

Harvest of green willow biomass for feed

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Harvest of willow at various times in 2017.

Introduction

Willow (*Salix spp.*) is often grown as a biomass source for energy production. Due to the content of various bioactive compounds, however, the biomass may also serve as a valuable animal feed. Harvest of 'green' willow biomass during the growth-season may provide higher quality. However, very little is known about the effect of harvest time during the growth-season on yield, quality and subsequent regrowth.

Methods

A two-year field trial was performed at Ny Vraa Bioenergy, Tylstrup, Denmark, in an organic field with the willow clone Inger, planted in 2009 and harvested five times with latest harvest in April 2017. The field was not fertilized in the years 2017-2018. During 2017, plots were harvested on one of five different times from 13th June to 27th October, and yield and quality was measured. In November 2018, the yield was determined as the regrowth since the harvest in 2017.

Results

Willow biomass quality was significantly affected by harvest time, with increasing dry matter (DM) content and decreasing N content in DM when harvest was postponed gradually from 13th June to 27th October 2017 (Fig. 1A and 1B). DM yield increased significantly from June to September but was reduced from September to October due to leaf fall (Fig. 1C). The quantity of harvested N peaked in August and September with >80 kg ha⁻¹ (Fig. 1D). Regrowth in 2018 and total yield for 2017-2018 was reduced when willow was harvested in July and August 2017 (Fig. 2).

Conclusions

Harvest of willow during the growth-season offers interesting possibilities for optimizing the biomass quality including the content of crude protein. However, harvest time also affects the yield and subsequent regrowth.



Chopped willow biomass at various harvest times in 2017.

