From Field to Fuel: How Do Feedstock Variability and Plant-Experienced Stresses Affect Microbial Conversion?

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Project Goals:

Different growth conditions and deconstruction methods yield surprisingly diverse hydrolysates in which various small-molecule inhibitors disrupt microbial metabolism, cellular integrity, and product formation. But how plant species, growth conditions, and processing methods contribute to microbial inhibition is poorly understood. In our previous work, we showed, for the first time, that drought can severely inhibit downstream microbial conversion processes.[1] In this study, yeast growth was completely inhibited in drought-year switchgrass hydrolysate. This was due to a stress response in switchgrass that led to the accumulation of soluble sugars, which were ultimately degraded during pretreatment to compounds (imidazoles and pyrazines) that were inhibitory to yeast growth. These results demonstrated that plant-experienced environmental stresses can strongly affect fermentation microorganisms and biofuel yields. Our project aims to determine how variation in plants and growth environments, particularly stressful conditions, coupled with the effects of different deconstruction methods, impact microbial conversion.

References

1. Ong, R.G.; Higbee, A.; Bottoms, S.; Dickinson, Q.; Xie, D.; Smith, S.A.; Serate, J.; Pohlmann, E.; Jones, A.D.; Coon, J.J.; Sato, T.K.; Sanford, G.R.; Eilert, D.; Oates, L.G.; Piotrowski, J.S.; Bates, D.M.; Cavalier, D.; Zhang, Y., Inhibition of microbial biofuel production in drought-stressed switchgrass hydrolysate. *Biotechnology for Biofuels* **2016,** 9(1), 237. [10.1186/s13068-016-0657-0]

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