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FORAGE PASSAGE KINETICS OF BRAHMAN, ANGUS, ANGUS X BRAHMAN, AND TULI X BRAHMAN HEIFERS AT TWO ENVIRONMENTS

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Background. Commercially successful cattle breeds in the southern U.S. must be physiologically and behaviorally adapted to the stresses imposed by high ambient temperatures, high humidity, low feed quality and quantity, and the challenges of external and internal parasites. Semen from Tuli cattle was imported into Texas from Australia in 1991, so that this Sanga, African breed could be evaluated with *Bos taurus* and *Bos indicus* cattle. Heifers resulting from an A.I. breeding program using Brahman and Angus females were used in experiments to compare forage passage kinetics on bermudagrass pasture in East Texas (Overton) and kleingrass range in Southwest Texas (Uvalde). Fecal samples were collected directly from pasture at both Overton and Uvalde, dried, ground, and Ytterbium (Yb) determined via atomic absorption spectrophotometry. Estimates of passage kinetics were calculated using a 2-compartment, gamma 2 residence time model.

Research Findings. On East Texas bermudagrass pastures, the following breed types were used to compare digesta passage kinetics using Yb in a pulse-dosed marker technique: Brahman (BRM), Angus (ANG), Angus x Brahman (AxB), and Tuli x Brahman (TxB). Compartmental mass of the two compartments and the systems, as well as fecal output, did not differ between the breeds. However, there were differences between breeds (Table 1) in passage of feedstuffs in the RUMEN ($P < .004$), through the whole tract (GSTRO, $P < .04$), and time delay to first appearance of marker (TIME, $P < .004$). In ingestive behavior, the TxB cattle more closely resembled the heat-adapted BRM heifers, but in passage kinetics the TxB heifers were similar to ANG and BxA. Although differences in intake were not statistically different, ANG had the lowest numerical value. The ANG also had the slowest rate of passage (GSTRO). The observed reduction in grazing time reported in the companion paper would suggest a lower intake for ANG.

On the kleingrass semi-arid range at Uvalde, Brahman x Angus (BxA), BRM, and TxB heifers were used to evaluate forage digesta kinetics. The ANG cattle regurgitated the Yb boluses and could not be used for comparisons. There was a significant difference between breeds (Table 2) in the compartmental mass of the faster turnover compartment (CMPMS1, $P < .05$), the compartmental mass of the system ($P < .02$), and fecal output ($P < .05$), while there was no

difference ($P > .05$) between breeds in the compartmental mass of the slower turnover compartment, the compartmental residence time of the system, gastrointestinal residence time, or in the time delay to first appearance of the marker.

Application. Tuli crossbred heifers appeared to be well-adapted to both semi-arid and humid environmental conditions as well as possessing the ability to pass forage rapidly through their gastrointestinal system. As a result of passage rate, intake of forage increases. These foraging attributes are primarily responsible for performance levels attained by tropical genotypes in warm environments.

Table 1. Estimates of passage kinetics parameters in Angus (ANG), Angus x Brahman (AxB), Brahman (BRM), and Tuli x Brahman (TxB) heifers grazing bermudagrass at Overton.

ITEM ¹	Breed of Heifer			
	ANG	A x B	BRM	T x B
Number	8	7	8	8
CMPMS1	2.6	2.7	2.5	2.1
CMPMS2	9.8	9.8	9.0	10.4
CMPSYS	12.3	12.5	11.5	12.6
RUMEN	.110 ^a	.084 ^b	.105 ^{a,c}	.095 ^{b,c}
GSTRO	.063 ^a	.052 ^b	.056 ^b	.055 ^b
FECAL	8.1	9.1	8.7	9.2
TIME	.038 ^a	.031 ^{b,c}	.030 ^c	.036 ^{a,b}
INTAKE, DM lb/BW/day	30.1 + 1.8	31.7 + 1.9	33.2 + 1.8	34.3 + 1.8

Table 2. Estimates of passage kinetics parameters in Brahman x Angus (BxA), Brahman (BRM), and Tuli x Brahman (TxB) heifers grazing kleingrass at Uvalde.

ITEM ¹	Breed of Heifer		
	B x A	BRM	T x A
Number	8	8	8
CMPMS1	4.9 ± 1.25 ^{a,b}	2.8 ± .89 ^b	6.5 ± .95 ^a
CMPMS2	13.5 ± 1.88	14.8 ± 1.33	14.5 ± 1.42
CMPSYS	18.4 ± 1.054 ¹	17.6 ± .745 ^a	21.02 ± .799 ^b
RUMEN	.108 ± .0113	.119 ± .0080	.137 ± .0086
GSTRO	.074 ± .0123	.065 ± .0087	.093 ± .0093
FECAL	14.9 ± .91 ^a	12.2 ± .64 ^b	14.2 ± .69 ^a
TIME	.039 + .0027	.043 + .0019	0.41 + .0020

^{a,b,c}Within rows, means with differing superscripts differ ($P < .05$).

¹CMPMS1 (age-dependent compartmental mass); CMPMS2 (age-independent compartmental mass); CMPSYS (compartmental mass of the system); RUMEN (passage of feedstuffs in the rumen); GSTRO (passage of feedstuffs through the gastrointestinal tract); FECAL (fecal output); TIME (initial time delay to first appearance of marker).