

Too much salt for your grass?

by John Schmitz

■ More and more golf courses and other public recreation sites today are facing a serious health problem: too much salt in their diets, most of it coming from treated wastewater used for irrigation.

One prescription for the dilemma is to use salt-tolerant grasses. Another is over-irrigation, which some say flushes the offending salts away from the turf and root-zones.

A number of grass seed companies are researching salt-tolerant grasses. One of the first to address the dilemma is International Seeds, Tangent, Ore. What prompted the research, says senior seed research scientist Steve Johnson, were complaints from golf course superintendents.

Non-tolerant grass shrivels up and dies when exposed to salty water, says Johnson. Groundsmen and landscape managers can't mistake it for disease because the discoloration doesn't occur in patches, he notes.

In the summer of 1993, ISI began a program to identify grasses that can withstand the devastating effects of inorganic salt-laden effluent from such sources as municipal sewage treatment plants and local factories. To date, ISI has analyzed some 20 cultivars for their capacity to grow in salty environments. So far, the variety showing the most promise is a slender creeping red fescue marketed as Marker by ISI.

Ancestors to the variety actually came from grass growing on and around Dutch dikes, which thrive in salty, ocean air. The variety is also used extensively for roadsides in the Midwest, where a lot of salt is used during the winter.

Dr. Eric Nelson, director of turfgrass research and product development at Medalist America in Albany, Ore., says that



International Seed's Steve Johnson with some of the grasses ISI's looking at for their salt tolerance properties. These particular grass varieties are being considered for grass tolerance analysis, even though they're growing under normal conditions rather than being subjected to salty water.

the use of effluent on golf courses and other public reaction spots is definitely a trend.

"You'll see more recycling of water as treatment processes become better."

Nelson says that one benefit of using treated wastewater on turfgrass is that the plants are able to use the nitrogen and phosphorus, whereas the dumping of that same treated water in streams or oceans is harmful to fish and humans, as well as being against the law.

Different species of grass react differently to high salt concentrations, says Nelson. Some simply exclude salt from being taken up by plant roots while others can either exude it after being taken in or store it away from plant cells. Those plants having low tolerances for salt will become stressed and unable to take up water efficiently and even-

tually die.

Medalist America's Fults, an alkaligrass developed by Colorado State University, is being used successfully in mixtures for roadsides which are subjected to salt during and following snow storms. The variety was also used to seed a golf course in Chicago with a heavy amount of imported sewage sludge in its topsoil.

Nelson says that Fults will actually "fade" and become "non-competitive" without a certain amount of salt pressure. The variety grows best in slightly basic soil with a pH of around 8.0, he says.

Dr. Leah Brilman, research director for Seed Research of Oregon in Corvallis, says that extensive studies done at the University of Arizona show that "the turfgrass commu-

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nity" can actually clean effluent water, "so by the time it goes through the turfgrass and works its way down to the aquifer it's pretty much cleaned up of all the things that people don't like. Turf is a great cleaning mechanism for water."

Although effluent can provide beneficial nutrients to grass plants, you must keep regular tabs on the amount of nitrogen being supplied, says Brilman. "You have to be careful you don't over-fertilize because you're essentially fertilizing with nitrogen and phosphorus every time you water."

Brilman says that salty effluent can become even more of a problem and adds more stress to plants as the water evaporates off and leaves behind a salt crust. The cure for this, especially in well-drained soils, is a healthy irrigation program that tends to keep the rootzone flushed.

In many grass species, the relationship between salt tolerance and drought tolerance is similar, says Brilman. "What you have is the water wanting to leave the plant instead of come into it. So, very often if you can identify a plant or group of plants with good drought tolerance, such as the alkligrasses and some of the fine and tall fescues, often they will have pretty good salt tolerances."

"We have some things that show good salt tolerance but I won't say that's what we were breeding for," says Brilman. "When we were looking for drought tolerance, we got salt tolerance with it."

