Intake and Milk Production of Lactating Dairy Cows Grazing Diverse Forage Mixtures Over Two Grazing Seasons

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The XX International Grassland Congress took place in Ireland and the UK in June-July 2005. The main congress took place in Dublin from 26 June to 1 July and was followed by post congress satellite workshops in Aberystwyth, Belfast, Cork, Glasgow and Oxford. The meeting was hosted by the Irish Grassland Association and the British Grassland Society.

Proceedings Editor: D. A. McGilloway

Publisher: Wageningen Academic Publishers, The Netherlands

Intake and milk production of lactating dairy cows grazing diverse forage mixtures over two grazing seasons

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Keywords: pastures, forage mixtures, diversity, intake, milk production

Introduction Voluntary intake and stocking rate are key determinants of animal performance on pasture. Greater plant diversity in grassland plant communities has been linked to increased primary production, greater stability in response to disturbance, and reduced weed pressure. Thus, increasing plant diversity may be one approach to improving animal productivity. An experiment was conducted to determine the effects of forage diversity on intake and milk production of lactating dairy cows over two grazing seasons.

Materials and methods Four diverse forage mixtures were established in replicated 1-ha pastures at University Park, Pennsylvania, USA in the autumn of 2001: 1) orchardgrass (*Dactylis glomerata* L.)-white clover (*Trifolium repens* L.); 2) orchardgrass, white clover, chicory (*Cichorium intybus* L.); 3) orchardgrass, tall fescue (*Festuca arundinacea* Schreb.), perennial ryegrass (*Lolium perenne* L.), red clover (*Trifolium pratense* L.), birdsfoot trefoil (*Lotus corniculatus* L.), and chicory; and 4) six species plus white clover, alfalfa (*Medicago sativa* L.), and bluegrass (*Poa pratensis* L.). The experimental design was a randomized complete block with two pasture replicates. Pastures were subdivided and rotationally grazed with lactating Holstein cows during April to August in 2002 and 2003. Four 3-wk periods were conducted during each of two grazing seasons, so that by the end of each grazing season, all cows had been on all mixtures. Herbage allowance was 25 kg DM/cow per day. Cows were fed a 13% crude protein corn-based concentrate (1 kg/4 kg milk daily) in two equal feedings after milking. Cows were moved to a fresh paddock after each milking (2x/d). Herbage intake was estimated by the chromic oxide technique during each period. Daily milk yield and weekly milk composition samples were collected.

Results Pasture quality was within the range summarized by other regional studies (Table 1). A significant year effect was noted for most nutrients and yields with greater differences noted during 2002 (a drought year). Forage yield was affected by pasture mixture in 2002. Pasture DM intake was not affected by pasture mixture; however, there was a significant year effect (Table 2). Milk yield, milk fat, and milk protein were not affected by pasture mixture or year. Milk urea nitrogen was significantly affected by year.

Table 1 Nutrient composition of pasture diversity treatments

	Crude Protein		NDF		IVDMD[1]		Forage Yield	
	2002	2003	2002	2003	2002	2003	2002	2003
Mixture	% of DM		% of DM		% of DM		kg DM ha^{-1}	
2-species	21.8^{a}	23.2^{a}	36.6^{a}	40.8^{a}	66.6^{a}	66.7^{ac}	4800^{a}	9000
3-species	20.0^{b}	24.6^{ab}	31.6^{b}	31.8^{b}	70.4^{bc}	69.2^{a}	7400^{b}	9900
6-species	21.2^{ab}	24.1^{a}	29.3^{b}	35.4^{b}	67.1^{ac}	60.2^{b}	7900^{b}	11300
9-species	22.5^{a}	25.9^{b}	24.5^{c}	28.2^{b}	70.9^{b}	64.4^{c}	7400^{b}	9000
SEM	0.5	0.5	1.5	1.5	1.2	1.2		

[1]IVDMD=in vitro DM digestibility, ^{a,b,c}means in the same column with different superscripts differ ($P < 0.05$)

Table 2 Pasture intake, milk production, and milk composition

	Pasture Intake		Milk Yield		Milk Fat		Milk Protein		Milk Urea N	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
Mixture	kg DM/d		kg/d		kg/d		kg/d		mg/dl	
2-species	13.7	11.1	33.7	34.5	1.20	1.11	0.90	0.85	12.4	14.5
3-species	13.7	10.5	34.6	36.2	1.19	1.14	0.93	0.92	11.1	15.2
6-species	13.6	10.5	34.2	34.6	1.18	1.16	0.92	0.87	12.3	13.4
9-species	12.9	10.2	33.4	35.2	1.19	1.10	0.89	0.88	12.5	15.0
SEM	0.5	0.5	1.1	1.1	0.07	0.07	0.04	0.04	0.30	0.30

Conclusions Pasture mixture did not affect intake or productivity of dairy cows. Managing for a moderately complex mixture of forages on pasture may result in greater carrying capacity of the pastures due to increased forage productivity, particularly in drought years, while maintaining high levels of animal productivity.