S.-Afr.Tydskr.Veek.,1991, 21(4)

Comparison of the voluntary feed and water intake between springbok and sheep under captive conditions

F. Vorster*
Jonkershoek Nature Conservation Station, Private Bag 5014, Stellenbosch 7599, Republic of South Africa

R.C. Bigalke
Department of Nature Conservation, Faculty of Forestry University of Stellenbosch, Stellenbosch 7599, Republic of South Africa

* Author to whom correspondence should be addressed

Received 9 October 1990; revised 30 April 1991; accepted 6 June 1991

The voluntary feed and water intake by springbok (*Antidorcas marsupialis*) and two breeds of sheep (*Ovis* spp.) were investigated by means of trials conducted in pens. The dry-matter intake (g DM/kg $W^{0,75}$/d) by the respective animals was as follows: springbok 90,5; Dorper 82,4; and Merino 88,6. These differences were not statistically significant ($P < 0,01$). In terms of stock units the sheep: springbok ratio given in the literature is 1:2,4 which compares favourably with the ratio of 1:2,1 which was derived from dry-matter intake. Water intake by the springbok was significantly ($P < 0,01$) less than by either breed of sheep. The volume of water taken in (ml/g DM/d) by the respective animals was as follows: springbok 1,9; Dorper 2,7; Merino 2,9.

Vrywillige voer- en waterinname deur springbokke (*Antidorcas marsupialis*) en twee skaaprasse (*Ovis* spp.) is deur middel van hokproewe ondersoek. Die droë-materiaalinname (g DM/kg $W^{0,75}$/d) van die onderskeie diere was soos volg: springbok 90,5; Dorper 82,4; en Merino 88,6. Hierdie verskille was nie statisties-betekenisvol nie ($P < 0,01$). In terme van vee-eenhede word die skaap: springbok-verhouding in die literatuur as 1:2,4 aangegee wat gunstig vergelyk met 'n verhouding van 1:2,1 wat in terme van droë-materiaalinname verkry is. Die waterinname deur die springbokke was betekenisvol ($P < 0,01$) minder as dié deur beide die skaaprasse. Die volume water gedrink (ml/g DM/d) deur die onderskeie diere was soos volg: springbok 1,9; Dorper 2,7; Merino 2,9.

Keywords: Springbok, sheep, feed intake, water intake, captivity.

In comparison with the stock farmer, the game farmer is handicapped by a relative paucity of scientific knowledge required to manage his undertaking successfully. The nutrition of game, for instance, is one such aspect that needs attention. Much of what is known about the nutritional requirements of domesticated ruminants would be advantageous to game farmers were it possible to apply this knowledge to game. In the Karoo region of the Cape Province, springbok (*Antidorcas marsupialis*) and sheep (*Ovis* spp.) occur together on many farms. It would therefore be of practical value to compare these two species with regard to certain aspects of their nutrition. Several studies have been undertaken to compare springbok and sheep with respect to diet (Liversidge, 1972; Davies, 1985), and behaviour and productivity (Davies, 1985; Fairall *et al.*, 1990). There is, however, no information available on

the comparative feed intake of these animals. In this investigation, the voluntary feed and water intake by springbok and two breeds of sheep (Dorper and Merino) were thus compared.

Three groups (viz. springbok, Dorper sheep and Merino sheep) of four animals were used for the trials. Free-roaming springbok rams were caught for the feeding trials. The taming and keeping of the animals has fully been described by Vorster (1976). To determine and compare the feed and water intake, a balanced change-over experimental design was used according to the recommendations made by Patterson & Lucas (1962). Four pelleted rations with varying protein contents were fed (Table 1).

Table 1 Chemical composition of experimental rations on a moisture-free basis

	Component (%)					
Ration	Dry matter	Crude protein	Crude fibre	Ether extract	Ash	Nitrogen-free extract
A	92,22	14,64	23,45	3,01	9,23	41,90
B	92,60	13,49	28,19	2,52	8,04	40,37
C	92,50	12,55	25,98	2,56	8,15	43,26
D	92,85	10,70	28,67	2,46	6,98	44,04

The rations were offered to the animals on an *ad libitum* basis for an adaptation period of 13 days before voluntary feed and water intakes were determined during a nine-day trial. The differences in feed intake in terms of metabolic mass (g DM/kg $W^{0,75}$/d) between rations, animal species and sheep breeds (Table 2) were not significant ($P < 0,01$).