Seed Research of Oregon is trying to identify good salt tolerators. It's screening germplasm from species that grow in salty environments, such as near seashores. Also being looked at are "new" species of grasses, which Brilman explained as being other species of grasses that potentially could have good salt tolerance but haven't been looked at for their turf potential. "Any new varieties that look promising may be crossed with existing varieties having other characteristics we want," she says.

For the past five years, Cactus Seed Co. in Arizona has been working with a promising salt-tolerant grass for use on the fringes of turfgrass areas. "It's very, very salt tolerant," says vice president and general manager Ernie Milner of a grass he calls "Salt Grass." Samples of the grass were brought to Milner by two Tucson seed breeders who specialize in developing salt-tolerant grain and vegetable seed for use in places like Saudi Arabia. Milner has been able to identify the male and female grass plants and

Irrigation systems fight sodium build-up

■ Landscape managers make informed purchasing decisions when they understand irrigation options and how they relate to a system's primary role. One of the effects of proper watering is a reduction in sodium build-up in the soil.

Soil composition—"The primary purpose of an irrigation system is to maintain the viability of your plant material," says Bud Knowles, president of Wolf Creek, a Rain Bird distributor in Dayton, Ohio.

For a healthy turf—and satisfied customers—sufficient water must reach the roots of the grass. That is, it must infiltrate the soil well. The irrigation system regulates infiltration by controlling salinity and bicarbonate levels as well as the Sodium Absorption Ratio, or SAR.

"An important factor is being in tune with what the plant and soil requirements are," says Bruce Funnell, specification manager at Wolf Creek.

• **Salinity.** Salts slow infiltration and keep water from plant roots. If water is applied too conservatively, it will aggravate the problem. When this happens, even less water penetrates the salt barrier. With less water flushing out excess salts, salinity will increase. Plants won't get enough water, and turf will die.

"All salts cause an imbalance in the water in the membrane of the plant cells," says Gil Landry, extension turf-

grass specialist at the University of Georgia. "Then the plant can't take up sufficient water."

The most common solution is leaching. That is, applying sufficient water each irrigation—being careful not to over water—so that enough nutrients reach all plant roots.

• **Sodium Absorption Ratio.** Sodium causes a problem when more than 160 mg/l is in the water, or if the SAR of the water is greater than six. The common result is plant stress.

"Many people use a non-ionic material like gypsum, which is calcium sulfate," Landry says. "The calcium displaces the sodium on the exchange complex, and the sodium can then be leached out as sodium sulfate."

• **Bicarbonates.** "Bicarbonates can cause calcium and magnesium to precipitate," Landry explains. "That brings about an increase in sodium."

High bicarbonates initially cause pooling. If this occurs, and soil extracts have high electrical conductivity, further testing should determine if bicarbonates are the problem.

The ultimate effect on the turf is the death of the plant. One solution, Landry says, is to apply enough fresh water to leach the nutrients below the root zone.

—James Holter

cross them to produce seed.

Salt Grass, which can be irrigated with ocean water, could be released next year, says Milner. It's presently being "bumped" in a small production field about 45 miles east of Yuma.

Milner says the grass, which is a bunch type that grows upright and spreads by sending out rhizomes two or three feet underground, is able to use the beneficial components of salty water while depositing the salt itself on the leaves. "It would make a good reclamation grass or contrast grass and requires very little maintenance. It only grows 18 inches high."

Plant breeder Crystal Rose Fricker of Turf Seed, Inc. in Hubbard, Ore. says that even effluent with low salt concentrations can become a problem over time. "It may seem okay in the beginning," she says, "but

as you water, the salinity builds up in the soil over time, so it gets hotter and hotter and hotter, starts burning the grass."

This burning action actually attacks the grass in two places: above ground where the freshly mowed tips of the plant are exposed to the salt, and below ground where the roots can't take in needed water because of the presence of salt.

Managing effluent use should be guided pretty much by both the level of salt in irrigation water and the type of soil, particularly drainage characteristics, says Fricker.

Seabreeze, a slender creeping fescue, and Dawson are the most salt tolerant of all cool-season grasses tested by Turf Seed, says Fricker. This September, Tee-2-Green will be releasing Seaside II, a Penn State-developed creeping bentgrass ideal for fairways, she adds.