2013 • Fluid Fertilizer Foundation Forum

Nutrient Concentrations and Balance in Corn Tissue

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Plus

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Culiacan, Mexico

Why the interest ?

- Response to foliar application of micro-nutrients to corn seedlings in Mexico
- Early season tissue testing to characterize nutrient status
- Nutrient balance (DRIS)

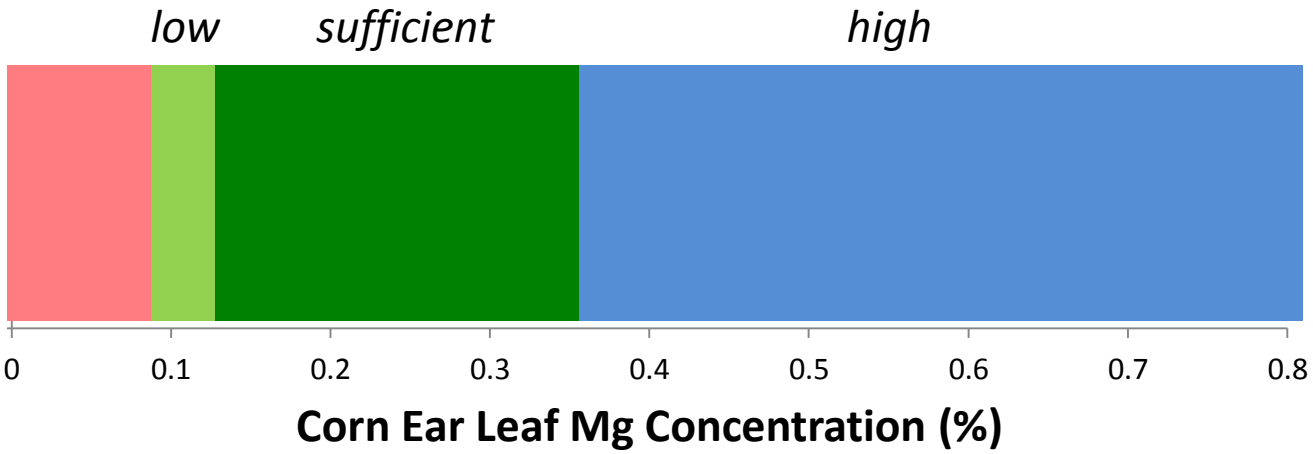
  "Diagnostic Recommendation Integrated System"
- Origin of "sufficient" reference concentrations
- Understanding green-snap in corn

What is the origin of nutrient sufficiency levels ?

---- ***Deficient*** -------- ***Low*** -------- ***Sufficient*** -------- ***High*** ----

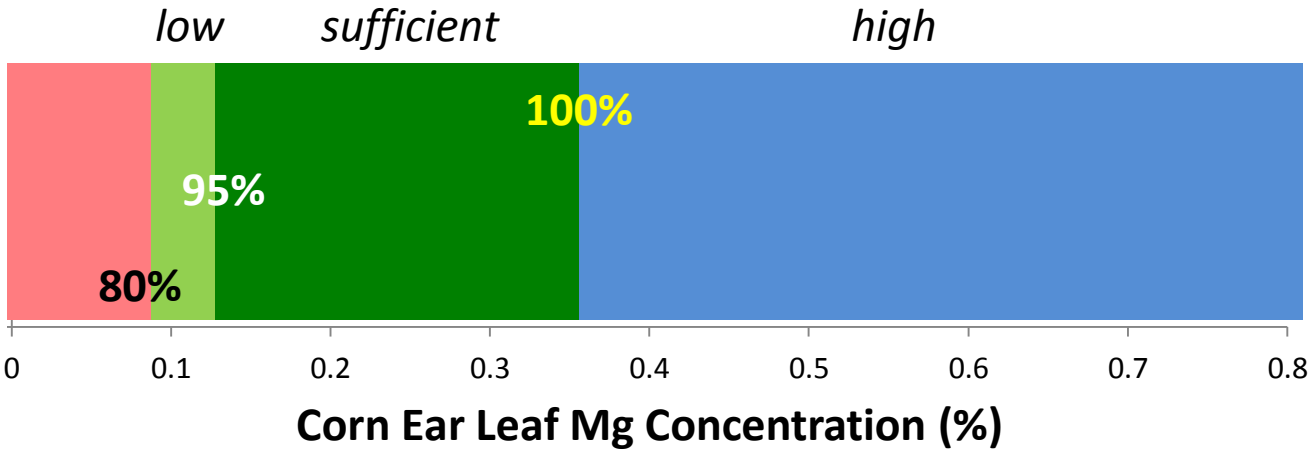
Ear Leaf Mg (%)

<0.09 0.09 - 0.12 0.13 - 0.35 0.36 - 0.80+



Sufficiency Level Delineation

Range	Yield	Symptoms
Deficient	<80 %	deficiency present
Low	80 – 95 %	hidden hunger
Sufficient	95 – 100 %	normal yield
High	100 % ***down to 70 %***	excessive / toxic



What is the origin of nutrient sufficiency levels ?

---- *Deficient* -------- *Low* -------- *Sufficient* -------- *High* ----

Ear Leaf Mg (%)

<0.09	0.09 - 0.12	0.13 - 0.35	0.36 - 0.80+

--- *Very Low* --- *Low* --- *Medium* --- *High* --- *Very High* ---

Soil Test Mg (ppm)

0 - 25	25 - 50	51 - 100	>101

Are sufficiency levels appropriate ?

- Modern high yielding corn hybrids

  corn yields have increased 100 % in 20 years

- Across growth stages

  can nutrient supply keep up with crop needs

- Location / area specific

  soil organic matter *and* ***mineral differences***

- Hybrid specific
- ? ? ? ?

Where to start ?

