Adapted and Non-Adapted Tropical Corn in Central Iowa: 1. Development, Growth and Quality Aspect

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Abstract:

Adapted and Non-Adapted Tropical Corn in Central Iowa: 1. Development, Growth and Quality Aspects

Recent research has shown a high theoretical potential for ethanol production based on both stover and grain as sources, using lignocellulosic and fermentation processes respectively. Corn germplasm has been even broadly studied for grain production, but scant research has been done on current commercial cultivars in regards to biomass production. However, tropical corn germplasm, conventionally grown in tropical regions, has been studied as a potential source for biomass accumulation over grain. The comparison between tropical and temperate corn with a focus on biomass production has not yet been explored under Iowa day-length conditions.

This study identifies the adaptability of tropical germplasm to central Iowa by means of studying the crop development, the productivity of temperate and tropical germplasm for biomass yields, and the quality of temperate and tropical germplasm as a lignocellulosic source for ethanol production. Field trials were established at Sorensen Research Farm in Boone County, IA, US, during the 2014 and 2015 growing seasons to evaluate adaptation of tropical germplasm, biomass productivity and quality coefficients.

Results of the study showed that unadapted tropical corn flowered later and had 20% greater biomass yields on average than adapted corn (20 Mg.ha⁻¹ for unadapted versus 16 Mg.ha⁻¹ for adapted), while adapted yielded relatively more grain. In addition, a separate study showed that temperate corn performed better for grain yields and grain development, followed by adapted tropical corn, while non-adapted tropical corn performed better for vegetative development, again producing up to 20% higher biomass yields. In addition, results showed that the quality of the feedstock is equivalent for temperate and tropical corn in terms of cellulose, hemi-cellulose and lignin content. These results indicate a high potential for unadapted tropical corn as a source of biomass production in central Iowa.