

Evaluation of Pearl Millet with and without Soybean Hull Supplementation for Forage-Finished Beef Production Systems

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KIOSK MENU

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Introduction

- Growing demand for forage-finished beef
- Requires year-round production of high-quality forages
- Warm-season annual forages offer alternatives to warm-season perennials
 - Greater nutritive value than perennials
- Pearl millet (*Pennisetum glaucum*)
 - Yield, stress tolerance, nutritive value
- Soybean hulls offer degradable fiber and may improve forage digestibility through ruminal conditioning
- Lack of data on animal performance, carcass characteristics, and meat quality of beef finished on pearl millet with and without soybean hull supplementation

Methods

- 64 Angus-crossbred steers (339 ± 40 kg) over 2 years (32 yr⁻¹)
- Treatments: 2 x 2 factorial
 - Pearl millet: 'Tifleaf 3' (PM) and 'Exceed' brown mid-rib (BMR)
 - Soybean hull supplementation: 0 and 0.75% (+S) of BW d⁻¹
- Finished for 90 and 84 d during summers of 2017 and 2018, respectively
- Shrunk weights at initiation and termination of the finishing period
 - Average daily gains
 - Steers were harvested under USDA inspection
- Carcass data was collected 24 h postmortem
- Striploins removed and wet aged for 21 d prior to fabrication
- Striploins were fabricated into 2.54-cm steaks and allocated:
 - Meats proximate
 - 0 through 7 days of simulated shelf life
 - Trained sensory panel
 - Warner-Bratzler shear force
- All data were analyzed using PROC GLIMMIX in SAS v. 9.4

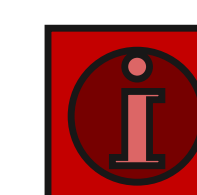
Objective

Evaluate pearl millet with and without soybean hull supplementation for forage-finished beef production systems in the southeastern U.S.



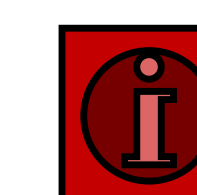
Results

Animal Performance and Carcass Characteristics:



- Supplementation increased ADG ($P > 0.01$)
- Supplementation in PM steers:
 - Increased HCW ($P > 0.01$)
 - More youthful, brighter lean ($P = 0.02$, $P = 0.03$)
- Marbling score ($P = 0.61$)
- Skeletal maturity ($P = 0.99$)
- Overall maturity ($P = 0.49$)
- 12th rib fat thickness ($P = 0.21$)
- Ribeye area ($P = 0.16$)
- Yield grade ($P = 70$)
- Subjective fat color ($P = 0.93$)
- Meats Proximate ($P > 0.05$)

Sensory Scores and Shelf-Life:



- Warner-Bratzler ($P = 0.94$)
- Sensory Scores:
 - Tenderness ($P > 0.05$)
 - Beef flavor ($P = 0.83$)
 - Off-flavor ($P = 0.54$)
 - Juiciness ($P = 0.36$)
- Thaw and cook losses ($P = 0.12$, $P = 0.11$)
- Lipid oxidation ($P > 0.05$)
 - BMR and BMR+S unaffected by day of display ($P = 0.07$, $P = 0.06$)
- L*, a*, b*, Delta E ($P > 0.05$)
- Hue, Chroma, redness ($P > 0.05$)

Conclusion

Results indicate pearl millet is a viable forage option for forage-finished beef systems and soybean hull supplementation improves animal performance over forage alone with minimal impacts on carcass characteristics, meat quality, and shelf life.

