FALLOW DEER CARCASS PRODUCTION

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Introduction

Fallow deer are the most common species of deer being farmed in Australia, and produce venison of high quality. The demand for venison is year round, although production of bruise-free carcasses during and immediately prior to the annual breeding season (March-July) has presented problems to many farmers, because of the inherent aggressive behaviour of males towards one-another at this time of year. The value of females for use as breeding stock remains above their value for use in the venison market and discussion in this paper will therefore concentrate on slaughter of males.

In general the aim of the producer is to get his annual production of animals grown to killing weight as soon as possible. However, since fallow deer are seasonal breeders, this means that most of the animals to be killed in any one year reach slaughter weight at about the same time. This does not matter if the market is of sufficient volume to absorb the large amount of available product at one time, or if the surplus can be successfully packaged and stored without consumer rejection of this type of product, but this is seldom the case. Most often a proportion of the market is for fresh venison, and therefore, farmers require management strategies at their disposal to produce volumes of fresh product on a continuous basis.

Much of the discussion in this paper will involve comparisons of the use of entire versus castrated bucks in venison production, but other aspects of carcass production such as the need to remove antler spikes from entires, the use of growth promotants, pre-slaughter management of deer and the possible impact of hybridisation of European fallow deer with Persian fallow deer on carcass production will also be addressed.

Growth of animals to slaughter age

At present only bucks are being slaughtered for venison and discussion in this paper will concentrate on them. However, with recent low demand for recruitment of females for breeding stock it is likely that does will become available for slaughter in the near future, and could prove to be very useful during the breeding season for management reasons.

Buck fawns are usually weaned at 14 weeks of age and should weigh between 18kg and 25kg. They can attain 50kg liveweight at 17 months of age (figure 1), with a killing percentage of 61% after a 16h fast, if placed on a high plane of nutrition from weaning. This represents a growth rate of approximately 100g/d between birth and slaughter age. However, to maintain consistent growth of stock through their first winter, some supplementation, even in temperate climates, is necessary. Feeding of concentrates can lead to over-fatness, even in young animals, and the subcutaneous and intramuscular fat composition of carcasses from over-fat animals changes greatly. To maintain product consistency throughout the year it is obviously important to consider the type of animal (ie doe, buck, castrate) to be killed, the time of year, and pre-slaughter management.

Castration

There has been considerable debate on whether there is any justification for castration

