



Selecting for Salt-Tolerant Cultivars

by Christian Baldwin, Ph.D.

Salinity is one of the most challenging aspects of turfgrass management. Saline water accumulates as total salts or toxic salt ions which leads to turf decline and soil degradation. Cultural practices to alleviate salinity stress include leaching excess salts by applying deep irrigation, modifying soils with amendments, and installing subsurface drainage. Currently, the global demand for fresh potable water doubles every 20 years. To address the increasing problem of salinity, Jacklin seed has initiated our own trials and participated in university trials to identify cultivars that perform well in saline environments.

In Post Falls, I initiated several greenhouse salt trials testing our experimental varieties to identify potential salt-tolerant varieties during the breeding process. As seen in the photo below, differences are often found, indicating high variation in salt tolerance among cultivars. Based on these findings, the future of Jacklin varieties with salt tolerance seems promising.

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Jacklin Seed greenhouse salinity testing facility. Note the differences in the response to salt. Some cultivars are completely brown and others are able to maintain live, green tissue.



4-Year Salinity Trial Wraps Up Near Great Salt Lake

by Jonathan Schnore

How much salt can a variety handle? This is the question many sod producers and golf course superintendents debate when switching to an alternative water source. Typically the answer for a Kentucky bluegrass would be roughly 3 dS/m.



Jon Schnore, assistant plant breeder at Jacklin Seed, records salinity stresses on turf varieties at a sod farm in Utah.



Other grasses may be higher. The question is where do researchers come up with this data? And more importantly, is there a difference in salt performance between cultivars?

Like many traits, salt tolerance varies by species. In the cool-season grasses, fine fescues were once thought to have high salt tolerance, with tall fescue next on the list, perennial ryegrass third and Kentucky bluegrass fourth. This ranking at first glance seems pretty straightforward. Unfortunately this common knowledge is untrue, as new research is proving. A recent publication from the Texas Cooperative Extension Service ranks Kentucky bluegrass as the least tolerant at about 3 dS, followed by fine fescue and perennial ryegrass both at 6 to 8 dS, tall fescue at 8 to 10 dS and **Fults** alkaligrass at greater than 10 dS. While this is a good guideline, it doesn't answer the question of do the species trends extend to every cultivar. *Continued p. 2*

Selecting for salt, continued

To back up our own studies, we entered several Jacklin varieties into a greenhouse screening trial at the University of Rhode Island that included a total of 154 perennial ryegrasses. Salt levels included 12, 16, 20, 24, and 27 dS/m. As a reference, seawater is approximately 45 dS.

Every cultivar in the URI study had less than 70% ground cover at salinities above 24 dS. While at 12 and 16 dS, every cultivar rated more than 70% cover. Therefore, the meaningful data (i.e., the “sweet spot” for varietal separation) is at the 20 dS salt level. The best performing Jacklin perennial ryegrasses (>70% cover) included **Caddieshack II**, **Accent**, and **CSI** – Jacklin’s new spreading perennial ryegrass.

Additional university substantiation came from a recent study at the University of Minnesota where researchers presented salt performance results from 75 cool-season cultivars from a variety of species when planted in saline roadside locations. Jacklin cultivars in the top one-third of the trial in fall establishment included **Caddieshack II**, **JR-521**, **Monterey 4**, **Accent II**, and **JT-158** (experimental tall fescue). Cultivars that were persistent throughout the following year included **Fults** alkaligrass, **Marco Polo** sheep fescue, and **Accent II** perennial ryegrass, which survived the winter at one of the Minnesota roadside locations.

A separate roadside trial was initiated by Mark Grundman (Jacklin Seed Senior Technical Manager), in conjunction with Illinois Department of Transportation (IDOT). It tested 51 cultivars from a variety of species, including hard, sheep, creeping red, and tall fescue, Kentucky bluegrass, perennial ryegrass, buffalograss, and Idaho bentgrass. This particular roadside site was chosen due to the heavy salt load it receives from deicing the Illinois interstate system and the need to reseed the following spring because of significant turfgrass cover loss. A representative from IDOT did the rating and provided Jacklin Seed with the data.

Regarding establishment, the top two cultivars in the trial were hard fescue cultivars **Ecostar** and **Rescue 911**. Other cultivars that provided acceptable establishment included **Fults** alkaligrass, **Accent II** ryegrass, **Inferno** and **Quest** tall fescue, and **Audubon** creeping red fescue. The cultivars that provided the best ground cover in the spring included **Quest**, **JF-116** (experimental Jacklin fine fescue), **GolfStar** Idaho bentgrass, **Ecostar**, and **Audubon**. 🏡

Great Salt Lake, continued

At Jacklin Seed, as we are developing trait-specific products, we find that there is often a wide range of performance for those traits between two cultivars.

To test the salt tolerance of our own varieties and develop new varieties with improved tolerance, we

planted hundreds of experimentals and standards at a saline sod farm site in Utah near the Great Salt Lake. The reason for this location choice is that it provided us with naturally occurring salt starting off at establishment with 10 dS and later ranging from 3 to 6 dS, depending upon irrigation. This differs from the majority of salt studies which usually occur in the greenhouse or growth chamber. We have tested bluegrass, ryegrass, and fescue at this location since 2008. What we have found is that there is a good relationship between performance at this site and other studies that corroborate across tests. The reason for this concern is that there is evidence that environmental conditions can have an effect on the way salt tolerance is expressed.

Two different trials were planted in Utah in 2008 and 2009. Each year for four years we traveled to Utah to rate quality and salt stress on the plots.



Utah’s Great Salt Lake

Among the Kentucky bluegrasses, **EverGlade**, **Liberator**, and **BlueChip Plus** maintained the best turf quality under salt stress in the 2009 study. The same year **Arid 3** performed well among tall fescues and **Accent II** among ryegrasses. Some of these results were mirrored in the results of the 2008 trial. In our 2008 trial **Quest** did well in the tall fescues and our **Jacklin’s Scottish Links** blend did well among fine fescues.

In a growth chamber salt study at Rutgers University, researchers tested 24 Kentucky bluegrass varieties, experimental lines and Texas bluegrass hybrids. Plants were treated with 3, 6 or 9 dS using saline overhead irrigation. Jacklin Seed’s **Liberator** Kentucky bluegrass was among the top two cultivars with best performance.

The most striking result of the study was that the Texas hybrids performed poorly under salt stress. The result was that bluegrass cultivars like **Liberator** were able to tolerate three times the amount of salt than the species was reported to handle.

The NTEP National Test has been evaluating salt stress in Las Cruces, New Mexico, since 2005. The salt at this location was measured at 1800 ppm total dissolved solids and an SAR score of 2.06. Some of the cultivars in this NTEP trial also appeared in our Utah trial. In the NTEP trial, **EverGlade** scored well. These results show that salt performance can be reflected across different sites with similar results. 🏡