Filling the winter feed-gap : Autumn oversowing of a kikuyu (*Pennisetum clandestinum*) dominant sward in the Sydney Metropolitan region

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Kikuyu (*Pennisetum clandestinum* Hochst ex Chiov.) occupies at least 30% of the dairy farming area on the New South Wales coast and provides 75% of the pasture available over the summer and autumn period (Anon, 1992). This grass species is active from spring to autumn but becomes dormant once the mean minimum temperature drops below 10°C. Thus in the dairy regions of the Metropolitan and South Coast, this dormant or slow growth period occurs from May to September. For dairy farming, the most common method of filling this occurring feed gap is to oversow winter active species such as Italian ryegrass into the sward on an annual basis.

An autumn application of glyphosate to kikuyu at the recommended rate has been shown to be more effective than alternative methods in promoting establishment and growth of oversown species. Unfortunately this practice (glyphosate) has a negative residual effect of up to 10 months on kikuyu recovery, hence potentially creating a late spring - early summer feed-gap (Read, 1988). It has been observed at the University of Western Sydney, Hawkesbury that closely managed kikuyu is particularly sensitive to glyphosate. Hence in this field trial, which occurred between April and November 1997, it was decided to include a treatment of half the commercially recommended rate of glyphosate.

Methods

This research was conducted at the University of Western Sydney, Hawkesbury campus located at Richmond, New South Wales (lat. 33°36'S and long. 150°47'E ; 19 m above sea level) on the University's dairy farm. The site was sown to kikuyu in 1994, and in the autumn of 1997, the sward was mostly kikuyu with white clover producing less than 5% of dry matter. The soil is a sandy loam of approximately 1 meter in depth under which overlies a clay sub soil.

The site was slashed in March to a height of 5 - 10 cm, with all loose matter removed with a hay rake, and four days prior to sowing (April 4th) the site was mown using hand mowers and catchers to a height of 5 cm. Italian ryegrass (*Lolium multiflorum* cv. Concord) was sown using a Baker Boot plot

seeder at a rate of 20 kg/ha. The experiment contained 4 treatments applied to the kikuyu sward prior to sowing as indicated in Table 1. The experimental design was a randomised complete block with four replications and a plot size of 4 m x 2 m.

When there was enough growth for the practical grazing (about 1.5 t/ha), treatments were selectively harvested. Dry matter yield was measured using two 50 x 50 cm2 quadrat samples taken at random from the plot designated for harvesting to a height of 5cm. Each treatment was harvested three times over the period between 4th April to 6th October. Spring regrowth was assessed using a 1 m2 quadrat on the 25th October (three weeks after the final harvest) to determine the survival and regrowth of the suppressed kikuyu.

All plots received an application of 40 g/ha molybdenum in the form of sodium molybdate, 200 kg/ha single superphosphate and 100 kg/ha of Muriate of Potash at the time of sowing (7th April). A topdressing of 80 kg/ha sulfate of potash was applied to all plots on the 22nd August. Nitrogen as ammonium nitrate was applied at 50 kg N/ha, one week after sowing, to all plots. The original plan was to apply 50 kg N/ha to all plots after each harvest. However, nitrogen deficiencies became apparent in the slashed and Spray Seed plots in July, so an application of 50 kg/ha N was applied to these plots on the 22nd August, although they were not harvested until the 9th of September. All other nitrogen applications followed dry matter harvests.

Irrigation (50 mm on each pass) was applied by travelling irrigator, to maintain adequate soil moisture levels or to water in the nitrogen fertilizer.

Results

The use of suppression treatments to reduce kikuyu competition made no significant difference to the total amount of useable feed produced ($P<0.05$). However, the suppression treatments did affect the components of "useable feed", comprising of kikuyu, ryegrass and clover. A higher amount of ryegrass DM was produced from the treatments with Roundup as the suppression agent. Ryegrass production within those plots treated with Roundup CT averaged 7927 kg/ha DM while the Spray Seed and slashed only treatments averaged 6397 kg/ha DM (Table 1). To balance this however, the slashed only and slashed/Spray Seed treatments enabled the kikuyu to continue its growth over the autumn period, and thus make a significant contribution to useable feed in April and May.

Visual assessment on the 25th October, showed the slashed only and slashed/Spray Seed® treatments had significantly higher levels of kikuyu ground cover than those plots treated with Roundup CT®, and plots treated with Roundup CT at 0.5 L/ha, had significantly higher ground cover of kikuyu than those plots treated at 1.0 L/ha (Table 2). Conversely, the amount of exposed soil or bare ground was significantly higher in the Roundup treatments, and greater for Roundup CT at 1.0 L/ha than 0.5 L/ha.

Table 1: Total average dry matter (sum of 3 harvests) for each suppression treatment.

