Planted Pasture Production

SESSION CHAIR: SIGRUN B AMMANN

Wednesday, 21 July 2010, 11:00-12:30

Platform & Poster Presentations

POSTER PRESENTATION: BENEFITS OF PASTURE PLANT BREEDING

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Overseas data indicate that during the past 50 years plant breeding has improved the yields of perennial ryegrasses by approximately 6 percent per decade (34 percent yield increase in 50 years). Yield data from the *Lolium multiflorum* ryegrass breeding programme at ARC Cedara provides substantial evidence of the benefits of breeding: yield increases of new varieties during the past 30 years have ranged from 20 to 50 percent for various seasonal yield data, which is approximately 6 to 16 percent per decade.

The major emphasis currently, and since the early 1990's, is on the improvement of nutritive value of ryegrass. Pasture grasses are frequently rich in protein but poor in energy. Breeders are having considerable success in addressing this problem by producing varieties with higher water-soluble carbohydrate (sugars) contents. TNC contents have been improved by up to 19% in autumn and 6% in winter. This results in better intake and digestibility, better utilization of the protein in the grass, and consequently improved animal production.

NOTES:

POSTER PRESENTATION: THE INFLUENCE OF CUTTING FREQUENCY AND PLANTING DATE ON *RAPHANUS SATIVUS* YIELD

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Fodder radish, previously referred to as Japanese radish (*Raphanus sativus*), belongs to the *Brassicaceae* or mustard family. A somewhat drought-resistant crop requiring evenly distributed annual rainfall of at least 350 mm during the growing season. With lower rainfall supplementary irrigation is needed. It is tolerant of a wide range of soil types, though heavy clays may lead to malformed roots. The aim of the study was to investigate the effect(s) cutting frequency on re-growth to establish the possible recovery rate in a rotational grazing system.

Fodder radish (Nooitgedacht) was established at the Hygrotech Research Station, near Moloto in Gauteng. It was established in rows with 50 cm inter-row spacing and its response in terms of dry matter production at different intra row densities was recorded. The plants were established over a three month period in 2007, at monthly intervals, on 15th February, 15th March and 15th April.

To simulate grazing, the leaves were cut at a height of 5 cm above the tuber or ground level 10, 14 and 18 weeks after planting. For the 10 weeks cutting treatment, re-growth material was cut after 4 and 8 weeks. In the case of the 14 weeks treatment re-growth of leaves were cut again 4 weeks after initial cutting, the 18 weeks treatment was cut once (at a mature stage).

The various planting dates and cutting frequencies had different effects on the results. The earlier the cutting treatments started, the more suppressed the tuber growth was. The production obtained from early cuttings (10 weeks) was lower compared to that of late cuttings (18 weeks). With the late planting, early cutting is recommended because in late cutting frequencies the dry matter material was reduced and flowering started. That showed the early planting (February) favors late cutting (18 weeks treatment) and late plantings (March and April) favors early 10 and 14 weeks cutting frequencies.

In conclusion it could be said that the more frequent cutting was applied, the more yield was suppressed. The use of fodder radish (*Raphanus sativus*) as a fodder crop has big potential and can provide quick and abundant feed for livestock.

NOTES:

POSTER PRESENTATION: THE EVALUATION OF DRY MATTER YIELD AND FORAGE QUALITY FOR FOUR PASTURES AS INFLUENCED BY THREE FREQUENCIES OF FLOOD IRRIGATION IN THE FALSE UPPER KAROO

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Water is a scarce resource, particularly in the False Upper Karoo area where the average rainfall is 350 mm per year. Water, therefore, has to be used efficiently to avoid over-irrigation and under-irrigation of cultivated pastures. Flood irrigation is inefficiently used by farmers and most of them are uncertain about the impact of water on the dry matter yield and forage quality of different cultivated pastures. Due to the water constraints in the False Upper Karoo area, it is essential to provide flood irrigation guidelines to farmers for different annual and perennial pastures, as well as their response to different water treatments.

There are four cultivated pastures which are commonly used by the farmers in the False Upper Karoo area that have been evaluated under three frequencies of flood irrigation: *Trifolium resupinatum* (Persian clover), *Medicago sativa* (Lucerne), *Lolium multiflorum* (Italian ryegrass) and *Festuca arundinaceae* (Tall fescue). The three frequencies of flood irrigation treatments were: 1) Flood irrigation once per week (T1), 2) Flood irrigation once in two weeks (T2) and 3) Flood irrigation once in three weeks (T3). Amount of water was measured by V notch and rainfall was recorded. Annual and seasonal dry matter yields were measured. Dry matter yields of four pastures under different treatments are shown in Tables 1, 2, 3 and 4.

