# Mowing Height Influence on Carbohydrate Content of Buffalograss

K.W. Peterson, R.C. Shearman, R.E. Gaussoin, G.L. Horst, W.H. Schacht, C.J. Wegner
Department of Agronomy and Horticulture, University of Nebraska – Lincoln, Lincoln, NE 68583

## INTRODUCTION

Total nonstructural sugar and starch determinations among turf-type buffalograss [*Buchloë dactyloides* (Nutt.) Engelm] genotypes and the influence of mowing height (MH) on sugar and starch content have not been investigated. The objectives of this study were to determine the influence of mowing height on sugar and starch content throughout the growing season and to determine differences among four turf-type buffalograss genotypes.

## MATERIALS AND METHODS

The study was initiated in June 2008 and conducted at the John Seaton Anderson Turfgrass Research Facility at the University of Nebraska Agricultural Research and Development Center located near Mead, NE.

Four buffalograss genotypes, of two ploidy levels, were chosen for this study. Legacy (6n = 6x = 60) and Prestige (4n = 4x = 40) are released cultivars from the University of Nebraska. NE2979 (6n = 6x = 60) and NE2964 (4n = 4x = 40) are selections belonging to the buffalograss breeding program at the University of Nebraska.

The experimental design was a split-block with 3 replications. Treatment factors were mowing height (5 cm and 1.6 cm) and genotype (Legacy, Prestige, NE2964, and NE2979).

Soil type was a Tomek silty clay loam (fine montmorillonitic mesic Typic Agriudoll). Plots received 5 g N $m^{-2}$ in June 2008 and June 2009. Turfgrass was mowed at 5 cm, once weekly, and 1.6 cm, three times weekly. The study was maintained with 2.54 cm of water per month from rainfall or irrigation.

Tissue samples were collected at monthly intervals, from June to November 2008 and March to September 2009, and placed on dry ice in the field. Samples were collected at 1230 h $\pm$ 30 min, each time. Tissue samples consisted of stolon and attached leaf. Samples were stored at -20°C and then placed in an oven and dried at 55°C for 48 h before grinding. Sugar and starch determinations were conducted by Ward Laboratories, Inc. (Kearney, NE) using a YSI 2700 Select Biochemistry Analyzer (YSI Incorporated, Yellow Springs, OH).

Analysis of variance, using the PROC GLM (SAS Institute Inc., Cary, NC) procedure, was used to test for significance ($P < 0.05$).

## RESULTS AND DISCUSSION

### Seasonal Variation

Starch content was greatest in July 2008 and June 2009 and lowest in November 2008 and March 2009 (Figure 1). An increase of starch content was observed in 2009 as the turf came out of dormancy in the spring and continued until early summer (Figure 1). Starch content decreased greatly from July to August in 2008 and June to July in 2009 (Figure 1). The decrease of starch content during the summer months likely show the period of greatest buffalograss growth which results in carbohydrate demand being greater than storage. Starch content decreased greatly from October to November in 2008. This occurrence may be due to repartitioning of carbohydrates to the roots. Root growth of warm-season grasses may extend 2 to 4 weeks after the turf appears dormant (DiPaola and Beard, 1980; DiPaola et al., 1982; Sifers et al., 1985). In 2008, the turf had lost most of its green color by October and was completely brown by November. Though the turf may not have been photosynthetically active, physiological processes were still active after the turf appeared dormant.

Sugar content increased from April to June 2009 (Figure 2). This observation coincides with an increase in starch content. The turf is likely making and storing carbohydrate. Sugar content then decreased throughout the growing season from June to September during both years (Figure 2).

### Genotype Variation

Significant differences among genotypes for starch content were observed in June, July, September, October, and November 2008 and March, May, July, August, and September 2009 (Table 1). Legacy consistently had the greatest mean starch content throughout 2008 and 2009. NE2979 consistently had the lowest starch content among the genotypes throughout 2008 and 2009..

