



Comparison of growth and relationship with genomic body size for dairy heifers managed in confinement or on pasture

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BACKGROUND

Genomic estimates of performance of dairy cattle are becoming more common on farm as well as the use of management intensive grazing (MIG) for feeding dairy heifers in Wisconsin. Genomic data is primarily based on data from confinement raised dairy cattle. The relationship of genomic body size (stature and weight) predictors in dairy cattle with growth of dairy heifers raised in confinement or on pasture has not been previously evaluated.

OBJECTIVES

Our objective was to evaluate the relationship of genomic body size estimates with heifer growth for heifers managed in confinement or on pasture.

MATERIALS & METHODS

- 32 heifers were managed in a confinement pen-based bedded pack barn (16 heifers) or in a management intensive grazing system on pasture (16 heifers) during each year. Two years of study were conducted with new heifers used in each year for a total of 32 heifers on each system.
- Heifers were blocked by weight (light or heavy) and randomly assigned to a management setting
- The pasture contained a mixture of red clover, white clover, meadow fescue, festulium, and ryegrass
- Heifers on pasture were moved twice a week to a new paddock
- Forage height measurements were taken with a rising plate meter on the pre and post grazed paddocks. Three calibration locations were taken weekly on each paddock. Forage quality was determined from the calibration clips
- Heifers on pasture were provided a mineral/vitamin mix daily
- Heifers in confinement were limit-fed a total mixed ration to obtain growth rates of 0.8 to 1 kg/d
- Body measurements were taken at the start and end of each year
- Genomic estimates of body size were obtained from a herd database with tissue samples previously submitted as a pre-weaned calf
- Regressions of genomic predictions of size (stature or body size composite) with final heifer height and weight were performed (SAS v9.4)

RESULTS

Table 1: Confinement ration data

	Diet composition (%DM)			DMI (kg/day)		
	Average	2017	2018	2017	2018	
NDF%	47.4	46.0	49.2	June	13.5	13.7
NDFD%	79.2	79.1	79.3	July	15.6	13.5
IVDMD%	58.8	58.8	58.9	Aug	15.6	14.9
Ash%	9.53	9.14	10.0	Sept	15.7	16.2
				Oct	16.2	-

Table 2: Pasture data

	Mean	2017	2018
Forage Availability (kg/ha)	2360	1991	2736
NDF%	47.4	47.6	45.3
NDFD%	61.2	59.0	64.3
IVDMD%	80.8	79.5	82.7
Ash%	9.87	9.98	9.72

Table 2: Heifer growth data

	Barn			Pasture			P-values	
	Mean	2017	2018	Mean	2017	2018	Trt	Trt x year
ADG (kg/d)	0.76	0.88	0.64	0.93	0.96	0.91	0.017	0.009
Hip height change (cm)	12.62	16.10	9.13	13.36	17.54	9.17	0.418	0.192
BCS change (units)	0.23	0.31	0.16	0.43	0.44	0.42	0.341	.5004