- Hybrid study *(14 hybrids)*

  V3 - V4 ***V8*** ***VT***

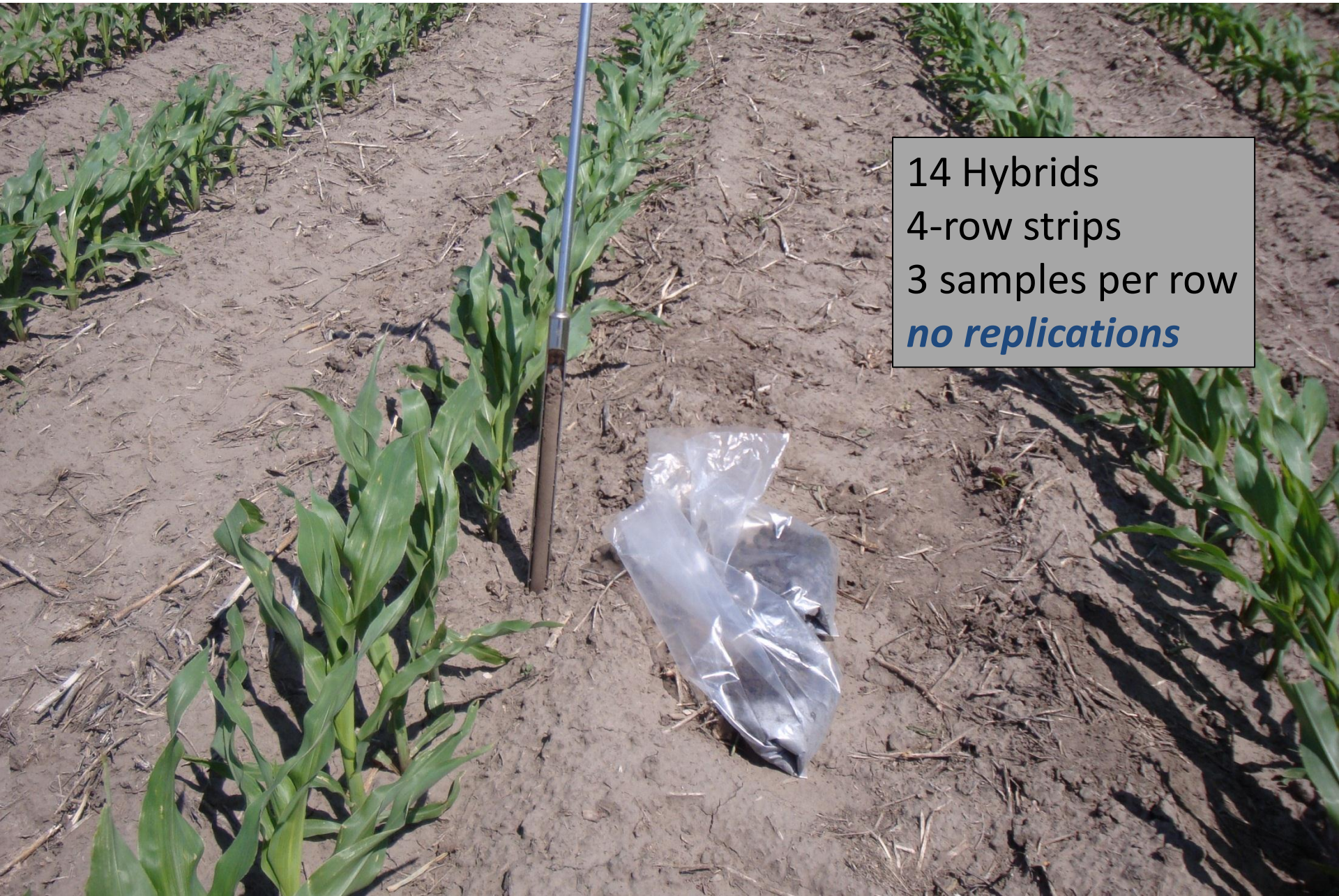
- Hybrids x locations

  Shelton ***York*** ***Lincoln***

