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In field integration of winter cereals with corn stover to improve biomass yield and quality

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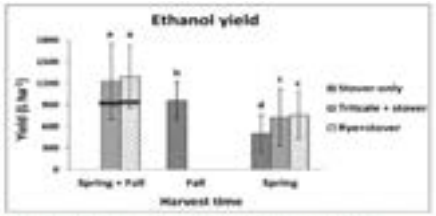
The objective of this study was to evaluate the integration of winter cereal cover crops with corn stover to improve biomass and potential bioethanol yield. Cropping systems evaluated included 1) a corn stover experimental check; 2) early spring harvest of winter cereal's following a fall corn stover harvest; and 3) mixed stands of corn stover and winter cereals harvested together. Two winter cereals; cereal rye (Secale cereale L.), and triticale (Triticale hexaploide Lart.) were evaluated and no winter cereal crop was used as the experimental control). Two harvest time factors were evaluated including; a two-harvest system (fall followed by spring), and a one-harvest system (fall or spring). Spring-harvested corn stover ethanol content [EtOH] was the greatest (0.201 g g-1) followed by spring-harvested mixed feedstocks of rye + stover (0.175 g g-1) and triticale + stover (0.180 g g-1). Ethanol yield on a land area basis (L ha-1) decreased by 47% when stover-only feedstock was harvested in the spring compared to the fall. When only considering a single harvest system, incorporation of a winter cereal did improve ethanol yield by 242 L ha-1 at spring harvest. The two-harvest sequential system of a fall stover harvest followed by a spring, winter cereal harvest was the most productive with 41.8% greater ethanol yield when compared to the single harvest. Overall, the incorporation of a winter annual cereal with corn stover improved biomass and ethanol yield relative to stover-only feedstocks.



Recent Publications

1. Jean, M., K.D. Thelen, M. Quigley, D. Pennington. 2017. Improving biomass and ethanol yield by intercropping a winter cereal with corn. Agron J. 109:1-7
2. Robertson, G. Philip, Stephen K. Hamilton, Bradford L. Barham, Bruce E. Dale, R. Cesar Izaurralde, Randall D. Jackson, Douglas A. Landis, Scott M. Swinton, Kurt D. Thelen, James M. Tiedje. 2017. Cellulosic Biofuel Contributions to a Sustainable Energy Future: Choices and Outcomes. Science 356, eaal2324 (2017).
3. Sanford, G. R., Jackson, R. D., Oates, L. G., Robertson, G. P., Roley, S. S., & Thelen, K. D. (2017). Biomass production a stronger driver of cellulosic ethanol yield than biomass quality. Agron. J. 109:1911-1922. Laurenz, R., P. Tumbalam, S. Naeve, and K.D. Thelen. 2017.
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5. Tumbalam, P., K. Hard and K.D. Thelen 2016: Integrating winter annual cereal rye or triticale into a corn forage biofuel production system, Journal of Crop Improvement, 30:5:526-530.

Biography

Kurt D. Thelen, is a Professor at Michigan State University, USA. Dr. Thelen's research is focused on cropping systems agronomy with an emphasis on bioenergy and developing crop systems that increase food, feed, and energy production while safeguarding soil, air, water, and biodiversity.

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