



Session 17: Pastures II

Chair: Sigrun Ammann

Effects of nitrogen fertilization and cutting interval on biomass yield and quality of banagrass (Hybrid *Pennisetum*) and guinea grass (*Panicum maximum*) grown as biomass crops

Sabelo J Ndlazi* and Ignacio C Madakadze

University of Pretoria, South Africa. Email: sabelojndlazi@gmail.com

High biomass yielding grasses are being evaluated globally as renewable energy sources. *Panicum* and *Pennisetum* species are some of the perennial grasses with potential for high lignocellulosic biomass. *Panicum maximum* (cv. Caprivi, Gatton and PUK8) and banagrass (Hybrid *Pennisetum*) were evaluated at the University of Pretoria Hatfield Experimental Farm for dry matter yield and chemical composition under varying levels of nitrogen fertilization (0, 75, 150, 225, 300 and 375 kg N.ha⁻¹) and two cutting regimes (2 cut vs. 1 cut system). A split-plot design with three reps was used for the experiment. Grass entries were assigned as main plots and nitrogen (N) x cutting regime as sub-plots. Each main plot measured 12 m x 12 m (144 m²) and sub-plots 3 x 4 m. For the 2-cut regime herbage was harvested mid-season in February and the other at the end of the season in April. Herbage was only harvested in April for the 1-cut regime. The N was applied in two equal dressings, one at the beginning of the season in November and the other mid-season (February). Canopy height (CH), leaf area index (LAI) and light interception (LI) were monitored bi-weekly. Biomass was estimated from 2 quadrats of 2 x 1 m each. Herbage was sub-sampled, hand separated into composite, stem and leaf portions. The samples were dried at 70 °C to constant weight and analysed for acid detergent fibre (ADF), neutral detergent fibre (NDF), ash, N and gross energy (GE). Canopy height, LAI, LI, ADF, NDF, ash, N, DM and GE increased ($p < 0.001$) with increasing levels of N fertilizer regardless of cutting frequency. Average CH of grass entries at mid-season ranged from 83.23-239.37 cm for banagrass, 73.38 – 229.87 cm Caprivi; 61.60 – 167.78 cm Gatton, and 58.80 – 154.23 cm PUK8. The respective values at the end of the growing season were 101.75 – 269.80, 88.95 – 230.85, 61.80 – 154.23 and 49.80 – 147.87 cm. The average biomass yields of Bana, Caprivi, Gatton and PUK8 ranged from 26 – 59, 19 – 45, 10 – 23 and 6 – 20 t DM.ha⁻¹, respectively. Ash, N, ADF, NDF and GE also increased significantly ($p < .001$) with N levels for both cut systems and ranged from 6.5 – 8.10, 6.1 – 9.8, 310.2 – 615.3, 390.1 – 799.1 and 14.25 – 16.79 g.kg⁻¹ DM, respectively. However, herbage from the 2-cut system was characterised by high N and ash but lower ADF, NDF, and GE than the 1-cut system. These results indicate the potential of these entries to produce high biomass which could be used for bioenergy and/or chemical production.

Keywords: lignocellulose, gross energy, tropical grasses, biomass, bioenergy



With Pasture OEMFF®
 « you ensure
growth
 at every stage. »

Pasture OEMFF® is a tailor-made foliar product to enhance both pasture performance and animal production. **Pasture OEMFF®:**

- Enables the pasture to draw on the considerable nutrient reserves in the soil organic matter without slowing down growth rates.
- Stimulates and maintains pasture growth and assists in reducing excess protein levels in the grass.
- Will stimulate growth through plant growth regulators and improved chlorophyll production for photosynthesis during periods of slow growth rates and cold.
- Is specifically formulated to meet the specific needs of intensive pastures and the applicable micro-elements are chelated.
- Contains growth promoters and gibberellins.

Kynoch – enhanced efficiency through innovation

011 317 2000 | info@kynoch.co.za | www.kynoch.co.za
 Not trading in the Western Cape.

