**Effects of Swelling Granular Corn Starch and Corn Flour on Amylase Conversion and Fermentation for Ethanol Production.**

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<th>Graduate Student:</th>
<th>Statement of Problem:</th>
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<td>Gustavo Correa</td>
<td>In the production of bioethanol, grains or starchy feedstock are traditionally cooked with thermal stable alpha – amylase to convert starch to fermentable sugars. In 2005, Genencor International introduced a line of granular hydrolyzing enzymes that could converts granular or uncooked starch to fermentable sugars in a simultaneous saccharification and fermentation process. The new technology is claimed to improve productivity, reduce energy consumption, and achieve high ethanol yield. However, starch is partially crystalline and occurs in higher plant enzymes and long conversion time. We propose that partially swelling granular starch minimum cooking would dramatically increase the rate of starch conversion to fermentable sugars. The new proposed technology would reduce overall cost for ethanol production.</td>
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**Goals.**

1. To evaluate the swelling of corn starch granules and corn flour using a range of temperatures and how it affects the hydrolysis process using two commercial enzymes.

2. To analyze the glucose conversion rate as well as the efficiency and effects of swelling the starch granule to obtain ethanol.

**Recent Publications.**

**Expected outcomes:**

We think that partial or limited swelling of starch granules could reduce the level of granular hydrolyzing enzymes needed, increase the rate of converting starch to fermentable sugars, increase fermentation rate, and reduce the overall cost for ethanol production. It should be noted that starch granules will not be completely dispersed in this proposed project compared to the traditional ethanol production process. As a result, the proposed process will not generate high concentration of soluble solids in the fermenter and therefore could enhance the active yeast population, reduce side – products, increase distillation throughput, and increase plant capacity.

**Current Activities:**

Current activities are focused on evaluating enzyme concentration, sample running time, and literature review of ethanol production to replicate the process used commercially at the laboratory scale.

Already several glucose conversion curves have been obtained to provide important information about the temperature to swell the granules and the associated enzymatic activity. The ethanol production phase is under observation as high glucose conversion means high ethanol production. This phase could be evaluated during the last conversion curves.