Plant Tissue Analysis CSI – From the Field

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Crop Scene Investigation

AGVISE LABORATORIES

Plant Nutrient Analysis

- *How Plant tissue analysis can be a useful management tool*
- *How to collect the samples properly*
- *Interpreting the analysis*
- *CSI Examples from the real world*

What is Plant Analysis

- *One "Snap Shot" in the life of a plant*
- *A measure of what nutrients have been taken up by the crop so far*
- *A measure primarily of <u>History</u>*
- *A valuable tool for Agronomists*

Using Plant Analysis as a Tool

- *Diagnosing visible nutrient symptoms*
  - *Nitrogen vs. sulfur*
- *Detecting hidden hunger*
  - *Crop growth seems slow or uneven*
- *Evaluating your fertilizer program*
- *Monitor spoon feeding nutrients*
  - *Nitrogen (irrigated potatoes)*

Plant Analysis and Soil Analysis
CSI – Complete information required

- *Information on Good and Bad tissue samples*
- *Information on Good and Bad soil samples*
- *Observations from the field (symptoms)*
- *Information of fertilizer rates and application*

Collecting Plant Samples

- *When*
  - *Plant must be collected within a 7-10 days after visible symptoms appear (results questionable later)*
- *What part of the plant*
  - *It is critical to collect the right plant part. The interpretation is based on that part.*
- *Care of the sample*
  - *Brush any dust off the sample (iron and Manganese contamination in the dust)*
  - *Ship the sample immediately or keep cool in the refrigerator. The sample bags have holes in them to keep the sample from getting moldy*

Fill out the Sample Information completely

Essential Info:

Crop

Stage of Growth

Plant Part

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Date Sampled ___/___/___
Date Received ___/___/___

GROWER
NAME Mr Grower
ADDRESS
ZIP

FIRM SUBMITTING SAMPLES
NAME Mr Consultant/Dealer
ADDRESS
ZIP

Crop Wheat Variety Rambler
Irrigated ☐ Dryland X
Growth Stage (see other side) Tillering
CHECK PLANT PART SAMPLED:
Leaves ___ Petiole ___ Whole Plant X
Normal ___ Abnormal X

County/Range Polk Field I.D. Bad spot
Township Fanny Acres 10
Section 22
Quarter SW

OPTION CHOICES
(Check the Desired Option)

Complete Analysis: Total Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sodium, Zinc, Iron, Manganese, Copper, Boron, (Chlorid included on small grain) X

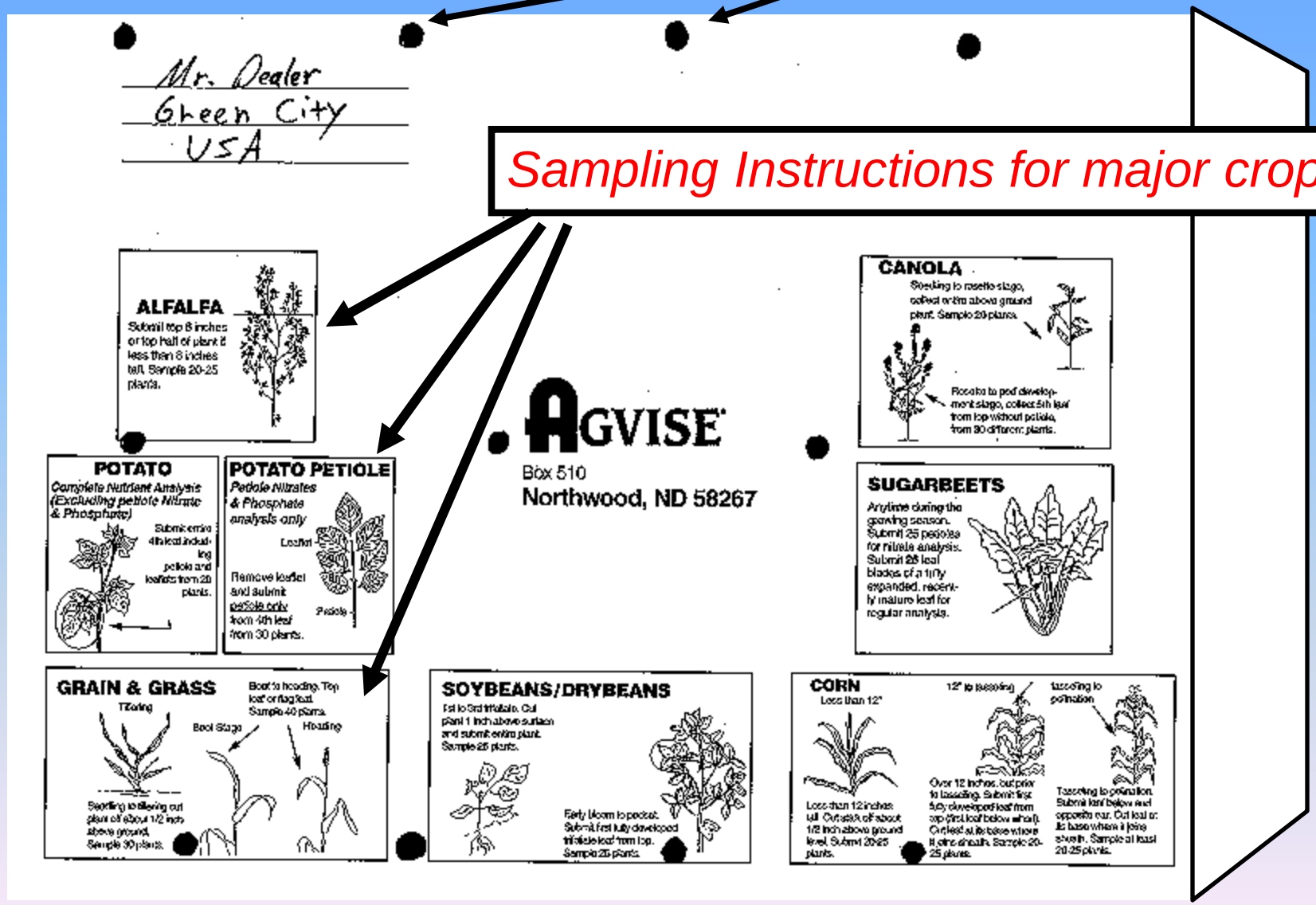
Potato Petiole Option: Nitrate-Nitrogen, Phosphate-Phosphorus .....

Individual Nutrients: Total Nitrogen .....
Nitrate-Nitrogen .....
Phosphate-Phosphorus .....
Chloride .....
Boron .....
Other Tests: _____

Plant Sample Envelope

Holes for ventilation

Sampling Instructions for major crops



Which Plant Part to Collect

- *Small plants*
  - *In most cases the entire above ground plant (i.e. wheat at tillering, corn <12”)*
- *Large plants*
  - *In most cases the most recently mature leaf (I.e. soybeans after flowering starts)*
- *Use our Plant Sampling Guide*
- *Make sure you get enough plants!!*

Correct Plant Part is Critical!

Crop	**Growth Stage**	**Plant part**	**# for Sample**
Wheat	Tillering	Whole plant (above Ground)	50
Wheat	Jointing to Boot	Upper Leaves	50
Wheat	Heading	Flag leaves	50
Corn	Less than 4” to 12”	Whole plant	15-20
Corn	Taller then 20”	First fully developed leaf	15-20
Corn	Tasseling to pollination	Leaf below and opposite from ear	15-20
Soybean	1-2 trifoliate stage	Whole plant (above ground)	25
Soybean	Early bloom to pod set	First fully developed trifoliate	25

Make sure you collect a big enough sample as well!

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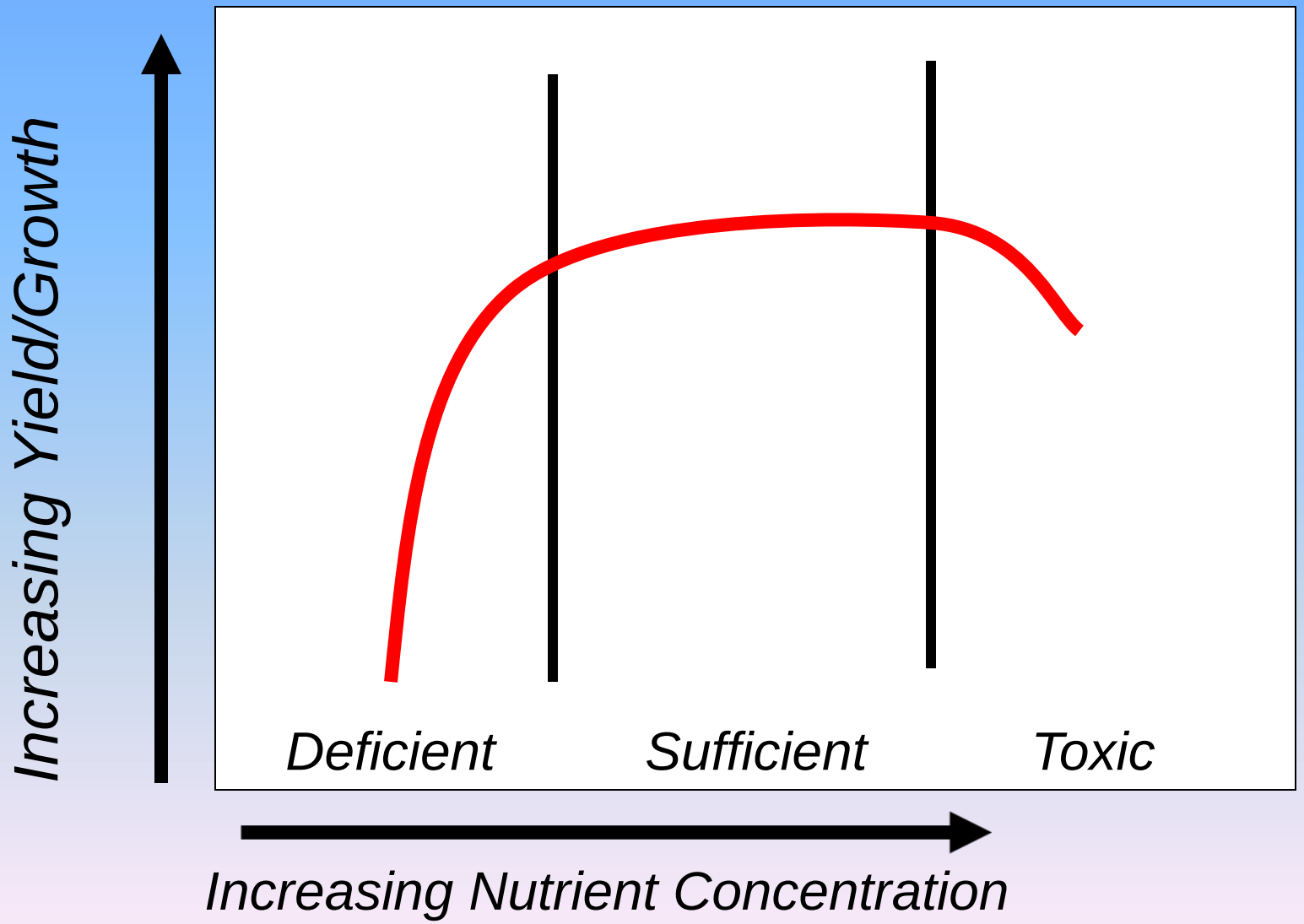
Plant Nutrient Analysis Sampling Guide

