



Research and Performance Summary for 'Liberator' *Poa pratensis*

'Liberator' Kentucky bluegrass (smooth stalked meadow grass, *Poa pratensis* L.) has been an exceptional turf performer in the US since its release. Liberator has good color, density, disease resistance, and other attributes requisite of a top-performing variety. But three performance traits set it apart from other bluegrass varieties:

- (1) Prior to being registered in Europe, Liberator was tied for #1 in the US/Canada national turfgrass evaluation program (NTEP) trials. Liberator outscored 100 other varieties in the trial. When reentered in the new NTEP trial years later, Liberator went on to a subsequent page 1 finish.
- (2) The best and fastest Kentucky bluegrass for turfgrass sod production is Liberator. Check out the NTEP table where it was the #1 commercial variety in sod strength, 2 NTEPs in a row:
http://www.ntep.org/data/kb00/kb00_02-1/kb0002t40.txt
- (3) Liberator has exceptional salt tolerance, as identified by numerous independent research studies. Salt tolerance is important for areas where effluent water, deicing salts, saline soils, or salty fertilizers are used.

The best endorsement for Liberator is its use on golf courses, sports fields, and lawn areas around the world in many different countries. Here are just a few of the golf courses that grow Liberator:

- Angel Hill Golf Club, Wulong, China
- Haenam Pine Beach CC, Korea
- Soto de Mozanaque, Madrid, Spain
- Pine Valley and Jinhai Lake, China
- Thracian Cliffs, Black sea coast, Bulgaria
- Nondela Golf Estate GC, South Africa
- Eagle Creek GC, Almaty, Kazakhstan
- Winchester CC, Winchester, VA, USA
- Cielo Paraiso GC, Panama
- The Glacier Club, near Detroit, MI, USA

- Palouse Ridge, Pullman, WA, USA
- Keene Manor, Lexington, KY, USA



Liberator is a particular favorite of turfgrass sod producers. The aggressive underground rhizome system, proven in the NTEP trials, assures quicker and easier lifting of turfgrass sod harvest. In China, sod farms in the Shijiazhuang area of Hebei Province, 2 hours south of Beijing, nearly all grown Liberator due to its excellent sod production characteristics. This area is a huge bluegrass sod production area (about 10,000 mu total), and farmers in this area harvest bluegrass sod an incredible 2-3 times per year. Chinese sod

Toyota Park, home field of the Chicago Fire professional soccer team, in Chicago, Illinois. Field was sodded to a blend featuring Liberator Kentucky bluegrass.

producers favor Liberator because of its:

- Rich green color
- Early spring green-up
- Fast establishment
- Fine-medium texture
- Good root system

A more "usual" sod harvest schedule for Liberator is 6 to 18 months, depending upon climate. But the good news is, that because of its aggressive rhizome system, Liberator can be harvested months earlier than competing varieties. And when it comes to sod production, time is money.



Liberator Kentucky bluegrass growing in a turfgrass sod blend in Western Ohio, USA.



South Side Country Club, Decatur, IL, took on a three-year interseeding plan featuring a Liberator bluegrass blend. Prior to seeding, the fairways had been a mixture of grasses, including Poa annua. Photos show the fairways excelling during one of the longest and hottest summers on record.



Liberator in the NTEP

Liberator outscored 100 other varieties in the NTEP trial. Its best sites were Iowa (1st place), Kentucky (2nd place), and Missouri (3rd place). It was also highly ranked in Minnesota and Alberta. All of these sites have severe climate fluctuations of harsh winters and warm, humid summers.

Liberator was largely unaffected by fertility rate, placing among the top 9 at all three fertility levels. It was relatively unaffected by mowing height. Liberator ranked 4th nationwide at 1 to 1.5 inch (25 to 37 mm) heights, 7th at 1.6 to 2 inches (37 to 50 mm), and among the top 16 at the other two heights. Liberator was the #1 entry in the transition zone, and was in the top 13 in the other two zones.