Acknowledgements

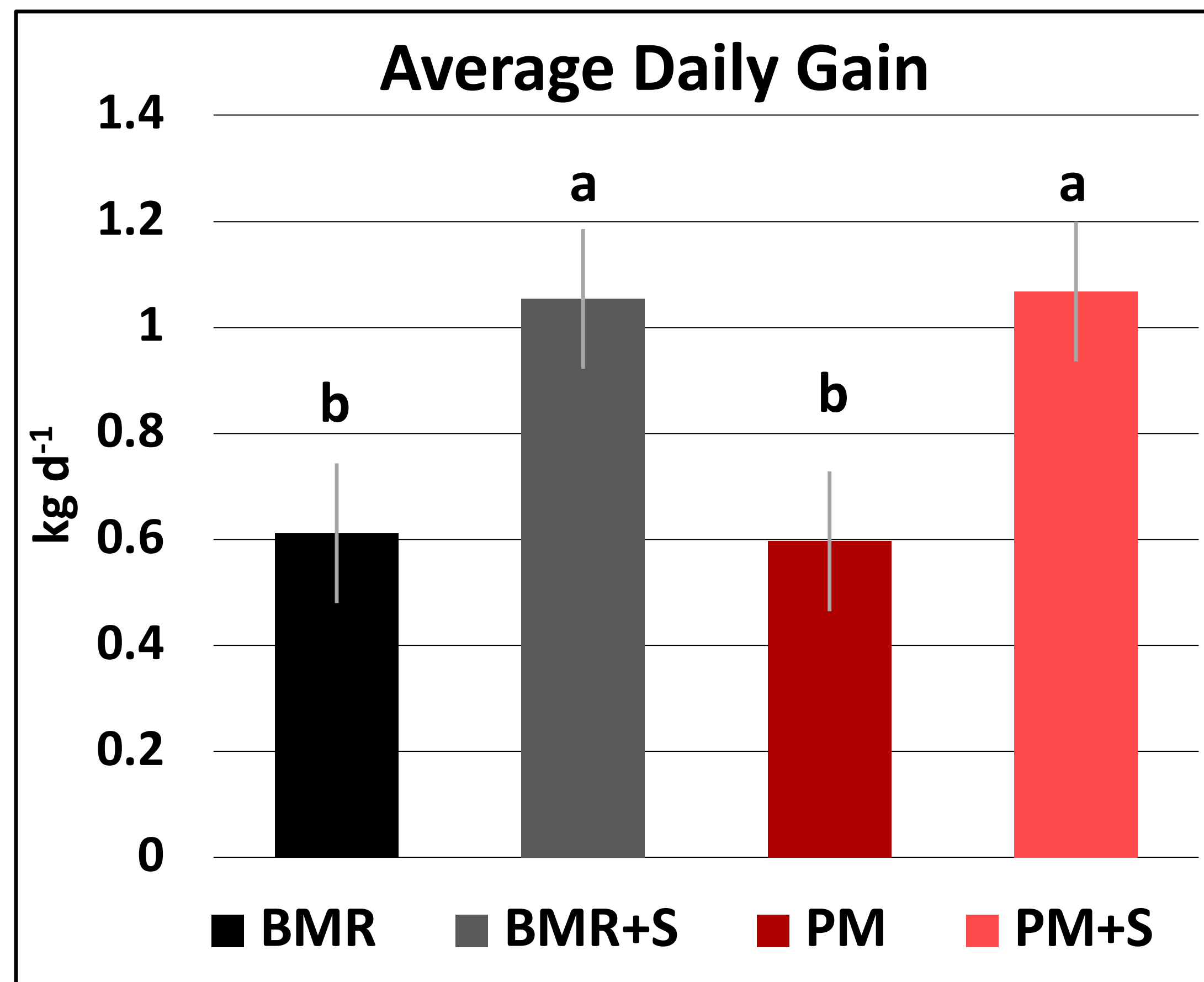
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- The experimental procedures were reviewed and approved by the University of Georgia Institutional Animal care and Use Committee (Protocol #A2017 03-002-R2)



