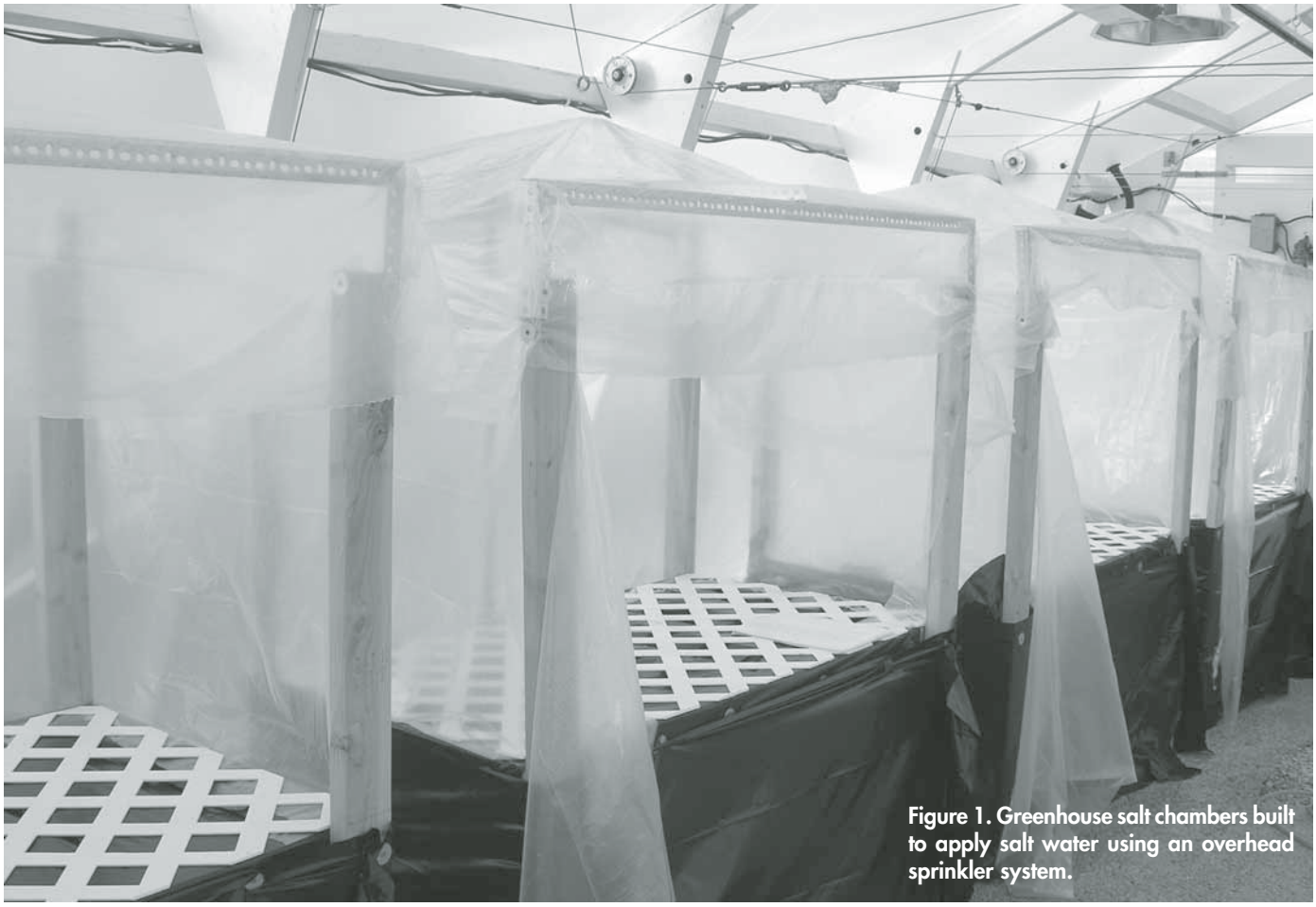


Figure 1. Greenhouse salt chambers built to apply salt water using an overhead sprinkler system.