Significant differences among genotypes for sugar content were observed in June, July, September, and October 2008 and March, May, June, July, August, and September 2009 (Table 1). NE2964 consistently had the greatest sugar content while NE2979 consistently had the lowest sugar content among the genotypes throughout 2008 and 2009.

### Mowing Height Variation

Significant differences between MHs were observed in September 2008 and 2009 for sugar content and in October 2008 and June 2009 for starch content (Table 1). In general, starch content was greater at 5 cm MH than at 1.6 cm MH while sugar content did not exhibit such a trend.

A significant mowing height x genotype interaction for sugar content was observed in October 2008 and April, May, and July 2009 (Table 1). The interaction was also significant for starch content in October 2008 and July, August, and September 2009 (Table 1). The partitioning and utilization of sugar and starch between MHs may differ among these genotypes.

## CONCLUSIONS

Seasonal variation trends were well defined throughout both seasons of data collection. Sugar and starch content trends of all genotypes in this study were similar during both seasons. Genotype had a greater influence on sugar and starch content of buffalograss than did MH. Mowing height does not appear to influence the carbohydrate content of buffalograss.

Table 1. Analysis of variance table for sugar and starch content in 2008 and 2009.

| Source | DF | 2008 June Sugar | June Starch | July Sugar | July Starch | August Sugar | August Starch | September Sugar | September Starch | October Sugar | October Starch | November Sugar | November Starch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean Square | | | | | | | | | | | |
| Block (B) | 2 | NS | NS | NS | NS | * | NS | NS | NS | ** | ** | * | * |
| Mowing Height (MH) | 1 | NS | NS | NS | NS | NS | NS | ** | NS | NS | * | NS | NS |
| B x MH | 2 | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| Genotype (G) | 3 | ** | *** | *** | *** | NS | NS | *** | * | *** | ** | NS | ** |
| B x G | 6 | NS | NS | NS | NS | NS | NS | NS | NS | NS | * | NS | NS |
| MH x G | 3 | NS | NS | NS | NS | NS | NS | NS | NS | * | * | NS | NS |

| Source | DF | 2009 March Sugar | March Starch | April Sugar | April Starch | May Sugar | May Starch | June Sugar | June Starch | July Sugar | July Starch | August Sugar | August Starch | September Sugar | September Starch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean Square | | | | | | | | | | | | | |
| Block (B) | 2 | NS | NS | ** | NS | NS | NS | NS | NS | * | NS | NS | NS | NS | NS |
| Mowing Height (MH) | 1 | NS | NS | NS | NS | NS | NS | NS | * | NS | NS | NS | NS | * | NS |
| B x MH | 2 | NS | NS | ** | NS | *** | * | NS | NS | NS | NS | NS | NS | NS | NS |
| Genotype (G) | 3 | * | ** | NS | NS | ** | ** | ** | NS | * | * | ** | ** | * | ** |
| B x G | 6 | NS | NS | NS | NS | ** | NS | NS | NS | * | NS | NS | NS | NS | NS |
| MH x G | 3 | NS | NS | * | NS | *** | NS | NS | NS | * | * | NS | * | NS | * |

*, **, ***, and NS indicate significance at $P < 0.05$, 0.01, 0.001, and not significant, respectively.

