

COMPARISON OF DIFFERENT MANAGEMENT TECHNIQUES ON HAY WASTAGE IN HORSES FED ALFALFA HAY

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ABSTRACT

Two studies were conducted to determine waste of alfalfa hay when fed to horses. In study one, four quarter/paint horse open mares (*Equus caballus*) between the ages of four and seven years old were used to determine hay wastage on round baled alfalfa (*Medicago sativa*) (ALF) hay when hay rings were present or absent. Average daily gain (ADG), dry matter intake (DMI), and DMI as a percentage of body weight were also collected. Results indicated that percent wastage was higher ($P<0.001$), for horses fed hay without rings (WOR) than 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 or DMI as a percent of body weight in horses between treatments. In study two, fifteen long yearling quarter horses were used to determine square bale waste in a stall setting while feeding in a feeder versus on the ground. DMI and ADG were also collected. Results indicated that percent wastage was higher ($P<0.05$), for horses fed hay on the ground versus in the feeder. No differences ($P>0.05$) were found in DMI or ADG.

KEYWORDS: alfalfa, waste, horses

INTRODUCTION

The price of hay in the U.S. has drastically increased in recent years due to increased fuel costs and lack of supply due to drought. To compound the problem, feeding and storage practices of hay have also contributed to large annual economic losses (Gibbs, 2007). The combination of these variables has made horse ownership become increasingly more expensive. General horse hay feeding practices include either pasture feeding or feeding while housed in stalls. Pasture feeding generally includes the use of round baled hay. In general, it has been thought that the cost of hay fed as round bales is typically lower on a per pound basis than hay purchased as small 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 bales (Lawrence and Coleman, 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 feeding as well (Lawrence and Coleman, 2000).

While pasture feeding is common, stall feeding is also very common and generally includes the use of conventional baled hay that is fed either in a feeder or on the stall floor. Some horse owners believe feeding hay on the ground is a more natural way to feed, is safer, and helps reduce ingestion of foreign materials. However, many scientists believe that by feeding hay in feeders, chance of colic may be reduced, waste may be reduced, and internal parasite incidence may not be as high (NRC, 1989). Therefore, a better understanding of wastage and consumption of hay being fed to horses is needed. These studies were conducted to determine the amount of hay wastage when horses are fed both round baled hay with and without the use of hay rings and square baled hay fed either on the ground or in a commercial feeder.

MATERIALS AND METHODS

Study 1

This experiment was conducted simultaneously at Texas Tech University Lubbock, Texas and Sam Houston State University Huntsville, Texas. At each research facility, four paint/quarter horse mares (*Equus caballus*) 4 – 7 years of age were rotated through treatments consisting of ALF round baled hay without ring (WOR) and with hay ring (WR). Nutrient analysis of ALF round baled hay is listed in Table 1. The experiment was designed as a completely randomized design with two replications per treatment at each site and four replications per treatment total. Horse Round Bale Feeders measuring eight feet in diameter and two feet nine 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 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 ALF hay. Prior to the start of the trial, 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 allowed to consume all hay that was not ruined by fecal or urine contamination. 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 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 procedure of SAS (SAS). Pen was the experimental unit. Treatment was the fixed effect, and the LSMEANS statement of SAS was used to obtain standard errors.

Table 1. Nutrient analysis of ALF round and conventional baled hay^a

Item	Round	Small Square
DM, %	91.27	90.25
ADF ^b , %	34.24	35.87
CP ^c , %	19.70	22.77
TDN ^d , %	60.91	62.15
Ca, %	1.05	1.97
P, %	0.52	0.55

^aAll values except DM, % are expressed on a DM basis

^bADF = acid detergent fiber

^cCP = crude protein

^dTDN = total digestible nutrients

Study 2

Fifteen long-yearling Quarter Horses in training were used to determine hay waste when fed ALF hay on the ground or in hay feeders while being housed in 10' x 10' stalls. Nutrient analysis of ALF conventional baled hay is listed in Table 1. On day 0 horses were de-wormed with a common commercial anthelmintic, placed in stalls, and offered ALF hay at 2% of their body weight in a common commercial feeder. Horses were fed for 7 days before collection began to allow for any adjustment necessary to the ALF hay. Horses were fed at approximately 7 am and 5 pm daily. On day 7, horses were weighed and placed back in stalls. Horses then received ALF hay at 2% of their body weight in hay feeders for 35 continuous days. Upon completion of the 35 days, horses were de-wormed, weighed, and placed back in stalls. On day 35, horses were fed ALF on the ground for another 35 continuous days. Daily collection of wasted hay occurred two hours post feeding. Stalls were cleaned of urine and fecal material daily. Clean, fresh water was provided free choice. Upon placing hay in stalls, each flake of hay was sampled for dry matter analysis and nutrient composition. After trial was completed, statistical analysis was performed to determine differences amongst treatments. All data were analyzed using the Mixed procedure of SAS (SAS).

