Harvest Frequency and Timing Effects on Dry Matter Yield and Nutritive Value of Two Switchgrass (*Panicum virgatum* L.) Cultivars

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Introduction

Switchgrass is a C4 perennial warm-season grass, native to the prairies of USA, with potential as a bioenergy and forage crop. 'BoMaster' and 'Performer' cultivars of switchgrass were developed by the USDA-NCSU Agricultural Research Service Forage Program and were released because of their potential as lignocellulosic feedstock and forage, respectively. 'BoMaster' provides significantly increased biomass and 'Performer' was released because of its greater digestibility, both compared to several cultivars grown in the region. Harvest management studies including different defoliation schedules of clipping may influence productivity and nutrient composition of switchgrass either for forage or bioenergy feedstock. In addition, delayed harvest, such as in November or February, outside the season of active plant growth, may be an strategy to extend the supply of biomass and forage.

Objective: To determine the effects of harvest frequency and harvest timing on biomass yield, dry matter (DM) concentration, crude protein (CP), and *in vitro* true digestibility (IVTD) of 'BoMaster' and 'Performer' switchgrasses.

Materials and Methods

Location: Central Crops Research Station, Clayton, North Carolina (35°40' N, 78°29'W)
Treatments: Factorial combination (2 x 3) of:

Harvest frequency:
- **1)** One clipping at the end of the growing season (1x)
- **2)** Two clippings per season (2x), mid-June and at the end of the growing season

Harvest timing at the end of growing season:
- **1)** October
- **2)** November
- **3)** February

Results and Discussion

Biomass Yield

Harvesting two times per season (2x) resulted in greater biomass yield for both cultivars with the exception of October for 'BoMaster' (Fig. 1). Delaying the end-of-season harvest from October to February reduced biomass ~42 and ~48% for 1x harvest of both 'BoMaster' and 'Performer', respectively; nevertheless, there was no difference for 2x.

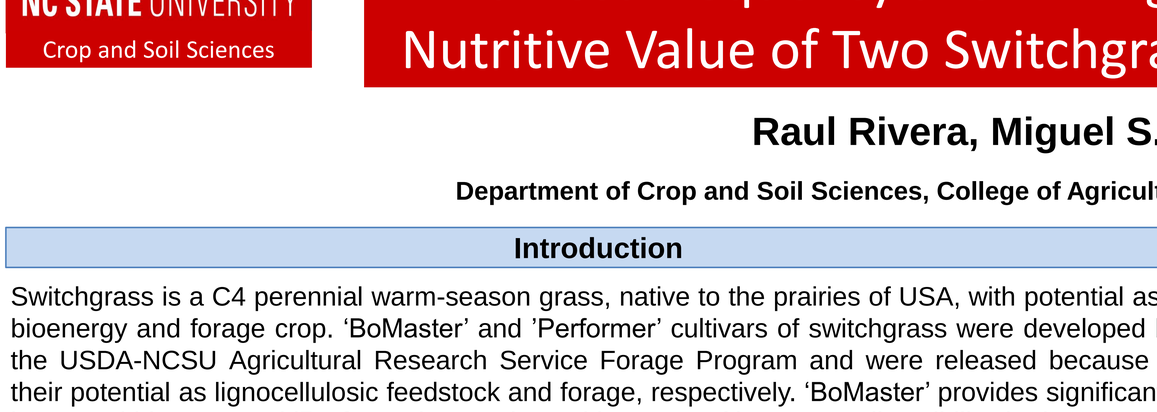

Figure 1. Biomass yield of 'BoMaster' and 'Performer' switchgrasses clipped once (1x) or twice (2x) per season with three harvest timings at the end of the growing season (Oct., Nov. and Feb.). Error bars represent treatment means (n = 3) ± one standard error. * *P* ≤ 0.05, ** *P* ≤ 0.01, n.s. = not significant.

Dry Matter Concentration

Harvesting 1x per season resulted in greater DM concentration in October only for 'BoMaster'. For 'Performer', 1x harvest resulted in greater dry matter concentration than 2x for Oct. and Nov. Overall, DM concentration almost double when delaying harvest from Oct. to Feb. for both cultivars.

