NITRATE CONCENTRATIONS IN DRAINAGE WATER FROM A CONTINUOUS CORN PRODUCTION SYSTEM: IMPACTS OF TILE SPACING AND PRECIPITATION EVENTS

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Abstract

Characterization of agricultural drains as point sources for nitrates in surface waters has generated keen interest in regional grab-sample monitoring programs. Grab sample tile drain monitoring programs are being explored by numerous public and private organizations interested in encouraging BMP's for nitrogen and/or implementation of TMDL policy. Our objective was to determine if nitrate concentrations in water collected from individual tile lines could be interpreted independent of information on tile spacing and rainfall or drainage flow volume data. Continuous corn (Zea mays L.) was grown on a well-structured Mollisol. Subsurface drains were installed at 10, 20 and 30 m spacing. Since 1995, rainfall and tile flow volumes have been collected hourly and nitrate concentrations have been measured daily. Mean monthly nitrate concentrations ranged from 16-52, 13-45 and 21-50 ug/ml, for 10, 20 and 30 meter spacings, while monthly flow volumes ranged from 0 to over 100,000 l/ha with 20 m tiles tending to have the greatest flows. Within a given month, CV's for both variables were commonly substantial. No strong general relationship between concentrations and flow volume could be described.

Conclusions

1. Variability in nitrate concentration values suggests that single "grab" samples may not represent average concentrations.

2. Tiles with higher N concentrations do not necessarily have higher nitrate loss due to high variability in flow.

3. Differences in nitrate concentrations between years are influenced by rainfall, climate changes and the previous year's yield.

4. More research and analysis is needed to quantify the specific number of "grab" samples needed to adequately represent nitrate concentrations in a given drain.

Water Nitrate – N Testing Results
What do your results mean?

Questions about interpreting nitrate-nitrogen analysis results of tile water have increased as awareness of water quality continues. The following chart summarizes possible interpretations for nitrate-nitrogen analysis. Note: these interpretations are only a guideline.

(mg/liter or ppm) Nitrate - N Concentration	Interpretation
Less than 5	Land is grass cropped Nitrogen deficiency or no nitrogen applied
5 to 20	Optimum nitrogen efficiency is achieved
Above 20	Nitrogen management is a problem Productivity problems are a factor - factors that are not controllable by the producer (e.g. drought) Land is fallow

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