Nitrogen Status in 2014 Corn Fields

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Background

In 2014 the OMAF & MRA field crops team once again surveyed a range of corn fields to determine the impact that this springs weather has had on the level of residual soil nitrate. This year April was cool with less growth than normal and from May 1 to early June temperatures have been about normal but with rainfall less than average in many areas of the province. What impact has the weather had on residual N supply and therefore on N application rates?

To provide some insight on this question soil samples were taken from over 70 fields on June 9, 10 and 11from across the province and included a range of previous crops and soil types.

Results

On the medium textured soils (loams and silt loams) that had not received fertilizer nitrogen or manure, and where the previous crop was not red clover or alfalfa, soil nitrate levels were below the long term trend. The average from these soils this year was 9.8 PPM nitrate, compared to an historical average of 11.0 PPM and compared to 12.2 PPM in 2012 (warm spring) and 9.5 PPM in 2011 (cool spring).

Unique to the 2014 PSNT data was the fact that soil texture did not seem to have much impact on soil nitrate status. Heavy, medium and light textured soils all had similar soil nitrate levels where lighter textured soils averaged 9.7 PPM and the heavier soils 10.1 PPM nitrate. The sands and the clays are more sensitive to heavy rainfall in terms of nitrate loss (through leaching and denitrification respectively) and in many areas of the province these processes were perhaps less active in 2014.

It appears the cool temperatures in April and into parts of May have potentially contributed to slower mineralization and thus reduced the overall nitrate levels. The other thing that stands out this year, even though average nitrate levels are slightly below normal, was the higher than usual number of low testing fields (below 8 PPM).

Based on the number of low test findings in this survey and the number of late planted fields of corn in some areas of the province, especially on heavy textured soils, producers should be thinking about using a PSNT test on suspect fields to determine the adjustment amount of fertilizer nitrogen required compared to normal rates of nitrogen planned for.

A 1PPM change in PSNT test level suggests a change in recommendation of about 10 lbsN/ac. If the traditional average PPM level of soil nitrogen for early June timing is 11.0, then normal rates of fertilizer nitrogen might be 10-20 lbsN/ac short. However, if your soils are part of the very low levels seen in a number of the survey samples , normal fertilizer nitrogen application rates could be as much as 50 lbsN/ac short of meeting historical yield goal.

This however, cannot be determined without taking a PSNT soil sample yourself. While growers may feel they are short on nitrogen, bear in mind that late planted corn often has reduced yield potential and fertilizer nitrogen rates should be adjusted accordingly.

Remember that soil nitrogen tests are based on a well-mixed composite of multiple 30cm/12inch cores collected across the field. Samples must be quickly cooled and kept cool in transport to the labs for rapid and accurate analysis.

Sampling in fields where fertilizer nitrogen has been previously broadcast or planter applied there is little evidence that this nitrogen has been lost. This suggests that any lack of soil nitrogen is the result of lower than normal nitrogen release from the soil organic matter pool. Applied fertilizer N remains fully in place.

Table 1. PSNT Soil N Test Levels for Fields Requiring Sidedress Nitrogen Application. Samples taken June 9, 10 and 11 2014.

# Fields Sampled	Sample Depth	Soil Texture	Soil Nitrate N Level (PPM)
24	0-30cm (0-12")	Loam, Silt Loam	9.8
25	0-30cm (0-12")	Sand, Sandy Loam, Loamy Sand	9.7
15	0-30cm (0-12")	Clay, Clay Loam, Silty Clay Loam	10.1

Recommendations

1) In general terms, across all soil types, slightly higher than normal sidedress rates might be recommended. This may be particularly true on high yield potential loam soils where normally soil nitrates are higher than on sands or clays but based on this survey are not.

2) Producers who generally apply full N rates in early May should have little reason to fear that N has been lost from the system or require any supplemental N. High rainfall areas on heavy soils would be the exception.

3) The rather high frequency of low soil nitrate status fields does suggest that growers should consider testing fields to get a better handle on N status. Medium textured soils that are lower in organic matter would be fields to target first. We remind side-dressers that the numbers presented here are averages and that there is considerable variability across sites. Taking your own pre-sidedress N test in order to fine-tune application rates is strongly recommended (See Table 2).

Acknowledgements

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Table 2. OMAFRA Publication 811 Table 1-24. Nitrogen Recommendations Based on Nitrate-Nitrogen

Spring Nitrate Nitrogen[1] in top 30 cm (1 ft)	Pre-Side-Dress Nitrate Nitrogen[2] in top 30 cm (1 ft)	Actual Nitrogen Recommended	
(ppm)	(ppm)	(kg/ha)	(lb/acre)
1	1	211	189
2	3	199	178
3	4	186	166
4	5	173	155
5	7	161	144
6	8	148	132
7	9	135	121
8	10	123	110
9	12	110	98
10	13	97	87
11	14	85	76
12	16	72	64
13	17	59	53
14	18	47	42
15	20	34	30
16	21	21	19
17	22	9	8
18	23	0	0

Conversion Factors

To convert soil test results from kg/ha to ppm for a 30-cm (12-in.) sample, divide kg/ha by 4. For example, if the nitrate-nitrogen concentration of a sample taken from the top 30 cm (12 in.) of soil is 32 kg/ha, the nitrate nitrogen is 32 kg/ha ÷ 4 = 8 ppm.

[1] Spring nitrate-nitrogen refers to samples taken within 5 days of planting (either before or after).

[2] Pre-side-dress nitrate-nitrogen refers to samples taken when the corn is 15-30 cm (6-12 in.) tall (usually within the first 2 weeks of June).