# PROCESSING HERBACEOUS ENERGY CROPS INTO FUEL ETHANOL

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Achieving national goals for fuel ethanol production will rely on using alternative feedstocks such as energy crops to supplement grain ethanol. We are working to help achieve this goal by collaborating with ARS plant production researchers to develop higher quality energy crops and developing highly integrated processing technologies. Plant cell wall material is highly resistant to being converted to fermentable sugars, but plants can be bred for increased ethanol yields. Converting energy crops into ethanol requires the following processing steps: pretreatment, enzymatic saccharification, and fermentation. A novel medium-throughput assay that encompasses these steps has been used to grade historic libraries of switchgrass and Bermuda grass samples and identify superior cultivars for ethanol production. The data sets indicate wide distributions of yields, supporting the potential of plant breeding as a promising method for improving processing traits.

The assay used for ranking plant samples for relative ethanol yield is based upon traditional dilute acid pretreatment technology. Alternate pretreatment methods are being pursued that appear better suited for herbaceous energy crops. These include liquid hot-water and alkaline based pretreatments. They are recommended because they avoid destruction of soluble sugars present in the plant material and should allow for simpler processing of biomass streams through to fermentation. Current results demonstrate that treating switchgrass with alkali is especially promising in terms of recovering sugars for fermentation and avoiding destructive side-products that are inhibitory to ethanol fermentation.

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