**Genotypic differences in nodulation and growth of diverse red clover cultivars under different levels of nitrogen fertilization.**

R. M. M. S. Thilakarathna[1]; M. McElroy[1]; Y. A. Papadopoulos[2]; S. A. E. Fillmore[3]; B. Prithiviraj[4]

[1]Department of Biology, Life Science Centre, Dalhousie University, 1355 Oxford Street Halifax, NS, Canada B3H 4J1; [2]Agriculture & Agri-Food Canada, Nova Scotia Agricultural College, PO Box 550, Truro, NS, Canada B2N 5E3; [3]Agriculture & Agri-Food Canada, 32 Main, Kentville, NS, Canada B4N 1J5; [4]Departmentof Environmental Sciences, Nova Scotia Agricultural College, PO Box 550, Truro, NS, Canada B2N 5E3.

Plants have diverse adaptive responses to nitrogen (N) not only at the species level, but also at the cultivar level. Different red clover (*Trifolium pratense* L.) cultivars are commonly used in legume based pasture mixtures in North America but detailed information on how soil N affects nodulation and initial plant growth is lacking. It is hypothesized that there is genetic variability between different red clover (RC) cultivars for nodulation under different N fertilization. Nodule formation of three diploid RC cultivars (AC Christie, Tapani, CRS 15) and three tetraploid RC cultivars (Tempus, CRS 18, CRS 39) was compared in the controlled environment of growth chamber at 23 ± 2 $^{o}$C and a photoperiod of 16 $h^{-1}d^{-1}$ (425 μmol $m^{-2}$ $s^{-1}$). Using randomized split-plot design (main plot, N fertility treatment and sub-plot, RC cultivar) pre-germinated seedlings were transplanted in prewashed sand (no nitrogen) and inoculated with *Rhizobium leguminosarum* biovar *trifolii*. Plants were fertilized once a week with N free Hoagland's nutrient solution plus amount of ammonium sulfate to deliver one of four N treatments (0, 0.5, 1.0 and 2.5 N mg $plant^{-1}$ $week^{-1}$) for 8 weeks. At the end of week eight plants were evaluated for number of active nodules (nod $plant^{-1}$) at harvest, root and shoot dry weights (DW), and leaf and root morphological profiles. As expected, a negative response to increasing the rate of N was found for number of nod $plant^{-1}$ at harvest but there was also a significant interaction between RC cultivar and N treatment. In general, diploid cultivars had a greater number of active nodules than tetraploid (27 and 20 nodules $plant^{-1}$, respectively). Furthermore, the number of nodules $g^{-1}$ root DW was higher for diploid cultivars (147) than for tetraploid cultivars (99). Tetraploid cultivars were also more sensitive to elevated rates of N application than diploid cultivars. At the highest N application rate the diploid AC Christie had the highest nodulation (12 nod $plant^{-1}$) compared to the tetraploid Tempus (6 nod $plant^{-1}$). This study clearly demonstrated that with respect to nodulation, RC cultivars respond differently to increasing N application rate, suggesting genetic variability for this trait.

**Key words:** red clover cultivars, nitrogen fertilization, diploid, tetraploid