

# The effects of strategic nitrogen fertiliser application during the cool season on the composition of a perennial ryegrass-white clover pasture in the Western Cape Province of South Africa

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**Introduction** Application of fertiliser N to stimulate DM production of perennial ryegrass-white clover pastures during the cool season can be an important management tool. Application of fertiliser N should however maintain clover contents between 30 and 50 percent (Martin, 1960; Harris, 1994). The aim of the study was to develop a better understanding of the effect of a strategic N fertiliser application during the cool season on the grass-clover balance and to identify possible management guidelines that would maximise dry matter production without suppressing clover content to values lower than required to maintain the benefit of clover in the pasture.

**Materials and methods** A perennial ryegrass-white clover pasture was established under irrigation in autumn 1999 and treatments commenced in autumn 2000. The trial was laid out as a randomised complete block with a 4 x 5 factorial arranged in a split-plot design (Snedecor & Cochran, 1967). Four N levels (0, 50, 100, and 150 kg N ha<sup>-1</sup>) were applied during five seasons (late-April/early-May [autumn], early June [early winter], mid-July [late winter], late-August [early spring] or late-September/early October [late spring]) with four replicates. Each plot received a single annual application of fertiliser nitrogen after cutting, the timing of application depending on season. To facilitate soil N studies the pasture was grazed at four weekly intervals in summer and mowed five weekly from late autumn to late spring. Clover content was determined 5 and 10 weeks after N application.

**Results** Increased fertiliser N rates resulted in increasingly lower clover percentages (Table 1). No differences in clover percentage were recorded between the 100 and 150 kg N ha<sup>-1</sup> application rates five weeks after fertiliser N application. The effect of season of application was inconsistent due mainly to different initial clover percentages. Partial recovery of clover content was noted at the end second re-growth cycle (10 weeks) but did not reached the same levels as at the 0 kg N ha<sup>-1</sup> treatment combinations. Clover content (%) of treatments that received 50 kg N ha<sup>-1</sup> normally recovered to the same levels as measured at the 0 kg N ha<sup>-1</sup> treatments within 4-5 regrowth cycles. The predicted clover content (%) after fertiliser N application during a specific season can be described by a linear function:  $y = a + (b_1x_1) + (b_2x_2)$  where  $x_1$  is the initial clover percentage and  $x_2$  the fertilizer N rate.

**Table 1** Clover percentage of a perennial ryegrass-white clover pasture five and ten weeks after fertiliser N application during year 2000 at Elsenburg, South Africa

Season	Five weeks				Mean
	Fertiliser N rate (kg ha <sup>-1</sup> )				
	0	50	100	150	
Autumn	66.47	49.79	47.06	39.65	50.75 a*
Early winter	55.48	46.89	41.07	39.12	45.64 ab
Late winter	52.91	36.24	32.66	26.31	37.03 bc
Early spring	47.4	29.06	21.18	19.04	29.17 c
Late spring	50.42	32.24	22.02	20.00	31.17 c
Mean	54.53 a	38.84 b	32.80 c	28.82 c	38.75
	Ten weeks				
Autumn	55.48	47.21	46.95	43.82	48.37 a*
Early winter	52.91	49.06	43.39	36.11	45.37 ab
Late winter	47.4	38.93	35.58	22.41	36.08 bc
Early spring	50.42	35.79	23.44	19.99	32.41 c
Late spring	57.42	41.44	30.11	27.05	39.00 abc
Mean	52.73 a	42.48 b	35.89 c	29.88 d	40.25

\*Means of a specified sampling time in the same column or row followed by the same letter are not significantly different (P<0.05). Nitrogen rate x Season of application = NS

**Conclusions** This study showed that the application of 50 kg N ha<sup>-1</sup> did not reduce the clover content to less than 30% during any season if an initial clover content of ca 47% was present before fertiliser N application. The application of 150 kg N ha<sup>-1</sup> in the current study resulted in numerous treatment combinations to have clover percentages of less than 30%. Initial clover content (%) of the pasture, the season when N application is planned and pasture productivity will dictate the fertiliser N rate to be applied.

## References

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