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Carcass Characteristics						
Characteristic	Treatment				SEM	P-Value
	PM	PM+S	BMR	BMR+S		
LW, kg	484 ^a	521 ^b	494 ^{ab}	513 ^{ab}	8.02	> 0.01
HCW, kg	284 ^a	313 ^b	296 ^{ab}	309 ^{ab}	5.67	> 0.01
REA, cm ²	74.9	77.7	74.6	81.2	2.33	0.16
12 th rib FT, cm	0.63	0.79	0.61	0.70	0.08	0.21
Yield Grade	2.21	2.46	2.35	2.29	0.28	0.70
Marbling Score	SL ⁸⁴	SM ⁰²	SM ²⁰	SL ⁹⁷	19.64	0.61
Lean Maturity	B ^{08a}	A ^{83b}	B ^{02ab}	A ^{89ab}	25.16	0.02
Skeletal Maturity	A ⁶⁹	A ⁶⁷	A ⁶⁹	A ⁶⁹	31.41	0.99
Overall Maturity	A ⁸⁶	A ⁷³	A ⁸²	A ⁷⁶	27.96	0.49
Lean Firmness ¹	2.3	2.0	2.3	2.1	0.23	0.73
Lean Texture ²	1.5	1.4	1.5	1.7	0.26	0.68
Subj. Lean Color ³	5.0 ^a	4.0 ^b	4.5 ^{ab}	4.3 ^{ab}	0.39	0.03
Lean L*	37.89 ^a	40.22 ^b	39.29 ^{ab}	40.31 ^b	0.87	0.02
Lean a*	28.76	30.14	29.86	29.99	0.51	0.17
Lean b*	20.38	21.93	21.70	21.70	0.54	0.17
Subj. Fat Color ⁴	2.8	5.8	2.7	2.8	0.28	0.93
Fat L*	80.96	80.75	81.18	80.49	0.46	0.57
Fat a*	9.03	9.38	8.90	10.04	0.81	0.23
Fat b*	24.12	24.70	24.83	25.13	0.75	0.81

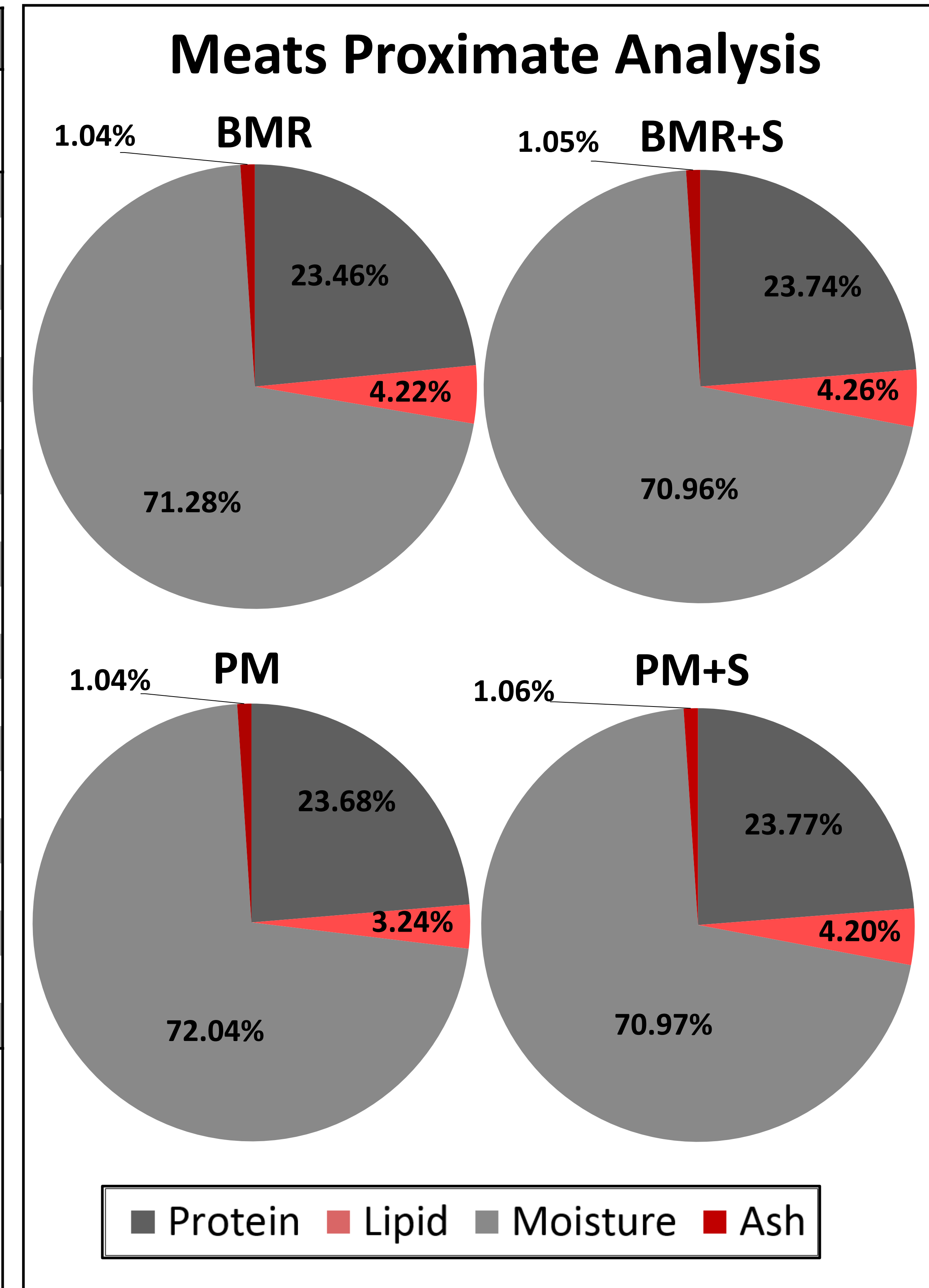
^{ab} Means within a row without a common superscript differ ($P < 0.05$).

