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Cutting Management for Brown Mid Rib Sorghum Sudangrass

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Introduction

There is a growing interest in Brown Mid Rib (BMR) sorghum sudangrass as an environmentally-sound alternative to corn silage in the Northeast. Its ability to compete with corn is totally dependent on how well we can manage the crop for yield and quality. During the past three years field studies were conducted to determine optimum timing of first and second cutting for yield and quality in 2-cut systems in different climatic and soil regions of New York State. In this article we present and discuss the results of these trials.

Materials and Methods

Four studies (two in 2000, and one each in 2001 and 2002) were conducted on excessively drained outwash gravel in a low elevation and warmer location in Columbia County (Eastern NY). Another three trials (one in 2001 and two in 2002) were conducted on glacial outwash at high elevation in Delaware County (Southeastern NY) while one trial (2002) was conducted on lake-deposited silt in St. Lawrence County (Northern NY). Most of the 2000 and 2001 trials focused on determining optimum harvest time for first cut, while the 2002 trials were managed as 2-cut systems. In St Lawrence County a rain-delayed July planting and drought in August and September limited harvest to one cut only. For all trials, harvests took place at 1-2 week intervals during active growth periods in July and August/September. Actual stand heights at harvest varied from 24 to 71 inches for the first cutting and 29 to 63 inches for the second cutting. Plant height, yield and dry matter content were taken at each harvest. All samples were analyzed for mineral content and quality parameters at the forage laboratory of Dairy One Cooperative Inc. in Ithaca, NY. The alfalfa-grass spreadsheet of Milk2000 version 7.4, was used to estimate milk yields using standard values for neutral detergent insoluble crude protein (NDICP; 2.4% on a dry matter basis) and ether extract (3.6% on a dry matter basis) as reported for sorghum sudangrass silage in the 2001 Nutrient Requirements for Dairy Cattle (National Research Council, 2001). The 30 hour dNDF was multiplied by 1.16 to obtain an estimate of the dNDF at 48 hours (J.H. Cherney, unpublished, 2003).

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Results and Discussion

Growth rates and yield

Growth rates during harvest windows ranged from an average of less than 0.5 inch per day (all sites during mid-August and September of 2002) to 2 inches per day under moist and warm conditions in Columbia in July of 2000 and Delaware County in July of 2002. Growth rates were close to zero during the extended drought periods in early August in 2002 in all three counties indicating that BMR sorghum sudangrass is not insensitive to extreme drought. Unlike corn, however, sorghum sudangrass yield potential is not permanently damaged by severe drought and growth will continue relatively normally after drought. On average across all sites and years, yields increased by 0.16 tons/acre per inch (35% dry matter) for first cut (July period) to 0.20 tons/acre per inch for the second cut (mid-August through September).

Quality parameters

Because stand height measurements were difficult to standardize and because yield and stand height were positively correlated in each trial, we compared yield rather than stand height with quality parameters across sites and years.

The average fiber content (%NDF) was greatest at a yield of 6.3 tons (35% dry matter) per acre (Figure 1). This equals a harvest stand height of about 40 inches. The average fiber content decreased from 59% to below 58% with stand heights of 50 inches or greater. Sorghum sudangrass behaves more like corn than other grasses and legumes, with a relatively narrow range in optimum yield, but a relatively wide range for optimum quality. Most grasses and legumes have a distinct forage quality decline coinciding with increased yield. The 48 hr digestibility of NDF (Figure 2), lignin, starch, sugar content (data not shown) and crude protein (Figure 3) decreased with yield, especially after booth stage had been reached. The fiber digestibility fell below 65% at a yield of 8 tons/acre and an average stand height of 50 inches. Dry matter yield and predicted milk yield per acre were highly correlated despite a decrease in quality with increase in yield (Figure 4). These results were similar to those reported by Cerosaletti and others in the 2001 growing season and suggest that at stand heights of 50 inches or shorter, yield drives milk production whereas at greater stand heights, quality declines become significant.

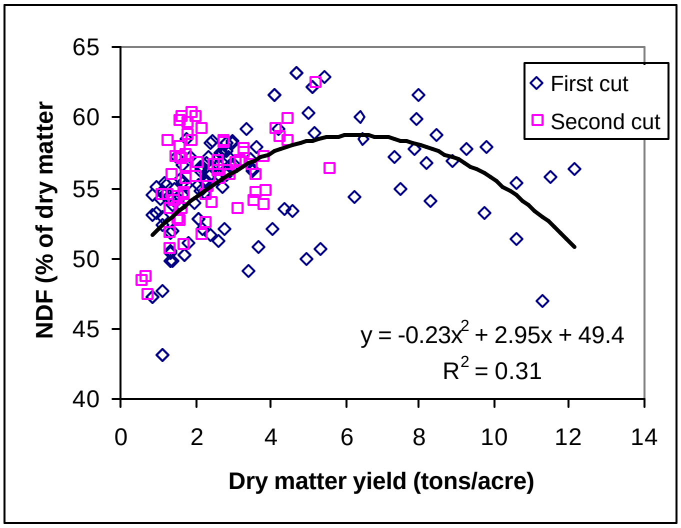

Figure 1: Neutral detergent fiber concentration at harvest as affected by dry matter yield. A dry matter yield of 8 tons/acre corresponds with a stand height of about 50 inches.

