

# Technical Note

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USDA –Natural Resources Conservation Service  
Booneville Plant Materials Center

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Plant Materials Technical Report

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CP 512 – Pasture & Hay Planting

## **Total Digestible Nutrients and Protein per Acre Produced by Five Indiangrass Cultivars**

### **SUMMARY**

A three-year study was conducted at the USDA-Natural Resources Conservation Service, Booneville Plant Materials Center in Booneville, AR, for the purpose of evaluating total digestible nutrients and protein produced on a per acre basis of five Indiangrass cultivars.

### **CONCLUSIONS**

- ~ Total digestible nutrient means (averaged over year) ranged from 57.34 % for Osage to 62.55 % for Rumsey Indiangrass.
- ~ Generally, total digestible nutrient yearly values decreased from 1997 to 1999.
- ~ Crude protein produced on a per acre basis (percent crude x pounds of dry-matter per acre) ranged from 301 to 430 lb/acre for Osage and Rumsey, respectively.
- ~ Generally, pounds of crude protein produced per acre increased from 1997 to 1999. This was primarily the result of an increase in dry-matter production from the first to the last year of the study.

### **INTRODUCTION**

Studies have been conducted evaluating the quality parameters and protein of Indiangrass (*Sorghastrum nutans* L. Nash) cultivars at various locations throughout the south central United States. However, limited information exists on the total digestible nutrients and protein produced on a per acre basis of Indiangrass in the Booneville PMC service area.

Total digestible nutrients (TDN) are sometimes used to describe energy available in feed. Total digestible nutrients must be calculated from predication equations and require separate equations for various feed types (Moran, 2005 and Lofgreen, 1953). Total digestible nutrients report the percentage of digestible material in forage. Total digestible nutrients are calculated from acid detergent fiber and express differences in digestible material between forages (Henning, et al., 1991).

Reynolds, et al. (1969) compared three harvest frequencies and two levels of nitrogen for 'Boone' orchardgrass (*Dactylis glomerata* L.) and found that TDN decreased with more frequent

harvests. He also observed a general downward trend in TDN as the season progressed, and that there were no significant differences found in TDN between different nitrogen levels of the same harvest. He also reported that doubling the nitrogen rate nearly doubled the TDN within each harvest frequency.

Crude protein, expressed in lb/acre, is important to producers for determination of winter feed value of hay and in determining supplemental protein feed. Knowledge of this value may be beneficial in the reduction of winter feed costs.

This three-year study was conducted for the purpose of determining the production potential for total digestible nutrients and evaluating crude protein produced on a per acre basis of five native warm-season Indiangrass cultivars.

## **METHODS and MATERIALS**

The study was located at the USDA-NRCS Plant Materials Center, Booneville, AR. The study was conducted on a Taft silt loam (fine-silty, siliceous, Thermic Glossaquic Fradiuoult) soil. Five Indiangrass cultivars were harvested at the end of the growing season. The five entries included 'Cheyenne', 'Lometa', 'Osage', PI-514673 (released as 'Americus' from the Jimmy Carter Plant Materials Center), and 'Rumsey'. Establishment seeding rates for replicated subplots were based on NRCS and University of Arkansas Extension Service recommendations. Harvest data was obtained two years after establishment year. Commercial fertilizer (400 lb/acre of 13-13-13) was applied at the beginning of each growing season. The plots were burned in the spring of each season.

The harvest regime for end of season and total dry-matter production were based on best management practices for maximizing production and/or hay production for individual grass species. Clipping height for each variety was 4 inches.

Grab samples were obtained from individual plots after the harvest for dry-matter and quality determination. Samples were dried, ground, and analyzed for crude protein, acid detergent fiber, and neutral detergent fiber. Results for total digestible nutrients are presented on a percentage basis and protein per acre is the result of multiplying the nitrogen component by 6.25 to determine crude protein percent and this value multiplied by dry-matter production. Total digestible nutrient value was determined by a calculation from a prediction equation of  $111.8 - (0.95 \times \% \text{ protein}) - (0.36 \times \% \text{ acid detergent fiber}) - (0.7 \times \% \text{ neutral detergent fiber})$ . The equation was obtained from the University of Arkansas Soil Testing laboratory, Fayetteville, Arkansas.

## **RESULTS and DISCUSSION**

Results for total digestible nutrient results for years and means (Table 1) ranged from 54.53 to 62.71 % for Osage (1999) and Cheyenne (Year 1997), respectively. Mean observations ranged from 57.34 to 62.55 % for Osage and Rumsey, respectively.

Total digestible nutrient results for 1997 indicate that the differences between the highest (Rumsey, 67.01 %) and lowest (Lometa, 60.33 %) values were greater than for 1998 and 1999. Differences between the highest and lowest total digestible nutrient values in 1998 (Osage, 56.05 % and Rumsey, 60.50 %) were 4.54 and 5.53 percentage points higher in 1999 (Osage, 54.53 % and Rumsey, 60.06 %).

Generally, total digestible nutrient year values declined from 1997 to year 1999 for Cheyenne, Lometa, and Osage. Year values for total digestible nutrients for PI-514673 and Rumsey decreased between 1997 and 1998 3.98 and 6.42 percentage points, respectively, but remained similar between 1998 and 1999.

Total digestible nutrient means, averaged over three years, indicated that Rumsey produced 62.55 % TDN and Osage (57.34 %) was lower than other varieties tested. This is a difference of 5.21 percentage points.

Pounds of crude protein per acre (lb/acre) were calculated by multiplying the crude protein value from chemical analysis by the total dry-matter production (lb/acre). Winter fed crude protein is an incurred cost by producers for the maintenance, health, and production of any cattle operation. Information on a hay producing forage and its quality is important to determine the value of fed hay and may be used in the calculation of winter feed protein supplements.

Crude protein lb/acre yearly observations (Table 2) indicate that values ranged from 230.1 lb/acre for PI-514673 (1997) to 509.8 lb/acre for Rumsey (1999). Mean value differences were from 301.7 to 430.5 lb/acre for Osage and Rumsey, respectively. This is a difference of approximately 130 lb. The mean values for chemical analysis for crude protein for Osage was lower than for Rumsey and Rumsey produced approximately 800 lb/acre more dry-matter than Osage Indiangrass.

Differences between years for crude protein lb/acre were greater for Lometa (149 lb/acre) and PI-514673 (194 lb/acre) between 1997 and 1998 than for other observed cultivars.

## LITERATURE CITED

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**Table 1. Total Digestible Nutrients of Five Indiangrass Cultivars**

Variety	Year			Mean
	1997	1998	1999	
	-----%-----			
Cheyenne	62.71	59.21	57.89	59.94
Lometa	60.33	57.22	56.39	57.98
Osage	61.44	56.05	54.53	57.34
PI-514673	61.21	57.23	58.34	58.93
Rumsey	67.01	60.59	60.06	62.55

**Table 2. Crude Protein (lbs/ac) for Five Indiangrass Cultivars**

Variety	Year			Mean
	1997	1998	1999	
	-----lbs/ac-----			
Cheyenne	281.7	353.1	470.7	368.5
Lometa	230.2	379.9	448.5	352.9
Osage	258.3	303.2	343.5	301.7
PI-514673	230.1	424.5	508.3	387.6
Rumsey	375.3	406.5	509.8	430.5