

# What's New in Diagnostic Services?

- New Madison Soil and Plant Analysis Lab ready for occupancy by mid-January, 2004
- On-line information sheets for samples
- Access account information on-line

# Current Madison Lab Facility



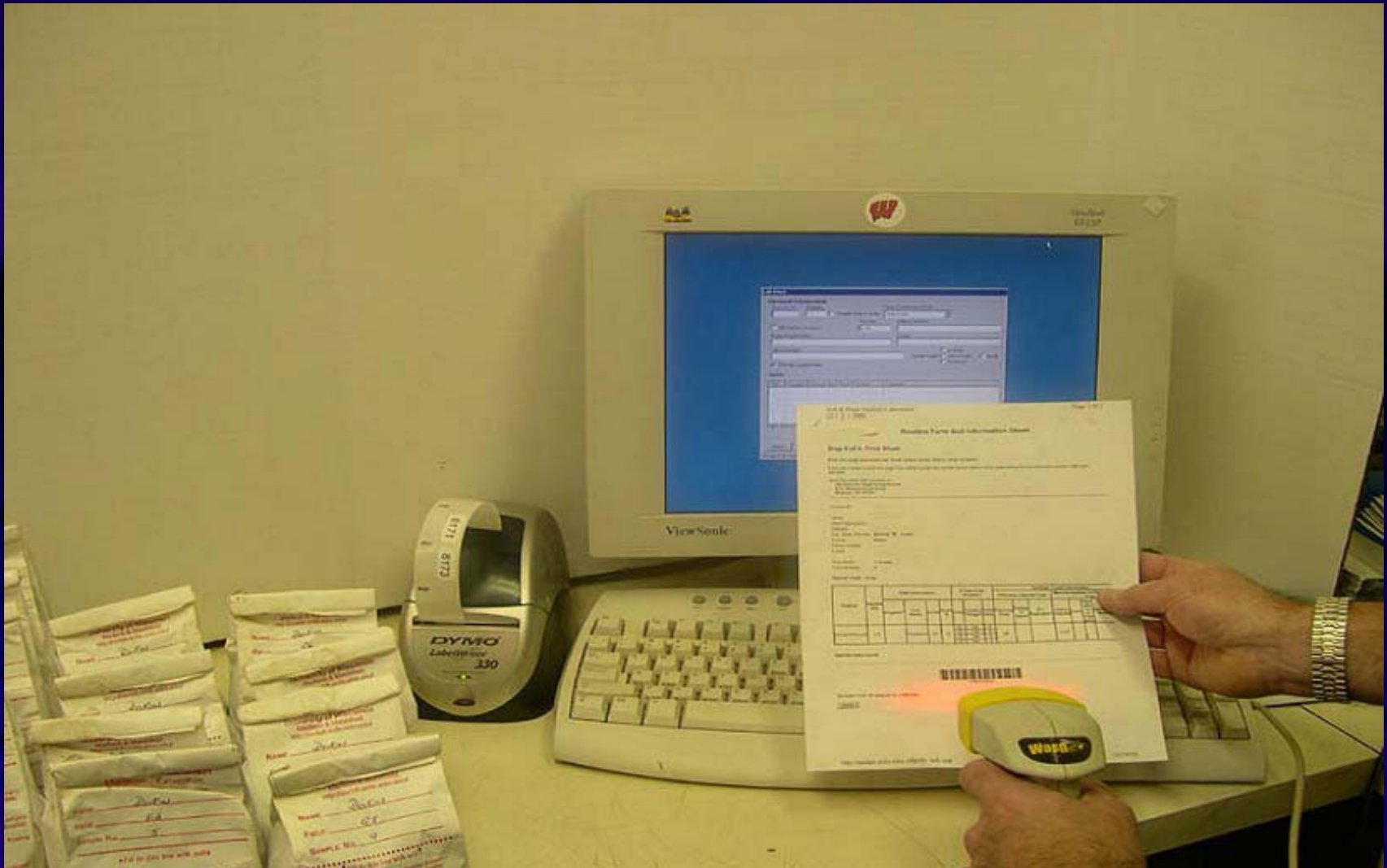
# Building site at West Madison ARS Madison Lab Construction Began in Spring



# New Lab at West Madison



# On-line submission

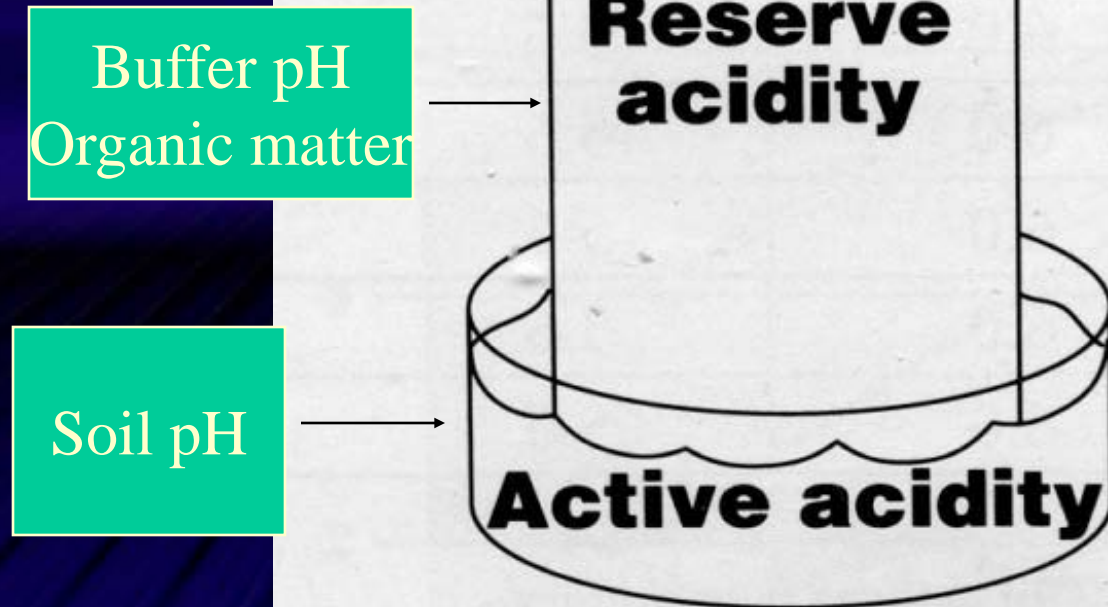


# **Lime Recommendation Terminology**

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**Figure 6-2. Active and reserve acidity in soil compared with a poultry watering fountain.**

# Variability exists between states

- All Midwestern states use a combination of chemical purity and particle size to rate lime

# What determines the quality of a liming material

- Purity
  - measure of  $\text{CaCO}_3$  equivalency
  - determined in the laboratory
- Fineness – a dry sieving process is used
  - exact sieves used vary by state

# The purity factor ( $\text{CaCO}_3$ ) Equivalent

**Table 6-5. Liming materials and their calcium carbonate ( $\text{CaCO}_3$ ) equivalent**

Liming material	Neutralizing agent	$\text{CaCO}_3$ equivalent of pure material (%)
Dolomitic limestone	$\text{CaCO}_3 \cdot \text{MgCO}_3$	110–118
Papermill lime sludge	Mainly $\text{CaCO}_3$	*
Marl	Mainly $\text{CaCO}_3$	variable
Calcitic limestone	$\text{CaCO}_3$	100
Water treatment lime waste	$\text{CaCO}_3$	variable
Wood ash	$\text{K}_2\text{CO}_3$ , $\text{CaCO}_3$ , $\text{MgCO}_3$	20–90
Fly ash	$\text{CaO}$ , $\text{Ca(OH)}_2$ , $\text{CaCO}_3$	variable
Hydrated lime	$\text{Ca(OH)}_2$	135
Air-slaked lime	$\text{Ca(OH)}_2 + \text{CaCO}_3$	100–135

\* According to the Wisconsin Lime Law, one cubic yard of papermill lime sludge is equivalent to one ton of aglime having a neutralizing index of 60–69.

