INCREASING VELVET PRODUCTION BY IMPROVED NUTRITION

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Introduction

The farming of stags for velvet antler in New Zealand has proceeded along different lines from the systems used by our major competitors in the market, Russia and China The New Zealand farming system is based on the intensive use of pasture to maximise production while minimising costs Feed shortfalls at any time of the year are made up by feeding out conserved forages or supplementary feeds Producers generally consider periods of feeding out are 'holding' rather than 'productive' periods. Feeding out is therefore regarded as uneconomic if pasture is available. Velvet antler production systems in New Zealand operate under the constraints of this broad strategy. Stags are kept on pasture throughout the year and are fed out supplementary rations in winter, if adequate pasture is not available. The management of stags in the post-rut period can be difficult due to aggressive behaviour; and in addition the seasonal pattern of food intake means that appetite is naturally reduced during winter. The fact that food intake is reduced does not lessen food requirements; indeed very often the environmental conditions mean that the energy requirements of a velveting stag are very high in winter despite the fact that he is neither gaining weight nor growing velvet.

In contrast to the above typical system for velvet producing stags in New Zealand, stags in China and Russia are fed high levels of concentrate diets throughout the velvet growing period. Indeed Chinese deer are fed on concentrates, off pasture, for 12 months of the year. In Canada, which may become a major potential competitor for New Zealand velvet, stags are fed concentrates during winter and during the velvet growing period, partly due to the fact that stags grow antler in the far north before pasture growth in spring takes place. New Zealand is thus alone in having a pasture-based velvet industry.

This paper is in two parts. The first part recounts our efforts to improve velvet production by feeding improved diets during winter, the typical time for supplementary feeding of stags. The second part provides a justification for feeding out during velvet production, so called 'strategic feeding'.

Winter Feeding

Since the late 1970's Invermay has carried out many trials designed to determine the effects of feeding high and low levels of nutrition to stags at different times of the year (Fennessy, 1989). These data are summarised in Table 1.

Table 1: Effect of level of nutrition at different stages of the antler cycle on subsequent velvet antler production (After Fennessy 1989)

	Season			
	Autumn (Post-rut)	**Winter**	**Late Winter**	**Spring (Antler growth)**
Number of trials	1	4	2	1
Days of trial	50	80	50	65
Velvet antler yield (kg/ stag)				
High level of feeding	2 70	1 80	2 06	2 20
Restricted level of feeding	2 40	1 66	1 94	1 87
Difference (%)	13	8	6	18

Underfeeding of stags reduced antler production during the subsequent spring most severely when it was imposed during the autumn post-rut period and during the velvet antler growth period in spring, although underfeeding reduced velvet antler growth at all stages from autumn to spring. On-farm studies in the early 1980's, which are summarised in Table 2, demonstrated that underfeeding during winter reduces subsequent velvet production in the spring. The penalty seemed more severe in lower producing stags. In conclusion undernutrition of stags during autumn and winter lowers subsequent antler production. As a result farmers now feed their stags well on conserved high quality hay or silage with grain (barley or oats) during winter.

Table 2: Velvet antler production of groups of stags under different nutritional regimes during winter (After Fennessy and Suttie 1985)

	Velvet antler yield (kg)			
Farm[1]	**A**	**B**	**C**	**D**
Hay only	1 22	1 37	1 77	2 28
Hay + 1/2 concentrates	1 38	1 61	1 94	2 30
Hay + *ad lib* concentrates	1 46	1 73	1 77	2 17

[1]Farms A and D, Muir and Sykes (1988), F arms B and C, Fennessy, Drew and Moore, unpublished

Can improved nutrition in winter boost performance? We have attempted to increase subsequent antler production in spring by using diets containing high levels of protected protein (Table 3).

Table 3: Effect of feeding diets containing soluble or protected protein sources to 3-year old red deer stags during winter on subsequent velvet antler weight and stag liveweights Antler weight is adjusted for velvet cutting date Enerpro is a diet containing high levels of groundnut meal as a protein source (N = 15 stags per group)

	Diet		
	Soluble protein	**Protected protein**	**Enerpro**
Liveweight (kg)			
Winter	138	137	138
Spring	144	146	145
Velvet antler weight (kg)	2 1	1 9	2 0

The protected protein diet, which contained fishmeal, cottonseed meal and lupins did not significantly increase velvet antler production compared with a diet containing peas as the source of protein. Hence increasing protein availability alone did not improve velvet production.

