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Deer are what they eat

The links between feed and venison quality

By Eva Wiklund

Tenderness, juiciness and flavour are often referred to as the most important attributes for the eating quality of meat.

Different groups of consumers have different preferences for these attributes, which affect the markets for all kinds of meat. Traditionally in Europe, meat from Roe deer, Red deer, Fallow deer, Moose and Reindeer is associated with the autumn hunting and slaughter season, and the meat is appreciated for its “wild” and “gamey” flavour – clearly linked to its feed. But in other countries, like the US, the tradition is not at all the same and “wild” flavour in venison is considered to be a negative attribute.

New venison production systems such as intensive farm-based management with commercial feed mixtures and possibly new ingredients used to supplement or replace pasture as well can alter venison quality. It could be of interest for the venison industries worldwide to recognise these quality differences. For example, venison with more or less pronounced “wild” flavour could be directed to specific markets based on information about production system/feeding regime and consumer preference.

One topic that has been very much debated in the Scandinavian countries is the image of Reindeer meat as a natural, free-range origin, clean and healthy product. This is an image that is valid for most of the worlds’ venison industries. Concerns about how this image could change when new feeding regimes are introduced have to be balanced against the need of using these feeds as supplements or replacements when pastures cannot provide enough nutrients for maintenance and growth.

Deer in poor body condition at slaughter will not produce meat of optimal quality. It is important that slaughter animals have the right amount of glycogen (energy) stored in their muscles, as this affects meat quality, (as discussed in the previous issue of TDF). This is why nutritional status of the animals and feeding regimes are important. Of course there are also animal welfare concerns.

If the choice of feed is based on requirements for high energy content, one or several types of grain are normally included. There are many international research studies on most of our meat-producing animals (cattle, sheep, pigs, goats, deer) showing that grain-based feeds will increase the glycogen content in the animals’ muscles. Good pastures with high energy content will do the same.

It is much easier to change meat/muscle composition of the monogastric pig than ruminants like cattle, sheep and deer. Why? In ruminants the feed has to pass through the rumen and three other stomachs before nutrients can be absorbed in the intestines. In the rumen there is also a flora of many different microorganisms that will break down and use the different nutrients (fat, protein and energy) in the feed, and later the nutrients in dead microorganisms will be used by the ruminant animal. So pigs metabolise the feed nutrients directly and ruminants do it indirectly, through the microorganisms. However, small amounts of feed nutrients will pass the rumen microorganisms as they can’t keep up to 100 % and these feed nutrients will be absorbed in the ruminants’ intestines.

Natural or managed pastures (grasses, herbs and bushes) contain high levels of good fatty acids, so called poly-unsaturated fatty acids (PUFA). The green plants are also rich in different antioxidants. Grain-based feeds are higher in not-so-good fatty acids (saturated fatty acids: SFA) and antioxidants like vitamin E are often added to commercial feed mixtures. When animals are grazing pasture or if they are fed grains, the fatty acid composition in their muscles/meat will change towards the composition of their feed. For pigs this change happens

relatively quickly but for ruminants it takes longer time because of their different ways of metabolising the feed nutrients.

How do changes in chemical composition of the meat affect its quality? Venison is a meat with lower fat content than beef, lamb and pork, so the types of fatty acids (PUFA or SFA) are not of major importance from a consumer health perspective. However, it is important to include more foods with high PUFA content – like venison from grass-fed deer - in our diets, so we should be careful to keep these natural PUFA sources.

Different fatty acid profiles in venison from Red deer (New Zealand) and reindeer (Sweden and Alaska) related to feed-type have been thoroughly investigated and linked to meat flavour. In the Red deer study (AgResearch), grazing animals were compared with animals fed commercial deer pellets (Standard Deer Nuts, Reliance Stockfoods Ltd., Dunedin) for 10 weeks before slaughter. The pellet-fed deer had much higher content of SFA in the meat than the grazing deer. According to the taste panel, the grazing deer produced venison with more “grassy” and “gamey” flavour. Reindeer studies from Sweden and Alaska (Swedish University of Agricultural Sciences and University of Alaska Fairbanks) show similar results; free-ranging reindeer grazing natural pasture gave meat with high content of PUFA and lots of “wild” or “gamey” flavour. As the type of pasture plants in the Reindeer diet changes over the grazing season, the flavour of the meat also changes. Reindeer eat more grasses, herbs and sedges during the summer and during the winter a large proportion of their feed intake is dominated by lichens. In the Alaskan study it was demonstrated that “strong” and “gamey” flavour in the Reindeer meat increased over the season so that animals slaughtered in July produced meat with a milder flavour while meat from Reindeer killed in March had a clear “gamey” flavour.

Consumers in Sweden were served two different types of Reindeer meat: one from free-range grazing animals and another from Reindeer fed commercial Reindeer pellets for eight weeks before slaughter. One group of consumers were dominated by Reindeer herders who ate Reindeer meat more than five times per week, while the other consumer group was recruited at a supermarket in a major city in southern Sweden and had very little or no experience of eating Reindeer meat. In both these consumer groups half of the consumers preferred meat from the free-range Reindeer and 50 % preferred meat from the pellet-fed animals. Consumer comments like “strong flavour” and “Reindeer flavour” were often mentioned for the free-range samples and comments like “mild” and “taste almost like beef” were only used to describe the samples from pellet-fed Reindeer.

Is it possible to use the positive effects of feeding a commercial grain-based feed mixture without getting high content of SFA in the meat? In Scandinavia, Reindeer husbandry is based on free-range animals on pasture. But in 1986 when the Chernobyl nuclear power plant exploded and radioactive fallout contaminated the Reindeer pastures, alternative feed had to be developed. Several types of commercial Reindeer pellets are available today and all of these are based on grains, mainly oats and barley. In a recent experiment by Swedish University of Agricultural Sciences, the formulation for one of those pellets was changed and the fat source used (a commercial fat-mixture dominated by palm oil) was replaced with linseed cake. Linseed is rich in PUFA. Two groups of Reindeer were fed the standard or the new formulation of the pellets for eight weeks and then slaughtered. The fatty acid composition in the meat from linseed-fed animals was very similar to that of animals grazing natural pasture, that is, high in PUFA, while the Reindeer fed standard pellets gave meat with high content of SFA.

A similar product to the linseed cake used in the Swedish Reindeer study is palm kernel extract, another by-product from seed oil extraction. The fat composition is very different though, with the palm kernel extract being high in SFA and the linseed cake high in PUFA. Extended use of palm kernel extract as feed for deer intended for slaughter can therefore be expected to change the fatty acid composition in venison from PUFA-dominated meat to a meat with more SFA.

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