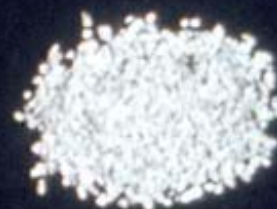
# Mesh size



> 8



8-20



20-60

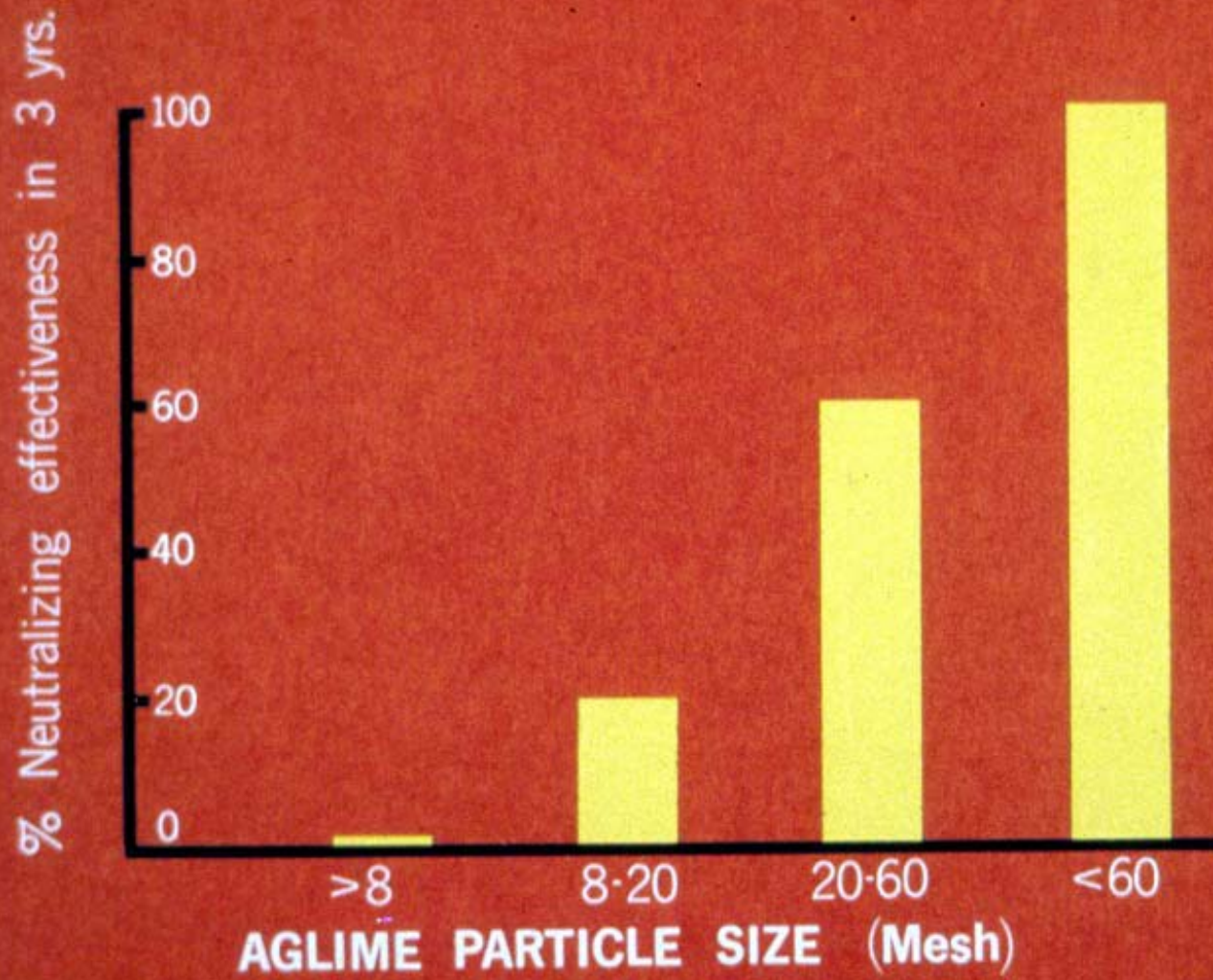


< 60



# Sieves used by state

- Iowa – 4, 8, 60 mesh
- Illinois – 8, 30, 60 mesh
- Minnesota and Wisconsin – 8, 20, 60 mesh
- Michigan – 8, 60 mesh



**Table 2. Effect of various rates of dolomitic lime sizes on the pH of Withee silt loam**

Fraction (mesh size)	Soil pH*			
	1 mo	1 yr	2 yr	3 yr
<b>0 ton/a lime</b>				
—	4.96	5.18	5.23	5.30
<b>2 ton/a lime</b>				
20-40	5.04	5.39	5.70	5.91
40-60	5.12	5.52	5.82	6.05
60-100	5.18	5.64	5.94	6.03
< 100	5.44	5.58	5.97	6.03
<b>6 ton/a lime</b>				
8-20	4.98	5.28	5.78	6.10
20-40	5.17	5.66	6.15	6.40
40-60	5.29	5.81	6.40	6.50
60-100	5.33	5.95	6.48	6.60
< 100	5.73	6.19	6.59	6.61
<b>16 ton/a lime</b>				
8-20	5.41	5.66	6.24	6.47
20-40	5.35	5.99	6.50	6.71
40-60	5.56	6.10	6.63	6.81
60-100	5.70	6.21	6.73	6.82
< 100	6.17	6.45	6.97	6.98

\* Each value represents the average of three replicates.  
Adapted from Love et al. (1960)

# Lime Quality in Wisconsin

- In Wisconsin lime quality is listed by neutralizing index (NI)
  - Fineness factor x Purity factor = NI

LR given for NI of 60-69 and 80-89

# Calculating the Neutralizing Index of a liming material

## Example 2: Lime B (90% calcium carbonate equivalent)

Screen size	Screen analysis		Effectiveness factor		
	%				
greater than 8 mesh	5.0	x	0.0	=	0.0
8 to 20 mesh	25.0	x	0.2	=	5.0
20 to 60 mesh	20.0	x	0.6	=	12.0
less than 60 mesh	50.0	x	1.0	=	50.0
			Total	=	67.0

$$NI = 67.0 \times 90\% = 60.3$$

# Reporting terminology

- MN – LR in lbs/a of Effective Neutralizing Power (ENP)
- Example a ton of lime with an ENP of 1000 lbs/a is equivalent to a NI of 50

# Reporting terminology

- IL – LR in tons/a based on Effective Calcium Carbonate (ECC) based on “typical lime”.
- MI- LR in tons/a based on their Calcium Carbonate Equivalency (CCE) or Neutralizing Value of 90.
- If the ECC and ECCE is approximately 85, this is nearly equivalent to a NI of 80-89

# Summary

- The criteria used by states in the upper Midwest are quite similar
- ECC or ECCE of 85 = NI of 80-89
- ENP value (per ton)/ 20 = WI NI value

Any questions?



