

EFFECT OF PREPARATION METHOD ON THE GLYCEMIC RESPONSE TO INGESTION OF BEET PULP IN THOROUGHBRED HORSES.

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Previous studies in our laboratory demonstrated a marked glycemic response when horses were fed a fiber mix consisting of equal parts rice bran, soy hulls, wheat bran, and soaked beet pulp (Pagan et al. 1999). We speculated that, in part, the beet pulp portion of this fiber mix was responsible for the increase in plasma glucose concentrations after meal ingestion. We further hypothesized that the magnitude of the glycemic response to beet pulp would depend on how the beet pulp was prepared. Therefore, the objective of this study was to determine how different preparations of shredded beet pulp (beet pulp shreds, American Crystal Sugar Co.) affect glycemic response in Thoroughbred horses. In a 4 X 4 Latin square design, four mature geldings (mean age 12 yr, body weight 568 kg) were fed: 1) 0.75 kg rinsed beet pulp (Rinse), 2) 0.75 kg hydrated beet pulp (Hydrate), 3) 0.675 kg dry beet pulp and 0.075 kg molasses (BP/molasses), and 4) 0.75 kg whole oats (Oats). Water was added to both the rinsed and hydrated beet pulp, which were then allowed to stand overnight. In the Rinse treatment, excess water was drained and the beet pulp was washed repeatedly until the concentration of glucose in the wash water was <1 mg/dl. In Hydrate, water was not removed before feeding the beet pulp. Each treatment period was of 7 days duration. In each period, the diet consisted of the treatment meal (0700h), 2 kg of whole oats (1600h), and 6.8 kg alfalfa hay cubes, divided into 3 equal feedings, at 0700, 1600, and 2200. Horses were given access to free exercise on pasture during the day, although they were not allowed to graze. The glycemic response trials were performed on day 7 of each period after an overnight fast (10 h). The test meal was fed at 0700 h. Blood samples were taken before feeding to determine baseline glucose values and at 30-min intervals following feeding for 480 min. The morning allotment of alfalfa cubes was fed after completion of sample collection. Measurements included area under the curve, mean glucose (mg/dl), peak glucose (mg/dl), and time to peak glucose (min). Plasma glucose concentrations were statistically analyzed by the general linear model procedure for analysis of variance, with period, horse, and treatment included in the model. Statistical significance was set at $P < 0.05$. Using area under the curve for whole oats as a standard of reference, a glycemic index was determined from area under the curve for the other treatments.

Ingestion of rinsed beet pulp resulted in significantly lower area under the curve, mean glucose, peak glucose, and time to peak glucose when compared to the other treatments (Table 1). Ingestion of Oats and BP/molasses resulted in the highest glycemic response (Fig. 1), while the plasma glucose response after Hydrate was intermediate between the Oats and BP/Molasses treatments and the Rinse treatment (Table 1, Fig. 1). The estimated glycemic index was substantially lower for Rinse when compared to the other treatments (Table 1). The results of this study demonstrate that the glycemic response to a meal of beet pulp is markedly affected by preparation method. Removal of residual sugars by hydrating and rinsing dry beet pulp results in a negligible glycemic response, whereas the addition of 10% molasses to dry beet pulp results in a plasma glucose

response that is indistinguishable from that observed after a meal of whole oats. These findings have important implications in the design of diets and feeding methods for horses that require diets low in hydrolyzable carbohydrate (e.g. horses with recurrent exertional rhabdomyolysis, polysaccharide storage myopathy).

Key Words: Glycemic index, fermentable fiber, molasses

Literature cited

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Table 1. Area under the curve, mean glucose, peak glucose, and time to peak glucose concentration for all dietary treatments.

	Area under curve	MG (mg/dl)	PG (mg/dl)	TTP (min)	GI
Rinsed	1422 ^a	91.2 ^a	94.5 ^a	195 ^b	34.1
Hydrated	3017 ^b	94.4 ^b	105.4 ^b	75 ^a	72.2
Dry + molasses	3834 ^b	95.1 ^b	119.0 ^c	83 ^a	94.8
Whole oats	4175 ^b	94.8 ^b	114.6 ^c	83 ^a	100
SEM	406	0.41	2.72	37	
Statistical significance	0.01	0.05	0.01	0.01	

^{abc} Treatments lacking a common superscript differ (P<0.05)

MG, mean glucose; PG, peak glucose; TTP, time to peak glucose; GI, glycemic index

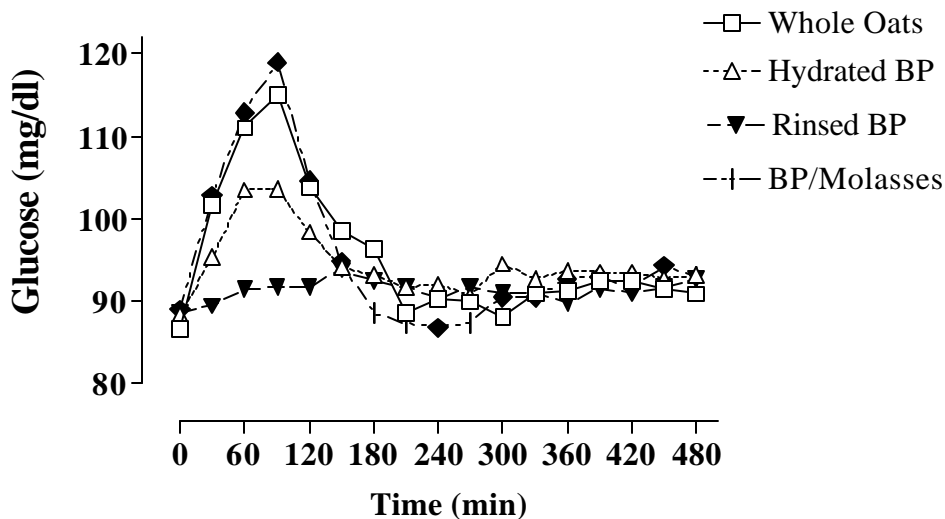


Figure 1. Plasma glucose concentrations after ingestion of whole oats, hydrated beet pulp (BP), rinsed BP and BP/molasses in four horses.