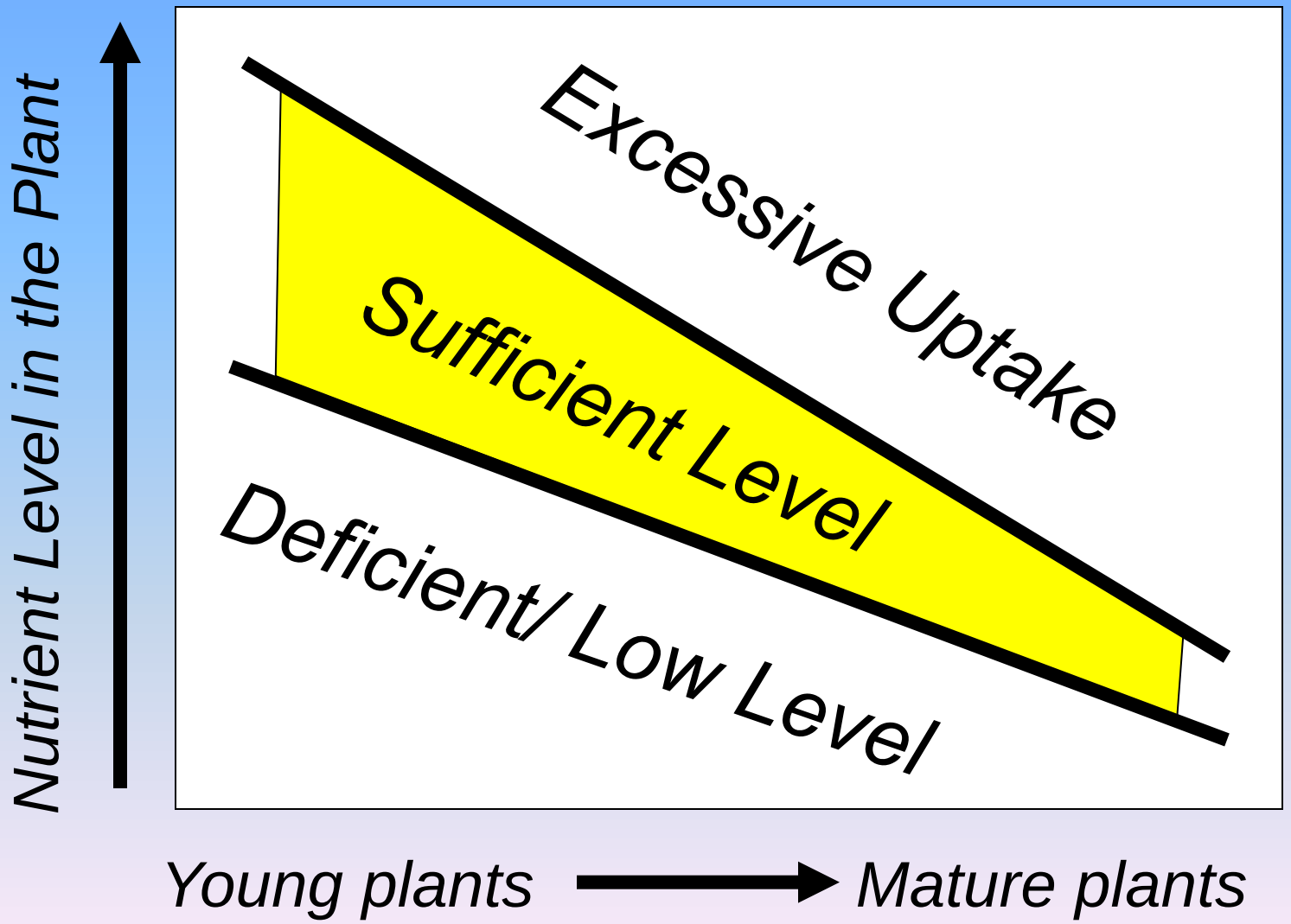
Interpreting Plant Analysis

- *Sufficiency Range Interpretation*
  - *University research has determined the sufficient level of each nutrient for most crops. The sufficient range is always based on a specific plant part and stage of growth*
- *DRIS (Diagnosis Recommendation Integrated System)*
  - *University research has shown that the ratio of nutrients to each other in plants is fairly constant through the season. A numerical index is calculated for each nutrient to determine if that nutrient is deficient*

Sufficiency Range Interpretation



Sufficiency Range Interpretation



Sufficient Nutrient Range vs. Plant Age

Crop Stage	Potassium
Corn 2-12”	2.9-5.0%
Corn 12-20”	2.4-3.5%
Corn - tasseling	1.7-2.8%

Nutrient Levels decrease as plants mature!

Sufficiency Range Interpretation

- *Advantages*
  - *University research available on almost every crop*
  - *Contamination of the sample doesn't affect interpretation of other nutrients*
- *Limitations*
  - *Interpretation for specific stage of growth*
  - *If more than one nutrient is below the sufficiency range, it does not tell you which nutrient is the most limiting*

DRIS Interpretation

Diagnosis
Recommendation
Integrated
System

DRIS Interpretation

- *Based on University Research (MN, WI)*
- *Calculates a numerical index value for each nutrient compared to all other nutrients*
- *Indexes from –20 to +20 are **normal***
- *Indexes larger than -20 indicate a deficiency. (i.e. –35)*
- *Ranks which nutrient is the biggest problem*
  - *-45 is more of a problem than -30*

DRIS Interpretation

Age vs. Nutrient Ratio (Corn)

Plant Age	N/P	N/K	K/P
30 days	15	1.4	11
60 days	15	1.6	9
80 days	14	1.8	8
110 days	15	1.7	9

The ratio of N to P stays the same as healthy plants age

DRIS Interpretation

- *Advantages*
  - *Crop stage is not as important*
  - *Ranks nutrients in order of most limiting*
- *Limitations*
  - *DRIS indexes not available for all crops*
  - *No DRIS index research for edible beans, Sugarbeet, canola etc.*

CSI (Crop Scene Investigations) Examples From the Real World

- *Information on Good and Bad tissue samples*
- *Information on Good and Bad soil samples*
- *Visible symptoms on the plants*
- *Other information from the grower (witness)*

Example 1 - Corn: Good Tissue Sample

MN Corn: 12" to tasseling (recently mature leaf from top)

Lab Number 376 Good Corn

No nutrient rated as VL

Nutrient	Test Level	Rating	Sufficient Range
Total N	3.8 %	H	3.0 To 3.4
P	0.37%	S	0.25 To 0.50
K	1.8 %	L	2.0 To 2.4
S	0.22%	S	0.16 To 0.50
Ca	0.33%	S	0.30 To 0.60
Mg	0.34%	S	0.16 To 0.40
Na	0.05%	S	0.00 To 0.10
Zn	16 ppm	L	20 To 75
Fe	359 ppm	VH	50 To 250
Mn	60 ppm	S	18 To 150
Cu	9 ppm	S	5 To 15
B	8 ppm	S	5 To 25

(high iron is Dust on tissue)

All DRIS Indexes between –20 and +20

D.R.I.S. FOR CORN:

N	P	K	S	CA	MG	ZN	FE	MN	CU	B
11	2	-1	-6	-13	15	-16		7	0	1

Ratings for: CORN 12 in TO TASSLING

VL=Very Low, L=Low, S=Sufficient, H=High, VH=Very High

Corn: Good Soil Sample

NUTRIENT IN THE SOIL		INTERPRETATION			
		VLow	Low	Med	High
0-6" Nitrate	96 lb/ac	****	****	****	****
Olsen Phosphorus	27 ppm	****	****	****	****
Potassium	184 ppm	****	****	****	****
Chloride					
0-6" Sulfur	14 lb/ac	****	****		
Boron					
Zinc	0.77 ppm	****	****	***	
Iron					
Manganese					
Copper					
Magnesium	656 ppm	****	****	****	****
Calcium	3332 ppm	****	****	****	****
Sodium					
Org.Matter	4.3 %	****	****	****	
0-6"	0.86 mmho/cm	****	****	****	*

1ST CROP CHOICE			2ND CROP CHOICE			3RD CROP CHOICE		
YIELD GOAL			YIELD GOAL			YIELD GOAL		
								GUIDELINES
								APPLICATION
N			N			N		
P_2O_5			P_2O_5			P_2O_5		
K_2O			K_2O			K_2O		
Cl			Cl			Cl		
S			S			S		
B			B			B		
Zn			Zn			Zn		
Fe			Fe			Fe		
Mn			Mn			Mn		
Cu			Cu			Cu		
Mg			Mg			Mg		
Lime			Lime			Lime		