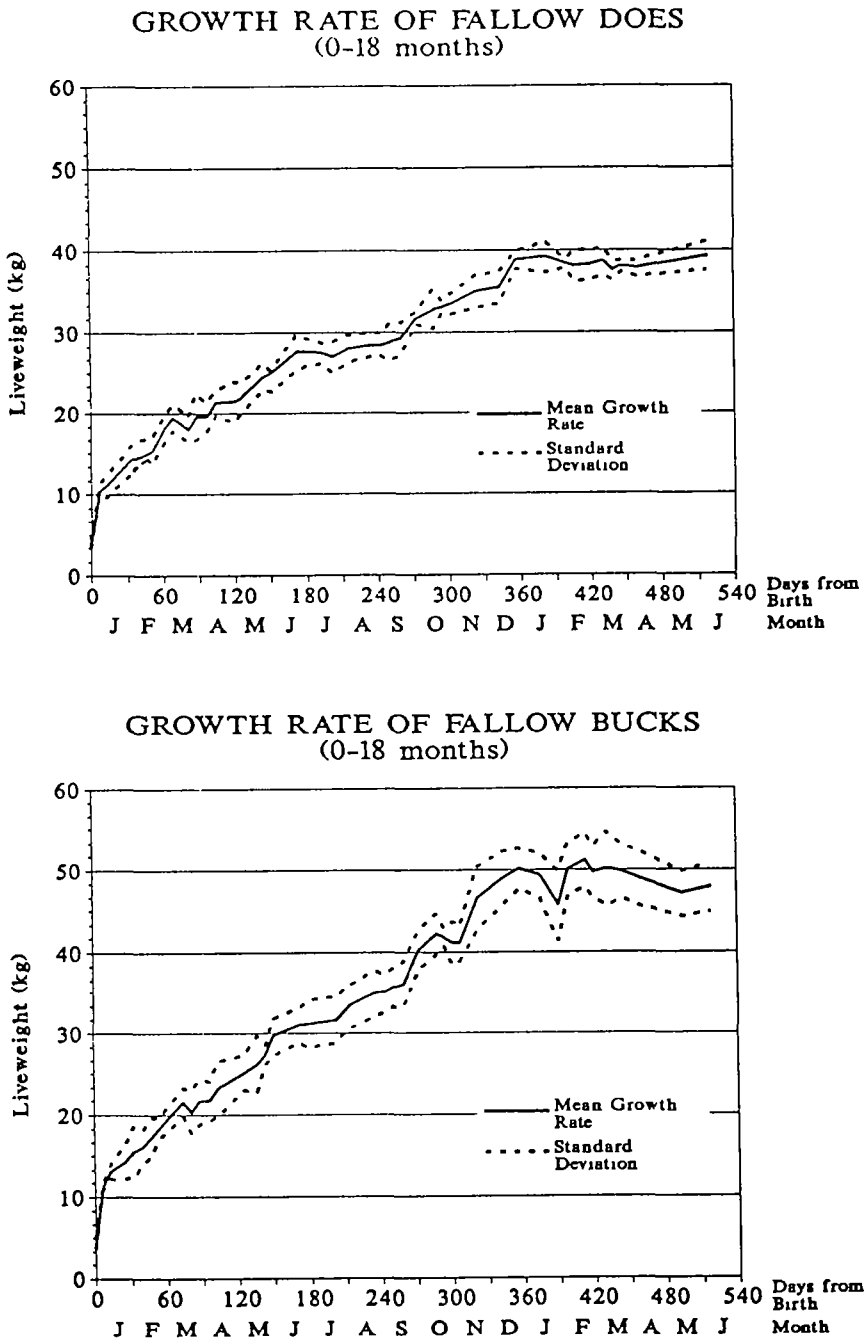

Figure 1: Growth rates of male and female fallow deer from birth to eighteen months of age. Data represents over 2000 separate weighings and each point on each curve represents the mean weight of 10 or more deer. Weights for deer from all farms in this study are combined

of farmed deer. The suggested need to castrate fallow bucks (Mulley and English 1985) is associated with modifying behaviour during the breeding season (early autumn to mid-winter). This is an exhausting and stressful period for these animals and has presented farmers with many problems, including death of animals during yarding and transport, and condemnation of bruised carcasses at slaughter. The same problems do not appear to occur as much with red deer, rusa deer or chital deer and therefore castration of males of those species appears not to be necessary.

Behavioural modification is easily achieved in fallow bucks by castrating pre-puberally but recent studies (Mulley and English 1985; Asher 1986, 1988a; Asher et al 1987; Mulley 1990; Hogg et al 1990) have shown that castrated bucks have a slower growth rate. In the study of Mulley (1990) the liveweight difference between entire and castrated bucks at slaughter (17 months old) was 3kg (Table 1) and in the study of Hogg et al (1990) 3.5kg (12 months old) and 6.5kg (24 months old)(Table 2). Some Australian venison processors buy their stock on a liveweight basis and pay a premium of A$0.10/kg liveweight for castrates killed in the winter because they are less likely to yeild bruised carcasses. On current market prices (1991) the difference in liveweight value between entire bucks and castrates killed as yearlings would be A$1.60 – $2.60/hd and A$7.50 for animals two years old.

Differences in cold carcass weight between entire and castrated bucks as yearlings (Hogg et al 1990) and at 17 months old (Mulley and English 1991) were 1.6kg and 2.1kg respectively. On current commercial carcass values this represents a loss of between A$3.40 and A$4.90 per animal. Hogg et al (1990) argue that in economic terms this loss should not be encouraged and farmers should not consider the procedure of castration in fallow deer unless differences in body weight are compensated by payment of a premium price. However, in practice it is far better to slaughter the more easily managed castrate during the breeding season rather than risk the possible death of animals or condemnation of bruised carcasses during transit or at the abattoir, and many farmers in Australia prefer that option. In Australia some venison wholesalers pay a premium for castrates killed during winter and only those animals to be killed at that time of year should be castrated. From the study of Hogg et al (1990) it can be seen that castrated bucks do not reach the minimum carcass weight of 24kg by twelve months of age, when entire bucks can be killed without difficulty anyway. However by 17 months of age (during the rut in May) the carcass weight of castrates is above 24kg (Mulley 1988a) and approximates the yearling carcass weight of entires (Hogg et al 1990).

Each of the major studies comparing differences in carcass composition of entire and castrated fallow bucks (Mulley 1988a, Hogg et al 1990) have shown that there is no significant difference in muscle weight of the saddle and hindleg primal cuts between the two types of animal. The results of a study that compared carcasses of equal weight from entire and castrated bucks (Mulley and English 1991) showed that there is proportionately more muscle on the hindleg and saddle of the castrate. Since it is these two primal cuts that are of principal economic importance, the venison processor is not going to be markedly disadvantaged by the slightly lighter whole carcass from the castrate. Furthermore, bucks castrated pre-puberally at the time of their second 5-in-1 vaccination (approx. 5 months old) do not grow pedicles or antlers and therefore are handled on one less occasion by the farmer. Future research to establish the per hectare cost of producing venison from intact and castrated bucks will help to resolve the question of whether castration of deer is cost effective or not.

