ESTABLISHMENT OF AN OPTIMAL GRAZING TIME OF KIKUYU PASTURES FOR DAIRY COWS

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Summary. The quality of kikuyu (*Pennisetum clandestinum*) regrowth was examined to determine the stage of optimal quality for grazing dairy cattle. Samples were obtained above the 5cm stubble height and separated into leaf-blade, leaf-sheath, stem and dead material and corresponding leaf number monitored over a 40 day regrowth period. After the 4.5-leaf, the proportion of leaf available declinded rapidly and stem and dead material rose sharply. These changes were reflected in a decline in crude protein (CP) (to 11%) and organic matter digestibility (OMD) (to 34%) over the experimental period. Calcium concentration at the 4.5-leaf stage of regrowth was twice that at the 1-2 leaf stages. The quality of individual leaves changed with age with a decline in CP, P and K content, and an increase in concentrations of Ca and Mg. These changes were more marked in the second and subsequent leaves compared to the first.

INTRODUCTION

Kikuyu (*Pennisetum clandestinum*) is the predominant summer grass pasture used for milk production on the east coast of New South Wales and is also important in certain areas of Queensland and Western Australia. Milk production from these pastures is commonly low and this is generally attributed to low quality of pasture on offer.

To obtain reasonable milk production from kikuyu grass, quality rather than quantity of pasture of offer is important. However, from an ecological viewpoint, pasture management strategies should aim not only to optimise forage quality, but also utilisation by stock and the regrowth potential of the plant (6). A key aspect of management likely to affect pasture quality and growth is the grazing interval. Often time of grazing is based on a set time interval which disregards variations in growth rate due to environmental fluctuations. A better method of determining an appropriate grazing interval is based on pasture availability or height (3). However, as height of pasture is associated more with nutrient supply it can only be used to compare areas of uniform fertility rather than grazing readiness.

The 3-leaf stage of regrowth in ryegrass is a more relevant plant-related indicator used for timing grazing. By grazing at approximately this stage of regrowth, wastage through leaf senescence, and a concomitant decline in pasture quality is prevented (4). Also plant reserves have been replenished sufficiently to cope with regrowth after re-grazing (2).

This study aimed to establish the stage of regrowth at which quality of kikuyu grass pasture was optimal for grazing dairy cows and how this related to the number of fully expanded leaves per tiller.

MATERIALS AND METHODS

Two plot trials were conducted on established *common* kikuyu pastures grown on red kraznozem soils at Wollongbar Agricultural Institute situated on the north coast of NSW. Each plot was hand mown to a 5cm stubble height and fertilised at a rate of 100kg urea/ha during January and February, 1995. Plots were irrigated when required to replace evapo-transpiration losses. Regrowth above 5cm stubble height was examined as this was the portion deemed available to the grazing cow.

Study 1: Changes in kikuyu plant components and their quality in relation to leaf number

At 4-day intervals, 4 replicates were defoliated at 5cm stubble height within the plot (3 x 9m^2) and separated into leaf-blade, leaf-sheath, stem and dead portions. Samples was dried to determine the dry matter (DM) content and subsequently analysed for level of crude protein (CP) and organic matter digestibility (OMD). Additionally, the leaf regrowth of 36 individually marked tillers within the plot was

monitored over the same period. The stage at which a particular leaf was considered to be fully expanded was when the relevant leaves on 90% of the plants examined had ceased to elongate.

Study 2: Changes in the mineral content of the whole plant regrowth and quality within individual leaves

Pasture was cut to 5cm stubble height at weekly intervals over a 6 week period and analysed for mineral content. At the same time, samples (40 x 10 cm^2) in 4 replicates were obtained above ground level and separated into the remnant leaf (the last expanding leaf prior to mowing), new leaf (ie. 1st leaf, 2nd leaf, 3rd leaf etc), old leaf and stem and each component analysed for N, OMD and minerals.

RESULTS AND DISCUSSION

Study 1 - Changes in components and quality in relation to leaf number

Fig. 1 illustrates the DM changes in the portions of plant components above the 5cm stubble height.

Following the 4.5-leaf stage of regrowth, the proportion of leaf available declined below 80% and

there was a corresponding increase in both the stem and in particular, the dead fractions.

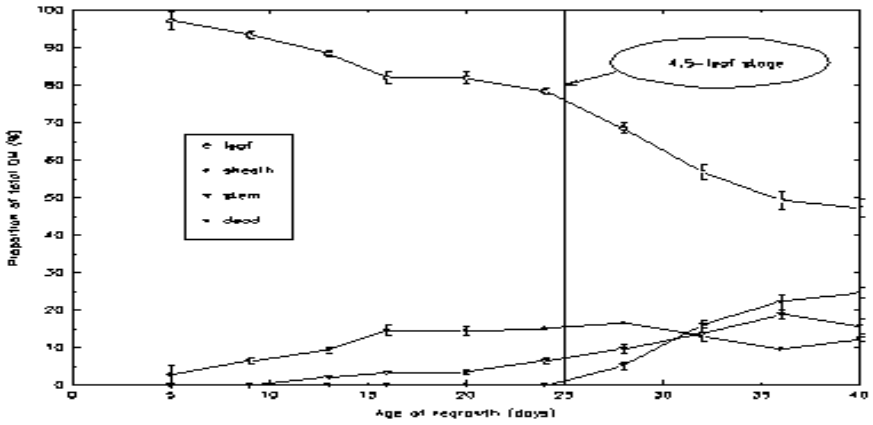

Figure 1. Changes in the proportion (% DM) of leaf-blade, leaf-sheath, stem and dead material in kikuyu on offer above 5cm stubble height with days regrowth