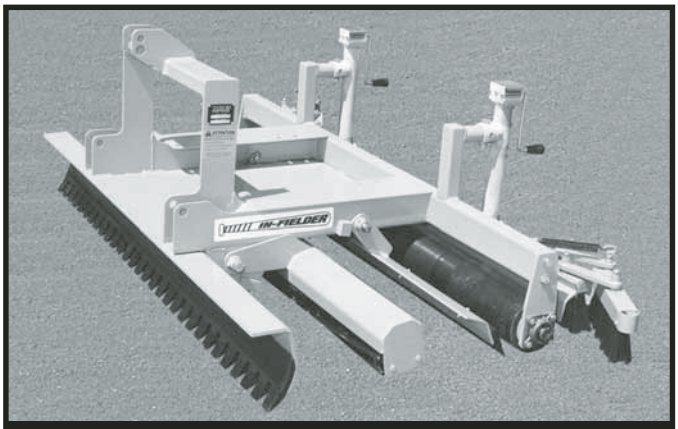
SCREENING COOL SEASON TURFGRASSES FOR SALT TOLERANCE

STACY A. BONOS, MATHEW KOCH, BINGRU HUANG & THOMAS GIANFAGNA • RUTGERS UNIVERSITY • NEW JERSEY

Salinity has been recognized as a major agricultural problem on more than 20 percent of irrigated agricultural land around the world. Turf managers can support water conservation efforts by using non-potable water sources for irrigation of turfgrass areas. However, non-potable water sources can contain high levels of dissolved salts, which can cause salt stress injury and reduce turf quality. The goal of this research project is to develop screening methods to assess the salt tolerance of cool-season turfgrasses and identify cultivars and selections with increased levels of salt tolerance. Two screening techniques (one greenhouse and one field) were developed to evaluate Kentucky bluegrass, Texas x Kentucky bluegrass hybrids and bentgrass cultivars for salinity tolerance.

A greenhouse salt chamber system was developed to apply saltwater with overhead irrigation. This screening method is unique in that it simulates real world stresses that a turfgrass manager would face if irrigating with water containing high levels of salt. This method results in both salt stress injury directly to the leaf tissue from overhead irrigation as well as salt stress injury to the whole plant from an accumulation of salt in the water and growing medium. Previous greenhouse salt screening studies have evaluated turfgrasses under hydroponic conditions. This method involves exposing the roots to high concentrations of salt water, but it does not include salt stress injury to the leaf tissue.

Re-circulating salt spray chambers (Figure 1) were constructed and used to overhead irrigate turfgrass plants in sand trays with four concentrations of salt water. The salt water concentration measured in EC (EC = Electrical Conductivity) was evaluated at EC concentrations of 1 dS/m (control – treatment 1), 3 dS/m (treatment 2), 6 dS/m (treatment 3), and 9 dS/m (treatment 4). Salt solutions were made by adding a product called Instant Ocean to the water filled reservoirs beneath each chamber. Instant Ocean, was chosen due to its high similarity to ocean water which contains various types of salts. In addition to the salt, 1/4 strength Hoagland's nutrient solution was added to the salt



REIST INFIELDER

72" width • Floating clod breaking pulverizer roller & leveling bar • 6 section packer roller, reduces skidding during turns & comes with a **5 YEAR WARRANTY**
Also features the first in spring loaded wing brushes
OPTIONAL 48" width available & tow hitch with adjustable wheels
The **BEST WARRANTY** in the industry.

