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Performance of sheep grazing *Brachiaria decumbens*, *Panicum maximum* and *Pennisetum purpureum* in *Gliricidia sepium* alley plots

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SUMMARY – The introduction of forage legumes into pastures has generally improved animal productivity from grasses by increasing total edible biomass. Tree foliages have essentially the same role in the nutrition of ruminants as legume forage. In addition, trees are deep rooted, which allows them to grow often well into the dry season, whereas forage legumes are often shallow rooted and may dry off during dry seasons. It was against this background that an experiment was designed to study performance of sheep grazing *Brachiaria decumbens*, *Panicum maximum* and *Pennisetum purpureum* in *Gliricidia sepium* alley plots. Twelve paddocks of approximately 0.03 ha containing *Gliricidia sepium* alley planted in rows 4 m apart and interplanted with 4 rows of either *Brachiaria decumbens*, *Panicum maximum*, or *Pennisetum purpureum* were each grazed by 3 sheep. The three grass combinations within the alley plots were replicated four times. The animals grazed continuously for 28 days in the sub plots. Sheep grazing the *Gliricidia/Panicum* plot had a higher (P<0.01) growth rate (38 g/d) than those animals grazing both the *Gliricidia/Bracharia* (23 g/d) and *Gliricidia/Pennisetum* (21 g/d) plots respectively. There was no difference between sheep grazing the *Gliricidia/Bracharia* and *Gliricidia/Pennisetum* plots. The total dry matter intake of sheep on the *Gliricidia/Panicum* plot was higher (P<0.05) (1.33 kg DM/d) than that of sheep on *Gliricidia/Bracharia* (0.86 kg DM/d) and *Gliricidia/Pennisetum* (0.43 kg DM/d) plots respectively. The total biomass from the *Gliricidia/Bracharia* (23 t/ha) and *Gliricidia/Panicum* (21 t/ha) plots respectively were higher (P<0.01) than the total biomass from the *Gliricidia/Pennisetum* (13 t/ha) plot. These results demonstrate that grazing West African dwarf sheep in a *Gliricidia sepium/Panicum maximum* plot improved their growth rate during dry periods when feed supplies are limited. It also underscores the poor performance of animals grazing *Pennisetum purpureum* in *Gliricidia sepium* alley plot.

Keywords: Grazing, *Brachairia, Panicum, Pennisetum, Gliricidia*, sheep.

RESUME – *"Performances d'ovins broutant* Brachiaria decumbens, Panicum maximum *et* Pennisetum purpureum *sur des parcelles en couloirs de* Gliricidia sepium". *L'introduction de légumineuses fourragères dans les pâturages améliore généralement la productivité animale par rapport aux plantes herbacées, en augmentant la biomasse alimentaire totale. Les feuilles des arbres ont essentiellement le même rôle que les légumineuses fourragères pour la nutrition des ruminants. En outre, les arbres ont des racines profondes, ce qui leur permet souvent de croître même lorsque la saison sèche est bien avancée, tandis que les légumineuses fourragères sont souvent à racines superficielles et peuvent se dessécher pendant les saisons sèches. C'est dans ce cadre que s'est déroulée une expérience dont le but était d'étudier les performances d'ovins broutant* Brachiaria decumbens, Panicum maximum *et* Pennisetum purpureum *sur des parcelles en couloirs de* Gliricidia sepium. *Douze prairies d'environ 0,03 ha contenant* Gliricidia sepium *cultivée en couloirs sur des rangées espacées de 4 m et avec culture intercalée de 4 rangées de* Brachiaria decumbens, Panicum maximum, *ou* Pennisetum purpureum, *étaient broutées chacune par 3 ovins. Les trois combinaisons herbacées dans les parcelles en couloirs ont été répétées quatre fois. Les animaux pâturaient en continu pendant 28 jours dans les sous-parcelles. Les ovins pâturant la parcelle de* Gliricidia/Panicum *avaient un taux de croissance plus élevé (P<0,01) (38 g/j) que les animaux pâturant les parcelles de* Gliricidia/Bracharia *(23 g/j) et* Gliricidia/Pennisetum *(21 g/j) respectivement. Il n'y avait pas de différences entre les ovins pâturant les parcelles de* Gliricidia/Bracharia *et* Gliricidia/Pennisetum. *L'ingestion totale de matière sèche des ovins sur la parcelle de* Gliricidia/Panicum *était plus élevée (P<0,05) (1,33 kg MS/j) que celle des ovins sur les parcelles de* Gliricidia/Bracharia *(0,86 kg MS/j) et* Gliricidia/Pennisetum *(0,43 kg MS/j) respectivement. La biomasse totale provenant des parcelles de* Gliricidia/Bracharia *(23 t/ha) et* Gliricidia/Panicum *(21 t/ha) respectivement était plus élevée (P<0,01) que la biomasse totale provenant de la parcelle de* Gliricidia/Pennisetum *(13 t/ha). Ces résultats montrent que les moutons nains d'Afrique de l'Ouest pâturant une parcelle de* Gliricidia sepium/Panicum maximum *ont amélioré leur taux de croissance pendant les périodes sèches lorsque l'approvisionnement alimentaire est limité. Il en ressort également les faibles performances des animaux pâturan*t Pennisetum purpureum *sur une parcelle en couloirs de* Gliricidia sepium.

