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Sensory profiling of Egyptian goose (*Alopochen aegyptiacus*) meat

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ABSTRACT

No sensory profile information is available for Egyptian goose (*Alopochen aegyptiacus*) meat. The aim of this study was to conduct descriptive analysis in order to establish the sensory attributes of the breast portion of this species. Meat from guineafowl, Pekin duck, ostrich and broiler chicken were used as reference species. Egyptian goose meat had a very intense game aroma, game flavour and metallic aftertaste, mainly attributable to the muscle's high percentage of polyunsaturated fatty acids and Fe. Egyptian goose meat was also low in tenderness and high residue; this may be due to the high level of physical exercise endured by the breast muscle. Egyptian goose meat proved to be similar to ostrich meat regarding appearance (dark, red colour) and low tenderness, but differed from guineafowl and broiler chicken, the latter two meat types illustrated a higher degree of juiciness and tenderness. These results of Egyptian goose meat can now be used for further sensory studies as it is important to also establish the influence of extrinsic factors such as season and gender on the meat quality of this waterfowl species.

1. Introduction

Globally, unusual animal species have been increasingly utilised as valuable sources of meat (Hoffman & Cawthorn, 2012; Hoffman & Wiklund, 2006). Irrespective of its contribution to human nutrition, the consumption thereof is becoming popular amongst modern day consumers. These unconventional meat sources include a wide variety of wild bird species, especially those that are either widespread or considered to be agricultural pests. However, the significance of these meat sources has been overlooked particularly in rural Southern Africa.

The Egyptian goose, a waterfowl species, is native to Africa south of the Sahara and the Nile Valley. In South Africa Egyptian geese are found in regions with inland water, along the coastline and in close proximity to croplands that they utilize for foraging (Viljoen, 2005). Egyptian geese are renowned for flying great distances. This species is also one of the leading gamebirds hunted in South Africa (Viljoen, 2005). The research by Mangnall and Crowe (2001, 2002) and Viljoen (2005) stresses the fact that population numbers have increased considerably and are still rising, especially in the Western Cape, South Africa. Consequently, farmers suffer financial losses due to damage on croplands. This situation could, however, be beneficial to farmers as wingshooting of this gamebird could provide farmers with an additional income if the meat is sufficiently utilized (Mangnall & Crowe, 2001).

Another common gamebird is the guineafowl (*Numida meleagris*). Guineafowl is considered to be the most abundant gamebirds in South Africa (Little & Crowe, 2011; Viljoen, 2005) and is also well known for being used in traditional cooking. Contrary to gamebirds, domestic birds such as ostrich, Pekin duck and broiler chicken are mainly farmed with for meat production. Scientific-based knowledge regarding the quality of gamebird meat is limited and it is therefore important to gain insight into the full sensory profile thereof. Especially since the gamebird industry in South Africa is becoming more viable. (Geldenhuys, Hoffman, & Muller, 2013a). There are a limited number of studies in which the sensory characteristics of meat from different species are compared (Rodbotten, Kubberod, Lea, & Ueland, 2004). Shahidi (1998) describes that several of the flavour volatiles, which occur in meat from different species, are in fact similar; however, the quantity thereof varies from species to species. Sensory reference standards could therefore be valuable tools when characterizing the sensory profile of a product such as Egyptian goose meat. Reference standards may be food products, chemicals or other substances and are used to communicate the concept of product attributes, thus ensuring that sensory panellists have the same understanding of the nature of a sensory attribute (Drake & Civille, 2002). Ostrich and Egyptian geese are similar with regard to the appearance of the meat; both having dark, red meat. Pekin ducks and Egyptian geese are both waterfowl species; however, the former is a domestic bird while the latter is a gamebird. Broiler chicken meat is regarded as having the least variation in terms of quality and is therefore considered to be a good reference standard when conducting sensory analysis of meat. This is due to the genetic selection and controlled environment under which domesticated animals such as broiler chickens are reared, resulting in a decrease in the intrinsic variation of the sensory attributes.

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The diet of Egyptian geese is mainly forage-based, consisting of growing crops, green plants, aquatic vegetation, invertebrates and insects (Viljoen, 2005). Guineafowl forage on bulbs and stems of plants, grass seeds, harvested grains, maize, as well as insects (Little & Crowe, 2011). Domestic species such as Pekin duck, ostrich and broiler chicken usually receive a standard commercial feed.

The physical and chemical characteristics of meat influence the sensory profile thereof, and it is widely regarded that the fatty acid composition of the diet can have a major influence on the flavour of meat (Calkins & Hodgen, 2007; Hornstein & Crowe, 1960, 1963; Mottram, 1998; Wood et al., 2003). In addition, the presence of certain minerals such as iron could also have an effect on the flavour of meat (Yancey et al., 2006). For instance, high iron content in meat has been linked to a metallic/livery flavour. Furthermore, when comparing game and domestic birds, the extent of physical exercise the different species are subjected to will have a direct influence on the sensory quality of the meat, mainly due to the difference in muscle constituents of active and inactive animals (Lawrie & Ledward, 2006). By investigating all the influential factors, i.e. chemical and physical, it is possible to conduct regression analysis to determine which of the latter intrinsic chemical and physical attributes predict specific sensory attributes of Egyptian goose meat. This will provide the necessary insight to understand the factors driving the sensory quality of meat.

