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Influence of evisceration time and carcass ageing conditions on wild venison quality. Preliminary study

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ABSTRACT

The influence of common carcass preparation practices of wild red deer on the physicochemical, microbiological and sensory quality of venison was assessed by varying evisceration time and ageing method. Deer were head shot; half were eviscerated 30 min and the other half 4 h post mortem. In both groups (n = 18), 6 carcasses were skinned immediately after evisceration and aged for 24 h; 6 were aged unskinned for 24 h and 6 were aged unskinned for 72 h at 10 °C. Ageing method had a significant effect on the sensory quality of venison loin; unskinned ageing was associated with an increase of odour and taste intensity, and higher scores for gamey and sweet/caramel flavours. Carcasses aged for 72 h displayed darker and tender meat, but increased aerobic bacterial counts. Evisceration time had less influence on loin quality, although off-flavours were more often detected in deer eviscerated 4 h post mortem.

1. Introduction

Venison from wild red deer represents a viable alternative to traditional red meats. It has a high nutritional value and is rich in proteins and heme iron, while fat content and saturated fatty acid levels are low (Daszkiewicz, Janiszewski, & Wajda, 2009; Hoffman & Wiklund, 2006; Wiklund, Manley, Littlejohn, & Stevenson-Barry, 2003; Zomborszky, Szentmihály, Sarudi, Horn, & Szabó, 1996). Venison also has a number of distinctive and desirable organoleptic properties, including an intense red colour, tenderness and a variety of specific flavours (Utrilla, García Ruiz, & Soriano, 2014a; Utrilla, García Ruiz, & Soriano, 2014b). Venison currently enjoys a positive image as a healthy "natural" product (Hoffman & Wiklund, 2006; Wiklund, Farouk, & Finstad, 2014), since it is obtained from deer raised with natural or managed pastures (grasses, herbs, and bushes), sometimes in the wild with unlimited access to exercise. Consumers are also increasingly concerned about the meat production systems, and tend to prefer meat from animals obtained from hunting or from game farms using extensive methods, that graze in a free-range manner which is perceived to be more ethical than the standard commercial production of beef, pork or poultry (Hoffman & Wiklund, 2006; Wiklund et al., 2014). However, the worldwide production and consumption of wild venison, and indeed of game meat in general, remains very small. Even so, demand has gradually risen in Europe over the recent decades, especially in the most developed countries, where game meat is viewed as a luxury product. To foster this trend with a view to strengthening the game-meat sector, it is essential to ensure that the meat is of top quality. This means that good practices must be observed across the whole production sector: state owners, hunters and cutting plants. To date, European legislation is limited to a series of general regulations on the hygiene of foodstuffs (Regulations (EC) Nos. 852/2004, 853/2004, 854/2004, 882/2004 and 2075/2005) as adapted into the legislation of member countries and regions (e.g. Decree 65/2008, Resolution 08/10/2008 in Spain). These provisions, applied to hunted wild game in Spain, have introduced the educational concept of 'trained hunter' in animal health issues and set out a number of good practices for hunters, while providing a legal framework to ensure food safety. The 'trained hunter' will collaborate with veterinarians in some modalities of hunting in order to determine the suitability of wild game for marketing, but will never replace the veterinary inspection. To date the 'trained hunter' has not been effective throughout Spain (only in some north areas); once in general use, these practices will have a positive impact on the game trade.

At present, post mortem deer dressing practices carried out by hunters and cutting plants vary considerably, and this variation may have a significant influence on the physicochemical, microbiological and sensory quality of wild venison. Once the deer has been shot, the evisceration is carried out by the hunter or the staff of the state. The interval to evisceration varies and little attention is paid to the environmental conditions in which hunting takes place, which may seriously undermine venison quality. The interval and the prevailing conditions

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between hunting and transport of the eviscerated carcass, previously approved by a veterinary inspection, to the cutting plant in refrigerated trucks also vary considerably. Finally, cutting-plant managers are often unaware of the optimum conditions for carcass ageing, which currently takes place over a wide range of temperatures (4–10 °C) and times (1–4 days), using different carcass ripening methods (mainly skinned vs. unskinned).

There is clearly a need to assess the influence of conditions wherein the carcass is obtained on the quality of venison from wild red deer with a view to establishing certain minimum recommendations. The present preliminary study sought to ascertain the influence of evisceration time and carcass ageing conditions on meat quality.