Table 1 The effect of castration and zeranol treatment on growth of entire and castrated fallow bucks (± standard error)

Treatment group	n	Mean birthweight (Kg) Dec, 1985	Mean liveweight (Kg) May, 1986	16 hr fasted liveweight May, 1987	Cold carcass weight (Kg)	Killing proportion
Entire	10	4.20 ± 0.13	26.7 ± 0.93	43.8 ± 0.64	26.8 ± 0.46	0.61 ± 0.01
Entire [Z]	10	4.64 ± 0.22	26.8 ± 0.84	43.5 ± 0.66	26.3 ± 0.32	0.61 ± 0.01
Castrate	10	4.40 ± 0.24	26.5 ± 0.91	40.8 ± 0.64	24.7 ± 0.31	0.61 ± 0.01
Castrate [Z]	10	4.30 ± 0.15	26.7 ± 0.82	42.6 ± 1.12	25.5 ± 0.33	0.60 ± 0.01

TABLE 2

Liveweights, carcass weights and primal joint proportions in one and two year old entire and castrate male Fallow deer

Component	Age				Significance of difference			SED
	1YR		2YR		Sex	Age	Sex by Age	
	Entire	Castrate	Entire	Castrate				
n =	(7)	(7)	(7)	(7)				
Liveweight (kg)	44 0	40.5	54.8	48.3	***	***	ns	1 57
Hot carcass weight (kg)	24 5	22.9	30 6	26.2	***	***	*	0.92
Cold carcass weight (kg)	24.2	22.6	29.8	25.4	***	***	*	0.90
Dressing out proportion	0.55	0 56	0.55	0.54	ns	*	*	0 0068
Shoulder (g/kg)	177	181	170	176	ns	ns	ns	4.9
Rib (g/kg)	139	139	116	120	ns	***	ns	3.1
Neck (g/kg)	113	103	125	117	*	**	ns	5.3
Saddle (g/kg)	176	169	174	162	***	ns	ns	3.6
Leg (g/kg)	395	413	405	423	***	**	ns	4.8

from HOGG etal (1990)

Growth promotants

The ethics of whether growth promotants have a role in the production of venison have been discussed elsewhere (Mulley these proceedings) and will not be repeated here. However, in view of the small reduction in growth rate incurred by castration, some Australian fallow deer farmers wished to implant castrates with the readily available growth promotant zeranol, in an attempt to overcome the growth rate deficit associated with castration, while still maintaining the practical management advantages associated with castrates. Results of trials conducted on fallow bucks treated with zeranol (Mulley 1988a,b) are presented below. There are no other reports on the use of growth promotants in fallow deer.

Treatment of entire and castrated fallow bucks (n=10 per group) with 36mg zeranol at 6 months old and again at 9 months old had no significant effect on bodyweight, cold carcass weight or dressing percentage when killed at 17 months old (table 1), but castrated bucks were slightly heavier than their untreated counterparts. An interesting side effect of zeranol in entire bucks during this growing phase was that pedicle and antler development was markedly suppressed, thus eliminating the need to remove antler spikes at 12 months of age. At slaughter all carcass and offal components were collected from 5 animals in each group and weighed (99.5% recovery). In animals treated with zeranol there was a significant increase in the weight of the hide, heart, seminal vesicles ($p<0.001$ for castrates) and thymus, and a decrease in the weight of the liver, kidneys, seminal vesicles ($p<0.01$ for entires) and distal hind and forelimbs. Dissection of each cold carcass into muscle, bone and fat using the method of Butterfield and May (1966) indicated that treatment of castrated and entire bucks with zeranol did not significantly effect weight or proportion of total muscle or bone, but did significantly increase ($p<0.001$) both the weight and proportion of fat. Fat deposition was significantly increased in all fat depots of the body, including intramuscular fat, and the muscle:fat ratio markedly decreased.

Twelve of 94 muscles dissected individually were proportionately larger in animals treated with zeranol but most of these were in the muscles of the neck, thorax and abdomen, which are of lower commercial value. However the longissimus dorsi muscle, a large muscle located in the saddle region (61% of total saddle muscle), was significantly larger by weight ($p<0.0$) and proportion ($p<0.0$) in animals treated with zeranol. Four of 94 muscles were proportionately smaller in bucks treated with zeranol but again these were of no commercial consequence. Both the length and weight of some bones were significantly reduced in animals treated with zeranol, a common oestrogenic effect. There were no detectable levels of zeranol in muscle or fat of bucks treated with zeranol (36mg at 6 months old and again at 9 months old) and slaughtered at 17 months old.