Table 1: Monthly and annual dry matter yield (kg ha^{-1}) for a Persian clover pasture under different water treatments

Treatment	Months				Total
	Sept	Oct	Nov	Dec	
T1	2453	2107	2493	3943	**10996**
T2	1107	2285	2933	3472	**9797**
T3	1788	2561	2768	3495	**10612**

Table 2: Monthly and annual dry matter yield (kg ha^{-1}) for an Italian ryegrass pasture under different water treatments

Treatment	Months				Total
	Sept	Oct	Nov	Dec	
T1	914	1022	1390	1349	**4675**
T2	2453	2678	2087	1438	**8656**
T3	1654	1548	1110	1084	**5396**

Table 3: Monthly and annual dry matter yield (kg ha^{-1}) for a Lucerne pasture under different water treatments

Treatment	Months								Total
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
T1	1211	1339	1677	2096	2769	1777	1730	946	**13545**
T2	1156	1240	1744	2166	3040	2028	1631	1089	**14094**
T3	993	1138	1863	1795	2623	2166	2058	1488	**14124**

Table 4: Monthly and annual dry matter yield (kg ha^{-1}) for a Tall fescue pasture under different water treatments

Treatment	Months								Total
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	
T1	437	872	993	1068	1024	1040	1207	529	**7170**
T2	1560	1125	1573	1767	1321	1280	1390	733	**10749**
T3	1028	1554	2305	1911	1291	1213	1406	1239	**11947**

Persian clover pasture performed well under treatment one and low dry matter yield obtained under treatment two (Table 1). High dry matter yield was obtained under treatment two and low dry matter yield under treatment one for an Italian ryegrass pasture (Table 2). Lucerne and Tall fescue perennial pastures have high dry matter yields under treatment three (Tables 3 and 4).

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PLATFORM PRESENTATION: THE INTEGRATED EFFECT OF WATER AND NITROGEN ON ITALIAN RYEGRASS (*LOLIUM MULTIFLORUM*) PRODUCTION AND ITS WATER USE EFFICIENCY

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In South Africa Italian ryegrass, *Lolium multiflorum*, is an important pasture species under irrigation and is mainly utilised for milk and to some extent meat production. High dry matter (DM) production and good quality forage is essential. The shortage of water and nitrogen is, however, a limiting factor for the production of this type of pasture. By using proper irrigation and nitrogen management tools, the production and quality of the pasture can be improved. The objective of this study was to evaluate forage yield and water use efficiency of annual ryegrass at different water and nitrogen levels.

The trial was conducted under a rain shelter on the Hatfield Experimental Farm of the University of Pretoria. The plots were arranged in a complete randomised block design with three replications. Treatments consisted of three water and three nitrogen levels. The three water applications to field capacity were; a schedule of 1) twice a week, 2) once a week and 3) once every two weeks. Nitrogen was top-dressed after each harvest at a rate of 0, 30 or 60 kg N per hectare. In each plot, an access tube was installed and the soil water content was measured with a Neutron Probe to a depth of 1.2 m. After calculating the deficit, plots were irrigated to field capacity. Ryegrass was harvested to 50 mm above the ground on a 28 day cycle.

The highest cumulative total yield of 12.90 t DM ha^{-1} and 12.29 t DM ha^{-1} over five harvests was achieved by the treatments that were irrigated twice weekly and once weekly and top-dressed with the highest nitrogen application rate. There was no significant difference ($P>0.05$) between these two treatments but they differed significantly ($P<0.05$) from the other treatments. The treatment that was irrigated once every two weeks with no nitrogen application produced the lowest DM of 4.16 t DM ha^{-1}. The highest water used was 647.1 mm for the treatment that was irrigated twice a week while the lowest water used was 426.0 mm for the treatment that was irrigated once every two weeks. The highest leaf area index of 6.12 m m^{-2} was also recorded for the treatment with the high water and high nitrogen application rate. The highest water use efficiency of 27.7 kg ha^{-1}mm^{-1} was recorded for the treatment that was irrigated once every two weeks and top-dressed with the highest nitrogen. The response of forage yield to irrigation frequency and nitrogen application generally increased as the rate of water and nitrogen application increased.

The study revealed that increased water and nitrogen application could be used to stimulate DM production as higher yield was produced from the most frequently irrigated treatment but these treatments recorded lower water use efficiencies.

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PLATFORM PRESENTATION: DEVELOPING IRRIGATION AND N MANAGEMENT STRATEGIES OF ANNUAL RYEGRASS USING THE SWB-SCI MODEL

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In order to increase pasture production in the dairy industry, considerable nitrogen (N) and irrigation water inputs are required. Due to irrigation water scarcity, increasing N fertiliser prices and environmental pollution concerns, prudent, efficient and cost effective N and water management is essential. Developing sound irrigation and N management strategies using long-term experiments for different sites and pasture management practices are, however, expensive and time consuming. Therefore, there is a need to extrapolate experimental results to other sites and management practices using mechanistic models. The Soil Water Balance model (SWB-Sci) is a locally developed mechanistic, crop growth, soil water and N balance, irrigation-scheduling model. The model was calibrated and tested for irrigated annual ryegrass (*Lolium multiflorum*) using data collected from field studies with a range of N management practices at two locations (KwaZulu-Natal and Gauteng) in South Africa. The model simulated forage yield, leaf area and N uptake with reasonable accuracy under different management scenarios. It is proving to be a useful tool to develop irrigation and N management strategies for ryegrass production. A few example strategies for major milk producing regions of South Africa are presented in this paper.