One of the strongest points of Liberator was its excellent ground coverage throughout the year. Liberator maintained a tenacious ground coverage throughout all seasons, ranking 8th in the summer and 9th in fall ground coverage. It ranked 10th in summer density, 10th in fall density and 4th in spring density.

Liberator has a rich green color (8th nationwide in genetic color), with a fairly fine leaf texture, excellent winter color (7th nationwide), good winterkill resistance, and virtually no stemminess or seedhead expression in the springtime (ranked 5th and 7th, respectively). Liberator had the 5th best resistance to spring melting out, 4th best resistance to leaf spot, and was in the top 20 for resistance to rust, dollar spot and drought.

At the end of the five-year NTEP trial, Liberator finished #3 for quality in NTEP, #3 for quality in dense shade and fall density.

Liberator's results in schedule A (golf course conditions) (Isd=0.3) showed that the only EU variety that beats Liberator 5.7 was Bedazzled 6.3. With schedule B (sports field management) no other EU variety beats Liberator. And for schedule C (lawn and landscape maintenance), no other EU variety beats Liberator.



North Scott Community Schools Soccer field I was seeded to a Liberator Kentucky bluegrass blend. The field was mowed at 5/8" (16mm) and is used for both varsity soccer and JV American football. The fields went on to win field of the year awards from the Sports Turf Managers Association.



Liberator was tested again and again and showed enduring performance. The following results summarize its performance against 172 other promising Kentucky bluegrasses across the US and Canada:

Among Jacklin Seed's best 3 in tree shade tolerance (So. Illinois).

#18 in seedling vigor

Tied for rank #5 in fall density

#5 at fall ground cover

Among the three best Jacklin varieties in drought tolerance

Tied for #1 in Microdochium pink snow mold resistance

Among the three best Jacklin varieties in red thread resistance

#15 against summer patch

Tied for #3 against stripe smut

Tied for #1 in resistance to bluegrass billbug

#6 in fall (September) color

#16 in sports field shear strength

Tied for #4 in rust resistance in North Carolina

#14 in least Poa annua at Rutgers in November

Among the three best Jacklin varieties in downy mildew resistance

#2 at sod stretching in Nebraska

Tied for #1 in brown patch resistance (Wisconsin)

Tied for #4 against dollar spot (North Carolina)

#3 in (North Carolina) leaf rust resistance

Tied for #1 in (North Carolina) stem rust resistance

#17 in Rutgers "slapper" wear tolerance.

Liberator had the highest sod strength in Nebraska and Maryland of all commercial cultivars, 12 months after seeding. At 12 months, 41 and 17 entries, respectively, in the Nebraska and Maryland trials had sod strength exceeding 22 kg, which was considered the minimum value for sod harvesting, handling, and transplanting. At 18 months after seeding, only eight entries in Nebraska and three in Maryland did not meet the minimal value.

Sod strength measurements ranged from 7 to 36 kg and 10 to 30 kg at Nebraska and Maryland, respectively, at 12 months while at 18 months the ranges were 5 to 65 kg and 13 to 48 kg.

Sod strength results are summarized in: *Shearman, R. C., T. R. Turner, K. N. Morris, R.*

E. Gaussoin, M. R. Vaitkus, and L. A. Wit. 2001. Sod strength and lateral spread of Poa pratensis cultivars and experimental lines. Int. Turfgrass Soc. Res. J. 9(Part 2):p. 928-933.

In a related study, Robert Shortell, William A. Meyer, Bingru Huang, and Stacy A. Bonos of Rutgers Univ. studied the capability of bluegrass varieties to reroot after simulated sod cutting under summer heat stress. Some varieties, including Cabernet and Eagleton (typical Mid-Atlantic types), grew fewer roots quickly into the deep profiles and then began to branch. Liberator and two other Jacklin bluegrasses were classified as “steady rooters” and grew slowly but had a higher amount of roots. Other cultivars such as Baron did not produce roots deep in the soil profile even at the end of the six week study period. Texas hybrid bluegrasses rerooted primarily into the top 14 cm of the soil, while Kentucky bluegrass rerooted into the deeper 21 to 35-cm soil depth.

