

Changes in sugar concentration over the day and the season in green forages



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Introduction

Simple sugars are produced during photosynthesis and a sufficient amount is essential when making silage. The concentration is affected by temperature, radiation, maturation, and day length. **Aim:** To investigate the variation in water soluble carbohydrates (WSC) in different green forages over the day in two seasons under Danish conditions.

Methods

Plots of forage was harvested on 3 days in August and 3 days in October 2020, and within each day, forage was harvested in the morning, at noon, and in the evening resulting in 126 samples. Dried samples were analysed for glucose, fructose, sucrose, and fructans (sum of these = total WSC). Data was analysed statistically using forage type, period, day, and time as fixed effects plus their 2- and 3-way interactions, except forage type × period × day.

Forage types are: **DPR**=diploid perennial ryegrass, **TPR**=tetraploid perennial ryegrass, **TIM**=timothy, **TF**=tall fescue, **MF**=meadow fescue, **OG**=orchard grass, **LUC**=lucerne.



Results

Across species, total WSC concentration was higher in August (Figure 1) than October (120 vs. 74 g kg⁻¹ of DM). Increase in sucrose concentration during the day (Figure 2) was highest for TF and lowest for OG (+24 and 11 g kg⁻¹ of DM, respectively). The increases in concentration of glucose, fructose, and sucrose from morning to evening were higher in August compared to October (Figure 3A and B). Sucrose concentration increased (59 and 91 % in August and October, respectively) more than glucose, fructose, and fructans and was the main driver for the increase in total WSC concentration.