NOTES:

POSTER PRESENTATION: THE EFFECT OF PLANTING DATES AND CUTTING TREATMENTS ON THE GROWING PATTERN OF DIFFERENT PEARL MILLET FODDER CULTIVARS

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Pearl millet (*Pennisetum glaucum*) is a warm season crop, planted in early summer when soils have reached higher ground temperatures. Pearl millet will yield the best on fertile, well drained soils. However, it also performs relatively well on sandy soils that are acidic and when available soil moisture and soil fertility levels are low. This specie can be an important fodder resource for animals in most of the arid and semi-arid zones. This is especially the case where (1) the dry season is too long (≥6 months) for native pasture to maintain an animal, and/or (2) where an increased population density has drastically reduced the area of fallow/common property land that traditionally provides dry season grazing. The aim of the study was to determine the effect of planting dates and cutting treatments on the growth pattern of different Pearl millet cultivars as fodder crops.

The study was conducted at the Dewagenings drift (Hygrotech) Research station situated in Moloto district, Gauteng Province. The plants were established on three planting dates namely: 19th November 2007, 19th December 2007 and 18th January 2008. Four cutting treatments were applied, namely first cut at 4 weeks, followed by cuttings at 8 weeks, 12 weeks and 16 weeks respectively after planting. The 4 weeks treatment was cut every four weeks to measure re-growth potential. Six different pearl millet cultivars were used in the study namely, Speed feed, Nutri-feed, Milk star, Common, Hypearl millet and Hypearl millet BMR (Brown midrib).

In all planting dates, Speed feed, Nutri-feed and Hypearl millet were found to be better producers as compared to Milk star, Common, and Hybrid pearl millet (BMR), respectively. For re-growth potential monitoring different observations were made were Milk star, Common, and Hypearl millet performed better than Speed feed, Nutri-feed and Hypearl millet (BMR). The cultivars performed well when planted in December and better then those that were planted in November and January.

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PLATFORM PRESENTATION: THE IMPACT OF DEFOLIATION FREQUENCY AND INTENSITY ON THE ROOT DEVELOPMENT OF *TRITICALE* HYBRID, (TRITICALE) *SECALE CEREALE* (STOOLING RYE) AND *LOLIUM MULTIFLORUM* (RYE GRASS)

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Winter grains can perform an important function as a green fodder, especially for higher producing animals such as dairy cows and ewes with lambs. With respect to sheep, lambs born in autumn can be weaned on green fodder for fattening and for the spring lambing season it can be valuable grazing for pregnant ewes. The effect of defoliation of these cultivars is not known and a pot experiment was done to measure the effect of defoliation height and frequency on the root development of it.

A comparative study was done between *Triticale* hybrid, *Secale cereale* (stooling rye) and *Lolium multiflorum* (rye grass) to evaluate the impact of defoliation on root development. The pot experiment was done in a shade house, under irrigation, and the following cutting treatments were applied: three cutting frequencies (weekly, every three- and five weeks) and three cutting heights (2 cm, 8 cm and 14 cm). Five plants per pot were used per treatment. The first cut was applied when plants of different species reached an average height of 30 cm, after that treatments were applied as explained. At the end of the growing season plants were removed from the pots and soil was washed from the roots. The dry matter root mass of the five plants, in each treatment, were weighed and results are given in g per 5 plants per pot.

The plants of all three cultivars, cut to 2 cm every week, died early during the experiment with consequently low production. The 2 cm defoliated plants, at 3 and 5 weeks, survived the full experimental period, but production was in all cases less than 50% of the rest of the treatments. If rye grass is defoliated to a height of 14 cm, every week it produced 12.05 g per 5 plants per pot, every 3 weeks 24.2 g per 5 plants per pot and every 5 weeks 15.7 g per 5 plants per pot. *Triticale* had the highest production when cut every 3 weeks to 8 cm (7.75 g) and 14 cm (7.85 g) while Stooling rye did the best when cut at 14 cm every 3 weeks (12.5 g) and 5 weeks (11.2 g).

Results showed that frequent and intensive defoliation were detrimental to all species. Looking at the main effect of treatments it showed that defoliation of *Triticale* every 3 weeks gave the best results (at 8 and 14 cm) and that stooling rye can be defoliate every 3 or 5 weeks but not lower than 14 cm. Rye grass showed the ability to develop a relative high root production even under weekly defoliation (at 14 cm), although the best results were obtained when defoliated every 3 weeks.

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