Digestibility of feeds for ruminants is commonly determined with sheep with the assumption that cattle and sheep have equal digestive capacity. This assumption is not fully proved by experimental results (Aerts et al., 1984). Terada et al. (1987) reported large differences in total digestible nutrient (TDN) content between cattle and sheep when they were given low protein diets. However, when sheep were fed diets containing more than 10% crude protein (CP), TDN content rose to the same level as that for cattle. Ruminants in the tropics tend to be fed low quality diets, and are considered to adapt to such low quality feed better than the ruminants in the temperate zone. This study compares the digestibility of nutrients and the effect of protein levels on fibre digestion between cattle and sheep in order to characterise protein and energy metabolisms of these animals in the tropics.

The study was carried out in Khon Kaen, Thailand. Six wethers and four castrated male Brahman cattle (average body weight 37.3 and 419 kg, respectively) were subjected to four dietary treatments. CP contents in the four dietary treatments were 3.4, 6.9, 10.4 and 13.9% by a supplement of soybean meal to Ruzi grass (brachiaria ruzzienis) hay (3.4% CP). The daily amount of feed was 1.7% of body weight. Each dietary treatment consisted of a 9-day preliminary period and a 5-day sampling period. The total feces and urine were collected over the five-day sampling period and subjected to chemical analysis.

Only cattle were subjected to a respiration trial. Oxygen consumption, and the productions of carbon dioxide and methane were measured with a ventilated flow-through method using a face mask during the last 4 days of the sampling period. These measurements were conducted 6 times, each 6-10 minutes in duration, per day using the following schedule: 0700, 1000, 1300, 1600, 1900, 2200 and 0100h. Heat production (HP, kJ) was calculated by the equation, HP = 16.18*O2 + 5.02*CO2 - 2.17*CH4 - 5.99*N, where O2, CO2 and CH4 represent volumes of oxygen consumed, carbon dioxide and methane produced (l) and N is the quantity of urinary nitrogen excreted (g) (Brouwer, 1965).

Crude fibre, neutral detergent fibre and acid detergent fibre digestibilities were greatly improved in sheep by supplement with soybean meal until CP content in the whole ration reached 10%. The difference was more than 10 unit in each fibre fraction. In cattle, fibre fraction digestibilities in the animals given Ruzi grass hay without soybean meal supplement were relatively high. The values were improved by the smallest amount of supplement (6.9% CP). Beyond this level, there was no effect of the supplement. CP digestibility was lower in sheep when no protein supplement was given, and was higher when high protein diets were given (10.4 and 13.9% CP). Nitrogen retention became larger according the levels of soybean meal supplement in both species and was significantly lower in sheep when lower protein diets were given (3.4 and 6.9 % CP). This was related to urinary nitrogen excretion.

TDN and digestible energy contents well represented the overall feature of the differences in nutrient digestibilities between sheep and cattle. At lower levels of soybean meal supplement, these values were lower in sheep than in cattle. While, at higher levels of the supplement, there were no differences between the species. Sheep are often used as a model animal for cattle in order to examine nutritive value of feed resources. The results suggest that in the design of feeding trials using sheep CP content of whole ration, in which a target feed resource is included, should be more than 10 %.

The respiration trial, Brahman cattle only, revealed that the ratio of metabolisable energy to gross energy (GE), i.e. metabolisability, was improved by the minimum supplement of soybean meal (6.9% CP), and that beyond this level, there was no effect on metabolisability. The ratios of energy loss into methane and heat production to GE were not affected by supplementation and averages of these values were 5.7 and 31.5 %, respectively.


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