Ostriches can thrive

Little detail is known about ostrich nutrition, although their production is increasingly common. Studies in South Africa are being done to fill in the gaps of our knowledge. Their remarkable ability to adapt to high fibre diets is explored.

By Tertius Brand

Like pigs and poultry, ostriches are monogastric animals. Ostriches are herbivores (plant-eaters) and their digestive systems have adjusted to cope with large amounts of low quality, fibre-rich plant material (roughage) (Angel, 1996). Milton et al (1994) found that wild ostriches select a diet that contains up to 24% crude fibre. The significant role played by the hindgut of non-ruminants in fermentation is, however, sometimes ignored or underestimated by nutritionists (Van Soest, 1987).

The digestive tract capacity of three common farm animal species, chickens, pigs and ostriches, are compared graphically in Figure 1. It is clear that the lower digestive tract of an ostrich is much larger than that of poultry or pigs in relation to the total digestive tract. This larger lower digestive tract is directly associated with the ability of an animal to digest fibrous materials. The lower digestive tract (colon or large intestine plus caecum) of poultry, pigs (Getty, 1975) and ostriches (Bezuidenhout & Van Aswegen, 1990) constitutes about 11%, 21% and 61% of the total digestive tract of the different species respectively.

An important factor that influences the digestion of fibre by ostriches is age. Angel (1993) found that three-week old ostrich chicks digest 6.5% of the neutral-detergent fibre (NDF) in their diet, while mature animals (at 30 months) could digest 61.5%. In the same study Angel also found that ostriches are able to digest fibre as early as the age of 10 to 17 weeks (51.2 and 58.0% NDF digestion) almost as efficiently as mature birds (61.6% NDF digestion). Another important factor in the digestion of raw materials by farm animals is the retention time of the feed or rate of passage of the digesta. This is the time it takes for feed to move through the digestive tract of the animal. The longer the rate of passage, the more time there is for the actions of digestive enzymes and microbes, and the more material is digested. The retention time of feed for chickens, pigs and ostriches is presented in Table 1.

Energy value of feedstuffs

In order to compare the efficiency of digestion of diets for ostriches, pigs and chickens, a survey was conducted at the Ostrich Research Unit of the Elsenburg Agricultural Research Centre in South Africa in which nine diets with various crude fibre levels were fed to the three animal species (Brand et al., 2000a). The results are shown in Figure 2. The research clearly shows that ostriches consistently showed 20% higher energy values for the same diet compared to pigs. With the higher dietary fibre contents, ostriches had considerably higher metabolisable energy values for the same diets compared to poultry. The exceptional ability of ostriches to utilise lower quality raw materials better than pigs and chickens was clearly illustrated in this study.

It was also revealed from this study that the metabolisable energy content of ostrich diets and feedstuffs for ostriches can be predicted from dietary values for pigs and poultry by the following equations (Brand et al., 2000a):

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\text{TME ostrich (MJ/kg)} = 6.743 + 0.683 \text{ TME pig}
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\text{TME ostrich (MJ/kg)} = 9.936 + 0.326 \text{ TME poultry}
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Capacity of the large intestine

The ability of the ostrich to utilise lower quality raw materials was also clearly indicated by the pioneering work of Swart (1988). He indicated that the ostrich has the ability to digest both cellulose and hemicellulose. It was also established that ostriches could probably obtain 12% to 76% of their energy in the form of volatile fatty acids (the end product of the digestion of fibre-rich feed in the large intestine). With pigs, that are also able to digest fibre fractions (hemicellulose) to a certain extent, energy supply in the form of volatile fatty acids from the lower digestive tract may contribute 10% to 30% to their total energy requirements (Eggum et al., 1982). In contrast, the lower digestive tract of chickens does not supply any energy to the animal (Ensminger, 1992).

Another local study performed at the Ostrich Research Unit of the Elsenburg Agricultural Research Centre by Salih et al. (1998) illustrated that feeding of a high fibre containing diet at a young age (4 - 12 weeks) did not lead to a significant increase in the relative weight and length of the large intestines at that age (up to 12 weeks). At an age of 52 weeks, the length of the large intestine was, however, around 27% greater.
in birds consuming a high fibre diet than in those consuming a low fibre diet during the same period (Salih, 2000). Baltmanis et al (1997) similarly found that in animals fed with fibre-rich feed, the capacity of the colon is larger and that the type of diet offered affects the relative size of the lower digestive tract as well as the ability to obtain more nutrients from the diet. The study by Salih et al (1998) revealed that the amount of cellulolytic bacteria found in the large intestines of ostriches was only two to one fold ($10^2 - 10^3$) lower than the amounts found in the intestines of ruminants.

Ostriches may be birds, but their feeding is very different from that of poultry.

The study by Salih et al (1998) found that the use of high fibre diets significantly reduced the production performance of birds during the starter phase. During the grower and finisher phases it seems that the gradual morphological adaptation of the intestinal tract in birds fed high fibre diets allows for better utilisation of the available nutrients from these diets. In the study by Salih et al (1998), high-quality roughage (lucerne hay) was used in the diets, and feed conversion was not negatively affected by the high roughage level (from 12 to 52 weeks of age and 28–105 kg growth interval). In a study by Brand et al (2000b) where lower quality roughage (oat mid-
dlings with an ME content of 6.9 MJ ME/ kg DM and a CP content of roughly 5%) was used, birds on the low energy diets consume more feed relative to birds on higher energy diets. The slaughter birds in this study also used more feed per kilogram weight gain for the growth interval 4 to 11 months age (± 25–89 kg growth interval) when utilising lower energy-containing diets compared to the higher energy-containing diets.

Conclusions

The determination of the energy content of feedstuffs for ostriches is laborious, expensive and time consuming. These values are therefore not yet available for many raw materials. The use of prediction equations, derived from balanced diets, may in the meantime help to predict these values for ostriches from existing values for pigs and poultry. Recommendations for the energy requirements for ostriches differ widely and Janssens et al (1997), for example, documented a variation between 7.9 and 10.6 MJ ME per kg DM as dietary energy level for breeding birds. It is however clear from the literature as well as studies performed at Elsenburg Agricultural Research Centre’s Ostrich Research Unit that ostriches are able to utilise high fibre diets to a great extent after three months of age. This advantage is partly due to the adaption of the large intestine of the birds exposed to high fibre containing diets. Birds fed high fibre containing diets are also able to increase their dry matter intake to a certain extent to increase their energy intake to a required level (Gous, 2000).

The outstanding ability of the ostrich to utilise high fibre diets may therefore also be applied to optimise the use of pastures as feedstuff for ostriches, especially mature birds. Information on the intake and utilisation of different types of pasture by ostriches on a more intensive scale as well as the effect of concentrate supplementation on pasture intake and production is however non-existent at this stage. These aspects of ostrich nutrition will also be addressed in future research programs.●

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References


The digestive physiology of the ostrich can adapt to handle increasing dietary crude fibre, so pasture feeding is a viable option.