

# Production and persistency of red clover (*Trifolium pratense*) varieties when grown in mixtures

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## Abstract

In the Netherlands organic and conventional dairy farmers are taking an increasing interest in grass and red clover mixtures for ley pastures (cutting only). A constraint to the adoption of such mixtures is the persistency of the red clover (*Trifolium pratense* L.) varieties presently used in the Netherlands; Rotra, Barfiola, Violetta and Merviot. The latter being the most persistent under practical circumstances. Testing of red clover varieties in Switzerland showed a high degree of persistency of the so-called 'mattenklee' varieties such as Astur and Pica (Suter *et al.*, 2004). We compared eight red clover varieties including 2 'mattenklee' varieties in mixtures with perennial ryegrass (*Lolium perenne* L.) and white clover (*Trifolium repens* L.), and a mixture containing white clover and perennial ryegrass only. Red clover mixtures out yielded the white clover mixtures by 5.4 t dry matter (DM) ha<sup>-1</sup>. ULC 1715186 and Astur were the most productive red clover varieties. The development of the clover content of Astur showed that this variety scored highest on persistency.

Keywords: red clover, varieties, yield, persistency.

## Introduction

Red clover, in combination with perennial ryegrass and white clover, can achieve high yields with a low degree of fertilisation. A mixture of perennial ryegrass with red and white clover out yields a mixture of perennial ryegrass with only white clover by 1 to 1.5 t DM ha<sup>-1</sup> (Wit *et al.*, 2004). This makes such mixtures interesting crops for organic dairy farmers as well as intensive conventional dairy farmers in the Netherlands. In such systems the mixture fits perfectly in a crop rotation with maize. Red clover usually yields well for two to four years, after which the majority of nitrogen fixation is taken over by white clover. The production and persistency of these systems depend on the red clover variety and frequency of harvesting. A constraint to the adoption of grass/red clover mixtures is the persistency of the red clover varieties presently used in the Netherlands; Rotra, Barfiola, Violetta and Merviot.

This paper presents the production and persistency results of a comparison of eight red clover varieties in a mixture of perennial ryegrass and white clover in comparison with a mixture of perennial ryegrass with only white clover over two years.

## Material and Methods

The experiment was established on a commercial dairy farm in the north of the Netherlands, on a clay soil. The following red clover varieties were compared; Barfiola, Rotra, Tedi, Lemmon, Astur, Merviot, ULC 1715/86 and Pica. Red clover varieties were sown in a mixture with 30 kg ha<sup>-1</sup> perennial ryegrass, 3 kg ha<sup>-1</sup> white clover (Alice). The amount of red clover seed was based on the number of seeds in 5 kg ha<sup>-1</sup> Barfiola. The mixtures were sown on plots of 3 m x 8 m each replicated three times. The trial was sown in August 2002 after a crop of barley and peas. In 2003 and 2004 the plots were fertilised with 25 m<sup>3</sup> ha<sup>-1</sup> of slurry. Dry matter percentage and clover content in the dry matter were determined by taking 7 m x 1.5 m strips just before each cut. In 2003 as well as in 2004 the plots were cut four times.

## Results and discussion

In the first year, red clover developed slowly. This may be explained by the high soil nitrogen level left by the previous crop of barley and peas. Another explanation could be that the experimental plots were

invaded with chickweed (*Stellaria media* L.). Despite the slow establishment, high total yields were achieved in both years (on average 15.5 t DM ha<sup>-1</sup> in 2003 and 17.3 t DM ha<sup>-1</sup> in 2004; Table 1). However DM production of red clover in the second year almost tripled compared to the first year. When looking at DM production of red clover in 2003, it can be seen that the varieties Pica and Lemmon were less productive than ULC 1715/86 and Rotra (which formed the middle group) whilst Barfiola, Astur, Tedi and Merviot produced the highest clover yields.

Table 1. Production and persistency of red clover varieties.

