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G18 WHITE CLOVER — A NEW CULTIVAR FOR LOWLAND PASTURES

J. VAN DEN BOSCH, J.A. LANCASHIRE,
B. M. COOPER[1], T. B. LYONS,
W. M. WILLIAMS[2]
Grasslands Division, DSIR,
Palmerston North and [1]Kaikohe
[2]Victorian Crops Research institute,
Horsham, Victoria

ABSTRACT

G18 white clover (*Trifolium repens* L.), a larger leaved, more upright growing clover than 'Grasslands Huia' and 'Grasslands Pitau', has been bred for intensive lowland farming, particularly dairy farms. It originated from crosses between 'Grasslands Pitau' and Ladino plants, selected in soil infested with stem nematode (Ditylenchus *dipasci* (Kuhn) Filipjev).

G18 has produced more than both Pitau and Huia in trials in Northland and Manawatu Total pasture production has often been similar for the three cultivars, but clover DM has increased 25.84% over four years compared with a Huia pasture in Northland, the superiority being greatest under laxer rotational grazing. G18 has persisted well, even after more than 3½ years of continuous sheep grazing, with some spells for yield cuts.

Keywords: white clover, *Trifolium repens* L., G18, Ladino, Pitau, stem nematode, production, persistence.

INTRODUCTION

'Grasslands Huia' has been the main white clover (*Trifolium repens* L.) cultivar sown throughout New Zealand for many years, and it has been productive and persistent in many areas. However, it was realised there was a need for improved cultivars in specific areas.

'Grasslands Pitau', a cultivar bred for improved winter production, was an improvement over Huia in many areas, but a cultivar for the intensively grazed lowlands was still needed, especially on dairy farms.

Ladino clovers have been found to be the most resistant lines to stem nematode (*Ditylenchus dipasci* (Kuhn) Filipjev) (Williams 1972), and are very productive, especially in summer. In Ladino, all vegetative parts are larger than in other registered varieties, which includes Huia. The stolons are very thick and fleshy, the leaves are extremely large and the petioles long. Growth habit is tall, erect, lax and open in comparison with Huia (Barnard 1972). Large-leaved clovers are usually less persistent and less tolerant of heavy grazing pressure (Williams 1978). Therefore a breeding programme was used to combine the productivity and disease resistance of Ladino with an adapted cultivar (Pitau).

METHODS

Breeding

G18 is based on crosses between 'Grasslands Pitau' and 3 Ladino cultivars. Progenies of these crosses were grown in stem nematode infested soil at Palmerston North, and a few outstanding plants were selected on the basis of yield and disease resistance.

Evaluation

1. Northland

(a) A sheep grazing trial, which ran for 4 years, included G18, Pitau and Huia in mixtures with 'Grasslands Nui' ryegrass (*Lolium perenne* L.) on both podzol (gumland) and basalt (volcanic) soils at Kaikohe. There were 4 grazing treatments over the

summer/autumn period, but common grazings for all plots in winter and spring. The summer/autumn grazing treatments were:

1) hard grazing every 2 weeks
2) at 8 cm grazing to 3 cm
3) at 15 cm grazing to 3 cm
4) at 20 cm grazing to 3 cm

Plots were 3 m × 1 m arranged in a randomised block design. The 4 replicates were separated by fences, but the species sub-plots within replicates were not separately fenced.

(b) Three G18 lines, as well as Pitau and Huia, were grown as spaced plants at Kaikohe. There were 6 replicates with each replicate having 2 rows of 5 plants. Plants were 30 cm apart within the row, with 60 cm between rows, and 90 cm between plots. Growth was scored visually on a O-5 scale.

2. Manawatu

(a) Mixtures of Nui ryegrass with Huia, Pitau and G 18, plus 'Grasslands Manawa' ryegrass (*Lolium (perenne* L. × *multiflorum* L.))/G 18 were established in 2 m × 1 m plots in April 1978. There were 3 replicates with 2 frequencies of mowinq (generally 3-4 weeks and 5-7 weeks), and 2 nitrogen treatments 2% and 5% of D.M. returned for the first 22 months of the trial. Then plots were continuously grazed with sheep, with some spells for yield cuts. Five trifoliate leaves per plot were measured in September 1983, to indicate the clover type that had persisted.

(b) A small-plot trial was established in mid-April 1980. G18, Pitau and Huia were sown with Nui ryegrass at 15 or 30 kg/ha, with two mowing intervals (3.4) weeks, 5-7 weeks). There were 3 replicates of 2 m × 1 m plots. From November 1980 the plots were continuously grazed with sheep, and spelled occasionally for yield cuts,

RESULTS

1. Northland

(a) In the grazing trial G18 produced more clover dry matter than both Pitau and Huia on both soils, its superiority being greatest under the laxer grazings (Table 1). The increases compared with Huia varied from 25-84%. Total pasture yields of the 3 mixtures, meaned over the four years, did not differ.

(b) In the spaced plants, growth of the G18 lines was similar to that of Pitau over late spring/summer, but its yield was 20-50% higher over late autumn/winter. The number of plants showing disease symptoms, particularly rust and stem nematode, was much lower in G18 than in both Pitau and Huia (a mean of 17% of G18 plants infected, compared to 34% for Pitau and 36% for Huia).

2. Manawatu

(a) In the mowing/grazing trial yields did not differ during the first 9 months (April 1978-January 1979). However, large differences developed during summer/autumn to give significant yield differences between the species in the first year (Table 2). The Nui/G 18 plot gave a higher yield than the other mixtures, the increase being in the white clover DM, while ryegrass growth was lower with G 18 than with Huia. There was more clover in the infrequent cutting treatment (4667 vs 3008 kg DM/ha; LSD 5% 600) and the low N treatment (4669 vs 3006 kg DM/ha; LSD 5% 540). There were no consistent interactions. For the following 10 months, before continuous grazing with sheep, similar results were obtained. Clover growing points/m* were 25% lower in the G18 plots than in the Huia or Pitau plots, after the 22 months of cutting.