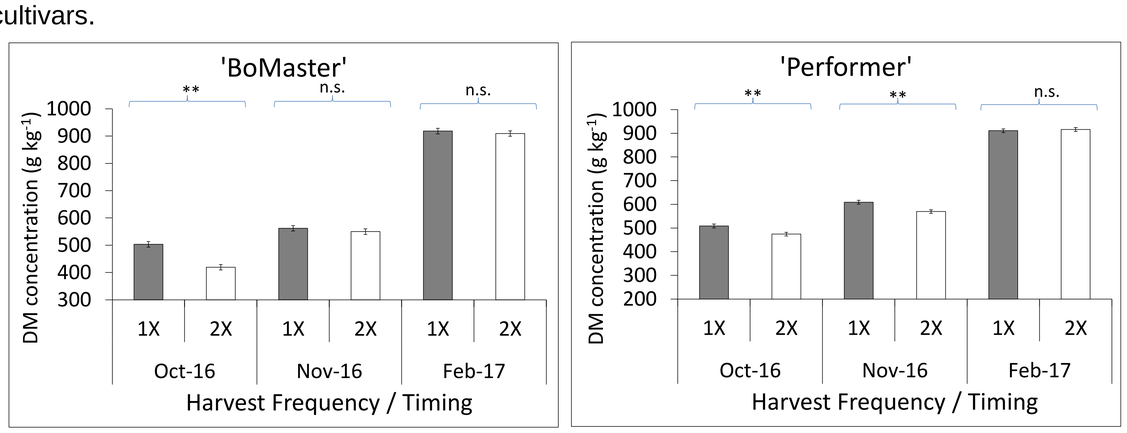

Figure 2. Dry matter concentration (DM) for 'BoMaster' and 'Performer' switchgrasses clipped once (1x) or twice (2x) per season with three harvest timings at the end of the growing season (Oct., Nov. and Feb.). Error bars represent treatment means (n = 3) ± one standard error. * *P* ≤ 0.05, ** *P* ≤ 0.01, n.s. = not significant.

Crude Protein and *In-vitro* Digestibility

Crude protein was lowest for November in both cultivars (Fig. 3) and IVTD followed the same trend for both cultivars, being lower as end-of-season was delayed (Fig. 4).

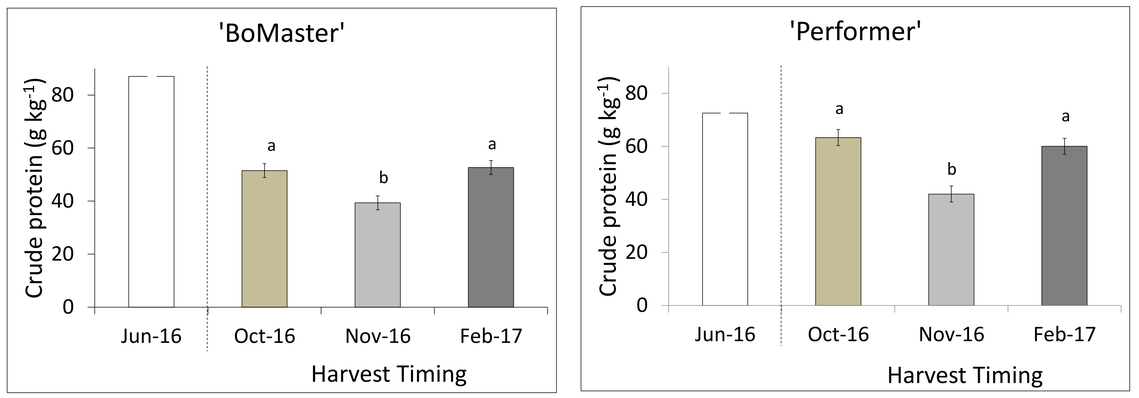

Figure 3. Crude protein for 'BoMaster' and 'Performer' switchgrasses clipped with three harvest timings at the end of the growing season (Oct., Nov. and Feb.). Error bars represent treatment means (n = 6) ± one standard error.

