UNIVERSITY OF GEORGIA
EXTENSION

Impact of Grazing and Heat Stress on Intake of Dairy Cows

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Allowing dairy cows the opportunity to graze pasture is a practice frequently used by dairy producers. Some producers use grazing as the primary source of forage while others use it as a supplement to a partial total mixed ration (pTMR). There are several challenges associated with grazing—especially during periods of heat stress—that producers should take into account to maintain intake and production, especially when grazing comprises a significant amount of the feed allotment. This bulletin will provide information on these challenges and changes that can be used to minimize the impact of heat stress.

The biggest challenge with grazing dairy cows is maintaining adequate dry-matter intake (DMI) to provide the energy they require for grazing plus what they need for milk synthesis. Pasture DMI is affected by forage availability, bite size, and grazing time. Most producers use an intensive rotational grazing system to maintain forage availability and quality. Researchers at Iowa State University reported that the bite size and grazing time vary with season (Table 1). Although grazing time and eating rate increase during the summer and fall, lower bite size resulted in lower DMI. Some of the difference relates to a difference in forages grazed and forage availability within each season, but it also reflects the negative effect of heat stress. This work was conducted in the Midwest, which has less chronic heat stress than is typically experienced in Georgia.

Table 1. The Effect of Season on Grazing and Pasture Intake.

	Spring	**Summer**	**Fall**
Grazing time, min/day	490	540	570
Eating rate, bites/min	59	65	65
Bite size, oz dry matter	.018	.011	.010
Intake, lb dry matter/day	32.0	24.6	22.9

From "Feeding dairy cows on quality pasture" (LT-106), by L. Tranel and D. Combs, 1999, Iowa State University Extension.

When grazing, the maintenance energy requirements of the cow increase because of the additional energy used for walking to and from the pasture, changes in elevation in the pasture, and the additional time spent grazing. The increase ranges from 5% to 10% depending primarily on the distance to the pasture and the pasture's elevation changes. The 2001 edition of Nutrient Requirements for Dairy Cattle did not include any adjustment for heat stress other than a reduction in DMI. However, since that time research has reported that the decrease in DMI only accounts for 40%–50% of the reduced milk yield observed because of heat stress (Rhoads et al., 2009).

Simulated Effects

To illustrate the effect of grazing and heat stress on potential milk yield, the NRC model was used to predict allowable milk for a 1,250 lb cow, 175 days in milk, and producing 60 lb of milk containing 3.5% fat and 2.9% true protein. The ration was balanced for cows grazing lush grass approximately 0.25 miles from the milking parlor and cows were fed a pTMR based on corn silage. The same TMR (without pasture) was modeled for cows housed in a total confinement system at the same intake.

Two other simulations were modeled using pasture and pTMR with a 10% reduction in DMI, which would be expected when grazing, or 10% lower DMI and a 7% increase in maintenance to model grazing under heat stress conditions. The results (Table 2) illustrate how the combination of reduced DMI and increased maintenance requirements associated with grazing and heat stress contribute to the reduction of available energy to sustain milk yield. Metabolizable protein (MP) intake would have supported higher milk yield, but the energy intake was not sufficient to utilize the higher MP intake. The model does not completely account for the additional energy that would be used to convert the excess protein consumed into urea, which would be excreted in urine.

Table 2. Intake, metabolism, and milk allowance data for cows under different feeding programs.

	TMR	Graze 1	Graze 2	Graze 3
DMI, lb/day				
Pasture	—	14.60	13.15	13.15
TMR	44.10	29.50	27.95	27.95
Total	44.10	44.10	41.15	41.15
NE_L, Mcal/day				
Maintenance	9.3	10.4	10.4	11.1
Lactation	18.7	18.7	18.7	18.7
Total	27.9	29.1	29.1	29.8
NE_L intake	29.1	29.1	26.2	26.2
NE_L Balance	+1.2	+0.1	-2.6	-3.6
MP, lb/day				
Maintenance	1.62	1.62	1.48	1.59
Lactation	2.60	2.60	2.60	2.60
Total	4.22	4.22	4.08	4.19
MP intake	4.31	4.31	3.83	3.84
MP Balance	+0.09	+0.09	-0.25	-0.35
Milk allowance, lb/day				
NE_L	63.7	60.2	50.8	48.6
MP	62.1	62.1	54.3	51.9

		TMR	Graze 1	Graze 2	Graze 3

Note. Data show intake (DMI), energy (NE_L), metabolizable protein (MP) balance, and milk allowance for cows fed either (a) total mixed ration (TMR), (b) grazed plus partial TMR (pTMR) and no change in DMI or heat stress (Graze 1), (c) grazed plus pTMR and 10% reduction in DMI because of heat stress (Graze 2), or (d) grazed plus pTMR with 10% reduction in DMI and 7% increase in maintenance requirements because of heat stress (Graze 3). The information was calculated using the NRC (2001) model for a 1250 lb Holstein cow, 175 days in milk, producing 60 lb milk containing 3.5% fat and 2.9% true protein. The TMR used corn silage as the sole forage and was balanced to meet the needs of the Graze 1 simulation.

Studies on the Effects of Different Feeding Systems

Researchers at Pennsylvania State University compared the production response of high-producing Holsteins provided one of three feeding systems: (a) pasture plus concentrate; (b) a combination of pasture plus a pTMR; or (c) a complete TMR. The pastures were a combination of smooth bromegrass, orchardgrass, and Kentucky bluegrass that would provide more energy than Georgia's warm-season grasses (bermudagrass, crabgrass, bahiagrass, etc.). The DMI of cows on the grazing system was 20% less than that observed for the TMR group in confinement (Table 3).

Table 3. Intake and Production of Holstein Cows Under Different Feeding Conditions.

	47.[a]	55.[b]	58.[c]	1.1
	1	1	9.9	
,	35.[a]	4[b]	43.[c]	1.5
	62.[a]	7[b]	84.[c]	2.6
3.5	59.[a]	68.[b]	8[c]	2.2
Fat	3.1	3.3	3.3	

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a b b

2.8 2.9 2.9

a ab b

14. 12. 1

c

b

a

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