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PURPOSE

The purpose of *USGA Turfgrass and Environmental Research Online* is to effectively communicate the results of research projects funded under USGA's Turfgrass and Environmental Research Program to all who can benefit from such knowledge. Since 1983, the USGA has funded more than 215 projects at a cost of $21 million. The private, non-profit research program provides funding opportunities to university faculty interested in working on environmental and turf management problems affecting golf courses. The outstanding playing conditions of today's golf courses are a direct result of ***using science to benefit golf***.

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Desert Saltgrass: A Potential New Turfgrass

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SUMMARY

A cooperative effort betwee Colorado State University and the University of Arizona is evaluating desert saltgrass (*Distichlis spicata*) for use as drought-tolerant turfgrass.

- Twenty-one lines of saltgrass were planted in field plots in both Arizona and Colorado. Plants maintained at both sites were evaluated for turf characteristics.
- A nursery was established of 190 accessions from Arizona, Colorado, the Northern Great Plains, the Great Basin, and Northern California in 1999 and 2000 in Colorado. These clones were evaluated for potential seed production, rust resistance, short height, as well as overall turf quality characteristics. Based on these evaluations, 15 females and 11 males were selected and pooled for improved germplasm.
- There was greater winterkill among the Great Basin and Utah lines compared to those collected from Colorado and more northern regions.
- There appears to be a relationship between chromosome number and the region. Most clones collected east of the Rocky Mountains have a chromosome number of 2n = 4x =38. A second region from northern California across northern Nevada and into Idaho also has plants with chromosome numbers of 38, see Figure 5. Plants collected west of the Rocky Mountains tend to have chromosome numbers of 2n = 4x = 40. Plants with higher numbers of chromosomes (72+) are found among both chromosome types.

Water usage in the dry regions of the western United States has been greatly impacted as population shifts have generated increased demands for potable waters. With continued population increases there is interest in the development of native grasses as turfgrasses which offer not only the potential for reducing irrigation requirements, but also the potential for irrigating with non-potable water.

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Collecting saltgrass lines

Evaluation of desert saltgrass (*Distichlis spicata*) as a potential new turfgrasses dates back several years when Dr. Jackie Butler and Dr. Robin Cuany at Colorado State University initiated evaluation studies of several native grass species. However, little further work was done until 1995 when Dr. David Kopec, University of Arizona, made a collection trip into Colorado with Dr. Tony Koski, Colorado State University. Those collected saltgrass lines were maintained and preliminary evaluations were made at the University

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of Arizona. As a follow-up, a cooperative effort was initiated between UA and CSU faculty to investigate that and other collections for their potential in the development of turf-type saltgrass.

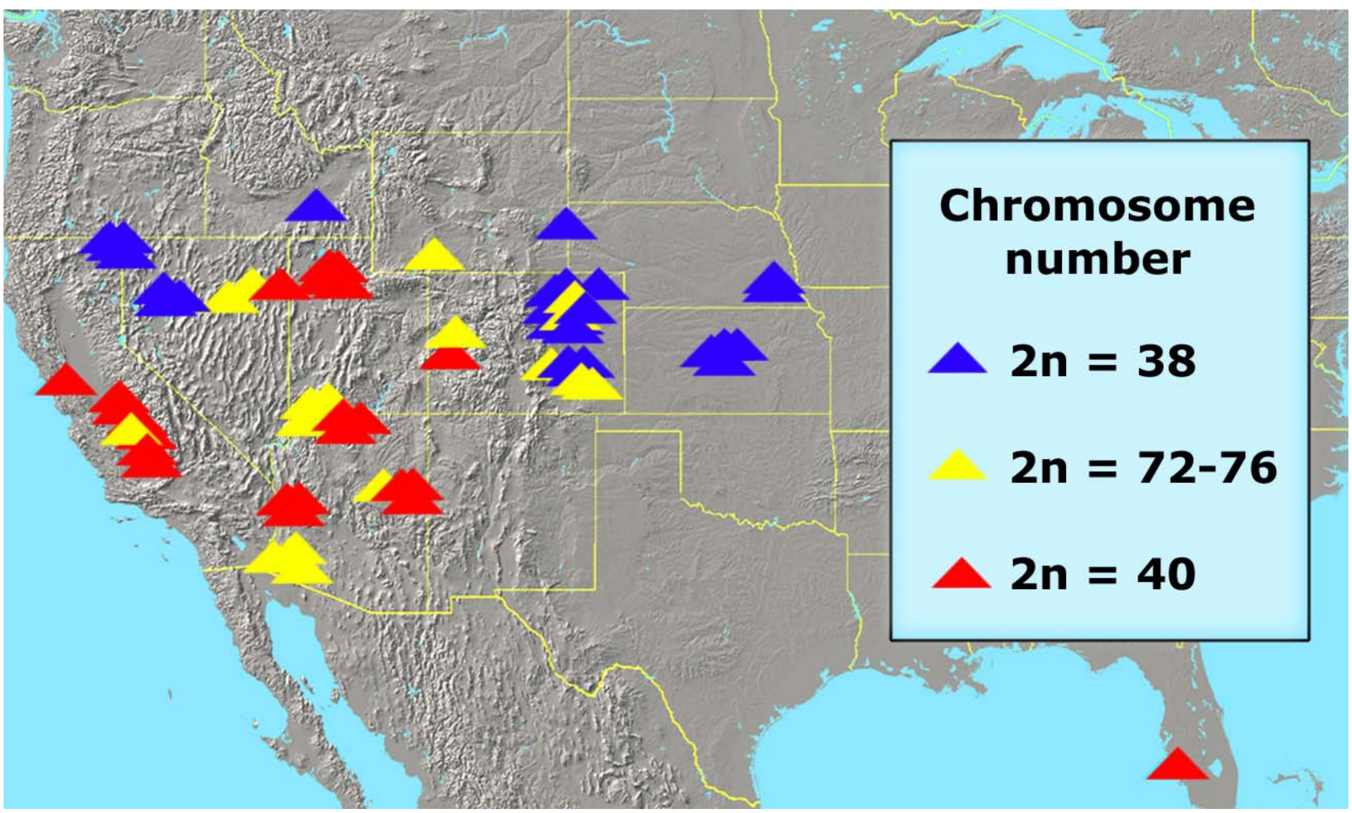
In Colorado, two of the Arizona lines were selected as having superior turf characteristics. One of these lines was selected to be used as a seed parent. In addition, a nursery was established of 190 accessions from Arizona, Colorado, the Northern Great Plains, the Great Basin, and Northern California in 1999 and 2000 in Colorado at the Horticulture Research Center.

