

Nutritive value of selected indigenous legumes for livestock feed in NamibiaHembapu, N.¹, Thamina, D.N.², Mpofu, I.², Kahumba, A.² & Lutaaya, E.²¹Aimab Superfarm, Mariental, Namibia²Department of Animal Science, University of Namibia, Private Bag 13301, Windhoek, Namibia**Corresponding author:** elutaaya@unam.na

Abstract

The study was conducted to evaluate the nutritional characteristics of five indigenous legumes compared against Lucerne as potential livestock fodder. Samples of the five legumes (*Indigofera cryptantha*, *Rhynchosia totta*, *Medicago laciniata*, *Otoptera burchellii*, and *Senna italica*) were obtained from Omaheke and Khomas regions of Namibia during January-April 2012, air-dried and ground through a 3 mm sieve. Lucerne (*Medicago sativa*) samples were obtained from Neudamm campus, Namibia for comparison. Duplicate samples of the six legumes were analysed for crude protein (CP), Neutral Detergent Fibre (NDF) and digestibility. The CP (%) for *I. cryptantha*, *R. totta*, *M. laciniata*, *O. burchellii*, *S. Italica* and *M. sativa* were 30.4 ± 0.1 , 31.3 ± 0.1 , 26.4 ± 0.1 , 32.2 ± 0.1 , 29.5 ± 0.1 , and 26.0 ± 0.1 , respectively. The respective NDF (%) levels were 25.0 ± 0.2 , 36.1 ± 0.2 , 28.7 ± 0.2 , 32.8 ± 0.2 , and 26.5 ± 0.2 , and 40.2 ± 0.2 . The *in vitro* digestibility percentages were 65.7 ± 0.1 , 46.7 ± 0.1 , 83.1 ± 0.1 , 77.0 ± 0.1 , 49.6 ± 0.1 and 65.6 ± 0.1 , respectively. Based on these preliminary analyses and potential biomass production, *I. cryptantha* and *O. burchellii* are comparable to *M. sativa* and warrant further analyses for anti-nutrients and persistence so as to assess their role as alternatives for improving performance of ruminants.

Key words: Crude protein, digestibility, legumes, neutral detergent fibre, ruminants

Résumé

L'étude a été menée afin d'évaluer les caractéristiques nutritionnelles de cinq légumineuses locales comparées par rapport au potentiel de Lucerne comme fourrage pour le bétail. Des échantillons de cinq légumineuses (*Indigoferacryptantha*, *Rhynchosiatotta*, *Medicagolaciniata*, *Otopteraburchellii*, et *Senna italica*) ont été obtenus à partir des régions d'Omaheke et de Khomas en Namibie, au cours de la période qui va de janvier à avril 2012, l'air et la terre séchés à travers 3 mm de tamis. Les échantillons de Luzerne (*Medicago sativa*) ont été prélevés à partir du campus de Neudamm, de la Namibie pour la comparaison. Des échantillons en double des six légumineuses ont été analysés pour la protéine brute (CP), le Fibre Neutre de Détergent (NDF) et la Digestibilité. Le CP (%) pour *I. cryptantha*, *R. Totta*, *M. laciniata*, *O. burchellii*, *S. Italica* et *M. sativa* étaient de $30,4 \pm 0,1$, $31,3 \pm 0,1$, $26,4 \pm 0,1$, $32,2 \pm 0,1$, $29,5 \pm 0,1$, et $26,0 \pm 0,1$, respectivement. Les niveaux respectifs FDN (%) étaient de $25,0 \pm 0,2$, $36,1 \pm 0,2$, $28,7 \pm 0,2$, $32,8 \pm 0,2$ et $26,5 \pm 0,2$ et $40,2 \pm 0,2$. Les tests *in vitro* des pourcentages de digestibilité étaient de $65,7 \pm 0,1$, $46,7 \pm 0,1$, $83,1 \pm 0,1$, $77,0 \pm 0,1$, $49,6 \pm 0,1$ et $65,6 \pm 0,1$, respectivement. Sur la base de ces analyses

préliminaires et la production potentielle de biomasse, *I. cryptantha* et *O.burchelliare* comparable à *M. sativa* et des bons de souscription de nouvelles analyses des anti-nutriments et de la persistance de façon à évaluer leur rôle en tant que solutions de rechange pour améliorer la performance des ruminants.