Farmisco (Pty) Ltd t/a Kynoch Fertilizer Reg nr: 2009/0092541/07
 Pasture OEMFF® K0029 (Act 36 of 1947). Pasture OEMFF® is registered as fertilizer group 1.

« Introducing
KynoPlus™
 the **nitrogen** power source. »

Power your crops with **N-hanced-N™**, a new category of Enhanced Nitrogen products for enhanced quality, yield and profit.

KynoPlus™, the first product in a new range of **N-hanced-N™** efficient nitrogen fertilizer blends.

KynoPlus™:

- Is powered by **AGROTAIN®**, a volatilization inhibitor which enhances nitrogen efficiency, therefore, increasing the available nitrogen in the soil.
- Allows for flexibility in application.
- Decreases seedling mortality and improves initial plant growth.

The power of blue will put green back into your crops.

011 317 2000 | info@kynoch.co.za | www.kynoch.co.za
 Not trading in the Western Cape.

Farmisco (Pty) Ltd t/a Kynoch Fertilizer Reg nr: 2009/0092541/07
 KynoPlus™ is registered as fertilizer group 1 - K8021 (Act 36 of 1947)

Illustration 9: Kynoch



The effect of bio-digester slurry on the mineral and chemical composition of napier fodder at different growth stages

*Joseph J Baloyi**, Mfanuzile W Lubisi, Jestinos Mzezewa and Simbarashe Katsande

University of Venda, South Africa. Email: joseph.baloyi@univen.ac.za

The effect of biogas slurry was determined on mineral and chemical compositions of Napier fodder harvested at different stages of maturity. The two treatments (bio-digester slurry and no slurry) were used to irrigate the Napier fodder for twenty weeks at two different sites (Maila and Ntabalala) in a complete randomised block design. There was no significant difference for K, B, Cu, Fe, Mn, Fe and Mo content in the fodder. However, P, Mg, Ca and Fe contents significantly differed between treatments at an early stage of growth ($p < .05$). The crude protein (CP) contents in the late stage of maturity at Maila were significantly different ($p < .05$). Ash content was not influenced by the stages of maturity. The moisture content at both sites decreased significantly with maturity ($p < .05$). At Nthabalala, dry matter, acid detergent fibre and neutral detergent fibre increased significantly ($p < .05$) with maturity. The application of slurry as nitrogen fertilizer has positive effect on CP of the Napier fodder harvested at late stages of maturity compared to the other chemical components of the grass.

Keywords: irrigation, biogas slurry, napier fodder, mineral content

Optical chlorophyll methods as tools for rapid and accurate nutritional assessment of pasture herbage: A review

Martin P Hughes^{1}*, Victor Mlambo², Cicero H O Lallo¹ and Paul G A Jennings³

¹University of the West Indies, Trinidad and Tobago; ²North-West University, South Africa;

³MARJEN Consulting Group, Jamaica. Email: aggiemh2000@hotmail.com

Traditional methods used to determine nutritional properties of pasture herbage require destructive sampling, are time-consuming, laborious and expensive to undertake. Consequently, the results of these procedures cannot provide real-time information necessary to synchronize nutrient requirements of the grazing animal with the feed supplied. This, therefore, highlights a need to develop alternative methods capable of providing instantaneous information on pasture nutritive value prior to grazing in order to facilitate judicious supplementation. One possible approach is the use of optical chlorophyll methods. The objective of this paper is to present a review of the current knowledge pertinent to optical chlorophyll measurements and their relationships to nutritional properties of pasture herbage. These methods are based on the strong relationship between chlorophyll and nitrogen concentration because chlorophyll contains the majority of nitrogen found in green tissues. Optical chlorophyll meters measure light absorption in the red (640 nm) and near infrared (940 nm) regions and calculate an index representing proximal chlorophyll concentrations that can be related to foliar nitrogen and other nutrient component through appropriate regression equations. Despite their limited applications in forage plants to date, optical chlorophyll methods have been used extensively in non-forage crops such as rice, wheat and corn to aid in managing fertilizer N nutrition. Optical chlorophyll measurements have shown potential to accurately predict nitrogen, crude protein (CP), *in vitro* organic matter digestibility (IVOMD), acid detergent fiber (ADF), neutral detergent fiber (NDF) concentrations, herbage yield and some minerals such as phosphorus and potassium in pasture herbage. However, the main limitation to optical chlorophyll measurements is probably the wide variety of pasture species, particularly those of interest in the tropics and their concomitant morphological and physiological diversities which can affect the accuracy of these measurements.