Most nutrients are medium or higher
Sulfur is questionable

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
6.4		22.6 meq	(65-75) 73.7	(15-20) 24.2	(1-7) 2.1	(0-5)	(0-5)

Corn: Bad Tissue Sample (shorter plants)

MN - Corn: 2-12" (whole above ground plant)

Lab Number 374 Bad Corn

Three nutrients listed as low

Nutrient	Test Level	Rating	Sufficient Range
Total N	3.4 %	L	3.5 To 5.0
P	0.49%	S	0.35 To 0.80
K	2.7 %	L	3.0 To 5.0
S	0.30%	S	0.20 To 0.50
Ca	0.97%	S	0.30 To 1.60
Mg	1.14%	H	0.21 To 0.80
Na	0.03%	S	0.00 To 0.10
Zn	11 ppm	L	20 To 75
Fe	871 ppm	VH	50 To 300
Mn	208 ppm	H	50 To 160
Cu	13 ppm	S	6 To 20
B	11 ppm	S	6 To 25

All Other Indexes higher than -20

D.R.I.S. FOR CORN:

N	P	K	S	CA	MG	ZN	FE	MN	CU	B
-18	-3	-2	-16	8	70	-78		46	-3	-3

Corn: Bad Soil

NUTRIENT IN THE SOIL		INTERPRETATION			
		VLow	Low	Med	High
0-6" Nitrate	60 lb/ac	****	****	****	****
Olsen Phosphorus	7 ppm	****	***		
Potassium	83 ppm	****	****	*	
Chloride					
0-6" Sulfur	18 lb/ac	****	****	**	
Boron					
Zinc	0.26 ppm	****			
Iron					
Manganese					
Copper					
Magnesium	751 ppm	****	****	****	****
Calcium	4247 ppm	****	****	****	****
Sodium					
Org.Matter	1.3 %	****			
0-6"	0.64 mmho/cm	****	****	***	

1ST CROP CHOICE			2ND CROP CHOICE			3RD CROP CHOICE		
YIELD GOAL			YIELD GOAL			YIELD GOAL		
SUGGE						GUIDELINES		
LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		APPLICATIO
N			N			N		
P_2O_5			P_2O_5			P_2O_5		
K_2O			K_2O			K_2O		
Cl			Cl			Cl		
Fe						Fe		
Mn						Mn		
Cu			Cu			Cu		
Mg			Mg			Mg		
Lime			Lime			Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
8.1		27.7 meq	(65-75) 76.6	(15-20) 22.6	(1-7) 0.8	(0-5)	(0-5)

P & K marginal

Zinc is Very Low

%OM low

CSI Information

- *Good tissue*
  - *DRIS Indexes were all OK (-20-+20)*
- *Good Soil*
  - *Nutrients medium – high, %OM high*
- *Bad tissue*
  - *Zinc very low (-78 DRIS index), N,K, marginal*
- *Bad Soil*
  - *Zinc Low, P & K marginal, %OM low*
- *Observations – short plants, leaf symptoms*

Zinc needed for corn, More K in starter?)

Example 2 – Sugarbeet: Good Tissue Sample (normal height)

Sugarbeets (most recently mature leaf)

Lab number 531 Good sugarbeets

All Nutrients are in Sufficient Range

Nutrient	Test Level	Rating	Sufficient Range
Total N	4.5 %	S	3.5 To 5.0
P	0.48%	S	0.31 To 0.80
K	2.6 %	S	2.0 To 6.0
S	0.35%	S	0.25 To 0.50
Ca	0.70%	S	0.50 To 1.50
Mg	0.89%	S	0.30 To 2.50
Na	3.04%	S	0.02 To 3.70
Zn	33 ppm	S	21 To 80
Fe	386 ppm	H	56 To 140
Mn	59 ppm	S	25 To 360
Cu	8 ppm	S	6 To 30
B	37 ppm	S	25 To 79

Ratings for: SUGAR BEETS
VL=Very Low, L=Low, S=Sufficient, H=High, VH=Very High

No DRIS Indexes (no Research)

Sugarbeet: Good Soil

NUTRIENT IN THE SOIL		INTERPRETATION			
		VLow	Low	Med	High
0-6" Nitrate	25 lb/ac	****	****	*	
Olsen Phosphorus	12 ppm	****	****	****	*
Potassium	131 ppm	****	****	****	**
0-6" Chloride	2 lb/ac	*			
0-6" Sulfur	4 lb/ac	***			
Boron	1.7 ppm	****	****	****	****
Zinc	1.47 ppm	****	****	****	***
Iron	9.6 ppm	****	****	****	***
Manganese	3.1 ppm	****	****	****	*
Copper	0.66 ppm	****	****	****	**
Magnesium	869 ppm	****	****	****	****
Calcium	6253 ppm	****	****	****	****
Sodium	121 ppm	****	****	****	*
Org.Matter	5.7 %	****	****	****	***
0-6"	0.45 mmho/cm	****	***		

1ST CROP CHOICE			2ND CROP CHOICE			3RD CROP CHOICE		
YIELD GOAL			YIELD GOAL			YIELD GOAL		
N			N			N		
P_2O_5			P_2O_5			P_2O_5		
K_2O			K_2O			K_2O		
Cl			Cl			Cl		
S			S			S		
B			B			B		
Zn			Zn			Zn		
Fe			Fe			Fe		
Mn			Mn			Mn		
Cu			Cu			Cu		
Mg			Mg			Mg		
Lime			Lime			Lime		

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation (Typical Range)				
			% Ca	% Mg	% K	% Na	% H
7.9		39.4 meq	(65-75) 79.4	(15-20) 18.4	(1-7) 0.9	(0-5) 1.3	(0-5)

Most Nutrients high except Sulfur
Sugarbeet not sensitive to low chloride

Sugarbeet: Bad Tissue Sample (stunted growth)

Sugarbeets (most recently mature leaf)

Lab number 532 Poor sugarbeets

Phosphorus

Nutrient	Test Level	Rating	Sufficient Range
Total N	4.5 %	S	3.5 To 5.0
P	0.26%	L	0.31 To 0.80
K	3.8 %	S	2.0 To 6.0
S	0.39%	S	0.25 To 0.50
Ca	1.45%	S	0.50 To 1.50
Mg	1.47%	S	0.30 To 2.50
Na	2.48%	S	0.02 To 3.70
Zn	30 ppm	S	21 To 80
Fe	332 ppm	H	56 To 140
Mn	60 ppm	S	25 To 360
Cu	5 ppm	L	6 To 30
B	34 ppm	S	25 To 79

Copper?

Ratings for: SUGAR BEETS
VL=Very Low, L=Low, S=Sufficient, H=High, VH=Very High

No DRIS Indexes (no Research)

Sugarbeet: Bad Soil

NUTRIENT IN THE SOIL		INTERPRETATION			
		VLow	Low	Med	High
0-6" Nitrate	30 lb/ac	****	****	**	
Olsen Phosphorus	7 ppm	****	***		
Potassium	112 ppm	****	****	***	
0-6" Chloride	3 lb/ac	**			
0-6" Sulfur	120 +lb/ac	****	****	****	****
Boron	1.6 ppm	****	****	****	***
Zinc	1.99 ppm	****	****	****	****
Iron	6.2 ppm	****	****	**	
Manganese	1.7 ppm	****	***		
Copper	0.62 ppm	****	****	****	*
Magnesium	716 ppm	****	****	****	****
Calcium	6327 ppm	****	****	****	
Sodium	79 ppm	****	****		
Org.Matter	5.0 %	****	****	****	**
0-6"	1.1 mmho/c	****	****	****	**

1ST CROP CHOICE			2ND CROP CHOICE			3RD CROP CHOICE		
YIELD GOAL			YIELD GOAL			YIELD GOAL		
SUGGESTED GUIDELINES			SUGGESTED GUIDELINES			SUGGESTED GUIDELINES		
LB/ACRE	APPLICATION		LB/ACRE	APPLICATION		LB/ACRE	APPLICATION	
N			N			N		
P_2O_5			P_2O_5			P_2O_5		
K_2O			K_2O			K_2O		
Cl			Cl			Cl		
S			S			S		
B			B			B		
Zn			Zn			Zn		
Fe			Fe			Fe		
Mn			Mn			Mn		
Cu			Cu			Cu		
Mg			Mg			Mg		
Lime			Lime			Lime		

	pH	Capacity	% Ca	% Mg	% K	% Na	% H
			ypical Range)				
7.9		38.2 meq	(65-75) 82.7	(15-20) 15.6	(1-7) 0.8	(0-5) 0.9	(0-5)

Phosphorus Low

Copper level is high

Salt level > 1.0 - Part of problem

CSI Information

- *Good tissue*
  - *All nutrients in Sufficiency Range (no DRIS index)*
- *Good Soil*
  - *Critical Nutrients med-high*
  - *Chloride low but Sugarbeet not sensitive*
- *Bad tissue - P low (No DRIS),*
- *Bad Soil - P low, salt high, copper high*
- *Field Observations – stunted plants*

Starter P needed to correct problem

Example 3 – Wheat: Good tissue sample

Nutrient	Test Level	Rating		Sufficient Range
Total N	5.9 %	H		2.5 To 3.5
P	0.38%	S		0.21 To 0.50
K	3.5 %	H		1.6 To 3.0
S	0.35%	S		0.20 To 0.50
Ca	0.36%	S		0.20 To 0.50
Mg	0.26%	S		0.13 To 0.40
Na	0.01%	S		0.00 To 0.10
Zn	38 ppm	S		20 To 70
Fe	106 ppm	S		50 To 250
Mn	98 ppm	S		25 To 100
Cu	4 ppm	L	***Copper - Low***	5 To 25
B	10 ppm	S		3 To 40
Chloride	0.19%	L	***Cl - Low***	0.21 To 0.50