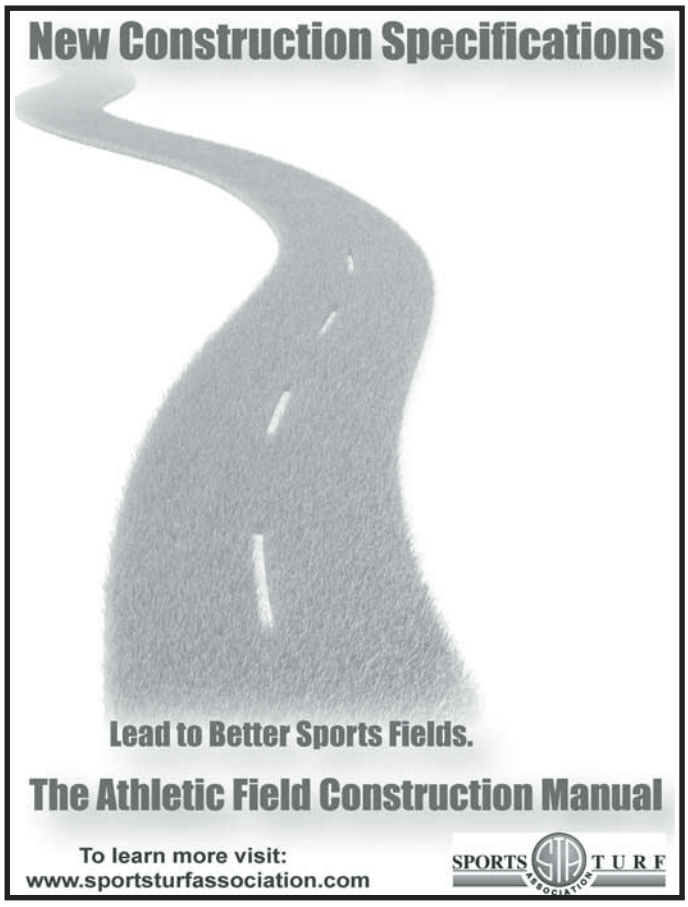
REIST AERASEEDER

Comes in widths of 24", 48", 72" & 96"
With the largest seed box capacity
The 72" will give you over 1700 perforations per square yd • The base unit comes with front cone spike or knifing tine roller and a solid rear packer roller
Seed is distributed through our ground drive mechanism
OPTIONAL rear cone spike or knifing tine roller

REIST INDUSTRIES

Visit our website www.ReistIndustries.com to preview a video presentation of our equipment.

1-877-467-3478



QS Quality Seeds

Quality Turf Seed Specialists

Quality Seeds **for Sod Growers, Golf Courses, Sports Facilities, Municipalities & Landscape Contractors**

DISTRICT SALES MANAGERS

Peter Coon • Cell: 705-715-3760
John Konecny • Cell: 905-376-7044

PRODUCT MANAGER

Cathy Wall • Cell: 416-802-4391

Exclusive Distributors **for hydraulic mulches featuring**
Flexterra FGM • Jet Spray • FlocLoc Tackifier
Futerra F4 Netless Erosion Control Blanket

1-877-856-7333 • 905-856-7333 • www.qualityseeds.ca

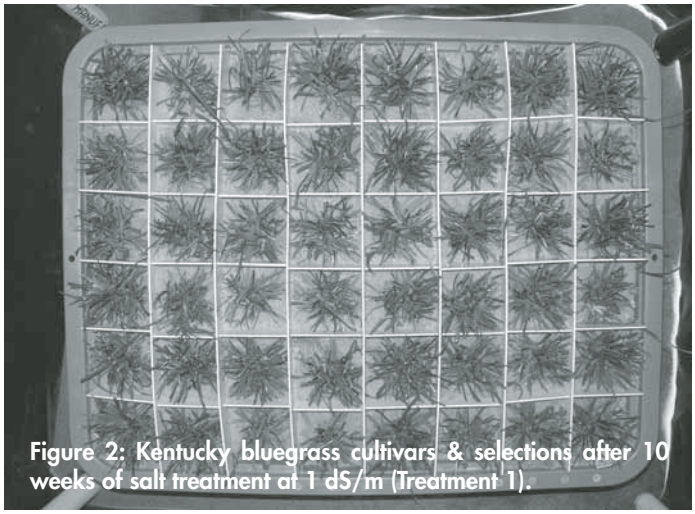


Figure 2: Kentucky bluegrass cultivars & selections after 10 weeks of salt treatment at 1 dS/m (Treatment 1).