Treatment	Ryegrass (kg/ha)	Kikuyu grass (kg/ha)	Useable feed (kg/ha)
Slashed only	6180 b	964 a	7144 a
Spray Seed 3.0L/ha	6613ab	1086 a	7699 a
Roundup CT 1.0L/ha	7940 a	0	7940 a
Roundup CT 0.5L/ha	7913 a	0	7913 a

Table 2: Botanical composition of mown plots in late spring (mean percentage ground cover).

Treatments	Ryegrass	Kikuyu	Bare ground
Slashed only	25 a	56 a	16 b
Spray Seed 3.0L/ha	34 a	46 a	19 b
Roundup CT 1.0L/ha	41 a	11 b	40 a
Roundup CT 0.5L/ha	35 a	24 b	33 a
Species Mean	34 a	34 a	27 a

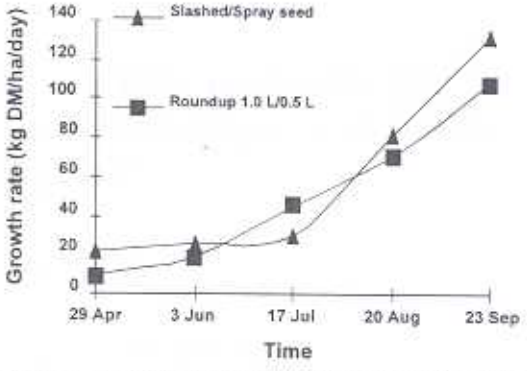

Figure 1: Average daily production of usable feed for Roundup and non-Roundup treatments.

Weed and clover represented less than 10% of the ground cover and showed no significance between the treatments (Johnston, 1998).

Discussion

The results of this study confirm that Concord ryegrass provides substantial levels of herbage when oversown into kikuyu. No significant difference was shown between the four suppression treatments for total ryegrass yield. This contrasts with reports written by Hill (1985) and Drummond *et al.* (1977) who reported significant increases in DM production in ryegrass plots treated with glyphosate at the recommended rate. The nitrogen fertilizer regimes may have influenced the results of the UWSH experiment. As reported in the methods section, the slashed only and slashed/Spray Seed plots received an additional 50 kg N/ha on the 22nd August when

The pattern of production of useable feed from the ryegrass plots over the duration of the trial was affected by the suppression treatments, as is seen in Figure 1. Although the differences were not always significant, the plots with Roundup had slower growth in late autumn, faster growth in mid winter and slower growth in spring (compared to the slashed or Spray Seed plots). This difference in autumn, is attributed to kikuyu growth, and in spring may be due to the timing of nitrogen applications. The Roundup treatments received 50 kg N/ha on 30th July and 9th September while the slashed and Spray Seed treatments received 50 kg N/ha on 22nd August and 9th September. Two applications of N relatively close together would have boosted the growth rates of the Spray Seed and slashed only plots in the period leading up to the harvest on 6th October.

For the Hunter Valley and Metropolitan areas Griffiths (1989) suggests annual ryegrass should grow at 40 kg/ha/day in July and 100 kg/ha/day in September. These figures are comparable with the figures achieved in the UWSH trial for the plots treated with Roundup (Figure 1). The growth rates of ryegrass in plots slashed or treated with Spray Seed were slower than expected in June, July and early August. Nitrogen was applied on the 22nd May after Harvest 1 but observations suggest this was lost due to leaching and volatilization (Johnston, 1998).

The most significant outcome of the trial is the suggestion that the recommended rate of Roundup CT (1.0 L/ha) may be higher than necessary. The lower rate not only reduces the cost of chemical application but leads to more rapid recovery of kikuyu in the spring.

References

Anon (1992) Advisory survey, 1992. *Department of Agriculture, New South Wales.*

Drummond, G., Wright, W., Wetherall, B. and Ware, B. (1977) Farming with kikuyu. *New South Wales Department of Agriculture.*

Griffiths, N. (1989) Intensive Pasture Management in the Lower Hunter, 1st edn. *NSW Agriculture and Fisheries*, Orange

Hill, M.J. (1985) Direct drilling tall fescue (*Festuca arundinacea* Schreb.), prairie grass (*Bromus catharticus* Vahl) and italian ryegrass (*Lolium multiflorum* Lam.) into kikuyu and paspalum pastures. *Australian Journal of Experimental Agriculture*, **25**, 806-817

Johnston, S.M. (1997) Filling the winter feed-gap : Autumn oversowing of a kikuyu (*Pennisetum clandestinum*) dominant sward in the Sydney Metropolitan region. Honours Thesis 1997.

Read, J.W. (1988) Agfact P2.5.3, Kikuyu management, 2nd edn. *NSW Agriculture*, Sydney.