# Corn Response to Liming

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5 23 80

pH 4.9

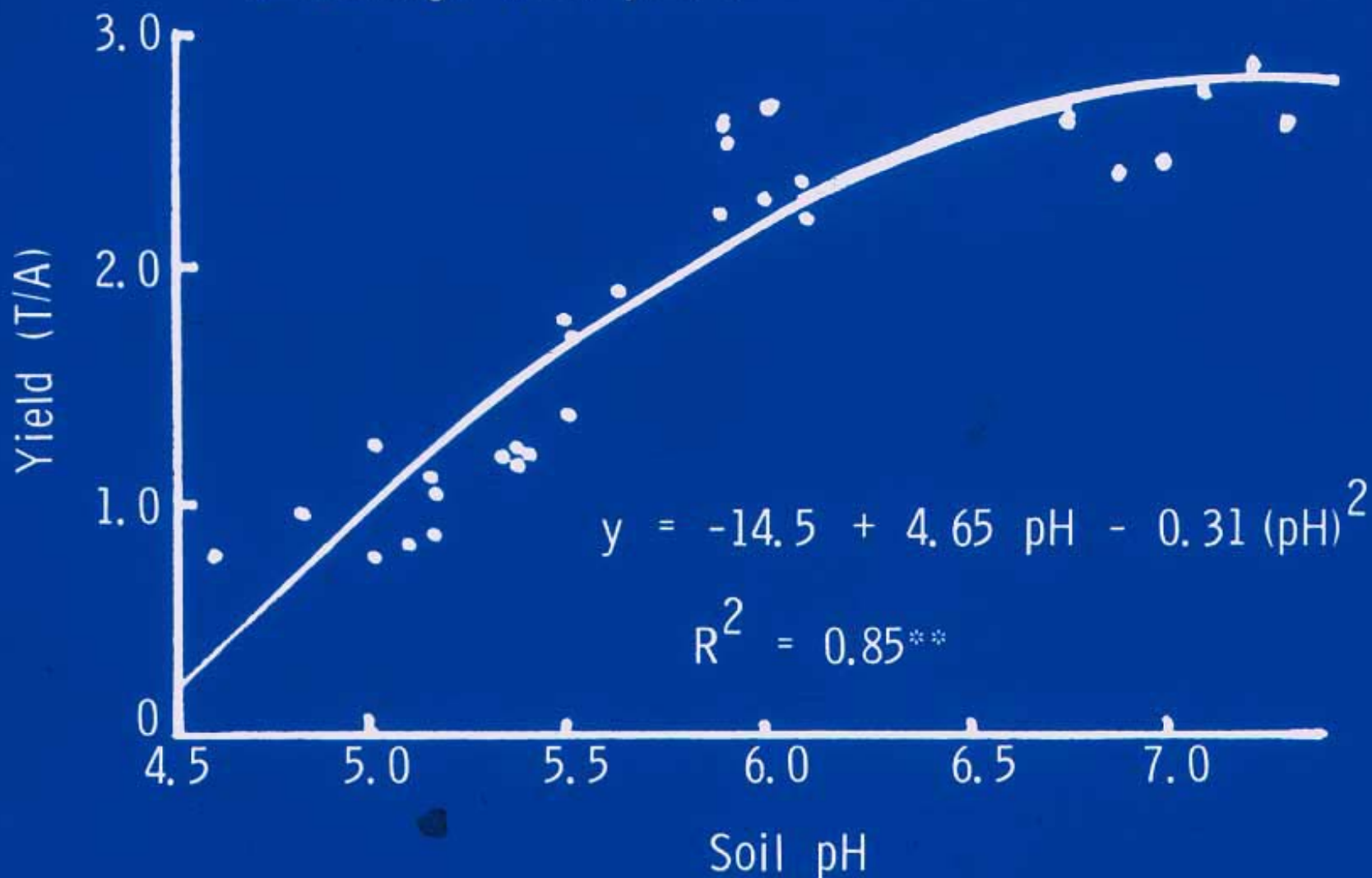
ALF

One year old stand



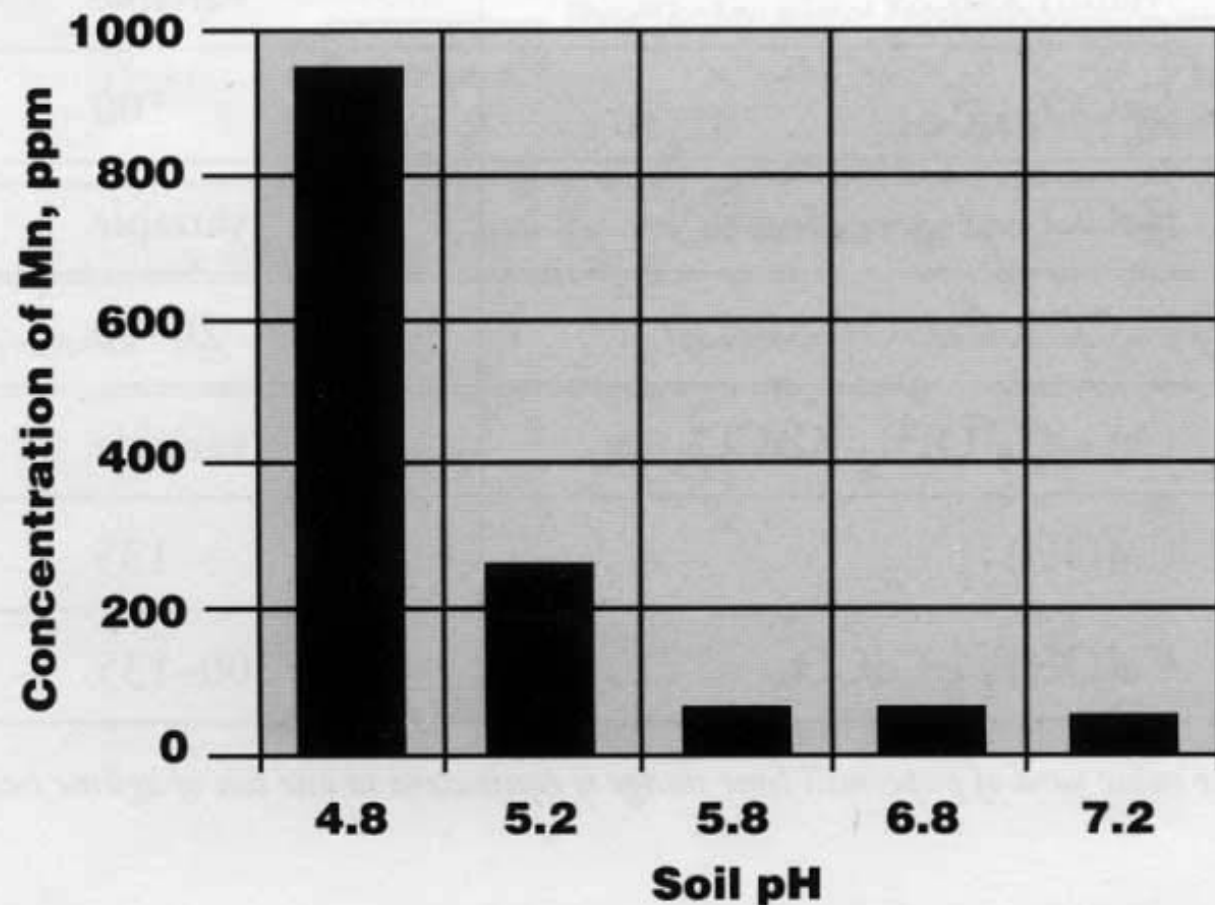
One year old stand

Effect of soil pH on avg. alfalfa yields at Marshfield (avg. of 1980-1981; sum of 2 cuttings each year).



