

SENSORY MEAT QUALITY IN RED DEER (*CERVUS ELAPHUS*) GRAZED ON PASTURE OR FED A COMMERCIAL FEED MIXTURE

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Background

In a ruminant like the red deer, the fatty acid composition of meat is more difficult to influence using various feed compared with a monogastric animal, as the rumen microorganisms hydrogenate unsaturated fatty acids (Demeyer, 1999). However, studies performed on cattle, sheep, red deer, reindeer and free-living ruminants have indicated that the fatty acid composition of meat changed in response to diets (Crawford *et al.*, 1970; Manley & Forss, 1979; Wood & Enser, 1997; Sampels, 1999; Wachira *et al.*, 1999). Generally, a higher proportion of long, unsaturated fatty acids were found in meat from grazing animals compared with animals fed a grain-based diet. The unsaturated fatty acids are known to be susceptible to oxidation, which may contribute to development of various off-flavours in the meat (Demeyer, 1999; Young, 1999). The purpose of this project was to study the effects of two diets for red deer (grass feeding and 'feedlot' feeding) on the sensory quality of the meat.

Objectives

The ultimate aim of the sensory work was to develop a flavour profile of venison from the two treatment groups and to assess any flavour differences between the treatment groups.

Methods

A total of 16 male red deer (age 1 year) were included in the study. Two feeding regimes were applied to these animals (grass-feeding and pellet-feeding; $n=8$ in each treatment group) for 10 weeks prior to slaughter. The feeding of the animals was carried out at AgResearch, Invermay Agricultural Centre, Mosgiel, New Zealand. The pellets used was a commercial feed mixture for red deer (Standard Deer Nuts, Reliance, Dunedin, New Zealand) based on barley and lucerne meal. At slaughter, all red deer were stunned with a captive bolt, dressed and chilled as carcasses at X°C. To prepare samples for sensory analysis, one striploin (*M. longissimus*) was removed for sensory evaluation at 24 hours post mortem from the carcass, vacuum packed, chilled and stored for 3 weeks at -1.5°C. The striploins were then frozen at -20°C and transported to AgResearch Ruakura (MIRINZ site) for sensory analysis.

Sensory evaluation

The frozen striploins were cut into 40 mm steaks and held vacuum packaged (one animal per bag) at -35°C until evaluation. Prior to all assessments, portions were thawed overnight at 4°C and cut in half to give two 20 mm steaks per animal. The samples were cooked on a hotplate at 190°C to an end-point temperature of 62-65°C. The sensory profile of the red deer meat was assessed by a trained expert panel of 11 members with, in general, a minimum of four years experience in odour and flavour analysis of meat and meat products. The questionnaire was formulated with particular reference to venison. The definitions of the profile attributes are presented in Table 1. The panel scored the sensory attributes on a line scale where 0=none and 10=intense. Data was collected using Compusense five, an automated data collection system (Compusense Inc. Guelph, Canada).

Statistical analyses

The statistical analysis was carried out using Microsoft Excel 5.0 analysis of variance.

Results and discussion

There was a significant difference between the two treatment groups for the sensory attribute of grassy flavour, with the pellet fed animals having less grassy flavour than the animals grazing pasture (Figure 1 and Table 2). There were no significant differences between the two treatment groups for any of the other attributes assessed. However, a trend ($p=0.14$) towards a stronger game flavour in meat from the grass fed group could be observed.

Relative to other food groups, game meats offer high levels of protein and iron, and compared with beef, pork and lamb, lower levels of fat (Drew, 1991). Although game meat has characteristics distinct from domestic meat species, it is evaluated by consumers according to the same criteria as other meats, including colour, texture, flavour, juiciness and price (Krieg, 1991). There is a common consensus among reindeer herders in Sweden that the flavour of reindeer meat varies considerably, depending on the pre-slaughter handling technique, seasonal variation in the natural diet, and supplementary feeding using commercial feed mixtures. A so-called 'stress-flavour' has been found in meat from intensively pre-slaughter handled reindeer (Wiklund *et al.*, 1996), but the phenomenon has not been described or explained chemically (Hanssen & Skei, 1990). Brooks & Collins (1984) showed that the meat from reindeer in poor physical condition had an 'undesirable' flavour. Hamilton (1994) refers to the widely differing opinions about perceived flavour differences in meat from farmed versus wild deer, and concludes that a strong gamey flavour in meat from wild deer can sometimes be due to the method and duration of storage rather than the animals *per se*. After 6 weeks of feeding reindeer various diets, an expert taste panel (Uppsala University, Sweden) could not find any differences in the flavour of the meat (Wiklund *et al.*, in press), possibly because the feeding period was too short. From the present study it can be concluded that a pasture diet, which is a part of the normal deer farming practices in New Zealand, produced venison with more off-flavours compared with the diet of a commercial deer pellets. It is of great interest to explore further how the consumer appreciates these different types of venison.

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Table 1. Definition of sensory attributes used in the sensory profiling of venison

Attribute	Definition
Grassy flavour	Fresh, green, clean, grass-fed flavours
Game flavour	Venison-animal flavour, wild, gamey
Sweet flavour	Sweetness associated with sugars
Tenderness	Amount of force required to chew the sample assessed during initial 3-5 bites
Juiciness	Amount of moisture released after 3-4 bites
Livery/offally flavour	Fresh liver/offal flavour slight bitterness to it, not storage-type livery
Bloody flavour	Serum-raw-blood flavour, metallic, rich
Astringency	Dry, mouth-puckering, sharp, metallic, bitter, usually an aftertaste

Table 2. Sensory evaluation scores in meat (*M. longissimus*) from red deer fed two diets

Attribute	Pasture	Pellets	Sign. ¹
Grassy flavour	4.93	4.22	*
Game flavour	5.82	5.36	n.s.
Sweet flavour	4.13	3.93	n.s.
Tenderness	8.45	8.35	n.s.
Juiciness	8.41	8.18	n.s.
Livery/offally flavour	2.54	2.45	n.s.
Bloody flavour	5.05	4.65	n.s.
Astringency	3.81	4.12	n.s.

¹*= $p \leq 0.05$.

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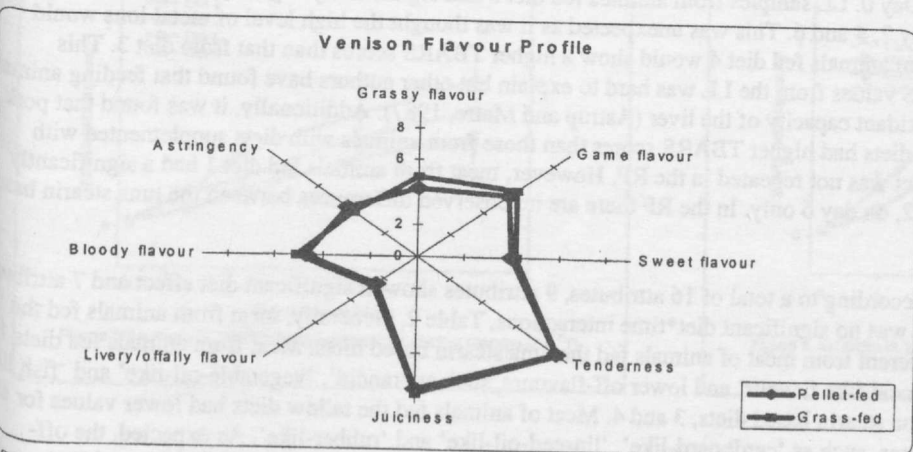


Figure 1. Flavour profiles of venison from the two treatment groups included in the study.