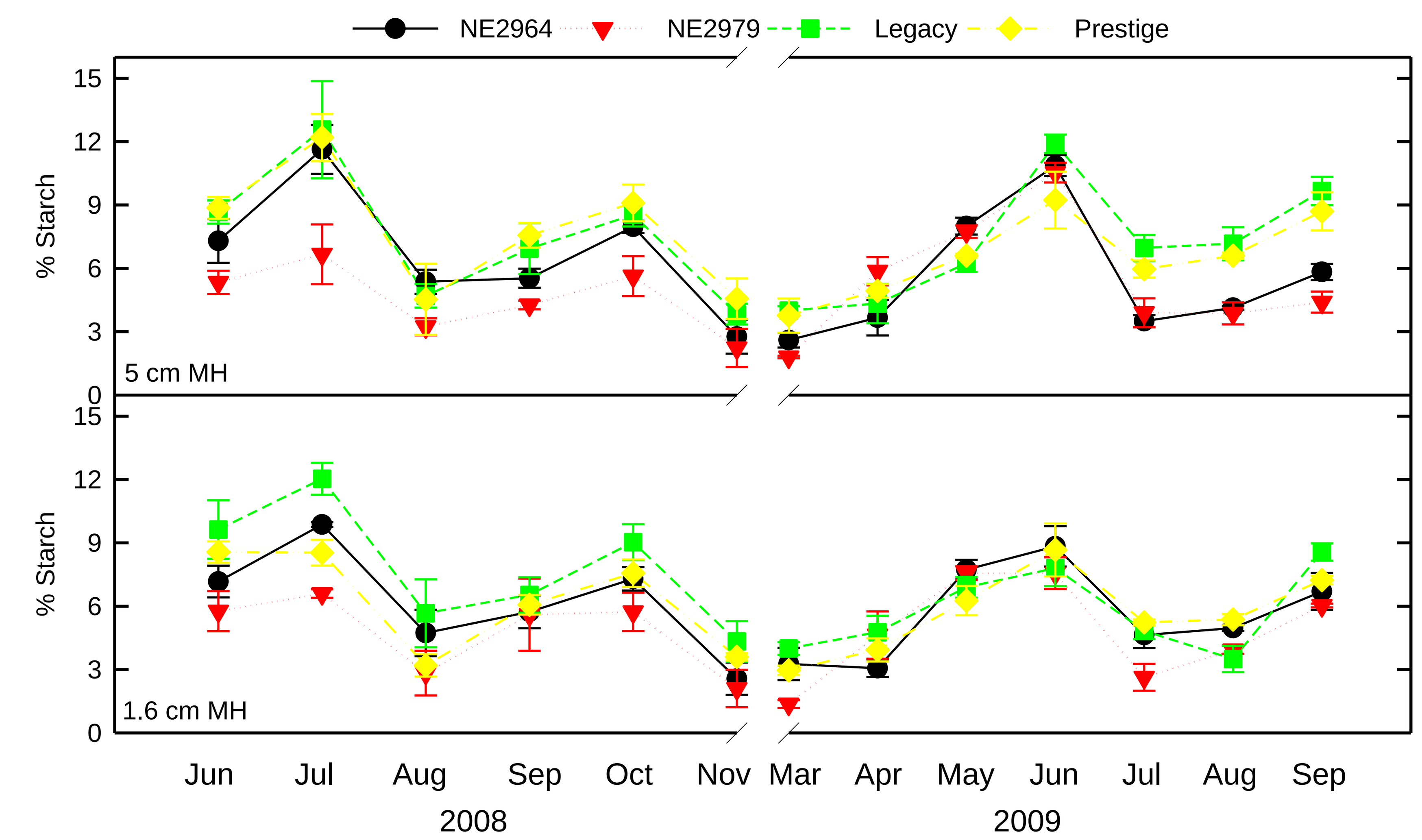



Figure 1. Mean starch content in 2008 and 2009. Error bars represent standard error.