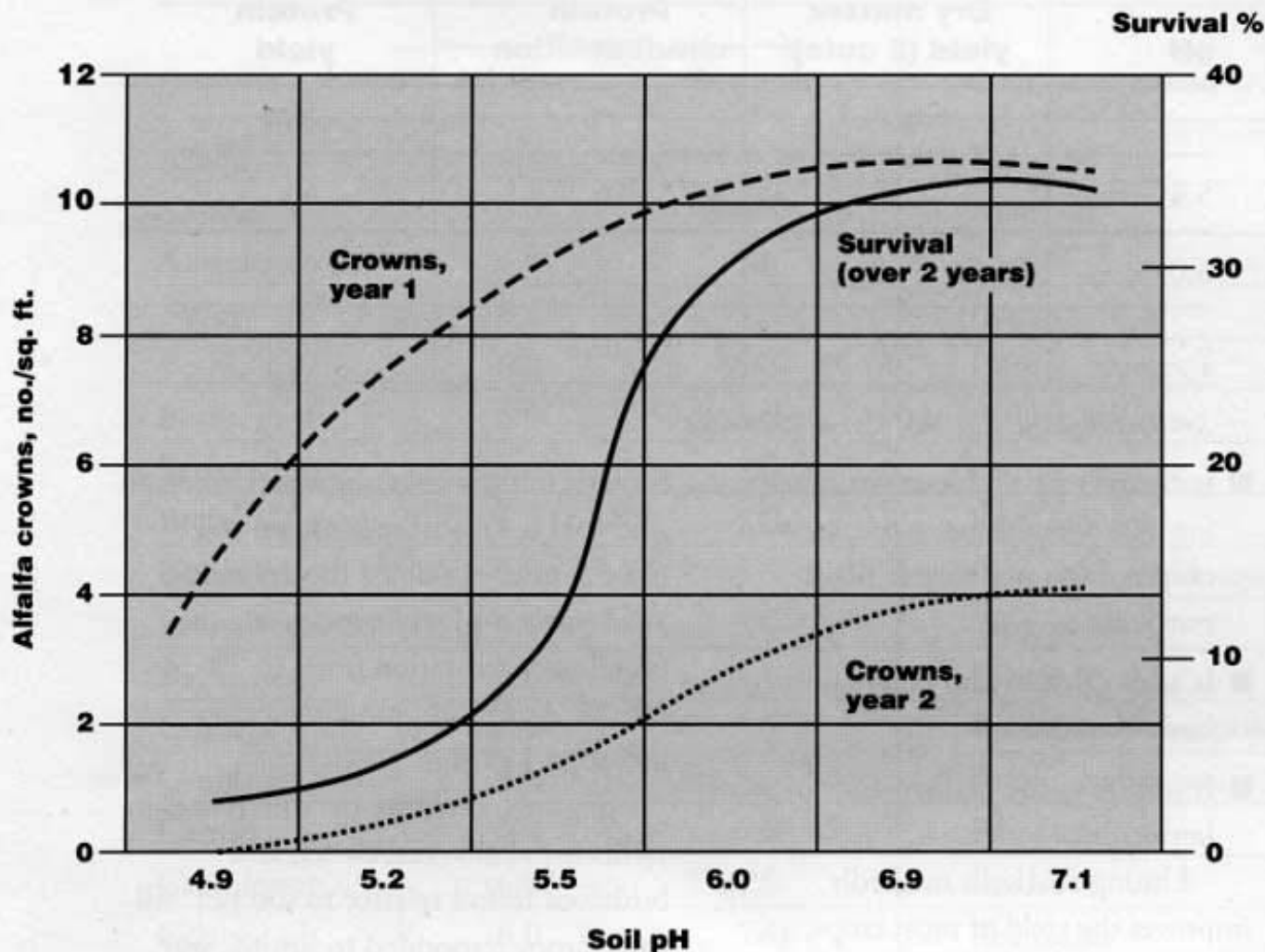
# Mn toxicity at low pH levels

**Figure 6-8. The influence of soil pH on the concentration of manganese in alfalfa tissue (Marshfield, WI).** *Source: Schulte, E.E. 1982. Unpublished data.*



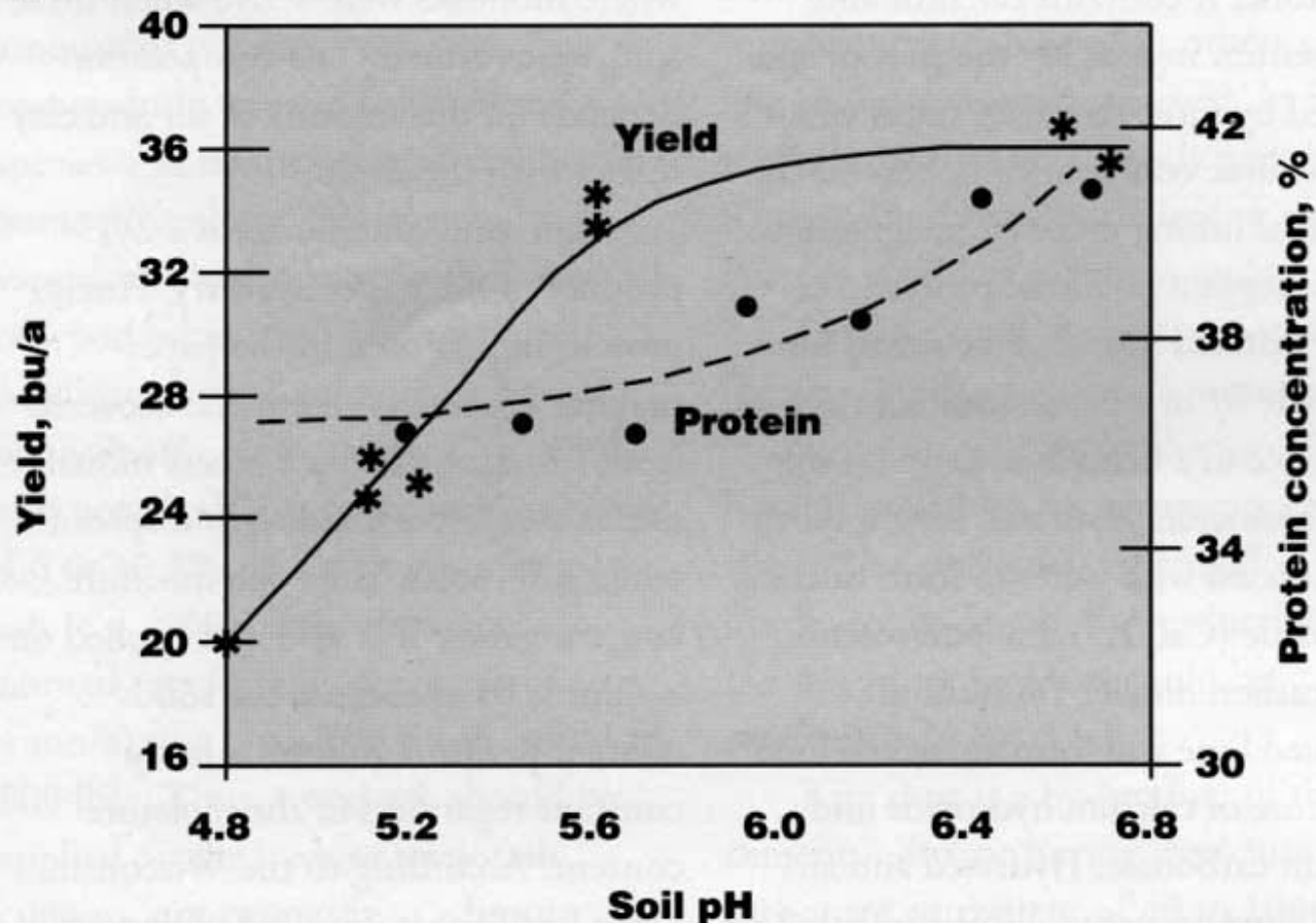
# pH Influence on Alfalfa Stand

**Figure 6-4. Effect of soil pH on establishment and persistence of alfalfa in Withee silt loam (Marshfield, WI).** *Adapted from Proc. 1981 Fert., Agrilime & Pest Mgmt Conf. 20:77-85*



