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# Salt Tolerance of Perennial Ryegrass Varieties

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Salt tolerance of turfgrass varieties is becoming increasingly critical due to the increased use of high salt effluent water, increasing salts in other water sources and increasing periods of drought. Perennial ryegrass is used in both permanent and winter overseeded turf on many of these sites, but it is classified as only a moderately salt tolerant species. Previous studies have shown that varieties differ in salt tolerance at both the seedling stage and in mature plants. These studies have demonstrated that germination of perennial ryegrass seedlings is reduced at lower salt levels than the levels that cause a reduction of growth in mature plants. However, because most turfgrass managers do not have the luxury of switching to better quality water sources at establishment, and they can't guarantee rainfall at seeding time, *seedling salt tolerance* is the most critical variety trait in establishing perennial ryegrass on a salt-affected site. In order to evaluate the seedling tolerance level of our current turfgrass varieties, and to start selecting for increased salt tolerance, we germinated seeds on a mesh substrate above a water bath with 10,000 ppm of artificial ocean salts, including high levels of sodium. We screened many of the same varieties at 12,000 ppm, approximately 1/3 the strength of seawater. Most of the problem soil and water tests we have seen have more than one salt involved, so we decided this solution came closer to real life turf manager situations than using just sodium. Two control varieties were included in these trials that had previously shown increased salt tolerance. Charger II has been shown to have higher germination in salt than other varieties, and Brightstar SLT has demonstrated improved growth as a mature plant in saline conditions.

The figures on the reverse side show the results we have seen to date. With limited space for these trials, not all varieties were included in all trials. The temperature of the water baths was 68 degrees F and the pH was 8.1. The plants that germinated the quickest in all of these trials have been placed in crossing blocks to further increase the salt tolerance in our future varieties. Figure 1 shows the total germination percentage of the varieites after 1 month at 10,000 ppm, with a planting in April and again in November. Figure 2 shows seedling vigor, which is a measure of speed of germination in this salt solution. Many varieties eventually achieve the same total germination but at a much slower rate. Figure 3 shows the germination rate at 12,000 ppm.

In a final screening at 15,000 ppm SR 4220 and SR 4420 achieved a final germination of 2%, while the commercially salt tolerant variety Brightstar SLT germinated at 1%.

All of the Seed Research of Oregon varieties tested had seedling germination rates in salt conditions, equivalent to or above the salt tolerant varieties currently being marketed. The high turf quality variety SR 4220 had consistently higher germination under salt stress, at both 10,000 and 12,000 ppm. SR 4420 also demonstrated significantly higher salt tolerance than the check varieties. In a preliminary trial SR 4500 had germination rates in a 10,000 ppm salt solution similar to SR 4420 and our wear tolerant variety SR 4350 showed similar seedling salt tolerance to SR 4220. At the 12,000 ppm level, our new variety SR 4550 was equivalent to Brightstar SLT and Charger II. We are using the best plants from all of these trials to develop new varieties with even higher salt tolerance, with improved turf quality and higher disease resistance as well.

*High salt problem on golf course*

*Salt tolerant ryegrass overseeded on fairway*

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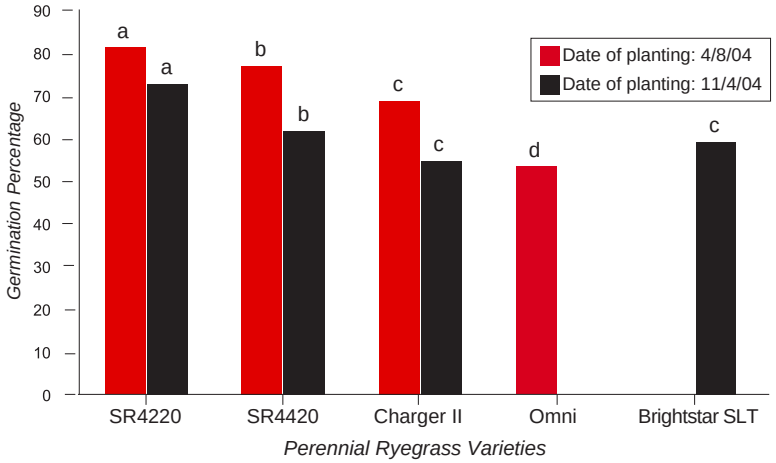
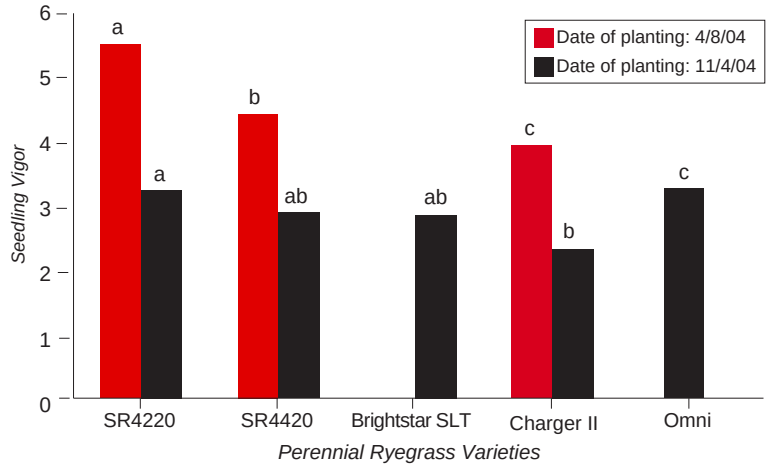
## Fig. 1: Seedling Salt Screening of Perennial Ryegrass at 10,000 ppm Salt Concentration



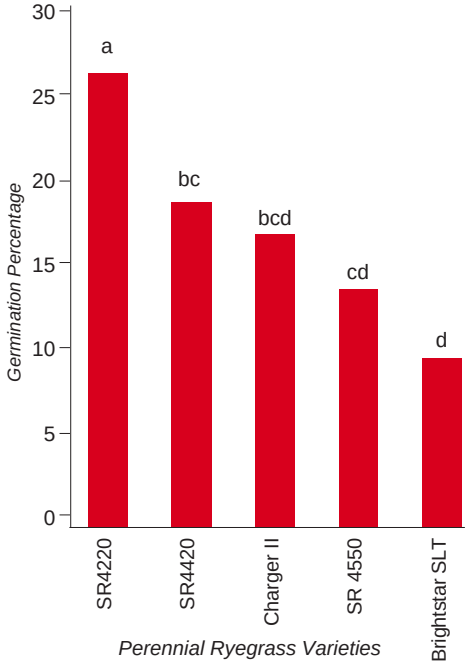

Note: Values followed by the same letter on the same color bar do not differ significantly according to Duncan's Multiple Range Test (P<0.05)

## Fig. 2: Seedling Vigor of Perennial Ryegrass Planted on Two Different Dates at 10,000 ppm Salt Concentration




Note: Values followed by the same letter on the same color bar do not differ significantly according to Fisher's Protected LSD (P<0.05). Seedling Vigor = number of normal seedlings /days of first count + number of normal seedlings/ days of second count+ ....+ number of normal seedling/days of last count (AOSA, 1983)

## Fig. 3: Seedling Salt Screening of Perennial Ryegrass at 12,000 ppm Salt Concentration




Note: Values followed by the same letter do not differ significantly according to Duncan's Multiple Range Test (p<0.05)

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