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Seedling Competition of Cool- Season Turfgrasses[1]

Ralph E. Engel[2]

In the earliest years of professional turf growing, seed mixtures commonly included many species. This practice may have been borrowed from forages, yet there was some belief in the need for a seed mix that both covered the assortment of soils, moisture, nutrients and light that commonly occurred and offered some resistance to the various diseases. The earlier era may have been called the days of the "shotgun approach."

Recently, there is a tendency to use fewer species in a mixture. More monocultures are also used. Many turf growers have become more aware of the competition that occurs between plants germinated from seed mixtures.

With these concerns, the need for information on species competitiveness, ratio of species seeded and rate of seeding is evident. As the most desired species become known, enhancement of these species is sought. Knowledge of seedling competition warns of the wastefulness of higher seeding rates that do not aid establishment and the possible loss of species that are important to the turf, which can be destroyed by more aggressive grasses.

Procedures — Seedling competition was studied in a greenhouse with seedling growth of approximately 12 weeks of Kentucky bluegrass, *Poa pratensis* L., red fescue, *Festuca rubra* L. and Colonial bentgrass *Agrostis tennuis* Sibth. These were grown with and without seedlings of annual ryegrasses *Lolium multiflorium,* ordinary perennial ryegrass, *Lolium perenne* L. and redtop *Agrostis alba* L. Although the results of this research were published in 1973, I expect many present growers have not seen the results of this study. For this reason, permission was obtained from the American Society of Agronomy Crop Science Division to present parts of this paper. It is hoped this will give a concept of the competition that can occur between plants of a new turf seeding.

The grasses were grown in five-inch pots with various mixes and seeding rates as shown in the graphs. Seed quantities were based on seed numbers. After 12 weeks, one square-inch of seedlings was taken from the center of each pot of each replication, for identification. The seedlings were counted, weighed for the two largest plants and weighed for total topgrowth.[3]

Kentucky bluegrass, Colonial bentgrass and red fescue were grown and compared as a group of three species in one seed mixture and each were grown in one-to-one mixtures. Three companion grasses (annual ryegrass, ordinary perennial ryegrass and redtop) were used with the three permanent-type grasses. The competitiveness of the ryegrasses and redtop were measured by seeding them as varied percentages of the mixture and at varied seeding rates. Soil fertility was moderately low, which would be expected to minimize competitiveness for the test period. Also, comparative seedling counts at 8- and 12-week intervals were made to show the effect of plant maturation on numbers of shoots.

Results — Figures 1, 2 and 3 show weight of the two largest plants, the number of shoots and total weight of topgrowth produced in the square inch of turf sampled from the combinations of Kentucky bluegrass, bentgrass and red fescue. Weight of the two largest plants in all combinations dropped consistently when the seeding rate was increased from 20 to 40 and to 60 seeds per square inch. With the exceptions of the seed mixture of Kentucky bluegrass and red fescue (figure 2, graph 1) the number of seedling shoots was reduced in most comparisons when the seeding rate was increased from 40 to 60 seeds.

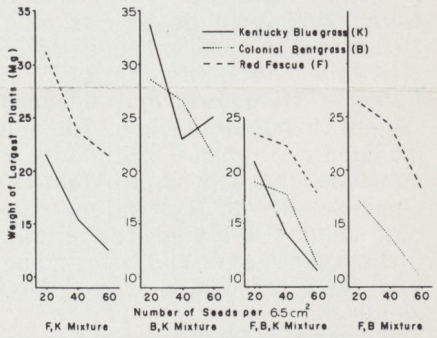

Fig. 1. Weight of largest seedling plants of Kentucky bluegrass, red fescue, and colonial bentgrass when grown in competition in two greenhouse tests for 12 weeks. The L.S.D. values for the respective grasses at 0.05 are: 9; 7; 7.