RESULTS

Study 1

There were no differences in data by research site ($P > 0.05$). Hay wastage and feed intake data are presented in Table 2. Percent wastage on a DM basis was higher ($P < 0.003$) for horses fed ALF hay WOR than for those fed hay WR. Mean wastage for ALF when fed WR was 9.10% whereas WOR was 31.50%. Percent wastage on an OM basis followed

the same pattern as DM wastage, indicating that sampling techniques were effective in removing soil from the orts and correcting for percentage ash in the offered hay. All unspoiled hay had been consumed at day 7 of the WOR treatment, and day 9 of the WR treatment. No differences were seen ($P>0.05$) in DMI or ADG between the treatments. Mean ADG for the treatment WOR was 1.42 lbs/day and for the treatment WR was -0.33 lbs/day.

Table 2. Effects of feeding method on round baled ALF hay wastage, ADG and feed intake^{a,b}

Item	Treatments ^a			P-value ^b
	ALF		SEM	
	WR	WOR		
DM waste ^c	9.10	31.50	3.20	<0.003
OM waste ^d	7.25	28.63	2.94	<0.002
ADG ^e , lbs	-0.33	1.42	1.81	0.47
DMI ^f , lbs	21.95	23.05	2.46	0.76
DMI, %BW ^g	2.29	2.38	0.19	0.75

^aFeeder: WR = with hay ring; WOR = without hay ring

^bObserved significance level: Ring = hay ring effect

^cPercentage waste on dry matter basis

^dPercentage waste on organic matter basis

^eAverage daily gain

^fDry matter intake per day

^gDry matter intake as a percent of body weight, per head

Study 2

Hay wastage on a DM basis was higher ($P<0.05$) when hay was fed on the ground rather than when fed in a feeder (Table3). The mean wastage for ALF when fed in a feeder was 1.3% whereas when fed on the ground, 7.3% was wasted. DMI was lower ($P<0.05$) for horses consuming hay from the ground in the stall. DMI intake for horses fed hay on the ground was 14.9 pounds versus 15.9 pounds for those consuming hay in the feeders. No differences were seen in ($P>0.05$) in ADG between the treatments. Mean ADG while fed in feeder was 1.9 lbs/day and 1.8 lbs/day when fed on the ground.

Table 3. Effect of Feeding Method in a Stall Setting on ALF Hay Wastage

Item	In Feeder	On Ground	SEM
DM waste ^c	1.3 ^a	7.3 ^b	1.98
DMI ^d , lbs	15.9 ^a	14.9 ^b	0.37
ADG ^d , lbs	1.9 ^a	1.8 ^a	0.64

^{a,b} Means in same column with different letter superscripts differ ($P < .05$)

^cPercentage waste on dry matter basis

^dDry matter intake per day

^eAverage daily gain

DISCUSSION

The results of this study confirm that feeding ALF hay without the use of hay rings or common commercial feeders results in a high percent of wastage. This appears to be primarily because hay rings and commercial feeders help reduce waste caused by urine and fecal contamination, trampling, and hay used for bedding.

When round baled hay was fed 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 and cause waste, which is a similar result communicated by Lawrence and Coleman (2000). The hay that was discarded in this manner was trampled during feeding and soiled with urine and fecal matter, thus spoiling it. When hay was fed on the ground inside the stall, the hay was many times distributed throughout the stall and mixed with urine and fecal material while also being trampled.

Additionally, when round baled hay was fed 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 lower in hay collected from WR treatments, which is a potential economic savings. Furthermore, hay collected from the WR treatments typically appeared to be less contaminated by urine.

In the stall, hay fed in a commercial feeder also reduced waste when compared to being fed on the ground and again is a similar finding to the reported results from Lawrence and Coleman (2000). When comparing hay fed in the feeder versus hay being fed with a round bale ring, it was observed that the feeder had a lower wastage on a percent basis. This was somewhat expected due to the much smaller amount that was fed in the stall.

When considering initial cost and labor, round bales are generally cheaper per pound and labor is much less. However, feeding hay from round bales has also 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.

In this study, 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 as well as provides economic values that may offset additional cost of hay rings. 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 when considering colic and digestive upsets associated with hay spoilage. However, in this study it was found that waste is reduced the greatest by feeding in the stall with common commercial feeders. However, stall feeding increases labor and potential costs due to more frequent feeding schedules. Therefore, labor, initial cost of hay, and amount of waste are all considerations when determining the best management technique.

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