

Identifying Causes of Non-Uniform Establishment of Red Clover Underseeded to Winter Wheat



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Introduction

Red clover provides significant benefits when under-seeded to winter wheat: 1) nitrogen credits, 2) increase in subsequent corn yield, 3) improvements in soil health and structure (Vyn et al., 2000; Deen, 2006). Nitrogen fertilizer costs have increased by approximately 57% over the past six years (McEwan, 2006). Red clover stands are often not uniform across a field (Figure 1). With non-uniform red clover stands, the nitrogen benefits associated with red clover cannot be captured. In addition, with non-uniform clover establishment, growers will commonly apply uniform rates of fertilizer in the subsequent crop year leading to environmental risks associated with excessive N (Magdoff, 1991) in areas of the field where clover did establish.

Objective: To determine red clover population and biomass response to winter wheat nitrogen management and row spacing.



Figure 1. Typical non-uniform red clover stand, post-wheat harvest

Materials and Methods

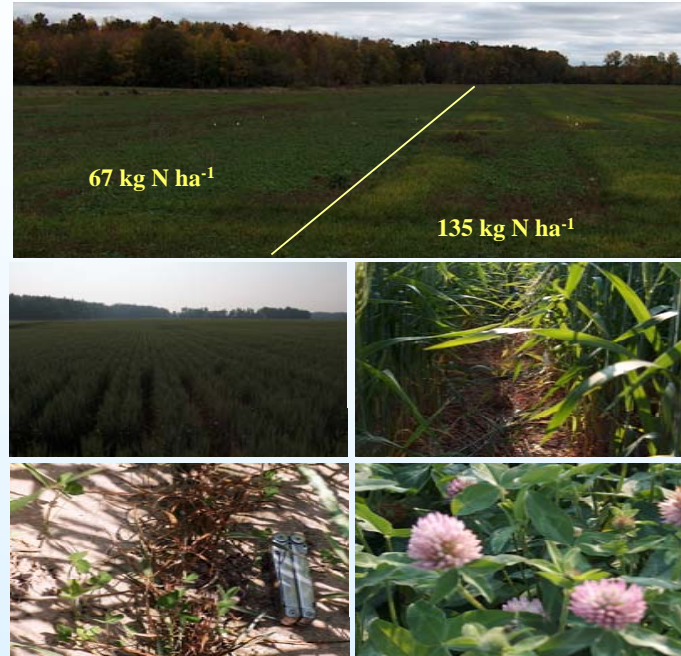
Locations: Trial conducted over two years with six locations selected across Ontario each year (Oxford, Middlesex, Elgin, Perth counties)

- two wheat row spacings (19 cm and 19/38 cm rows)
- two nitrogen rates (67, 135 kg N ha⁻¹)
- four positions per field

Measurements taken: red clover stand count and dry weight, winter wheat dry weight and yield, light penetration through the wheat canopy, gravimetric and volumetric soil moisture

References

- Deen, B., Janovicek, K., Stewart, G. Influence of red clover on maize nitrogen recommendations in Eastern Canada. Book of Proceedings of IX ESA Congress, Warsaw, Poland, September 4-7, 2006.
- McEwan, K. 2006. Farm Input Survey Report. Economics Research Group. Ridgetown College, University of Guelph.
- Magdoff, F. 1991. Understanding the Magdoff pre-sidedress nitrate test for corn. Journal of Production Agriculture 4: 297-305.
- Vyn, T.J., Faber, J.G., Janovicek, K.J. and Beauchamp, E.G. 2000. Cover crop effects on nitrogen availability to corn following wheat. Agronomy Journal 92: 915-924.



Results

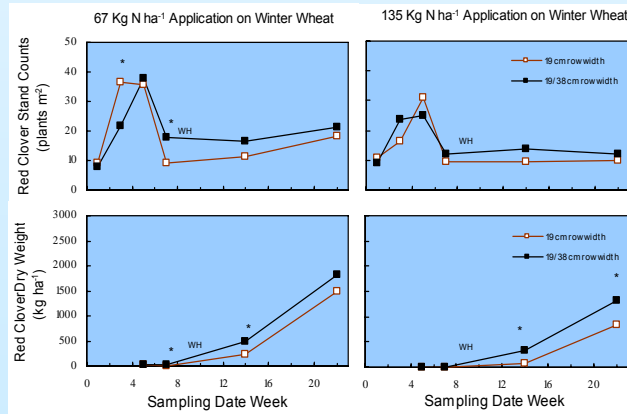


Figure 2. Red clover stand counts and red clover dry weight for a field location in Oxford county in 2005 given by sampling date week for 67 and 135 kg N ha⁻¹ application on winter wheat.

WH indicates date of wheat harvest (sampling date week nine)

* Significantly different at the 0.05 probability level

• Results indicate the following:

- When compared to the 60 N application rate, the 120 N application rate decreased red clover stand count across sample dates by 15.8% in 2005 (e.g. Figure 2) and 18.16% (P=0.011) in 2006 (e.g. Figure 3).
- Red clover stand counts across sample dates were increased by 11.4% (P=0.061) and by 15.6% (P=0.036) when adjusting row width configuration from 19 to 19/38 cm under the 60 N and 120 N application, respectively, in 2005. An increase of 8.7% (P=0.151) was observed in 2006.
- In 2005, red clover mortality occurred at anthesis of winter wheat (eg. Figure 2). This trend was not observed in 2006 (e.g. Figure 3).
- Preliminary results suggest that soil gravimetric and volumetric water contents were unaffected by treatment (data not shown).
- Mean light penetration was significantly less with 19 cm than with 19/38 cm row widths under the 60 N and 120 N for 2005 (P=0.0006, P=0.0003) and 2006 (P=0.0001). Increased N rate in 2006 significantly reduced mean light penetration (P=0.0003) (data not shown).
- End of season red clover dry weight was increased significantly with the 19/38 cm wheat row width under both the 60 N (P=0.0099) and 120 N (P=0.0217) applications (e.g. Figure 2) in 2005 and in 2006 (P=0.006) (e.g. Figure 3).

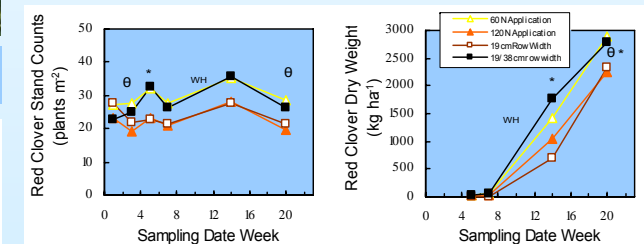


Figure 3. Red clover stand counts and red clover dry weight for a field location in 2006 in Elgin county given by sampling date week.

WH Indicates date of wheat harvest (sampling date week nine)
* Indicates row width configuration differences at the 0.05 probability level
θ Indicates N rate treatment differences at 0.05 probability level

Conclusions

Nitrogen rate and row width configuration had effects on both red clover stand count and red clover dry weight. Although mean light penetration into the wheat canopy was affected by treatment, soil moisture was unaffected. Subsequent analysis will be performed to determine the specific effects of light and soil moisture on clover establishment and growth.

Acknowledgements

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