- N-rate effects *(2 hybrids)*

  0% ***50%*** ***70%*** ***100%*** ***130%***

Shelton - 2012 *V3 – V4*



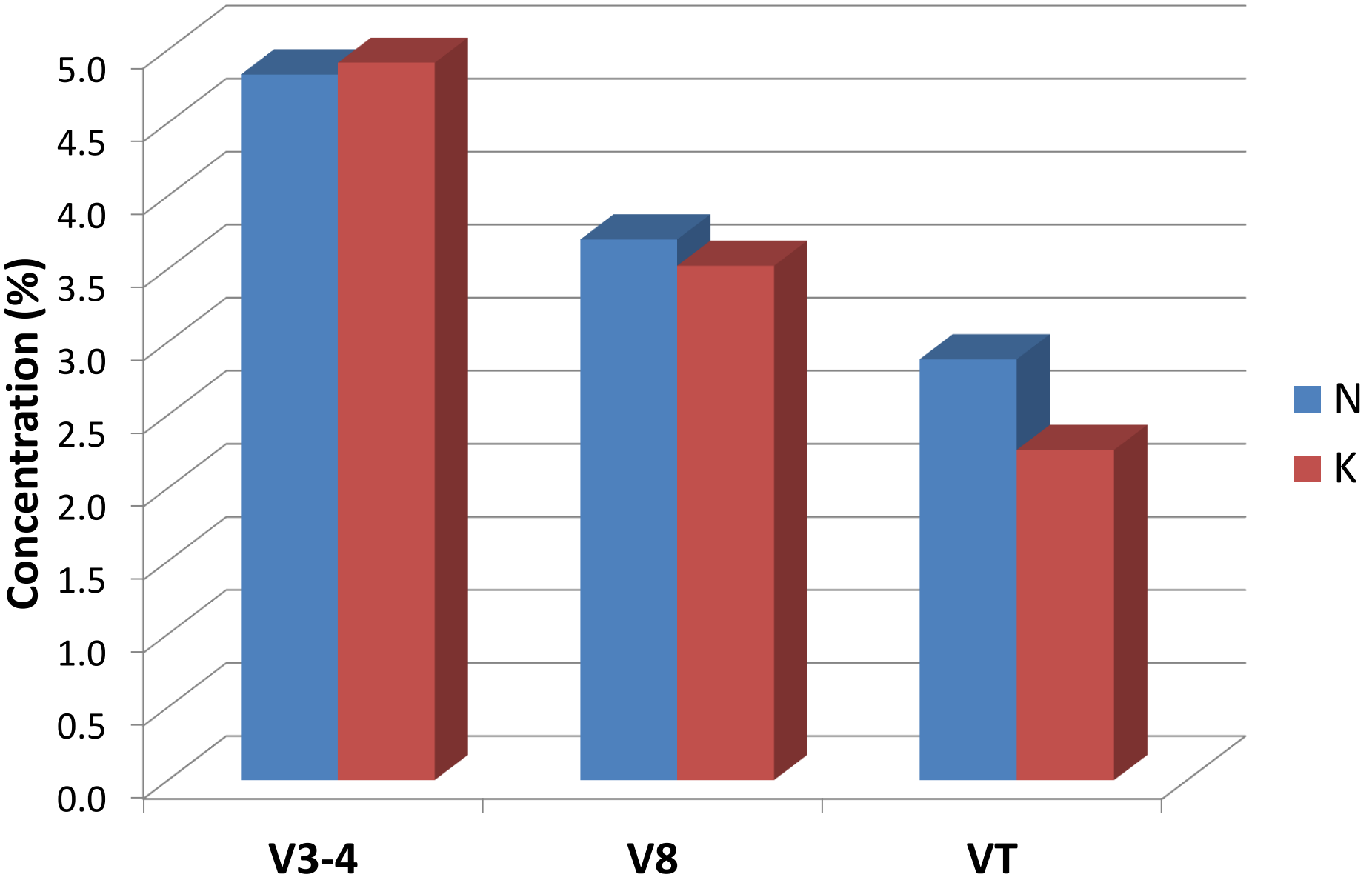
Shelton - 2012 V8

