Technical note

Long-term adaptation of Sabi grass (*Urochloa mosambicensis*) on a low fertility soil

D.B. COATES
Division of Tropical Pastures, CSIRO, Townsville, Queensland, Australia.

Introduction

Many factors affect the botanical composition of grazed pastures and their interaction is extremely complex. Small shifts in the relative competitive ability amongst component species may have important and enduring effects. The complexity of interacting factors makes it risky to draw firm conclusions about the effect of any one factor on botanical composition, particularly over a short time frame. This paper illustrates this point with the potential of Sabi grass (*Urochloa mosambicensis* cv. Nixon) to tolerate low soil phosphorus (P) not being clearly evident until after 8 years.

Materials and methods

Data for this paper were taken from an experiment investigating the effect of P inputs on pasture and animal productivity at Lansdown Pasture Research Station near Townsville in north Queensland. In December 1980 an area with low soil P status (3-4 ppm bicarbonate extractable P) was sown with a mixture of Sabi grass, Verano (*Stylosanthes hamata* cv. Verano) and Seca (*S. scabra* cv. Seca) into cleared and disced native pasture. The experiment comprised 16 paddocks, 4 to each of 4 P fertilizer treatments, with rates ranging between a nil control to an annual input of 10 kg/ha of P. Phosphorus supplement was fed via the drinking water in half of the paddocks with daily P intakes averaging 6 g/hd. Paddocks were continuously grazed with yearling cattle at 0.75 an/ha. From 1988, stocking rate at the two higher fertilizer rates was increased to 1 an/ha. The yield and botanical composition of pasture were estimated using the BOTANAL technique (Tothill *et al.* 1978) at or near the end of the wet season of each year.

Correspondence: Mr D.B. Coates, CSIRO, PMB, PO Aitkenvale, Townsville, Qld 4814, Australia.

Results and discussion

Period 1 (1981-1986)

Fifteen months after sowing, the Sabi grass content in all paddocks averaged only 10% of dry matter (DM) on offer. There was a progressive annual increase of Sabi grass in all fertilized paddocks to a mean of over 50% by mid-1986 but no net increase in 3 of the 4 unfertilized paddocks (Figure 1a). All unfertilized paddocks quickly developed stylo dominance with legume content reaching a mean of 77% by April 1985. There were substantial annual increases in the presentation yields of Sabi grass in the fertilized paddocks from 1982 to 1986 but yield of Sabi grass in the unfertilized paddocks remained consistently low (Fig. 1b). Thus, in April 1986 the mean presentation yield of Sabi grass in unfertilized paddocks (430 kg/ha DM) was less than 15% of that in the fertilized paddocks (2970 kg/ha).

The Sabi grass component of unfertilized swards was generally sparse and patchy and appeared to lack vigour. Individual plants tended to be spindly, tillering was poor and leaves were much shorter than those in fertilized swards. Seed production was also poor due to both lack of vigour in individual plants and the often intense grazing pressure on the limited amount of Sabi grass available. Based on the results of the first 5 years, it could be reasonably concluded that productive stands of Sabi grass are unlikely to develop on P-deficient soils without adequate P fertilizer, a conclusion in accord with that published by McIvor (1984).

Period 2 (1986-1990)

The late wet season proportion of Sabi grass in the fertilized paddocks levelled out at about 65%

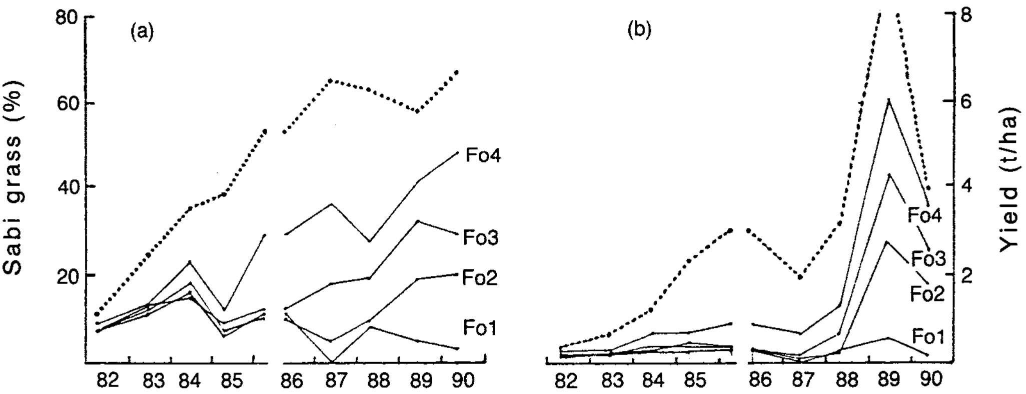

Figure 1. (a) Sabi grass (*Urochloa mosambicensis* cv. Nixon) content (%) and (b) Sabi grass presentation yields (kg/ha DM) of sown grass-legume pasture with (---) and without (—) phosphorus fertilizer. Content and yield of Sabi grass in fertilized pasture is the mean of 12 paddocks. Content and yield of Sabi grass for unfertilized pasture are shown for each of 4 unfertilized paddocks, Fo1-Fo4.

while yield fluctuated according to seasonal conditions. In the unfertilized paddocks, however, there were substantial changes in both content and yield of Sabi grass during the 4 years 1986-1990, but the extent of the changes was not the same in each of the 4 paddocks (Fig. 1). Thus, there was a wide range (3-48%) of Sabi grass contents in May 1990, with 3 of the 4 unfertilized paddocks supporting substantial proportions of Sabi grass. Similarly, yields of Sabi grass in these 3 paddocks late in the wet season showed very large increases in 1989 and 1990 to levels in excess of 6 t/ha in one paddock. Low content and yield of Sabi grass were measured in only one of the 4 paddocks in 1990. With the exception of 1 paddock, plant vigour, sward density and uniformity, and seed production of unfertilized Sabi grass improved noticeably.

Above average rainfall during the 1988/89 and 1989/90 wet seasons and the improved soil nitrogen status following years of legume dominance may have contributed to the rapid development of Sabi grass in unfertilized paddocks. The variation between paddocks also suggests that once the yield or content of Sabi grass has exceeded a critical level, there is likely to be an accelerated development. This latter aspect would seem to be closely associated with the interaction between grazing intensity on sown grass and those plant attributes affected by grazing which would enhance or jeopardise the competitive ability of the sown grass, eg. rooting vigour and depth; plant size and vigour; availability of light, moisture and nutrients; and seed production. Three of the four unfertilized paddocks appear to have entered into this phase of accelerated development, while the Sabi grass content of the fourth paddock has remained too low for accelerated development. Supplement was fed in the 2 unfertilized paddocks with the higher proportions of Sabi grass (Fo3 and Fo4 in Fig. 1). Thus, the small input of P via supplement may have encouraged the development of Sabi grass but this was not apparent in paddock Fo3 during the first 5-year period.

The current outlook is for the Sabi grass to increase still more under these low fertility conditions and to provide a productive, persistent, perennial grass base even without any P fertilizer. The use of superphosphate fertilizer to promote the rapid development of productive swards of Sabi grass on low-P soil is still recommended because of time scale considerations. However, the results of this study demonstrate that Sabi grass is remarkably adaptable to a wide range of soil fertility and, contrary to former belief, can compete and develop successfully on P-deficient soils.

References

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