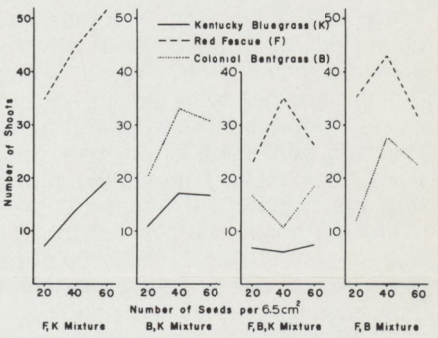

Fig. 2. The number of shoots of seedling plants of Kentucky bluegrass, red fescue, and colonial bentgrass per 6.5 cm² when grown in two greenhouse tests for 12 weeks. The L.S.D. values for the respective grasses at 0.05 are: 7; 14; 15.

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[1] New Jersey Agricultural Experiment Station Publication No. J-15001-3-85.

[2] Res. Prof. of Turfgrass Management, Dept. of Soils and Crops, N.J. Agr. Expt. Stn., Cook College, Rutgers University, New Brunswick, N.J.

[3] Engel, R.E. and J.R. Trout. 1980 Seedling Competition of Kentucky Bluegrass, Red Fescue, Colonial Bentgrass and Temporary Grasses. Proceedings of the International Turf Society 3:379-389.

Comments and Opinions

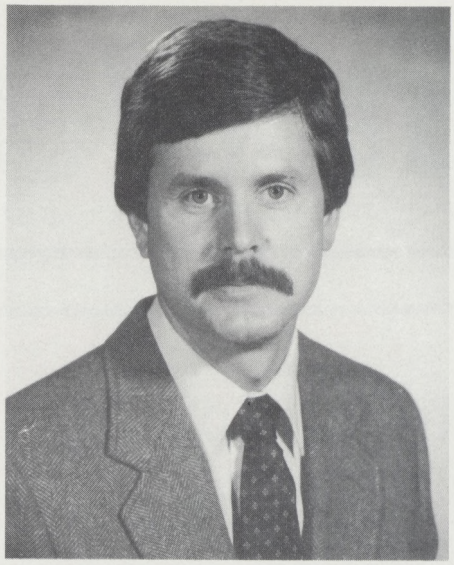
Another Not Guilty

And Australia Makes 3: Agent Orange exonerated. First, the Center for Disease Control report from Atlanta, Georgia regarding a national study on veterans, then the final report in Wisconsin by the Department of Veterans Affairs and now a final report from the "Royal Commission on the Use and Effects of Chemical Agents on Australian Personnel in Viet Nam." Volume VIII of this final report, issued in July, 1985 and entitled "Conclusions, Recommendations and Epilogue" states as its first conclusion: "Agent Orange Not Guilty." The study included more than 8,500 infants and concluded that exposures of fathers to chemicals in Viet Nam did not cause birth defects. The study further found that cancer rates of Viet Nam and non-Viet Nam servicemen were virtually identical.

The Alliance of Environmental Concerns
December 1985

Comment: We have great sympathy for those who were harmed physically or mentally in the Vietnam war. And we have the greatest sympathy for those who lost a relative or dear friend. How sad it is that so many veterans have been led to believe their physical ailments came from Agent Orange (which contained some dioxin). Also, the waste from dioxin hunting and burial, which is still going on at many locations, has cost vast amounts of money that the government needs for many useful purposes. Remember the U.S. Government buying $25,000,000 of turf fertilizer from one company and burying it because it may have contained one or two tablespoons of dioxin. Of the many forms of dioxin, only one has been shown truly dangerous, but most of the "dioxin clean-ups" have not bothered to check on the type of dioxin. This chemical comes from many sources, but its occurrence in silvex and 2,4-5T was carefully controlled in its late years of production. Chemical spills, with much greater contamination of dioxin than in the herbicides we used, have not been known to cause more than a skin rash. We hope our government can proceed with studies and tests that will lead to proper diagnosis and whatever medical help Vietnam veterans need. Its time to quit the "whipping boy" stuff on Agent Orange.