¹ 1 = very firm; 2 = firm; 3 = slightly firm; 4 = slightly soft; 5 = soft.

² 1 = very fine; 2 = fine; 3 = slightly fine; 4 = slightly coarse; 5 = coarse.

³ 1 = light cherry red; 2 = bright cherry red; 3 = cherry red; 4 = slightly dark red; 5 = moderately dark red; 6 = dark red; 7 = very dark red; 8 = extremely dark red.

⁴ 1 = white; 2 = creamy white; 3 = slightly yellow; 4 = moderately yellow; 5 = yellow.



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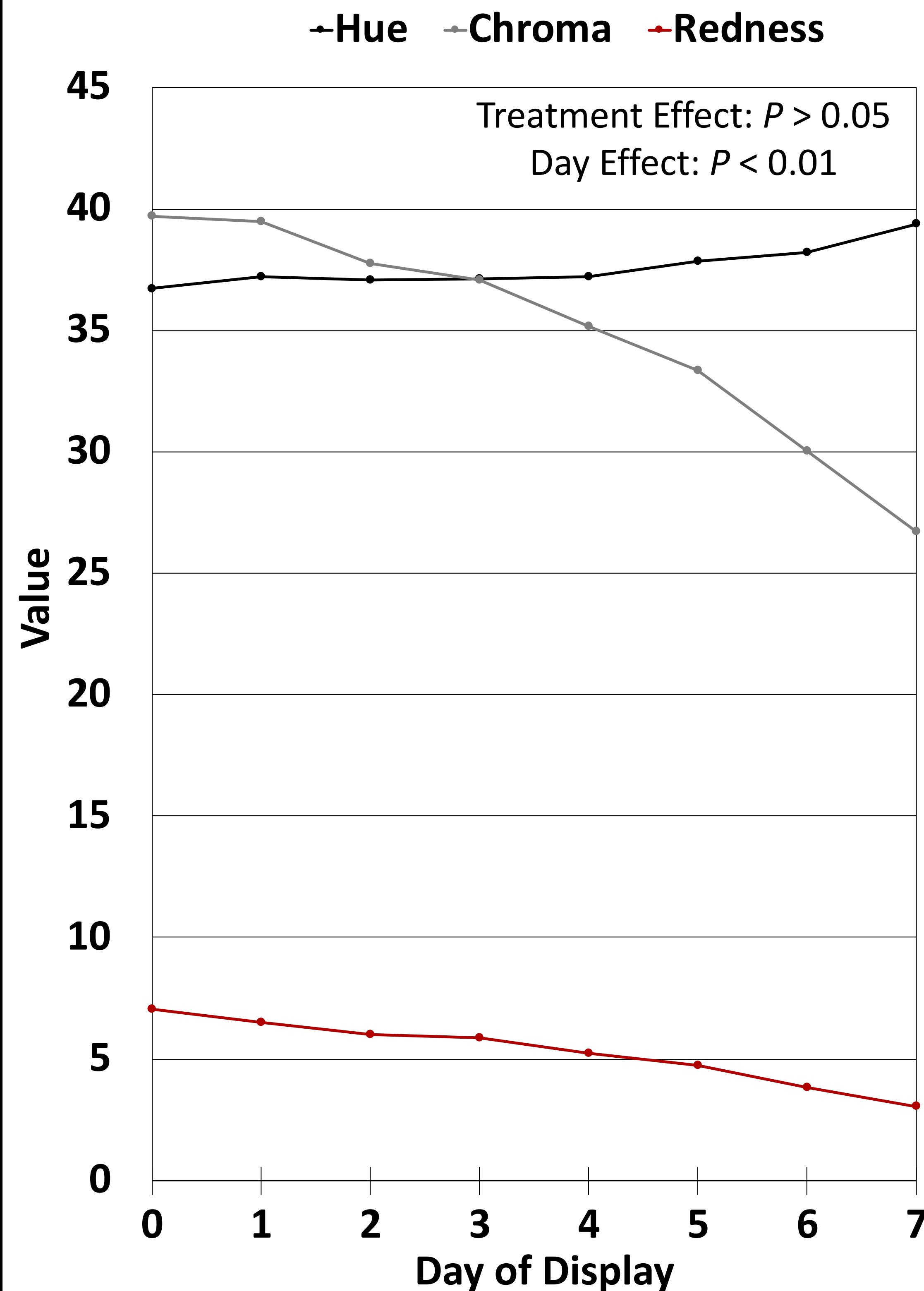
Sensory Scores and Warner-Bratzler Shear Force

Item	Treatment				SEM	P-Value
	PM	PM+S	BMR	BMR+S		
I. Tenderness	5.12	5.65	5.42	5.34	0.28	0.66
S. Tenderness	5.81	5.96	5.49	5.57	0.29	0.29
Beef Flavor	5.04	5.21	5.14	5.21	0.21	0.83