In view of this, the objective of this study was to fingerprint and describe the sensory profile of Egyptian goose meat in comparison to other well-established species which are consumed on a regular basis in South Africa. The sensory, physical and proximate characteristics, together with the fatty acids and minerals, were determined, where after multivariate analyses were conducted to determine the drivers of sensory meat quality, as well as to quantify the potential of Egyptian goose meat for the meat industry.

2. Materials and methods

2.1. Experimental layout, sampling and slaughtering

The experimental layout is indicated in Table 1. The design consisted of six meat treatments which included the breast portion of Egyptian geese, guineafowl, Pekin duck and broiler chicken together with ostrich fan fillet (*Musculus iliofibularis*) and ostrich moon steak (*Musculus femorotibialis*). There were six samples per treatment. The different species and muscles were selected based on the fact that this is a descriptive study and that the samples should be representative of each species. As such, the extrinsic (diet etc.) and intrinsic (muscle differences) factors that may be influential are recognized and accepted as being characteristic of each sample.

The gamebirds Egyptian geese (*Alopochen egyptiacus*) and guineafowl (*N. meleagris*) were harvested during August 2010 on Mariendahl Agricultural Experimental Farm, Western Cape, South Africa (−33° 51′ 1.9074″; 18° 49′ 21.1476″). A double barrelled shotgun was used during the wingshooting activities (ethical clearance reference number: 10NP_HOF01). The geese and guineafowl were collected in the field and placed in a refrigerator (4 °C) over-night (±12 h) where after the slaughtering procedures were carried out manually as described by Geldenhuys, Hoffman, and Muller (2013b). The broiler chicken carcasses were slaughtered according to the acceptable standard slaughtering methods used for commercial chickens (Department of Agriculture, Forestry and Fisheries (DAFF) [DAFF], 2006). The breasts (M. pectoralis) were removed from the respective bird carcasses and each meat sample was individually vacuum-packed in a polystyrene bag and frozen at −18 °C for approximately 6 weeks. The Pekin duck breasts (*M. pectoralis*), ostrich fan fillets (*M. iliofibularis*) and moon steaks (*M. femorotibialis*) were sourced from commercial producers and also frozen at −18 °C for approximately 6 weeks. Sensory analysis was performed on the right breast (M. pectoralis) of the carcass, while the physical measurements were performed on the left breast. The two portions used for the analyses were treated as an entity and cooked together. Two strips were removed down the centre of the cooked ostrich fan fillet (*M. iliofibularis*) and moon steak (*M. femorotibialis*) samples, one of which was used for the sensory analysis and the other for the instrumental measurements.

Four reference standards were also prepared and used during the training phase of descriptive sensory analysis (Corollaro et al., 2013). The reference standards included commercial free range chicken, beef sirloin, beef rump, as well as the longissimus dorsi muscle of locally harvested blesbok (*Damaliscus pygargus phillipsi* — a free ranging wild ungulate). The reference samples enabled the panellists to calibrate their sensory perception during the training sessions, thereby allowing them to recognize and score all of the attributes tested in the respective meat samples.

Table 1
Sample set and experimental units.

Meat treatments	Cuts used	Number of birds analysed
Egyptian goose	Breast	6
Guinaefowl	Breast	6
Pekin duck	Breast	6
Ostrich	Fan fillet	6
Ostrich	Moon steak	6
Broiler chicken	Breast	6

2.2. Sample preparation

Sensory analysis was conducted on the six meat treatments (six different muscles/species) with six replications per treatment. The samples were randomly selected for each of the six replications. The vacuum-packed, frozen meat samples were thawed for 36 h in a refrigerator (4 °C) prior to each of the pre-determined sensory analysis sessions. The two breast meat samples of each bird were treated as one entity and placed together inside in an oven bag (Glad®), while one ostrich fan fillet and ostrich moon steak sample were placed in separate oven bags, respectively. No salt (NaCl) or any other seasoning was added to any of the meat treatments throughout the sensory analyses. The oven bags and meat samples were then placed on stainless steel grids which were fitted on an oven roasting pan. Thermocouple probes attached to a handheld digital temperature monitor (Hanna Instruments, South Africa) were placed in the centre of each of the meat samples (AMSA, 1995). The prepared samples were then placed in two conventional ovens (Defy, Model 835), pre-heated to 160 °C (AMSA, 1995). The ovens were connected to a computerized monitoring system responsible for regulation of the temperature (Viljoen, Muller, De Swardt, Sadie, & Vosloo, 2001). The meat samples were removed from the oven when a core temperature of 75 °C was reached (AMSA, 1995). The samples were cooled for 15 min where after they were cut into 1 cm × 1 cm cubes, individually wrapped in aluminium foil and placed into glass ramekins coded with randomized three-digit codes. The coded ramekins, each containing two wrapped meat cubes, were then placed in a preheated industrial oven (Hobart, France) at 100 °C for 10 min after which they were removed and immediately served to the sensory panel for analysis.

2.3. Descriptive sensory analysis

Descriptive sensory analysis (DSA) was performed on the six meat treatments (six different muscles/species). A panel of eight judges, based upon previous experience with sensory analysis of meat, was selected. The panellists were trained according to the guidelines for sensory analysis of meat by the American Meat Science Association (AMSA, 1995) and the generic descriptive sensory analysis technique as described by Lawless and Heymann (2010).