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## BREED DIFFERENCE IN WATER CONTENT OF FAECES FROM FIVE BREEDS OF SHEEP

By  
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One of the most striking differences in nutrition of herbivorous and omnivorous domestic stock is the large amount of intestinal waste excreted in the faeces of the former, the elimination of which requires water. In cattle for instance, the large losses of water in the faeces are of the same magnitude as the losses of urinary water (*Mitchell 1962*).

This is strikingly different from the water balance of omnivorous animals, for instance man and pig. By man the faecal loss is only 7 % of the urinary water. The excessive use of water by the herbivores in the elimination of faecal wastes is a function of the type of ration high in ballast which these animals consume.

There is a difference of water content in faeces between species of herbivores. For instance horses have an average water content of faeces of 70 % (*Leitch & Thomson 1944*), while figures for cattle on maintenance or higher levels are between 75 and 85 %. The loss of water through faeces may be of importance for the water economy of animals in marginal areas. The physiological adaptation to water restriction has been intensively studied in desert rodents, particularly the Kangaroo rat, and it has been shown that this animal on the same diet excretes faeces with 45 % moisture as compared with 68 % for the white rat (*Schmidt Nielsen & Schmidt Nielsen 1952*).

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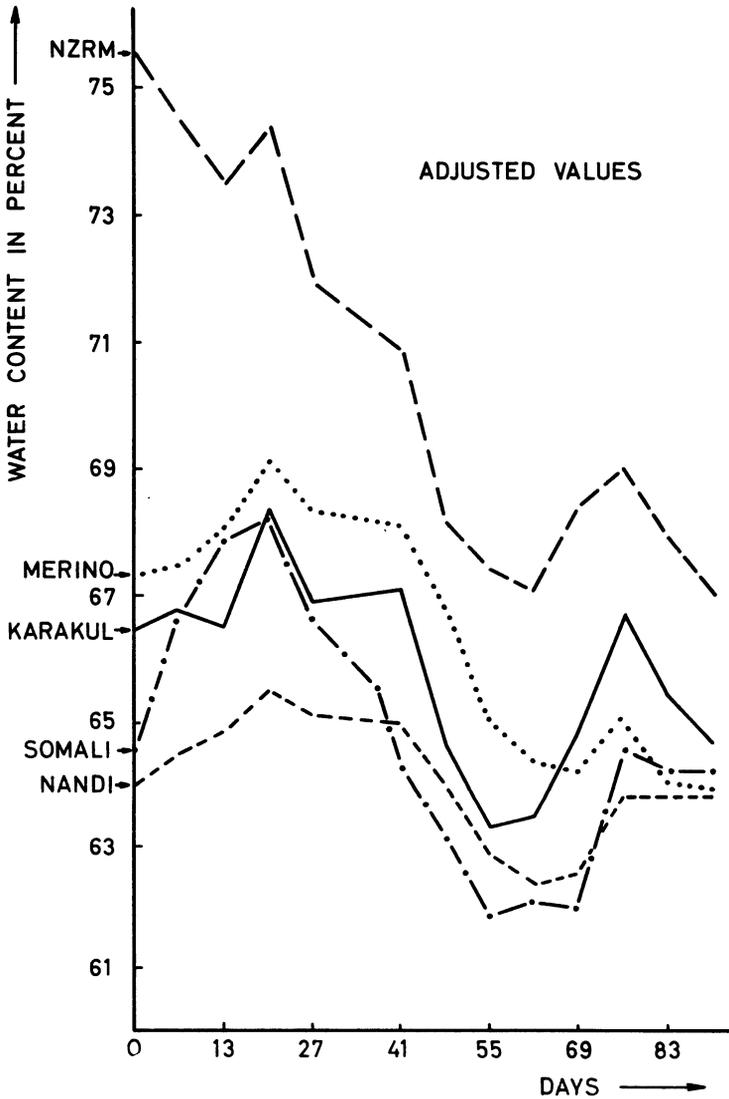


Figure 1. Water content in faeces from five breeds of sheep.

Some breeds of one species seem to be better adapted to a particular environment than other breeds. *Payne* (1963) for instance seems to indicate that Boran cattle are better adapted to the very dry districts of Kenya and other arid and semi-arid areas than for instance exotic cattle. According to *Payne* animals can partly adapt themselves to such an environment by exer-

cising economy in water expenditure at three different procedures: (a) reduction in urine output, (b) reduction in the moisture of the faeces and (c) reduction in evaporation losses. Likewise, Somali sheep seem better adapted to semi-arid areas than British mutton breeds.

Merino is better adapted than Corriedale, Southdown or Columbia (*Lee 1950*).

#### MATERIAL AND METHODS

The observations were made in sheep from the five breeds — Somali, Merino, Nandi and Karakul and New Zealand Romney Marsh during the period 9. Dec. 1966—16. March 1967. The animals which were used primarily for investigations of oestrus in different breeds of sheep were kept on the same pasture. They were given no additional food with exception of salt lick. Treatment for internal parasites were given in the ordinary way, to all sheep.

Faeces samples were collected weekly at the weighing day, from the same eight sheep of each breed. The samples were taken directly from rectum and placed in water-tight boxes, brought to the laboratory, weighed, dried at 100°C until constant weight, and weighed again.