Shelton - 2012 V8

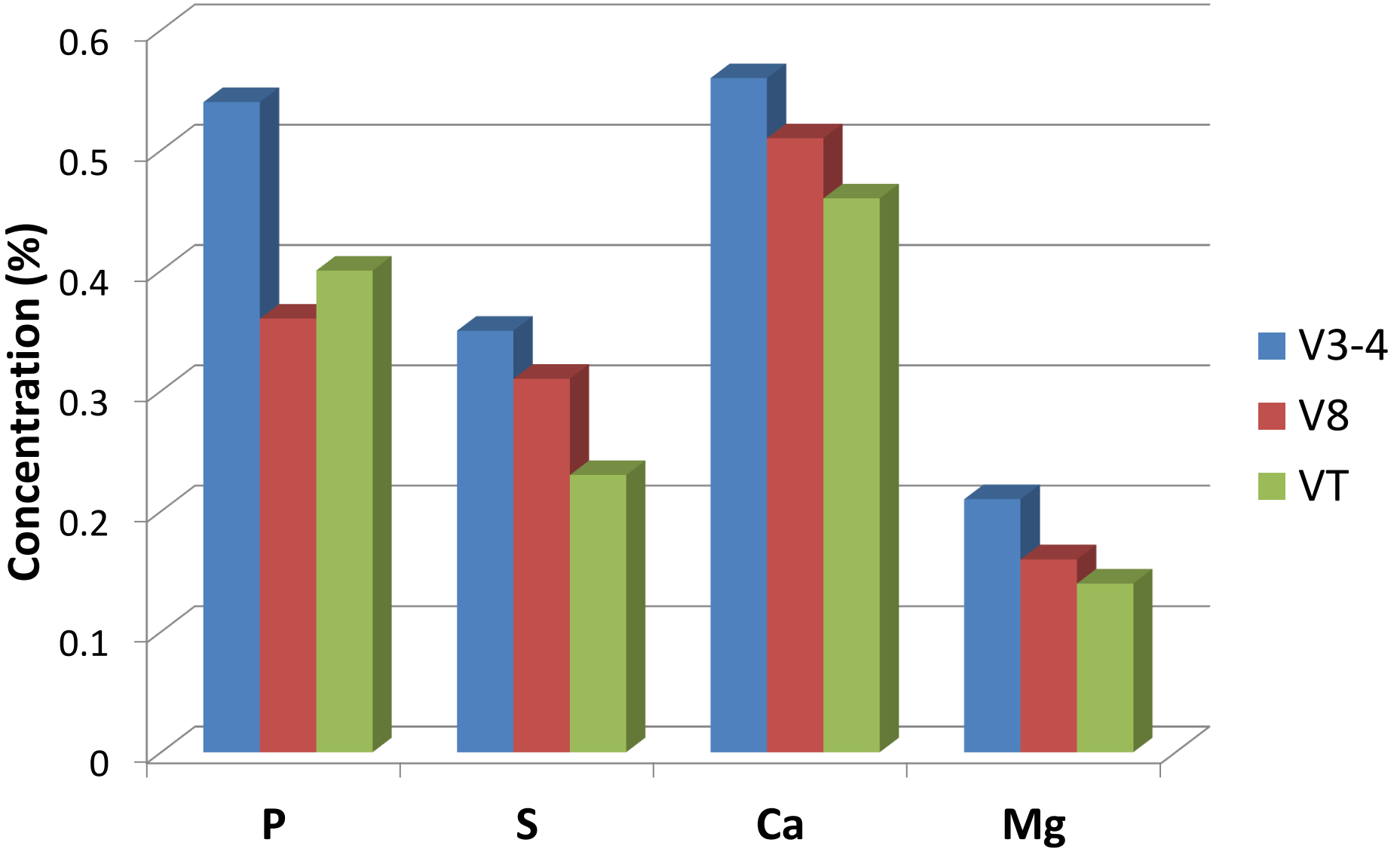
Shelton - 2012 VT

Shelton - 2012 VT

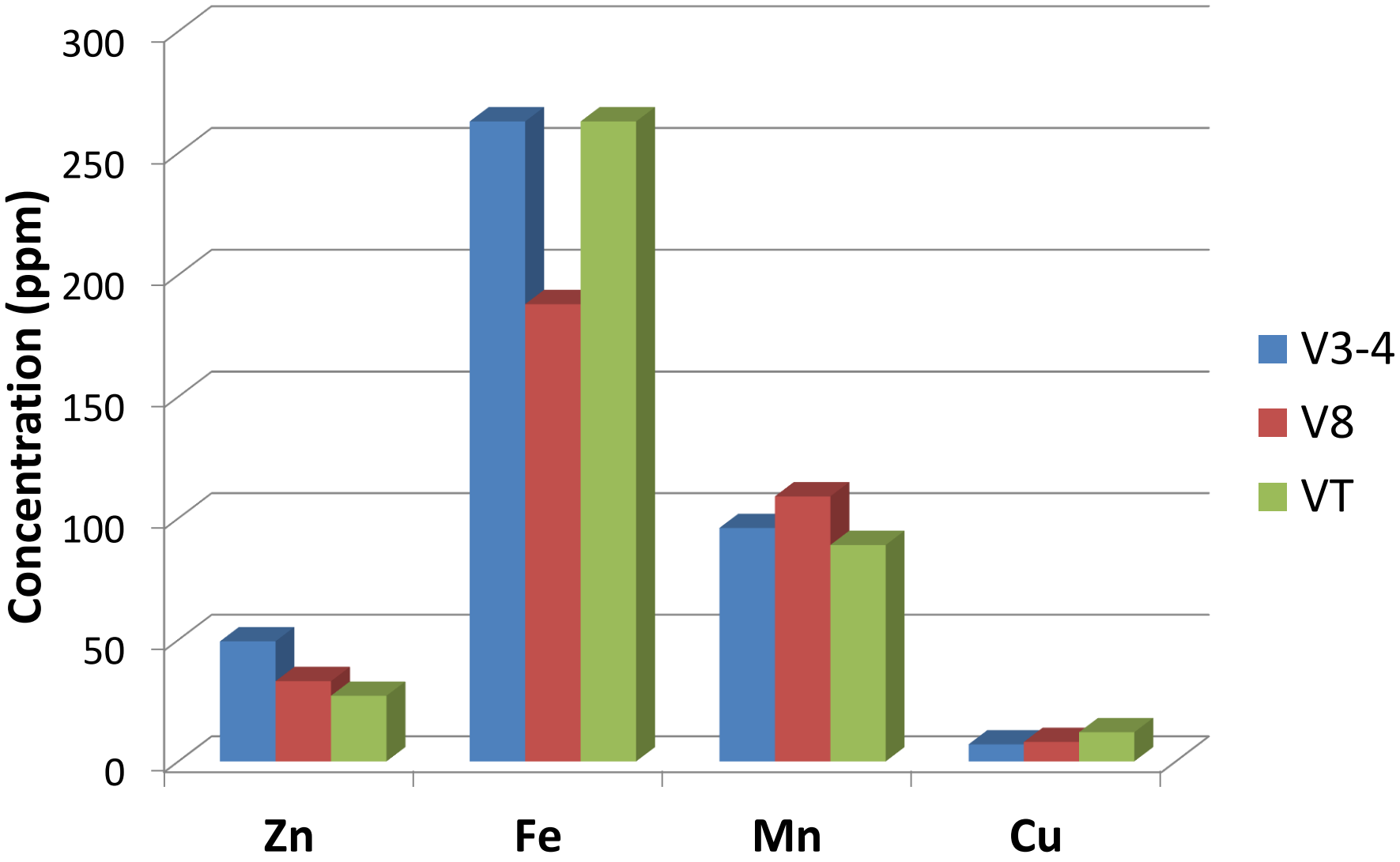
Shelton - 2012 VT