D.R.I.S. F *Few DRIS indexes*

N	P	K	S
9	-4	-2	-2


Good wheat

Wheat: Good soil

Olsen Phosphorus	23 ppm	******	******	******	******
Potassium	207 ppm	******	******	******	******
0-6" Chloride	5 lb/ac	**			
0-6" Sulfur	22 lb/ac	******	******	***	
Boron	0.5 ppm	******	*		
Zinc	1.22 ppm	******	******	******	*
Iron	80.6 ppm	******	******	******	******
Manganese	26.6 ppm	******	******	******	******
Copper	0.69 ppm	******	******	****	
Magnesium	432 ppm	******	******	******	******
Calcium	1643 ppm	******	******	******	**
Sodium	13 ppm	**			
Org. Matter	3.8 %	******	******	***	
Carbonate	0.3 %	**			
0-6" Sol. Salts	0.57 mmho/cm	******	******	*	

LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE		A
N			N			N		
P_2O_5			P_2O_5			P_2O_5		
						K_2O		
Cl			Cl			Cl		
S			S			S		
B			B			B		
Zn			Zn			Zn		
Fe			Fe			Fe		
Mn			Mn			Mn		
Cu						Cu		
Mg			Mg			Mg		
						Lime		

Chloride is low

Copper is high

CEC – 12-15 Loam

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation(Typical Range)			
			% Ca	% Mg	% K	% Na
5.0		12.4 meq	(65-75) 66.2	(15-20) 29.0	(1-7) 4.3	(0-5) 0.5

Wheat – Bad tissue sample

Nutrient	Test Level	Rating		Sufficient Range
Total N	5.6 %	H		2.5 To 3.5
P	0.37%	S		0.21 To 0.50
K	3.4 %	H		1.6 To 3.0
S	0.32%	S		0.20 To 0.50
Ca	0.31%	S		0.20 To 0.50
Mg	0.20%	S		0.13 To 0.40
Na	0.01%	S		0.00 To 0.10
Zn	28 ppm	S		20 To 70
Fe	106 ppm	S		50 To 250
Mn	109 ppm	H		25 To 100
Cu	3 ppm	L	***Copper - Lower***	5 To 25
B	8 ppm	S		3 To 40
Chloride	0.13%	L	***Cl - Lower***	0.21 To 0.50

D.R.I.S. FOR G

Limited DRIS Research available

N	P	K	S
8	-3	-1	-5


Bad wheat 1

Wheat – Bad soil

Olsen Phosphorus	29 ppm	******	******	******	******
Potassium	202 ppm	******	******	******	******
0-6" Chloride	4 lb/ac	*			
0-6" Sulfur	16 lb/ac	******	******		
Boron	0.2 ppm	***			
Zinc	0.39 ppm	******	**		
Iron	47.7 ppm	******	******	******	******
Manganese	16.9 ppm	******	******	******	******
Copper	0.4 ppm	******	***		
Magnesium	247 ppm	******	******	******	
Calcium	1162 ppm	******	******	**	
Sodium	14 ppm	**			
Org. Matter	1.5 %	******			
Carbonate	0.0 %				
0-6" Sol. Salts	0.17 mmho/cm	****			

LB/ACRE		APPLICATION	LB/ACRE		APPLICATION	LB/ACRE	
N			N			N	
P_2O_5			P_2O_5			P_2O_5	
K_2O			K_2O			K_2O	
Cl			Cl			Cl	
S			S			S	
B			B			B	
Zn			Zn			Zn	
Fe			Fe			Fe	
Mn			Mn			Mn	
			Cu			Cu	
Mg			Mg			Mg	
Li						Lime	

Soil pH	Buffer pH	Cation Exchange Capacity	% Base Saturation(Typical Range)			
			% Ca	% Mg	% K	% Na
5.1		8.4 meq	(65-75) 68.8	(15-20) 24.4	(1-7) 6.1	(0-5) 0.7

Chloride is low

Copper - Low

CEC – <10 sandy soil

Bad wheat 2

Dying twisted leaf tip = Copper symptoms

Chloride deficiency
Symptom is Leaf spot

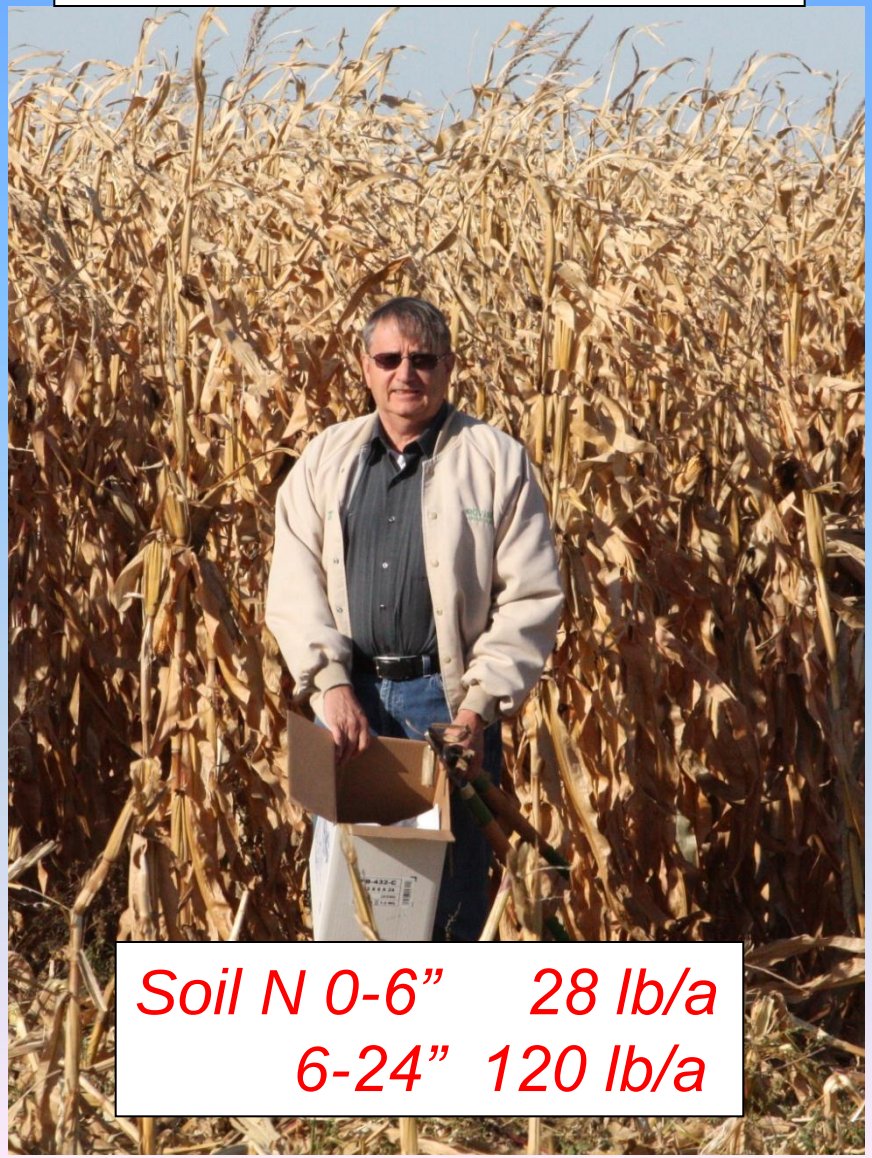
CSI Conclusion?

- *Good tissue*
  - *Chloride and copper low (Few DRIS index available)*
- *Good Soil*
  - *Copper High , chloride low, CEC 12.4 (loam)*
- *Bad tissue*
  - *Chloride lower, copper lower*
- *Bad Soil*
  - *Copper low, chloride low, CEC 8.4 (sandy soil)*
- *Visual symptoms verify Copper deficiency*

Copper application needed for wheat production

Example 4 – Corn: Good and Bad tissue and soil

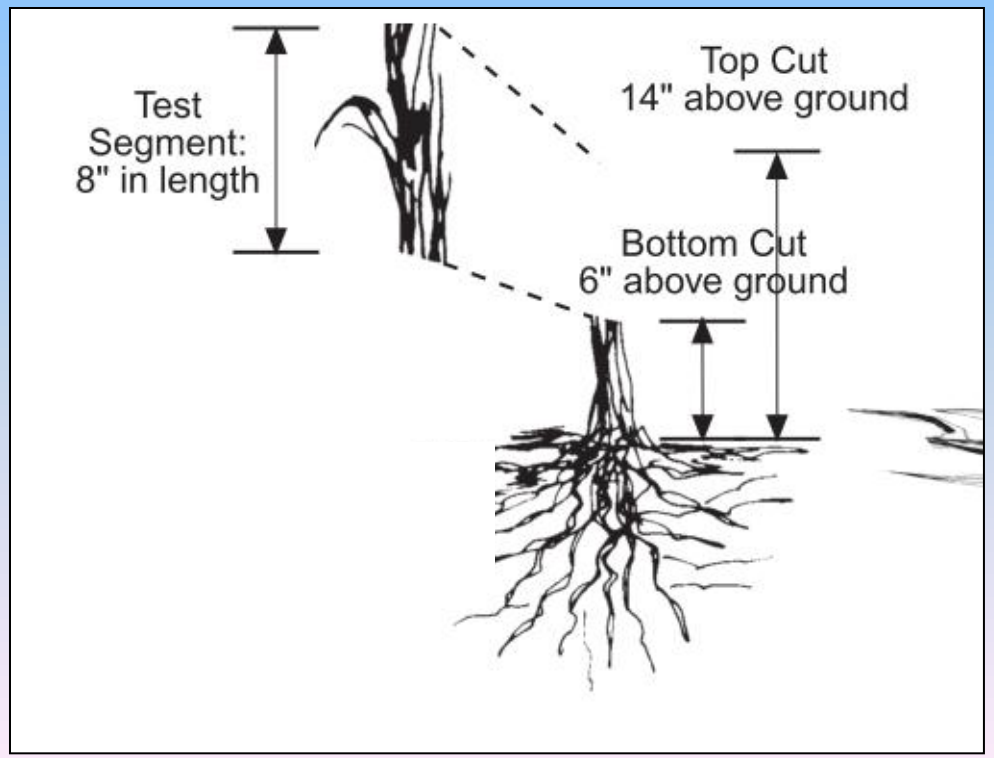
Good Corn
Stalk Nitrate – 2885 ppm



Bad Corn
Stalk Nitrate – 133 ppm

Corn Basal Stalk Nitrate

NO3-N ppm	Interpretation
0-250 ppm	Low – Nitrogen was probably deficient during growing season
250-700 ppm	Marginal – it is possible that nitrogen shortage limited yield
700-2000 ppm	Optimum – yield was not limited by nitrogen
>2000 ppm	Excessive – nitrogen rate was too high or something else caused yield reduction (drought)



Corn stalk nitrate sample
Collected after black layer

Don't wait too long!
Nitrate leaches from stalks!