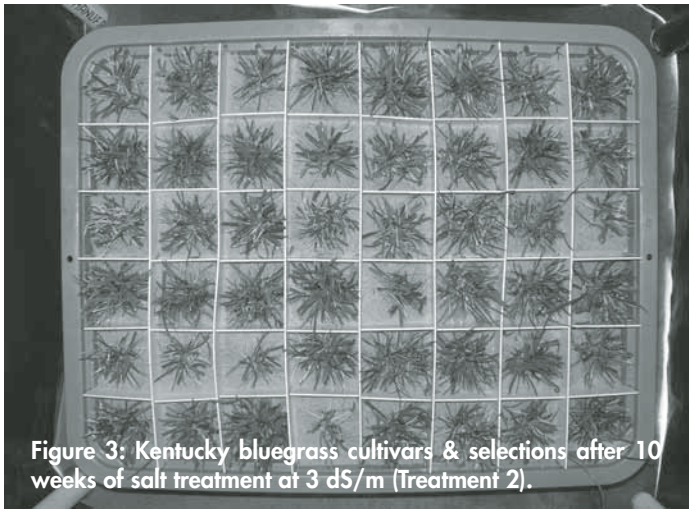


Figure 3: Kentucky bluegrass cultivars & selections after 10 weeks of salt treatment at 3 dS/m (Treatment 2).

Figure 4: Kentucky bluegrass cultivars & selections after 10 weeks of salt treatment at 6 dS/m (Treatment 3).

Figure 5: Kentucky bluegrass cultivars & selections after 10 weeks of salt treatment at 9 dS/m (Treatment 4

water tanks to provide the plants with nutrients needed for normal growth.

Twenty-one Kentucky bluegrass cultivars and selections were evaluated in the greenhouse salt chamber screening including Jefferson, Langara, Argos, Liberator, Diva, Bedazzled, Fairfax, P105, RSP, A03-84, Moonshadow, Bewitched, Julia, Baron, Eagleton, A00-1400, A99-2559, Lakeshore, Rhythm, Midnight and Cabernet. Three Texas x Kentucky bluegrass cultivars and selections were also evaluated (Bandera, A03TB-676 and A03TB-246). Treatments were replicated three times. Plants in each of the trays were randomized and separated with plastic inserts to minimize interactions. Plants were irrigated every other day with fresh water and the nutrient solution for a week before salt treatments were initiated. Salt was added at 1.5 dS/m each irrigation day until the maximum EC was reached in order to prevent shocking the plants with the full strength salt solution. After the final salt treatment was reached, plants were exposed to the salt treatments for 10 weeks. Throughout the study, all plants were maintained at 1.5 inches.

Percent green ratings were collected weekly on the Kentucky bluegrass plants. Additionally, every other week, dried clipping weights, relative water content, photochemical efficiency, and chlorophyll content were measured on the Kentucky bluegrass plants. At the end of the 10 week study, roots were washed free of all sand particles and final root lengths, dried root weights, and dried shoot weights were measured. All of these measurements were then analyzed as a proportion of the control plants in order to take into account the innate differences in growth habit between cultivars. In order to determine the final EC of the sand for each treatment, samples were removed from each tray and analyzed at the Rutgers University Soil Testing Laboratory for soil EC.

Significant differences were observed between treatments (Figures 2-5) and cultivars indicating that this method should be useful for evaluating salinity tolerance of Kentucky bluegrass. Under greenhouse conditions after 10 weeks of overhead irrigation at 9 dS/m (treatment 4), the cultivars exhibiting the highest percent green ratings were Eagleton, Liberator and Cabernet. The cultivars and selections with the lowest percent green were a Texas x Kentucky bluegrass selection, A03TB-246, Baron and the Kentucky bluegrass selection A03-84. The limitation of this greenhouse research is that it is being conducted under controlled environmental conditions. Therefore, we are also exploring the possibility of screening cool-season turfgrass cultivars for salt stress tolerance under field conditions.

