Sun Grant Western Regional Center
Oregon State University

Arid Land Development of Sweet Sorghum as a Renewable Feedstock

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OVERVIEW

Alternative fuel production is of increasing interest throughout the U.S. and cost and demand increase while fossil fuel supplies are decreasing on a global scale. The Southwestern U.S. is an ideal place for feedstock growth, with an abundance of sunny days; however, limited water availability is a growing concern. Dr. Ogden will investigate a feedstock that requires low inputs of nutrients, energy and water. Sweet sorghum is salt tolerant and requires less seed, fertilizer, pesticide, irrigation water and tillage than other crops currently used for ethanol production.

Progress to Date

The research team has determined the sugar content of three varieties of sorghum, and has successfully fermented sorghum juice to ethanol in the laboratory. Juice preservation methods are also being investigated.

Crop production studies: Three varieties of sweet sorghum were planted, and samples were harvested and analyzed for sugars at two week intervals. Total juice content, weight, stem diameter, lodging and sugar content were determined as a function of line and planting density. Once sucrose is detectable it overtakes the concentrations of fructose and glucose, whose levels appear to level off after week 16, depending on the variety. Density studies indicate that between 4 and 6 plants per meter is best to optimize the amount of total sugars per acre. The line M81E produces the most sugars of the three lines studied, and it is easier to harvest.

Fermentation studies: Sweet sorghum juice that was harvested in October 2009 was fermented to ethanol at the laboratory scale using Ethanol Red yeast cells. Initial bench scale fermentation studies indicate that all of the sugars are fermented and the ethanol concentrations of 9% are feasible. Results indicate that the juice can be stored in the freezer for extended periods of time prior to fermentation. However, other methods of preservation are being investigated, including strategies such as lowering the pH and adding the preservative $Na_2S_2O_5$.

Collaborators

Co-PIs: Mark Riley, Michael Ottman, Dennis Ray and George Frisvold, University of Arizona

Academic/Industrial collaborators: Colin Kaltenbach, University of Arizona; Mike Kazz, Zelen Environmental; Peter Livingston, Bosque Engineering; Randy Drake, Arizona Public Service Energy Services; Melissa Miller, Southwest Gas Corporation; Jerry Rhody, Pasqua Yaqui Tribal Nation; Jason Kai, Kai Family Farming Corporation; Colleen Crowninshield, Clean Cities; Allan Kleinman, San Carlos Apache Tribe ; Brian Pasbrig, Pinal Energy

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