

## VENISON - A MARKETABLE PRODUCT

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### INTRODUCTION

Meat consumers of the next century will require more pre-cooked convenience meats. At the 1990 US Reciprocal Meats Conference, estimates presented for the market size suggested that the market in convenience meat products valued at \$100M in 1989 was expected to increase in value to \$5,000M by 1995. There was no dissension about this figure and a French speaker said that consumption had doubled for "sous-vide" products in France from 1984-9.

In the USA the red meat industry is shrinking by about 1% per year with the 1989 market being 17.8 million tons (Palmer, 1990). Poultry and fish have increased dramatically and are perceived to be better value, more healthy and more convenient than red meats. The response of the red meat industry is to re-position its image with consumers, move towards more convenience foods (smaller portions, pre-cooked red meats, sub-unit packaging for freshness and microwaveability) and move towards healthier "lite" products to meet the health issues of fat, calories, cholesterol and sodium (Palmer, 1990).

### VENISON

World trade in game meat at 30,000 tonnes per year (Luxmore, 1989) is microscopic compared with traditional meat products. Nevertheless if science had been commissioned to produce a "designer" red meat that had all the best attributes of our traditional farm animals and none of the perceived bad features then the successful result would have been something remarkably like venison (Table 1). The product is extremely high in protein and iron while being very low in fat, energy and cholesterol (Drew and Seman, 1987).

TABLE 1. Nutrient composition per 100 g of untrimmed venison meat from red deer<sup>a)</sup>

	<u>Loin</u>	<u>Leg</u>
Protein (g)	24.7	23.8
Fat (g)	3.3	3.0
Water (g)	70.8	71.2
Minerals (g)	1.4	1.9
Energy (KJ)	545	519
Cholesterol (mg)	66	74

<sup>a)</sup> Data from Drew and Seman 1987

From a practical consumer's point of view separable lean, fat and bone are the important components. Table 2 compares a number of traditional meat species with deer. The yield of lean meat from beef, lamb, pork and chicken is between 48 and 59% of the carcass while red deer and wapiti/red deer are 73-76%. Chicken is relatively fat and has a lot of bone.

Venison is well known in Europe as a traditional product. In North America it is almost unknown as an item that can be purchased but well known as hunting fare. Farm-raised venison is a different product from hunted venison and must be promoted and marketed as a new product. The same "new product" image must apply in countries such as Japan where there is no significant history of venison consumption. The skill of the marketers in highlighting the excellent characteristics of venison and promoting quality production, packaging, processing and promotion will largely determine the future for the New Zealand deer industry.

**TABLE 2.** Separable lean, fat and bone from the carcass of different animal species

Species	Carcass weight (kg)	Percent yield			
		lean	fat	bone	lean/bone
Beef <sup>1</sup>	239	59.0	23.0	18.0	3.3
Pork <sup>1</sup>	52.0	48.0	25.0	27.0	1.8
Chicken <sup>2</sup>	1.2	59.0	15.0	24.0	2.5
Red deer <sup>3</sup>	62.6	72.7	7.0	20.3	3.6
Wapiti/red deer <sup>3</sup>	67.6	76.0	4.7	19.3	3.9

<sup>1</sup> Paul and Southgate 1978

<sup>2</sup> Hayse and Marion 1973

<sup>3</sup> Drew 1989

## QUALITY FROM THE DEER SLAUGHTER PLANT

### The farm and transport

The quality of the final product starts right back at the farm. Top quality venison must be produced from animals raised specifically for choice venison and not as a by-product from velvet production or breeding. With red and fallow deer there is no case to be made to take animals past 2 years of age for top quality venison. Breeding programmes should be established to produce progeny that are fed well enough to achieve target liveweights at weaning, 15 months or 2 years of age (Table 3).

**TABLE 3.** Target stag live weights for meat production (kg)

Age	Red deer	¼ wapiti
Weaning (3 mo)	49	60
15 months	107	133
2 years	132	165

Until recently there has been a clear premium for marketable carcasses which are available pre-Christmas for the northern hemisphere trade. This situation has led research people to aim at a slaughter carcass from rising yearling deer. Fennessy (1989) suggested in particularly good well-fed red stags which averaged 90 kg in late October only the top 20% would be over 100 kg. Ataja *et al.* (1989) achieved 75-79% of stags reaching 92 kg by early December on pasture kept 10 cm in length. With the recent downturn in European venison prices the pre-Christmas premium was not seen in 1990/1 and may not be a strong feature of future markets. Efforts will increasingly be made, particularly in developing markets, to provide year round quality venison which should be from deer aged between 10 and 27 months of age.

Having raised the right kind of animal it is most important that it arrive in perfect condition at the slaughter plant. Mustering from paddock to yards must be able to be done quietly, quickly and easily. Several circuits of the paddock or run back in badly designed raceways can produce bruising and consequently damaged carcasses. Yards should be devoid of any protuberances, high enough to prevent jumping, equipped with good loading ramps (not a heap of hay bales in an outside doorway) and the stag MUST have had spikes or regrowth antler removed before trucking.