Picture 1: Heifers grazing on pasture

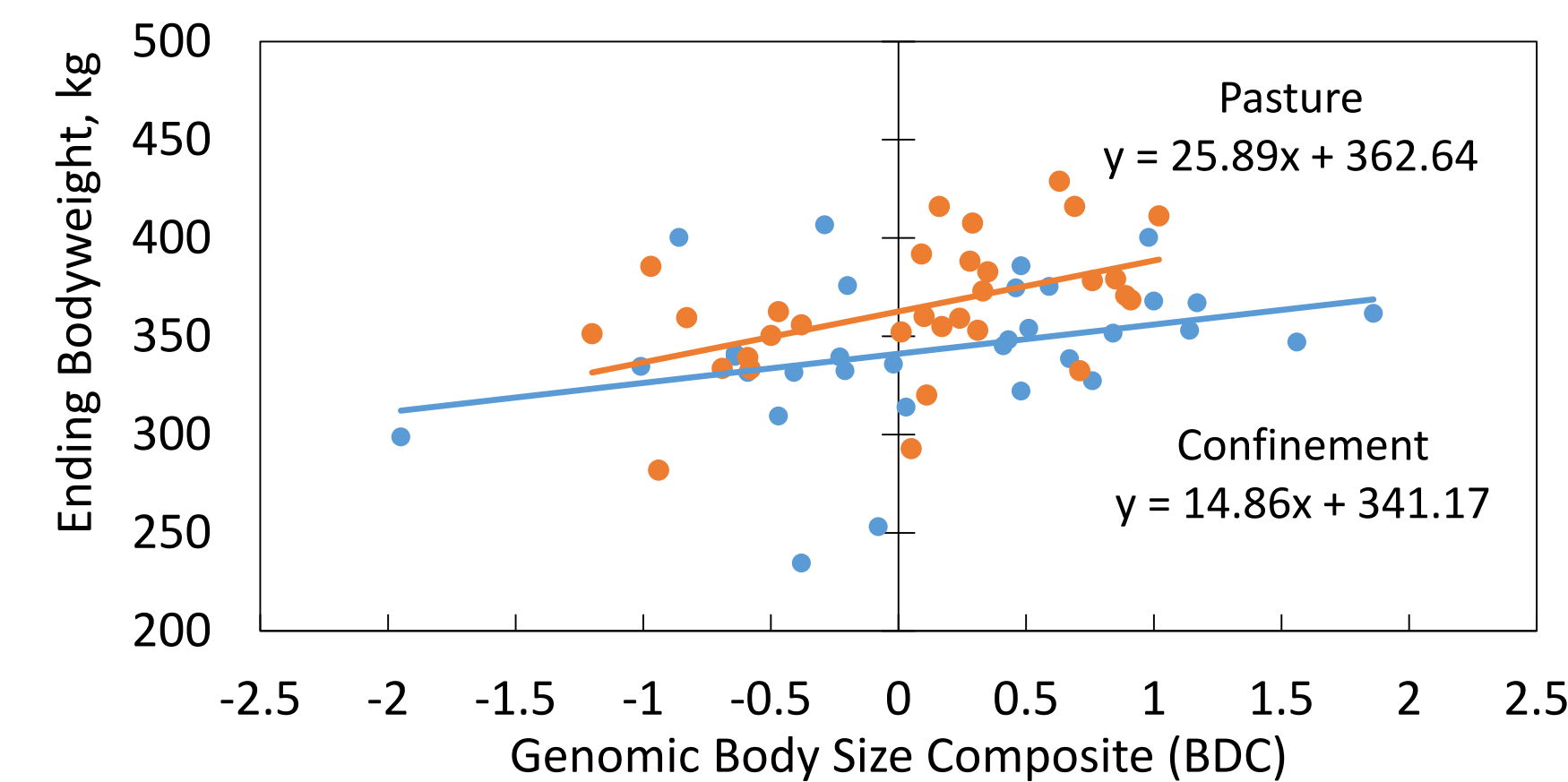


Figure 1. Relationship of end weight to genomic predicted body size composite for pasture ($R^2 = 0.1065$) and confinement ($R^2 = 0.1981$) raised heifers.