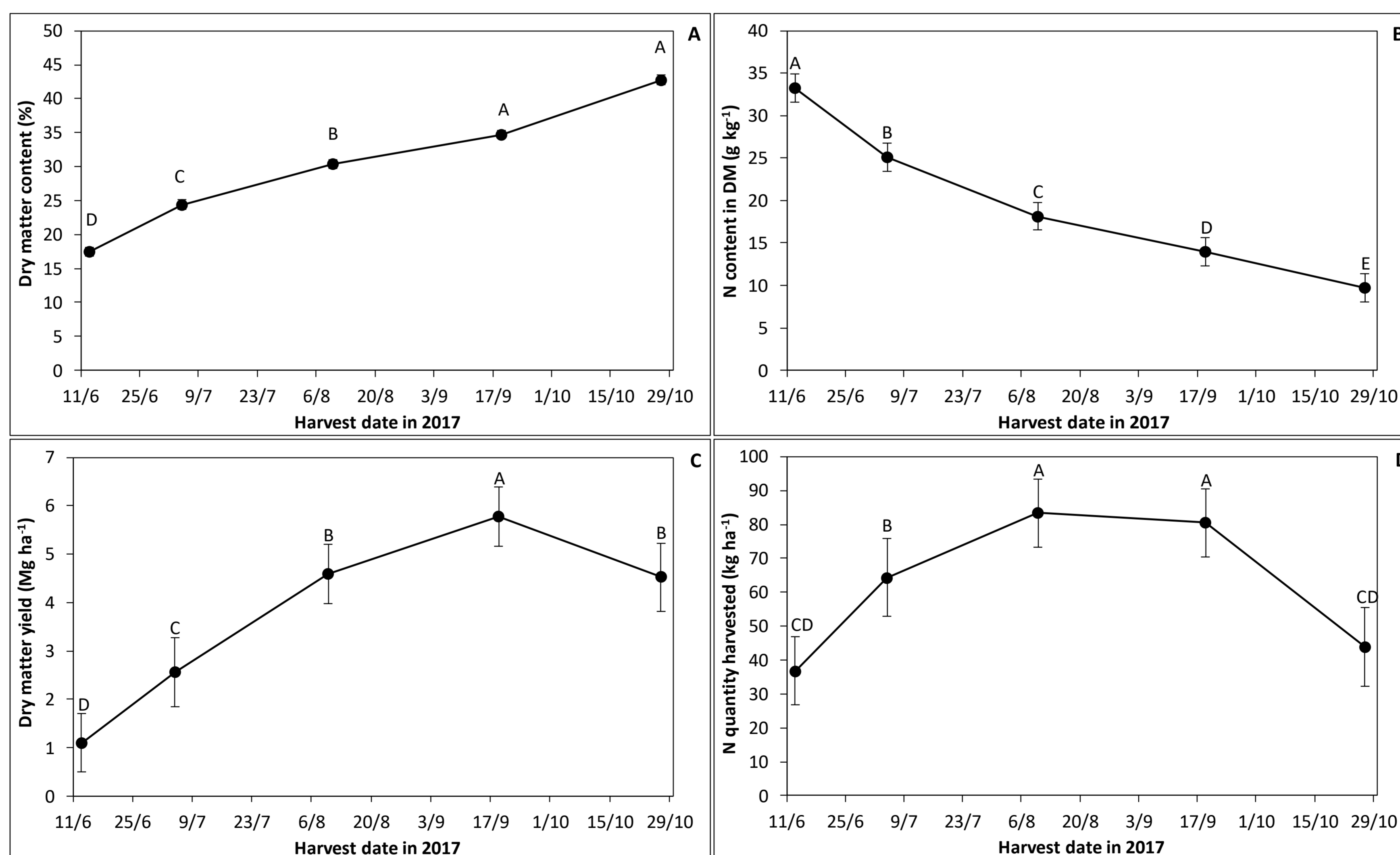
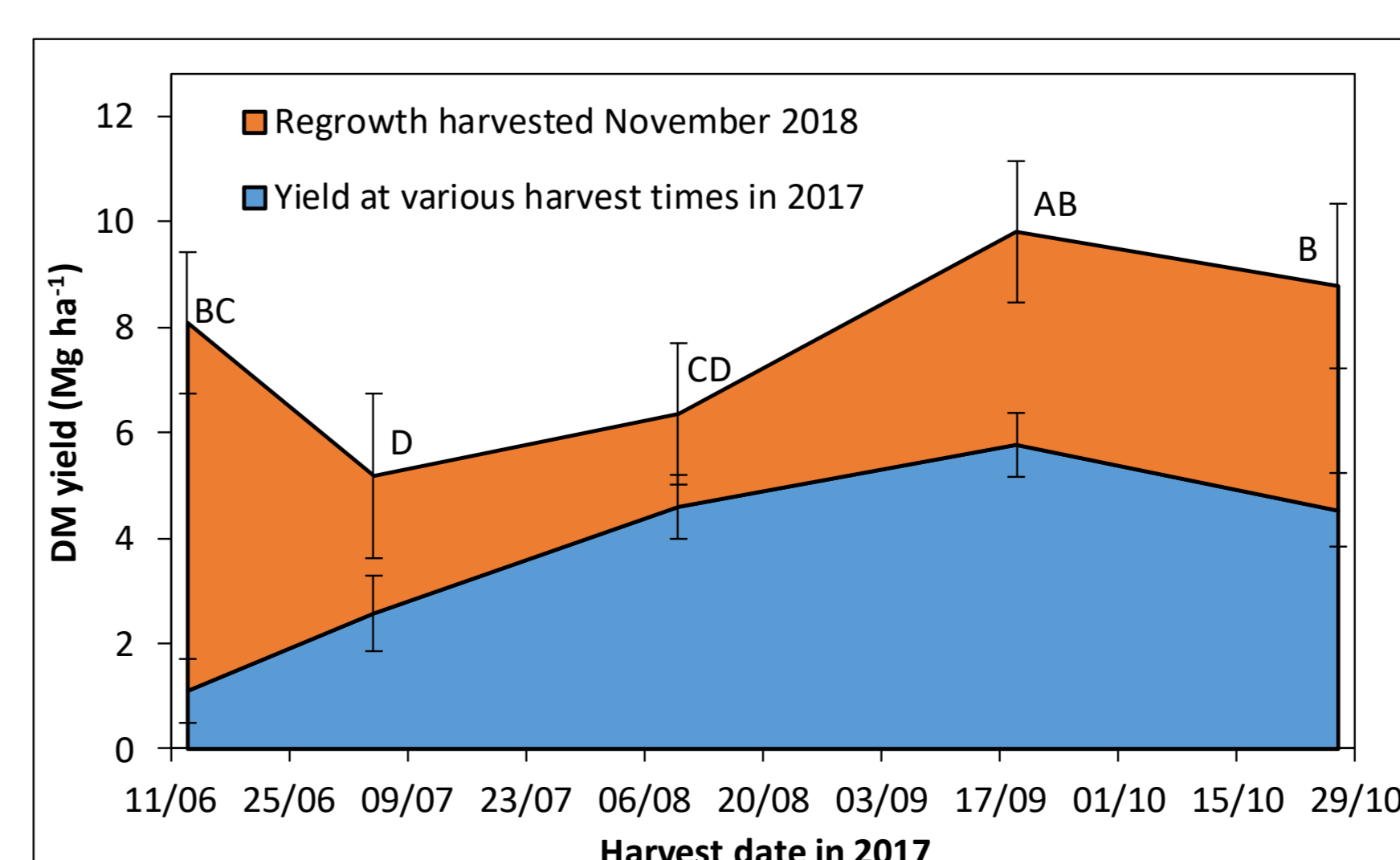


Figure 1. Dry matter content (A), N content (B), dry matter yield (C) and N quantity harvested (D) in willow biomass at different harvest times in 2017, i.e. in first growth-year after previous harvest. Harvest times varied from 13th June to 27th October 2017. Error bars indicate 95% confidence limits, and letters indicate LSD groupings; harvest dates with the same letter do not differ significantly ($P \leq 0.05$).

Figure 2. Dry matter yield of willow at various harvest times in 2017 and from subsequent regrowth when harvested in November 2018. Harvest times in 2017 varied from 13th June to 27th October 2017. Error bars indicate 95% confidence limits, and letters indicate LSD groupings for the sum of yields over the two growth years; harvest dates with the same letter do not differ significantly ($P \leq 0.05$). For comparison, the DM yield was 11.4 Mg ha⁻¹ when no harvest was done in 2017, i.e. for a full two-year harvest rotation.



Harvest of willow regrowth in November 2018.