

Relationships between goat foraging behaviour and pastoral value in High Bassin zone of Mandrare rangeland in Southern of Madagascar

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Introduction

Goats have particular anatomical behaviour for browsing leaves to satisfy their energy requirements. In rangelands, available shrubs, leaves and biomass resources influence ruminant's activities and rhythms such as foraging, walking, resting, ruminating and drinking. At semi-arid areas, this study aimed to determine how shrubs interact with pasture value to effect goat foraging behaviour.

Materials and Methods

At Ebelo-South Amboasary (24° 29' 0" South, 46° 2' 0" East), one ram, two castrated goats and three ewes were used to study ruminant foraging behaviour in pastoral zones with different structures. In rangelands, superficial monitoring repeated over an area of 400 m² was used to determine the modification of floristic features, such as species, floristic density and specific diversity using the methods of Hiernaux (1980). Preferential intake, phenological state and nutritive value of plants such as dry matter, crude protein, crude fibre and gross energy were carried out to estimate a species quality index. A pastoral value (PV) was then calculated as follows:

$$PV = \frac{1}{SI_{\max}} \times \sum SC_i \times SI_i$$

where: SI_m is maximum specific index in the permanent phytomass, SI_i is the specific quality index of plant i ; and SC_i is the Specific Contribution of plant species i in rangeland.

Foraging behaviour and bite rates were examined and recorded in native pasture over six days during two grazing periods (Period 1: September to October 2002 and Period 2: July to August 2003) according to methodology in rangeland (Le Houérou 1980; Bourbouze 1981; Meuret *et al.* 1985). The sequential recording involved five minutes per animal over thirty minutes during the dominant foraging time (08:30 – 11:00 and 13:00 – 15:30).

The data was subjected to analysis of variance (ANOVA) to estimate the significant difference between variables or individual data and Principal Component Analysis (PCA) was used to classify the rangeland characteristics with botanical composition and foraging

behaviour parameters.

Results and Discussion

In native rangelands, four pasture areas were identified with dominant plant species such as *Acacia farnesiana* (Site 1), *Poupartia caffra* (Site 2), *Kigelianthe madagascariensis* (Site 3) and *Rhigozum madagascariense* (Site 4). Their floristic density was low, between 100 and 658 plants per hectare ($P < 0.05$) according to Hiernaux (1980). Forty-two fodder species were identified and nutritive value was significantly different between species ($P < 0.05$) with dry matter (DM) ranging from 14 to 66%; crude protein between 82 and 227 g/kg DM; crude fibre from 144 to 488 g/kg DM and gross energy between 3367 and 4998 kcal/kg DM according to Skerman (1990).

The pastureland of low altitude had a higher pastoral value (24.7 %; $rsd = 5.6$) because the soil characteristics marked by higher available water and an accumulation of organic matter. The pastoral value decreased to 12.6 % ($rsd = 5.1$) towards the end of the rainy season. During the dry season, the rangeland pastoral value decreased without significant variation between areas ($P < 0.05$, Figure 1).

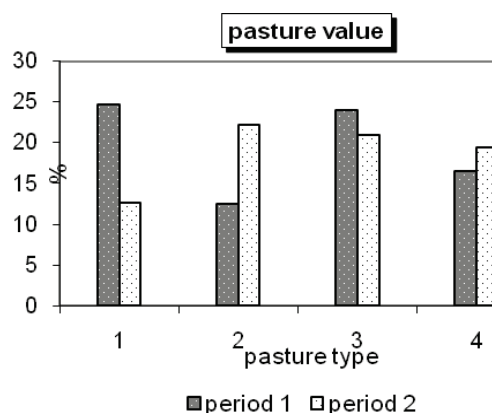


Figure 1 Relationships between the pasture value index and rangeland type : 1: *Acacia farnesiana*, 2: *Poupartia caffra*, 3: *Kigelianthe madagascariensis* and 4: *Rhigozum madagascariense* in the wet (period 1) and dry season (period 2).

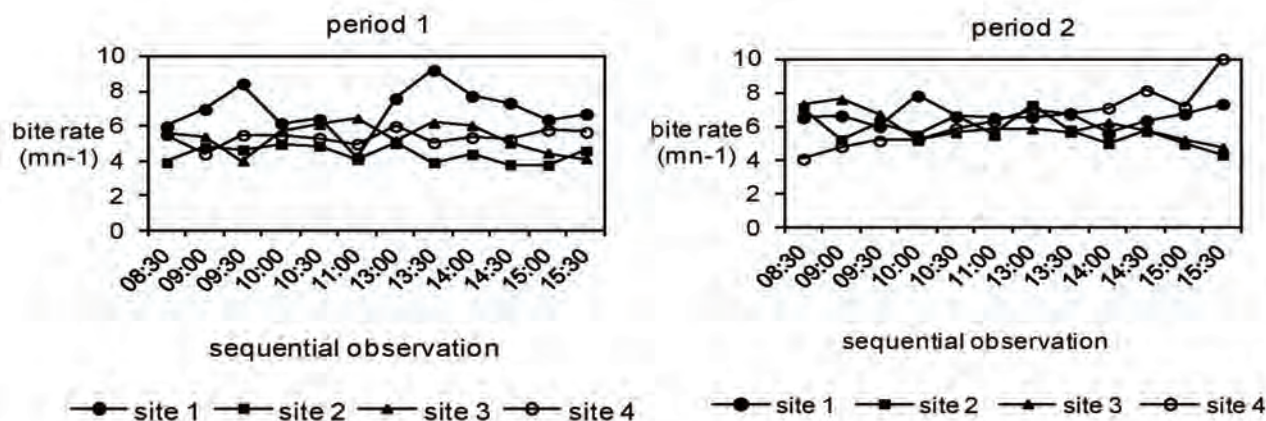


Figure 2. Sequential observation of bite rate per site for period 1 (left) and 2 (right).

The ecosystems had better pastoral value during the leafing stage. The dominance of good quality species increased the pastoral value (Rippstein 1989), due to higher coverage rate of pastureland and the botanical composition. *Acacia farnesiana* range presented the best foraging with daily bites of 7-8 bites/min, ($P < 0.05$, Figure 2) due to high availability of biomass according to Gong et al. (1996).

Conclusion

The relationships between phytosociology and nutritional parameters are studied for range management to improve rangeland floristic composition of indigenous species. Globally, this work can provided information to improve the management of fodder resources with the aim of improving the use of natural pastureland by ruminants.

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