Example 5 – Durum: Good tissue sample

Nutrient	Test Level	Rating	Sufficient Range
Total N	4.5 %	S	4.0 To 5.0
P	0.31%	S	0.21 To 0.50
K	2.1 %	S	1.6 To 3.0
S	0.41%	S	0.20 To 0.50
Ca	0.59%	H	0.20 To 0.50
Mg	0.25%	S	0.13 To 0.40
Na	0.07%	S	0.00 To 0.10
Zn	19 ppm	L	20 To 70
Fe	110 ppm	S	50 To 250
Mn	51 ppm	S	25 To 100
Cu	8 ppm	S	5 To 25
B	202 ppm	VH	3 To 40
Chloride	1.17%	VH	0.21 To 0.50

Zinc Low

	N	P	K	S
D.R.I.S. FOR GRAIN:	4	-4	-24	25


07 13 2005

Durum – Good soil

		VLow	Low	Med	High
0-6" 6-24" 0-24" Nitrate	5 lb/ac 21 lb/ac 26 lb/ac	*****			
Olsen Phosphorus	21 ppm	******	******	******	******
Potassium	611 ppm	******	******	******	******
0-24" Chloride	24 lb/ac	******	***		
0-6" 6-24" Sulfur	38 lb/ac 360 +lb/ac	****** ******	****** ******	****** ******	*** ******
Boron	1.0 ppm	******	******	**	
Zinc	1.30 ppm	******	******	******	**
Iron	48.5 ppm	******	******	******	******
Manganese	14.0 ppm	******	******	******	******
Copper	1.0 ppm	******	******	******	
Magnesium	432 ppm	******	******	******	******
Calcium	1949 ppm	******	******	******	*****
Sodium	35 ppm	*****			
Org.Matter	3.3 %	******	******	*	
Carbonate(CCE)	0.1 %	*			
0-6" 6-24" Sol. Salts	0.23 mmho/cm 1.24 mmho/cm	****** ******	******	******	**

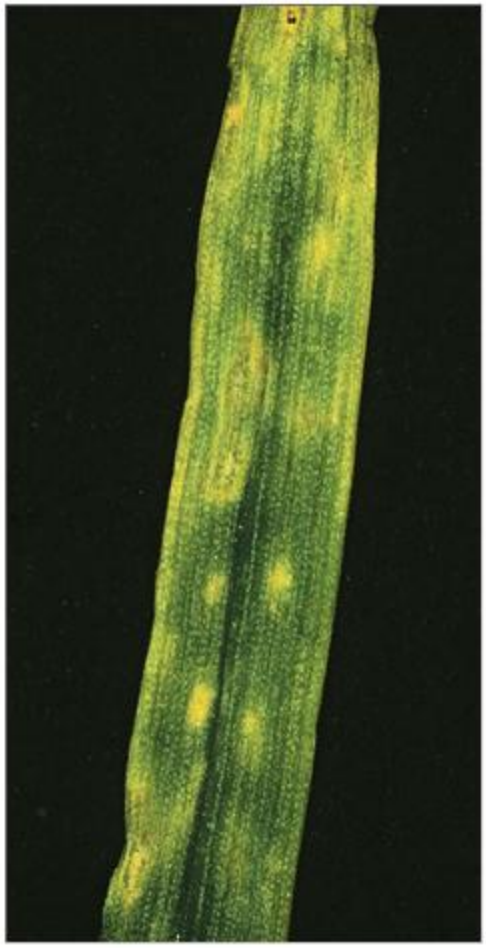
Most Nutrients High
Chloride – low to medium

Example 5 – Durum: Bad tissue sample

Nutrient	Test Level	Rating		Sufficient Range
Total N	3.0 %	D		4.0 To 5.0
P	0.25%	S		0.21 To 0.50
K	1.8 %	S		1.6 To 3.0
S	0.50%	S		0.20 To 0.50
Ca	0.41%	S		0.20 To 0.50
Mg	0.28%	S		0.13 To 0.40
Na	0.30%	VH		0.00 To 0.10
Zn	13 ppm	L	*Zinc Low*	20 To 70
Fe	111 ppm	S		50 To 250
Mn	53 ppm	S		25 To 100
Cu	7 ppm	S		5 To 25
B	1872 ppm	VH		3 To 40
Chloride	0.42%	S		0.21 To 0.50

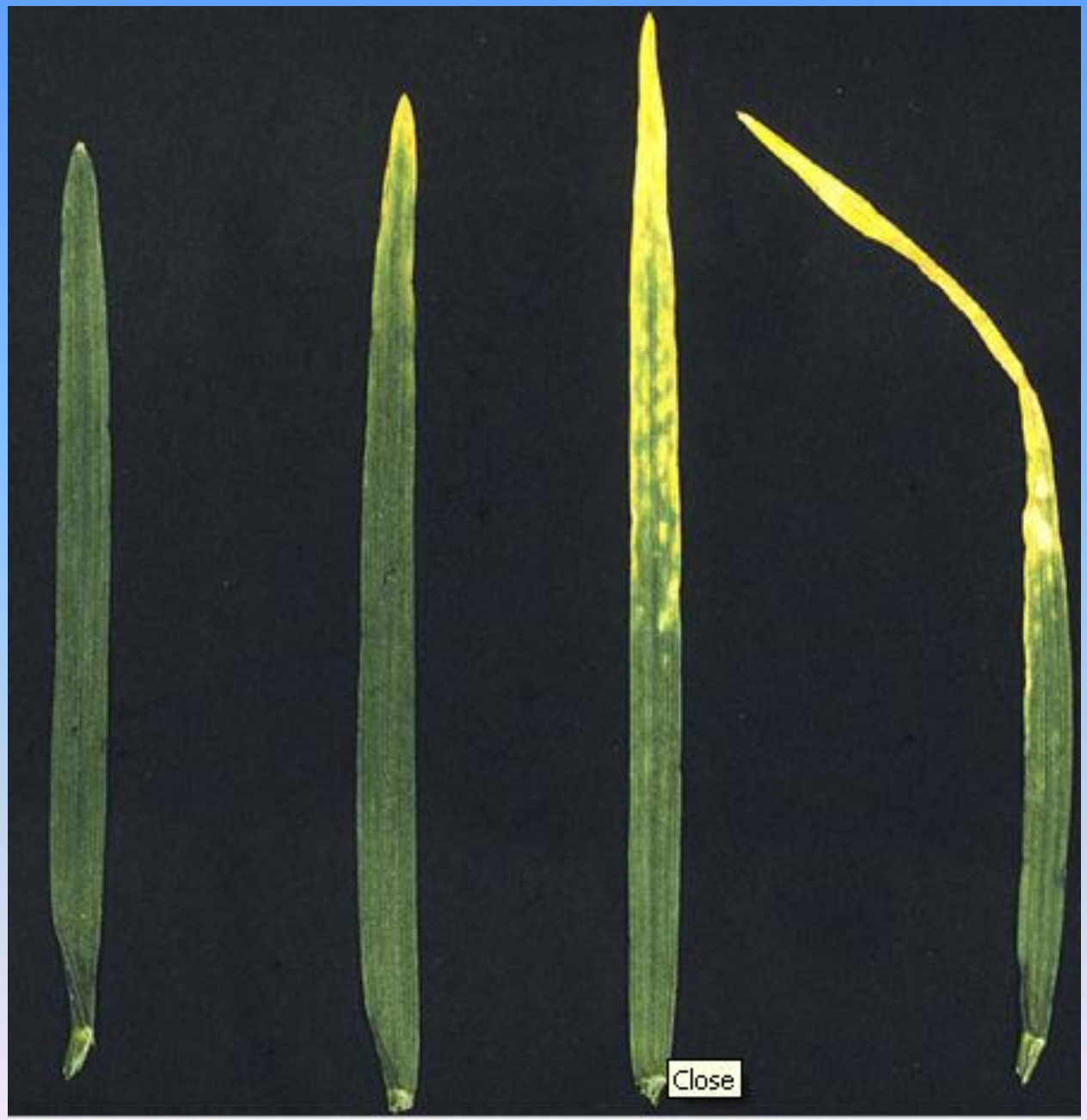
	N	P	K	S
D.R.I.S. FOR GRAIN:	-19	-15	-30	64


07 13 2005



Boron Toxicity

Close (Esc)



Boron Toxicity

Close (Esc)

Durum – Bad soil

Most Nutrients Very High

		INTERPRETATION			
		VLow	Lo		
0-6" 6-24" 0-24" Nitrate	14 lb/ac 168 lb/ac 182 lb/ac	******	******	******	******
Olsen Phosphorus	25 ppm	******	******	******	******
Potassium	631 ppm	******	******	******	******
0-24" Chloride	68 lb/ac	******	******	******	******
0-6" 6-24" Sulfur	92 lb/ac 360 +lb/ac	****** ******	****** ******	****** ******	****** ******
Boron	6.8 ppm	******	******	******	******
Zinc	1.84 ppm	******	******	******	*****
Iron	36.6 ppm	******	******	******	******
Manganese	12.1 ppm	******	******	******	******
Copper	1.11 ppm	******	******	******	
Magnesium	753 ppm	******	******	******	******
Calcium	1520 ppm	******	******	******	
Sodium	301 ppm	******	******	******	******
Org.Matter	2.6 %	******	****		
Carbonate(CCE)	0.2 %	*			
0-6" 6-24" Sol. Salts	0.44 mmho/cm 3.52 mmho/cm	****** ******	**** ******	******	******