For the field study, 19 of the 21 Kentucky bluegrass cultivars and selections and all three Texas x Kentucky bluegrass hybrids were replicated and established as spaced plants in a sandy loam soil at the Plant Biology Research and Extension Farm, Adelphia, NJ. All plants were mowed at 2.5 inches once a week with a

STM CORRECTION

Turn Off the Pesticides and Turn on the Vacuum (Spring 2008 *Sports Turf Manager):* The adult chinch bug (shown below) was mistakenly identified in the photo on page 9. The photo is actually its predator, the adult big-eyed bug (pictured above). The two are similar in size and are often confused when seen in the grass. The big-eyed bug is usually brown in colour and has very large eyes (hence the name); the chinch bug's head and eyes are much smaller and its adult colouration is typically black and white. We apologize for any confusion this may have caused.

Toro Groundsmaster. Equal parts of sodium chloride (NaCl) and calcium chloride (CaCl) was used to make a salt solution with a concentration of EC = 10 dS/m. A 500 gallon pump-tank was used to apply the salt water solution. Each plant received 0.125 gallons of this salt solution three times a week. A total of 36 separate salt applications were made to the field grown spaced plants. Each week, soil tests were taken from various points throughout the field and analyzed for soil EC by the Rutgers University Soil Testing Laboratory. Visual percent green ratings were taken throughout the summer to identify the level of salt tolerance of each of the cultivars included in the trial (Fig. 3).

By the end of the season, the soil EC reached levels above 3 dS/m which caused significant stress on the turfgrass plants. Significant differences were observed among cultivars and selections under field conditions. Bewitched, the experimental selection, A03-84, Langara, Bedazzled, Jefferson, Diva, P105, Rhythm and Liberator had the highest percent green leaf tissue under these conditions while Julia had the least.

The field results were not strongly correlated to greenhouse salt chamber results. The greenhouse is an extremely controlled environment – temperature, humidity and other stresses are controlled – while under field conditions, plants are exposed to other stresses such as heat, drought, mowing, etc. in addition to salinity stress. Salinity tolerance is a complex trait that is affected by other environmental factors including both air and soil characteristics. Therefore it is not surprising that there was little correlation between the greenhouse and field experiments. We hope to use this information to identify the critical factors influencing salinity tolerance under field conditions in order to develop efficient selection techniques for improving salinity tolerance in cool-season turfgrasses.

This research indicates that it should be feasible to evaluate salt tolerance of Kentucky bluegrass under greenhouse and field conditions. We are in the process of screening bentgrass cultivars and selections for salinity tolerance under both greenhouse and field conditions. We are hopeful that this research will provide practical recommendations to sod growers, golf course superintendents and turfgrass managers attempting to grow and establish Kentucky bluegrass and bentgrasses under salt stress conditions. In the upcoming year, we hope to expand correlation studies between greenhouse and field screening techniques to determine the most useful screening technique for evaluating salt tolerance in cool-season turfgrasses. Additionally, we have initiated inheritance studies to determine the genetic component of salt tolerance in cool-season turfgrasses and we are also testing experimental selections on salt-affected sites to validate our screening techniques. The information generated from all of these trials will prove useful for turfgrass managers and sod growers interested in using non-potable water for irrigation of cool-season turfgrasses. ♦

Stacy Bonos can be reached at 732-932-9711 x255, bonos@aesop.rutgers.edu.
Reprinted from *Turf News*, Turfgrass Producers International, Volume 31, Number 3, May/June 2008.

STA Member Profile

Bruce Hay • Manager of Parks Maintenance • City of Brampton

1. What is your role with the City of Brampton? Manager of Parks Maintenance.

2. What kind of team do you work with? I work with a dedicated team of parks maintenance professionals who are often called on to produce excellence on the spur of the moment. I have learned this positive trait is not just unique to Brampton, but is industry wide.

3. What are you and your team responsible for? Sportsfield maintenance and renovations, litter control, pathway maintenance, playground maintenance, winter snow operations at recreation facilities.

4. What is the biggest challenge in your job? Translating what our customers want in an athletic field and using the best turf practices possible to provide superb field conditions during unpredictable weather events.

5. What is the most satisfying part, what makes the job worthwhile for you? I enjoy the people I have met in this business. They remain lifelong friends and accomplices. Also there is nothing like a dense, green sward of grass on a soccer field or a perfectly cut infield on a ball diamond.

