

INTAKE RESPONSE OF HORSES CONSUMING A CONCENTRATE VARYING IN PELLET SIZE

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Story in Brief

Four yearling and four mature horses were fed a concentrate processed in four different sized pellets in order to measure intake response. The four yearling horses and two of the mature horses were fed four pounds of concentrate and four pounds of hay twice daily. The remaining two mature horses were fed six pounds of concentrate and six pounds of hay twice daily. The yearling horses consumed slightly less concentrate by 20 minutes post feeding when offered the 3/16 inch pellet as compared to the 5/8 inch pellet. Mature horse response was similar to yearlings although differences were not significant. Pellet density appeared to affect intake response as less dense pellets were consumed at a faster rate during the first 20 minutes post feeding. The mature horses offered more ration consumed a lower amount during the first 20 minutes post feeding. No significant differences in chewing rates were detected between pellet sizes. No digestive disorders were observed with any of the horses on any of the pellets. Results of this trial suggest that pellet sizes ranging from 5/32 inch to 3/4 inch in diameter had little effect on consumption of the concentrate portion of the ration.

(Key Words: Horse, Feed Intake, Pellet Size.)

Introduction

Previous work indicates that horses consume total rations processed into pellets faster than rations which are not pelleted (Hintz and Loy, 1966). Similar responses have been documented in dairy cattle (Kertz et al., 1981). While previous research with horses has noted differing consumption rates of total diets fed in pelleted versus unpelleted form, there is little documentation of intake response of the concentrate portion of a ration fed in different sizes of pellets. The objective of this trial was to measure intake responses of mature and yearling horses consuming a concentrate ration fed in varying pellet sizes.

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Materials and Methods

Four yearling and four mature Quarter Horses were randomly assigned treatments within two 4 x 4 Latin square experiments consisting of four 2-week periods. Treatments consisted of a single concentrate mixture (Table 1) processed into pellet sizes of 5/32, 3/16, 5/8, or 3/4 inch in diameter. Total diets consisted of 50% concentrate and 50% Bluestem hay. The horses were fed twice daily at 12-h intervals. Yearlings were fed 4 lb of concentrate and 4 lb of hay each feeding to meet estimated nutrient requirements for growth. The mature horses were fed at levels to maintain a moderately fleshy body condition (Henneke et al., 1983); two received 4 lb of concentrate and 4 lb of hay each feeding. The remaining two mature horses received 6 lb of concentrate and 6 lb of hay each feeding. One required the additional feed because of activity as a breeding stallion and the other horse was fed to increase body condition from a thin condition at the start of the trial to a moderately fleshy condition by the end of the trial. The horses were maintained in individual stalls with free access to water. The horses were immunized and dewormed prior to the initiation of the study.

The amount of concentrate remaining at 20 min post feeding was measured to determine relative consumption rate during the last three days of each experimental period. The hay portion of the diet was fed after the 20 min post feeding measurement to remove the effects of hay intake on concentrate consumption. Chews per minute were determined twice in each of the monitored feedings by observation of jaw movements.

A random sample of each pellet size was taken for density determination. Ten pellets of each size were measured for length and diameter for area determinations and weighed on an air dried basis. Density was expressed as weight per unit volume (mg/mm³).

Table 1. Composition of concentrate, as fed basis^a.

Ingredient	percent
Corn, grain	50.0
Alfalfa hay, midbloom	25.0
Soybean meal	20.0
Molasses, sugarcane, dehydrated	3.0
Limestone, ground	1.5
Sodium chloride	.5

^a Vitamin A topdressed at levels of 450 IU Vitamin A/lb.

All data were subjected to analysis of variance to determine differences in treatments, and Tukey's procedure was used to identify differences between treatment means ($P < .05$).

Results

Small differences ($P < .05$) were observed in the amount of concentrate consumed in different pellet sizes fed to yearlings (Table 2). Mean amounts consumed at 20 min post feeding ranged from 2.6 lb for the 3/16 inch pellet to 2.9 lb for the 5/8 inch pellet. The number of chews per minute were similar for all the pellet sizes ($P > .05$).

Consumption of pellets by mature horse followed a pattern similar to the yearlings, although differences were not significant. Amounts consumed after 20 min ranged .5 lb with smallest amounts consumed corresponding to the 3/16 inch pellet and the largest with the 5/8 inch pellet. Chews per minute were not different between treatments, and were similar to values observed in yearlings.

A contrast between the mature horses consuming 4 lb and 6 lb per feeding was constructed to determine the influence of concentrate level on consumption patterns. The two horses fed 6 lb concentrate across treatments consumed less in 20 min post feeding (2.88 lb) than those receiving 4 lb concentrate (3.78 lb).

Table 2. Mean concentrate intake of horses consuming pellets with different diameters.

Age	Pellet diameter, inch				SE
	5/32	3/16	5/8	3/4	
Yearlings					
Amount consumed, post 20 min, lb	2.8 ^{ab}	2.6 ^b	2.9 ^a	2.8 ^{ab}	.11
Chew rate, chews/min	83.8	81.8	82.0	79.8	2.4
Mature					
Amount consumed, post 20 min, lb	3.4	3.0	3.5	3.4	.16
Chew rate, chews/min	82.8	85.3	83.5	81.3	2.5

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

Slower intakes for those horses consuming more concentrate and hay per feeding would be expected if gut fill from the previous feeding had an effect on appetite.

Discussion

These results indicate that pellet size differences (5/32 to 3/4) had little effect on the acceptability and consumption patterns of both groups of horses. Results of this trial may be more influenced by pellet density than pellet size. Although it was not the intent of the trial to vary pellet density between treatments, differences in density were observed between pellets of different sizes. Pellet densities ranged 1.64 mg³/mm³ across treatments (Table 3). Pellet density and consumption followed a similar pattern across treatments. Lowest consumption amounts post 20 min of feeding were observed with the denser pellets.

One disadvantage of pellets, particularly very small pellets, has been suggested to be rapid intake (NRC, 1989). The rapid intake may more readily lead to digestive disorders from overconsumption and rapid fermentation in the horse's digestive tract. No digestive disorders were apparent in any of the horses on any of the treatments. Another perceived disadvantage of feeding large pellets to young horses is the increased potential for choking due to swallowing large particles. No evidence of choking or difficulty in swallowing was observed for any of the treatments. Apparently, pellet size did not influence the ability of these horses to break the pellets into a safe size for swallowing.

Additional studies need to be conducted to verify intake responses of horses consuming rations differing in physical form. Many of the traditional whole grain rations fed to horses are becoming more and more uneconomical,

Table 3. Density of pellets with different diameters and intake response of horses.

Item	Pellet diameter, inch				SE
	5/32	3/16	5/8	3/4	
Pellet density, mg ³ /mm ³	12.63 ^{bc}	13.99 ^a	12.35 ^c	12.84 ^b	.13
Amount consumed, post 20 min, lb	3.1 ^a	2.8 ^b	3.2 ^a	3.1 ^a	.14

a,b,c Means in the same row with different superscripts differ (P<.05).

and many of the alternative grains can be fed in pelleted form. Pelleted feeds have many advantages in utilization of different feedstuffs; however, potential problems with digestive disorders of feeding pellets need further research. While Scott and Potter (1989) recently reported that varying the fiber content of pellets has little effect on intake responses of horses, level of intake and pellet density are two confounding factors observed in this trial which do appear to affect intake response. These factors need to be considered in the design of further studies on intake response of horses fed rations of differing physical form.

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