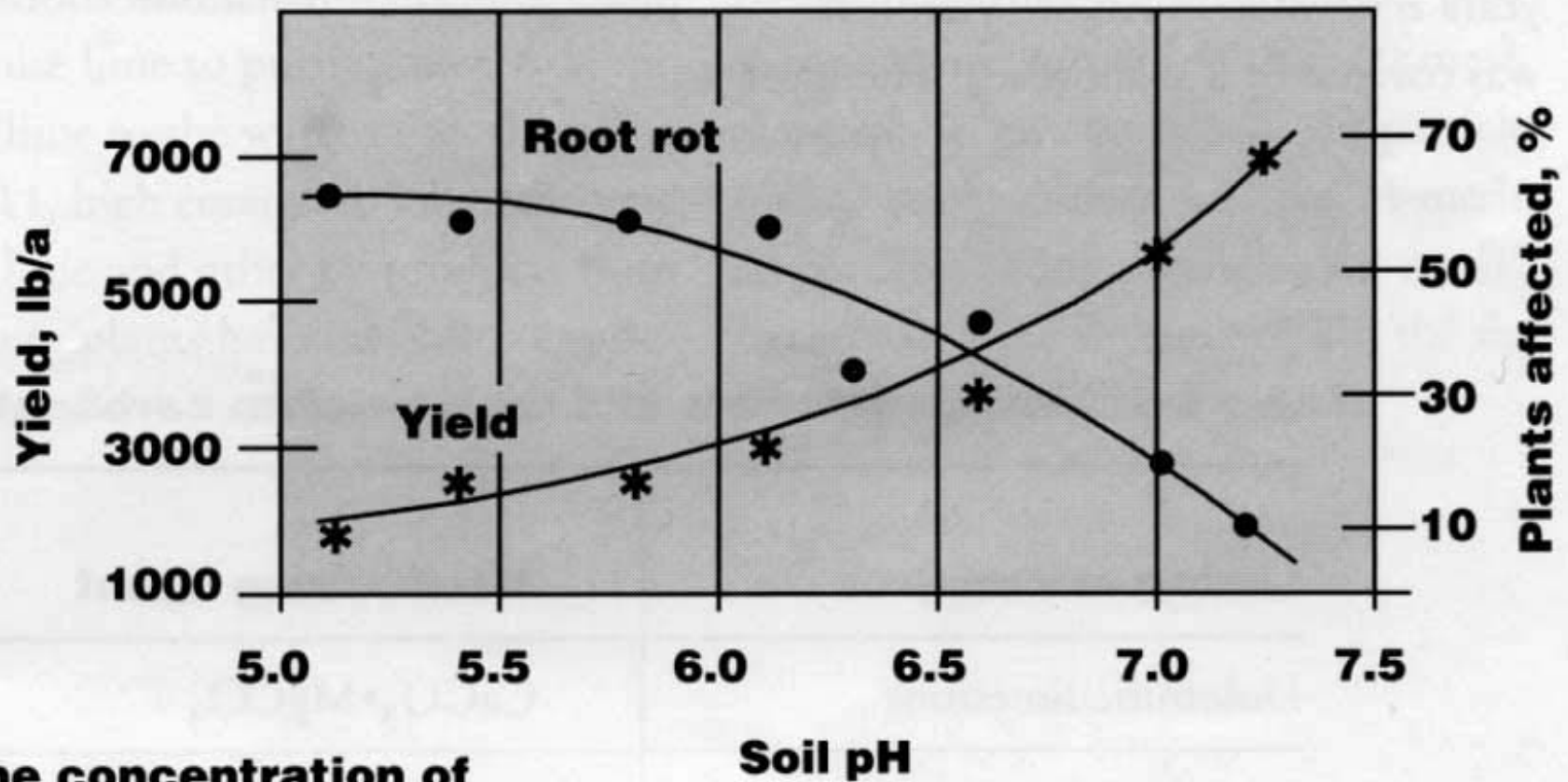
# Soil pH Effect on Soybeans

**Figure 6-6. Effect of soil pH on soybean yield and protein (Marshfield, WI).** Source: Gritton et al., 1985. *Proc. 1985. Fert., Agrilime & Pest Mgmt. Conf.* 24:43-48.