Mots-clés : *Pâturage,* Brachairia*,* Panicum*,* Pennisetum*,* Gliricidia*, ovins.*

Introduction

A major problem facing livestock farmers worldwide is how to economically maximize animal production with limited land availability. The situation is even worsened by desertification, leaching and population explosion in the humid tropics. The potential to increase ruminant production on these land areas can be realized if innovations in managing rangeland are adopted. Tropical pastures have long been recognized as capable of producing large quantities of forage dry matter; however, individual animal performance is normally less per animal than for similar animals grazing temperate zone forages (Minson and Wilson, 1981; Moore and Mott, 1973). Ellis *et al*. (1976) reported that grazing behaviour of animals is based on their preference for plant species and/or portions of plants available.

Small ruminant production system in Nigeria is based on indoor feeding, free roaming, grazing of natural or sown pasture or a combination of these. Grazing of sown pastures however, is limited to universities, research institutions and a few private farms where animal performance can be better evaluated. There have been few grazing trials in the country to determine productivity of pasture, and small ruminant performance. Sumberg (1985) reported an improvement in the nutritional quality of natural fallow re-growth in a *Gliricidia sepium* alley plot.

The planting of browse species such as *Gliricidia sepium* and or *Leucaena leucocephala* as hedgerows of alleys in native or productive permanent grass species may overcome the constraint to animal production caused by lack of fodder in the dry season. The presence of legume forages and tree forages in pasture have been generally accepted to improve ruminant productivity in both temperate (Ulyatt, 1980) and tropical pastures (Milford, 1967). In addition, the extensive root systems of leguminous trees bind soil and so control soil erosion. Trees also reduce the direct effects of wind erosion. This study was therefore undertaken to determine the performance of sheep grazing *Brachiaria decumbens*, *Panicum maximum* and *Pennisetum purpureum* in *Gliricidia sepium* alley plots.

Materials and methods

The study was carried out at the International Livestock Centre for Africa (ILCA), now International Livestock Research Institute (ILRI), Ibadan, Nigeria. The station is located between latitudes 6°10' and 9°10' North of the equator and longitudes 3° and 6° East of the Greenwich, at an altitude of 200 m above sea level with annual rainfall averaging 1500 mm. The vegetation in this area is made up of derived guinea savanna and humid forest zone (Ezenwa, 1995) and mixed farming had been practised in the area for several decades.