Conclusions drawn from this work by Mulley (1988a, b) were that there are no apparent advantages either economically or at the carcass level by using zeranol implants in fallow bucks being grown for slaughter at 17 months of age. The main affect on the carcass was an increase in dissectable and intramuscular fat deposition, an affect that opposes the natural leanness of venison, which has been one of the most marketable properties of this meat (Drew 1990). However, kept in context the entire animals killed in this trial at 17 months of age (during the rut in May) had chemical fat levels of 2% compared with 5.8% in entire bucks treated with zeranol. These levels of fat content in muscle compare with 6.1% in entire bucks killed at the end of summer (13 months of age) in New Zealand (McCall 1985), when a large number of bucks are slaughtered and processed without market resistance toward the product. A slight fat cover improves the keeping quality of a carcass and is apparent on carcasses of castrates and entire bucks treated with zeranol and killed at 17 months of age, when the carcasses from entire bucks are devoid of subcutaneous fat.

As argued earlier (Mulley, these proceedings), the advantages of using growth promotants in deer would need to be substantial to justify their use, given the increasing public awareness and resistance to the use of chemicals in agriculture. Public scrutiny and opinion will no doubt dictate the non use of growth promotants in deer farming irrespective of the availability of any scientific evidence suggesting advantages in their use.

Hybridisation

Crossbreeding of European fallow deer (Dama dama) with the larger Persian fallow deer (Dama mesopotamica) is the only hybridisation option available to breeders of fallow deer. The advantages of heterosis in other domestic species are well described, and crossbreeding European fallow does with Persian fallow bucks should provide the fallow deer farmer with the potential to produce a commercial sized carcass sooner than can be achieved with Dama dama x Dama dama. While the use of such a hybrid for meat production appears sound, most aspects of the growth, development and nutritional maintenance of those animals is unknown. Until information on the production efficiency and growth of hybrid fallow deer becomes available their value as a meat producing unit will remain unclear.

Pre-slaughter management

Good facilities and experienced stockmen will minimise stress and traumatic injuries to deer prior to slaughter. Notwithstanding, there have been some regrettable attempts at slaughtering of entire fallow bucks during the breeding season, where condemnation of the whole or part of the carcass due to bruising has been the outcome. These episodes have made the procedure of castration of entire bucks due for slaughter during the breeding season look attractive to many farmers, as discussed previously.

If animals have been travelled long distances to the slaughtering facility it is advantageous to delay killing for up to two weeks if suitable holding paddocks are available. However, confinement of entire bucks in small paddocks during the breeding season is a recipe for disaster. For several weeks prior to slaughter bucks in lean condition should be fed high quality feed to improve carcass quality. If the slaughtering facility is close to the farm, and animals are to be slaughtered on the day they are taken to the abattoir, then they should be fasted for at least 12h prior to slaughter.

Antler management

Given that the majority of fallow bucks slaughtered for venison are killed before their second birthday, there is no velvet antler return from these animals. It is therefore mandatory that antler spikes be removed from all bucks to allow ease of handling and to reduce injuries among bachelor groups. If bucks are not sold for slaughter before they rub velvet from their antlers, these spikes can be cut off just at the point of rubbing. Groups of spikers can usually be yarded without difficulty at that time (mid-January in NSW). Bucks can be physically restrained, either in a cradle or by hand, and the spikes cut off with large shears. Provided the cut is made above the burr of the spike, no analgesia is required. This procedure is cheap, requiring no drugs, and is readily performed by experienced deer handlers. The young buck is then left with the familiar hard buttons, which can still inflict bruising on other deer, but at least deep penetrating wounds are prevented.

The removal of hard spikes has been the most commonly adopted method for controlling antlers on bucks destined for slaughter in Australia, although pre-puberal

castration, which eliminates pedicle and antler growth, is becoming increasingly popular. The popularity of castrates is likely to remain for bucks slaughtered during the breeding season, or until 2yo does or hybrid does of the appropriate killing weight become available for slaughter. The practise of cutting off pedicles and antler at the level of the skull in the conscious animal, using only local anaesthesia as described for fallow deer elsewhere (Asher 1988b), should not and will not be adopted in Australia on animal welfare grounds. The other procedure occasionally used to control subsequent antler growth is surgical polling (Asher 1988b, English 1990) which is carried out on the pre-puberal animal under general anaesthesia. However, this technique is not cost effective in animals destined for slaughter, and if all primordial tissue is not removed from the skull, mishapen antler may still occur.

Schedule weights

It is usual for venison wholesalers to produce a schedule of prices for animals of different weight classes. To maximise profits, the farmer should observe that schedule and kill only those animals that meet the criteria for premium prices. For fallow deer fasted for 16h:

$$\frac{\text{LIVEWEIGHT x 61}}{100} = \text{carcass weight}$$

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