



# Crop Solutions that Work

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## **Plant Tissue Test Interpretation In Season on Winter Wheat 2009**

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This spring season is presenting us with some challenges, especially the winter wheat crop in certain regions of the trading area. The wheat crop is displaying a number of leaf diseases and nutrient deficiencies. Often times confusing symptoms are present and usually a multitude of issues can be present concurrently. This can make diagnoses difficult.

One of the tools we can use to determine nutrient status is a plant tissue analysis. Submitting the appropriate plant part to a laboratory will result in a report displaying the total concentration of selected essential nutrients. The example below was submitted from a wheat field in Southwestern Ontario.

The flag leaf was submitted. A random sample of 60 flag leaves was collected. Usually the “most recently matured” leaf is sampled (MRM). The reason for sampling was to confirm or determine if there were any nutrient deficiencies. This field displayed a number of symptoms including some very prominent striping on the penultimate leaf, as well as some leaves had fine pin stripes indicative of magnesium and some speckles indicative of manganese. The flag leaf was basically clean.

Soil test results show a high P and K reading and overall pH at 6.3. This field is due to be re-sampled after harvest.

The field also exhibited uneven growth with normal looking plants beside short dwarfed plants. It was also noted that the field had soil compaction.

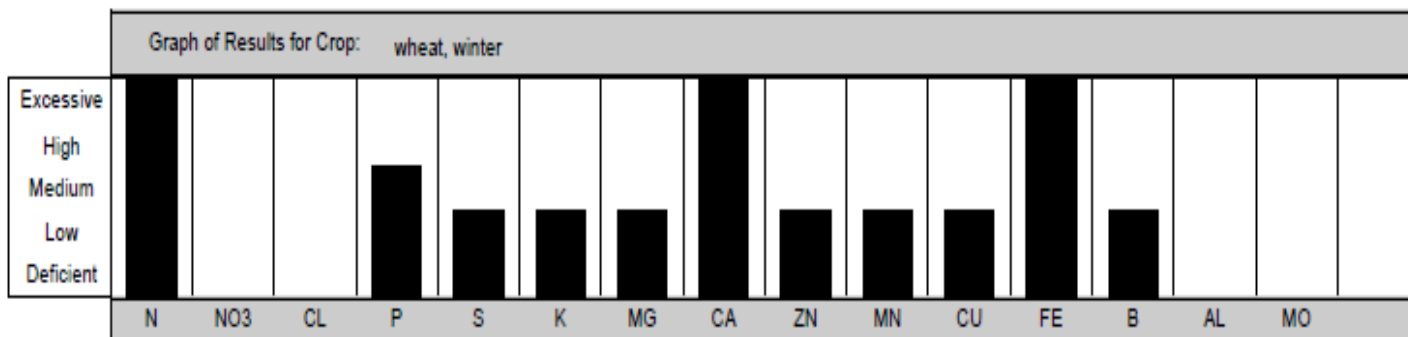




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The plant tissue report displays the values found from the lab analysis as well as a “Critical Value” for winter wheat under each nutrient tested. The Critical Value is set at a level where 90 per cent of potential yield can be achieved. Potential yield will be conditioned by the growth environment encounter. Including but not limited to, plant genetics, weather and timely management input and soil conditions.

Lab No.: 9353801      Sample: 1 - Winter Wheat										
	Nitrogen %	NO3-N ppm	Chloride %	Phosphorus %	Sulphur %	Potassium %	Magnesium %	Calcium %	Zinc ppm	Manganese ppm
Analysis	3.26			0.28	0.23	1.05	0.24	0.73	20.35	40.57
Critical Level	2.00			0.10	0.20	1.00	0.15	0.28	10.00	15.00
	Copper ppm	Iron ppm	Boron ppm	Aluminum ppm	Molybdenum ppm					
Analysis	4.16	138.71	4.49							
Critical Level	3.00	36.00	3.00							



What is apparently obvious is the nutrient profile is quite good with all nutrients above the critical value indicating that nutrients at time of sampling are non-limiting. This can be surprising as the expectation was that the analysis should line up and support the condition of the crop.

There are a couple of key factors on both the field observation and a few nutrients on the tissue report. First key observation was soil compaction and uneven plant growth. On the tissue report, relatively high Nitrogen, Iron and Calcium content are evident. Manganese is well above the critical level of 15 ppm, iron is also excessive, these two elements are usually a clue to soil compaction. High Nitrogen is a clue to lower utilization due to limited plant stature as evident by small head size. Higher N relative to the marginal potassium is also an indicator of difficult root environment.

Symptoms of soil compaction are increased soil strength and mechanical impedance of root growth, but more importantly a low oxygen condition. This will result in a more “reduced” form of Manganese and Iron increasing the plant availability and subsequent uptake. Granted, iron can often be a contaminant from soil splash up on the leaf, but these were flag leaves and no rain for 25 days may rule that out in this situation.



Even though plants can adapt to compaction stress, overall crop growth is reduced. Roots compensate for their reduced length by increasing the rate of nutrient uptake per unit length of root by as much as 40% over normal roots. Roots have greater, more intimate soil contact and better access to nutrients including less mobile nutrients. However the increased uptake is not sufficient to overcome the reduction in total root length. Plants grown in compacted soil will yield less. Plant roots grown under stressed conditions will release more ethylene accelerating plant die down and limiting the length of time for grain fill.

## **Summary**

Plant tissue analysis is one tool to be used but it must be supported by in field observation of crop conditions, weather and an understanding of plant growth stage. In this case no apparent nutrient deficiencies were detected. Plant tissue analysis is limited in its ability to predict yield or nutrient response on a standalone basis.

Overall the crop is suffering from soil compaction and a host of ailments that compaction brings with it such as low oxygen, poor drainage, restricted root growth, stress on root health predisposing the crop to a cascade of secondary disease issues.

How to alleviate compaction will be coming later.