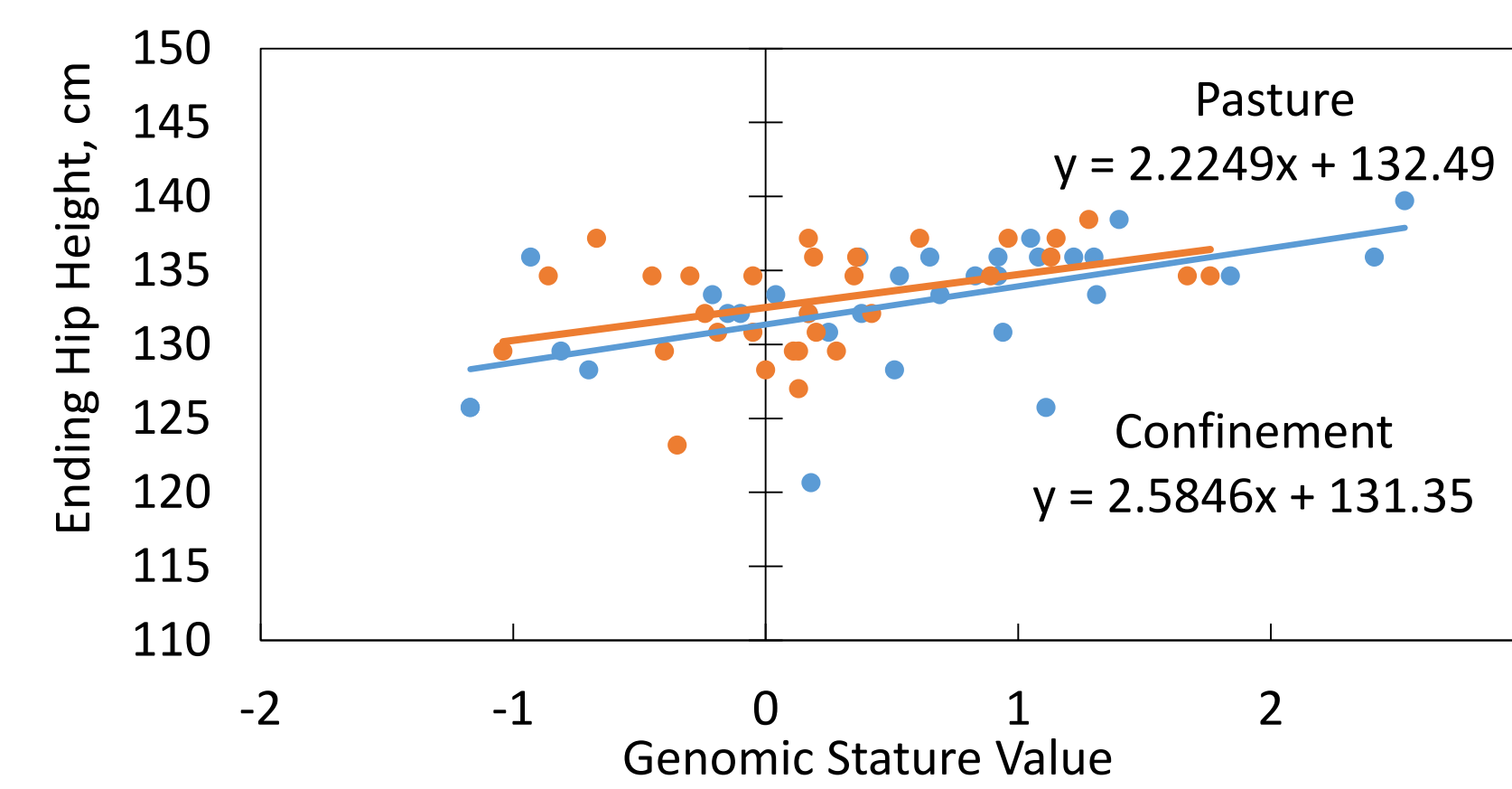


Figure 2. Relationship of ending hip height to genomic predicted stature for pasture ($R^2 = 0.3221$) and confinement ($R^2 = 0.1773$) raised heifers

SUMMARY

- Heifers grazing on pasture had greater growth than those in confinement during both years (0.93 vs. 0.76 kg/d; $P = 0.02$)
- A treatment x year interaction occurred with a lower daily gain for confinement raised heifers in 2018 due to nutritional management of the limit feeding program.
- Hip height gains and body condition change during the season were similar ($P > 0.34$). Pasture heifers had a hip height change of 13.4 cm and a BCS change of 0.41 units with confinement heifers having a hip height change of 12.7 cm and a BCS change of 0.23 units.
- Relationship of the ending body weight with genomic predicted body size composite were positive for both pasture and confinement raised heifers. Body weight relationship with body size composite may have been affected by lower gains for the confinement heifers in 2018.
- Relationship of the ending hip height with genomic predicted stature was positive and had very similar slope and intercepts for heifers raised on pasture or in confinement.

CONCLUSIONS

- Heifers raised in a managed intensive grazing had similar or improved daily gains compared to heifers raised confinement
- Relationship of genomic predicted size traits were similar for the pasture and confinement raised heifers, thus genomic predicted traits for size could be applied in both management systems.

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REFERENCES

- Weigel, K., Kriegel, T., & Pohlman, A. (1999). Genetic Analysis of Dairy Cattle Production Traits in a Management Intensive Rotational Grazing Environment. *Journal of Dairy Science*, 82(1), 191-195. doi:10.3168/jds.s0022-0302(99)75223-9
- Kearney, J., Schutz, M., Boettcher, P., & Weigel, K. (2004). Genotype x Environment Interaction for Grazing Versus Confinement. I. Production Traits. *Journal of Dairy Science*, 87(2), 501-509. doi:10.3168/jds.s0022-0302(04)73189-6