6. What is the biggest misconception about your job? That I don't enjoy it

7. What is your educational/employment background?

- 3 yr. Landscape Technologist with Honours, Humber College
- Business Administrative Studies, York University.
- 5 yr. private sector landscaping maintenance
- 3 yr. City of Etobicoke Arborist
- 29 yr.City of Brampton Gardener, Cemetery Manager, Parks Foreman/ Supervisor, Urban Forestry Supervisor, Parks Manager

8. Tell us about your family. Married for 29 years with two lovely daughters.

9. What do you enjoy doing outside of the workplace? Hobbies, favourite past times? Playing music on piano, organ and guitar and travelling abroad.

10. How has the industry changed and in what direction(s) would you like to see the industry, as a whole, move towards? The industry has benefited much more from science than in the past to provide excellent turf. I think that the industry continues to learn how to strike a balance between new cultural practices and what we have known all along. I have learned that without an underground irrigation system it is very difficult, nearing impossible, to have a good field that has lots of use.

11. What do you consider to be the biggest benefit of being a member of the STA? There isn't just one. The generosity of the STA members to share information on what has worked and what has not worked in the business of turf; the dedicated number of professionals that have served and continue to serve on the STA's executive board: and a quality publication and excellent conferences. ♦

The *Sports Turf Manager* isn't your only member resource. Why not visit…

STA On-Line

at www.sportsturfassociation.com

View a listing of all *Sports Turf Manager* articles from 1987 to the present. Go to the "publications/ Sports Turf Manager" link and click on "cumulative index."

Go further afield via the Michal J. Bladon Education Link to the Michigan State University's Turfgrass Information File in the "Member's Only" section of the website.

STA Facility Profile

Donald M. Gordon Chinguacousy Park • City of Brampton

1. Name, location of facility. Donald M. Gordon Chinguacousy Park, located at the northwest corner of Queen Street East and Bramalea Road.

2. General information regarding the facility. Chinguacousy Park is home to: Mount Chinguacousy Ski Hill, Chinguacousy Curling Club, Brampton Firelife Safety Facility, animal farm and petting zoo, formal gardens and greenhouses, ponds, children's playgrounds, and cenotaph.

3. What types of sports fields are on site? Soccer, football, baseball, beach volleyball, and track and field.

4. How many employees are involved with turf care at this facility? Two.

5. How many acres of turf are maintained at this facility? How many acres of sports turf? 65.

6. What percentage of this acreage is irrigated? 50%.

7. What is the primary type of turfgrass? Name of varieties. Kentucky bluegrass and perennial ryegrass.

8. Is yearly overseeding part of your sports turf maintenance program? Yes.

9. How many times do you fertilize?
Irrigated fields – 4 times per year
Non-irrigated – 2 times per year

10. Do you aerate? Topdress?
Irrigated fields – 4 times per year
Non-irrigated – 2 times per year

11. Has your municipality banned the use of pesticides? No, we have had a Pesticide Use Policy in place since 2002 that regulates our pesticide application and is based on the principles of Integrated Pest Management. As a municipal, industry stakeholder, Brampton staff are prepared, through public consultation, to provide input to the Province of Ontario and produce revisions to our Pesticide Use Policy, based on the new legislation banning the use of Cosmetic Pesticides.

12. Are community user groups involved or have they been involved in the construction/maintenance of this facility? In what manner? Community groups are consulted and provide comments (more so than ever) into the quality of design and maintenance of their sportsfields.

13. How many hours per year are the fields permitted? Who permits them? Are the fields ever closed during the season to give them a rest? How much input do you have in the amount and timing of use? The City of Brampton's Sports Division (Recreation Division) permits all city, public and school board fields in our inventory. We have very little input into the amount and timing of use, however we do close each major field two days per month for turf maintenance and are working with our Sports Division to renovate and rest fields by the season. ♦

STA ANNUAL FIELD DAY

This year's popular event will be held in Brampton. See page 4 for info…