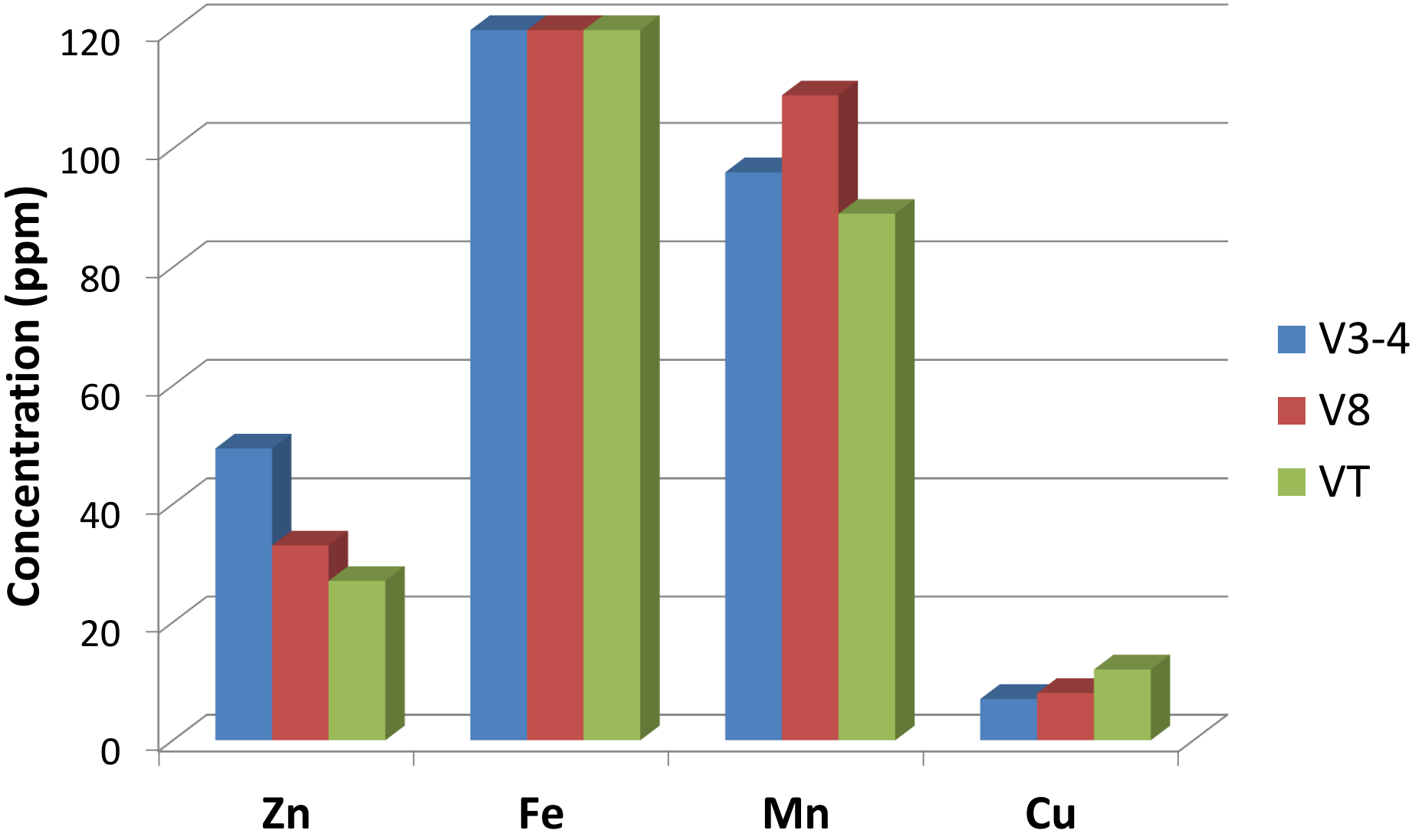
Shelton - 2012 VT



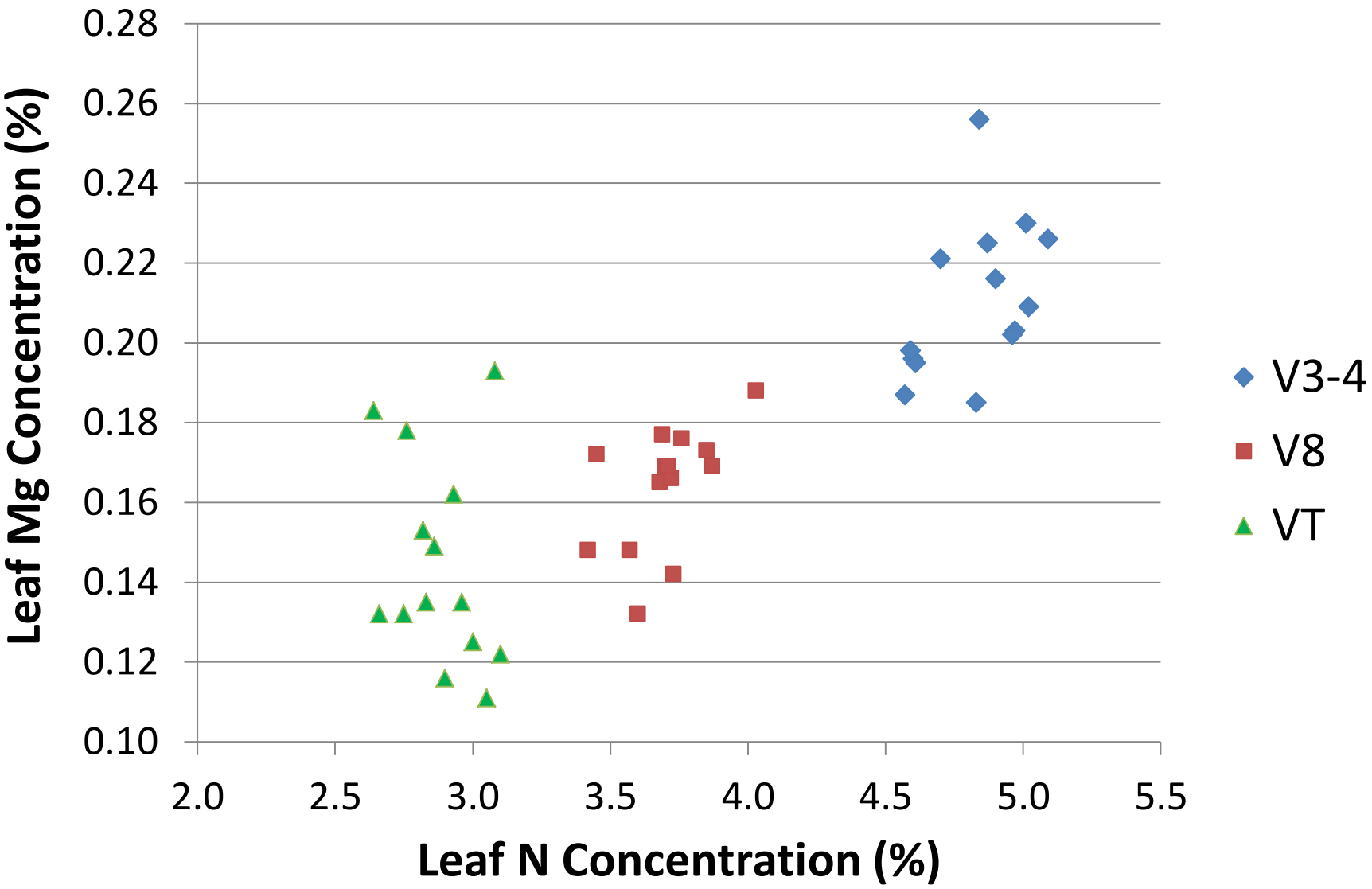
Shelton - 2012 VT



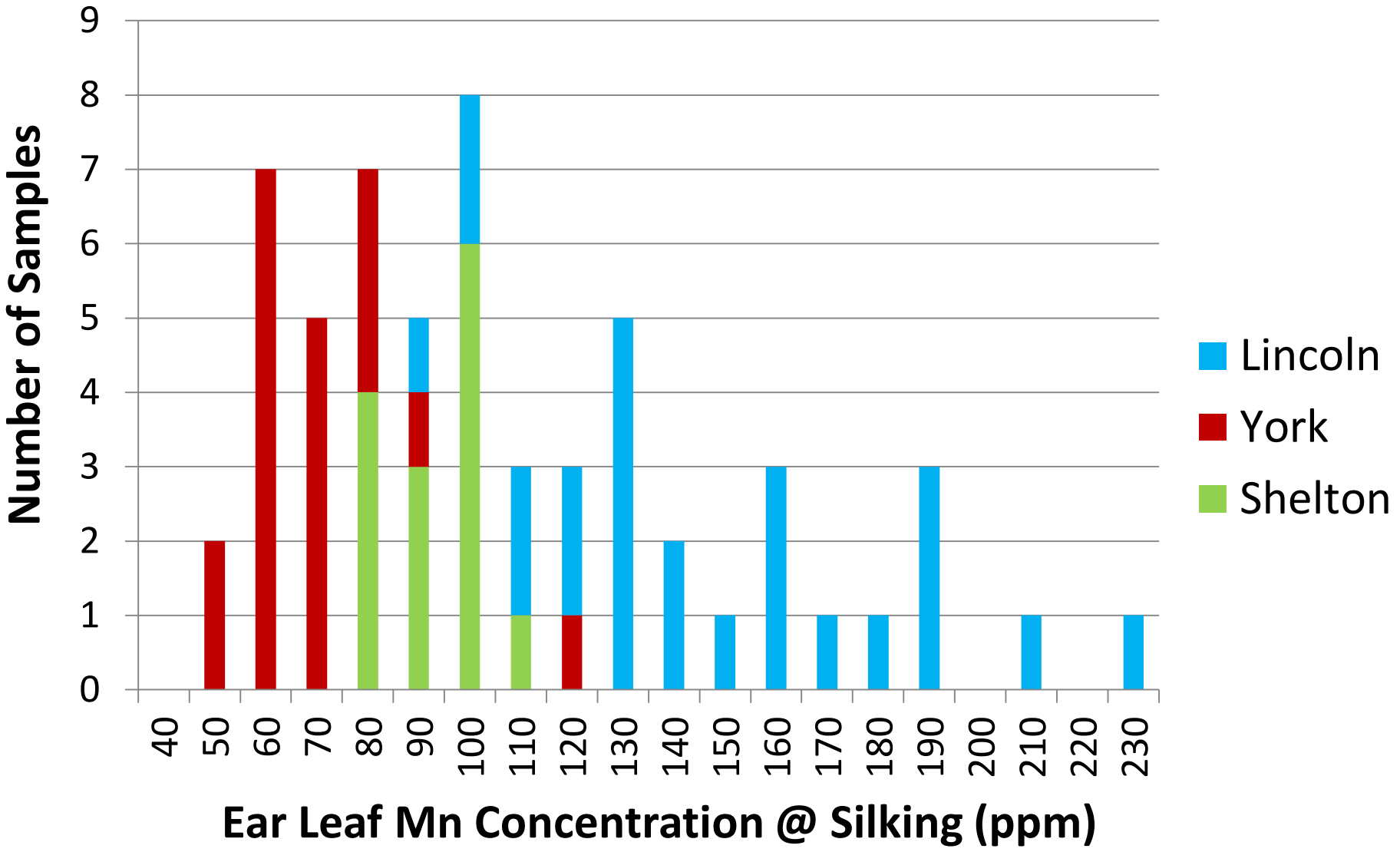
