Story by Courtney Smith

Tolerant Turf

Collaborators work to improve turfgrasses' response to drought and salinity

Although turfgrass is not food, fiber, or animal feed, it still impacts the lives of millions of people—mentally, socially, and physically—according to Dr. Ambika Chandra. Climate change, recurrent droughts, and increasing public demands on water resources mean that less potable water will be available for irrigation of turf landscapes and golf courses in the future. Chandra, assistant professor of turfgrass breeding and molecular genetics at the Texas AgriLife Research and Extension Center at Dallas, and researchers from five other universities have partnered with three objectives in mind—to develop, improve, and commercialize drought- and salinity-tolerant turfgrass.

These collaborators will do so with a $3.8 million grant from a Specialty Crops Research Initiative program of the U.S. Department of Agriculture's National Institute of Food and Agriculture. This Coordinated Agricultural Project (CAP) includes researchers from Texas AgriLife Research along with the University of Florida, the University of Georgia, North Carolina State University, and Oklahoma State University. Turfgrass breeders, agricultural extension specialists, physiologists, economists, and social scientists from these major universities will work together over the next five years to develop and commercialize cultivars of five common turfgrass species.

"With this coordinated effort, it's not just Texas involved," said Chandra, who is the project's director. "This project is really going to impact the overall productivity and economic gain of the turfgrass industry in the South. Turfgrasses with improved drought and salinity tolerance will help conserve potable water resources, enhancing the sustainability and profitability of the entire southern turfgrass industry."

Chandra said the team will take a traditional breeding approach targeting warm-season turfgrasses—bermudagrass, St. Augustinegrass, zoysiagrass, and seashore paspalum—as well as ryegrass, a cool-season turfgrass. Researchers will develop and test hundreds of experimental lines of these species. "The idea is that from that large number, we will select for drought and salinity tolerance and narrow the genetic pool down to about 10 percent of elite material that would then be studied in further detail in greenhouses and out in the field," she said.

Dr. Grady Miller, North Carolina State University professor and Extension turf specialist, said, "It is critical that we find turfgrasses that can be used that require fewer inputs (water and pesticides). To meet the demand of our clientele, we'll have to develop grass cultivars that can handle our change in water use."

Another approach the team will use is marker-assisted selection. Markers for these two traits—drought and salinity—will be identified with hopes of transferring them to other related species. The breeding process will continue in each year of the project. Chandra said researchers will develop new experimental lines annually so the new material can be evaluated in the field the next year.

"We expect the outcomes of this process to be commercialization of scientific intellectual property—in terms of new cultivars of these different grass species, as well as genes and/or molecular markers for drought and salinity," she said.

In the past, each university led the breeding and evaluating of certain turfgrass species, resulting in efforts that were somewhat isolated. However, this grant allows these five universities to exchange genetic materials for these five turfgrass species to evaluate for adaptation to various regions in the South. This encourages a large flow of information, ideas, expertise, and genetic material across the Southern Region Turf Development Program, Chandra said, and possibly avoids duplication of effort.

Extension specialists will serve an important role in the project's evaluation phase. As universities exchange the genetic material, the specialists will help evaluate these developed lines of turfgrass

Dr. Ambika Chandra of the Texas AgriLife Research and Extension Center at Dallas and others work on a turfgrass field at the Dallas center. Photo courtesy of the Texas AgriLife Research and Extension Center at Dallas.

species. The evaluation of the experimental lines will occur at multiple locations to get a better understanding of the breeding lines' environmental interaction and genetic makeup. "There might be some lines that will do very well across the southern region; they'll have a broader adaptation and therefore a broader impact," Chandra said.

National and regional turfgrass industry stakeholders will participate in an advisory panel. Representatives from major turf organizations from each collaborating state will also serve on the advisory panel to provide regular feedback to the researchers. Stakeholder involvement will continue throughout the course of the study, not only through their participation on the advisory panel, but also through involvement in the evaluation of breeding materials.

In addition, the Dallas center recently submitted release documents for two developed varieties of turfgrass in hopes of commercialization and production next year. The zoysiagrass variety (DALZ 0102; 'Chisholm') is a joint release between AgriLife Research and Kansas State University. This variety was bred for improved cold tolerance, and test results showed an increased cold-hardiness in Kansas.

"Zoysiagrass is a warm-season grass; it likes warmer weather, so the idea was to increase its adaptation up north by improving the cold-hardiness," Chandra said.

The St. Augustine variety (DALSA 0406) has great visual traits, and its performance is comparable to other industry turfgrasses for drought tolerance, water-use efficiency, and resistance to diseases and insects, she said.

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