Transport to the plant should be done in appropriate trucks by people who know the job. The number of animals in the truck pen should be enough to prevent much animal movement in transit but not enough to allow riding.

or flailing within pens. Variations in age, sex and size mean that there are no easy density formulas and truck drivers need to be experienced in loading density

Skin damage is a good indicator of deer handling down the line from the farm to the stun box. In studies of skin damage in farmed deer skins, 99% had some form of damage in the form of lacerations, abrasions and scoring. Only 10-15% of deer skins can be used for exclusive grain nappa leather and more than half are virtually worthless. Probably the single most important procedure in preventing carcass and skin damage in slaughtered deer is the yard storage and handling at the DSP. Stockmanship and yard facilities such as sprinkler systems are key issues in preventing pre-slaughter damage and stress

### Plant operation

After stunning and bleeding, adequate electrical stimulation is essential to the production of tender venison. There are situations where the low voltage stimulator operates ineffectively through malfunction or inadequate earthing. The Meat Industry Research Institute of NZ is perfecting an excellent monitor which will audit the stimulation and give an end of day tally of "successful stimulations". This machine should remove one significant source of variation in venison tenderness

Bacterial contamination of a carcass during dressing can cause poor quality in the final product and a very short shelf life as chilled venison. Hair and gut contents are the two major sources of contamination. Staff must be particularly careful when separating the skin from around the hind legs and tail in traditional dressing. The new inverted dressing procedure using a machine has major advantages in almost eliminating the fall of hair onto the carcass. Removing the paunch and soft tissues must be done carefully to avoid spillage. Washing carcasses with a "touch of green" does not wash off the contamination - it only spreads it widely. Carcasses should not be washed. Contamination on a carcass obviously means contaminated cuts when the carcasses are broken down and the more the breakdown into cuts, the worse is the problem

### **VENISON QUALITY AND ANIMAL AGE**

Animal age is included in most carcass classification systems for traditional livestock species because toughness has been generally found to increase with animal age. Experiments with red deer have shown that venison from one and two year old stags is more tender than that from animals aged 5 or more with 3 year olds intermediate in tenderness. Comparisons were made using both a tendrometer and taste panels. Venison from hinds did not show any evidence of becoming tougher with increasing animal age

While tenderness is the most important characteristic in meat to the consumer at the point of consumption, colour is the vital factor in moving red meat off display shelves at the point of sale. Venison is naturally a dark meat and often perceived as poor quality because the preferred colour in red meat is bright red. The dark colour of venison is actually due to the high iron content (Drew and Seman, 1987) which is a very important mineral in human nutrition

Quality assessment work in venison has not shown any evidence that flavour intensity varies with animal age although panels have found this a difficult attribute to assess and further research in the area is required.

### **VENISON QUALITY AND SEX OF THE ANIMAL**

Limited information on this topic strongly suggests that striploin and topside (leg) venison from hinds is more tender than that from stags. This is perhaps surprising and more information is required. Venison from hinds has a higher overall flavour intensity score than stags for striploin but not for topside. Carcasses from red hinds are generally less than 50 kg and although there may be special market niches for this product the carcasses are smaller than most market requirements. One venison exporter now offers a schedule for hind venison and has developed specialist export outlets where the product attracts premium prices

With live sale prices now as low as they are it is possible to profitably purchase weaner hinds for slaughter at one or two years of age for venison. The use of part wapiti in this context has much to commend it. Table 4 presents a comparison of carcasses from red and wapiti x red (relk) females

**TABLE 4. Hinds for venison production (kg carcass)**

Age	Red deer	Wapiti x red
15 months	48	73
27 months	55	90

The red deer carcass weights are for particularly well grown red hinds but there is a very large gap to wapiti x red. Quarter-bred wapiti hinds can be expected to give carcass weights of 60 to 70 kg which would be ideal for current market requirements.

## **PACKAGING AND STORAGE**

### **Chilled venison**

The market perception that "fresh" meat is chilled means that exporters are increasingly moving towards shipping the product by sea as chilled even when the market is Europe. Therefore a shelf life for sea freight needs to be at least 12 weeks and clearly 16 weeks would be better. Providing venison has a very low bacteriological count at packaging and the vacuum packaging is of a high standard then a shelf life of 12 weeks at -1°C can be expected (Seman *et al* 1989). If storage is longer than 12 weeks, colour acceptability under retail conditions deteriorates rapidly although quality in terms of tenderness and flavour was still very acceptable at 18 weeks. Controlled atmosphere packaging in CO<sub>2</sub> did not impart any quality advantage over vacuum packing (Seman *et al* 1989).

### **Frozen venison**

Some years ago there was an expectation that venison frozen held at -12°C would retain quality for 2 years or more. This idea does not conform to generally recognised standards for other frozen red meats and has been criticised as being misleading and misrepresenting the product to the intended consumers. Therefore research was carried out at Invermay to determine quality changes in frozen venison when whole muscle and retail-ready portions were vacuum packed and stored at either -12°C or -18°C for up to 28 months. Some product was assessed at 4 monthly intervals. Whole muscle cuts had a lower incidence of leaking packs, a lower level of oxidation, less surface discolouration and overall, a better colour stability than the retail-ready portions but there was no indication of significant deterioration in product quality over the 2 years. The freezer temperature did not affect product quality and freezer storage time did not affect meat tenderness.

## **CONCLUSIONS**

Future world consumer demand for meat products will emphasise minimal fat and convenience foods. Venison has all the best attributes of red meat with none of the perceived bad features. A quality venison product depends on quality management of deer on the farm, skilled and careful transport operators and a high standard of performance by the deer slaughter plant staff. Venison from stags increases in toughness with age in animals older than 2 years but age does not appear to have a significant effect on meat toughness in hinds and hind venison is as tender as that from young stags. Vacuum packed venison from uncontaminated carcasses has a shelf life of at least 12 weeks when stored at -1°C.

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