RESEARCH

Salinity and seedlot affect rough bluegrass germination

The speed of emergence varies among cultivars and seedlots, but is generally slowed by higher salinity.

James J. Camberato, Ph.D., S. Bruce Martin and Amy V. Turner

Rough bluegrass (*Poa trivialis*) is frequently used to overseed golf course greens in coastal areas of the southern United States, where irrigation water can be somewhat saline. Because seeding is performed annually, germination and subsequent seedling establishment are critical to turf quality. Salinity retards seed germination and delays turf establishment.

Sensitivity to salinity varies greatly among turfgrasses and differences have been detected among:

- Species (1)
- Cultivars of creeping bentgrass (5), tall fescue (2) and Kentucky bluegrass (3)
- Seedlots of bentgrass cultivars (5)

Differences in germination sensitivity to cold have been found in rough

Photo by Richard Hurley

Salinity influences the germination speed of *Poa trivialis* seed (shown here on an overseeded green), but the effect varies greatly depending on cultivar and even seedlot.

KEY POINTS

- Germination rate of rough bluegrass is slowed substantially by salinity.
- Differences in sensitivity to salinity occur among rough bluegrass seedlots as well as cultivars.
- Seeding multiple cultivars and seedlots may overcome this variability in saline conditions.

bluegrass seedlots (4). In view of this earlier research, we suspected substantial differences in tolerance to salinity among rough bluegrass cultivars and seedlots. To explore this idea, germination of 14 rough bluegrass cultivars and seedlots was determined at four levels of salinity (none, 1.8, 3.4 and 5.0 decisiemens per meter) under controlled conditions.