As part of the National Turfgrass Evaluation Program (NTEP) Kentucky bluegrass test the University of Massachusetts evaluated necrotic ring spot resistance of bluegrass cultivars near Amherst, MA. The trial consisted of 173 commercially available and experimental cultivars seeded to 3 ft x 6 ft plots in Oct 2000. The experimental design was a randomized complete block with three replications. Plots were mowed at 1.25-in. height of cut. All plots received 3.25 lb nitrogen (N)/1,000 sq ft (0.75 lb N in late May and 1.25 lb N in early Sep and late Nov), no irrigation or fungicides were applied.

Plots were rated for necrotic ring spot (*Ophiospharella korrae*) 30 Jul 09. Identity of the disease was confirmed by the University of Massachusetts Turfgrass Disease Diagnosis Laboratory. Necrotic ring spot was evaluated using a visual rating of incidence on a percent of plot basis. Cultivars ranged from 0 to 25% disease. Commercial cultivars exhibiting no disease included Liberator, and others. Seventeen percent of all entries evaluated exhibited only trace amounts of disease (1%). Approximately 1/3 of the NTEP roster exhibited objectionable disease (>5%). Commercially available cultivars including Blue Knight, Bodacious, Chelsea and Lily were statistically

among the most susceptible to necrotic ring spot with disease ratings ranging from 17 to 23 percent.

Trial results can be found in the publication: *Ebdon, J. S. 2011. Resistance of Kentucky bluegrass cultivars to necrotic ring spot, 2009. PDMR: Plant Dis. Manage. Rep. 5:p. T040.*

Liberator's outstanding salt tolerance

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



Utah's Great Salt Lake, near the site of Jacklin Seed's field salt tests.



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



The yellow grass is patches of fine fescue under salinity stress in the Utah trial. The dark green grass is Liberator Kentucky bluegrass. Salinity at this site ranged from neutral to 10 dSm.

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.

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.

Among the Kentucky bluegrasses, **Liberator**, **EverGlade**, and **BlueChip Plus** maintained the best turf quality under salt stress in the 2009 study.

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.

Simplot Research Scientist, Christian Baldwin, studied Kentucky bluegrass cultivar response to salt in a series of greenhouse studies. He brought 3.75-inch plugs of 20 mature Kentucky bluegrass cultivars from field research plots and placed them into greenhouse pots for salt tolerance evaluation. Salinity levels were 0, 4, or 8 dS/m. Salt levels were increased gradually by 1 dS/m every other day until the desired concentration was achieved to avoid "salt shock." Salt was applied 5 days a week using sodium chloride (NaCl). Mowing height was maintained at 1 inch 3 times a week.

He collected turfgrass quality, percent leaf firing, clipping yield, root biomass, chlorophyll, percent bare soil, relative leaf water content, and leaf water potential data.

Results. At the 4 dS/m salt level, cultivars with less than 20% leaf firing included Liberator and six other popular Jacklin varieties. At the 8 dS/m salt level, only Liberator and three other varieties had less than 40% leaf firing.

At the end of the study, Liberator and four other Jacklin varieties had the highest chlorophyll concentration at the 8 dS/m salt treatment. Relative leaf water content was similar for all cultivars at 4 dS/m.

Overall, Liberator showed consistently better salt tolerance relative to other cultivars in this study. After 10 weeks, these cultivars had the least amount of leaf firing and were able to maintain a high relative leaf water content because they were able to adjust internal water potential values. This adjustment enabled these cultivars to continue water uptake and movement in the plant despite salinity stress.