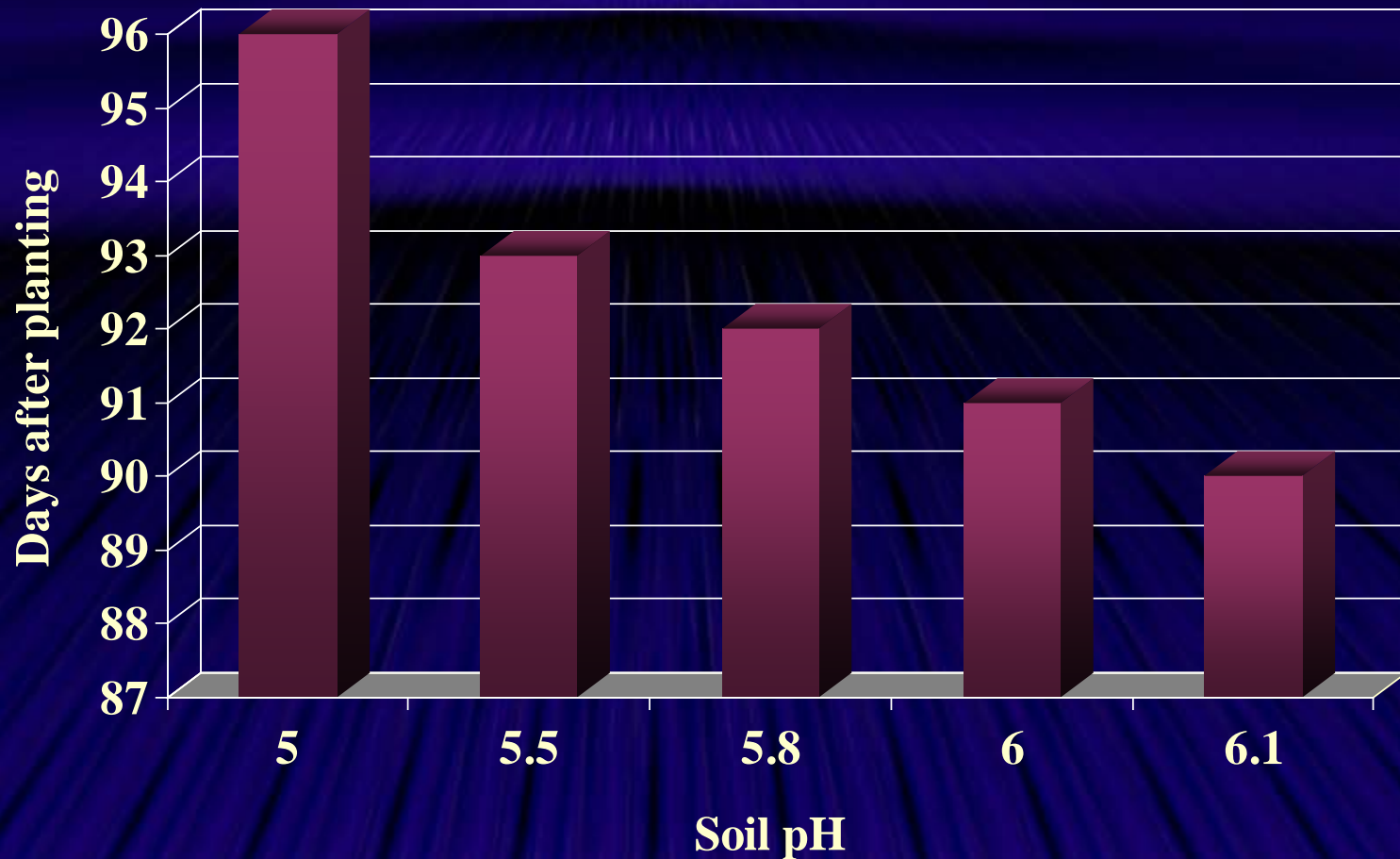


# Soil pH influence on root rot of Snapbeans

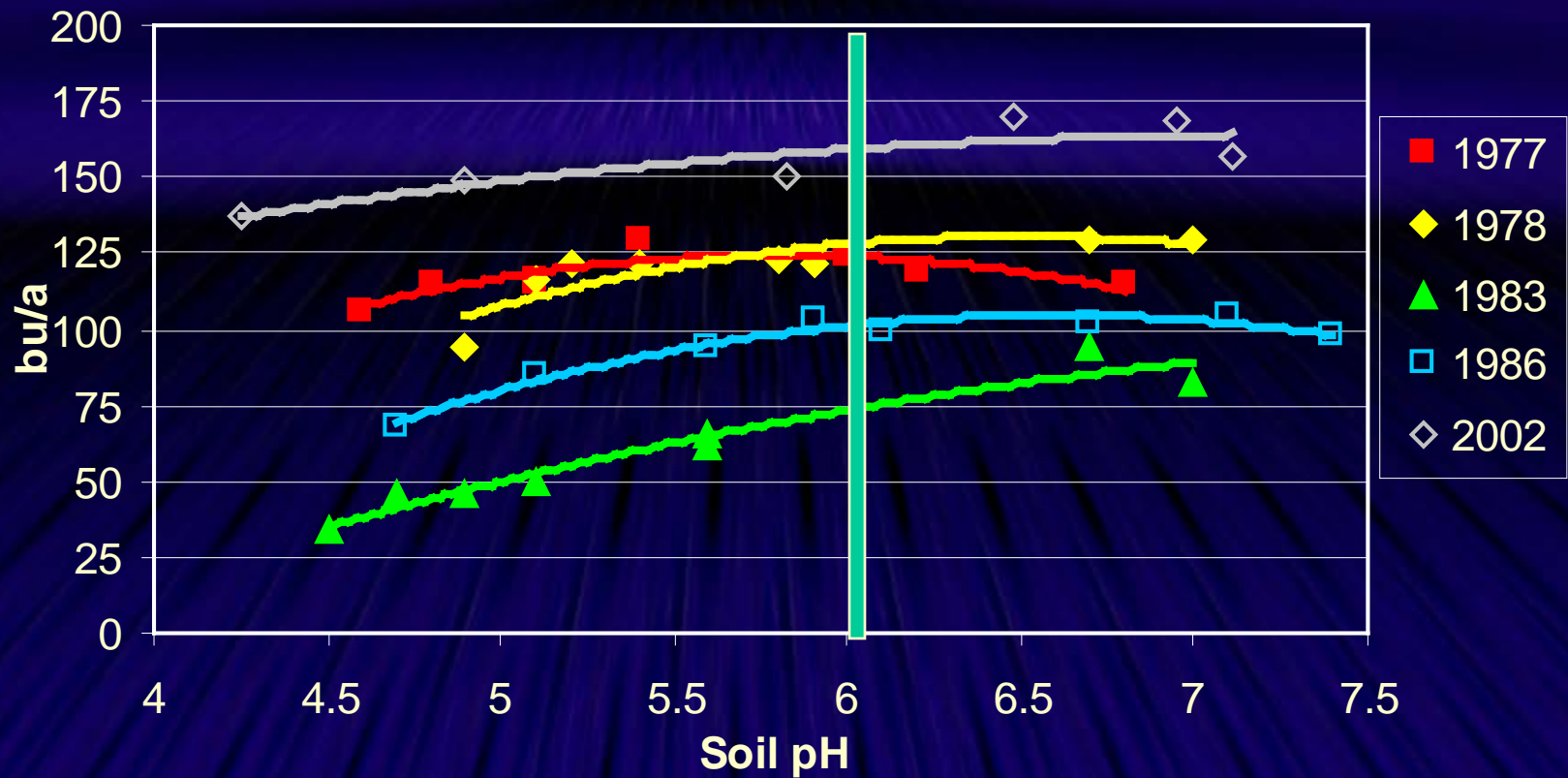
**Figure 6-7. Relationship between soil pH, snapbean yield, and root rot (Hancock, WI).** *Source: Schulte, E.E. 1987. Proc. Processing Crops Conf. Dept. of Hort., UW-Madison.*