Twelve paddocks of approximately 0.03 ha containing *Gliricidia sepium* alley planted in rows 4 m apart and interplanted with 4 rows of either *Brachiaria decumbens*, *Panicum maximum*, or *Pennisetum purpureum* were each grazed by 3 sheep. The three grass combinations within the alley plots were replicated four times.The animals (36 in total) grazed continuously for 28 days in the sub plots. Sampling of the grasses and *Gliricidia* was done at the start of grazing (i.e. before grazing), then weekly, and at the end of the grazing period. The weekly sampling was to ascertain estimates of forage quantity and utilization rates. Grazing was discontinued anytime dry-matter on offer falls below 2.5% of total body weight of the grazing animals.

Sheep (9-12 months old) were assigned to the various subplots on the basis of initial forage on offer allowing 20 kg DM for 15 kg sheep. Animals were weighed weekly.

The animals were able to harvest the upper foliage of the *Gliricidia* tree by leaning on the tender stem. The matured stem were bent down and tied in two or threes daily so that the upper foliage became available for consumption. The animals were treated with an anthelminthic before grazing began. They were provided with shade and mineral salt block in each paddock. Dry matter yield on offer was estimated by cutting from three random 0.5 x 0.5 m quadrats for the grass and 1m x 1m quadrats for *Gliricidia* in each paddock. The cutting was done at 10 cm above ground level with a hand shear for grasses and 25 cm above ground level for the trees.

Statistical analysis. Data was subjected to analysis of variance (Steel and Torrie, 1989) as a

randomised complete block design and treatment means were differentiated using Duncan's multiple range test (Duncan, 1955).

Results and discussion

The growth data of sheep grazing *Brachiaria*, *Panicum* and *Pennisetum* in *Gliricidia sepium* alley are shown in Fig. 1. Sheep grazing the *Gliricidia/Panicum* plot had a higher ($P<0.01$) growth rate (38 g/d) than those sheep grazing both *Gliricidia/Brachiaria* (23 g/d) and *Gliricidia/Pennisetum* (21 g/d) plots respectively. The effects of supplementing *Gliricidia sepium* to basal grass diets on growth and survival rates of WAD sheep and goats have been reported (ILCA, 1988). In that study, sheep response was twice that of the goats.

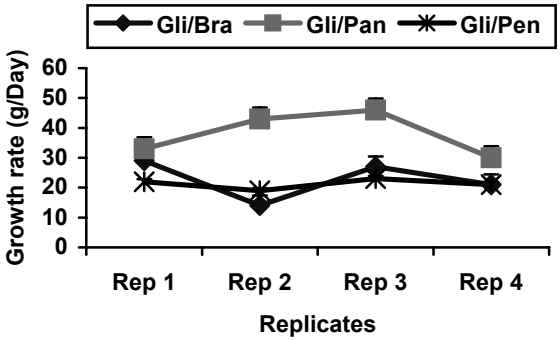

Fig. 1. Growth rate of sheep grazing *Brachiaria*, *Panicum* and *Pennisetum* in *Gliricidia* alley.

Total dry matter intake (TDMI) of sheep grazing *Brachiaria, Panicum* and *Pennisetum* in *Gliricidia sepium* plots are summarised in Fig. 2. Sheep grazing *Gliricidia/Panicum* plot had a higher ($P<0.05$) TDMI (1.33 kg DM/d) than those grazing *Gliricidia/Pennisetum* (0.43 kg DM/d) plot but not significantly different from sheep grazing *Gliricidia/Brachiaria* (0.86 kg DM/d) plots. The higher TDMI in the *Gliricidia/Panicum* plot could be attributed to preference of panicum grass to the other grass species, which resulted in higher growth rate of sheep in the *Gliricidia/Panicum* plot. The intake of dry matter of sheep on *Gliricidia/Pennisetum* alley plots was not different ($P>0.05$) from those on *Gliricidia/ Brachiaria* plots. The introduction of browse trees such as *Gliricidia* and *Leucaena* into planted pasture has contributed substantially to the diet of livestock under grazing condition (Quirk *et al*., 1990).

