VELVET ANTLER PRODUCTION : FEEDING AND BREEDING

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The potential maximum size of antlers is determined by the genetic make-up of the stag. Therefore for improved velvet antler production the objective must be to breed better stags and then to feed them to enable them to express their genetic capabilities. This paper looks at various factors which influence antler growth and covers the important aspects of feeding and breeding for better velvet antler production.

Improved velvet antlet simply means an increased weight of velvet cut at the appropriate stage of growth to meet the market requirements. There is no information available on the effects of either nutrition or breeding on the quality of the product. However there are many opinions as to what constitutes quality: for example, the absence of bez tines, all facets which probable have a genetic component and therefore could be incorporated into a breeding programme. It is also possible that there will be nutritional factors which could influence such quality characters but again such work must wait an objective criterion for quality.

PERFORMANCE

Velvet antler production increases with the age of the stag with some evidence that it plateaus at around 5 to 8 years of age before falling at some later age. Table 1 presents data for 3 herds of red stags as the animals age from 2 to 5 years (velvet antlers cut at the A grade stage). Since the data represent the same stags throughout and there was only a limited amount of culling, they provide a good indication of the effect of age on velvet antler production.

TABLE 1: Velvet Antler Production (kg) by age in herds of red stags

	HERD	A	B	C
Age (years)				
2		1.44	1.42	1.01
3		2.05	2.03	1.60
4		2.60	2.50	1.93
5		2.96	2.85	2.32
Number[1]		301	49	36

[1]*Approximately 30% of stags sold as yearlings or 2 year olds in herd A;no sales in herds B & C (Herd c: Moore et al.,1988)*

Table 2 presents data for cumulative velvet antler production (2 to 5 years) for a group of 90 stags ranked according to their 2 year old velvet antler weight. The top 1/6 of stags were 0.70 kg above the mean as 2 year olds and were about 2.3 kg above the mean in total cumulative production from 2 to 5 years. With 2 year olds, velvet antler is often harvested at variable stages of growth, unlike the situation with older stags where there are very good criteria for optimising the stage of growth at harvest. Therefore it is advisable to record both hard antler casting and velvet antler harvest dates for 2 year olds. The velvet antler weight can then be adjusted for days of growth and consequently the predictive value of 2 year old velvet antler weight is improved.

TABLE 2: Cumulative velvet antler production from 2 to 5 years of age for a group of 90 stags categorised according to their 2 year old velvet antler production.

Rank on 2 yr old velvet antler	2 yr old velvet antler weight (kg)	Cumulative (2 to 5 yrs) velvet antler production (kg)
Top 1/6	2.18	11.37
Next 1/3	1.55	9.35
Next 1/3	1.29	8.47
Bottom 1/6	1.02	7.69
Overall mean	1.48	9.11
+/- Standard Deviation	0.43	1.60

There is a strong relationship between antler size and body size (Huxley 1931) such that hard antler weight increases at a rate about three times faster than that of body weight. The expected hard antler weights for stags of different body weights (effectively different strains or subspecies) based on the Huxley data are presented in Table 3. There is also a strong relationship between velvet antler weight and bodyweight within a herd of red deer with a 10 kg increase in bodyweight associated with a 0.1 to 0.2 kg increase in velvet antler weight (Moore et al., 1988; Fennessy unpublished data).

TABLE 3 : Expected hard antler weights for stags of different live weights based on data on Huxley (1931)

Live Weight (kg)	Herd Antler Weight (kg)
100	1.6
150	3.1
200	4.9
300	9.4
400	14.9
500	21.3

Table 4 presents data for cumulative velvet antler production (2 to 5 years) for the group of 90 red stags ranked according to their yearling liveweight. The top 1/6 of stags were 14% heavier than the mean on yearling liveweight and produced 11% more velvet antler than average over the period from 2 to 5 years of age.

The relationship between 2 year old velvet antler weight and subsequent velvet production and that between yearling bodyweight and subsequent velvet production mean that some culling of potential low velvet producers can take place as yearlings or 2 year olds. Whereas the top 1/6 on 2 year old velvet antler were 25% above average on cumulative 2 to 5 year velvet production, the top 1/6 on yearling liveweight were 10% above average on cumulative velvet production. This illustrates simply that to select the best velvet producers it is better to wait until they have been harvested as 2 year olds. However, some culling on yearling liveweight is still very practical.

TABLE 4 : Cumulative velvet antler production from 2 to 5 years of age for a group of 90 red stags categorised according to their yearling liveweights

Rank on yearling liveweight	Yearling liveweight (kg)	Cumulative (2 to 5 yrs) velvet antler production (kg)
Top 1/6	119.6	10.06
1/3	107.5	9.14
1/3	101.6	8.88
Bottom 1/6	94.1	8.57
Overall mean	105.3	9.11
+/- Standard Deviation	9.57	1.60

FEEDING

There are no magic potions which you can feed to stags to dramatically increase velvet antler production (... that I know of). Rather, it is a matter of good feeding and good management to ensure that, firstly, the stags are given every oppportunity to express their genetic potential and that, secondly, the manager harvests the velvet antler at the appropriate time and without damage to ensure the highest quality of product.

Over the last 10 years there have been a few indoor and field experiments designed to look at the effects of different levels of feeding at different times of the antler cycle on velvet antler production. While the number of experiments is not large, they do produce a fairly consistent picture. Table 5 summarises these 9 experiments.