Shelton - 2012 VT



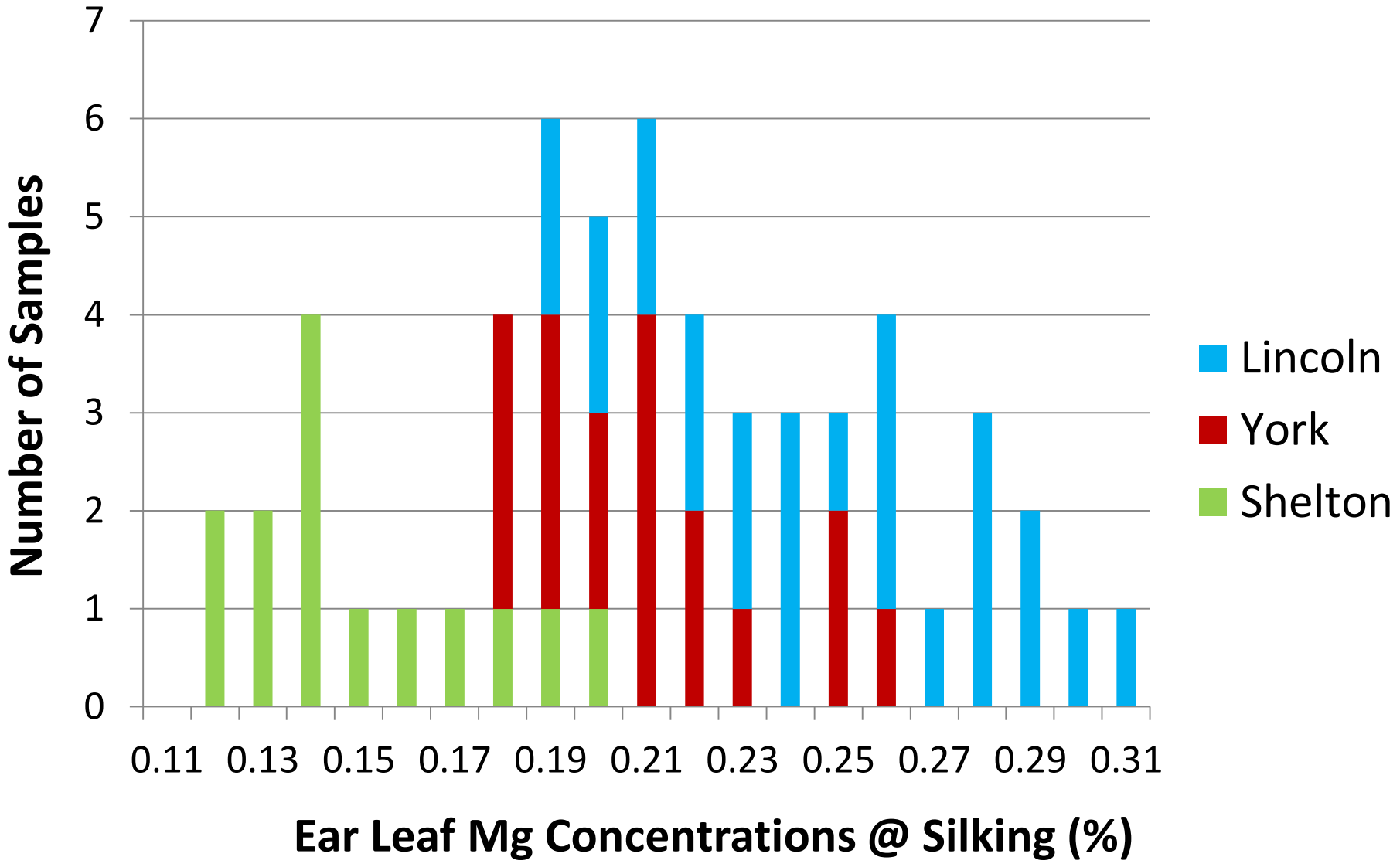
Shelton - 2012 VT

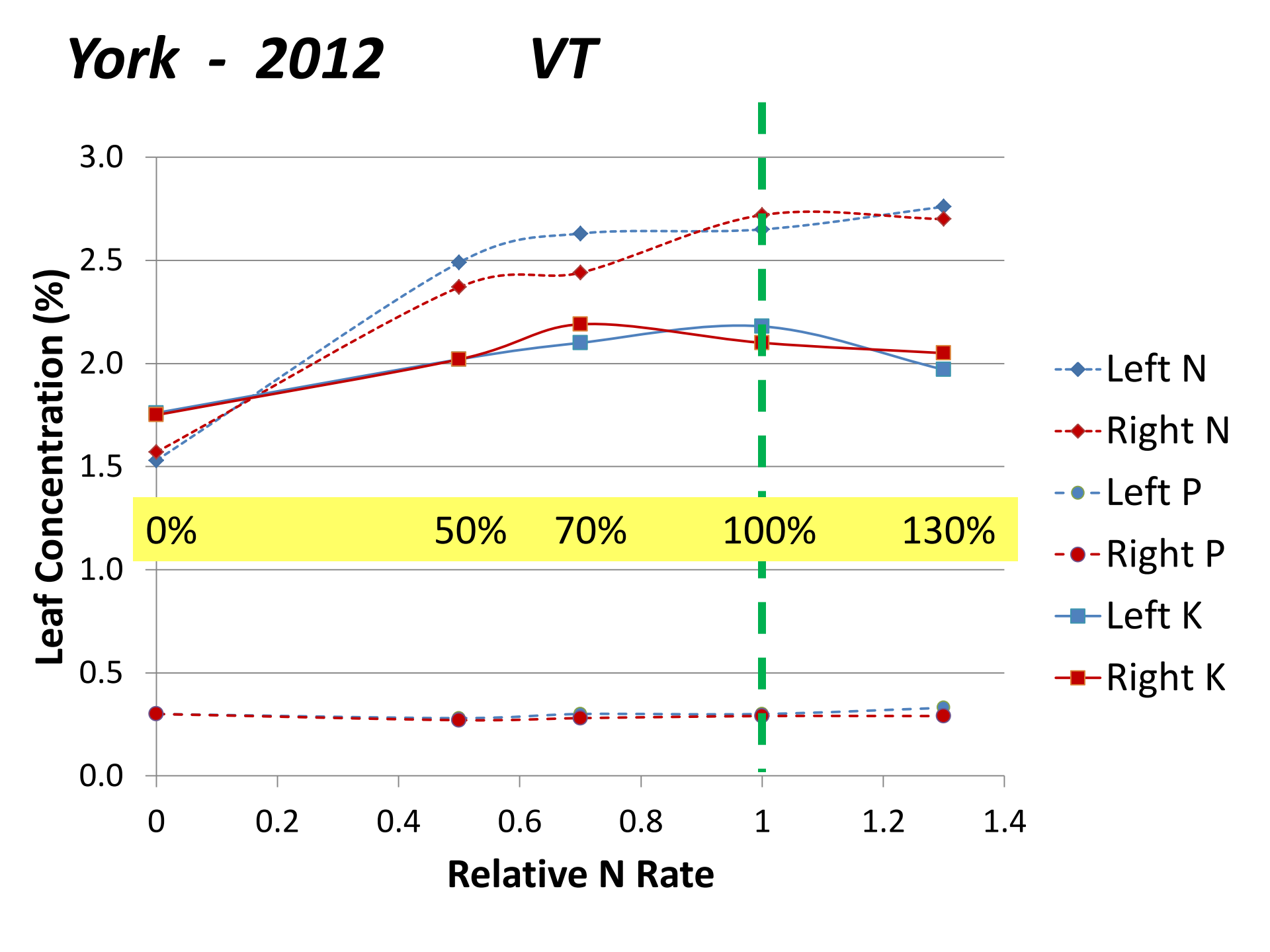


2012 VT

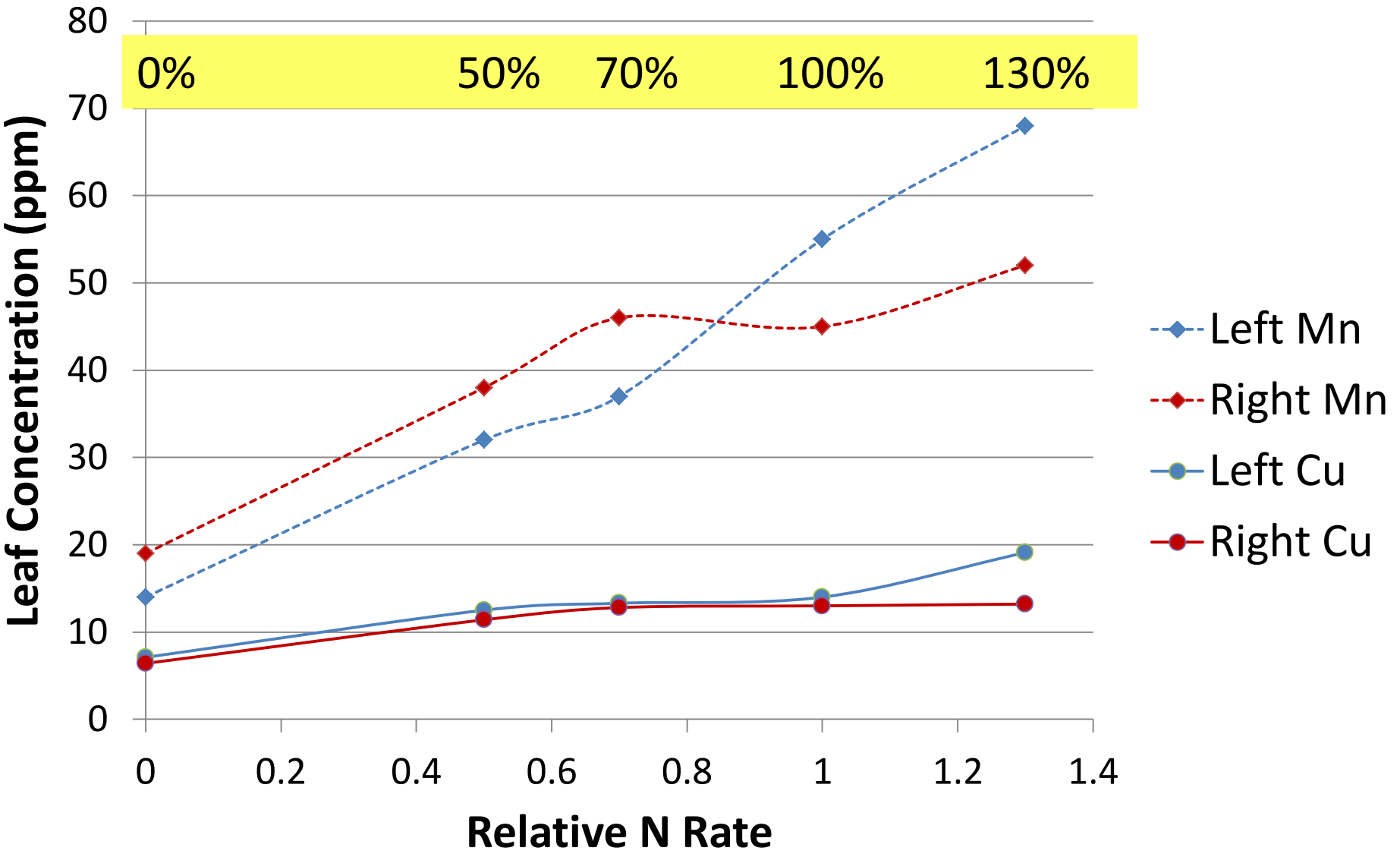

Number of Samples
0
1
2
3
4
5
6
7
8
9
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
Ear Leaf Mn Concentration @ Silking (ppm)
Lincoln
York
Shelton

