Kentucky Equine Research Technical Bulletin

A Review of Recent Research on Equi-Jewel® from Kentucky Equine Research

Apparent Digestibility of Equi-Jewel in Thoroughbred Horses

Glycemic Index of Equi-Jewel

Feeding Equi-Jewel to Performance Horses

Feeding Equi-Jewel Does Not Significantly Affect Serum or Urine Concentrations of Anabolic Steroids

An Evaluation of the Anabolic Effects of Equi-Jewel on Horses

Apparent Digestibility of Equi-Jewel® in Thoroughbred Horses

Apparent digestibility of Equi-Jewel, a stabilized rice bran (SRB) product, was measured in mature Thoroughbred geldings using total fecal collection. A digestible energy value was then calculated based on the findings.

Materials and Methods

A switchback study was conducted with three Thoroughbred geldings (mean ± SD: age 9.3 ± 2.3 years) to measure the apparent digestibility of Equi-Jewel using total fecal collection and to calculate the digestible energy value.

Diets were fed at a fixed intake level of 1.86% BW using 550 kg BW. Concentrate was divided into two equal meals at 700 h and 1900 h. Horses on the SRB diet were fed 2.2 kg Equi-Jewel, 1.1 kg sweet feed, 2.8 kg grass hay, and 4.12 kg of a fiber cube daily. Each experimental period was 28 days, with a 5-d total fecal collection study conducted at the end of each period. During the collection study, harnesses were emptied 3 times per day. Each 24-h fecal collection was weighed and mixed, and subsamples of 2.5% of total wet weight were collected and frozen.

Feed and manure samples were sent to Dairy One (Ithaca, NY) for analysis of dry matter, crude protein, acid detergent fiber, neutral detergent fiber, starch, water-soluble carbohydrates, nonfiber carbohydrates, fat, and gross energy.

Results

Mean DE of SRB was 4.13 ± 0.26 Mcal/kg (DM basis). The mean DM for SRB was 92.53%, resulting in a mean of 3.82 Mcal/kg DE for SRB as fed. This value is similar to the current DE value for rice bran used in formulations at Kentucky Equine Research based on previous analysis. The DE of SRB in this study is greater than previously reported DE values for both corn and barley, but is lower than previous digestibility experiments where SRB with a higher starch content was used.

The digestibility of the fat in the SRB diet was 68 ± 2%, and the estimated digestibility of the fat in SRB was 100 ± 1%. Total tract starch digestibility for the SRB diet was 96 ± 1%, and the estimated digestibility of the starch source in stabilized rice bran was 92 ± 6%, which is comparable to the starch digestibility of cereal grains.

Conclusions

Equi-Jewel, a stabilized rice bran (SRB) product, is a highly digestible fat source for horses. The high DE content of Equi-Jewel is due to the high fat content and the very high digestibility of fat and starch.

Glycemic Index of Equi-Jewel®

Glycemic index is used to rank carbohydrates based on their effect on blood glucose concentration. In equine nutrition, oats have been used as the standard (set at 100) to calculate the glycemic index of other feedstuffs. As a general rule, feeds that are higher in fiber or fat, such as Equi-Jewel, a stabilized rice bran (SRB) product, will have a lower glycemic response and lower glycemic index than feeds that are high in carbohydrates. Glycemic response and glycemic index can be used to compare feedstuffs according to their probability to raise blood glucose and corresponding insulin concentrations.

Materials and Methods

Three mature Thoroughbred geldings (mean ± SD: age 9.3 ± 2.3 years) were used in a switchback study design to determine the glycemic response and glycemic index of Equi-Jewel, a stabilized rice bran product, compared to oats. The two test meals used in this study were (1) 500 g Equi-Jewel and (2) 500 g crimped oats. All horses were adapted to a basal diet containing 1.1 kg sweet feed (45% oats, 45% cracked corn, and 10% molasses), 2.8 kg grass hay, and 4.12 kg fiber pellet. Horses that received Equi-Jewel had been fed 2.2 kg Equi-Jewel/ day for at least 7 d prior to glycemic response, whereas the horses that received oats were fed sweet feed only. An intravenous catheter was inserted into a jugular vein for blood sampling and blood samples were collected into heparinized tubes. Blood samples were collected before feeding, immediately post consumption of the test meal, and every 30 min after eating for 240 min. Plasma glucose concentrations were measured using the YSI 2300 STAT Plus glucose and lactate analyzer (Yellow Springs Instruments, Ohio 45387).