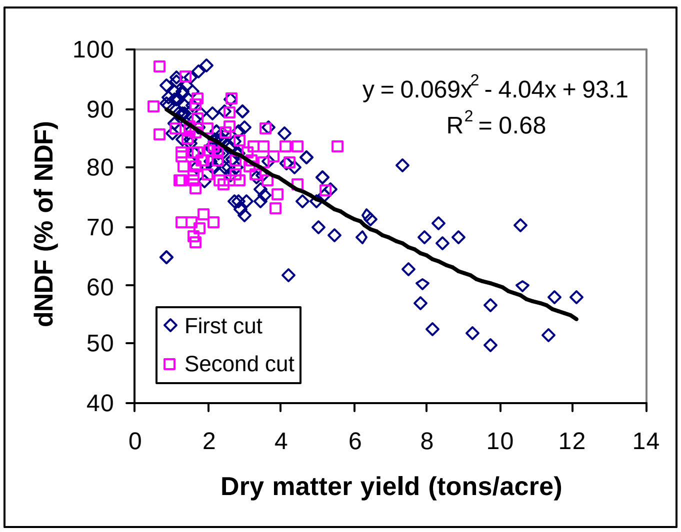

Figure 2: Digestibility of neutral detergent fiber and yield were negatively correlated.

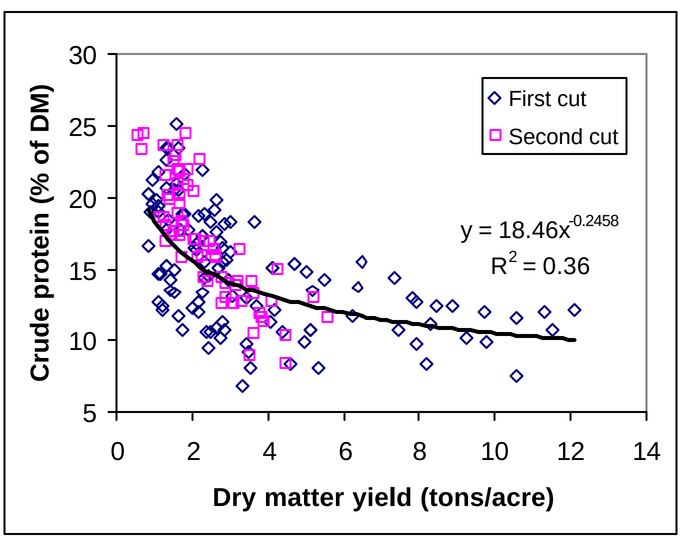

Figure 3: Crude protein decreased with increase in yield at the time of harvest.

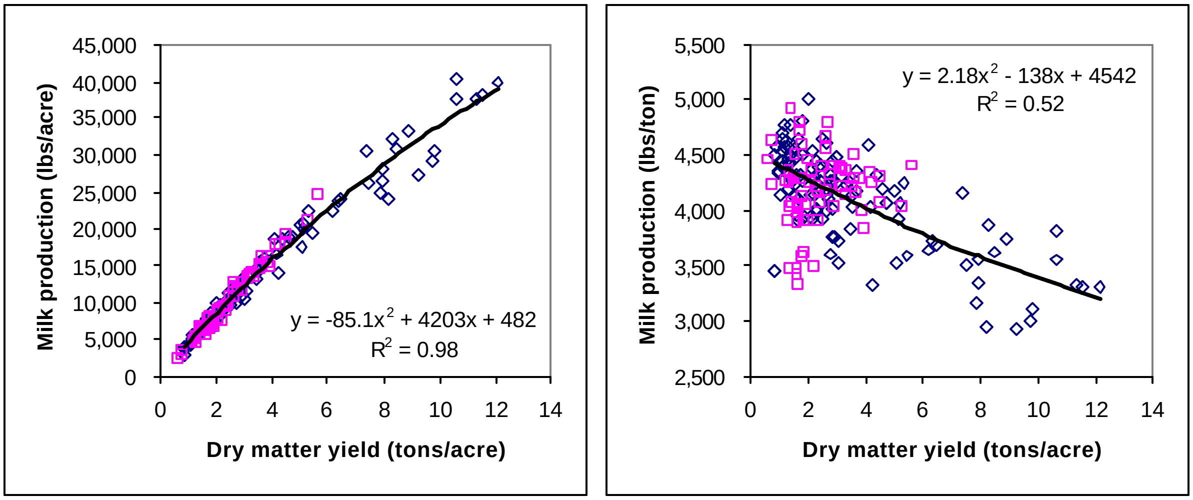

Figure 4: For all sites and years, the dry matter yield and predicted milk yield per acre were highly correlated whereas yield and quality were poorly correlated.

The modest decline in milk production with increased harvest height enlarges the harvest window. However, there are two reasons why a maximum stand height of 50 inches may be preferred. First of all, the shift from vegetative to reproductive growth lowers quality. Secondly, the amount of water that needs to be evaporated increases with yield. The average moisture content at harvest across all studies was 84% (ranges from 78 to 92% moisture). This means that to dry 12 tons of BMR sorghum sudangrass at 84% moisture to 65% moisture, about 6.5 tons of water will need to be evaporated.

Conclusions

Since dry matter yield was highly correlated with milk yield per acre, we conclude that BMR sorghum sudangrass has a relatively large harvest window in which to achieve quality forage able to compete with corn silage. However, to prevent the shift from vegetative to reproductive growth and better manage the amount of water at harvest, BMR sorghum sudangrass should be harvested when stand heights are 50 inches or less. There was a trend toward decreasing crude protein with increasing height. Trials conducted at the Mt Pleasant Research Farm in Tompkins and Columbia Counties (see What's Cropping Up? 12(5) pages 6-9 and 13(2) pages 1-3) showed that nitrogen fertilizer application greatly impacted the crude protein concentration in the forage. Additional trials are being conducted this 2003 growing season to determine optimum nitrogen recommendations but preliminary results show that a decline in crude protein concentration with yield can be avoided with appropriate N fertilizer and manure management.

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Acknowledgments and for Further Information

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