-germinating and rapid-growing perennial ryegrass was able to establish and remain competitive, even when very small seed numbers per unit area were seeded. The slower germinating and growing Kentucky bluegrass was able to fill in around the established ryegrass plants, and the species mix was maintained for the duration of this three-year test.

Fig. 3. Percentage of *Fusarium roseum* observed in Kentucky bluegrass/perennial ryegrass mixes in August 1978.

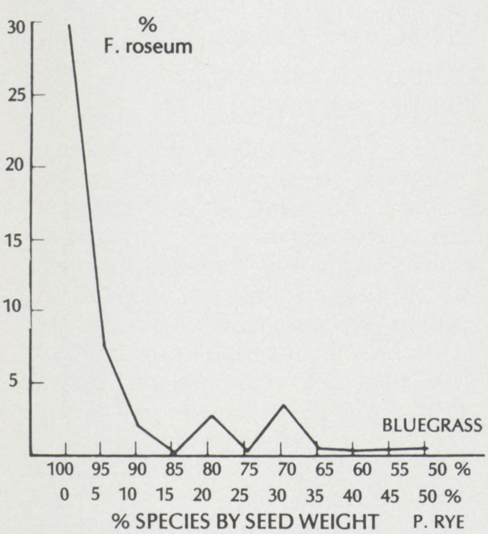
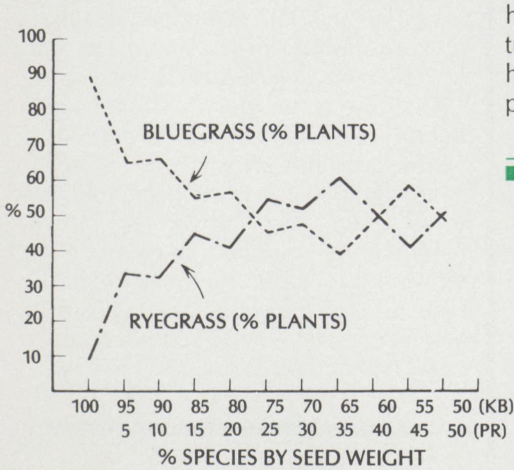


Fig. 4. Percentage of Kentucky bluegrass and perennial ryegrass plants 40 months after mixes were established.



In conclusion, mixes of Kentucky bluegrass and perennial ryegrass practically eliminated Fusarium blight activity, whereas control plots of straight bluegrass were damaged. The mixture of the two species resulted in a better color and higher turf appearance ratings than the bluegrass alone. A seeding of 15 percent or more perennial ryegrass, and 85 percent Kentucky bluegrass or less, by weight, resulted in approximately a 50/50 bluegrass/ryegrass plant count after three years.

Editor's Comment

Recently the California group, among others, reported that the presence of turf-type ryegrasses mixed in with Kentucky bluegrass had inhibited Fusarium blight. In this study the presence of the ryegrasses with Kentucky bluegrass reduced Fusarium blight ***Fusarium roseum*** to insignificance. While some turf pathologists still disagree on the nature of this disease, agronomists seem to have found a method of living with the problem.

A balanced mixture of ryegrasses with Kentucky bluegrass seems to be the optimum. This may require some agronomic skill since the ryegrasses grow quickly and are aggressive. Another point of interest is that the ryegrasses and Kentucky bluegrasses reached approximately the same plant numbers at 40 months when Kentucky bluegrass was seeded at rates ranging from 50-85% of the seed mixture.

Although some members of the last generation of turf growers proposed that ryegrasses should be banned from turf use, that has not been the case. Gradually turf-type ryegrasses have been used more and more. Yes, we have had lots of change in turf. The turf-type ryegrasses are second only to herbicides among the major turf improvements since World War II.

pH Effect on Pesticides

Dr. Winand Hock
Pesticide Coordinator
Penn State University

Many pesticides, particularly the organophosphate and carbamate insecticides, are decomposed quite rapidly by alkaline water (pH 7.0).

The decomposition is due to alkaline hydrolysis of the molecule which is converted to a form that is frequently inactive. For this reason, in those areas where water supplies are greater than pH 7.0, better pest control will be obtained if the pH is lowered to a range where pesticide stability is optimized. For most insecticides, the optimum pH is below 6.0. Let's look at a few examples of how pH affects the stability of pesticides.

Dylox Decomposition proceeds rapidly above pH 6.0. The following times are for 50% hydrolysis of the active ingredient:
pH 8.0 — 63 minutes
pH 7.0 — 386 minutes
pH 6.0 — 89 hours

Sevin Rapidly hydrolyzed to alpha-naphthol in alkaline preparations:
pH 9.0, 50% hydrolysis in 24 hours

Dimethoate (Cygon, De-Fend) Unstable in alkaline media. Stability increases at pH values between 4 and 7.

Phosphamidon Relatively stable in nonalkaline solution, quickly hydrolyzing in alkaline solutions. Time for 50% hydrolysis at 68°F. is:
pH 10.0 — 30 hours
pH 7.0 — 13.5 days
pH 2.0-5.0 — 90% undecomposed after 24 days

Dibrom (Naled) Hydrolyzes in water 90-100% in 48 hours. Very unstable under alkaline conditions.