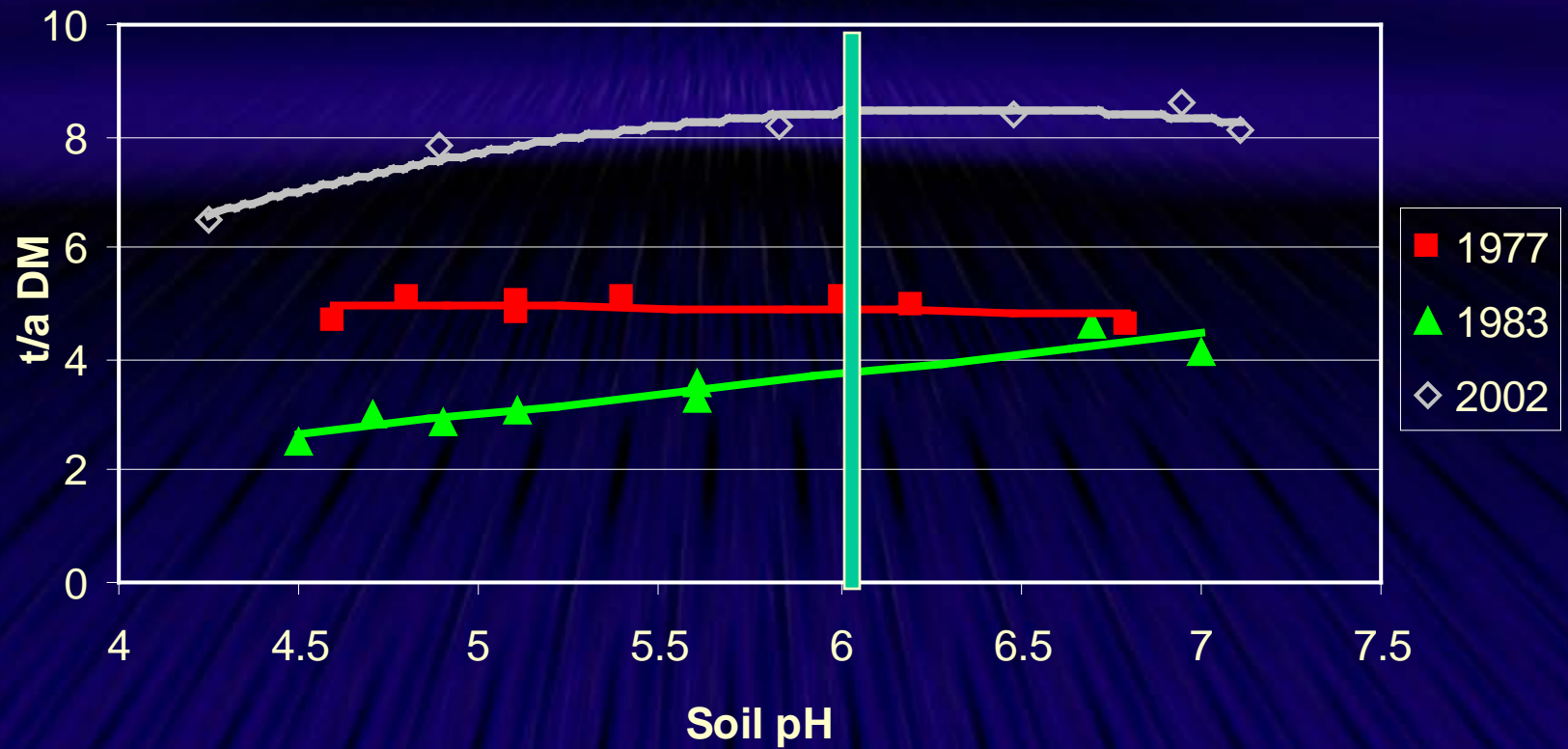
# Date of silking as affected by pH



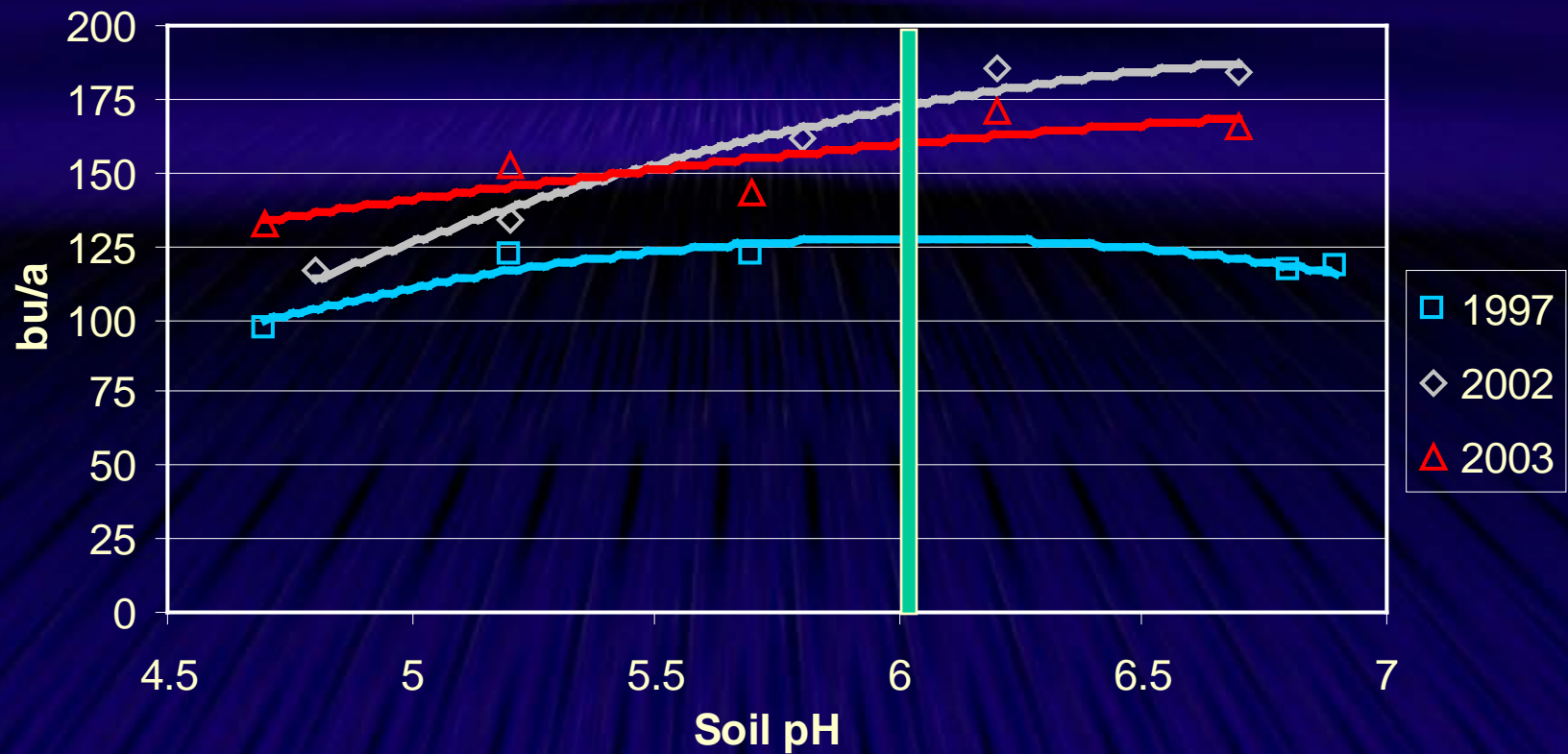
# Marshfield Grain



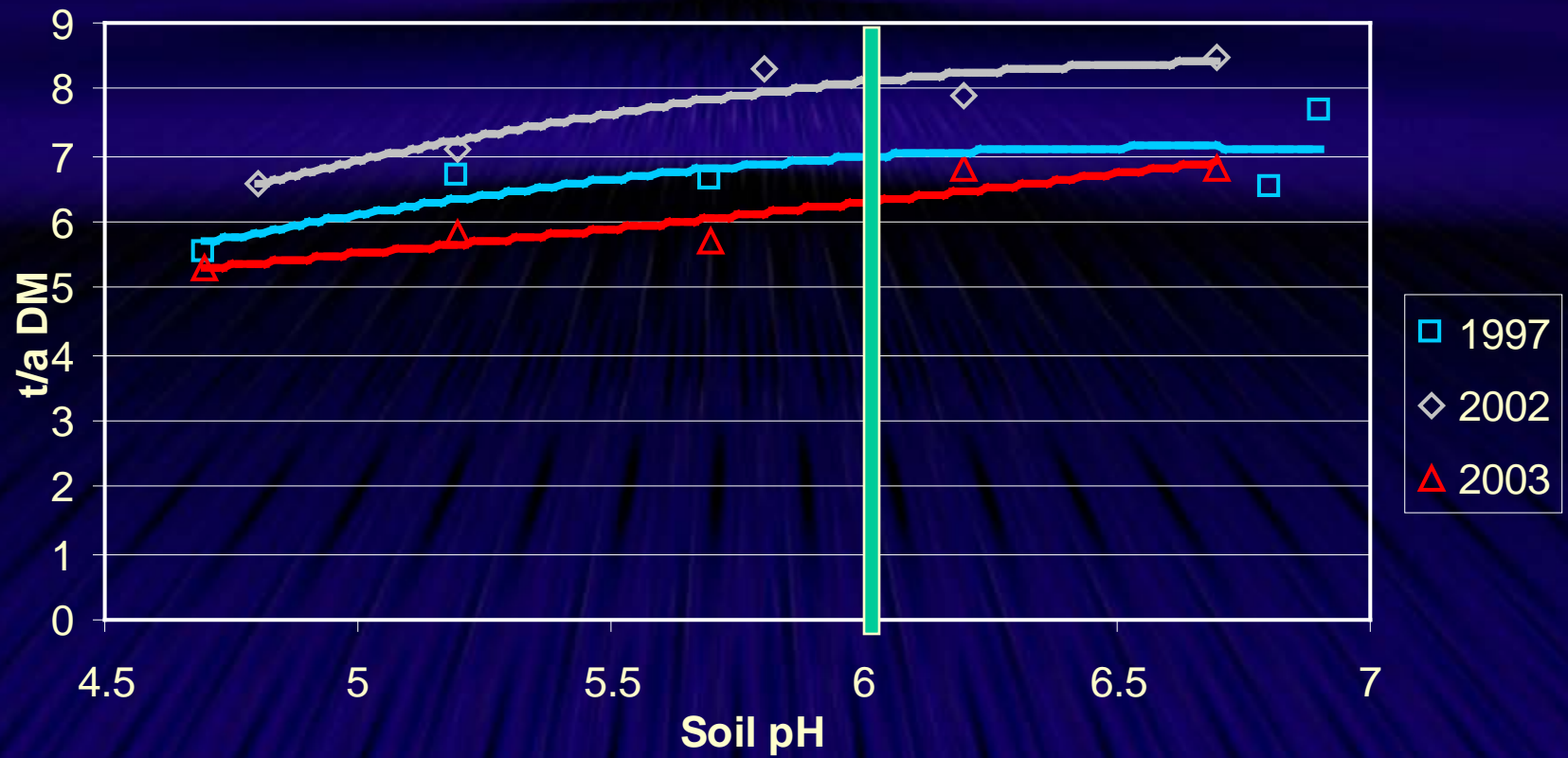