Table 2 Voluntary dry-matter intake by springbok and two breeds of sheep (g DM/kg $W^{0,75}$/d)

Animal species	Ration				Average ± *SE*
	A	B	C	D	
Springbok	92,7	89,2	88,4	91,6	90,5 ± 4,7*
Dorper	94,1	73,5	89,3	72,8	82,4 ± 5,8*
Merino	88,6	88,1	92,7	85,0	88,6 ± 4,3*
Average	91,8	83,6	90,1	83,1	87,2 ± 1,8

* Differences not significant ($P < 0,01$).

The springbok drank 2097 ± 363 ml of water per day while sheep drank 6625 ± 1907 ml.

When comparing the daily water intake per gram dry-matter intake (Table 3), it is evident that the springbok drank significantly ($P < 0,01$) less water than either of the sheep breeds. However, the difference in water intake between the breeds of sheep was not significant.

Tamed wild animals were used and it was therefore necessary to pay special attention to the stress factor. It is a reasonable assumption that the springbok would have become tamer during the six-month investigation and that stress factors may have fluctuated. Such conditions would, however, have led to large variations in feed intake. The average dry-matter intake

Table 3 Volume of water drunk by springbok and two breeds of sheep (ml H_2O/g DM intake/d)

Animal species	Ration				Average ± *SE*
	A	B	C	D	
Springbok	1,8	1,9	2,0	1,9	1,9 ± 0,1*
Dorper	2,9	2,8	2,7	2,5	2,7 ± 0,3
Merino	3,1	3,0	2,7	2,8	2,9 ± 0,1
Average	2,6	2,6	2,4	2,4	2,5 ± 0,1

* Difference significant ($P < 0,01$).

(g DM/kg $W^{0,75}$/d) during the four periods was 94,6, 90,5, 87,3, and 89,6 g by the springbok and 91,3, 80,0, 91,0, and 78,9 g by the sheep, respectively. In the case of the springbok, these differences were not significant ($P < 0,01$) and are similar in magnitude to those of the sheep. The coefficient of variation for the springbok was 10,3%, for the Dorper sheep 14,1% and 9,7% in the case of the Merino sheep. Steyn (1968) determined the intake of pelleted hay by three breeds of sheep which showed a coefficient of variation of 12,2%. Comparable figures were also achieved by Crampton *et al.* (1960), viz. 13,0%.

The standard error of the dry-matter intake recorded for the springbok (Table 2) is also similar to the standard errors calculated for the sheep. Steyn (1968), for example, in a similar trial, calculated a standard error of ± 6,3 g DM/kg $W^{0,75}$/d for this variable. It is therefore concluded that the springbok were suitable experimental subjects and that the requirements set for intake trials were adequately met.

To make a meaningful interpretation of the results, it is necessary to mention a few factors that could have influenced feed intake. Trials conducted in pens lead to a diminished feed intake (Osuji, 1974) and might exclude potential differences in grazing behaviour (Davies & Skinner, 1986). In order to prevent selection, the feed was pelleted. This in turn may have led to an increase in intake (Van Niekerk *et al.*, 1973). Springbok have a smaller body size and consequently a higher need for energy intake relative to their gastro-intestinal capacity than sheep (Van Soest, 1982). As a result, the springbok were expected to take in more feed than the sheep as selection for a more nutritious diet was not possible. Although the mean intake of the springbok was 8,06 g DM/kg $W^{0,75}$/d and 1,89 g DM/kg $W^{0,75}$/d more than that of the Dorper and Merino sheep respectively, these differences were not significant.

The amount of plant material which an animal consumes has important implications when grazing capacity of natural veld is discussed. Animals may be classified into large stock units (LSU) on the basis of voluntary feed intake (Meissner *et al.*, 1983). According to this system, the mass of the sheep used in this trial (84,3 kg) corresponds with the mean of the woolled-sheep rams (64,0 kg) and dual-purpose sheep rams (105,5 kg). The LSU equivalent for sheep rams corresponding to this mass is given as 0,22 LSU and for springbok (30,3 kg) as 0,09 LSU. According to this, the sheep:springbok ratio is 1:2,4 which is in good agreement with the ratio of 1:2,1 calculated from the dry-matter intakes determined in this investigation, viz. 2 377 g DM/d for the sheep and 1 120 g DM/d for the springbok.

From this, it is clear that acceptable norms were used to calculate the LSU equivalent for springbok (Meissner *et al.*, 1983). This is true only under comparable circumstances such as those which prevailed during this trial for the two species concerned. A wide variety of other factors must also be taken into account when the stocking rate of different kinds of animals are compared (Meissner, 1982; Bothma, 1986; Liversidge, 1986).

