August 2018

Investment Insight

Recent Research Results

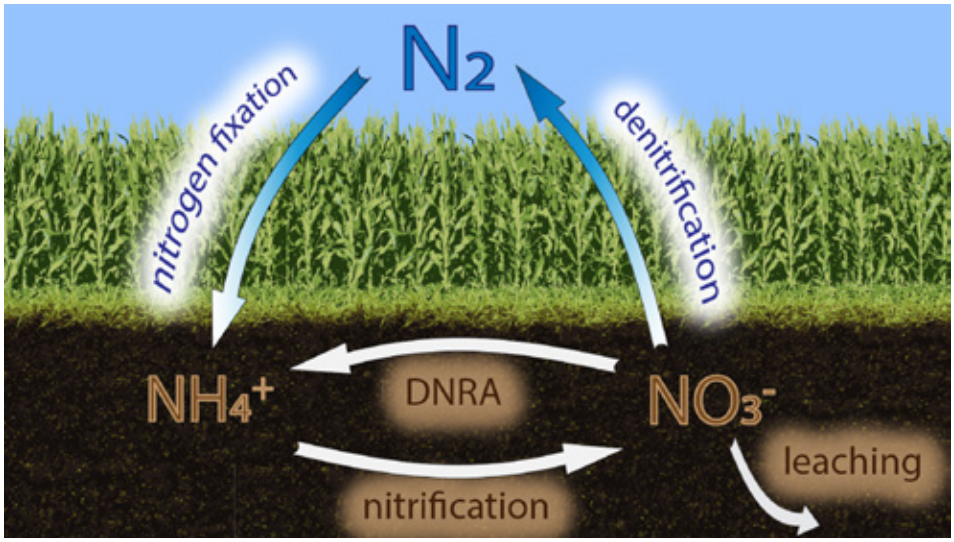
DNRA – what the heck is that?

Dissimilatory Nitrate Reduction to Ammonium (DNRA) is also known as nitrate ammonification and is the result of anaerobic respiration. In this process microbes oxidize organic matter and use nitrate (rather than oxygen) as an electron acceptor, reducing it to nitrite – then ammonium (as opposed to nitrogen gas – as in denitrification).

So why is this important? NREC is funding research at the University of Illinois to explore the microbial pathway for nitrate retention in soils. Led by Dr. Angela Kent and her team, the research seeks to fulfill three goals: to quantify DNRA rates; characterize abundance and diversity of microbial communities capable of DNRA; and, to determine the drivers of DNRA to help identify management practices that affect DNRA rates.

One thing that makes this research so important is that nobody before has explored DNRA in soil until recently. New evidence and next-generation sequencing have found that DNRA prevails under unexpected oxygen conditions. And just as important, a correlation between DNRA and nitrates in soils has been discovered in a diversity of ecosystems.

What does this mean for the producer? Farmers will have an additional tool to help them understand how nitrogen is retained in the soil and available to the crop. And they will have advance notice on nitrogen retention.



More research is needed and being accomplished – especially in other types of soils, most notably sandy soils. So far:

- Results at Urbana indicated that soils performed DNRA at meaningful rates to represent an N-retention process.
- Despite very diverse microbial communities, DNRA gene abundance was consistent across management treatments.
- DNRA activity responded to soil NO_3^- under low NO_3^- conditions and to moisture at higher NO_3^- conditions.
- Perennial and annual microbe communities performed the same. In fact, switchgrass plots recently converted to corn-soy plots exhibited the same pattern as existing corn-soy plots – confirming that controls on DNRA really are environmental.

For 2018, further work will evaluate identified drivers via controlled lab manipulations. Researchers will expand analysis to include other representative Illinois soil types and assess DNRA performance in situ in response to controlled soil conditions. Researchers will confirm that DNRA plays a similar role to nitrogen stabilizers already in farmers' toolboxes.

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