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Influence of Hay Ring Presence on Waste in Horses Fed Hay[1]

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ABSTRACT

Four quarter/paint horse open mares between the ages of four and seven years old were used to determine dry matter (DM) and organic matter (OM) hay wastage on round baled Coastal bermudagrass (*Cynodon dactylon*) and alfalfa (*Medicago sativa*) hay when hay rings were present or absent. Average daily gain (ADG), dry matter intake (DMI), and DMI as a percentage of body weight (BW) were also collected. Results indicated that percent DM wastage was higher ($P < 0.001$), for horses fed hay without rings (WOR) than for those fed hay with hay rings (WR). No differences ($P > 0.05$) were found in ADG. Furthermore, there were no differences ($P > 0.05$) in dry matter intake (DMI) or DMI as a percent of body weight (BW) in horses between hay ring treatments. However, there were increases ($P = 0.03$), ($P = 0.01$) respectively in DMI and DMI as a percentage of BW for horses fed alfalfa (ALF) independent of hay ring. Conclusions indicate that a high percent of wastage occurs when horses are fed either coastal bermudagrass or alfalfa round baled hay without hay rings. Also, when horses are fed alfalfa round baled hay, DMI is likely increased due to increased palatability.

KEY WORDS: bermudagrass hay waste, round bale hay, horse, alfalfa hay waste

INTRODUCTION

Coastal bermudagrass (*Cynodon dactylon*) and alfalfa (*Medicago sativa*) round baled hay is used extensively in the horse industry to provide hay to groups of horses either on poor pasture or in a dry-lot setting. The cost of CBG and ALF hay fed as round bales is typically lower on a per pound basis than when purchased as smaller square bales. This, combined with ease of feeding, is a large factor in some horse owners' decisions when deciding to feed round baled hay. However, the percentage of hay that is wasted when fed as round bales is poorly understood and may not be as economical as feeding conventional square bales (Lawrence et. al., 2000). Likewise, mold spores can contribute to colic in horses (Collins et al., 1997), and mold formation is likely when round bales are exposed to the elements for extended periods not only during storage, but

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feeding as well (Lawrence et. al., 2000). Thus, a better understanding of wastage and consumption of CBG and ALF round baled hay by horses is needed. The objectives of this study were to determine the amount of CBG and ALF hay wastage when horses are fed round baled hay with and without the use of hay rings. In addition, this study measured the average daily gain (ADG), dry matter intake (DMI), and DMI as a percentage of body weight (BW) of horses fed round baled hay with and without the use of hay rings.

MATERIAL AND METHODS

This experiment was conducted simultaneously at Texas Tech University, Lubbock, TX and Sam Houston State University, Huntsville, TX. At each research facility, four paint/quarter horse open mares (*Equus caballus*) four to seven years of age were rotated through treatments consisting of CBG or ALF round baled hay without ring (WOR) and with hay ring (WR). Nutrient analysis of CBG and ALF round baled hay is listed in Table 1. The experiment was designed as a completely randomized design in a 2 by 2 factorial arrangement of treatments with two replications per treatment at each site and four replications per treatment total. Horse round bale feeders measuring 8 ft in diameter and 2 ft 9 inches in height were used in the study and were provided by Priefert® Manufacturing Mount Pleasant, Texas. Horses were placed in an enclosed dry-lot setting where CBG or ALF hay was the only available source of nutrient consumption. Throughout the experimental period all horses remained indoors, removing any influence of wind, precipitation, or other environmental factors. Horses were provided free access to water and a trace mineralized salt block. Prior to the beginning of the first treatment cycle, horses were placed in the treatment area for three days and fed an ad libitum amount of CBG. After all CBG treatments were completed, horses were fed alfalfa hay ad libitum for 14 days before the beginning of the ALF treatments to ease the transition between hay varieties and minimize any potential transitional effects on feed intake.