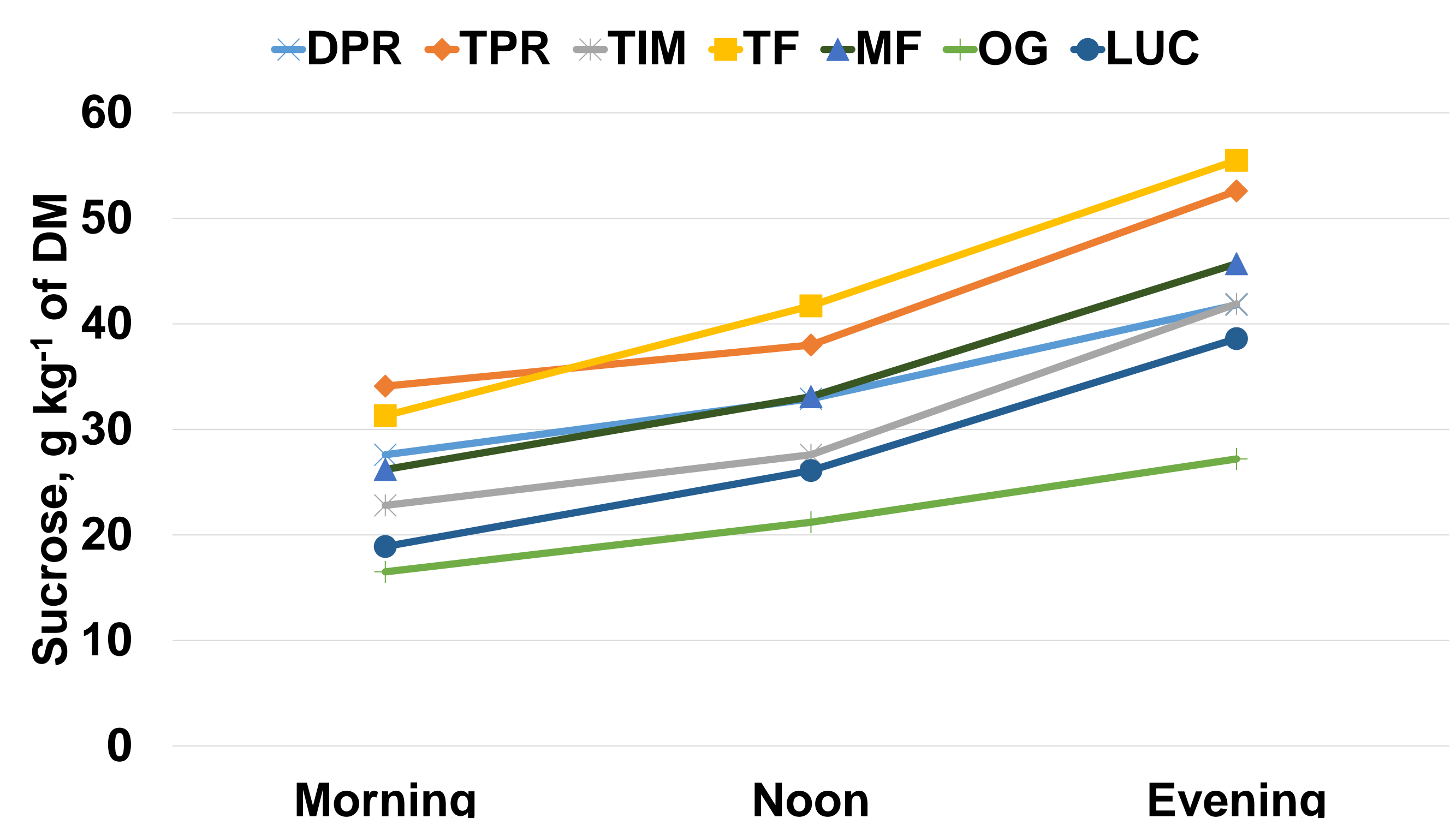
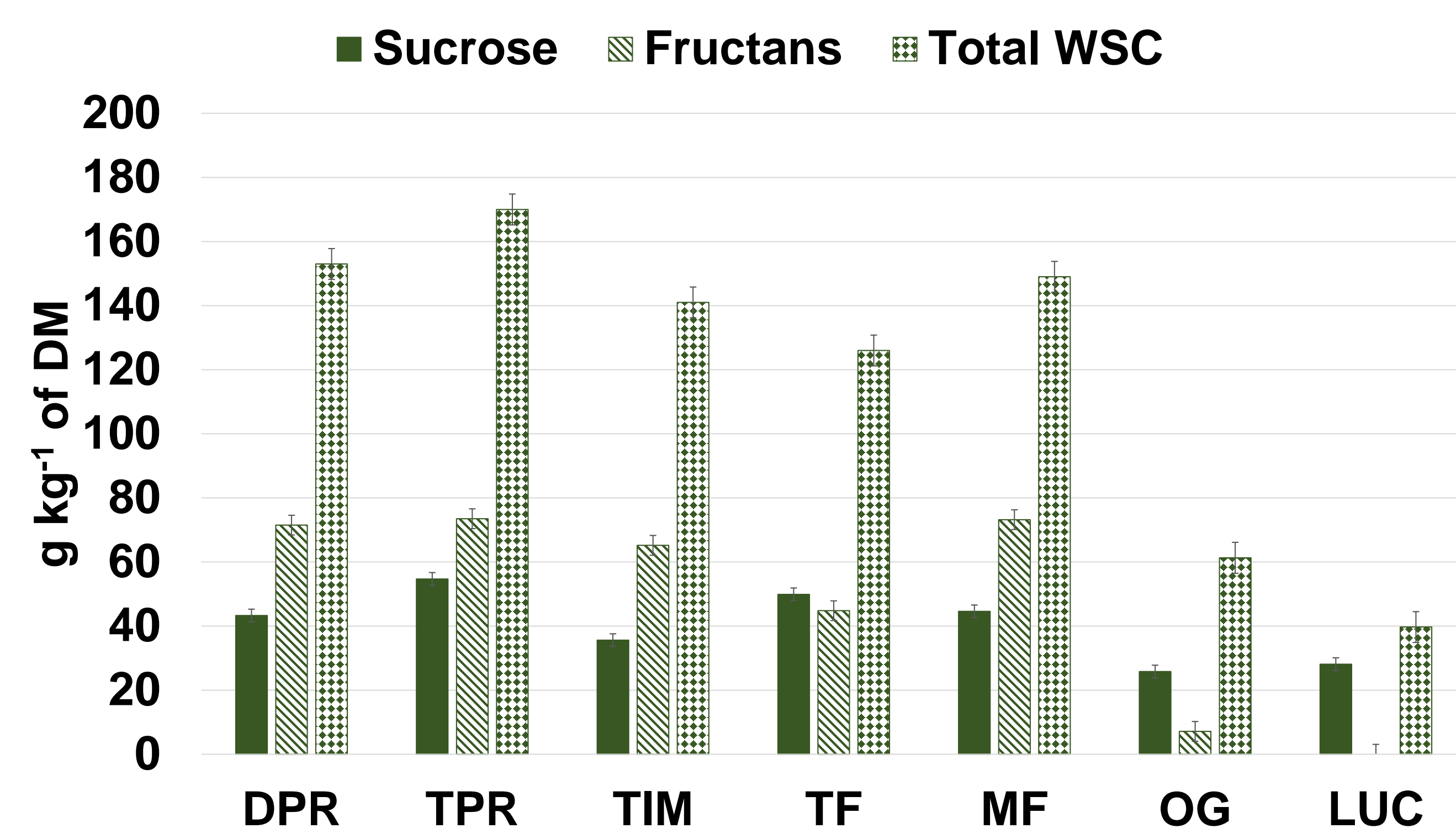


Figure 1. Concentrations of sucrose, fructans, and total WSC in different species in August across sampling day and sampling time.

