Breeding Red Clover for Yield and Persistence in Grazing Systems

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Red clover (Trifolium pratense L.) offers a number of advantages as a forage legume, but is constrained by poor persistence under grazing, limiting its impact in New Zealand pastoral systems. The objective of this research was to identify grazing tolerate germplasm by testing the growth and persistence of 21 populations among a wider set of 142 New Zealand and international accessions of red clover, in a replicated trial in a mixed sward under rotational grazing by cattle. We also studied relationships among the mixed-sward trial and traits measured in a row trial managed under periodic grazing by sheep; using samples of the same populations in each trial.

Most of the red clover populations showed a marked decline in growth score after the first two years under grazing in the mixed sward trial. The variation among the 142 accessions was clustered into four groups on a multivariate scale, with one group consisting of a number of medium leaf accessions with above average expression for all the seasonal growth traits and for plant survival in mixed swards after four summers of grazing.

The new variety Grasslands Relish showed significantly ($p<0.05$) higher growth and persistence than all other entries over the 42 months of the mixed-sward trial. After four summers under grazing, 60% of the Grasslands Relish plants were alive, more than any other entry, and significantly ($p<0.05$) more than any of the cultivar entries in the trial.

Traits observed in the single-year row trial were weakly to moderately correlated with performance in the mixed sward trial. Variation in growth habit observed in the row trial was the best predictor of yield over the 42 months of the mixed sward trial ($r^2 = 0.50$).

This research identified Grasslands Relish as a new variety with high yield potential, and markedly improved persistence under grazing. The project demonstrates an improved selection system for grazing tolerance, and the value of accessing global genetic resources for improving the genetic merit of red clover for pastoral systems in New Zealand.