Sustainable energy from biomass provides a promising alternative to fossil fuels, and its supply a mediates climate issues. Biomass and waste from agricultural crops and industrial residues have a great potential as low-cost feedstock for the production of value-added products: volatile fatty acids (VFAs), alcohols and sugars. Three platform: sugar, syngas or carboxylate platforms have been proposed for biomass conversion through chemical, biological or integrated reaction pathways [Agler et al., 2011].

Fermentation of sugars by mixed culture under anaerobic conditions is the most common method for converting sugars inherent within biomass feedstock into alcohols and VFA. Undefined mixed cultures have advantages over pure cultures because open microbes can tolerate the complexity and variability of substrates due to the metabolic flexibility [Agler et al., 2011; Spirito et al., 2014, Liang and Wan, 2015]. Additionally, mixed culture allow continuous operation of bioprocesses under non-sterile and anaerobic conditions with no risk of strain degradation adaptive capacity owing to microbial diversity, the capacity to use mixed substrates and the possibility of a continuous process.

The process is well established for some sugars, such as glucose from corn starch, now a mature industry. In the case of D-glucose, D-xylose and D-galactose, large efforts are made to make ready to fermentable sugars available from non-food-based raw materials, in particular lignocellulosics, by the degradation of structural carbohydrates of the plant cell wall [Boudet et al., 2003; Chandel et al., 2011; Chandel and Singh, 2011].

The metabolic pathway of sugars of mixed culture can be regulated by multiple factors, such as: pH, decreasing retention time, temperature, substrate types and carbon source [Hoelzle et al., 2014; Lee et al., 2014]. The pH value of the system have a large impact on the product spectrum and also on the composition of the microbial population established. It is known that different bacteria have developed different strategies to overcome stressful conditions. The fermentation products of sugars generated by mixed culture are generally a mixture of alcohols, VFA and other carboxylic acids and hydrogen [Lee et al., 2014; Liang et al., 2014]. VFAs and alcohols produced can be use further conversion to more valuable products as bulding blocks in chemical processes or of the downstream applications such as the production of polyhydroxyalkanoates (PHA) - biodegradable plastics or nylon polymers, electricity, biogas, and the biological removal of phosphorus and nitrogen from wastewater. Recovery of energy and valuable materials might reduce the cost of wastewater treatment and reduce our dependence on fossil fuels [Angenent et al., 2004].

The proposed project aims at investigating the product spectrum during fermentation by mixed culture under several different conditions of D-glucose, D-xylose and D-galactose as well as more complex substrates such as microcrystalline cellulose, lignocellulose organic waste streams. All product in the experimental system will be determined and the link between the product spectrum as a correlation of the pH, temperature and retention time will be elaborated..

In agricultural waste, D-glucose is often accompanied by other sugars and D-xylose and D-galactose which are the most abundant monosaccharides. Additionally, two substrates (D-glucose and D-xylose) will be studied as a mixture of the two substrates as a sole carbon source. The product spectrum will obtained at each condition will compared.

All of those aforementioned experiments aims at broadening knowledge about behavior of mixed culture fermentation process. Proposed research topic is expected to raise attention to converting mixed sugars of industrial and agricultural waste into volatile fatty acids, alcohols and energy production.

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