

Metabolic and Morphologic Effects of Psyllium Supplementation in Horses Grazing Rapidly Growing Cool Season Grass

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Introduction

Digestion of non-structural carbohydrates (NSC) from cool season pasture grasses can result in increased adiposity, risk of insulin resistance, and laminitis in horses¹. Lowering blood glucose concentrations and increasing insulin sensitivity will reduce the risk of laminitis and associated diseases². Supplementing horses with psyllium reduced blood glucose and insulin concentrations in horses that were meal-fed³. The objective of this study was to evaluate the effects of psyllium supplementation in horses grazing rapidly growing cool season grass.

Materials and Methods

- Eleven light-breed stock horses (7 mares and 4 geldings; ages 13.5 ± 2.5 yr [mean \pm SD]) were individually confined in dry lots overnight and strip grazed for 8 h daily for 30 d.
- Psyllium-supplemented horses ($n = 6$) received 180 g daily. All horses received an isocaloric protein supplement.
- Metabolic characteristics were evaluated by assay of glucose, insulin, leptin* and adiponectin* concentrations in blood samples collected on d 0, 8, 15, 22, and 29 at 0700, 0800, 0900, 1100, 1300, and 1500 h.
- Morphologic characteristics were assessed by measuring BW, BCS, mean neck circumference, and tail head fat mass on d 0 and 29.
- Data was analyzed using a repeated measures model with a compound symmetric correlation structure in R.
- Significance was accepted as $P < 0.05$.
- Data are presented as mean \pm SD.

*Only measured at 1500 h

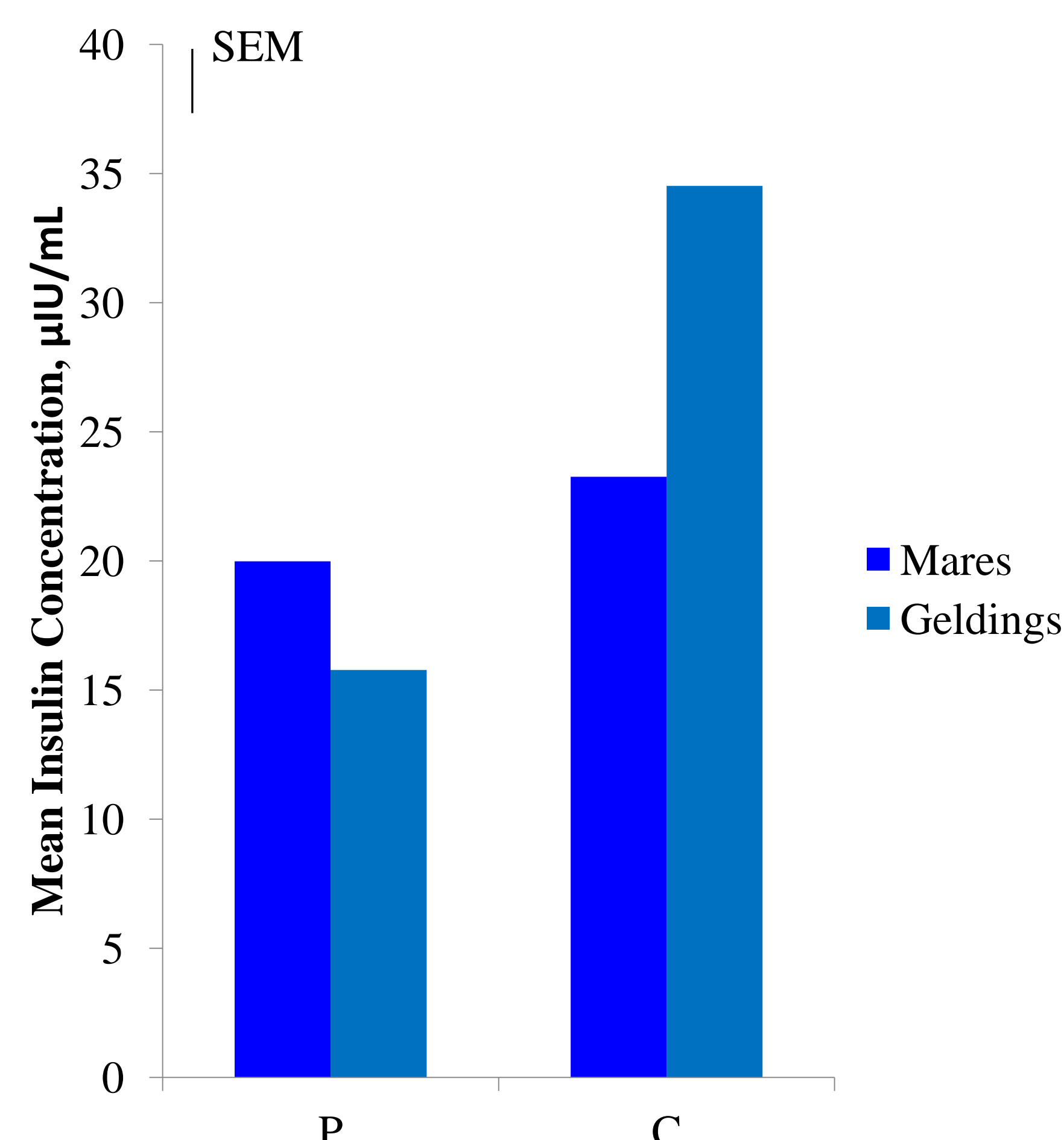
Average Glucose Concentration, Time to Peak Glucose, and Glucose AUC of Psyllium Supplemented ($n = 6$) and Control ($n = 5$) Horses Over 29 Day Period of Grazing Cool Season Pasture (Mean \pm SD)

