

Exploring Nitrogen Uptake, Utilisation and Use Efficiency of Different Wheat Species

*Fernando^{1,2}, K.M.C. and Sparkes², D.L.

¹Department of Crop Science, University of Ruhuna, Sri Lanka

²Division of Agriculture and Environmental Sciences,
University of Nottingham, Sutton Bonnington Campus, The United Kingdom

*Corresponding email: menaka@crop.ruh.ac.lk

One of the many challenges faced by wheat breeders is narrowed genetic diversity of existing bread wheat cultivars due to selective breeding for high yield. The present study was carried out to investigate the nitrogen use efficiency of ancient wheat species, a potential source to expand the genetic diversity of modern bread wheat. Two field experiments were carried out in 2013 and 2014 at Sutton Bonnington Campus, University of Nottingham, UK. Split-plot design was used in both experiments where N treatment was randomised on main plot and genotypes on the sub-plot with three replicates. Ten genotypes belong to Einkorn, Emmer, Spelt and modern bread wheat were used. Three N regimes equal to zero N (no fertiliser N applied), 100 kg N ha⁻¹ and 200 kg N ha⁻¹ were used in 2013 while zero N, 100 kg N ha⁻¹ and 150 kg N ha⁻¹ was applied in 2014. Soil type of the experiment site was sandy loamy. Plant N uptake (*N_{off}*; excluding roots), N uptake efficiency (NUpE), N utilisation efficiency (NUE) and NUE were calculated at harvest. *N_{off}* differed significantly between genotypes ($P < 0.05$) and N treatment ($P < 0.001$) while spelt and emmer had the most *N_{off}* in both experiments. Similarly, NUpE was also high in spelt and varied significantly between genotypes ($P < 0.001$ in 2013; $P < 0.05$ in 2014) and N levels ($P < 0.01$ in 2013; $P < 0.001$ in 2014). However, NUE was greater in modern bread wheat in both experiments resulting high NUE. The interaction between genotype and N level was significant ($P < 0.001$) for NUE in both experiments. According to the results, it can be concluded that ancient wheat genotypes have an ability to uptake more nitrogen hence high NUpE when compared to modern bread wheat. However, modern bread wheat perform well for NUE and NUE due to high harvest index.

Keywords: Efficiency, Nitrogen uptake, Utilisation, Wheat species