The Effect of Supplementation with Fresh Browse of *Ziziphus mauritiana* or *Combretum aculeatum* on Feed Intake, Nitrogen Utilization and Growth of Grazing Range Sheep

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ABSTRACT

The influence of 0, 60 or 120 min access to a grove of either *Ziziphus mauritiana* (*Ziziphus*) or *Combretum aculeatum* (*Combretum*) on forage intake and on the digestibility, growth and excretion of nutrients was determined using 40 Oudah rams grazing for 7 h/day on poor-quality dry season pasture in the Sahel. The effects of browse species and browsing duration (0, 30, 60 or 120 min) on the ruminal ammonia content were also evaluated using 8 mature fistulated rams. *Ziziphus* increased both total digestible organic matter and total dry matter intakes per (kg live weight)0.75 without decreasing herbage intake, whereas 60 or 120 min access to *Combretum* reduced herbage intake by 6.3% and 4.2%, respectively. The digestibility of the diet decreased (p < 0.05) with the duration of access to the groves. Despite the provision of more nitrogen (N) than in the control diet, ruminal NH3-N decreased 24 h after browsing commenced. The reduced live weight gain of sheep browsing *Combretum* may indicate more deleterious compounds in *Combretum* than in *Ziziphus*. *Ziziphus* appears to have more potential than *Combretum* to increase sheep production in low-input crop/livestock systems.

Keywords: browse, digestibility, nutrition, pasture, ruminal ammonia, sheep

Abbreviations: DM, dry matter; DOM, digestible organic matter; FDM, faecal dry matter; LW, live weight; LWG, live weight gain; N, nitrogen; NDF, neutral detergent fibre

INTRODUCTION

Although the contribution of foliage from woody plants within natural forage resources is considered to be modest (Le Houérou, 1980; Piot *et al.*, 1980; Breman and de Ridder, 1991; Hiernaux *et al.*, 1994), such plants are often considered to be an important resource in the arid and semi-arid tropics, especially during the dry season. This is because many browse species retain some green foliage during part or all of the dry season (Hiernaux *et al.*, 1994), and because of the N content in the foliage and
other parts browsed by livestock (young twigs, flowers, pods), which remains high during the dry season when the dry herbage and crop residues have a concentration of N lower than 0.6%. Some local woody plants are propagated in agroforestry programmes as windbreaks or to protect soil from erosion, and also with the intention that they can contribute supplementary N to livestock during the dry season. In most nutritional trials, the foliage of woody plants is cut, dried and carried to the animals.

However, some studies have shown that many African browse species contain high levels of polyphenols (Reed et al., 1990), which may affect the intake and degradability of roughage (Tanner et al., 1990; Wiegand et al., 1995), the protein digestibility and nitrogen metabolism in ruminants (Woodward and Reed, 1989; Degen et al., 1995) and, subsequently, the animals' performance. The effect of phenolics can vary widely with the mode of administration of the woody plant, namely whether it is offered as sole feed or as a supplement to roughage (Reed et al., 1990; Girdhar et al., 1991; Degen et al., 1995; Kaiso et al., 1998), as green foliage (browsed on trees), or dried and/or treated in some way (Palmer and Schlink, 1992; Bonsi et al., 1995; Ahn et al., 1997).

This study was aimed at determining the effects of daily access by sheep to a browse grove of either Ziziphus mauritiana (Ziziphus) or Combretum aculeatum (Combretum), as a supplement to 7 h grazing on a poor-quality range during the dry season, on their intake, growth and cycling of nutrients.

MATERIALS AND METHODS

Site

The experiment was carried out during the dry season (January to March 1997), at the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) (13°15’N, 2°18’E), Niger, West Africa. The average annual rainfall is 560 mm and 95% of the rainfall occurs from May to September (Powell et al., 1998). During the rainy season prior to this experiment, the rainfall was 543.9 mm.

Treatments, animals and feeding

Forty Oudah rams, 15–18 months of age, with an average initial live weight (LW) of 23.8 kg (SD = 1.7), were allotted to five treatments in groups of 8. The experiment lasted 75 days. The treatments consisted of a factorial combination of three durations of access (0, 60 and 120 min) and two planted browse groves (Z. mauritiana or C. aculeatum). The control (Pn), with no access to the browsed groves, was common to the two experimental groups. The sheep were otherwise herded on natural pasture (basal diet) for 7 h per day (from 10:00 to 17:00) and were penned during the night from 17:00 to 08:00. They had free access to water available on the edges of the natural pasture and the groves, and to mineral blocks during the night.

The estimated herbage mass at the onset of the experiment was 2697 (±347 SE) kg/ha. Thirty-seven plant species were identified, of which 23 were dicotyledons and 14