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Nitrification Inhibitors are not working or harming in Denmark

Nitrogen fertilizers are widely used in modern agriculture. However, the extra nitrogen can leach out and cause a few environmental problems. To slow down this process, nitrification inhibitors are used, but we are not sure if they are effective enough or harmful to soil microbes.

In this study, soil fungi, bacteria and springtails (some very tiny bugs living in the soil) were monitored by molecular methods. We didn't culture them in the lab or count them under the microscope. Instead, we tried to catch their leftovers in the soil and put those left fragments together to reconstruct such community. The change in their abundance and composition can reflect the influence by nitrification inhibitor. We put different nitrification inhibitors in a few experiment fields planted with barley, and later we extracted the fragments directly from the soil.

In our result, surprisingly, nitrification inhibitors seem not get their job done, as they did not reduce the number of those bacteria which can slow down the nitrification process. On the other hand, they are not harmful for soil microbes and springtails at all, even at 10 times higher dosages. The only difference is between the usage of chemical fertilizer or organic fertilizer, rather than with or without nitrification inhibitors.

Since they can be sold at a good price, we should be cautious when purchasing nitrification inhibitors for agricultural practice, at least in Denmark. Otherwise, there can be some recently discovered "hidden nitrification microbes" that were not detected by our approach. Future study can have a look at this particular bacteria, the commamox.

In conclusion, we used some molecular methods to look at the microbes and tiny bugs directly from the soil. We found nitrification inhibitors are neither doing the job nor harmful to the soil organisms.

Key words: Nitrificaiton Inhibitor, metabarcoding, soil microbiology, qPCR, environmental DNA

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