Enhanced root growth reduces Nitrous Oxide emissions

Jeffrey Aguilar[1,1], Eric Rogers[1,1], Mickala Stallman[2,2], Jesse Windle[1,1], Michael Castellano[2,2], Emily Wright[2,2], Makayla Garland[1,1], Rachel Greenhut[1,1], Jim Gumpert[1,1], William Niebur[1,1], Philip Benfey[1,1], and Sotirios Archontoulis[2,2]

[1]Hi Fidelity Genetics
[2]Iowa State University, Department of Agronomy

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Abstract

Nitrous oxide (N20) is a greenhouse gas that is three hundred times more potent than carbon dioxide. The majority of N20 emissions worldwide are the result of excess soil nitrogen being metabolized by microbes. It has been hypothesized that crops with better nitrogen uptake efficiency and more roots will reduce excess soil nitrogen therefore reducing N20 emissions. To test this hypothesis, a pilot study was performed in 2021 in collaboration with Iowa State University in which root growth dynamics were captured using RootTracker technology in four commercial maize hybrids. This preliminary study showed a correlation between increased root growth and reduced N20 emissions. Further, we find genetic differences in root growth that is consistent across reps, suggesting that i) cultivar choice impacts N2O emissions and ii) that it is possible to breed for root system architecture to limit N2O emissions. It was also observed that the hybrid with the fastest rate of root growth (lowest N20 emissions) did not reach the greatest soil depth, suggesting early root establishment could be pivotal to more efficient nitrogen uptake. These preliminary results suggest there are differences in root growth by variety that could be exploited to reduce agricultural N20 emissions at scale.

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