2012 VT

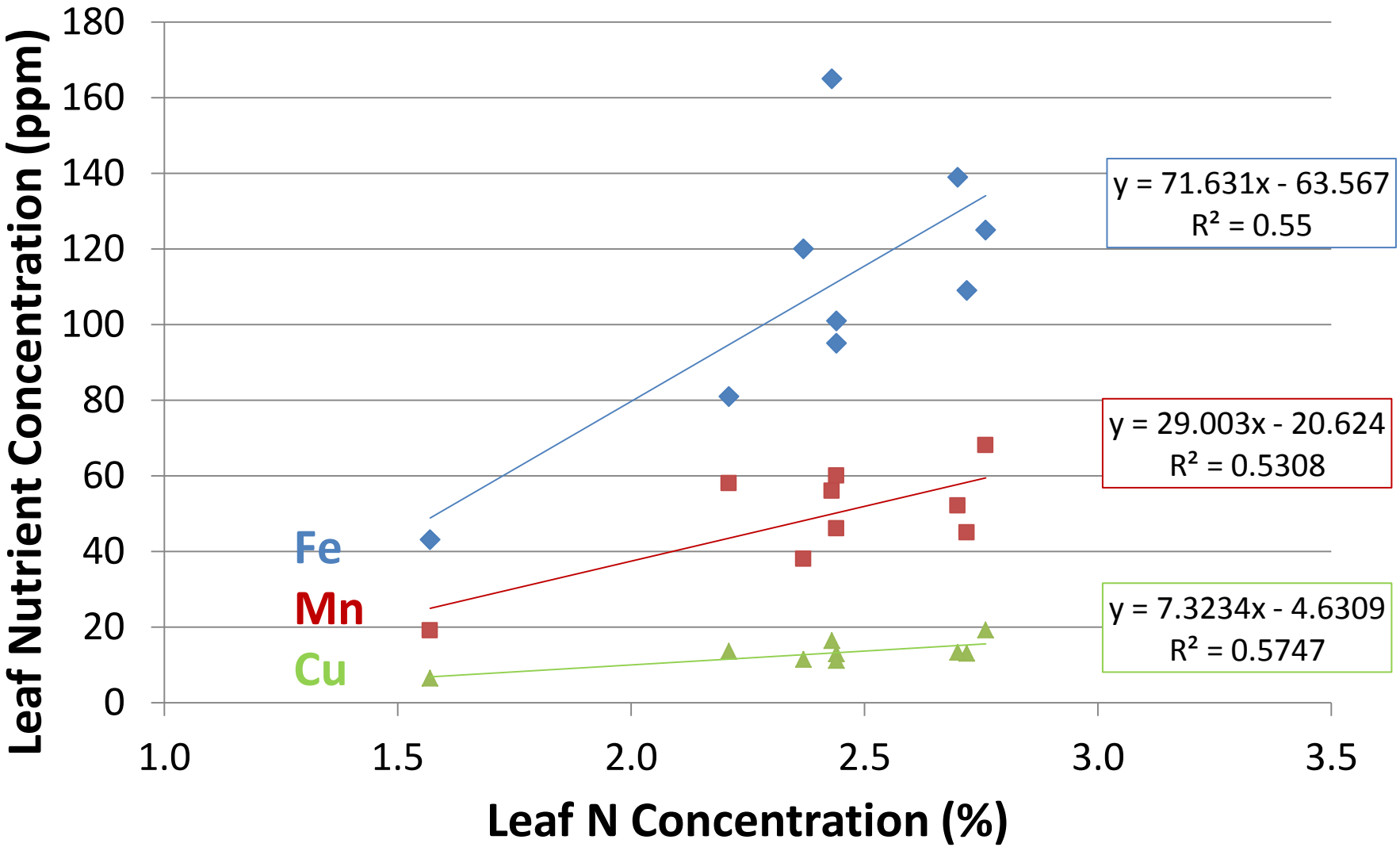

Number of Samples
0
1
2
3
4
5
6
7
0.11
0.13
0.15
0.17
0.19
0.21
0.23
0.25
0.27
0.29
0.31
Ear Leaf Mg Concentrations @ Silking (%)
Lincoln
York
Shelton


York - 2012 VT
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Leaf Concentration (%)
0%
50%
70%
100%
130%
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Relative N Rate
Left N
Right N
Left P
Right P
Left K
Right K

York - 2012 VT


0%
50%
70%
100%
130%
80
70
60
50
40
30
20
10
0
Leaf Concentration (ppm)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
Relative N Rate
Left Mn
Right Mn
Left Cu
Right Cu

York - 2012 VT


Leaf Nutrient Concentration (ppm)
180
160
140
120
100
80
60
40
20
0
1.0
1.5
2.0
2.5
3.0
3.5
Leaf N Concentration (%)
Fe
Mn
Cu
y = 71.631x - 63.567
R² = 0.55
y = 29.003x - 20.624
R² = 0.5308
y = 7.3234x - 4.6309
R² = 0.5747

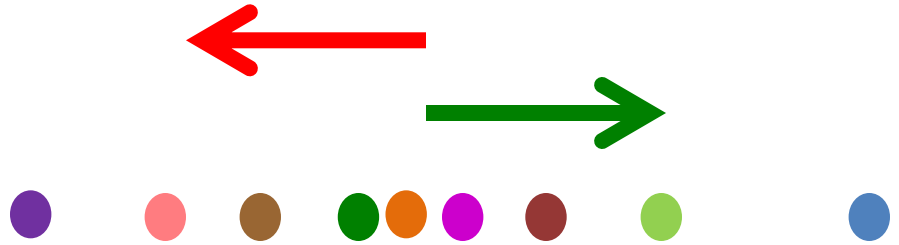
What is *DRIS* ?

- Tool to identify relative abundance and shortage of nutrients in plant tissue

How ***DRIS*** Works

- Calculates nutrient concentrations relative to a "***reference***" value

$$\frac{\textit{Concentration "X"}}{\textit{Reference Conc.}} = \; < 1.0 \;\cdots\; 1.0 \;\cdots\; > 1.0$$



What is the appropriate ***Reference Concentration*** ?

Special Thanks !

WARD Laboratories, Inc.

Ag Testing - Consulting

Account No. : 21038

Plant Analysis Report

SCHEPERS, JIM
SSA INC
3820 LOVELAND DR
LINCOLN NE 68506

Invoice No. : 1113694
Date Received : 08/14/2012
Date Reported : 08/24/2012

Lab Number : 7815

Possible

Conclusions

- Did N uptake enhanced uptake of other nutrients

NO_3^- -------- K Ca Mg Zn Mn Cu Fe Co NH_4 +

NH_4^+ -------- P S Cl B Mo NO_3 -

- Leaf Mg concentration varied widely across hybrids
- Leaf Mg and Mn concentrations varied widely across locations