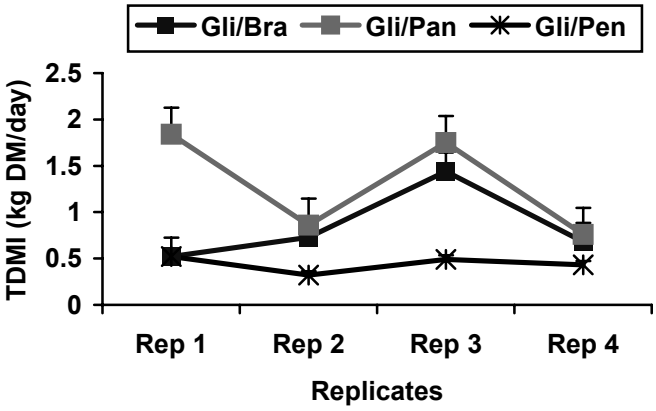

Fig. 2. Total dry matter intake of sheep grazing *Brachiaria*, *Panicum* and *Pennisetum* in *Gliricidia* alley.

Total biomass yields of the three grasses in Gliricidia sepium plots are shown in Fig. 3. The total biomass (TBM) yields from the *Gliricidia/Brachiaria* (23 t/ha) and *Gliricidia/Panicum* (22 t/ha) plots were higher (P<0.01) than the TBM (13 t/ha) from the *Gliricidia/Pennisetum* plot. It was observed that yields of total biomass declined as the grazing days increased. This is in agreement with the findings of Mears and Humphreys (1974) who reported reductions in green matter of Kikuyu grass (*Pennisetum clandestinum*) as stocking rate and grazing days increased.

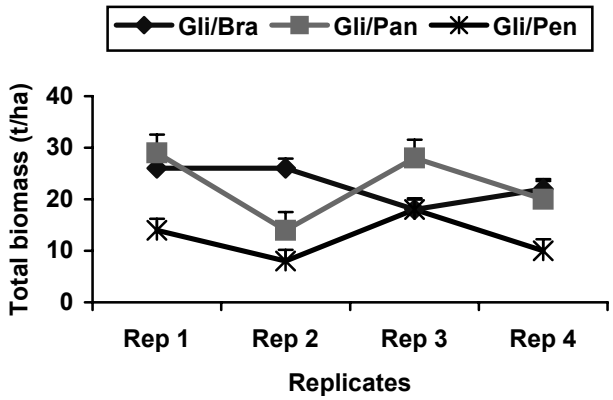

Fig. 3. Total biomass yields of *Brachiaria*, *Panicum* and *Pennisetum* in *Gliricidia* alley plots.

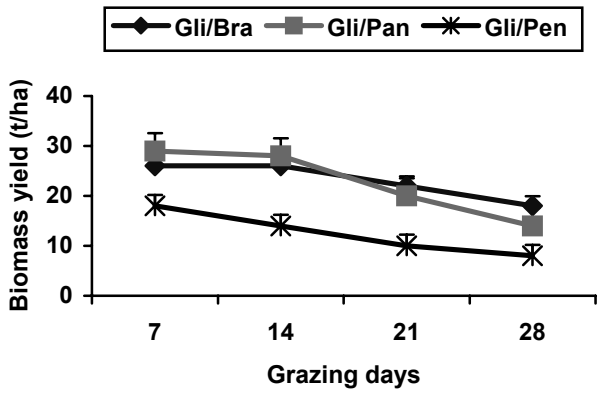

Fig. 4. Biomass yield decline of *Brachiaria*, *Panicum* and *Pennisetum* in *Gliricidia* alley plots with grazing days.

Similarly, Watson and Whiteman (1981) reported a drop in green yields of mixed pastures of *Panicum maximun* and *B. decumbens*. The general decline in live-weight gain as grazing progressed was attributed to reduced nutritive value due to advanced plant maturity (Blunt, 1978), and thus reduction in herbage, especially leaf, on offer (Laredo and Minson, 1973).

Conclusion

Data from this study showed that there is a great potential for improvement in growth rate of sheep grazing planted pasture with Gliricidia sepium as hedgerows or alleys. The availability of the browse plants during dry season would have mitigated the effect of the fall in nutritive value of the grass species, and hence reduced the characteristic weight loss of the animals during this period.

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