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Cultivation Site Dependent Variations of Forage Yield and Quality of Tropical Shrub Legumes

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Abstract

Ruminants play an important role as assets and sources of high quality food and income for the rural population in developing countries. Their productivity is often limited due to low protein supply owing to the limited availability of good quality forages, particularly in regions with a prolonged dry season and soils of low fertility. As part of an extensive search for forage shrub legumes that would meet the requirements as forage plants and perform well on low-fertility soils, a series of in vitro-experiments and agronomic evaluations were conducted. Five particularly promising legume species were tested in these experiments (*Calliandra calothyrsus*, *Cratylia argentea*, *Desmodium velutinum*, *Flemingia macrophylla*, *Leucaena leucocephala*). The results showed that the cultivation site may have an important influence on the forage quality of legumes, particularly for species containing condensed tannins (CT). In vitro-experiments with *Calliandra calothyrsus* showed differences in the tannin content and the degradability of nutrients, particularly of crude protein (CP), dependent on the cultivation site. Plants cultivated on more fertile soils had clearly lower CT contents than those on low-fertility soils. Apparent CP degradability of diets supplemented with *C. calothyrsus* from more fertile soils was approximately 30% higher ($p < 0.001$) than CP degradability of diets containing the same species cultivated on low-fertility soils. The agronomic evaluation revealed large variations in the adaptability of the different shrub legume species to acidic low-fertility soils and their response to fertilisation. While *Flemingia macrophylla* did not show any differences in biomass production due to soil type, the other species produced two to three times more biomass on the more fertile soil. Fertiliser application affected all species in terms of biomass production and leaf proportion but the extent of the response varied widely among species. Overall, these experiments showed a high impact of planting site on forage quality and yield and indicate that strong interactions between legume species and soil fertility may occur. These findings are of particular interest for future extension work, aiming at promoting legume-based feeding technologies.

Keywords: Legumes, protein, ruminants, tannins, tropical forages