MAINTAINING WHITE CLOVER *(TRIFOLIUM REPENS)* IN A KIKUYU *(PENNISETUM CLANDESTINUM)* PASTURE IN THE SUBTROPICS

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Summary. This plot cut study on clay soil flats on the north coast of NSW showed that white clover cv. Haifa could be successfully established and maintained in a vigorous sward of kikuyu grass. Over the three years of the study 49,880 kg DM/ha total forage was produced at the optimal defoliation combination (*when ready* (lower leaves of white clover beginning to senesce) in spring and autumn and 5 cm stubble height in spring). The plant density and vigour of the Haifa white clover declined dramatically in year 3 and the production in that year was almost entirely due to invasion of 'naturalised' white clover. The reason for the dramatic decline in productivity of Haifa is unclear, but is probably due in part to a buildup of the root knot nematode *Meloidogyne hapla*.

INTRODUCTION

The use of kikuyu grass in summer, oversown with annual ryegrass in autumn for winter/spring feed, is a common feed base for dairy cows on the subtropical north coast of NSW. Both pastures are maintained by applications of N fertilizer. There are questions as to the sustainability of such a system which relies on high inputs of N fertilizer - in terms of the environment (soil acidification) and cost (seed and fertilizer) and as a consequence, there is interest in the use of legumes. However, the vigour of kikuyu in summer precludes its coexistence with the most commonly used legume, white clover. Our approach has been to develop appropriate management so that both kikuyu and white clover complement each other over time, giving:

• Kikuyu in summer

• White clover for the rest of the year.

The *turning off and on* of each pasture is brought about by appropriate management. Thus, white clover is *switched on* in early autumn while soil temperatures are approximately 19?C, kikuyu grass is suppressed initially by hard defoliation and low level herbicide and then kept under control by defoliating when new leaf growth exceeds approximately 8 cm. The key is to maintain light to the growing points of white clover.

In late spring, management practices are designed to favour kikuyu growth - infrequent irrigation, frequent and lax grazing and application of N fertilizer.

A 3-year study was undertaken to determine the production and persistence of a kikuyu/white clover pasture, subject to various defoliation treatments over the autumn to spring period.

MATERIALS AND METHODS

A vigorous sward of kikuyu, cv. Whittet, was oversown with Haifa white clover at 4 kg/ha on 1 April 1992, two weeks after spraying the area with 0.5 L Glyphosate/ha. Kikuyu growth post-sowing was controlled by defoliating to 5 cm stubble height when regrowth of leaf exceeded 8 cm. At sowing, and annually thereafter, 250 kg superphosphate and 100 kg muriate of potash/ha was applied and irrigation was provided at 6-10 day intervals. In order to simulate more closely nutrient return through dung and urine under grazing, a proportion of P, K and N was returned as fertilizer (1).

Plots of 2x2 m were randomly allocated to various defoliation treatments (see results) with twelve plots, not sown to white clover, used as controls. Treatments were replicated three times.

RESULTS AND DISCUSSION

DM yields

Plots cut at 5 cm stubble height at the *when ready* stage in spring and autumn produced 23% more white clover than the next most productive defoliation treatment (Table 1). Total yield over the 2? years for this defoliation combination was 49,880 kg DM/ha, of which 57% was white clover.

Table 1. Yield (kg DM/ha) of white clover over the 2? years of the study, for plots defoliated at 5 or 12 cm stubble height in spring and at 14 days or when ready (WR) in spring and autumn (means with different superscripts are significantly different at $P < 0.05$).

Spring		Autumn	kg DM/ha
Stubble height (cm)	Defoliation Interval	Defoliation Interval	
5	14 d	14 d	18964[bc]
	14 d	WR	24408[ab]
	WR	14 d	21324[bc]
	WR	WR	28226[a]
12	14 d	14 d	17852[c]
	14 d	WR	20327[bc]
	WR	14 d	18341[c]
	WR	WR	16704[c]

WR = lower leaves beginning to senesce

The yield of sown clover declined dramatically in year 3 and the yield shown in Fig. 1A for year 3 was almost entirely from naturalised white clover. This is confirmed by the increased clover yields in the control plots not sown to white clover (Fig. 1B) over years 2 and 3.

The reasons for the decline in vigour and density of the sown white clover variety after year 2 is inconclusive. The conditions under which the trial was conducted were near optimal for moisture, fertility and pH, with a wide range of defoliation management practices.

However, there was a dramatic build up of the root knot nematode *Meloidogyne hapla* in the soil and roots of white clover. Soil samples taken from third year pasture under the plots, and from dairy farm pastures showing severe decline in vigour of white clover, were frozen for 48 hours to remove the general pathogen burden. Haifa white clover seed was sown in this and unfrozen soil. Seedlings sown in the previously unfrozen soil did not grow past the first trifoliate leaf stage, whereas plants in soil previously frozen grew well. Roots of plants from unfrozen soil were severely retarded and had galls at the ends which, on closer examination, contained nematode eggs.

The inability of clover seedlings to advance beyond the first trifoliate leaf is a common observation in 3-year-old white clover swards that have declined in vigour.

REFERENCES

1. Hutton, J.B., Jury, K.E. and Davies, E.G. 1967. NZ J. Agric. 10, 367-388.

Figure 1. Yield (kg DM/ha) of kikuyu (o) and white clover (n) for plots sown to Haifa white clover (A) or for control plots (B) not sown to Haifa and in which volunteer clover had gradually invaded. These control plots were subject to the same fertilizer and irrigation management. Means are for plots defoliated at 5 cm stubble height in spring and at the *when ready* stage in spring and autumn.