Red clover: A promising pasture legume for Ireland

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Introduction

Red clover is considered a very productive but short lived perennial legume. Previous research has shown attractive yields for red clover in the first year after establishment (O'Kiely *et al*., 2006). This experiment quantified the impacts of cultivar, companion grass, harvest schedule and nitrogen fertiliser on crop yield in the sixth year after establishment, and compared these to grass receiving inorganic N fertiliser.

Materials and Methods

Within a randomised complete block (n=4) design, field plots (10 m x 2 m) were used to evaluate a 2 (cultivar) x 2 (alone or with companion grass) x 2 (application of N fertiliser in spring) x 2 (harvest schedule) combination of factors relating to red clover, and a 2 (harvest schedule) x 4 (application of N fertiliser in spring) combination of factors relating to monocultures of perennial ryegrass. Two cultivars of red clover (Merviot and Ruttinova) were sown in autumn 2001 as monocultures or with perennial ryegrass (cv. Greengold). They received 0 or 50 kg inorganic fertiliser N ha^{-1} in mid March. The first harvest date was 24 May (Early schedule) or 11 June (Late schedule) and subsequent harvests following 24 May were after 57, 98 and 164 days, with corresponding durations after 11 June being 50, 99 and 147 days. Monocultures of perennial ryegrass received 0, 50, 100 or 150 kg inorganic N ha^{-1} in mid March and immediately after the first three harvests, and had similar harvest dates to red clover. All plots were harvested to a stubble height of 5 cm on four occasions and received P and K after each harvest. Dry matter (DM) content was determined by drying at 98°C for 16 h. Red clover data were analysed using a General Linear Model that accounted for each of the four factors as well as all two-, three- and four-way interactions, and for blocking. The data from the ryegrass that received N fertilisation were fitted with linear and quadratic equations.

Table 1. Herbage yield (kg DM ha^{-1}) for red clover treatments per harvest

Grass[2]	N[3]	S[4]	H[5] 1	H2	H3	H4	Total
Cult.[1] Merv.[6]							
No	No	E	6365	5405	3235	688	15693
No	No	L	6221	5465	3167	473	15325
No	Yes	E	6827	4992	3190	916	15924
No	Yes	L	7099	5146	3190	584	16019
Yes	No	E	6988	5025	3362	830	16204
Yes	No	L	6750	4971	3504	594	15817
Yes	Yes	E	6754	5297	2952	943	15945
Yes	Yes	L	7613	4297	2828	686	15422
Cult.[1] Rutt.[7]							
No	No	E	6827	5641	2722	969	16159
No	No	L	6383	5357	3115	388	15243
No	Yes	E	6471	5189	2582	928	14367
No	Yes	L	7057	5537	3078	453	16125
Yes	No	E	6779	5155	2826	980	15740
Yes	No	L	7982	5403	3154	561	17100
Yes	Yes	E	6984	5025	2535	1037	15584
Yes	Yes	L	7664	4951	2944	555	16117
Sig.[1]			NS	NS	**	NS	NS
Sig.[2]			**	**	NS	*	NS
Sig.[3]			NS	NS	*	NS	NS
Sig.[4]			NS	NS	NS	***	NS
s.e.m[8]			363.3	298.4	193.1	88.5	496.6

[1]Clover cultivar; [2]Presence of companion grass; [3]Application of inorganic N in spring; [4]Early (E) or late (L) first-cut harvest schedule; [5]Harvest; [6]Merviot; [7]Ruttinova; [8]four factor interaction; NS-non-significant; ***<0.001; **<0.01; *<0.05.

Table 2. Relationship between inorganic N fertiliser input (x; kg ha^{-1}) & ryegrass dry matter yield (y; kg ha^{-1})

H[a]	S[b]	a[#]	s.e.	b[#]	s.e.	c[#]	s.e.	R^2
1	E	4618	375.3	40.3	12.05	-0.19	0.077	0.55
1	L	6521	423.3	41.6	13.59	-0.22	0.086	0.45
2	E	2906	243.9	23.8	7.83	-0.07	0.050	0.72
2	L	2353	260.2	19.6	8.35	-0.05	0.053	0.65
3	E	1870	80.3	15.5	2.57	-0.05	0.016	0.88
3	L	2375	177.0	15.8	5.68	-0.07	0.036	0.51
4	E	1345	109.0	6.0	3.50	-0.03	0.022	0.18
4	L	643	120.3	12.9	3.86	-0.08	0.024	0.46
A[c]	E	12085	459.5	91.8	14.7	-0.40	0.094	0.84
A[c]	L	12536	539.0	103.1	17.3	-0.51	0.110	0.79

[a]Harvest; [b]Early (E) or late (L) first-cut harvest schedule; [c]Annual [#]$y=a+bx+cx^2$

Results and Discussion

Neither two-, three- nor four-way interactions were significant (P>0.05) (Table 1). Annual yield did not differ between Merviot and Ruttinova (15794 and15085 kg DM ha^{-1}; P>0.05) or between red clover monocultures or binary mixtures with ryegrass (15991 and 15607 kg DM ha^{-1}; P>0.05). No yield benefit occurred from applying inorganic N fertiliser to red clover-based swards in spring (15910 and 15688 kg DM ha^{-1}; P>0.05) and there was no difference between the early and late harvest schedules (15702 and 15896 kg DM ha^{-1}; P>0.05). Monocultures of ryegrass receiving the maximum allowance rate of inorganic N (125, 100, 100 and 100 kg N ha^{-1} for growths 1-4, respectively; Coulter and Lalor (2008)) had predicted (Table 2) yields of 6687, 4586, 2920 and 1645 kg DM ha^{-1} for the four harvests in the early schedule and correspondingly 8284, 3813, 3255 and 1133 kg DM ha^{-1} in the late schedule. First and third harvests of red clover treatments yielded similar to ryegrass (Table 2), whereas the fourth harvest yielded considerably less but the second harvest was superior to the ryegrass.

Conclusion

Red clover based swards in the sixth year after establishment produced an acceptable DM yield compared to perennial ryegrass monocultures receiving inorganic N fertilisation. Overall, the inclusion of grass with red clover, the application of N in the spring, harvest schedule or red clover cultivar did not affect annual DM yield.

References

Coulter, B.S. and Lalor, S. (2008) (ed.) *Major and micro nutrient advice for productive agriculture crops*. 3rd edn., pp. 46-47

O'Kiely, P., O'Riordan, E.G. and Black, A.D. (2006). *Grassland Science in Europe, 11:*243-245