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MEAT QUALITY OF SEVEN WILD UNGULATE SPECIES

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OPSOMMING: DIE VLEISKWALITEIT VAN SEWE WILDSOORTE

Volwasse manlike blesbokke, elande, gemsbokke, rooi hartebeeste, rooibokke, springbokke en swart wildebeeste is twee-maandeliks geoes en die volgende vleiskwaliteitseienskappe vergelyk: vet- en vog-inhoud, kleur, taaiheid, spierveseldeursnee, intensiteit en aangenaamheid van smaak. Statisties betekenisvolle verskille tussen die soorte is vasgestel ten opsigte van die meeste vleiskwaliteitseienskappe. Die springbokke het in sommige van die kwaliteitstoetse beter as die ander spesies gevaar.

SUMMARY

Adult male blesbok, eland, gemsbok, red hartebeest, impala, springbok and black wildebeest were cropped bimonthly and meat quality tests carried out with regard to fat and moisture content, colour, tenderness, muscle fibre diameter, intensity and acceptability of flavour. Several statistically significant interspecies differences were established. The springbok venison was better in several tests than that of the other species.

Increasing attention is being paid to the quality of meat as living standards rise and this tendency is accentuated in game meat. Whereas game meat is a common and essential component of the human diet in some countries, it is considered a delicacy in highly developed countries and for this reason stronger emphasis is placed on the characteristic quality of different species. As meat quality is a vague description of a conglomerate of traits found in meat, it will for the purpose of this study be defined as including colour, tenderness, fat and moisture content, coarseness of grain, intensity and acceptability of flavour. Except for some notes by Smithers (1966) Ledger, Sachs & Smith (1967) and Glees (1967) the literature provides scant evidence on the meat quality of African wild ungulates. The present investigation was initiated to collect some of this information which is essential in game meat production.

Procedure

Adult males of seven species namely blesbok (*Damaliscus dorcas phillipsi*), eland (*Taurotragus oryx*), gemsbok (*Oryx gazella*), red hartebeest (*Alcelaphus beselaphus*), impala (*Aepyceros melampus*), springbok (*Antidorcas marsupialis marsupialis*) and black wildebeest (*Connochaetes gnou*) were cropped bimonthly and concurrently at the S.A. Lombard Nature Reserve in the Western Transvaal Highveld. The numbers which were cropped per species are presented in Table 1. Cropping was done by close range shooting from hides. The shot animals were immediately bled and transferred to the station's abattoir where they were dressed, allowed to hang overnight in a cool draughty room and then dissected.

Muscle fibre diameter was measured according to Joubert (1956) on a sample preserved in 10% formalin and taken from the *m. longissimus dorsi* at the fourth lumbar vertebra after the carcass had been dressed. A loin piece taken *in toto* and including the first three lumbar vertebrae was wrapped in a plastic bag and taken to the meat laboratory for overnight storage at 2°C. The following analyses were done taking sub-samples according to a strictly adhered to routine to eliminate differences related to the locality of the sub-sample: meat colour (modification of Hart, 1961), meat tenderness (Warner-Bratzler shear-tester with 1,25 cm core on meat fried to constant internal temperature) the result representing the mean of ten to twelve shear-tests, moisture content, fat content – petroleum ether extraction.

Intensity of flavour and acceptability of flavour were each scored out of 10 points as maximum by a panel. The panel consisted of seven to twelve persons who were selected according to results achieved on duplicate samples. The panel members tested numbered samples of 1 cm^3 which were cooked for 65 seconds in taste- and flavourless cooking oil at 125°C. Points (out of 10) were independently given for intensity and acceptability of flavour ignoring all other quality factors such as tenderness, coarseness or juiciness.

Results and discussion

The variation in numbers of species cropped, complicates the statistical interpretation of the data but, except for eland and gembsok, an adequate sample was collected for each species. All the animals were cropped at the same

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Table 1

Meat quality of seven wild ungulate species

	B	E	G	H	I	S	W			
	Blesbok	Eland	Gemsbok	Harte-beest	Impala	Springbok	Wilde-beest	Mean	Standard deviation	Significant differences
Number	23	6	3	12	18	72	23	157		
Moisture content (%)	75,5	75,8	76,9	76,3	75,7	74,7	77,0	75,5	1,35	WGHIB > S 0,01; W > IB 0,01; W > E 0,05;
Fat content (%)	1,7	2,4	1,9	2,0	1,4	1,7	2,3	1,8	1,03	W > SI 0,01; W > B 0,05; E > 0,05;
Colour (Kolorimeter unit)	7,95	5,98	6,03	6,88	7,39	7,34	7,21	7,30	0,57	BSI > GEH 0,01; HW > E 0,01; HW > G 0,05; B > ISW 0,01; I > W 0,05;
Fibre diameter (m)	53,8	66,3	69,0	52,6	56,7	45,5	53,9	51,0	3,15	GE > BHISW 0,01; BHIW > S 0,01;
Toughness (g/cm)	2323	3366	4088	2907	2751	1181	1805	1891	3,24	GEHI > WS 0,01; B > S 0,01; W > S 0,05; E > B 0,01; G > B 0,05;
Taste panel scores for flavour										
Number	11	3	0	6	9	36	10	75		
Intensity (out of 10 points)	4,93	4,38	–	4,10	4,04	4,24	4,50	4,35	0,80	B > HIS 0,05;
Acceptability (out of 10 points)	5,84	5,33	–	3,66	5,21	6,05	5,23	5,59	0,80	BEISW > H 0,01; S > IW 0,01;

Nature Reserve where they could move freely over the whole area. Any inter-species differences recorded can thus be ascribed to inherent species characteristics of meat quality and/or feeding habits and food preferences of the species. The effect of season on meat quality of wild ungulates will be investigated in another study. However, all species were cropped bimonthly over one year to obtain an annual mean. The species group means of the meat quality traits investigated and the statistically significant interspecies differences are furnished in Table 1.