Meteorological observations were provided from the E. A. Meteorological Department and unfortunately were not taken on the spot in 1966. There was no precipitation during January and most of February 1967. The precipitation in March was 360 mm.

#### RESULTS

For all breeds there is a steady fall in water content in faeces during the period with no precipitation, 20—60th day of observation (Fig. 1). The water content in faeces seems to be positively correlated to the precipitation.

Table 1 further shows that there is a significant higher average water content in faeces from Romney Marsh than from the other breeds. The curves given in Fig. 1 are based on adjusted percentages being the average of the noted date, the preceding and following date.

The percentages given vary from one week to the other during the investigation, but the water content in faeces of Romney Marsh is constantly higher than in other breeds.

Table 1. Average water content in faeces in five breeds during the observation period.

Breed	Number of samples	Average water percentage in faeces
Somali	111	64.45 ± 0.58
Nandi	109	64.06 ± 0.31
Karakul	105	65.44 ± 0.62
Merino	106	65.45 ± 0.48
New Zealand Romney Marsh	100	70.24 ± 0.51
Total	531	65.86 ± 0.25

From Table 2, it will be seen that there is a highly significant difference in water content of faeces both between breeds and between dates, while there is no interaction between breeds and dates.

Table 2. Analysis of variance of water content in faeces of five breeds at one week's intervals.

Sources of variation	Degree of freedom	Sum of squares	Mean squares	F values
Total	530	17163.4		
Between breeds	4	2522.0	630.5	25.8 P<0.005
Between dates	13	2471.0	190.1	7.8 P<0.005
Interaction	52	929.2	17.8	
Within cells	461	11241.2	24.4	

## DISCUSSION

The observations show a significant difference in water content of faeces between Romney Marsh and the other breeds. As determinations were made on eight sheep of each breed and the difference was constant throughout the observation period, a real difference may exist. According to *Budtz Olsen et al.* (1961): The merino is a desert animal in its drought and heat resistance, whereas the Romney Marsh will only thrive in temperate and reasonably humid climates. Also Somali and Karakul are breeds which more or less have their origin in dry areas. On the other hand Nandi is a slowly growing fattail-sheep from an area with a medium to high precipitation. The common character of these breeds compared with Romney Marsh is their slower growth rate.

*Bianca et al.* (1965) have studied responses of steers to water restriction and found that a greater relative water conservation occurred in the faeces which became drier and less in quantity. Water loss in faeces was 23 % on the 4th day of water deprivation, while loss in urine was 53 % of normal. According to *Payne* (1963) the first responses to a decrease in the nutritive value of the feed, with a consequent decrease in voluntary water intake, was an increase in the percentage of urine and faeces losses relative to water intake. With a further decrease in nutritive value of the feed and in voluntary water intake, the animals responded with a decrease in urine output and a smaller decrease in output of faeces. When the animals were deprived of water for 96 hrs., there was a further small decrease in urine output and a larger decrease in faecal output.

*Riek et al.* (1950) stress that a high plane diet reduces the heat tolerance and that the Merino is better adapted to dry heat conditions than Corriedales. It is also known that differences in fibre content, protein etc. influence dry matter content and water elimination in faeces (*Leitch & Thomson* 1944). This may also to some extent have been the case with our sheep on the same pasture. Plant selection may have been different.

*English* (1966) studied water metabolism in sheep with restricted water intake and found a reduction of urine volume responsible for saving more water than the decrease in faeces water content. His figures show an important saving of water through faeces and that the water content of normal faeces varied with the individual sheep.

*Budtz Olsen et al.* are of the opinion that Merino's superiority as a desert animal is primarily due to its better water saving by excellent kidney concentration. They found that the average percentage of total body water was 62.7 % of shorn body weight in Merino, compared with 68 % in the Romney Marsh.

In twin experiments *Bos indicus* appeared to be able to reduce both urine and faeces water output better than *Bos taurus*, this would appear to be one reason why *Bos indicus* thrive better than *Bos taurus* cattle in semi-arid environment (*Payne* 1963).

The last two papers quoted may indicate that there is a higher dry matter content in tissues as well as in excreted from ruminants adapted to semi-arid areas, but the present observations cannot provide evidence.

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## SUMMARY

Water content of faeces from five breeds was examined (14 weekly observations — eight sheep of each breed). A higher water content was found of faeces from New Zealand Romney Marsh than from their pasture mates of breeds originating from drier areas — Somali, Merino, Karakul; but Nandi originating from a medium to wet area had a similar dry matter content of faeces as the dry area breeds mentioned above. The growth rate in New Zealand Romney Marsh is greater than in the other breeds.

## SAMMENDRAG

*Forskjell mellom saueraser i vanninnhold i faeces.*

Vanninnholdet i faeces fra 5 forskjellige saueraser ble undersøkt med ukentlige bestemmelser fra hver rase. Det ble funnet et signifikant høyere vanninnhold i faeces fra Romney Marsh enn fra sauer av rasene Somali, Merino, Karakul og Nandi som gikk på samme beiter. Bortsett fra Nandi stammer disse raser fra områder med tørt klima. Nandi stammer på den annen side fra et middels fuktig til fuktig område. Veksthastighet og utvikling er betydelig langsommere i de andre raser enn i Romney Marsh.

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