The springbok is generally described as a desert-adapted animal and Skead (1980) has suggested that it can survive without free water. Greenwald (1967), however, proved that springbok cannot stay alive without water when offered only dry feed. Springbok have a relatively deep kidney medulla, which theoretically allows them to excrete a more concentrated urine (Hofmeyr & Louw, 1987). It was also found that springbok excrete drier faeces than the domesticated goat under comparable conditions (Greenwald, 1967).

In this trial the animals were not exposed to extreme temperatures and drinking water was always available. It was therefore not necessary for the springbok to make physiological adaptations to conserve water. The fact that the springbok drank significantly less water than the sheep suggests that these mechanisms were always functioning and that they may play a more important role under extreme conditions.

We thank Dr F.J. van der Merwe, Prof. H. Heydenrych, Dr N. Fairall and the staff of the Vrolijkheid Nature Conservjtion Station for their contribution. The Chief Director, Chief Directorate Nature and Environmental Conservation of the Cape Provincial Administration, is thanked for the permission to publish the information.

References

BOTHMA, J. DU P., 1986. Wildplaasbestuur. Red. Bothma, J. du P., J.L. van Schaik (Edms) Bpk., Pretoria.

CRAMPTON, E.W., DONEFER, E. & LLOYD, L.E., 1960. A nutritive value index for forages. *J. Anim. Sci.* 19, 538.

DAVIES, R.A.G., 1985. A comparison of springbok, *Antidorcas marsupialis*, and Merino sheep, *Ovis aries*, on Karoo veld. M.Sc. dissertation, University of Pretoria, Pretoria.

DAVIES, R.A.G. & SKINNER, J.D., 1986. Temporal activity patterns of springbok, *Antidorcas marsupialis*, and Merino sheep, *Ovis aries*, during a Karoo drought. *Trans. Roy. Soc. S. Afr.* 46, 133.

GREENWALD, L.I., 1967. Water economy of the desert dwelling springbok (*Antidorcas marsupialis*). M.Sc. (Zool.) dissertation, Syracuse University, Syracuse, USA.

FAIRALL, N., JOOSTE, J.F. & CONROY, A.M., 1990. Biological evaluation of a springbok-farming enterprise. *S. Afr. J. Wildl. Res.* 20, 73.

HOFMEYR, M.D. & LOUW, G.N., 1987. Thermoregulation, pelage conductance and renal function in the desert-adapted springbok, *Antidorcas marsupialis*. *J. Arid Environs.* 13, 137.

LIVERSIDGE, R., 1972. Grasses grazed by springbok and sheep. *Proc. Grassld. Soc. S. Afr.* 7, 32.

LIVERSIDGE, R., 1986. Carrying capacity and stocking rates. *Farmer's Weekly* No. 76025.

MEISSNER, H.H., 1982. Theory and application of a method to calculate forage intake of wild southern African ungulates for purpose of estimating carrying capacity. *S. Afr. J. Wildl.* 12, 41.

MEISSNER, H.H., HOFMEYR, H.S., VAN RENSBURG, W.J. & PIENAAR, J.P., 1983. Classification of livestock for realistic prediction of substitution values in terms of a biologically defined Large Stock Unit. *Tech. Comm.* No. 79. Dept. Agric., Pretoria, Government Printer.

OSUJI, P.O., 1974. The physiology of eating and the energy expenditure of the ruminant at pasture. *J. Range Mgmt.* 27, 437.

PATTERSON, H.D. & LUCAS, H.L., 1962. Change-over designs. *N. C. Agric. Exp. Sta. Tech. Bull.* No. 147.

SKEAD, C.J., 1980. Historical mammal incidence in the Cape Province. Vol. 1: The western and northern Cape. Dept. of Nature and Environmental Conservation, Cape Provincial Administration, Cape Town.

STEYN, J.A., 1968. 'n Vergelyking van vier skaaprasse ten opsigte van verteervermoë, stikstofbenutting en vrywillige voerinname. M.Sc.(Agric)-verhandeling, Universiteit van Stellenbosch.

VAN NIEKERK, A.I., GREENHALGH, J.F.D. & REID, G.W., 1973. Importance of palatability in determining the feed intake of sheep offered chopped and pelleted hay. *Br. J. Nutr.* 30, 95.

VAN SOEST, P., 1982. Nutritional ecology of the ruminant. Corvallis, Oregon, USA, O&B Books.

VORSTER, F., 1976. 'n Vergelyking tussen springbokke en skape ten opsigte van sekere voedingsaspekte. M.Sc.(Natuurbewaring)-verhandeling, Universiteit van Stellenbosch, Stellenbosch.