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## NITRATE VARIATION IN SUDAN HAY BALES FROM THE SAME FIELD<sup>1</sup>

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### Summary

Individual large round bales of sudan hay from the same cutting and field ranged from 1,525 to 6,250 ppm nitrate (NO<sub>3</sub>), with an average of 2,764 ppm. These results illustrate the substantial variability that can occur in the nitrate content of forage packages because of location in the field and serves to caution producers when feeding such forages.

(Key Words: Nitrate, Sudan, Forage Testing.)

### Introduction

Many Kansas producers grow summer annuals such as sudan for dry forage. Because of stress caused from drought, chemicals, or lack of sunlight, many types of forage can accumulate nitrate. If forage is harvested with nitrate (NO<sub>3</sub>) levels higher than 6,000 parts per million (ppm; dry matter basis) and used as the only feed source, the potential exists for nitrate toxicity and cattle losses.

This study was conducted to determine the degree of nitrate variability present from bale to bale in sudan hay harvested off the same field.

### Experimental Procedures

Forage sudan was planted in late June and grown under dryland conditions on an upland Crete silt loam soil near Niles, Kansas. One week before planting, 30 lb of actual nitrogen was applied per acre. The sudan was drilled in 8-in. rows. The site suffered from lack of moisture and chinch bugs. Height of the sudan across the field varied from 2 to 6 ft at cutting time. The majority of the field was fully mature and headed. The sudan was swathed in late September and baled into 23 large round bales weighing 700 to 800 lb. All bales were stored outside on the ground. On February 9, each bale was sampled separately by probing at 10 locations around each bale with a Penn State Forage Sampler. The samples were analyzed for nitrate at the KSU Veterinary Diagnostic Laboratory.

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## Results and Discussion

The nitrate ( $\text{NO}_3$ ) content of the 23 bales averaged 2,764 ppm but varied from 1,525 to 6,250 ppm on an as-fed basis (Table 42.1). Thus, the nitrate level in individual sudan bales from the same field varied more than twofold from the average. These results stress the importance of thorough forage sampling and conservative application of nitrate test results, recognizing that substantial variation among forage packages exists.

As this study demonstrates, a perplexing variation in the nitrate content and possible toxicity of different forage bales off the same field can occur. What causes this inconsistency? Certainly, heterogeneity in soil type and topography, and improvements such as terrace channels can contribute to diverse fertility and moisture conditions across the same field. In addition, such effects as fertilizer spreader overlap and herbicide drift can cause variations in plant physiology, and they may operate parallel to plant rows. Thus, at harvest time, a single large round bale made parallel to the crop rows could contain a much higher nitrate content than a bale produced a few feet to the left or right. You may have tested a sample of the bales in the field for excessive nitrate levels, but you may not have tested the one or two that will do the damage!

**Table 42.1. Nitrate Variability among Sudan Hay Bales from the Same Field**

| Bale number | Nitrate content,<br>ppm $\text{NO}_3$ |
|-------------|---------------------------------------|
| 1           | 1,800                                 |
| 2           | 2,250                                 |
| 3           | 1,565                                 |
| 4           | 2,060                                 |
| 5           | 2,175                                 |
| 6           | 2,400                                 |
| 7           | 5,250                                 |
| 8           | 6,250                                 |
| 9           | 1,950                                 |
| 10          | 1,540                                 |
| 11          | 3,200                                 |
| 12          | 4,400                                 |
| 13          | 3,100                                 |
| 14          | 3,095                                 |
| 15          | 3,700                                 |
| 16          | 3,225                                 |
| 17          | 1,525                                 |
| 18          | 2,175                                 |
| 19          | 2,825                                 |
| 20          | 2,025                                 |
| 21          | 3,000                                 |
| 22          | 2,540                                 |
| 23          | 1,525                                 |
| Average     | 2,764                                 |