

## Temperature of vaquero hay stored in closed or open shed

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**Introduction** When fodders are preserved as hay, they can have their food value modified by the managed procedures during its production, storage and microbiological and biochemical phenomena that occur during such process. This has great influence on chemical composition, intake, fodder digestibility (Jobim, 2007) as well as on sanitary quality. Hay storage has been little studied in tropical conditions and it is known that part of it is used in livestock feeding since it is produced during summertime and stored for months until the winter comes, when tropical pastures have reduced their dry matter yield. Thus, this trial aimed at evaluating the variations on bales temperature of vaquero hay in both open and closed shed within 30 days.

**Material and Methods** The trial was carried out in a farm that has been producing Tifton 85 bermudagrass and vaquero (*Cynodon dactylon* L.) hay in Marechal Candido Rondon municipality, Paraná, Brazil. Hay fertilization on field was 30 days before its cutting with 70m<sup>3</sup>.ha<sup>-1</sup> from swine manure biofertilizers. The cutting at the experimental area was carried out on November 10<sup>th</sup>, 2012 with a mower with free swinging nylon flail fingers. The drying time was 44 hours and there was a turning with rake 16 hours after cutting. After baling, the bales were stored in appropriate places, in piles of five (5) bales (5 piles) under wooden pallets. Bales temperatures were measured daily at 1400 h (5 bales per treatment) as well as the room temperature was recorded with a skewer type thermometer. The experimental design was in a randomized block design with split plots over time with two storage systems and a 30-day evaluation of temperature with five replications. Data were submitted to analysis of variance and when there was some significance by F test, the averages were compared by Tukey test at 5% probability, according to SAEG program, version 8.0 for analysis.

**Results and Discussion** It was found out that temperature of bales in open shed differed from hay temperature in a closed shed ( $P < 0.05$ ), although, this difference was 0.68 °C higher in the closed one (Table 1). The studied bales were evaluated during 30 days, although they showed no significant difference ( $P > 0.05$ ) during 13 days among temperatures (Table 1). Temperatures of bales in open shed had been superior when compared to the closed one for 14 days. The temperature variation between sheds ranged from 0 to 4°C. The variation in room temperature ranged from 1 to 5°C in both sheds and it was observed the same temperatures in the different storage systems during three days. The temperature in the open shed was lower than in the closed one during 18 days. Muck & Shinnors (2001) highlight the importance of researching in order to understand the processes that affect hay quality during its production, storage and sanitary aspects. The lowest observed temperature in bales in closed shed was 22.8°C and the highest was 32.8°C. While, bales from open shed showed values that ranged from 24.8 to 30.4°C for minimum and

maximum temperature, respectively. Room temperature in the closed shed ranged from 25 to 35°C, as minimum and maximum records, while for open shed, these answers were 26 and 35°C, respectively. Since, the intense activity of microorganisms promotes an increase in hay temperature and it can also record values above 65°C and even spontaneous combustion. High humidity conditions and temperatures above 55°C are propitious to non-enzymatic reactions occurrence among soluble carbohydrates and amino groups of amino-acids, whose results are compounds called Maillard reaction products (Reis & Rodrigues, 1998). The extent of color changes provides some direction regarding heat intensity at storage and Maillard reaction occurrence (Moser, 1995). It should be noted that during rainfalls, a shed that has side walls (closed) also promotes greater protection of bales since there is an increase of moisture that can decrease their nutritional and sanitary answers.

**Conclusions** It was observed that storage systems little influenced on temperature variations.

**Table 1** Temperatures of bales and of storage places of vaquero hay

Storage days	Temperature (°C)			
	Closed Shed Place	Closed Shed - Bale	Open Shed Place	Open Shed - Bale
1	31	28.0b	29	29.0a
2	25	22.8b	26	24.8a
3	28	26.0b	29	27.2a
4	29	28.0	30	27.6
5	28	25.0	26	24.8
6	29	25.0b	31	28.6a
7	29	27.0a	27	25.8b
8	29	24.8b	28	26.4a
9	30	27.0	30	27.0
10	30	26.8b	30	28.6a
11	29	27.0b	29	29.6a
12	27	26.0b	27	27.0a
13	27	26.0	27	25.8
14	27	24.8b	27	27.0a
15	28	27.8	28	27.6
16	32	28.0b	32	29.6a
17	28	26.2b	28	27.6a
18	26	26.0a	26	25.8b
19	29	27.8	29	27.6
20	31	29.6	31	30.4
21	29	28.0b	29	29.4a
22	30	29.0	30	28.8
23	30	30.0	30	29.6
24	29	26.8b	29	28.6a
25	28	28.0	28	28.2
26	35	32.8a	35	29.8b
27	31	32.0	31	29.8
28	29	29.4	29	28.6
29	31	30.0	31	29.8
30	29	27.2b	29	29.8a
Averages		27.42b		28.01a
CV(%)1	2.39	CV (%) 2	2.49	

Means followed by same lowercase on the row do not differ by Tukey test at 5% probability ( $P < 0.05$ )