In terms of cost effectiveness the most important periods to ensure good nutrition for velveting stags are during the actual antler growing period in the spring and during the immediate post-rut period (early May-June). At these times, relatively modest increases in the level of energy feeding produced good increases in velvet antler production. In all cases the stags in the ad lib groups were fed to appetite, the extra feed being either grain or a high quality deer nut. Ad libitum feeding is particularly important for stags from immediately after the rut through winter because their lack of body fat and relatively poor insulation makes them particularly vulnerable to adverse climatic changes. As is evident from Table 5, it can also be expected to improve velvet antler yields. Table 5 also includes a calculation which gives the minimum price for velvet antler required to pay for the additional feed in the particular experiments described. The importance of good feeding during the spring antler growing period cannot be over emphasised. This may mean continuing supplementation into early spring to compensate for lack of pasture growth.

With regard to specific nutrients, there have been claims that extra protein or certain mineral such as copper or vitamins such as Vitamin D, stimulate antler growth and hence increase velvet antler production. While specific deficiencies of trace minerals could be expected to reduce antler growth, there is no evidence that luxury consumption of minerals will increase antler growth. However, the situation with protein is less clear. There have been 3 winter feeding trials and 2 spring feeding trials at Invermay where stags have been fed a high protein diet. In neither of the spring feeding trials was there any effect of large quantities of extra protein on antler growth. However, in one of the indoor winter feeding trials, but not in the other there was a very marked effect of high protein feeding on hard antler weight but not on velvet antler weight (one antler was cut for velvet antler and the other for hard; Table 6).

TABLE 5: Effect of level of nutrition at different stages of the antler cycle on velvet antler production of red stags[1]

Period (trials)	Post-rut May-June (1)	Winter June-Sept (4)	Late Winter July Sept (4)	Spring Casting (1)
Days	50	80	50	65
Velvet Antler yield (kg/stag)				
Restricted	2.45	1.66	1.94	1.87
Ad lib	2.70	1.80	2.06	2.20
Relative Increase with ad lib feeding (%)	10	8	6	17
Extra feed required to feed ad lib[2]				
Grain(kg/day)	0.65	1.0	1.0	0.65
Cost (30c/kg)	$10	$24	$15	$13
Minimum price per kg for velvet antler which is required to pay for extra feed[3]				
$/kg for velvet antler	$50	$150	$125	$38

[1]Data from Invermay and published trials (both indoors and field trials).

[2]1 kg grain/day can be expected to increase liveweight gain by 1-2 kg/week.

[3]Basea on a yield of 2 kg/stag for restricted stags; 1988 velvet antler price for A grade was substantially higher than any of these medium prices (in excess of $200/kg).

In this respect it is possible that diets which cause changes in the amounts of certain natural growth-promoting hormones in the stag may influence antler growth. However, this aspect will require much more research. The variability between the experiments may be due to the actual type of protein used, and in particular, the amount of

protected protein (i.e. protein which by-passes the rumen and is digested post-ruminally).

TABLE 6 : Effect of a high protein diet during winter on hard antler weight of red stags (n=16 stags per experiment)

	Hard antler weight (one antler only, kg)	
	Expt. 1 (2 yr olds)	Expt.2 (3 yr olds)
Low	0.49	1.09
High	0.67	0.98

SELECTION AND BREEDING

Genetic variability between animals is the raw material of selection. However all the variability between the stags in a herd is not of genetic origin and much is of environmental origin (e.g. health, differences in nutrition even though all stags are run together). In fact probably about 40% of the variability in velvet antler weight within a herd of the same strain is of genetic origin and therefore heritable, which means that it is passed on to the progeny.

An indication of the impact of this genetic variability between stags is provided by a progeny test of 5 red stags. The data are presented in Table 7 and show the range in cumulative velvet antler production from 2 to 5 years for the different progeny groups. The difference between the best and worst stag in terms of their progeny is over 1 kg in total over the 4 years velvet production. Table 7 also includes a calculation of the gross returns from velvet antler assuming that each stag was mated to 50 hinds in one year and a proportion of his male progeny retained for velveting. The difference in returns is substantial with the best stag's progeny producing a 13% higher gross income. Incidentally the mean weights for the progeny of all 5 stags were very similar in live weight. This sort of information provides a good indication of the importance of genetics and the importance of selection of superior stags from superior herds as sires.

TABLE 7: Comparison of the cumulative velvet antler production and gross returns from the progeny of 5 red stags from 2 to 5 years of age assuming that the stags were each used as sires for 1 year and mated to 50 hinds.

		Velvet antler production (kg) (2,3,4,5 years old)	Gross returns from velvet antler sales per year the stag is used as a sire (relative values where herdaverage=100)1
Herd Average		9.0	$25624 (100)
Indiviual sires (number of progeny)			
A	(29)	8.54	$24237 (94.6)
B	(32)	8.55	$24267 (94.7)
C	(22)	8.73	$24809 (96.8)
D	(17)	9.37	$26739 (104.4)
E	(35)	9.61	$27463 (107.2)

[1]Velvet antler at $200/kg; 128 kg of velvet antler from the progeny of the average stag mated to 50 hinds in one year; the assumptions are a 92% weaning rate, 3 deaths to 5 years of age, 5 yearling culls and 1.5 two year old culls with an average cumulative production from 2 to 5 years of age of 9.0 kg per male progeny.

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