Keywords: optical chlorophyll methods, pasture herbage, nutritional properties, nitrogen, chlorophyll



Yield, nutritional value and condensed tannin level changes in *Lespedeza cuneata* under different defoliation frequencies and intensities

Erika A van Zyl^{1*}, F S Botha², J.N. Eloff², P. P Msuntha¹, P. A. Oosthuizen¹ and C. Stevens³

¹Dundee Research Station, Department of Agriculture and Rural Development, KwaZulu-Natal, South Africa;

²University of Pretoria, South Africa; ³Cedara, Department of Agriculture and Rural Development, KwaZulu-Natal, South Africa. Email: erika.vanzyl@kzndard.gov.za

The rapid increase in the magnitude of anthelmintic resistance towards commercial chemical anthelmintics, calls for alternative methods to complement or replace anthelmintic treatment. Recent studies on bioactive forages highlight the potential of these to contribute towards parasite control. *Lespedeza cuneata*, a tannin containing legume, is, according to scientific literature, one of the promising bioactive forages. Besides anthelmintic properties, ruminant digestion can be complemented or compromised by condensed tannins, depending on the level of condensed tannins (CT) in the plant. The aim of this trial was to investigate *L. cuneata* in terms of dry matter production and forage quality, condensed tannin (CT) levels and changes in tannin levels over the growing season. Small plot trials, arranged in a randomized block design, were conducted to establish production criteria for *L. cuneata*, currently lacking in South Africa. The grand mean dry mass (DM) yield for the first growing season, (characterized by above normal rainfall), was 8.3 ton.ha⁻¹, compared to the 2.56 ton.ha⁻¹ for the second growing season, (characterized by below normal rainfall). Highly significant differences (p<.001) were measured between the yields produced under different cutting frequencies (6, 8 and 12 weeks) and cutting heights (5 cm and 15 cm). Except for crude protein levels, the ADF (acid detergent fibre) and NDF (neutral detergent fibre) analysis of the complete plant indicated a less acceptable nutritional quality. Separated leaf samples of plants were analysed. Chemical feed analyses of leaves were more favourable, compared to feed analysis of the whole plant. The CT content of leaves increased significantly (p<.05) with increased moisture stress and varied between 24.5 and 122 g.kg⁻¹ DM over the growing seasons. Therefore, although *L. cuneata* appears to have a good potential based on high yields and adaptability to low potential soils, its actual feeding value may be substantially lower than expected during certain times, such as drought, due to the high levels of CT.

Keywords: *Lespedeza cuneata*, dry matter production, forage quality, condensed tannins

Effect of types of legume intercrop on the mineral content of native *Panicum maximum* (Green Panic)

Olusola A Aderinola*, A A Akingbade, J A Akinlade, S T Oyewole and T T Afonja

Ladoke Akintola University of Technology, Nigeria. Email: oaaderinola@lautech.edu.ng