REE



Dr. Richard White **(BA and MS, Auburn University; Ph.D., Virginia Polytechnic Institute) began work as a stress physiologist in turfgrass science in October 1985 and will serve as Agronomic Co-editor of *Green World*.**

The present inhabitants of the earth will consume, during their lifetimes, more natural resources than all their ancestors have consumed in the 10,000 preceding centuries.

Aurelio Peccei (1909-1984)

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Seedling Competition
(continued from page 1)

When the three permanent-type species were seeded together, red fescue developed more rapidly than either Colonial bentgrass or Kentucky bluegrass in all comparisons for largest plants, numbers of plants and dry weight of topgrowth (figures 1, 2 and 3).

A seed mixture with 3-3-2 ratio by number of Kentucky bluegrass, red fescue and Colonial bentgrass was seeded at four rates with 24% of the mixture by weight from non-turf type perennial ryegrass. With an increase of seeding rate from 10 to 60 seeds, the size of the largest Kentucky bluegrass, red fescue and Colonial bentgrass plants decreased 74%, 54% and 79% respectively (figure 4).

In a somewhat similar comparison (figure 5) the largest Kentucky bluegrass plants and red fescue plants decreased 63% and 40%, respectively, when the seeding rate was increased from 10 to 60 seeds per square inch. The more severe competition of annual ryegrass was shown when the increase of seeding rate of the mixture to 60 gave 65% and 52% reduction for Kentucky bluegrass and red fescue, respectively.

Increasing percentages of perennial ryegrass in the mixture with the combination of Kentucky bluegrass, red fescue and Colonial bentgrass caused decreases of 54% and 68% respectively, in largest plant size of Kentucky

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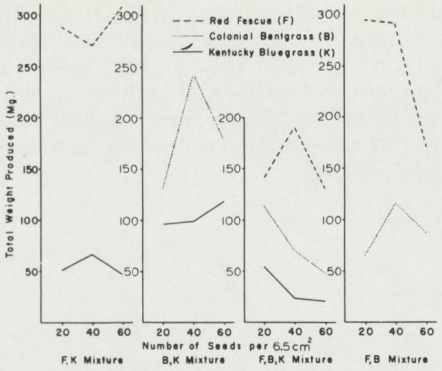

Fig. 3. Total weight of seedling shoots of Kentucky bluegrass, red fescue, and colonial bentgrass per 6.5 cm² when grown in two greenhouse tests for 12 weeks. The L.S.D. values for the respective grasses at 0.05 are: 43; 111; 94.

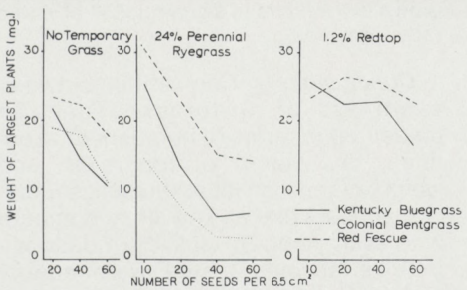

Fig. 4. Weight of largest seedling plants of Kentucky bluegrass, red fescue, and colonial bentgrass when grown in competition with perennial ryegrass or redtop in two greenhouse tests for 12 weeks. The L.S.D. values for the respective grasses at 0.05 are: 8; 14; 5.

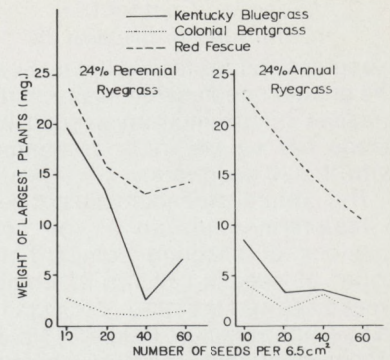

Fig. 5. The effects of perennial and Italian ryegrass competition on the weight of two large plants of Kentucky bluegrass, red fescue, and colonial bentgrass grown from seed in a greenhouse test for 12 weeks. The L.S.D. values for the respective grasses at 0.05 are: 8; 14; 5.