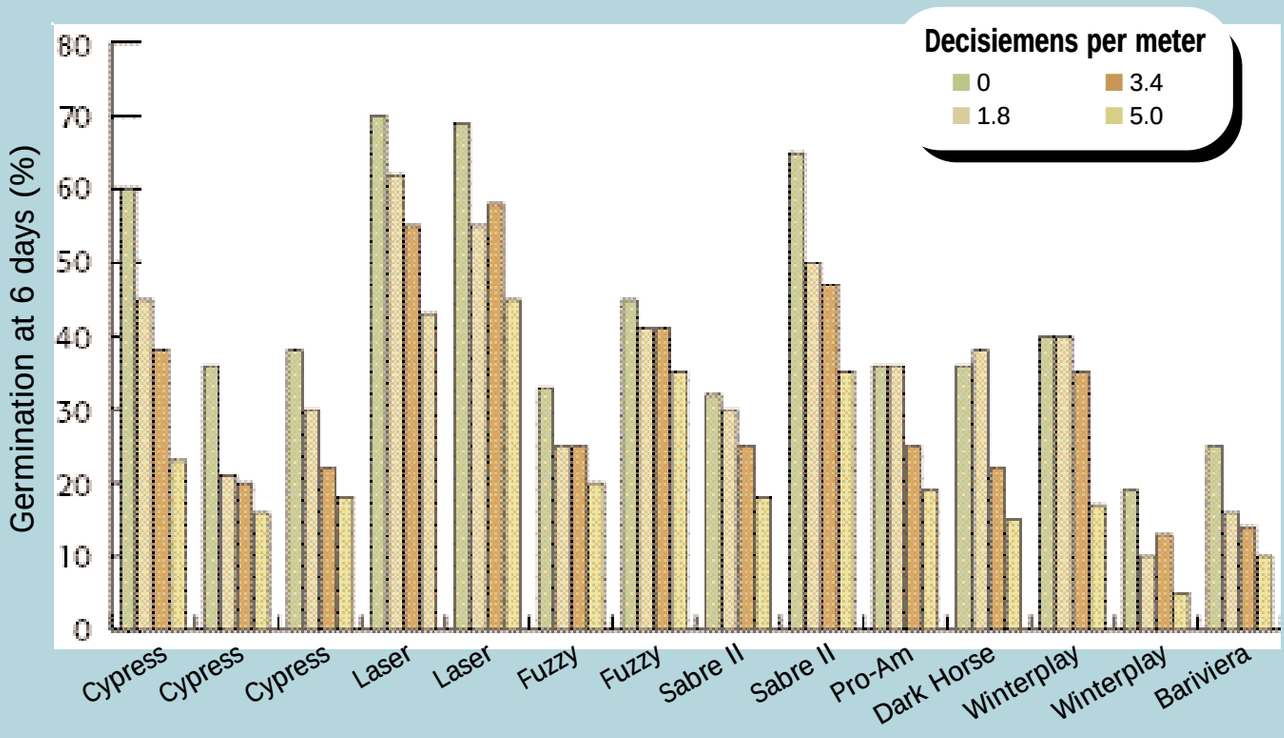
Methods

Seed from 10 rough bluegrass seedlots representing several cultivars was collected in October and November 1999 from golf course superintendents' purchased supplies of commercial seed. Seed from four cultivars was collected from commercially available seed that we stored from the previous year.

Fifty seeds of each cultivar were placed on pre-moistened germination paper in petri dishes and then sealed with parafilm. Moistening solutions differed, with levels of sodium chloride at 0; 1,150; 2,175; and 3,200 parts per million or milligrams per liter. Petri dishes were placed in growth chambers with 12 hours of light at 68 F and 12 hours of darkness at 50 F.

Six days after seeding, we determined germination percentages to rapidity of germination among the salinity treatments and the untreated seedlots. Total germination was determined 17 days after treatment, enough time to ensure all viable seeds had sprouted (4). Seed was considered germinated if both a shoot and root were visible under a magnifying lens.

Salinity vs. seedlot



The effects of four levels of salinity on germination of 14 rough bluegrass seedlots six days after seeding.

Results

There were substantial differences in early germination among the cultivars and seed lots. The most rapid germination occurred in the two Laser seedlots under no salinity treatment: 65-70 percent six days after seeding. The slowest seedlot was a Winterplay sample that had 18 percent germination after six days.

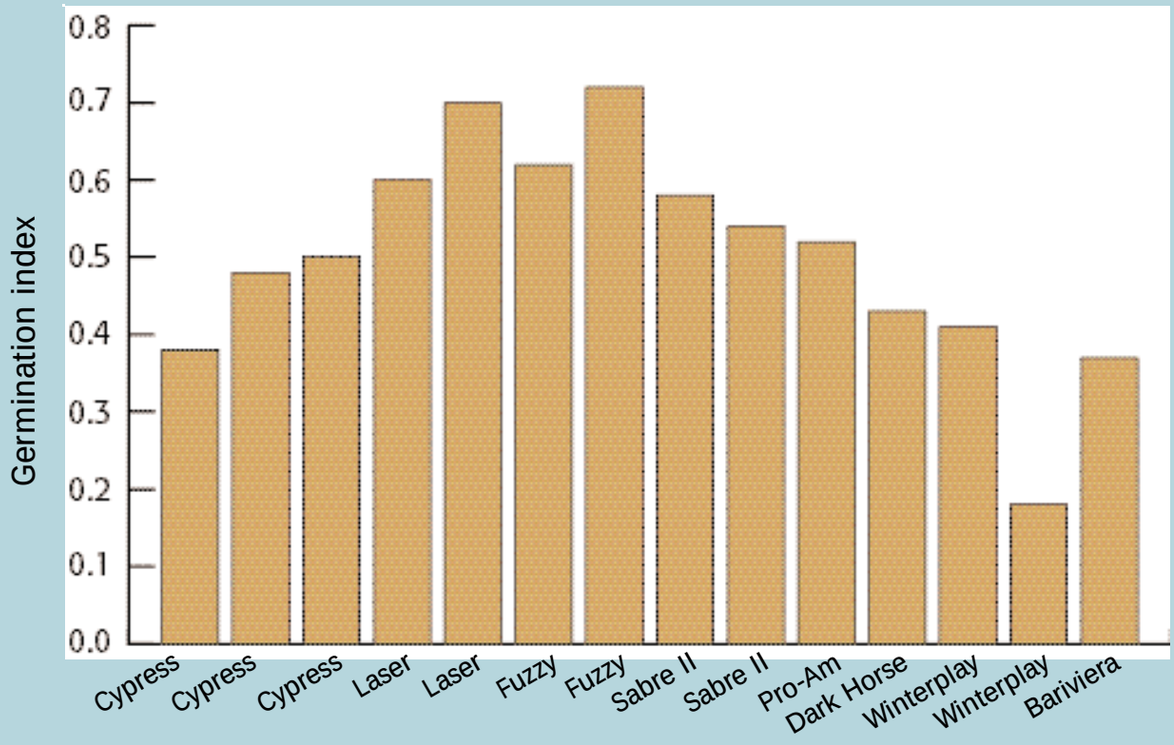
However, seedlot differences were just as great as cultivar differences. For example, the other Winterplay seedlot had twice the germination after six days as the slowest Winterplay seedlot. Similarly, the three seedlots of Cypress ranged from 34 to 60 percent germination in the no-salinity treatment.