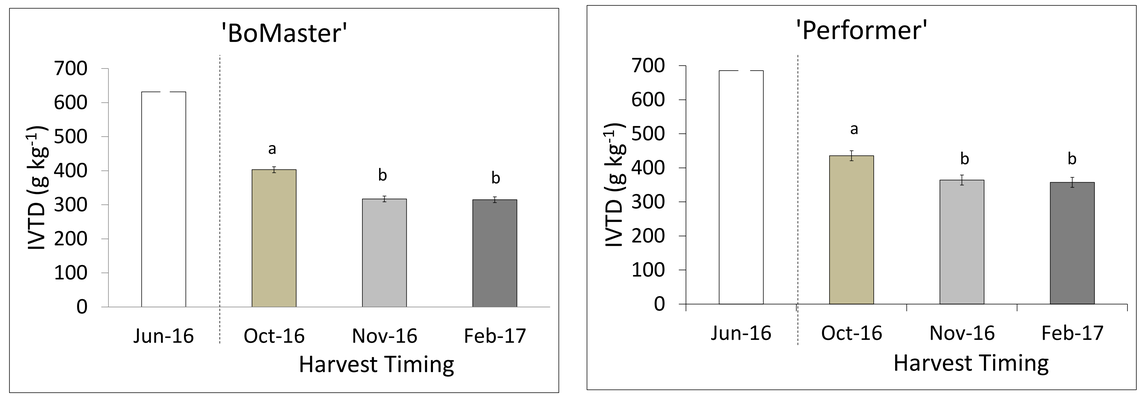

Figure 4. *In vitro* true digestibility (IVTD) for 'BoMaster' and 'Performer' switchgrasses clipped with three harvest timings at the end of the growing season (Oct., Nov. and Feb.). Error bars represent treatment means (n = 6) ± one standard error.

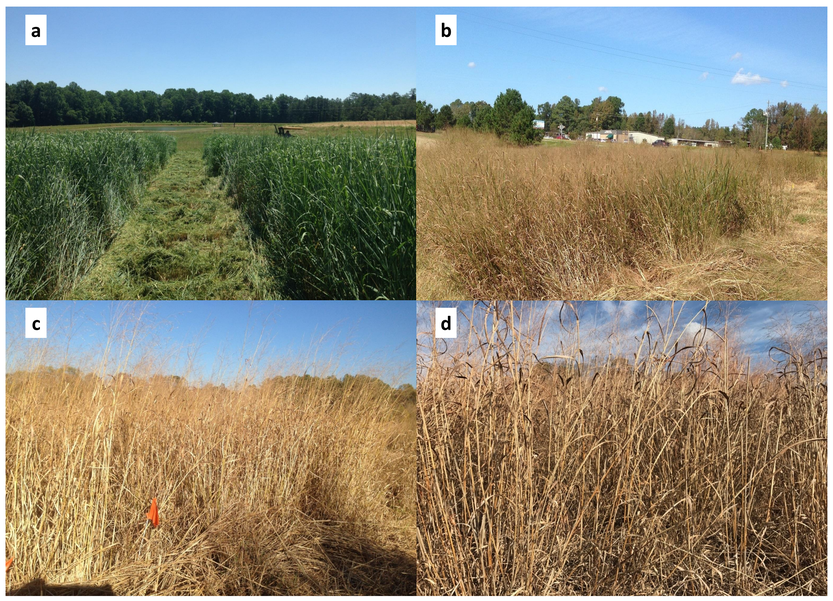

Figure 5. Harvest dates

a. Plot harvested in June

b. Plot harvested in October

c. Plot harvested in November

d. Plot harvested in February

Summary and Conclusions

- ✓ Delaying switchgrass harvest from Oct. to Nov. and to Feb. is a viable strategy to extend the biomass supply season in North Carolina with no losses of biomass yield under the 2x clipping system.
- ✓ Delaying the harvest to Nov. and Feb. resulted in lower CP and IVTD concentrations compared to Oct. harvest and much lower compared to the 2x-June harvest at the middle of the of the growing season.
- ✓ Two harvest frequency (2x) management may provide the opportunity to use the 2x-June clipping as forage and the 2x- and 1x-Oct., -Nov., or -Feb. for bioenergy.

Acknowledgments

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