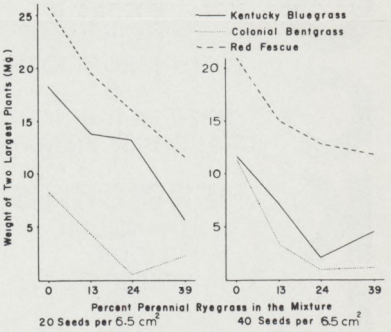

Fig. 6. Weight of the largest plants of Kentucky bluegrass, red fescue, and colonial bentgrass developing from seed mixtures at two seeding rates (SR) with perennial ryegrass at varied percentage of the mixture. The L.S.D. values for the respective grasses at 0.05 are: 10; 9; 5.

It's an old adage that the way to be safe is never to be secure. Each one of us requires the spur of insecurity to force us to do our best.

Harold W. Dodds

Seedling Competition
(Continued from page 3)

bluegrass and red fescue (figure 6). Note the greater suppression in size of these grasses in the mixture seeded at 40 seeds per square inch, as compared with the 20 seed rate.

The cultural procedure did not permit a long-term follow-up of the consequences of seedling competition. A count of seedling plants at 8 and 12 weeks showed thinning of the stand as the seedlings mature (figure 7). Note the highly consistent reduction in numbers of seedlings between 56 and 84 days. The loss of Kentucky bluegrass for combined seedling rates was 31%. The decrease in numbers of plants was most apparent with the higher rates of seeding. Since the soil fertility rate was purposefully low, a much higher loss might be expected with increased use of fertilizer.

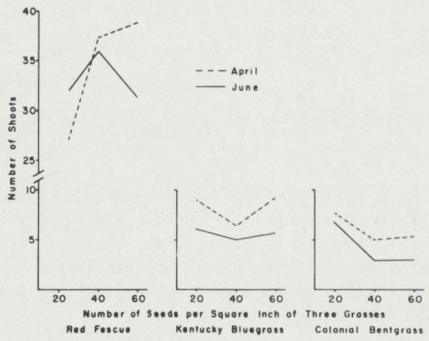

Fig. 7. Seedling population change from 8 to 12 weeks for three cool-season grasses grown in a mixture in a greenhouse at varied rates of seeding.

Conclusions — Competition between seedlings of turfgrasses can be measured in terms of numbers of seedlings, dry weight of topgrowth and weight of the individual seedling shoots.

It appears that all seedlings compete with each other. By rank, the most competitive species tested were annual ryegrass, perennial ryegrass and red fescue. Bentgrass and Kentucky bluegrass were the least competitive seedlings.

Perennial ryegrass, which is used frequently in lawn seed mixtures, seriously suppresses seedlings of Kentucky bluegrass, red fescue and Colonial bentgrass. This becomes increasingly severe with increased ryegrass content of the mixture or increased rate of seeding. The results of this study suggest that the total amount of ryegrass should be restricted if it is important to avoid serious suppression of the slower growing permanent-type grasses.

The study showed repeatedly that increasing the rate of seeding increases seedling competition. This indicates that the benefit of increased seeding rate is limited or can be harmful when it is above optimum amounts.

An upcoming issue of *Green World* will consider applied aspects of seedling competition in formulation of lawn seed mixtures.

Turf is Big Business

Turfgrass covered over 865,000 acres of land in New Jersey in 1983. This was nearly one-fifth of the total land area of the state and about twice the area devoted to crop production. The maintenance cost of this turf was estimated at $447 million. Nearly one third of this cost represented expenditure on materials and services, another third represented the value of paid labor used in lawn care and the remaining third was the depreciation of lawn-care equipment. Total labor in the turfgrass industry was estimated at 53,000 equivalent workers, of which nearly 14,000 equivalent workers were paid labor. Thus the turfgrass industry is a significant sector of New Jersey's economy.

From the 1983 Survey of New Jersey Turfgrass, N.J. Agric. Expt. Stn. P-02530-1-85.
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