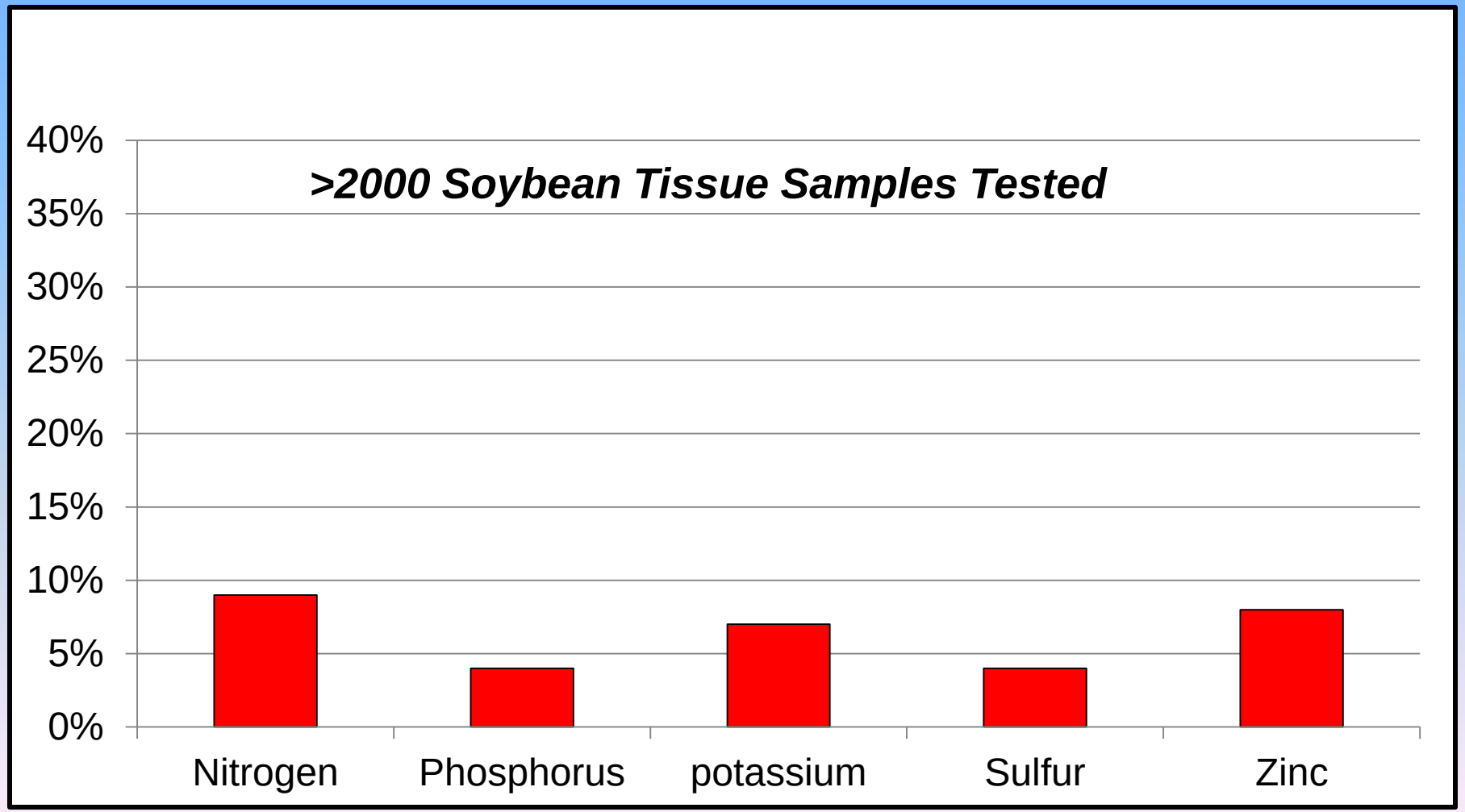
Excessively high tests
Boron (>3.0 toxic?)
Sodium
Subsoil salts

CSI Conclusion?

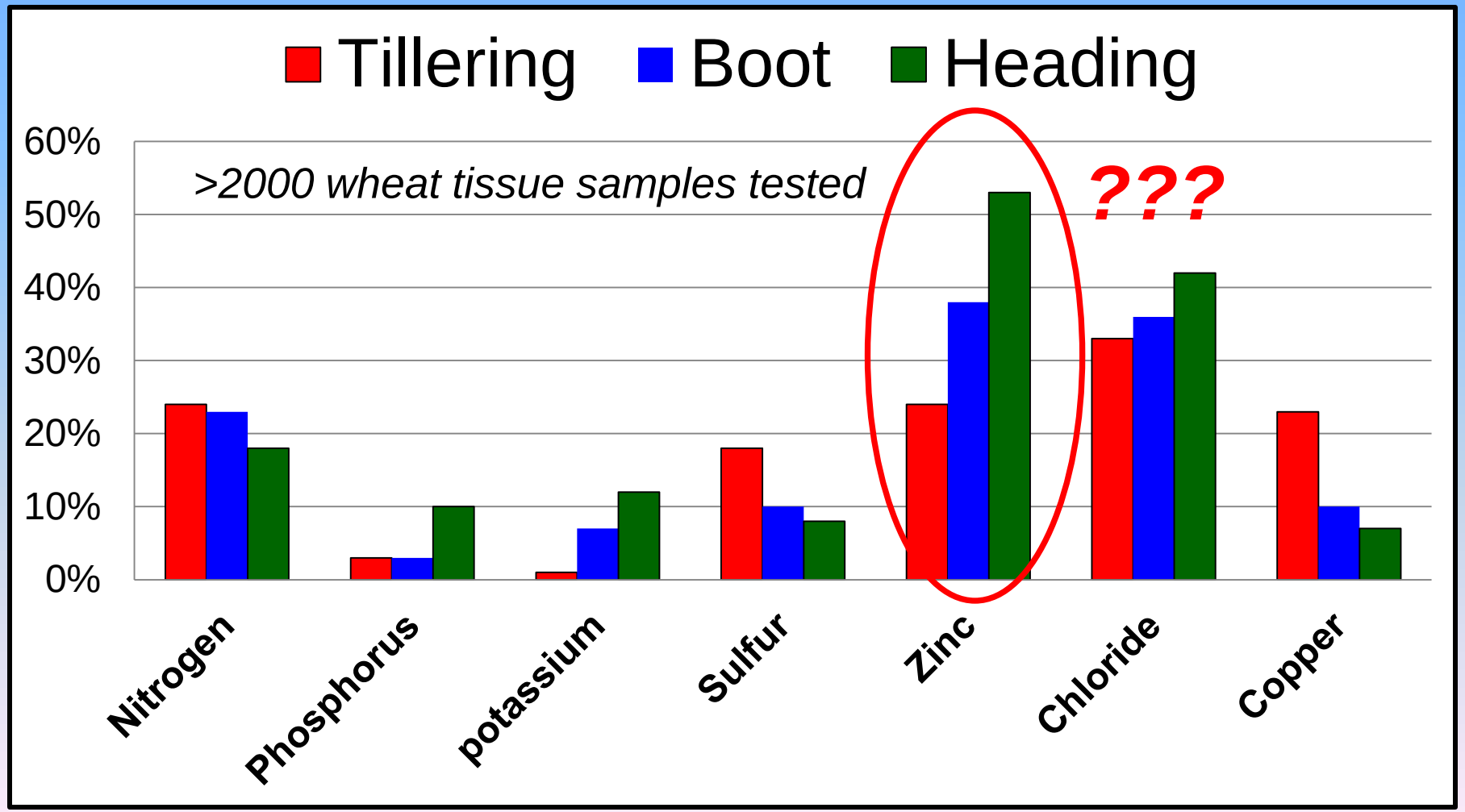
- *Good tissue*
  - *Boron high, zinc low*
- *Good Soil*
  - *All nutrients high except Chloride, some subsoil salt*
- *Bad tissue*
  - *Boron Excessive, sodium excessive, zinc low, N low*
- *Bad Soil*
  - *Boron excessively high, sodium high, salts very high*
- *Durum dies, but sunflowers (tolerance)*

