# Poster T1

## High pressure transesterification of microalgal oil over acid resin

*A. Santana*1, S. de Jesus1, R.M. Filho1, J. Maçaira2 and M.A. Larrayoz3*
(1)UNICAMP, Campinas, Brazil
(2)University of Porto, Porto, Portugal
(3)UPC, Barcelona, Spain
*scotelari@hotmail.com*

Transesterification is the common method used to transform triglycerides into biodiesel. Conventionally, biodiesel is produced from vegetable oils, animal fats, and waste cooking oils. Biodiesel production from microalgae oil is more promising and sustainable alternative to previously mentioned feedstocks. Compared to plants, algae do not compete with food crops and have higher energy yields per area than terrestrial crops. In this study, continuous transesterification of algae oil using high pressure and solid acid resin was investigated. The variables studied were reaction temperature (180 – 220 °C), pressure (200 – 350 bar), and residence time (2-15 min) with ethanol-to-oil molar ratio of 30. Experiments performed changing the reaction time indicated that most of the esters were formed during the first 5 minutes, the fatty ethyl ester yield becoming constant at reaction times higher than 9 minutes. This stationary value increased when higher values of the alcohol/oil molar ratio were adopted. When the pressure was increased at 250-350 bar, the performances of the process did not present significant modification.The results revealed that at the following optimum process conditions, reaction temperature of 190°C, reaction time of 10 minute, pressure of 250 bar and ethanol-to-oil ratio of 30, a biodiesel yield of 90 wt% can be obtained.

# Poster T2

## Evaluation of bagasse, straw and tops from different varieties of sugarcane for bioethanol production

*S.C. Pereira*1, L. Maehara1, C.M.M. Machado2 and C.S. Farinas1*
(1)Brazilian Agricultural Research Corporation, Embrapa Instrumentation, São Carlos, Brazil
(2)Brazilian Agricultural Research Corporation, Embrapa Agroenergy, Brasília, Brazil
*sandracerqueirapereira@gmail.com*

Typical sugarcane productivity in Brazil is around 85 tons/hectare, and for each processed ton of sugarcane biomass, 140 kg of trash (straw and tops) and 140 kg of bagasse are generated. The full harnessing of sugarcane biomass could expressively increase the production of ethanol/hectare, without the need for expansion of cultivated area. Several studies have been undertaken for bioethanol production using sugarcane bagasse. However, there are few reports on the assessment of the other parts of sugarcane biomass, such as straw and tops. Hence, in this study we evaluated the use of bagasse, straw and tops of different varieties of sugarcane for ethanol production. The biomasses were pretreated using 1.5% (w/v) sulfuric acid at a solids loading of 10%. Next, the pretreated materials were hydrolyzed using a commercial enzymatic preparation (30 FPU/gglucan), and the hydrolysates were fermented using an industrial strain of *Saccharomyces cerevisiae*. It was not found any significant difference among the varieties of straw or tops after 24 hours of enzymatic hydrolysis, while for bagasse, there was a significant difference among the varieties in the biomass conversion. The higher susceptibility to enzymatic degradation was observed for sugarcane tops, which achieved glucose levels up to 40 g/L. In the ethanol production, it was not found any significant difference among the varieties of straw, tops or bagasse after 8 hours of fermentation. Nevertheless, the highest efficiency of fermentation (up to 70%) was observed for sugarcane straw. These findings can contribute to bioethanol production process developments using the whole sugarcane biomass.

# Poster T3

## Biological activities of corn cob xylan

*L.P. Christopher*1, S. Seiler1, Y. Zhuang2 and K. Miskimins2*
(1)South Dakota School of Mines &Technology, Rapid City, SD
(2)Sanford Research, Sioux Falls
*lew.christopher@sdsmt.edu*

Corn cobs are a plentiful and renewable reservoir of xylan with a content of up to 40%. In the U.S. alone, 40 million metric tons of corn cobs are annually produced and available for harvest. While many studies have investigated the physico-chemical properties, little research has been performed on the biological activities of corn cob xylan. The objective of this study was to evaluate the biomedical potential of xylan extracted from corn cobs grown in South Dakota, USA. Methods were developed to isolate, characterize and test corn cob xylan for its antioxidant, antibacterial and antitumor activities. Extraction with dimethyl sulfoxide (DMSO) and NaOH was preceded by delignification of corn cobs to yield xylan of altering purities, composition, and molecular weights. Delignified corn cobs extracted with DMSO produced a xylan polymer that had superior characteristics over the other xylan extracts tested. The free radical scavenging capabilities of this xylan, determined against 2,2-diphenyl-1-picrylhydrazyl (DPPH), was in excess of 80% oxidative activity reduction. In addition, the antitumor tests conducted with human breast cancer cells showed encouraging results in excess of 60% tumor cell death. These studies suggested apoptosis through enhanced mitochondrial production of reactive oxygenated species and inhibited G1 cell cycle arrest. The significance of the biological activities of corn cob xylan will be discussed.

# Poster T4

## Characterization and detoxification of enzyme hydrolysates derived from dilute ammonia pretreated sorghum bagasse

*P.J. Pham-Bugayong**
Audubon Sugar Institute, Louisiana State University Agricultural Center, St. Gabriel, LA and G. Aita
Louisiana State University, St. Gabriel, LA
*PPham@agcenter.lsu.edu*

Lignocellulosic enzyme hydrolysate detoxification can be challenging because a balance between efficient detoxification strategies while avoiding sugar losses has to be met. In this study, milled Sorghum (*Sorghum bicolor*) bagasse was pretreated with ammonia (28% NH4OH solution), and water at a ratio of 1:0.5:8 at 160oC and 140-160 psi for 1h in a 300-mL pressure reactor. The pretreated sorghum was enzymatically hydrolyzed with different combinations of Spezyme® CP, a cellulase and Novozyme 188, a β-glucosidase. Samples were collected at various time intervals (0-72h). Enzyme loading was based on the glucan content and mass of dry biomass (sorghum bagasse) added (g glucan/g dry biomass). A 5% biomass loading was used. The resulting enzymatic hydrolysate liquor (EHLx) was analyzed for by- and degradation products. Organic acids, furaldehydes and phenolic acids were qualitatively and quantitatively detected through High Performance Liquid Chromatography (HPLC) - Diode Array Detector (DAD) method, developed for simultaneous and direct detection of EHLx components. Monomeric and oligomeric sugars in the EHLx were identified and quantified through an established HPLC-Refractive Index Detector (RID) method. Various detoxification strategies were evaluated.