In another trial at AgResearch Invermay (Table 4), two-year old red deer stags were fed a diet containing protected fat (Rumentek), to increase metabolisable energy intake during winter. There was no significant effect on antler weight, but there was a non-significant trend that stags fed the diet containing the protected fat had antler which graded higher.

Table 4: Effect of feeding a diet containing protected fat to 2-year old stags during winter on subsequent velvet antler characteristics (N = 4 stags per group)

	Antler weight (kg)	**Antler length (cm)**	**Days of growth**
Control	1 35	35 9	57
Fat-diet	1 35	35 4	58

Overall we conclude that underfeeding during winter before hard antler casting reduces velvet antler production in spring but feeding highly nutritious diets to stags during winter does not increase antler production.

Strategic Feeding

Strategic feeding moves away from traditional concept of supplementary feeding and fully addresses the issue of feeding non-pasture diets in combinations and at specific times to increase production. Table 5 gives data from a number of trials carried out during the winter and early spring of 1995 with effects on the 1995 velvet antler growing season.

Table 5: Effect of feeding a specially formulated supplement to stags during winter and early spring (the basal diet silage/hay and grain in winter with pasture in spring) (* indicates a significant difference P<0 05)

	Invermay Mixed Age Stags	Black Forest Mixed Age Stags	Black Forest 3 yr Stags
Antler Weight (kg)			
Control	3 6	3 4	2 6
Fed	3 6	3 6*	2 5
n	41	114	198
%SA Grade			
Control	3	14	2
Fed	21	18	0

The diet used was a combination of protected protein and specifically formulated protected fat and minerals. At AgResearch Invermay the grades of antler were improved and the mixed age stags at Black Forest Park showed a significant improvement in antler weight (using the previous years velvet antler weight as a covariate) when fed this diet. These results show considerable promise to increase velvet antler production and quality by supplementation with specific nutrients.

A further possibility to improve antler production is to investigate Chinese feeding levels and techniques, with a view to determining whether these are relevant in the New Zealand context. Most Chinese deer farmers maintain their deer in groups in brick pens throughout life. The animals are fed daily with concentrates and roughage. The composition of the diets in terms of amounts of protein and energy and the source of these nutrients varies with the time of antler cycle (Table 6). These feeding tables, calculated from data presented by Liang *et al* (1993) clearly show that Chinese deer farmers feed most during the antler growing period, in terms of both protein and energy. However, the protein is generally about 25% of the total intake. Feeding levels reduce during the rut and gradually increase over the recovery period in late autumn and the pre-antler period in late winter and early spring. Although soybean cake and maize are fed out at all periods of the year, most is fed during the antler growing period.

Table 6: Diet formulation for a 'Production' wapiti stag in China (Liang *et* al 1993)

	Compounds (kg/day)				
	Soybean Cake	Maize	Bran	Distillers Grain	ME intake (MJ/day)
Pre-Antler	1 0	0 5	0 7	1 5	45
Antler	1 45	0 7	1 1	1 5	58
Rutting	0 8	0 45	0 65	-	23
Recovery	0 95	0 45	0 65	1 25	40

ME = metabolisable energy

The economic relevance of the Chinese experience to New Zealand needs to be evaluated fully but it might be possible to develop strategic feeds with sufficient palatability to increase antler production if fed during the antler growing period. If rapeseed meal (a cost effective protein source in New Zealand) costs $400/tonne on the farm and is fed out for the 60 days of antler growth, plus 20 days adaptation, at the rate of 250 g/d, then the cost /stag is $8. Taking last years 'B' grade price of around $120/kg, then a 70g increase in antler weight would break even. If the antler was raised one grade then the break-even point would be reached without increasing antler weight. This projection needs to be tested carefully but as it represents only about a 5% increase in antler weight, the concept is reasonable.

Conclusions

Underfeeding of stags during winter reduces antler production but the feeding of highly nutritious diets during winter does not significantly improve production. We in New Zealand have the only pasture-based velvet antler growing system in the world. Our major competitors use a concentrate feeding system during antler growth. New data point to a role for strategic supplements both in terms of the composition of these feeds and the timing of their application in our velvet antler industry.

References

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