These clones were evaluated for potential seed production, rust resistance, short height, as well as overall turf quality characteristics. Based on these evaluations, 15 females and 11 males were selected and pooled for improved germplasm. Crosses were made among the lines and seed collected. This seed is being used to evaluate the potential for developing improved performance for the characteristics noted above.

Selecting for turfgrass qualities

One of the observations made among the 190 clones was that there were differences in winterkill among the clones according to their origin. In general, there was greater winterkill among the Great Basin and Utah lines compared to those collected from Colorado and more northern regions. As potential varieties of saltgrass are developed, it is important to identify where those varieties are most likely to be marketed and grown so these differences in climatic adaptation can match those regions.

We have also looked at the mowing effects on all 190 clones. We mowed one half of each plot and observed the clones to determine the influence of mowing on turf quality. Differences in shredding and browning of the plants were observed. This is another indication of differences for turf quality among the plants relative to potential for use in a turf situation.



There appears to be a relationship between chromosome number and the region. Most clones collected east of the Rocky Mountains have a chromosome number of 2n = 4x =38. A second region from northern California across northern Nevada and into Idaho also has plants with chromosome numbers of 38.

We also observed differences in flower production and greening during a drought in 2000 and 2001 in saltgrass as compared to buffalograss, blue grama, crested wheatgrass and bermudagrass. Saltgrass remained green and demonstrated a high level of flowering as compared to the other grasses which turned browned and had little flowering. This would indicate that saltgrass has far greater tolerance than other potential turfgrasses to grow under reduced moisture.

Chromosome numbers

As part of the breeding program, chromosome counts of many lines have been made. Over 160 lines have been collected from several regions. Most are clones that have been collected, but several come from two seed lots from California and Utah. The basic chromosome number is believed to be 10. The chromosome number that has been observed is 38, 40, and 72+ as well as several with small, morphologically different chromosomes believed to be so called "B chromosomes". A knowledge of this varying chromosome number will assist breeders in selecting those lines with similar chromosome numbers as they are more likely to cross freely.

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It is interesting to note as well that there is a general observation that the orientation of the leaf of the 38- and 40-chromosome plants varies. The 40-chromosome plants tend to have a more horizontal orientation while the 38-chromosome plants tend to be more vertical. Although we find considerable variation in this condition in all regions, this general observation seems to prevail.

There have been several reports that saltgrass is difficult to propagate via seed, i.e. few seeds are produced, and it is difficult to germinate those that are produced. Our experience is that if male and female lines are selected that flower abundantly and at the same time, seed production is generally good. In some evaluations of relative seed production, some of the best lines have produced in excess of 1000 pounds of seed per acre.

However, we do lack a clear understanding of the influence of environment on flowering. There have been reports that burning of fields increase flowering the following year in some turfgrasses. We attempted this and failed to get differences compared to plots that were not burned. We also tried to get an understanding of the influence of cold treatment on flowering by giving pots of saltgrass varying treatments of cold to see what their needs were. Again we failed to get a noticeable influence on flowering.

Turf characteristics that are important to include in saltgrass selections include genetic color, density, and mowing quality.

Seed germination occurs readily if seed is scarified (wearing down the seed coat), either by hand or mechanically. Previous to our work, most people who tried to germinate saltgrass would say that it was difficult to germinate. However, we found that uniform and high germination rates could be obtained if the seed were scarified prior to planting.

We have also found that seed priming may

When saltgrass seeds are primed before planting, this results in more uniform and dense stands.

speed seed germination. Priming is typically done prior to germination with seed treated in a high osmotic solution. Basically this allows seed to take up water, but limits the amount taken up. This results in stimulating various cellular processes in the seed, but because it is done at a high osmotic level, the seed do not actually germinate. Sometimes other chemicals are applied to aid in this process, as well.

These primed seed are then removed from the high osmotic solution and dried down. When the seed are planted they are "primed", i. e. ready to germinate. This results in quick germination that in turn may result in more uniform and dense stands. Seed treatments like scarification and priming are commonly used in the ornamental and vegetable industry and could quickly be adapted for saltgrass seed. However, this would add a cost that would have to be evaluated for relative value.

What is next?

We have selected clones that have good turf-type characters. We now will try to determine which male and female lines when crossed give the best seed production and when the seed are germinated result in good turf. It may take some time to find lines which will work. In the mean time, we have selected two lines and are proceeding to patent one of them. We hope to get it out on golf courses for evaluation soon. We are also working on plans to put it in a sod production system to see how well it can be produced under commercial conditions. We are also pursuing the development of a means of fingerprinting the clone. Additional collections will go into the field for evaluation as well as seed from crosses made among those superior lines already selected.