FEEDING VALUE OF FORAGES FOR VENISON PRODUCTION

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Early studies (Ataja *et al*, 1992) showed that growth of young stags on conventional NZ pasture was greater when the surface height was maintained at 10cm than at 5cm, but even at 10cm only approx. 50% of young stags attained the target slaughter criteria (92kg liveweight; 50kg carcass) by 12 months of age. This stimulated studies at Massey University on the development of alternative special purpose forages and their grazing management for deer production.

The legume red clover (*Trifolium pratense*) and the herb chicory (*Chichorium intybus*) were both highly preferred in grazing selection studies with red deer (Hunt and Hay, 1990), and were selected for study because both are deep tap rooting and can withstand summer moisture stress and because in sheep studies both were of higher *in vitro* digestibility than perennial ryegrass-based pastures. Pure swards of the two special purpose forages (plus one study with *Lotus corniculatus)* were compared against a control of perennial ryegrass-based pasture, both in grazing trials to determine relative feeding value and voluntary feed intake (VFI) and in indoor metabolism studies to determine aspects of the digestive process. In the grazing studies, forages were compared at the same DM allowance per animal in each season, under rotational grazing, with pre and post grazing heights being approx. 10-8 cm for pasture and 30-15 cm for chicory and red clover. Studies of calf growth were made during lactation in summer (January and February in NZ), with weaning at 3 months of age at the end of February, and also during post-weaning growth to slaughter at one year of age (March to November of the same year; autumn, winter and spring). Further details of the management of these crops are given by (Barry *et al*, 1998).

During summer, inputs of red clover, chicory and also *Lotus corniculatus* (birdsfoot trefoil) increased calf growth by approximately 20% relative to deer grazing conventional perennial ryegrass/white clover pastures, with little difference between individual forages (Table 1). Inputs of chicory increased growth by 47% during autumn and by 10% during spring (Table 2). Corresponding increases for red clover were 26% during autumn and 14% during spring. These increases in LWG from grazing young red and hybrid (0.75 red: 0.25 elk) deer on red clover and chicory resulted in the proportion of stags attaining the minimum slaughter criteria by 12 months of age being consistently increased to 90-100%, and carcass weight being increased by 11% (red clover) and 17% (chicory) (Barry *et al*, 1998).

Indoor metabolism studies showed that relative to perennial ryegrass, chicory was of higher organic matter digestibility (OMD), that it disintegrated more rapidly in the rumen with a low rumination time and that mean retention time (MRT) of liquid and particulate matter in the rumen was shorter than for perennial ryegrass (Table 3). Hence, clearance from the rumen was faster. This explains differences in VFI, which were 56, 26 and 15% higher for deer grazing chicory than perennial ryegrass/white clover pastures during summer, autumn and spring respectively (Kusmartono *et al,* 1996a). Similar results have been found for the digestion of red clover v perennial ryegrass by red deer (Freudenberger *et al,* 1994).

Grazing chicory can also result in reduced anthelmintic drench requirements (table 4). This is due to the taller growth habit of chicory and to the presence of the secondary compounds condensed tannins and lactones, both of which inhibited the larvae of deer – origin lungworm and gut worms in *in vitro* studies (Molan *et al,* 1999; Duncan *et al,* personal communication).

Table 1. Growth of deer calves during lactation (g/day) in summer (January & February). Values in brackets are relative to grazing perennial ryegrass/white clover pasture as 100, and are an index of relative feeding value.

Author	Perennial ryegrass/white clover pasture	Red clover	Chicory	*Lotus corniculatus*	S.E.
		SUMMER			
Niezen *et al.*, (1993)	333	433 (130)			15.1
	331	410 (124)	385 (116)		12.0
Kusmartono *et al.*, 1996a)	351		404 (116)		18.0
Adu *et al.*, (1998)	399			485 (122)	12.1
Mean	(100)	(127)	(116)	(122)	

Table 2. Growth of weaner red (R) and hybrid (H) stags to one year of age on chicory, compared with perennial ryegrass/white clover pasture. Values in brackets are relative to grazing perennial ryegrass/white clover pasture as 100, and are an index of relative feeding value.

Author	Perennial ryegrass/white clover pasture		Chicory		S.E.
	R	H	R	H	
		AUTUMN			
Kusmartono *et al.* (1996a)	178	203	246 (138)	318 (157)	17.2
Min *et al.* (1997)	152	199	235 (155)	271 (136)	11.4
Mean	(100)		(147)		
		SPRING			
Kusmartono *et al.* (1996a)	260	271	255 (98)	310 (114)	21.1
Min *et al.* (1997)	285	298	335 (118)	331 (111)	18.6
Mean	(100)		(110)		

Table 3. Kinetics of feed breakdown and outflow from the rumen in red deer fed chicory and perennial ryegrass under indoor conditions.

	Perennial ryegrass	Chicory	SE
Composition:			
Dry matter (g/kg)	247	161	
Total N (g/kg DM)	30.4	26.9	
Ash (g/kg DM)	102	180	
Apparent digestibility:			
Organic matter	0.744	0.820	0.0311
NDF	0.755	0.679	0.0231
Rumen pH	6.44	5.63	
Particle breakdown efficiency:			
Eating	0.37	0.27	0.038
Ruminating	0.47	0.65	0.038
Chewing time (mins):			
Eating	221	209	49.2
Ruminating	257	30	54.6
Rumen mean retention time (h):			
Liquid	8.9	6.4	0.01
Particulate	52.5	27.9	4.66

From Dryden *et al.*, (1995); Kusmartono *et al.*, (1996b, 1997).

Table 4. Effect of withdrawing anthelmintic treatment in weaner deer during autumn and winter.

	Pasture		Chicory		S.E.
	Treated	Trigger[1]–treated	Treated	Trigger[1]–treated	
Voluntary feed intake (g OM/d)					
Autumn	1920	835[2]	1015	1150[2]	127.3
Spring	1539	1739	1765	1631	55.2
Mean liveweight					
Initial (15/3/94)	50.4	49.8	51.1	49.2	0.95
End autumn (25/5/94)	63.8	57.2	62.0	64.0	1.20
End Winter (19/9/94)	80.0	74.5	77.0	76.7	1.94
End Spring (27/11/94)	96.4	90.0	94.7	94.5	(1.42)
Number of anthelmintic drenches	11	5	11	2	-

[1] Only treated with anthelmintic when pre-defined concentrations of faecal gastro-intestinal parasite eggs of lungworm larvae were reached or deer exhibited clinical signs of parasitism.

[2] VFI was measured prior to anthelmintic treatment being given to these groups. From Hoskin *et al*, (1999).