Group	Variety	White clover	Yield dry matter (t ha <sup>-1</sup> )				2 <sup>nd</sup> year % red* clover 4 <sup>th</sup> cut
			1 <sup>st</sup> year		2 <sup>nd</sup> year		
	Red clover		Total	Clover	Total	Clover	
Diploid 'Mattenklee'	Pica	Alice	15.5 <sup>b</sup>	3.4 <sup>b</sup>	17.6 <sup>bc</sup>	10.5 <sup>b</sup>	41 <sup>a</sup>
Tetraploid 'Mattenklee'	Astur	Alice	16.3 <sup>b</sup>	5.7 <sup>c</sup>	18.8 <sup>d</sup>	15.2 <sup>cd</sup>	74 <sup>b</sup>
Diploid 'Akkerklee'	Merviot	Alice	15.6 <sup>b</sup>	5.5 <sup>c</sup>	18.0 <sup>cd</sup>	13.2 <sup>c</sup>	42 <sup>a</sup>
Diploid	Lemmon	Alice	15.9 <sup>b</sup>	3.3 <sup>b</sup>	18.3 <sup>cd</sup>	11.0 <sup>bc</sup>	41 <sup>a</sup>
Tetraploid	Barfiola	Alice	16.5 <sup>b</sup>	6.3 <sup>cd</sup>	17.0 <sup>b</sup>	11.7 <sup>bc</sup>	52 <sup>a</sup>
Tetraploid 'Akkerklee'	Rotra	Alice	15.5 <sup>b</sup>	4.6 <sup>bc</sup>	17.4 <sup>bc</sup>	12.7 <sup>bc</sup>	44 <sup>a</sup>
Tetraploid	Tedi	Alice	16.4 <sup>b</sup>	5.6 <sup>c</sup>	17.8 <sup>c</sup>	11.8 <sup>bc</sup>	51 <sup>a</sup>
Tetraploid	ULC 1715/86	Alice	16.5 <sup>b</sup>	4.5 <sup>bc</sup>	18.8 <sup>d</sup>	14.3 <sup>cd</sup>	55 <sup>a</sup>
White clover		Alice	11.7 <sup>a</sup>	0.1 <sup>a</sup>	11.9 <sup>a</sup>	4.4 <sup>a</sup>	55 <sup>a*</sup>
<i>Average</i>			<i>15.5</i>	<i>4.33</i>	<i>17.3</i>	<i>11.6</i>	<i>50</i>

\* In the variant 'white clover' percentage white clover was measured instead of percentage red clover. Within a column, values that are followed by the same letter differ not significantly ( $P < 0.001$ ).

In 2004, the production groups contained almost the same cultivars, with the difference that ULC 1715/86 and Astur yielded the highest production and Barfiola decreased in production in comparison with the other varieties (differences between groups were found to be significant ( $P < 0.001$ )). In the plots with only grass/white clover, hardly any clover was found in 2003. This was probably due to the heavy infestation of chickweed (*Stellaria media*), which affected the establishment of white clover much more than the establishment of red clover. In both years, DM production of the plots with only grass/white clover was significantly lower than that of plots containing red clover, even when the white clover percentage recovered in the second year. In the last cut of the second year, percentages of red clover decreased, whereas white clover percentage increased.

The 'Mattenklee' variant Astur showed the highest persistency, with 74% red clover in the last cut (Table 1). This was significantly higher than any of the other varieties ( $P < 0.001$ ). The frequency of harvesting was equal for all variants in this experiment, four cuttings annually. Therefore, differences in persistency of the red clover varieties cannot be declared by harvesting frequency. The average harvesting frequency of four cuttings is, under Dutch circumstances, especially in case of high yields per cut, positive for the development of red clover (optimal three cuttings annually) in comparison with white clover (optimal five cuttings annually).

## Conclusions

In general, it can be concluded that grass mixtures containing both red and white clover gave higher yields when compared with grass mixtures with only white clover. Within the red clover varieties, Astur

and ULC 1715/86 gave the highest DM production over the two years of the experiment. Astur was the most persistent red clover cultivar in the study.

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#### **References**

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