STØTTET AF
Promilleafgiftsfonden for landbrug

SPECIAL ISSUE REVIEW

Semi-field root phenotyping: Root traits for deep nitrate uptake

Tomke Susanne Wacker, Olga Popovic, Niels Alvin Faircloth Olsen, Bo Markussen, Abraham George Smith, Simon Fiil Svane, Kristian Thorup-Kristensen

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Abstract

Deep rooting winter wheat genotypes can reduce nitrate leaching losses and increase N uptake.

We aimed to investigate which deep root traits are correlated to deep N uptake and to estimate genetic variation in root traits and deep ^{15}N tracer uptake.

In two years, winter wheat genotypes were grown in RadiMax, a semi- eld root-screening facility. Minirhizotron root imaging was performed three times during the main growing season. At anthesis, ^{15}N was injected via subsurface drip-irrigation at 1.8m depth. Mature

ears from above the injection area were analysed for N content. From minirhizotron image-based root length data, 82 traits were constructed, describing root depth, density, distribution and growth aspects. Their ability to predict ^{15}N uptake was analysed with LASSO regression.

Root traits predicted 24% and 14% of tracer uptake variation in the two years. Both root traits and genotype showed signi cant effects on tracer uptake. In 2018, genotype and the three LASSO-selected root traits predicted 41% of the variation in tracer uptake, in 2019 genotype and one root trait predicted 48%. In both years, one root trait signi cantly mediated the genotype effect on tracer uptake.

Deep root traits from minirhizotron images can predict deep ^{15}N uptake, indicating potential to breed deep-N-uptake-genotypes.

Supporting Information

Filename	Description
pce14227-sup-0001-Appendix.docx 411.7 KB	Supporting information.