Boron toxicity, salt issue – crop rotation

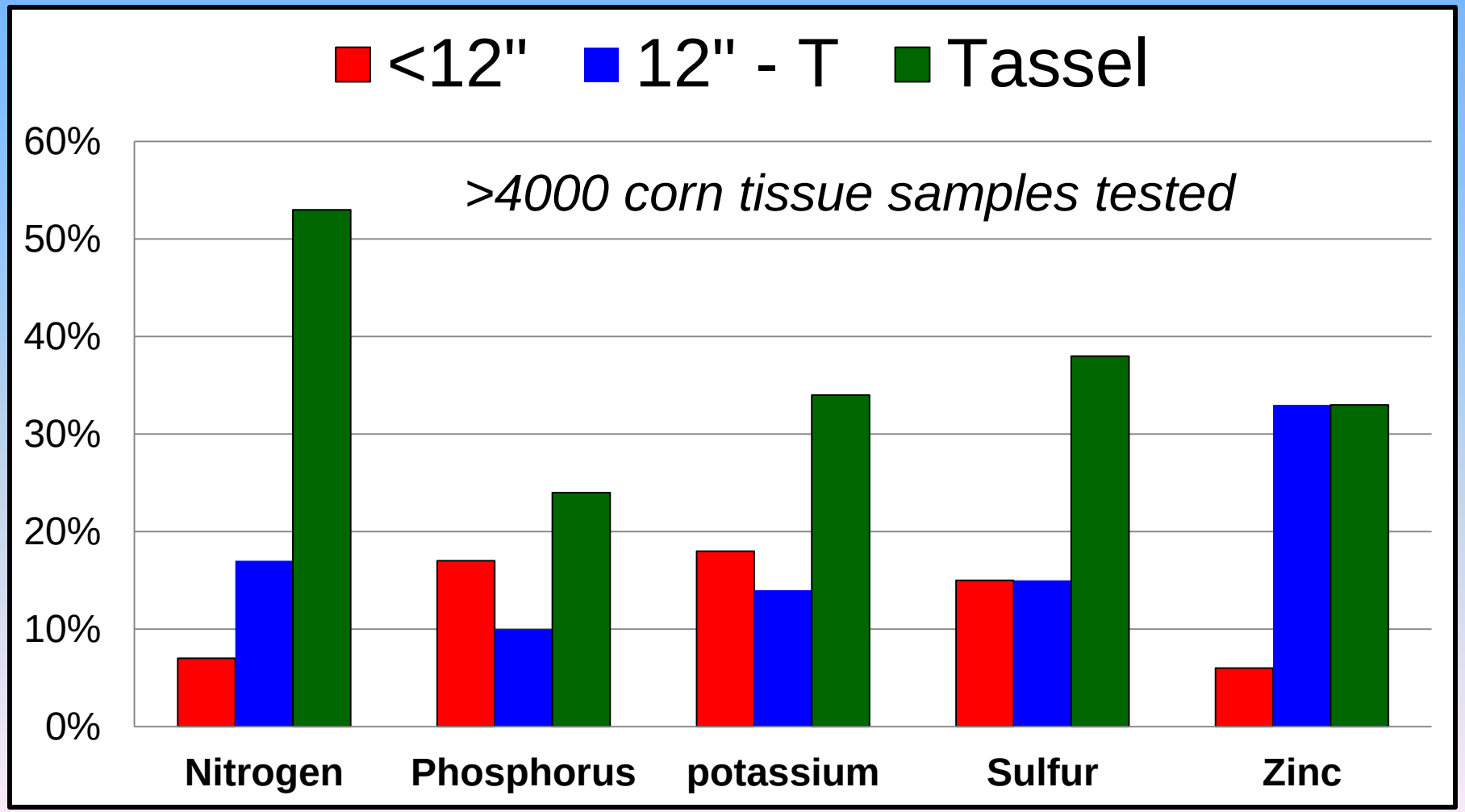
% Soybean Tissue Samples Testing Low or Deficient - 2010



% Wheat Tissue Samples Testing Low or Deficient - 2010



% Corn Tissue Samples Testing Low or Deficient - 2010



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Plant Tissue Data Available

Welcome to the Plant Tissue Data page.
To start please enter your account number and password:

Account number: LE0002

Password: ••••••

Show my files!

Enter your account number "LE0001" (Capitol letters)
Enter the password "agvise" (small letters)

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Plant Tissue Data

Viewing plant nutrient analysis reports: Plant analysis reports are placed on this site the same day the analysis is completed. Double click on the file you wish to view (scroll down to view the list of files containing plant analysis reports). Microsoft Internet Explorer must be used to view these files.

Potato Petiole Customers: Microsoft Excel will start up if the file has an ".xls" ending. This will allow you to view the reports, and print a copy of all the reports. You can also save the file on your computer for future reference.

General Plant Analysis Customers: Microsoft Notepad will start up if the file as a ".txt" ending. You can view and print the reports in Notepad. Microsoft Word will print a report that fits on one page. First save the tissue file on your computer, and then use Microsoft Word to open the file.

New pdf reports for 2011

Download a file by clicking on it's Data File Name.

Date	Data File Name	File Size
12/02/2010	LE0002-12-02-10-N.TXT	0.003 MB
8/10/2010	LE0002-CR4880-08-10-10-N.TXT	0.054 MB
7/12/2010	LE0002-07-12-10-N.TXT	0.008 MB
7/08/2010	LE0002-07-08-10-N.TXT	0.002 MB
7/05/2010	LE0002-CR4880-07-05-10-N.TXT	0.004 MB

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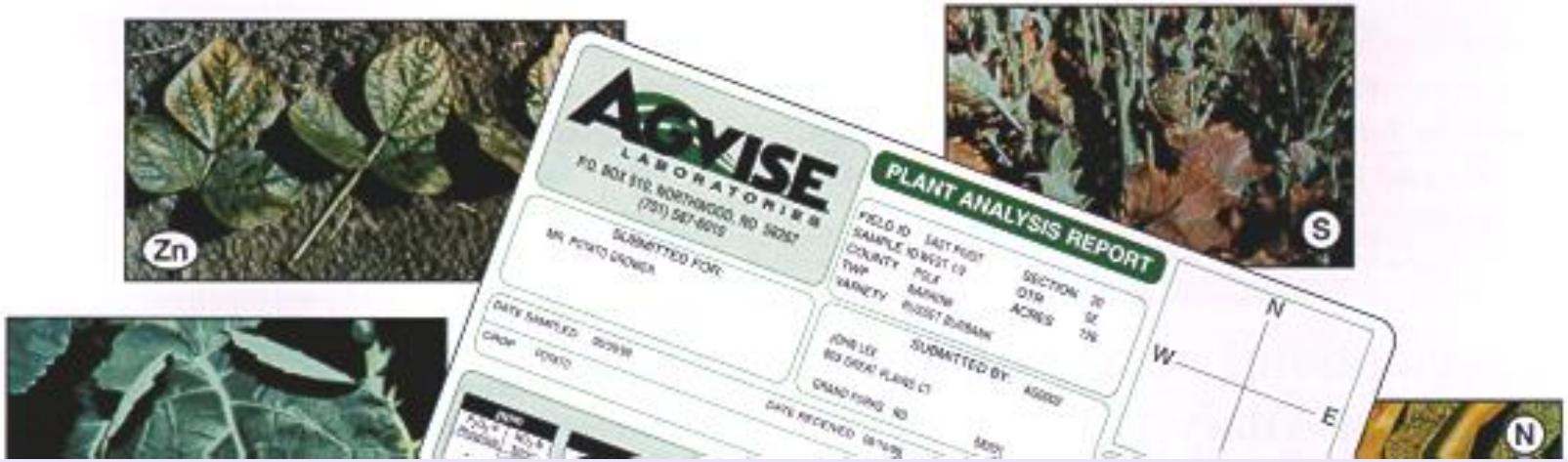
Interpreting Plant Analysis Reports

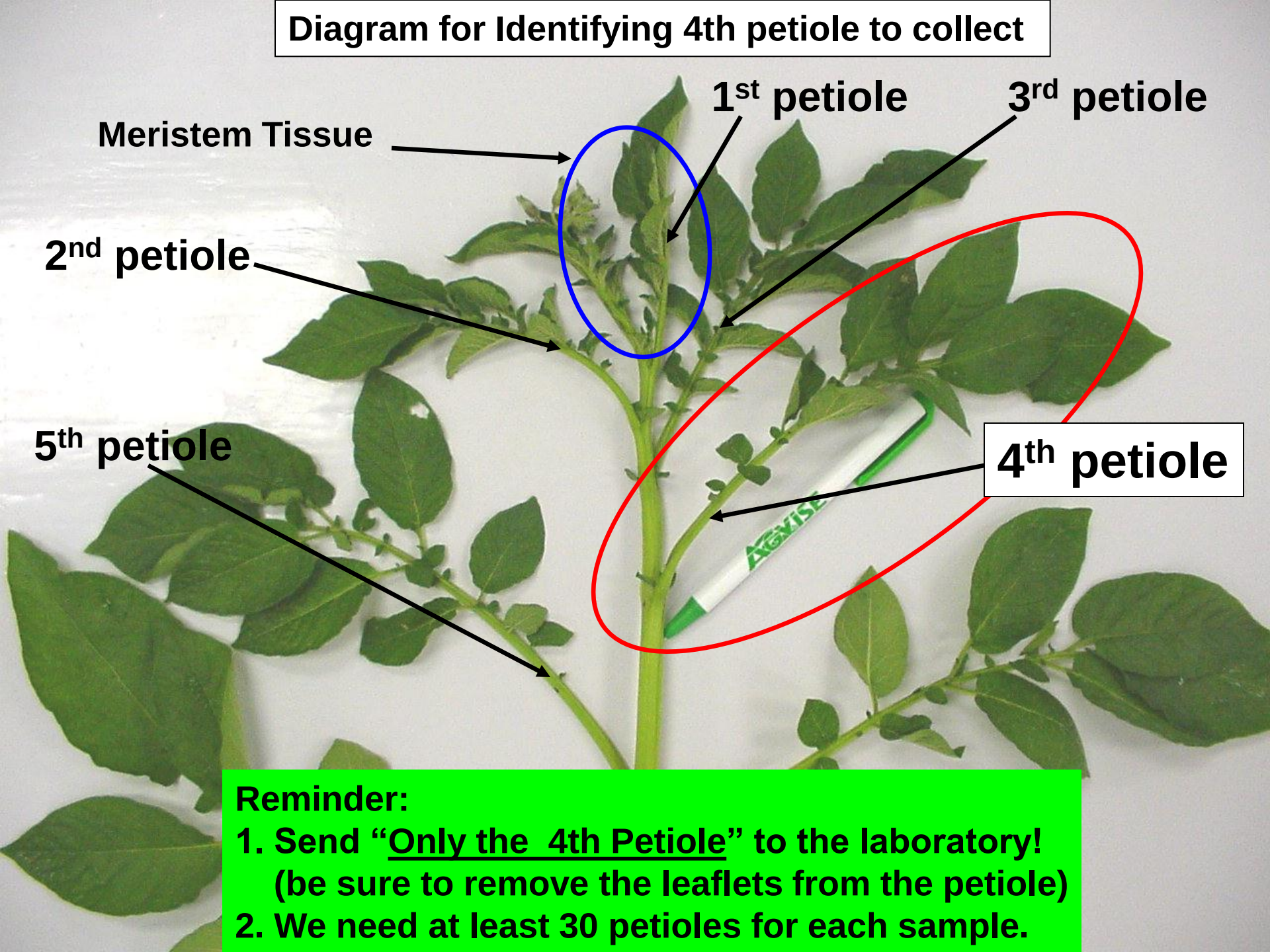


Plant Analysis along with Soil Analysis Can…

- *Shows us which nutrient is most limiting*
- *Tells us if the problem is slight or severe*
- *Shows us if a deficiency is occurring (hidden hunger)*
- *Improve your problem solving ability*
- *Make you the CSI expert!*

Thank You!