Mots clés: protéines brutes, digestibilité, les légumineuses, les fibres au détergent neutre, ruminants

Background

Reduction in feed quality and fluctuating feed supplies with seasonal feed shortages are the main constraints to increasing livestock productivity in Namibia. Specifically there is a decline of crude protein (CP) content in pastures to below seven percent during the dry months of May to November in Namibia which reduces the quality of feed (Wesuls *et al.*, 2009). There are many indigenous forage legumes in Namibian rangelands that are likely to contain significant amounts of CP, with high palatability and well adapted to the local semi-arid environment, but still overlooked in terms of contribution to ruminant nutrition simply because their nutritive and anti-nutritional factors have not yet been fully explored. Legumes can increase nutritive content of pastures through biological nitrogen fixation and thus this study aims at ascertaining the role that indigenous forage legumes can play in the improved nutrition of ruminants.

Optimal animal performance for a given productive function requires balancing the levels of different nutrients in the diet of the animal, while minimizing the effects of anti-nutrients. Correct formulation of feed supplements for enhancement of animal productivity therefore, requires knowledge of the nutritional composition of each of the forage legumes. The main objective of this study was therefore, to estimate the CP and digestibility of the five indigenous legumes in comparison to Lucerne.

Literature summary

Legume species are rich in protein (>20% CP) and can also supply significant amount of energy, vitamins and minerals (Olalekaan and Bosede, 2010). Supplementing poor quality basal grass diets of ruminants with legume forages increases efficiency of feed utilization, feed intake and diet digestibility and can also improve nitrogen retention when grass diets that do not meet ruminant energy and nitrogen requirement are fed (Foster *et al.*, 2009). Despite the benefits outlined above, some legume species may contain harmful substances like trypsin inhibitors, tannins and saponins that can act as deterrents against feeding by herbivores and these need to be assayed for. Correct formulation of feed supplements requires knowledge of the nutritional composition of each of the forage legumes. Legumes grazed at an immature stage of growth are usually of high apparent digestibility. Fiber content in forages increases with maturity and is the main factor affecting dry matter digestibility; likewise, increased proportion of stems to leaves ratio can also decrease digestibility (Dewhurst *et al.*, 2009).

Study description

Samples consisting of leaves and young shoots of six legumes were obtained from the range during the rainy season (January- April, 2012) from Khomas and Omaheke regions; Lucerne (*Medicago sativa*) samples were also obtained from Neudamm campus (Khomas region) for comparison. The samples were air-dried, ground and passed through a 3 mm sieve. Duplicate samples of the six legumes were analysed for crude protein (CP), Neutral Detergent Fibre (NDF) and digestibility. The CP (%) for *I. cryptantha*, *R. totta*, *M. laciniata*, *O. burchellii*, *S. Italica* and *M. sativa* were 30.4 ± 0.1 , 31.3 ± 0.1 , 26.4 ± 0.1 , 32.2 ± 0.1 , 29.5 ± 0.1 , and 26.0 ± 0.1 respectively. The respective NDF (%) levels were 25.0 ± 0.2 , 36.1 ± 0.2 , 28.7 ± 0.2 , 32.8 ± 0.2 , and 26.5 ± 0.2 , and 40.2 ± 0.2 . The *in vitro* digestibility (%) was 65.7 ± 0.1 , 46.7 ± 0.1 , 83.1 ± 0.1 , 77.0 ± 0.1 , 49.6 ± 0.1 and 65.6 ± 0.1 , respectively.

Research application

Based on these preliminary analyses, *I. cryptantha* and *O. burchellii* are comparable to *M. sativa* in terms of nutritional composition and *in vitro* digestibility and warrant further analyses for ease of establishment, biomass production, persistence and anti-nutrients so as to assess their role as alternatives for improving performance of ruminants.

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