

Varietal testing under reduced nitrogen conditions

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Farmer messages

- Nitrogen (N) increases dry matter yield with all species tested, on average there was a 23kg DM/ha grass yield response for perennial ryegrass (PRG) to one kilogram of N
- The effect of N on herbage quality is more variable than yield however, grass digestibility tended to be lower at higher N application rates
- Sward persistence was greater with higher N levels which could delay the need for re-sowing
- There were no consistent significant differences in the ranking of varieties for either PRG or timothy at different levels of N input
- The relative performance of varieties selected from the RGCL will be similar under most, lower N, conditions on farms
- Clover yields were significantly lower when grown in companion with Cocksfoot compared to PRG and TIM.

Executive summary

The Recommended List for Grass and Clover (RGCL) is an annual independent, technical publication that provides essential information on grass and clover varieties. This enables the selection of grass and clover varieties that are suited to British production systems, maximising the productivity and efficiency of these systems. However, the management of RGCL trials can be different from that which occurs at farm level. Most notably RGCL trials are managed under high inputs of nitrogen (N; 400kg/ha/yr). While this occurs to allow varieties to express their true genetic potential, it is essential to ensure evaluations from the RGCL trialling system can be reliably extrapolated to recommendations at farm level. In addition, although clover is widely used in grass swards there is little information on the performance of clover when sown with different companion grass species.

A study was established with the aim of assessing the effect of N application levels (with particular focus on low input systems) on pure stands of ryegrass (PRG) and Timothy (TIM). A supplementary trial was also established with the aim of evaluating the effect of companion grass species on the performance of white clover under cutting and grazing management. The study would provide information on the reliability of using recommendations from the current procedures for varieties when managed under low inorganic conditions.

Materials and Methods

Trials for evaluating the impact of nitrogen rate on variety performance were sown at three locations in 2011 and a further two locations in 2012 for both PRG and TIM monocultures. Six varieties of PRG (3 diploid, 3 tetraploid) and three varieties of TIM were sown. Plots were managed according to the National List (NL) trials procedures (<https://www.gov.uk/guidance/vcu-protocols-and-procedures-for-testing-agricultural-crops>) and received three different levels of N: 100, 200 and 400 kg N/ha. During the first and third year, plots were managed under conservation management, and under simulated grazing management during the second year.

White clover companion cropping trials were also established at the same sites in 2001 and 2012. Six PRG, three TIM and three cocksfoot varieties were selected. Each selected variety was sown with companion white clover varieties Aberconcord and Crusader. During the first and third year, plots were managed under conservation management, and under simulated grazing management during the second year.

Results

Perennial ryegrass

The addition of N to perennial ryegrass cultivars resulted in an average increase in grass yield equivalent to 23kg DM grass per 1kg of N applied.

In Year 1, under conservation management, Seagoe was the highest yielding variety at each N application rate. In contrast, Premium and Rodrigo exhibited the lowest yields at each N rate. Overall there was no significant difference in the ranking of varieties for dry matter yield in Year 1. There were significant differences between the varieties in the two lowest N

treatments in the first year harvests and in all N treatments in the third year harvests but rankings were little changed.

Under simulated grazing management, AberGreen was the highest yielding variety across all N application rates. Premium ranked higher under the 100 N treatment than the two higher levels of N however differences in rank were small and not significant.

Table A: Effect of N application rate on dry matter yield (t/ha) under conservation and simulated grazing management

	100 N	200 N	400 N	SE	LSD
Year 1 conservation	8.6	11.1	16.7	0.68	1.34
Year 2 simulated grazing	3.8	5.8	10.1	0.52	1.02
Year 3 conservation	5.0	6.8	12.7	0.7	1.39

There was no significant difference between D-value at the 100N and 200N treatments. However, D-values were significantly lower under the 400N treatment compared to 100 and 200N under conservation management. In contrast, D values increased with increasing N application rate under simulated grazing management.

Persistency improved with increasing N levels and there was less weed invasion in swards at the higher N levels. This was particularly noticeable at the Yorkshire site at Headley Hall. This could have a significant effect on the need to reseed. There were some changes in ranking between varieties for persistency although the differences in levels of ground cover were small.

Timothy

As with the PRG there were clear increases in yield due to the additional N. Yield differences between the varieties were small and there were no significant rank changes with the N treatments in comparison with the RGCL figures. As with the PRG the D values declined with increasing N levels under the second cut conservation management in year 1 but not with the first cut or the year 2.

Clover

There were significant differences between grass species in the yields of clover with less clover recorded when grown with Cocksfoot and more when Timothy was the companion species. There were no significant yield differences in the combined grass clover yields in both harvest years. Differences between the varieties used within grass species were small and not significant.

Two varieties of clover were used in the trials, both being medium leaf size types. Yields of Crusader were significantly lower than AberConcord in the second harvest year. Yields of grass and clover were similar with both clover varieties in both harvest years.

Conclusions

The results indicate that the Recommended Grass and Clover Lists can be used with confidence under lower N conditions.

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AHDB Dairy
Agriculture and Horticulture Development Board
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

T: 024 7647 8702
E: dairy.info@ahdb.org.uk
W: dairy.ahdb.org.uk

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