

ABSTRACT

Ruminants are mammals which are able to acquire nutrients from forages by fermenting it in a specialized stomach prior to digestion, principally through microbial actions. The stomach of ruminants is similar in structure and content while the four chambered stomach is a peculiar characteristic of ruminants. The rumen houses three microorganisms that turn forage materials into food and they are bacteria, fungi and protozoa. Ruminants largely feed on plant structural carbohydrates (lignin, cellulose, and hemicellulose), which other animals are not able to utilise because of their inability to produce appropriate hydrolytic enzymes to generate energy. Three techniques involved in the evaluation of structural carbohydrate were *in vivo*, *in sacco* and *in vitro*. Goats, sheep and cattle were used to determine the roles of *in vivo*, *in sacco* and *in vitro* in the evaluation of structural carbohydrate. Since carbohydrate and protein are the main nutrients required for livestock, non-human competitive malted sorghum sprouts (carbohydrate) were fed to sheep performed in which the sheep performed better when 40% malted sorghum sprout and 60% soyabean haulm were combined for feeding. Legume crop residues treated with alkali from palm bunch ash, by-products of palm fruits, mineral solubility of *Panicum maximum* with four herbaceous forage mixtures, rumen epithelial layer and *Tephrosia candida* and *Leucaena leucocephala* with Guinea grass were degraded in the rumen for assessment of their nutritive value, which showed high nutrient release of the feedstuff. The *in vitro* technique is a veritable tool and was adopted to mimic the rumen environment for a number of indigenous feedstuff to determine their quality in terms of gas production included hydrogen, carbon dioxide and methane. In this study, estimation of direct and indirect gas production in syringes, a tool to estimate short chain fatty acids production requiring minimal laboratory facilities was developed. There were no outstanding differences in the gas production characteristics of total gas production, methane emission and short chain volatile fatty acids when compared with that of sophisticated equipment. The tool was uniquely used to estimate total gas production, metabolizable energy, organic matter digestibility, methane emission and short chain volatile acids in tropical browse trees, shrubs and pulse legumes, *Tephrosia candida* leaf and its mixtures with Guinea grass and spent tea leaf and selected forages in late dry and early wet seasons. Due to prolonged dry period in Nigeria, a number of browse shrubs, trees, water plants and improved pasture were studied. During grazing, ruminants walk long distances without the presence of herdsman. Cattle know the kind of forage they want and shall go for it even if the herdsman does not lead them into that direction. Ruminants are very selective but the selectivity depends on the hour of the day such that the forage rejected in the morning was eaten in the evening while those rejected in early wet season were accepted in the dry period.