2. Materials and methods

2.1. Animals

A total of 36 red deer (*Cervus elaphus*), 18 male and 18 female, were hunted on an estate in Sierra Morena (Ciudad Real, central Spain). Deer were shot between 12 and 20 October, in the mornings; relative humidity was between 42% and 52%, and ambient temperature ranged from 15 °C to 20 °C. The stalking method was used (as laid down in Spanish Law 2/1993) in the best possible conditions to minimise stress; no use was thus made of beaters to chase the animals to the hunter's designated hunting spot, and the shot was made in the head using a 30–06 calibre rifle. All deer were between 1 and 3 years old (Saenz de Buruaga, Lucio, & Purroy, 1991). Once shot, animals were transferred immediately to the facilities of the estate, where carcass skinning, eviscerating and ageing were carried out under hygienic conditions. Half the deer (9 male and 9 female) were eviscerated 30 min after shooting, while the other half (9 male and 9 female) were eviscerated 4 h post mortem at room temperature (20 °C approximately), as is usually the case on hunts (Fig. 1). In both groups with different evisceration times, 6 carcasses (3 male and 3 female) were skinned and aged for 24 h at 10 °C in an ageing room, suspended from both hind legs. Thereafter, the carcasses were manually quartered using a disinfected knife into the following cuts: legs, shoulders, loin, sirloin, rib, brisket and neck. On the other hand, 12 unskinned carcasses (6 male and 6 female) of each evisceration group were left to ripen at 10 °C in another ageing room, suspended from the hind legs and separated an adequate distance so as not to touch each other. Within each group, 6 carcasses (3 male and 3 female) were aged for 24 h, and another 6 carcasses (3 male and 3 female) for 72 h. After ageing, carcasses were skinned and quartered into the cuts described above. The *longissimus dorsi* muscle of each carcass was removed immediately after quartering, for subsequent analysis.

2.2. Deer morphological parameters

Deer developmental status was determined morphologically by means of a set of biometric measurements on the carcass: head-trunk length, i.e. from the head to the end of the spine; thoracic girth; skinned carcass weight; skin weight; and extracted loin weight. The kidney fat index, i.e. perirenal fat weight divided by kidney weight and multiplied by 100, was also recorded as an indicator of nutritional status (Finger, Brisbin, & Smith, 1981).

2.3. Samples

The *Longissimus dorsi* muscle (loin) from each carcass was divided into three sections for microbiological, physicochemical and sensory analysis. A sample from the cranial portion of the loin, weighing around 200 g, was used for physicochemical analysis. A steak around 2 cm thick was then cut for microbiological analysis. The central portion, weighing roughly 600 g, was divided into two for duplicate sensory analysis. All loin portions for physicochemical and sensory analysis were wrapped in domestic food-grade transparent plastic (low-density polyethylene, moisture barrier; ITS, Apeldoorn, The Netherlands) and covered with aluminium foil. Samples used for microbiological testing were placed in sterile bags. The Samples were clearly tagged and transported to the laboratory in portable fridges at 4 °C. Samples for microbiological testing were kept frozen at −80 °C pending analysis. Samples for physicochemical testing (except pH measurement, pressure-induced weight loss determination and colour analysis) were ground using a blender, stored in airtight containers and kept frozen at −20 °C pending analysis. Samples for sensory analysis were stored at −20 °C.

2.4. Aerobic bacteria

10 g of meat sample was weighed into stomacher bags (IUL-Instruments Masticator) and homogenised for 2 min in 90 ml autoclaved 2% sodium citrate solution (w/v) (Panreac). A decimal dilution series was performed. Total aerobic mesophilic bacteria were analysed on Plate Count Agar (PCA) (Difco) by incubation for 72 h at 30 °C (APHA, 1976). Samples were analysed in duplicate.

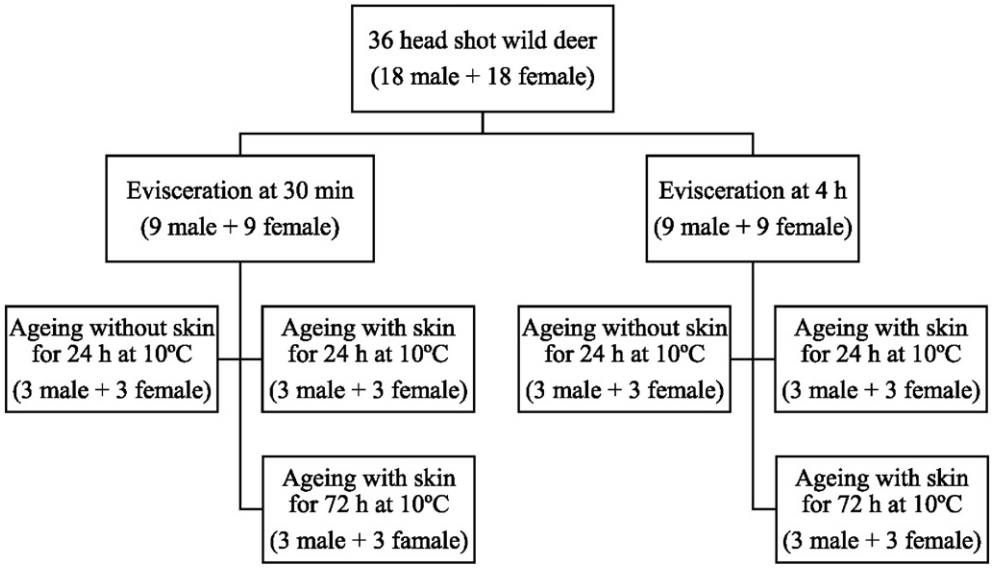

Fig. 1. Experimental outlay of the deer used in the study with different evisceration times and carcass ageing methods.