Results

The total peak area under the glucose-time curve was significantly greater for oats (4129 ± 926.2) than Equi-Jewel (2367 ± 907.0) ($p = 0.004$). Equi-Jewel had a significantly lower peak glucose value (124.7 ± 3.8 mg/dL) compared to oats (142.7 ± 4.8 mg/dL) ($p = 0.005$). There was no difference in the time to reach peak glucose values between Equi-Jewel (90 ± 17.32 minutes) and oats (110 ± 10.0 minutes) ($p > 0.05$). Equi-Jewel had a mean glycemic index of 53.1 ± 9.5, compared to crimped oats.

Conclusions

The glycemic index of Equi-Jewel at 53 is similar to the previously reported value of 47 by Kentucky Equine Research. The higher glycemic index obtained in this study may be due to differences in the starch content of Equi-Jewel, quantity of test meal fed, or rate of intake. The horses tended to consume Equi-Jewel faster than oats, which could result in elevated blood glucose, depending on its glucose content. The faster intake of Equi-Jewel may have been because the horses were not accustomed to being fed straight oats. In agreement with previous studies, feeding Equi-Jewel can increase the energy density of the diet while minimizing post-feeding fluctuations in blood glucose concentration.

Feeding Equi-Jewel® to Performance Horses

Fit Thoroughbred geldings were used in a switchback, repeated design study to evaluate Equi-Jewel, a stabilized rice bran (SRB) product, as an alternative energy source to traditional sweet feed for performance horses.

Materials and Methods

Eight horses were divided into two groups based on age (four 2-year-olds and four 5-year-olds). Each experimental period was 28 days. Hay and grain were offered every 12 hours, and horses were exercised 6 days per week on either a high-speed treadmill or a mechanical walker on alternating days. Equi-Jewel was added to the diet at a level of 0.2% BW to replace 0.25% BW of sweet feed to maintain isocaloric diets. At the end of each period, a standardized exercise test (SET) on an inclined (3^o) high-speed treadmill was conducted. The SET was performed at 1.7 m/s for 5 min, 4 m/s for 2 min, and 8 m/s, 9 m/s, 10 m/s, 11 m/s, and 12 m/s for 1 min per step. The horses were not allowed access to water, hay or feed for 4 h before the SET. All horses received furosemide (0.5 mg/kg, i.v.) 4 h before the SET. Venous blood samples were taken at -4 h, -3 h, and immediately before the SET. At the end of every step and 5 min post exercise, blood was analyzed for lactate and glucose. Heart rate (HR), VO2 (l/min), and VCO2 (l/min) were measured during the last 30 s of each step.

Results

There was no statistical difference in HR due to diet in both the 2-year-old and 5-year-old horses ($p > 0.05$). HR at the highest speed of the SET for the 2-year-old horses was 195 ± 2 bpm for control and 195 ± 3 bpm for SRB. HR at the highest speed of the SET for the 5-year-old horses was 200 ± 2 for control and 200 ± 1 for Equi-Jewel diet. There was no difference in lactate accumulation during the SET due to diet ($p > 0.05$). Blood lactate concentration post SET for the 2-year-old horses was 9.2 ± 0.6 mmol/L on the control diet and 8.5 ± 0.9 mmol/L on the Equi-Jewel diet. Lactate concentration post SET for the 5-year-old horses was 8.4 ± 0.9 mmol/L on the control and 8.1 ± 1.1 mmol/L on the Equi-Jewel diet.

Conclusions

The results of this study suggest that Equi-Jewel is a suitable alternative to traditional sweet feed for exercising horses. Substitution of Equi-Jewel for some dietary energy supplied by sweet feed did not affect the indicators of fitness studied, HR and blood lactate concentration. Throughout the exercise test HR and lactate concentrations were similar for both treatment diets.

An Evaluation of the Anabolic Effects of Equi-Jewel® on Horses

Fit Thoroughbred geldings were used in a switchback, repeated design study to evaluate the anabolic effects of Equi-Jewel, a stabilized rice bran (SRB) product, compared to traditional sweet feed.