Fat content

In agreement with Glees (1967) a low fat content was found in the *m. longissimus dorsi* of the seven species presently studied, although it should be mentioned that seasonal variations were observed within species. The relatively favourable fat content of the black wildebeest and eland should be noted, although the latter differed statistically in only one interspecies comparison because of the few eland cropped.

Moisture content

The data in Table 1 indicate that springbok meat had the lowest moisture content and differed significantly from all other species except the eland. Unfortunately it was not possible to determine the protein content of the meat samples, but by adding up moisture and fat content in Table 1 and subtracting from 100 the tentative suggestion could be made that the protein content of the springbok *longissimus* muscle could be somewhat higher than that of the other species.

Colour

It is interesting to note that analogous to a comparison between cattle and sheep the two largest species namely eland and gemsbok produced the lightest meat whereas the three smallest species had dark coloured meat. Whilst the meat colour of the other species ranged from a pale red to a darkish red brown the meat of impala had a different colour namely a redbrown brick colour and the meat of hartebeest had a characteristic bright cherry red colour. The existence of species differences in colour of fresh meat could be exploited to promote the sale of some specific venison. The consumer will, however, be more easily influenced by the colour of the prepared dish on which no objective data have been obtained and which could be modified by the manner of preparation. Incidental observations indicated that eland and gemsbok meat was pale when prepared as compared to the much darker meat obtained from blesbok, impala and springbok.

Muscle fibre diameter

Whereas the majority of the traits comprising meat quality can be modified by additives or ways of preparing

a dish, this does not apply to fibre thickness which determines the coarseness of grain and texture of the meat. The significant interspecies differences with regard to muscle fibre diameter as presented in Table 1 thus have an important bearing on meat quality as experienced by the consumer. The meritorious position of the springbok providing meat of finer grain than all the other species is noteworthy and could be one of the reasons for the high popularity of both springbok venison and biltong (air-dried meat). The eland and gemsbok, being by far the largest of the seven species cropped, as expected had the thickest muscle fibres of approximately 66 µm and 69 µm respectively compared to 45 µm in the springbok. This is in agreement with Joubert (1971) who found differences in muscle fibre diameter between the African elephant and lesser red musk shrew, which were however not in relation to the differences in body mass. In both studies muscle fibre diameter increased as carcass mass increased but not proportionately to the increase in carcass mass.

Tenderness

Tenderness is one of the most important quality factors and the low resistance offered to the shear-tests by fried springbok meat must strongly count in its favour. Ledger, Sachs & Smith (1967) remarked that game meat was not more tender or tough than meat of domestic animals of the same age. Although no such comparison has been made here, it is of importance that significant interspecies differences have been established with regard to meat tenderness (see Table 1).

Intensity of flavour

Only three statistically significant interspecies differences were recorded, all three at the P = 0,05 level. It can thus be deducted that the species did not differ much in this respect. This cannot be related to panel indifference as individual samples were scored from as low as 2,2 to more than 7,0 as an average of all members' scores.

Acceptability of flavour

The outstanding feature with regard to acceptability of flavour was that significant interspecies differences were apparent and that the meat of the red hartebeest was less acceptable than that of the other species. Although not statistically different from the blesbok and eland, the flavour of springbok venison again proved superior. In contrast to reports Smithers (1966), Glees (1967) and Ledger, Sachs & Smith (1967) no gamey taint or flavour was detected in any of the present samples tested. Properly bled and dressed game that has not been hung for long periods need therefore not have an offending taste. This at least is true for the six species tested by the panel and the odd sample of gemsbok.

Conclusions

Springbok meat fared best in the quality tests conducted, which is in agreement with the high esteem in which springbok venison is generally held. These results furthermore did not disqualify any of the species on trial, although some meat would seem to demand special care in preparation. The significant interspecies differences found are intriguing. This study does, however, not provide any explanation as to whether they resulted from differences in genetic make up and/or feed ingested. There are indications of seasonal fluctuations in meat composition and flavour within species implicating the latter, and these are the subject of further investigation. The existing species differences provide a platform for promoting the sale of different kinds of venison for a sophisticated market. Even the out of the ordinary flavour of the red hartebeest could be exploited as there is a ready demand for new dishes and delicacies.

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References

GLEES, A., 1967. Progress report on wild life utilization in Tanzania. July 1967. Project report FE 428.
HART, P.C., 1961. Tijdschr. Diergeneesk. 86, 340.
JOUBERT, D.M., 1956. J. agric. Sci., Camb. 47, 59.
JOUBERT, D.M., 1971. Agroanimalia, 3, 113.
LEDGER, H.P., SACHS, R. & SMITH, N.S., 1967. Wld Rev. Anim. Prod. 3, 13.
SMITHERS, R.H.N., 1966. The mammals of Rhodesia, Zambia and Malawi. London: Collins.