New dual-purpose bioenergy, forage crop set for release by AgriLife Research next year

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Dr. Russ Jessup, a Texas A&M AgriLife Research perennial grass breeder in College Station, is introducing a new biofuel-biomass feedstock hybrid. Credit: Texas A&M AgriLife Communications photo by Kay Ledbetter

A downturn in the bioenergy industry has led one Texas A&M AgriLife Researcher to reach to new heights in the forage biomass arena.

Dr. Russ Jessup, an AgriLife Research perennial grass breeder in

College Station, said he is introducing a new biofuel-biomass feedstock that is a hybrid "similar to seedless watermelons, seedless grapes and other sterile triploid crops."

Jessup is utilizing two grass species: pearl millet, a grain crop, and Napier grass, which is a very high-biomass crop that can be crossed to make progeny that are sterile triploids in the field.

"This is a dual-use crop with a low seed cost, high yield potential and quality perennial biomass suitable for both forage and dedicated biofuels," he said. "So in light of current downtrends in oil prices, this crop can stand on its own as a forage crop in the interim, until that reverses."

As a high-quality forage crop, Jessup said, it is sterile in the field but has seeded parents, unlike sugarcane that has to be planted from stocks.

To produce this hybrid he started with the larger seeded but shorter pearl millet to give it quality, large seeds and drought tolerance. Pearl millet is native to Africa and can be more drought tolerant than even sorghum, he said.

Then he crossed it with Napier grass, a closely related cousin of pearl millet that is grown in Africa for cut-and-carry silage and high biomass fodder.

"You can cross these two species and get ample seed off of the pearl millet parent," Jessup said.

The hybrid is not the only product the Texas A&M soil and crop sciences assistant professor intends to provide. He also will be releasing improved lines of each parent stock.

Jessup said when he arrived in 2009 there was no germplasm in the previous forage grass breeding program. So he started his from scratch. During 2009 and 2010, he collected germplasm from the wild, from germplasm banks and a few cultivars that were available.

"From 2009 to 2011, we made our own elite crosses and started evaluating those materials as millets, Napiers and as hybrids. After three years of trials, we have the Napier grass and the hybrids where we think we can release them as cultivars.

"We have also developed a novel pearl millet that can have 100 tillers per plant – high density, high biomass. So we now have a male sterile cytoplasm and an A/B line female system for millet that is tailored for biomass production, not forage or seed or grain production."

The plants he has growing in fields west of College Station are actual hybrids that can be planted from seed and will grow in a producer's field as a perennial feedstock, Jessup said. And it will not set seed of its own, so it is sterile and environmentally benign.

He said the crop also would work as a high-value pelleted feed amendment. His current prospects are to develop this in the southern U.S. or regions where high-value feedstocks for dairy cattle and other end uses are needed.

"Our goal in the short term is to release an improved pearl millet parent in the next 12 months, at least two of the improved Napier grasses in the next 12 months, and one of the seeded hybrids.

"Both the parental species and the hybrid are extremely heat and drought tolerant, as well as very water-use efficient," he said. "They are several-fold more efficient than energy cane or sugarcane. And compared to alfalfa for forage, they can produce four to five times the amount of

high-quality protein per unit of water."

A new bioenergy, forage hybrids can be planted from seed in a producer's field as a perennial feedstock. Credit: Texas A&M AgriLife Communications photo by Kay Ledbetter

Napier grass can be grown in Texas up to the Red River border with Oklahoma. The target area for this crop is as far north as southern Oklahoma and into Arkansas and most of what was referred to as the bioenergy belt, so the entire southeastern U.S. for the hybrid, Jessup said.

"We are currently working to improve the cold tolerance of both parents, which are tropical species, to move the hybrid further north. But for the first four or five years, it will be grown in Texas across to Georgia in the southern coastal plains."

Jessup said he also has worked with the agronomics of the crop. His research has included developing seeding systems for planters on the market and herbicides that are safe, both from the preplant standpoint as well as compatible safers and several post-emergent chemical options, to facilitate the production without the risk of weeds becoming a problem.

The hybrid crop can be planted with three or four seeds together every 5 inches in a hill with the goal of having the taller hybrids outcompete and survive against anything that might be small with lower biomass potential, he said.

Future work will be to develop inbreds on the Napier-grass side to get truly uniform parents like corn and sorghum, and target them to producers using them alone for forage or silage. On the pearl millet side,

he said he would target producers who still have forage millets who might want to use his female line for forage production.

At a minimum, Jessup intends to release both parental lines and have the initial hybrid that still has some variability ready to be produced or licensed by a producer as early as next year.

"They may not yet want to license it," he said. "They may want to wait until we improve uniformity in the Napier grass and if that's the case, it would be two or three years before there is something commercialized on the hybrid side."

Provided by Texas A&M University