DEVELOPING AN INTEGRATED BIOREFINERY: POTENTIALS OF SWITCHGRASS EXTRACTIVES

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Switchgrass (*Panicum virgatum* L.) is a widely considered model perennial grass for bioenergy production. Its natural traits, including high yield potential, tolerance to water and nutrient limitations, low establishment costs, mitigation of soil erosion, adaptation to marginal land sites, and a high net energy gain, make it highly desirable as a lignocellulosic feedstock. While the carbohydrates content of switchgrass averages 60-65%, about 10-15% of the dry weight biomass is composed of non-structural compounds (i.e. extractives). During biomass pretreatment, this significant fraction contains and/or generates chemicals that inhibit enzymes and yeasts involved in saccharification and fermentation. Therefore, these compounds must be removed for the most efficient conversion of switchgrass to biofuel. Our studies have demonstrated that switchgrass extractives contain bioactive components that can be further utilized to inhibit bacterial pathogens as well as reduce inflammatory responses of fat cells. In this work, chopped 'Alamo' switchgrass samples were extracted by ethanol in a flow-through reactor, further saturating this extractives stream by recycling the solvent back into the reactor three times. Extractives concentration, total phenolic content, and phenolics classifications of ethanol extractives were measured. These concentrated extractives were tested for fat cell inflammation and further concentrated on sterile antibiotic sensitivity disks to test for inhibition against bacterial plant pathogens, *Salmonella enterica* serovars, and isolates of *Escherichia coli* that produce shigatoxin. Utilizing the extractives portion of switchgrass as antimicrobials, biopesticides, and anti-inflammatory agents would add value to this biomass fraction and offer significant opportunities for increasing the sustainability of agriculture.