Diagram for Identifying 4th petiole to collect



Reminder:

1. Send "<u>Only the 4th Petiole</u>" to the laboratory!
   (be sure to remove the leaflets from the petiole)
2. We need at least 30 petioles for each sample.

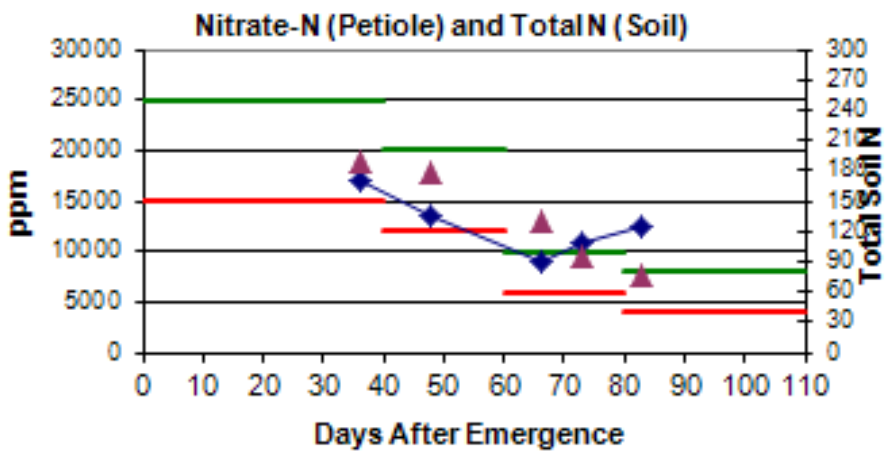
Example 5: Irrigated Potatoes

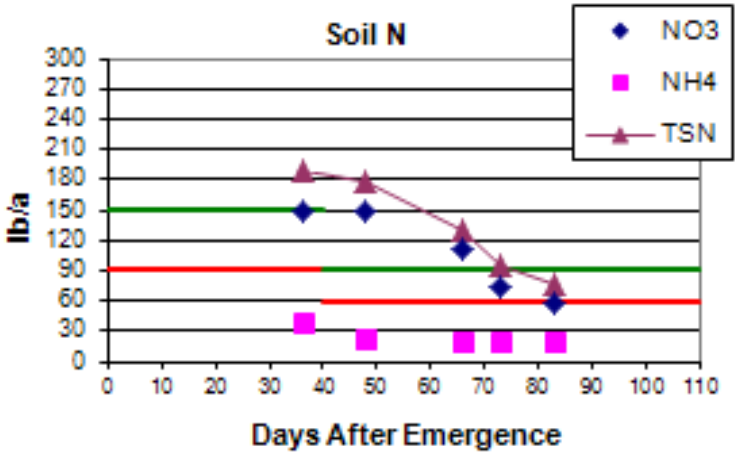
- *Petiole samples every week*
  - *Monitoring nitrate levels*
  - *Tracking nutrient trends*
- *Soil Samples*
  - *Monitoring ammonium and nitrate*
  - *Managing inputs of Nitrogen*

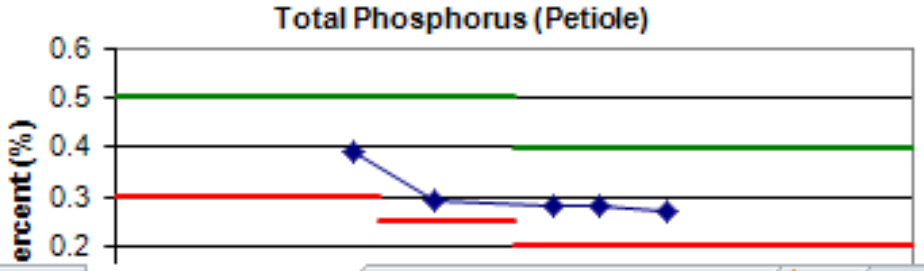
AGVISE Laboratories

Grower CMCDC
Field Name P.H. DEMO **Variety** RB
Field Number 3 **E. Date** 6/3/2008
Last Lab Number 5890

Date	DAE	P2O5	NO3	%P	%K	%S	%Ca	%Mg	Zn	Fe	Mn	Cu	B	Al	Na	Cl	Soil NO3	Soil NH4	Soil TSN
7/10/08	36		16960	0.39	8.1	0.27	0.65	1.2	42	273	35	12	35	204	0.08		150	38	188
7/22/08	48		13418	0.29	7.8	0.24	0.76	1.75	48	189	31	8	29	127	0.04		150	22	177
8/9/08	66		9081	0.28	6.8	0.3	0.72	1.88	143	85	40	13	29	45	0.05		110	20	130
8/26/08	73		10948	0.28	6.6	0.32	0.66	2.02	234	108	38	10	32	86	0.04		75	20	95
8/26/08	83		12356	0.27	6.5	0.3	0.76	2.32	49	110	42	11	42	96	0.08		57	20	77



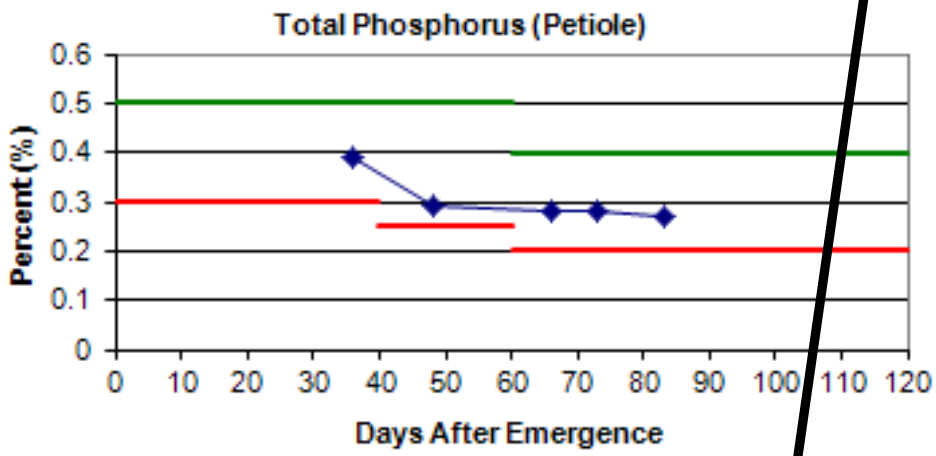


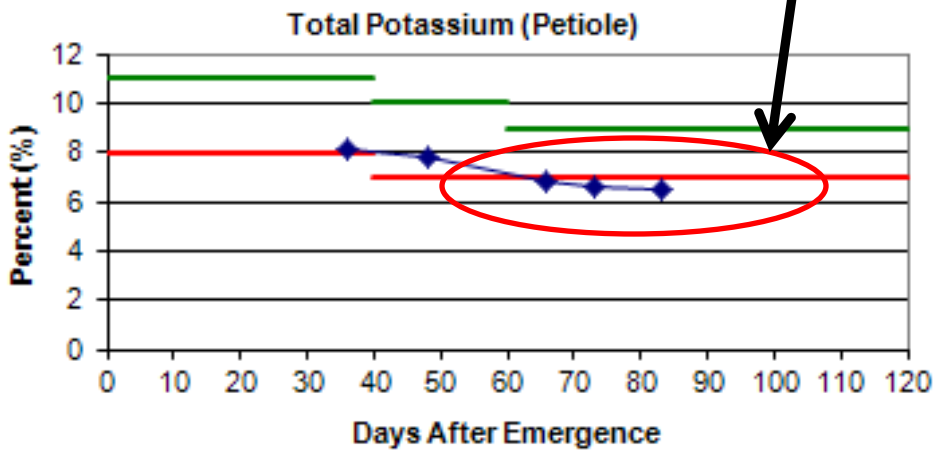


Nut.	Date	Low		High
%S	8/9	0.2	0.3	0.5
	8/26	0.2	0.3	0.5
	8/26	0.2	0.3	0.5
%Ca	8/9	0.4	0.7	0.8
	8/26	0.4	0.7	0.8
	8/26	0.4	0.8	0.8
%Mg	8/9	0.2		0.4 1.9

P.H. DEMO 3 | PLANT HEALTH PLOT 1

Potassium level low after 60 days





Nut.	Date	Low		High	
%S	8/9	0.2	0.3	0.5	
	8/26	0.2	0.3	0.5	
	8/26	0.2	0.3	0.5	
%Ca	8/9	0.4	0.7	0.8	
	8/26	0.4	0.7	0.8	
	8/26	0.4	0.8	0.8	
%Mg	8/9	0.2		0.4	1.9
	8/26	0.2		0.4	2
	8/26	0.2		0.4	2.3
Zn	8/9	20		30	143
	8/26	20		30	234
	8/26	20		30	49
Fe	8/9	20		50	85
	8/26	20		50	108
	8/26	20		50	110
Mn	8/9	20		30	40
	8/26	20		30	38
	8/26	20		30	42
Cu	8/9	2		4	13
	8/26	2		4	10
	8/26	2		4	11
B	8/9	20	29	30	
	8/26	20		30	32
	8/26	20		30	42
Al	8/9	10		20	45
	8/26	10		20	86
	8/26	10		20	96

CSI Information

- *Petiole Tissue Test*
  - *All nutrients in Sufficiency Range except Potassium during the season*
- *Soil Test*
  - *Total soil N during the season looked good*

Potassium fertility program needs to be better

% Potato Petiole Samples Testing Low or Deficient - 2010