	Average Glucose, mg/dL	Time to peak glucose, h	Glucose AUC, (mg/dL), h
Psyllium	115.08 ± 9.82	3.3 ± 2.37	946.90 ± 169.42
Control	126.64 ± 12.08	2.4 ± 2.48	1003.57 ± 131.58

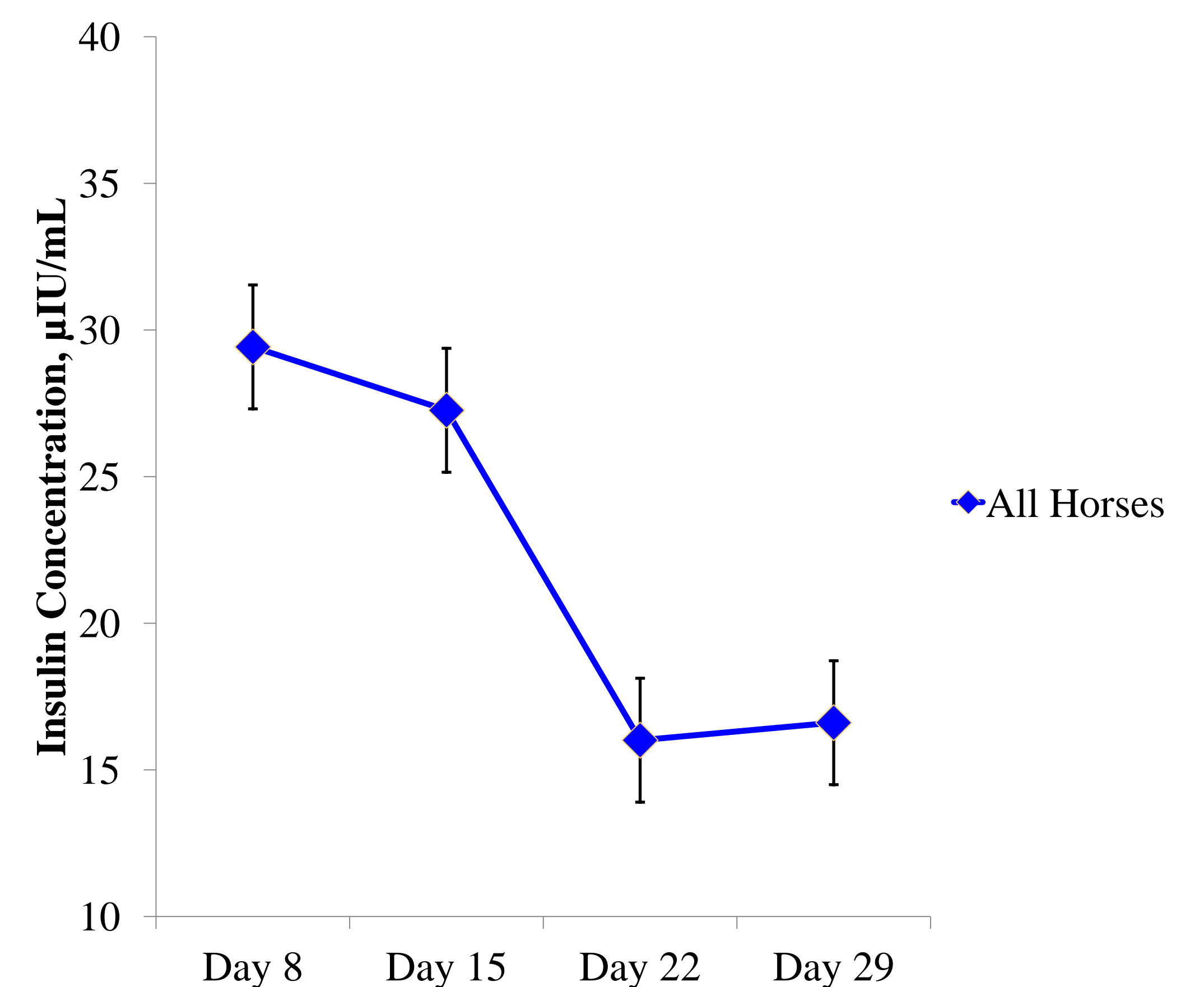
Results and Discussion

- On day 29, CP of forage samples was decreased ($P = 0.05$). Ash and ADF were higher ($P < 0.05$) on day 29. These changes are consistent with cool season grass growth cycle.
- NSC Intake was lower ($P < 0.05$) for treatment horses on day 29.
- **Peak insulin levels increased as NSC intake increased ($P < 0.05$)**
- **Mean glucose and glucose AUC concentrations were lower ($P < 0.05$) for psyllium supplemented horses.**
- **Time to peak glucose was longer for psyllium supplemented horses ($P < 0.05$).**
- **Average glucose, peak glucose, glucose AUC, average insulin, peak insulin, and insulin AUC decreased ($P < 0.05$) in all horses over the 29 day grazing period.**
- Older horses, regardless of supplement, had a shorter ($P < 0.05$) time to peak glucose and time to peak insulin and had a higher ($P < 0.05$) peak insulin concentration.
- Leptin concentrations were lower in ($P < 0.05$) mares than geldings.
- Adiponectin concentrations decreased ($P < 0.05$) with increased NSC intake in all horses.
- There was ($P < 0.05$) a sex by psyllium interaction for average insulin and peak insulin concentrations, and insulin AUC. Non-supplemented mares had lower concentrations and AUC than non-supplemented geldings, while psyllium-supplemented geldings had lower concentrations and AUC than psyllium-supplemented mares.
- There were no ($P > 0.05$) differences between treatment for morphologic characteristics in horses of this study.

Treatment by Sex Interaction for Mean Insulin Concentrations in Psyllium Supplemented (trt) Mares ($n = 4$), Psyllium Supplemented (trt) Geldings ($n = 2$), Control Mares ($n = 3$) and Control Geldings ($n = 2$). ($P < 0.05$).