Salinity reduced early germination of all cultivars, and each level of salinity slowed germination. The salinity levels used in this study were chosen to simulate the use of poor-quality irrigation water with salinity levels in the range of 0.8 to 2 decisiemens. With evaporation of water at the soil surface, the salinity of moisture surrounding the seed is likely to be two to three times that of irrigation water.

To illustrate which cultivars and seedlots were most and least affected by salinity, a germination index was calculated by dividing germination at 5.0 decisiemens per meter by germination at 0 salinity. A germination index of 1.0 would indicate that germination was just as rapid at 5.0 decisiemens per meter as at 0 decisiemens per meter.

Eleven of 14 seedlots had germination indexes between 0.36 and 0.63,

Germination index



At the highest salinity levels of this test (5 decisiemens per meter), germination rates six days after seeding varied among seedlots and cultivars. The index is derived by dividing germination at 5.0 decisiemens by germination at 0 salinity. The index indicates the relative effect of salinity on germination; a value of 1.0 would indicate germination was equal at 5 decisiemens and 0 decisiemens per meter.

Temperature, salinity and seed maturity can all affect the germination rate of *Poa trivialis* overseeded into warm-season grasses.

meaning early germination at the highest salinity was about half the germination at no salinity. Two seedlots of two different cultivars, one Laser and one Fuzzy, were slightly more tolerant of salinity than average, with germination indexes of 0.70 or better. The other seedlots of these two cultivars were just average in salinity tolerance, another example of how germination can vary from seedlot to seed lot. One seedlot from Winterplay was extremely sensitive to salinity, with a germination index of 0.17, but the other Winterplay seedlot's average germination index was 0.41.

Although salinity delayed germination, it did not have much effect on final germination, which was 90 percent at 5.0 decisiemens per meter and 92 percent at all other salinity levels.

Discussion

Differences in rough bluegrass germination rate and sensitivity to salinity depended greatly on cultivar and seedlot. Such variation highlights the need for a screening procedure to identify tolerant seedlots.

In the meantime, to avoid problems of poor performance, salinity sensitivity or cold sensitivity in rough bluegrass seed, we suggest overseeding with several rough bluegrass cultivars and seedlots. Blends of cultivars and seedlots are sold by seed companies and are convenient to use. Superintendents also may purchase several different cultivars and blend them as they seed. ■

Literature cited

1. Harivandi, M.A., J.D. Butler and P.M. Soltanpour. 1982. Salt influence on germination and seedling survival of six cool-season turfgrass species. *Communications in Soil Science and Plant Analysis* 13(7):507-517.
2. Horst, G.L., and N.B. Beadle. 1984. Salinity affects germination and growth of tall fescue cultivars. *Journal of the American Society for Horticultural Science* 109:419-422.
3. Horst, G.L., and R.M. Taylor. 1983. Germination and initial growth of Kentucky bluegrass in soluble salts. *Agronomy Journal* 75:679-681.
4. Liu, C., S.B. Martin and J.J. Camberato. 1999. *Poa trivialis* sprouts erratically when cold. *Golf Course Management* 67:57-59.
5. McCarty, L.B. and A.E. Dudeck. 1993. Salinity effects on bentgrass germination. *HortScience* 28:15-17.

James J. Camberato, Ph.D., is an associate professor of turf soil and management; S. Bruce Martin, Ph.D., is an associate professor of turfgrass pathology and physiology; and Amy Turner is a researcher at Pee Dee Research and Education Center, Clemson University, Florence, S.C.