

# Beyond Grain...Sorghum to Ethanol



By Jeff Dahlberg

*to a viable option for biofuel production without much modification to the crop.*

**A** frenzy of biofuels research involving sorghum has sprung up around the country thanks in part to an NSP educational campaign that is opening minds to the benefits of sorghum in the biofuels arena. Several years ago, NSP staff began attending biofuels meetings and talking with various public and private research and policy groups to remind them that sorghum can be a

Sorghum is unique in that it fits into many of the biofuel production schemes by providing starch from grain, sugar from juice pressed from sweet sorghums, and high biomass production from such sorghums as forage or sudangrasses. So where is all this education, research and promotion taking the sorghum industry?

## Sorghum grains for biofuel production

The sorghum grain is made up of 3 main parts. The largest percentage part is the endosperm where most of the starch is located. This makes up sixty to seventy-five percent of the grain. Ethanol is created just like alcohol, by fermentation of the starches in the grain. Research at Kansas State University by Dr. Donghai Wang shows that there is a tremendous amount of variation in the percentage of starch contained in different sorghum hybrids, with higher starch hybrids yielding more ethanol. Research is underway to evaluate many popular commercial hybrids for starch content and efficiency when they are grown in varying climates and environments. Kansas State University researchers are studying why some of the starches in sorghum are more usable for ethanol production than other starches.

## Sorghum Syrup: not just for biscuits

You have probably heard of sorghum molasses or sorghum syrup; you may have eaten it on biscuits or made it from old sweet sorghums your grandparents grew. Did you know that India and China are using these same sweet sorghums to produce ethanol? In the late 1960's and early 1970's in Meridian, Miss., the sorghum germplasm was identified and developed

for potential sugar production. But that research sat on the shelf in the U.S. until recently, when interest in these unique sorghums was renewed because of their potential use for ethanol production. Sweet sorghums are valuable for ethanol production because the simple sugars needed for fermentation into ethanol are squeezed directly from the stalks.

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A Department of Energy (DOE) research project in Florida is focused on the basic production of sweet sorghums so that producers will know how best to water, fertilize, and otherwise manage a sweet sorghum crop for high yields. In addition, researchers will study how to efficiently harvest, press, and store the juice for conversion to ethanol. Dr. Bill Rooney at Texas A&M University is working on the development of sweet sorghum hybrids that should produce more sugar per acre and will allow more efficient seed production than the old cultivar lines that have been in use for years. He is also studying the basic management of this relatively unknown crop.

Oklahoma State University is exploring how ethanol production from sweet sorghum may be efficiently achieved “on farm.” According to Dr. Danielle Bellmer, Associate Professor at Oklahoma State University, fermentation of sweet sorghum juice is feasible with little or no process control. “The goal is to press the juice from the stalks in a single pass, and then let it ferment on the edge of a farmer’s field in tanks,” says Dr. Bellmer. “The fermented juice would then be partially dewatered before shipping to a central facility for final dehydration and distribution.”

## Biomass, Biomass, Biomass

Biomass, in the energy production industry, is the biological feedstock that can be converted into alcohols and other industrial products. The entire sorghum plant, from root to panicle, can be utilized as biomass. Some traditionally

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*Background photo courtesy of Texas Agricultural Experiment Station*