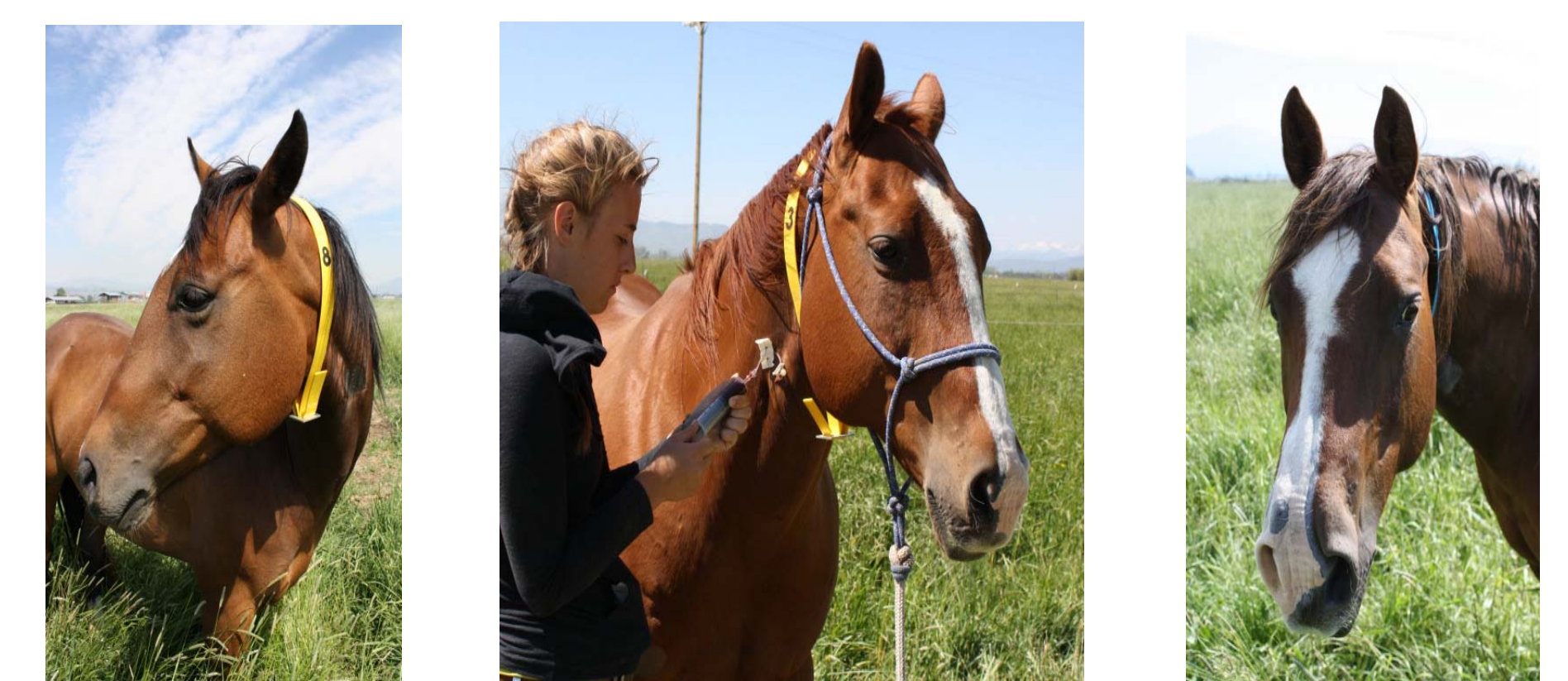
Average Insulin Concentration of All Horses ($n = 11$) on Days 8, 15, 22 and 29 ($P < 0.0001$). SEM = 2.11.



Summary and Conclusions

The results of this study indicate that supplementing horses grazing cool season grasses with psyllium lowered systemic glucose and insulin concentrations. These effects may reduce the risk of metabolic diseases, such as laminitis, insulin resistance, and Equine Metabolic Syndrome. However, systemic glucose and insulin concentrations were affected to a greater extent in males than females.

Decreased glucose and insulin concentrations, with no significant difference in morphologic characteristics, suggests that psyllium supplementation will decrease the risk of developing insulin resistance and laminitis in horses grazing cool season grass without compromising their ability to maintain body condition. The effects of psyllium supplementation for a period longer than 30 days needs to be explored.



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References

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