

Differences in hair coat shedding, and effects on calf weaning weight and BCS among Angus dams

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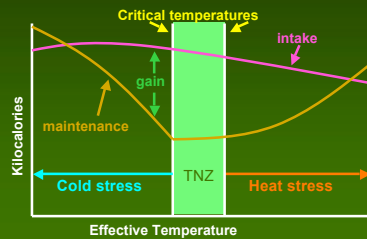


Introduction

- Heat dissipation in cattle
 - Evaporative cooling
 - Many factors (Blackshaw and Blackshaw, 1994)
 - Environmental
 - Humidity, temperature, wind speed
 - Physiological
 - Respiration rate, sweat gland activity
- Hair coat
 - Length
 - Density

Thermoneutral Zone (TNZ)

Range in effective temperature where rate and efficiency of performance is maximized



Source: Taylor. 1994. Beef Production and Management Decisions. 2nd ed.

Heat Stress

- When temperature and humidity exceed animal's thermal neutral zone
 - Evaporative cooling decreases
 - Water from sweat or sweat vapor trapped between hair follicles, expend more energy for thermoregulation (Finch, 1985)
 - Decrease performance
 - Reproduction
 - Milk production
 - Decreased appetite

Temperature-humidity Index

THI impacts conception rates

Temp., °F	Relative Humidity, %															
	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	
100	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	
98	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	
96	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	
94	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	
92	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	
90	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	
88	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	
86	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	
84	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	
82	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	
80	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
78	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	
76	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	
	Normal <74				Alert 75 to 78				Danger 79 to 83				Emergency >84			

Source: Ingraham et al. 1974. J. Dairy Sci. 57:476.

Heat Stress

- Southeast region of the U.S.
 - Subtropical environment
 - Critical threshold (72 to 75°F)
 - Many breeds or breed types
 - Dark color
 - Long hair coats
- Shedding ability?
 - Perception of cows that do not shed
 - Grazing shorter – shade or ponds
 - Late shedding = inferior dams with poor performing calves





Objectives

- Develop a method to assess hair coat shedding in purebred Angus cattle
- Determine how much variation exists for hair shedding
- Estimate effects on adjusted 205 day weight and body condition scores

Materials and Methods

- Data collected 2007, 2008, and 2009
- 532 purebred Angus cows with calves
 - 2 to 13 yrs
 - Locations
 - North Carolina State - Upper Piedmont Research Station (UPRS)
 - Wild-type endophyte-infected tall fescue
 - Calving season (Nov – Dec)
 - Mississippi – Leveck Animal Research Center (MSU), Okolona, Winona
 - Warm-season mixed grasses, annual ryegrass, non-toxic endophyte-infected tall fescue
 - Calving season (Sep – Nov, Jan – March)

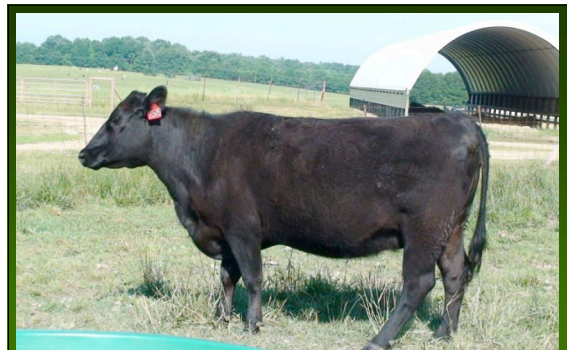
Materials and Methods

- Visual hair shedding scores
 - March to July (30-d intervals, 5 scores)
 - Two trained technicians

Hair Shedding Score	Definition
5	Full winter coat
4	Coat exhibits initial shedding
3	Coat is halfway shed
2	Coat is mostly shed
1	Slick, short summer coat



Hair Shedding Score = 5



Hair Shedding Score = 4



Hair Shedding Score = 3



Hair Shedding Score = 2



Hair Shedding Score = 1

Materials and Methods

- Cow Data

- Grouped into 5 categories based on month of shedding (month of first shedding = MFS)

- Considered shedding when scored a 3 or less
 - BCS at weaning

- Calf Data

- Calves weaned at approximately 6 months of age

- Adjusted weaning weight (d205wt) – considered to be a trait of the cow

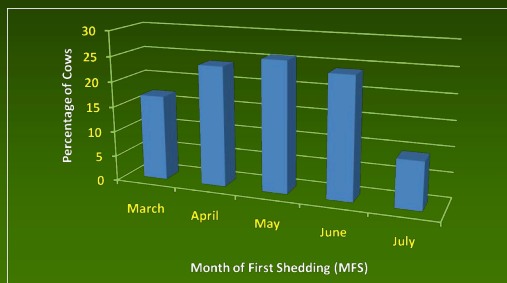
Materials and Methods

- **Statistical Analysis**
 - Phenotypic analysis (d205wt and BCS)
 - First model
 - Mixed model procedure (SAS) with year, location, sex, and MFS as fixed effects and the random effect of sire of calf
 - For BCS, age of calf (covariate) and age of cow (2 levels; heifer or cow) as a fixed effect were added to the model
 - Second model
 - Same as first model except Adapted Scores (AS) replaced MFS
 - AS criteria as follows
 - » Adapted with an MFS of March, April, or May
 - » Unadapted with an MFS of June or July

Materials and Methods

- **Statistical Analysis**
 - Genetic analysis (d205wt and AS)
 - Variance components estimated using THRGIBBS2F90 program
 - Fixed effects included year, sex of calf, and location
 - Random effects of cow and a permanent environmental effect were included
 - BCS was not significant and excluded from the analysis

Results



LS Means of adjusted weaning weights for MFS

MFS	d205wt (lbs)	Standard Error
March	597	6.4
April	589	8.8
May	587	7.1
June	578	7.3
July	551	8.8

LS Means differences of adjusted weaning weights for MFS

Contrast	Difference (lbs)	Standard Error	Pr > t
March – April	7.9	6.85	0.25
March – May	10.2	7.85	0.19
March – June	19.2	8.52	0.02
March – July	45.9	10.11	0.01
April – May	2.3	7.37	0.75
April – June	11.31	7.91	0.15
April – July	38.0	9.50	0.01
May – June	9.0	6.95	0.20
May – July	38.0	9.50	0.01
June – July	26.7	7.93	0.01

LS Means and differences of Adjusted weaning weights for AS scores

AS	d205wt (lbs)	Standard Error
Shed by May	589	5.6
Shed after May	565	6.8

Contrast	Difference (lbs)	Standard Error	Pr > t
Shed by May – Shed after May	24.1	6.16	.01

Heritabilities and Genetic Correlation

	d205wt	AS
d205wt	0.27	
AS	-0.50	0.35

*Heritability estimates on the diagonal and genetic correlation below diagonal

Conclusions

- Evidence that cows that shed later in the season wean lighter calves – more numbers needed
- Cows can be evaluated in late May on 1 to 5 scale
- Hair shedding is moderately heritable
- Animals with hair coat shedding scores of 4 or 5 could be considered for culling
 - In some areas these animals maybe kept

Other Explanations

- Does earlier shedding cause heavier weaning weights?
 - Prolactin concentrations
 - Associated with lactation
 - Influences hair regression regulation
 - Type of diet
 - Wild-type endophyte-infected tall fescue
 - Temperature
 - Rate of shedding

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Questions?