Materials and Methods

Eight horses were divided into two groups based on age (four 2-year-olds and four 5-year-olds). Each experimental period was 28 days. Hay and grain were offered every 12 hours, and horses were exercised 6 days per week on either a high-speed treadmill or a mechanical walker on alternating days. Equi-Jewel was added to the diet at a level of 0.2% BW to replace 0.25% BW of traditional sweet feed to maintain isocaloric diets. Body composition was evaluated by measuring rump fat thickness (RFT, in centimeters) using ultrasonography, after at least three weeks on each treatment diet. Additional measurements of body weight, heart-girth circumference, gaskin circumference, and body condition score (BCS) were made at the same time as RFT.

Results

There was no significant difference in RFT and BCS due to diet for both the 2-year-old and 5-year-old horses. When all the data was compared (n = 16), there was a trend for RFT to decrease on the control diet ($p = 0.07$), though there was no effect on BCS ($p = 0.84$). Changes in fat mass (kg) calculated using the equation reported by Fonseca et al. (2013) showed a trend ($p = 0.08$) in decreasing fat mass on the control diet when all horses were compared. Mean change in fat mass was -1.97 ± 0.84 kg on the control diet and 0.09 ± 0.66 kg on the Equi-Jewel diet. No difference in fat mass or heart-girth circumference due to diet was observed between age groups.

Conclusions

The results of this study suggest there was no evidence of anabolic effect due to the inclusion of Equi-Jewel in the diet. From this study it appears Equi-Jewel provided sufficient DE for the exercise demands of the horses, resulting in little change in body measurements and maintenance of body weight. The caloric density of 0.2% BW of Equi-Jewel may actually be greater than 0.25% BW sweet feed, because fat mass did not change on the Equi-Jewel diet but decreased on the control diet.

Feeding Equi-Jewel® Does Not Significantly Affect Serum or Urine Concentrations of Anabolic Steroids

Some regulatory organizations have cautioned against feeding stabilized rice bran (SRB) and related products to horses because of purported anabolic effects. A number of equine supplements containing rice bran, rice oil, or gamma oryzanol are marketed to improve muscle mass. Gamma oryzanol has been suggested to increase testosterone and growth hormone production and thus produce an anabolic effect. However, studies have shown mixed results and even demonstrated a negative effect of gamma oryzanol supplementation on both testosterone and growth hormone synthesis. In exercising human males, gamma oryzanol supplementation did not affect exercise performance or the blood concentration of testosterone, growth hormone, and several other hormones.

Materials and Methods

Ten exercised Thoroughbred horses (7 geldings and 3 fillies; mean ± SD age 3.2 ± 1.5 yr) were fed 1 kg of Equi-Jewel daily for at least 4 consecutive days at different times over a 4-m period. The horses were maintained on a basal diet of ad libitum grass pasture and grass hay supplemented with 4 kg of a textured sweet feed that was fed individually.

A total of 12 paired serum and urine samples were collected over the course of the study. Two horses (1 gelding and 1 filly) were tested on two separate occasions. Serum and urine samples were submitted to an accredited laboratory that performs regulatory testing in racehorses from several jurisdictions in North America (HFL Sport Science, Lexington, KY). Blood and urine were subjected to a comprehensive battery of tests designed to detect a large number of substances including anabolic/androgenic steroids and their metabolites.

Blood samples were screened specifically for testosterone, nandrolone, boldenone and stanozolol using methods with lower limits of detection of approximately 10 picograms per milliliter or less. Urine samples were screened against a mass spectral library that contains entries for more than 1,500 different substances, including a number of anabolic and androgenic steroids.

Results

None of the serum and urine samples was positive for a concentration above a regulatory threshold for anabolic or androgenic steroids or their metabolites.

Conclusions

Feeding Equi-Jewel at normal intakes for exercising horses did not significantly increase serum or urine concentrations of testosterone or parenteral anabolic steroids, such as stanozolol or boldenone, and their metabolites.

These results are in agreement with other studies performed in exercising humans. The results of this study indicate that feeding Equi-Jewel does not influence serum or urine concentrations of

testosterone, other anabolic steroids, or their metabolites which have been postulated to produce its anecdotal anabolic effect. It is unlikely that inclusion of Equi-Jewel in equine diets will increase systemic concentrations of anabolic steroids or act as an anabolic agent.