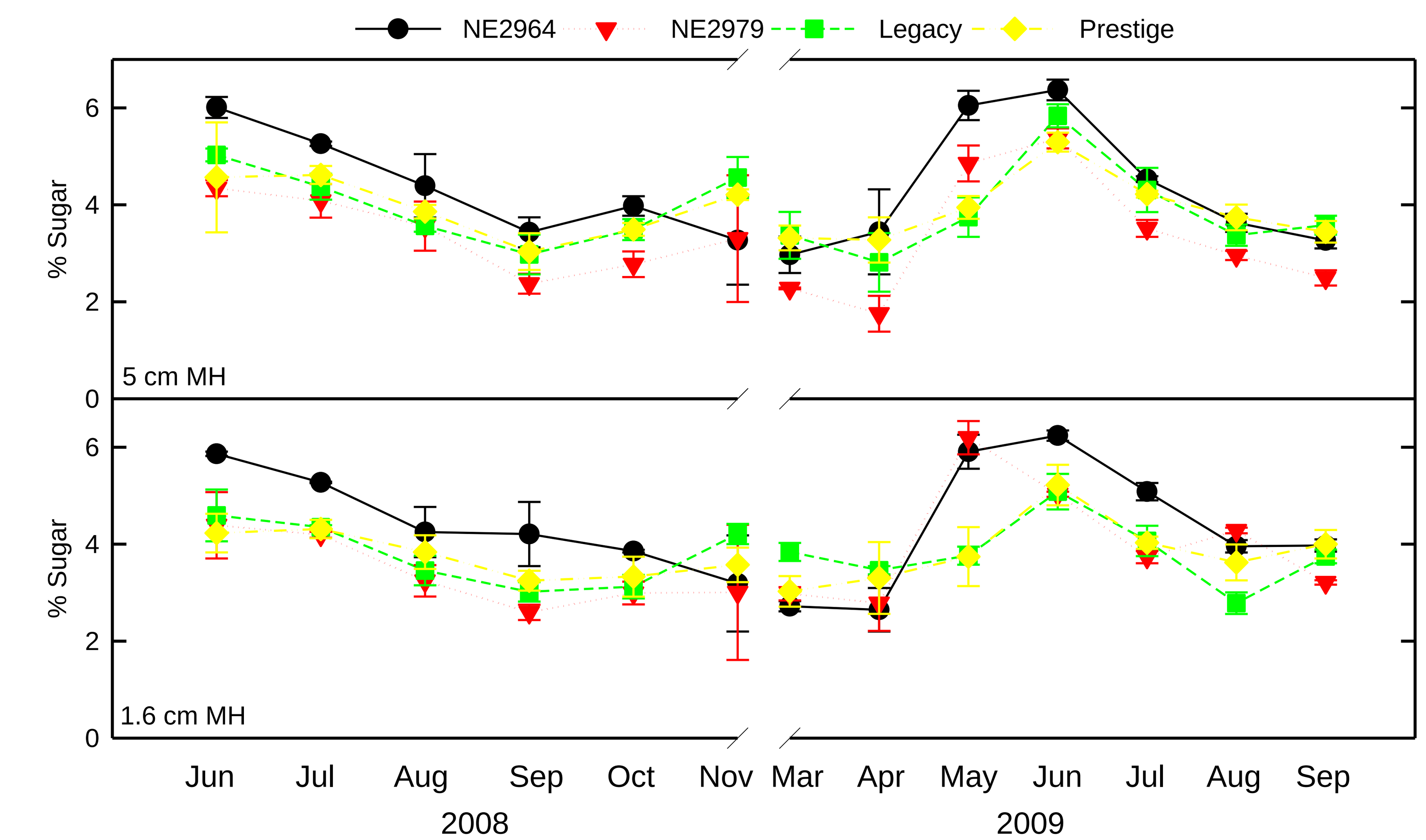



Figure 2. Mean sugar content in 2008 and 2009. Error bars represent standard error.

## LITERATURE CITED

DiPaola, J.M. and J.B. Beard. 1980. Spring root dieback of warm-season turfgrasses. USGA Green Section Record. 18(4):6-9.

DiPaola, J.M., J.B. Beard, H. Brawand. 1982. Key events in the seasonal root growth of bermudagrass and St. Augustinegrass. HortScience. 17(5):829-831.

Sifers, S.I., J.B. Beard, J.M. DiPaola. 1985. Spring root decline (SRD): discovery, description and causes. Intl. Turfgrass Soc. Res. J. 5:777-787.