The concomitant decline in CP and OMD is shown in Fig. 2. This suggests that grazing kikuyu at the 4.5-leaf stage of regrowth would provide stock with pasture of optimal quality. At this stage of regrowth, carbohydrate reserves should be adequately replenished for subsequent regrowth.

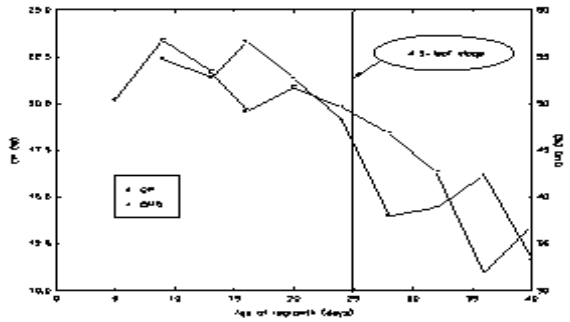

Figure 2. Changes in the levels (% DM) of crude protein (CP) and organic matter digestibility (OMD) of kikuyu on offer above the 5cm stubble height with days regrowth

Study 2 - Changes in the mineral content of the whole plant regrowth and quality within individual leaves

The mineral content of kikuyu did not alter significantly with the age of regrowth above the 5cm stubble height with the exception of calcium (see Fig. 3), with the mean level of P, K, Mg and Na being 3.89 ? 0.10, 15.82 ? 0.99, 3.14 ? 0.10 and 0.47 ? 0.03 g/kg DM, respectively.

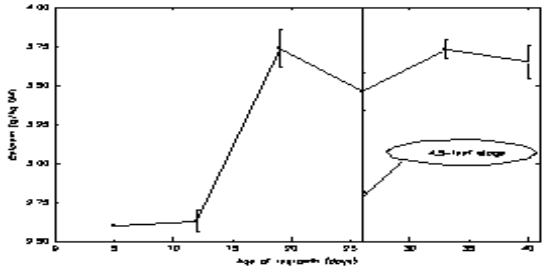

Figure 3. Changes in the Ca content of kikuyu regrowth above 5cm stubble height

Fig. 4 illustrates changes in the protein and mineral composition of the first new leaf to emerge after mowing. CP levels were high after emergence and maintained above 20% for a couple of weeks prior to a rapid decline. A similar trend was observed in subsequent new leaves, however, in the 3rd to 6th new leaves CP levels were not maintained and declined from emergence.

The disparity between changes in minerals in individual leaves and total herbage above 5 cm stubble, would have been due to the summation of minerals in the more developed leaves and new leaves as they emerged over time. Additionally, the elongation of stem (which contains a different mineral concentration to leaves) above the 5 cm stubble would also contribute to the variation.

The accumulation of Ca observed in the first leaf also occurred in subsequent new leaves and was reflected in the data obtained above 5 cm stubble height (see above). Grazing at the 4.5-leaf stage enables Ca levels to reach the levels required by milking cows (1). However, the presence of oxalate in

kikuyu (up to 1.1% DM; M. Reeves, unpub. data), may bind up Ca in insoluble crystals rendering them unavailable to the animal. Therefore, even at optimal total Ca levels in kikuyu, Ca concentration may be inadequate for the lactating dairy cow.

As the leaf aged, the levels of Mg increased and K declined which is beneficial to the cow since high K levels adversely affect Mg absorption through the ruminal wall and Mg is often limiting (5). P levels declined with leaf age but levels remained marginally above requirements of lactating cows after 20 days of regrowth.

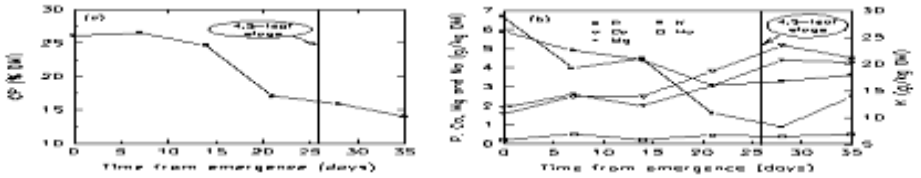

Figure 4. Changes in the (a) crude protein (CP) and (b) mineral composition of composite samples of the first leaf of kikuyu emerged following mowing.

Grazing at approximately the 4.5-leaf stage of kikuyu regrowth appears to be favourable in terms of both quality available to the dairy cow and the regrowth potential of the plant, however due to innate deficiencies of various nutrients in the pasture, supplementation would be required to optimise milk production from kikuyu.

ACKNOWLEDGMENTS

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