Figure 2. Concentration of sucrose at different time points during the day in different species across sampling period and sampling day.

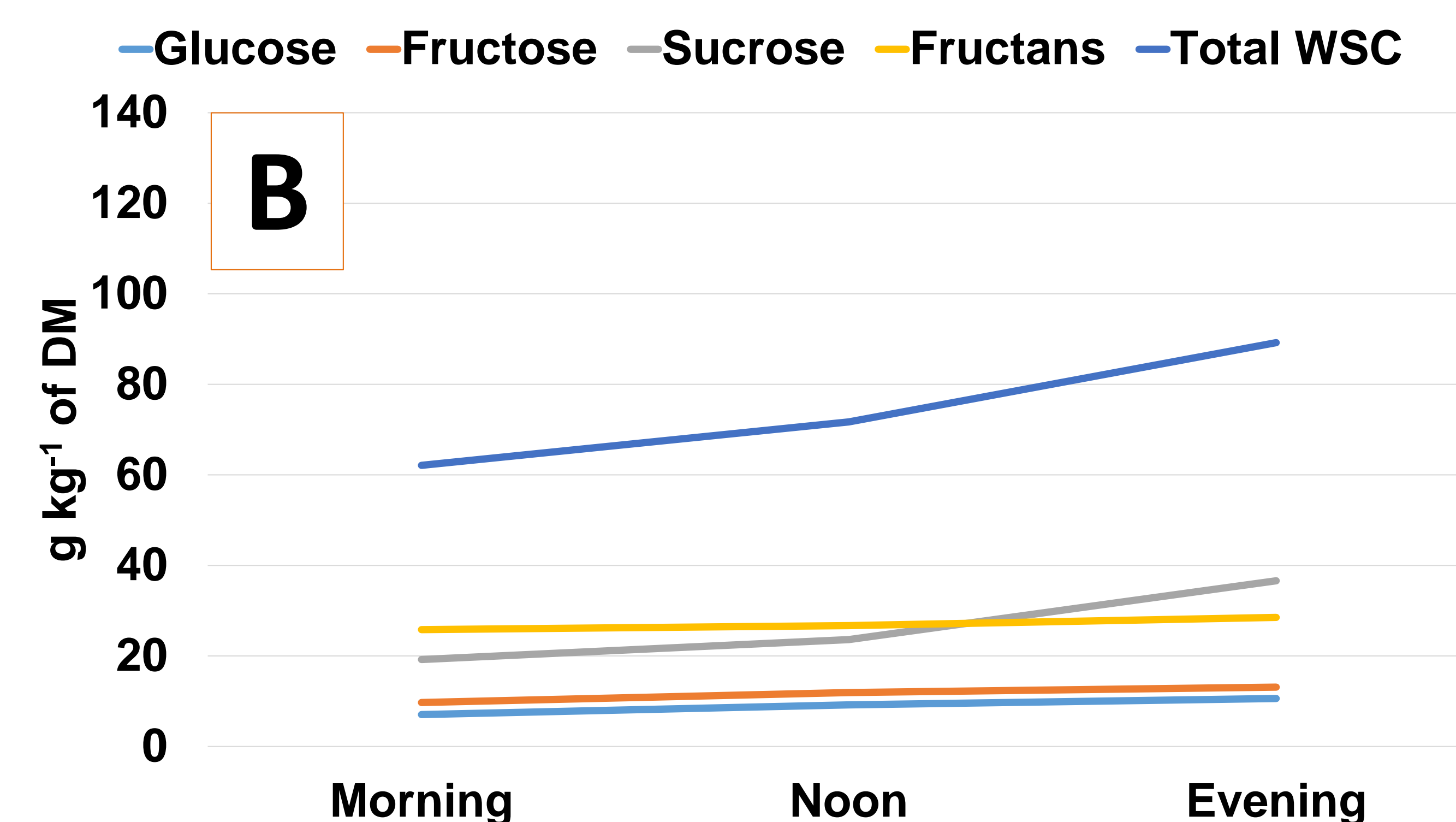
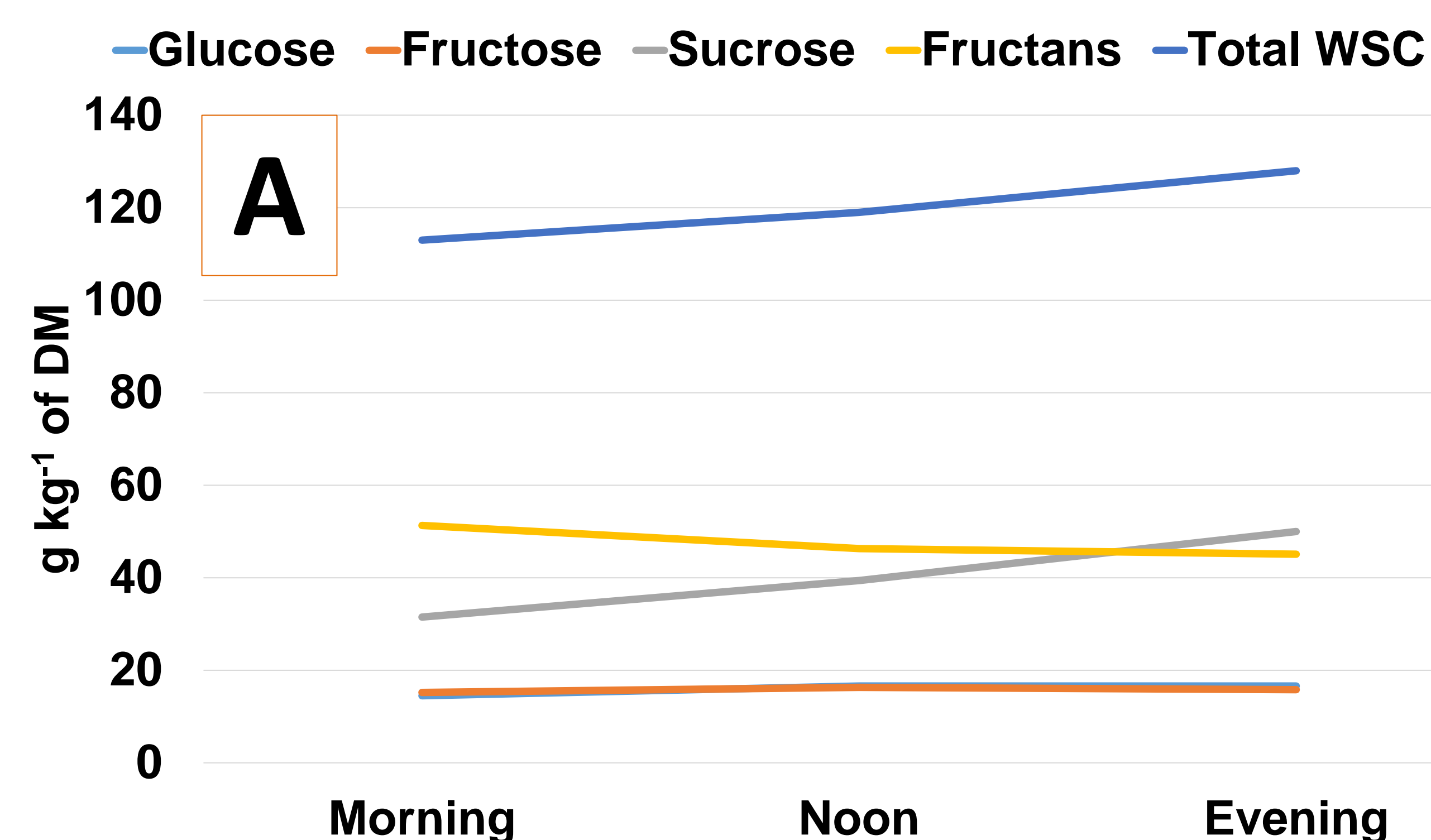


Figure 3. Concentrations of glucose, fructose, sucrose, fructans, and total WSC at different time points during the day in A) August and B) October across species and sampling day.

Conclusion

The concentration of sugars was affected by species, time of harvest, and was generally higher in August compared to October. Sucrose was the main driver for increases in total WSC concentrations.