In August 1980, G18 had maintained its superiority, but in June 1981 and May 1982 Pitau had the highest yield. No total DM yield differences occurred in 1983. In May 1983 the G18 plots had a higher clover content (12.9%) than Pitau (10.0%) and Huia (5.8%) plots.

Leaf size measurements taken more than 5 years after the trial's establishment indicated that G18 had persisted, even after more than 3 years of continuous sheep grazing (Table 3).

(b) In the small-plot trial there were no cultivar differences during the first 6-7 months of the trial. After the continuous grazing period began, no significant yield differences were found, but leaf size differences from surviving plants in July 1984 indicated that G18 was still present. This was after more than 3½ years of continuous grazing by sheep.

TABLE 1: Dry matter yield (kg/ha, clover only and total) over four years on two soils with four grazing treatments at Kaikohe.
(% clover in brackets)

	Grazing treatment			
	Every 2 weeks	8 to 3 cm	15 to 3 cm	20 to 3 cm
Clover only yield (mean of 4 years)				
Podzol soil				
Huia	4942	4524	4625	4794
Pitau	5099	5068	4830	5098
G18	6167	6006	6456	7121
LSD (5%)		729		
Basalt soil				
Huia	2164	2164	1564	1867
Pitau	2352	2567	2035	223 1
G18	2870	2700	2829	344 1
LSD (5%)		226		
Total DM yield (mean of 4 years)				
Podzol soil				
Huia	12843 (38)	12052 (38)	11752 (39)	12088 (40)
Pitau	13376 (38)	12136 (42)	12003 (40)	12057 (42)
G18	12898 (48)	12181 (49)	12233 (53)	12548 (57)
LSD (5%)	ns	ns	ns	ns
Basalt soil				
Huia	9754 (22)	9543 (23)	8004 (20)	8543 (22)
Pitau	9970 (24)	9675 (27)	7811 (26)	8803 (25)
G18	9582 (30)	9353 (29)	8704 (33)	8688 (40)
LSD (5%)	ns	ns	ns	ns

ns = not significant

TABLE 2: Yield (kg DM/ha from April 1978 to April 1979 in Manawatu.
(% clover in brackets)

	Total	Ryegrass	White clover
Nui/Huia	15004	10706	2896 (19)
Nui/Pitau	15093	10284	3429 (23)
Nui/G18	15727	9975	4508 (29j
Manawa/G18	14362	8323	4516 (31)
LSD 5%	505	629	461

TABLE 3: Mean **area (cm') of clover leaves (3 leaflets) in September 1983, under grazing in Manawatu.**

Cultivar	Leafaorea (cm^2)
Huia	6.47
Pitau	7.77
G18	9.89
LSD 5%	1.12

DISCUSSION

G 18 persisted as well as the other cultivars under grazing in all trials, including the Manawatu trials which were continuously grazed with sheep for 3-4 years. Large leaved white clovers are usually less tolerant of heavy grazing pressure (Williams 1978), but G 18 still outproduced the other cultivars under the 2 weekly grazing in the Northland trial.

Most grazing trials of G 18 have used sheep, but its potential appears greatest under cattle grazing. The number of stolons is less per unit area than for Huia and Pitau, and the stolons are larger, therefore G18 has fewer growing points per unit area. Under heavy grazing pressure, sheep will eat more stolons (Curll and Wilkins 1982), while under cattle this is unlikely to happen and the plants can spread rapidly and colonise new areas. In a relatively undisturbed site, one white clover clone was found to have spread more than 18 m (Harberd 1963). Chapman (1983) found that stolon elongation was greater under cattle grazing compared with sheep grazing. Sheep actively sought out clover in preference to grass whereas cattle did not (Birseno de la Hoz and Wilman, 1981). The response of the clover to sheep grazing was a large reduction in the amount of stolon, shorter internodes, petioles and leaflets, and thinner stolons closer to the ground (Briseno de la Hoz and Wilman 1981). Curll and Wilkins (1982), in a 4 grazing, 2 nitrogen treatment experiment, found that where no N fertiiiser was applied, stolon density increased at the lowest stocking rate but decreased at high stocking rates. Therefore we suggest rotational grazing, particularly with cattle, would greatly assist G18's establishment and growth, by allowing greater stolon spread and development.

G18 will probably be used mainly in the North Island, and has already shown particular promise in Northland, Waikato (Goold 1985, West and Steele 1985), and Manawatu. Goold (1985) found that G 18 did produce better than both Huia and Pitau in winter and in summer, when grown with Ellett ryegrass in the Waikato. Its advantage may be reduced in cooler areas. Ladino x Pitau lines were inferior to Huia in Southland (Widdup and Williams 1982).

The importance of stem nematode resistance has been previously shown in spaced plant trials in Kaikohe (Cooper and Williams 1983) and Palmerston North (Williams and Cooper 1980), with lines not resistant to stem nematode producing poorly after the first year. On a stem nematode infested soil a Ladino x Pitau cross (part of G18's parentage) was one of 2 resistant lines showing rapid establishment and least production loss due to poor establishment as pure clover swards (Williams and Barclay 1972).

Evaluations in other areas, especially under cattle grazing, will give a clearer picture of the potential of G 18. Trials are underway, including a farm trial on a dairy farm near Taupo.

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