Prior to the start of each treatment, hay was weighed and core samples (Han et al., 2004) were taken and analyzed for dry matter and nutrient composition. During each treatment replication, horses were left on hay until all unspoiled hay had been consumed. At the end of each treatment replication, unconsumed hay was collected, sorted from soil and fecal material, weighed and a representative sample was analyzed for dry matter, organic matter analysis, and nutrient composition. Additionally, all horses were weighed at the beginning and end of each treatment replication.

All data were analyzed using the mixed (General Linear Models) procedure of SAS (SAS, 2004). Pen was the experimental unit. Treatment was the fixed effect, and the LSMEANS statement of SAS was used to obtain standard errors.

RESULTS

There were no differences in data by research site ($P > 0.05$). Hay wastage and feed intake data are presented in Table 2. The main effect of percent wastage on a DM basis was higher ($P < 0.001$) for horses fed hay WOR than for those fed hay WR. Mean DM wastage for the WOR treatment was 34.8% vs. 5.5% for the treatment WR. There was an interaction ($P = 0.037$) in DM wastage between the effects of hay type and

presence of or absence of a hay ring. The mean wastage for ALF when fed WR was 9.10%, where only 1.84% of CBG was wasted when fed WR. Conversely, a lower percentage of ALF (31.50%) than CBG (38.15%) was wasted when fed WOR. For the WOR treatment with CBG all unspoiled hay had been consumed at d 6 of each treatment replication, whereas all unspoiled hay had been consumed at d 8 for three replications and d 9 for one replication of the CBG WR treatment. When ALF was fed all unspoiled hay had been consumed at d 7 of the WOR treatment, and d 9 of the WR treatment. Percent wastage on an OM basis followed the same pattern as DM wastage without the observance of an interaction (P = 0.08) of wastage between the effects of hay type and presence of or absence of a hay ring. There was no difference (P = 0.69) in the main effect of DMI in horses fed hay WR compared with horses fed hay WOR. Mean DMI was 8.98 kg/day for the WOR treatment and 9.33 kg/day for the WR treatment.

Table 1. Nutrient analysis of CBR and ALF round baled hay[a]

Item	ALF	CBG
DM, %	91.2	92.8
Ash, %	12.1	6.9
ADF[b],%	34.2	37.9
CP[c], %	19.7	11
TDN[d], %	60.9	58.9
Ca, %	1.05	0.41
P, %	0.5	0.22

[a]All values except DM, % are expressed on a DM basis. Samples collected weekly were composited and assayed by SDK Laboratories (P.O. Box 886, Hutchinson, KS 67504-0996.)
[b]ADF = acid detergent fiber.
[c]CP = crude protein.
[d]TDN = total digestible nutrients.

Likewise, no difference was observed (P = 0.53) in the main effect of DMI as a percent of body weight in horses fed hay WR than for horses fed hay WOR. Mean DMI as a percentage of body weight for the WOR and WR treatments was 2.1% and 2.5% respectively. There was an increase (P = 0.03) in DMI when horses were fed ALF versus CBG independent of hay ring. Additionally, there was similar (P = 0.01) increase in DMI as a percent of body weight when ALF was fed independent of hay ring. There were no differences in the main effect of ADG (P = 0.32) between the presence or absence of hay ring. Mean ADG for the treatment WOR was 0.82 kg/day and for the treatment WR was 0.06 kg/day.

Table 2. Effects of hay type and feeding method on round baled hay wastage, ADG and feed Intake[a,b]

	Treatments[a]							
	ALF		CBG			*P*-value[c]		
Item[b]	WR	WOR	WR	WOR	SE[d]	Hay	Ring	Hay x Ring
DM Waste[e]	9.1	31.5	1.84	38.14	2.97	0.92	<0.001	0.04
OM Waste[f]	7.25	28.63	1.63	34.87	2.16	0.92	<0.001	0.08
ADG[g], kg	-0.15	0.64	0.28	1	1.61	0.6	0.32	1
DMI[h], kg	9.96	10.46	8.71	7.53	1.86	0.03	0.69	0.37
DMI, %BW[i]	2.29	2.38	2.02	1.73	0.16	0.01	0.53	0.25