The effect of type of legume intercrop on nutritional performance of native *Panicum maximum* was investigated during wet season for 16 weeks. The experiment was laid out in a randomized complete block design with each treatment replicated three times. *Panicum maximum* was intercropped with *Canavalia brasiliensis*, *Centrosema pascuorum*, *Centrosema plumeri*, *Clitoria ternatea*, *Psophocarpus palustris* and *Aeschynomene histris* at a spacing of 50 by 50 cm. At week 20, grasses were harvested for mineral analysis. The *Panicum maximum* inter planted with *Centrosema pascuorum* was higher (p<.05) in P (0.37ppm), K (0.55 cmol.kg⁻¹), Mg (0.46 cmol.kg⁻¹) and Fe (177.33 mg.kg⁻¹) while *Panicum maximum* interplanted with *Aeschynomene histris* was higher (p<.05) in Cu (7.70 mg.kg⁻¹). *Panicum maximum* interplanted with *Psophocarpus palustris* had the highest (p<.05) value (30.50 mg.kg⁻¹) of Zn. It could be concluded that *Panicum maximum* was better in terms of mineral compositions when inter planted with *Centrosema pascurium*.

Keywords: *Panicum maximum*, *Canavalia brasiliensis*, *Centrosema pascuorum*, *Centrosema plumeri*, *Clitoria ternatea*, *Psophocarpus palustris*, *Aeschynomene histris*



Evaluation of grazing Jersey and Angus/Jersey nurse cows in a multiple suckling calf rearing system

Josef D V van Wyngaard* and Robin Meeske

Department of Agriculture Western Cape, South Africa. Email: josefww@elsenburg.com

Some dairy farmers in the southern Cape recently implemented a breeding system where the bottom half of the herd, based on genetic merit and production, is inseminated with beef cattle semen. This reduces the number of dairy heifers on the farm, consequently lowering roughage demand. Emerging farmers in the southern Cape buy these crossbred calves and rear them on culled Jersey or Holstein nurse cows in an intensive system. The aim of the study was to determine the beef production potential of F₁ generation Angus/Jersey calves in a multiple calf rearing system using Jersey or Angus/Jersey nurse cows. The study was carried out at the Outeniqua Research Farm, George, Western Cape. The farmlet (24 ha) consisted of a mixture of non-irrigated kikuyu (*Pennisetum clandestinum*), taaipol (*Eragrostis plana*), white clover (*Trifolium repens*), cocksfoot (*Dactylis glomerata*), fescue grass (*Festuca arundinaceae*) and perennial ryegrass (*Lolium perenne*) divided into 24 camps. Strategic fertilisation was implemented. Four F₁ generation Black Angus/Jersey first lactation cows and four pure-bred Jersey first lactation cows were compared. Each cow reared two calves (bull and heifer calf) by restricted suckling for three months, after which the calves were weaned on pasture with restricted access to a production supplement (15% crude protein) up to 12 months of age; subsequently calves were fattened on pasture-only up to 18 months of age and slaughtered. Cows reared two more batches of calves during their nine month lactation cycle, resulting in six calves reared per cow with a grand total of 48 calves reared during the study. Cows received 2 kg of concentrate split over two sucklings and suckling calves received calf growth pellets (18% CP) *ad libitum*. The different animal age groups grazed separately and were initially allocated four 1 ha camps each. A 56 day grazing cycle was implemented to ensure a forage availability of 2.5 – 3% of cow/calf body weight. Milk production of cows was estimated monthly by weighing calves before and after suckling. Weight and supplement intake of all animal groups were recorded on a monthly basis. Pre- and post-grazing sward height was recorded with a rising plate meter. Quadrat pasture samples were cut before each grazing for botanical composition and quality determination purposes. The weight of the Angus/Jersey and Jersey cows was 431 kg and 345 kg at the start and 450 kg and 327 kg after 5 months respectively. Average milk production of the Angus/Jersey and the Jersey cows did not differ significantly ($p > .05$) and was 9.9 kg.day⁻¹ and 8.4 kg.day⁻¹ respectively. The weight at weaning (3 months of age) did not differ between groups. Calves reared by the Angus/Jersey cows weighed 121.9 kg compared to the 119.7 kg of calves reared by Jersey cows. The weight of the Angus/Jersey cross calves at 5 months did not differ between the two groups and was 176 kg. The F₁ Angus/Jersey cow is a more sustainable option for intensive multiple calf rearing than the Jersey cow.

Keywords: pasture, beef cattle, cross bred