Carzol Time for 50% hydrolysis at 72°F.
pH 9 — 3 hours
pH 7 — 14 hours
pH 5 — 4 days

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Comments and Opinions

Weather Statistics

We had 13 days of 90°F or above in June, July, and August. Seven of these days occurred consecutively from July 8 -14. We had a total of 9.81 inches of percipitation in this period (3.13, 4.48, and 2.12 inches respectively). Starting August 6 we had a period of 27 days without effective (1/2 inch or more) rainfall. Fortunately, our driest period in August was cloudy and comparatively cool with only one 90° day. Compare all this with 1980 when we had 34 days, sixteen of them in August, with temperatures 90° or above. Further comparison shows we had four and nine days respectively in August 1980 and 1981 when the temperature did not reach 80°.

Weeds

It seemed we had more weeds than usual this year. This occurred in spite of the shortage of rain because we started the spring with turf that had not developed good density after the 1980 season.

Disease

There was less disease than usual. This is expected with a drier year. Also the new fungicides may have helped combat the problem.

The Lessons of Summer

Summer is seldom easy for turf growers. Therefore, it is important to be alert to the pitfalls of the season. Now is the time to review your 1981 experiences, observe the work of others, and listen to their problems. Become more aware of the summer conditions that cause trouble. Think about things you might change. Give consideration to water supply and equipment. The younger turf growers can learn from older, experienced men about their adjustments of watering facilities. Most of all, keep up your spirit, as summers are always a struggle.

REE

"Yet there are greens on which the rabbits are the Chief, and almost the only Greenskeepers. The rabbits crop the grass short and produce an admirable quality of spring turf. The cost being so little compared with the wages of Greenskeepers. Where did this Greenskeeper ascend from? It was the professional player whose main ambition 'Is one day to rise to become Keeper of the Green.' This professional class, alas, was referred to as 'Feckless, Reckless Creatures' — 'Their chief loves are golfing and whiskey''.

Horace Hutchinson —
1890's to early 1900's

Origin of Greenskeepers and Wages

Nothing really significant ever happens in a man's life until he wants something. If it is a compelling want, it will set him dreaming. This is the beginning of creativity.

Martin

Blue Grass

Next in profusion to the divine profusion of water, light and air, those three physical facts which render existence possible, may be reckoned the universal beneficence of grass.

John James Ingalls 1833-1900

pH Effect on Pesticides

continued

Malathion Easily hydrolyzed above pH 7.0. Relatively stable in neutral or moderately acidic media.

Diazinon pH 9.0, 50% hydrolysis in 36 days; pH 7.4, 50% breakdown occurs after 185 days.

As a general rule, most pesticides undergo some degree of hydrolysis in alkaline solutions. For many organic phosphates this hydrolysis is rapid enough to affect the degree of control obtained. The addition to the spray tank of an additive to control the pH of the water between 4 and 6 seems to have merit in those cases where alkaline water is used to prepare the pesticide dilution.

EDITORIAL COMMENT

Consistency of Pesticide Performance

All who make numerous chemical treatments to turf have encountered failure on occasions with a "treatment" that has worked well previously. Numerous reasons for failure can occur because a variety of chemicals are present in plant growth mediums and many biological variables are present. The preceding note emphasizes the great influence of water pH which must be regulated for some chemicals.

What influence should this information on water pH have on pesticide applications? First, the partial loss of effectiveness may not seem important. If the loss in pesticide efficiency is as great as 25 to 50%, this means many treatments will fail. A smaller loss may not cause failure of the treatment, but the dollar loss can be significant.

For those pesticides that deteriorate (hydrolyze) readily in water, apply the mixture promptly after mixing the treatment solution. When the pesticide and water reaction is unknown, avoid preparing the mixture in advance or allowing it to stand briefly in the tank. Also, testing the pH of the water and making any vital change can become a useful practice on occasion.

ABSTRACT

The Fate of Nitrogen Applied to Turfgrass

J. L. Starr and H.C. DeRoo

Crop Science 21:531-536 (1981)

A seeded turf of Kentucky bluegrass (*Poa pratensis* L) and red fescue (*Festuca rubra* L.), grown on a sandy loam soil, was fertilized for 3 years to study the fate of nitrogen. A 10-6-4 fertilizer that contained 50% organic nitrogen that was largely urea-formaldehyde was used the first two years. Ammonium sulfate was applied the third year with labeled ^{15}N nitrogen as a tracer. Rates of nitrogen application were 195 kg ha^{-1} (4 lb./M) the first two years and 180 kg ha^{-1} (3.7 lb./M) in the third year. The annual nitrogen application was split into May and September applications. Mowing height was 3.8 cm (1 1/2 inches) and 4.4 cm (1.7 inches) at weekly intervals in spring and fall with bi-monthly mowing in mid-summer. Where clippings were not returned, about equal quantities of N were derived from soil and fertilizer. Where clippings were returned, the yield of grass increased by about one-third and nearly equal proportions of N in the plant tissue came from soil, fertilizer, and grass clippings.

There was a near cessation of nitrogen uptake from ammonium sulfate after 3 weeks. The lack of a significant loss of fertilizer nitrogen by leaching suggested this nitrogen was rapidly converted to nonmineral forms.

Editorial Comments

This study which was made on a sandy loam soil with a comparatively low nitrogen content shows the soil and clippings are important sources of nitrogen for uniform growth of the turf. When most nitrogen fertilizer treatments are made, growth increases noticeably for a period of several weeks. This is not always undesirable, because extra growth is often needed for such things as prompt improvement in the turf cover. This research paper does not tell the types of urea-formaldehyde that were present in the fertilizer used the first two years. This could have contributed little or very significantly to the "soil nitrogen component". While this study again emphasizes the fertilizer potential of clippings, we must remember that removal of clippings and their use in other ways is better than returning them to some of our closely clipped turf areas that are watered and intensely maintained.

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