A glass house study at Rutgers University illustrated that an increasing amount of reclaimed water is being used in turfgrass management; however, reclaimed water is often high in total dissolved salts and can result in salt stress injury and poor turf quality. The objective of this study was to use an overhead irrigated greenhouse screening

technique to identify bluegrasses with increased salinity tolerance, using growth parameters and physiological measurements. Salt treatments were applied using an overhead sprinkler system. Twenty-four Kentucky bluegrasses and Texas bluegrass (*Poa arachnifera* Torr.) Kentucky bluegrass hybrids were established in 100% sand tanks and evaluated at a control (1 dS m⁻¹) and three salinity concentrations (3, 6, and 9 dS m⁻¹) for a total of 10 weeks. Percent green ratings and digital images were collected weekly and clipping weights were collected biweekly. Root and shoot weights were taken at the end of the study. Significant differences were observed between salinity treatments and cultivars.

Liberator and three other Kentucky bluegrasses exhibited the most salt tolerance, having the least decrease in growth parameters compared to the control plants (1 dS m⁻¹), while cultivars Baron, A03-84, and A03-TB246 were the most salt sensitive when compared to control plants. Relative water content and photochemical efficiency were useful to quantify physiological differences between tolerant and susceptible cultivars. Full results of the study can be found at:

Koch, M. J., B. Huang, and S. A. Bonos. 2011. Salinity tolerance of Kentucky bluegrass cultivars and selections using an overhead irrigated screening technique. Crop Sci. 51(6):p. 2846-2857.

The same researchers at Rutgers performed a field study to verify their glass house results.

An overhead irrigated field screening method was developed to closely mimic the challenges associated with irrigation of turf with saline water under summer stress conditions. A total 48 clones from each turfgrass cultivar were planted and were irrigated overhead with saltwater (EC = 10 dS/m). This technique effectively identified differences in salinity tolerance, of Kentucky bluegrass, bentgrass, and perennial ryegrass cultivars and selections as measured by percent green ratings. The most salt tolerant cultivars included: Liberator, and three other Kentucky bluegrasses. Cultivars and selections exhibiting the least salinity tolerance were: RSP, A03- TB676, A03-84, and Julia

Kentucky bluegrasses; EBM Comp and Tiger II colonial bentgrasses; SR7200 velvet bentgrass; and Fiesta III perennial ryegrass. Full trial results can be found online at: Koch, M. J., and S. A. Bonos. 2011. *Salinity tolerance of cool-season turfgrass cultivars under field conditions*. [Online] *Appl. Turfgrass Sci.* p. [1-11].



Breeding history of Liberator Kentucky bluegrass

'Liberator' Kentucky bluegrass (*Poa pratensis* L.) (PI 603099) is a turf-type cultivar released by Simplot Turf and Horticulture, Post Falls, ID. Liberator was tested under the experimental designations 92-2572 and ZPS-2572.

Liberator was developed from a highly apomictic, single-plant selection from hybrid cross number 90-0336, hybridized in the greenhouse during winter of 1990. Pollen from 'Glade' Kentucky bluegrass was used to pollinate plants of breeding line '50-14.'

Breeding line 50-14 originated from a collection by the late Arden Jacklin, made in the northeastern USA during the 1970's.

Seed harvested from plants of 50-14 were individually sown into cells of greenhouse flats during the spring of 1992. The resulting plants were transferred to a field nursery of 28800 plants near Post Falls. Offspring with characteristics dissimilar to 50-14, the female parent, were flagged during maturation in spring of 1992. Plant number 92-2572 was identified as being different from 50-14 by its leaf color and texture, prior to heading. Seed harvested from this plant was used to establish a turf trial in Sep. 1992, a replicated seed yield trial in Aug. 1993, and a Plant Variety Protection (PVP) trial in June 1994 near Post Falls.

Liberator is recommended for lawns, golf courses, parks, and sports turf in areas where Kentucky bluegrass is well adapted for turf. It can be grown in full sun or some shade. Liberator is compatible in blends and mixtures with other cool-season turfgrasses.