Juiciness	4.45	4.77	4.77	4.64	0.25	0.54
Off-Flavor	1.18	1.17	1.28	1.21	0.07	0.36
WBSF, kgf	3.28	3.25	3.14	3.27	0.45	0.94
Thaw Loss, %	1.01	0.34	0.79	0.61	0.21	0.12
Cook Loss, %	12.74	14.47	11.65	12.42	1.57	0.11

Lipid Oxidation by Day of Simulated Shelf-Life

Day	Treatment				SEM	P-Value
	PM	PM+S	BMR	BMR+S		
mg MDA kg ⁻¹						
0	0.14	0.14	0.13	0.14	0.01	0.93
1	0.20	0.18	0.16	0.19	0.03	0.41
2	0.19	0.24	0.19	0.24	0.03	0.19
3	0.15	0.20	0.22	0.20	0.04	0.12
4	0.18	0.19	0.20	0.21	0.02	0.69
5	0.17	0.22	0.19	0.19	0.05	0.41
6	0.22	0.23	0.23	0.22	0.03	0.99
7	0.26	0.20	0.20	0.20	0.04	0.13
SEM	0.04	0.03	0.03	0.03	-	-
Day Effect	0.01	0.01	0.07	0.06	-	-

Hue, Chroma, and Redness



Simulated Shelf-Life Objective Color

