

NITROGEN AND HARVEST IMPACT ON WARM-SEASON GRASS BIOMASS YIELD AND FEEDSTOCK QUALITY

Chamara Sandaruwan Weerasekara Imbulana Acharige

Dr. Newell Kitchen, Thesis Supervisor

ABSTRACT

Perennial warm-season grasses have drawn interest as bioenergy feedstocks due to their high productivity with minimal amounts of inputs under a wide range of geography while producing multiple environmental benefits. Nitrogen (N) fertility and harvest timing are critical management practices when optimizing biomass yield of these grasses. Our objective was to quantify the impact of N fertilizer rate and application timing in combination with the harvest date on warm-season grass yield and feedstock quality.

Research was conducted in 2014 and 2015 on a total of four field-plot locations in Missouri. The experiment was a split-plot design where N rate and harvest timing were main and sub-plot treatments, respectively. Nitrogen rates were 0, 34, 67, and 101 kg ha⁻¹ with two application timings, all early spring and split N (early spring and following 1st harvest). Harvest timing treatments included two single (September and November) and two double harvests (June harvest followed by a September or a November harvest) per year.

In both years, delaying harvest until November improved biomass yield, energy and ethanol production while reducing total N and ash contents across sites. November harvest and N rates ≥ 67 kg ha⁻¹ improved biomass yields. Although N fertilization improved yield, N use metrics declined with annual N rates of >34 kg ha⁻¹. Nitrogen fertilization at 67 kg ha⁻¹ year⁻¹ provides an opportunity to maintain a balance between yield and efficiency of N inputs while improving energy and ethanol production, high feedstock quality. Our results highlight the simultaneous implications of N fertilization and harvest management for optimizing warm-season grasses grown as bioenergy feedstocks.