a Roughage source: ALF = Alfalfa Hay; CBG = Coastal Bermudagrass Hay
[b]Feeder: WR = with hay ring; WOR = without hay ring
[c]Observed significance level: Hay = hay effect; Ring = hay ring effect; Hay x Ring = hay x ring interaction
[d]Pooled standard error of the treatment means; n = 4 pens per treatment
[e]Percentage waste on dry matter basis
[f]Percentage waste on organic matter basis
[g]Average daily gain
[h]Dry matter intake per day
[i]Dry matter intake as a percent of body weight, per head

DISCUSSION

The results of this study confirm that feeding round baled hay without the use of hay rings results in a high percent of wastage. This appears to be primarily because hay rings reduce a horse's access to the entire bale of hay. When fed round baled hay without a ring, horses tended to peel off a large section of the outermost portion of the bale in order to gain access to the center of the bale. The hay that was discarded in this manner was trampled during feeding and soiled with urine and fecal matter, thus spoiling it. Additionally, when fed hay without a ring, horses used the hay lying around the bale as bedding. By comparison, hay rings appear to reduce waste primarily by protecting the round bale from being trampled and contaminated with urine and feces. This was most apparent when collecting and measuring waste hay. Waste hay from all treatments was sorted from fecal material and soil by hand. Although the quantity and concentration of fecal material present in waste hay before sampling was not measured or recorded, it was observed to be dramatically lower in hay collected from WR treatments. Furthermore, hay collected from the WR treatments typically appeared to be less contaminated by urine.

An interaction between the type of hay fed and presence or absence of a feeder was observed in relation to the percentage of hay wastage. When a ring was used, the percentage wasted when fed alfalfa was 9.10%, compared to only 1.84% when fed CBG. Conversely, a lower percentage of ALF (31.50%) than CBG (38.15%) was wasted when fed WOR. This may be a result of the finer texture of the ALF. A greater amount of hay was dropped outside of the feeder when ALF was fed, exposing a greater percentage to

spoilage from trampling and contamination. However, this interaction is more likely due to presence of soil or other contaminants in the collected orts and the higher ash percentage in the ALF hay compared to the costal CBG (Table 1). When hay wastage was corrected for OM, there was no observance of an interaction, thus indicating that our sampling techniques were effective in removing soil from the orts and correcting for percentage ash in the offered hay.

Feeding hay from round bales has been shown to increase the risk of colic in horses (Hudson et al., 2001), and forcing horses to consume spoiled hay will likely exacerbate that risk. Hay spoilage was the factor used in determining when to end each treatment. Treatments were ceased when it appeared unlikely that the horses on trial could consume fresh, unspoiled hay. It is possible that the treatments conducted without a hay ring could have been continued for another day, but not without forcing the animals to consume contaminated hay and therefore increasing the risk of colic.

The absence of variation in DMI between treatments with and without a hay ring supports the observation that the lower percentage of wastage observed with the hay ring was primarily due to a reduced rate of spoilage. There was no observed effect on rate of consumption associated with the use of hay ring. This is further supported by the lack of significant difference in ADG between treatments. Although horses consumed more ALF than CBG, consumption was not increased enough to affect ADG. The variation in DMI and DMI as a percentage of body weight observed between treatments with ALF and CBG was most likely the result of the ALF being higher palatability.

The use of hay rings or round bale feeders appears to reduce hay wastage to a greater degree than was expected. Moreover, the use of hay rings reduces the quantity of spoiled hay available to horses being fed round bales. This could be of benefit in reducing the incidence of colic associated with the consumption of spoiled or moldy hay. This experiment did not consider the role of environmental factors such as drainage and precipitation in round bale wastage, and this is an area that needs further study to be completely understood. It appears that when fed under the right conditions, round baled hay may be an acceptable alternative to conventionally baled hay. If this is to be determined, more research is needed to compare the wastage of round baled hay to that of conventionally baled hay.

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