# Marshfield Silage



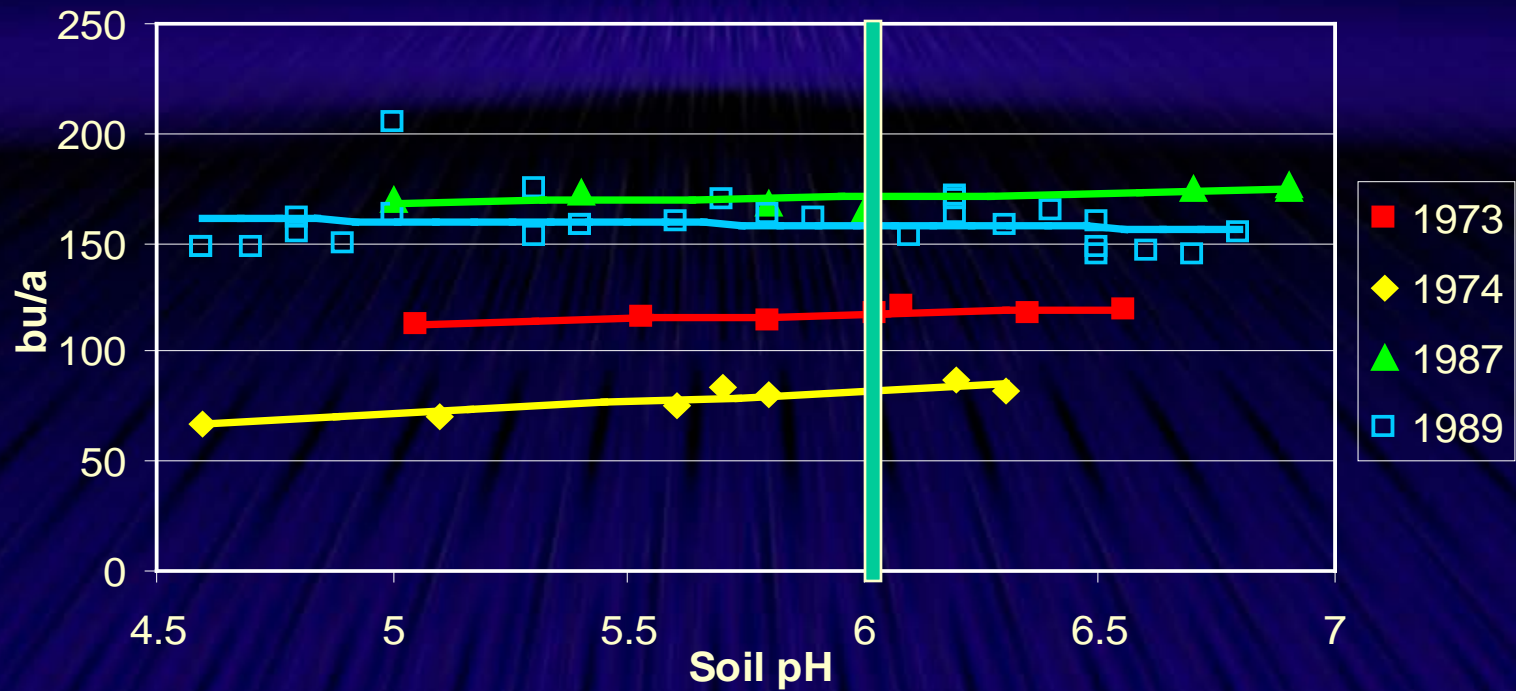
# Spooner Grain



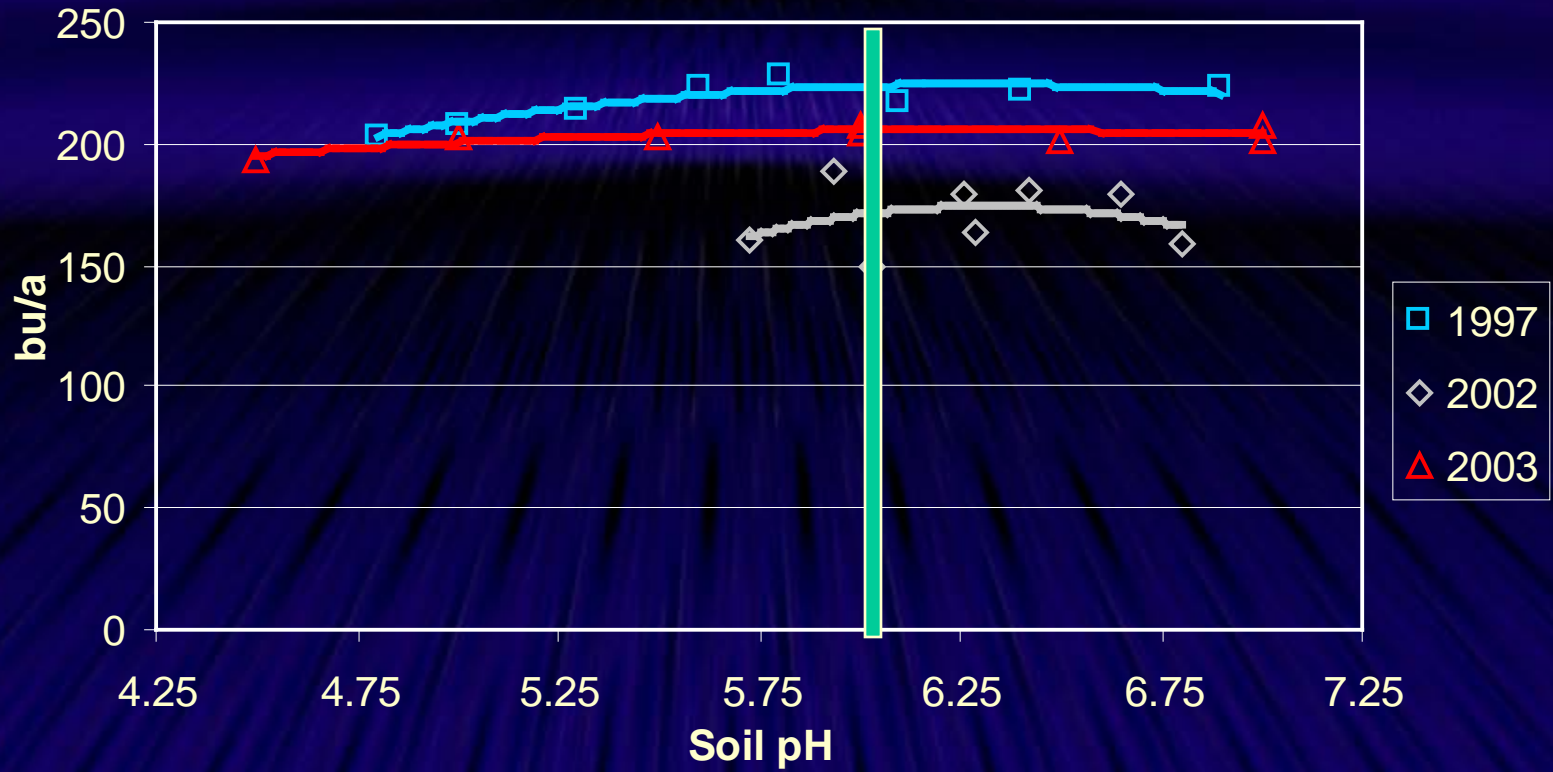
# Spooner Silage



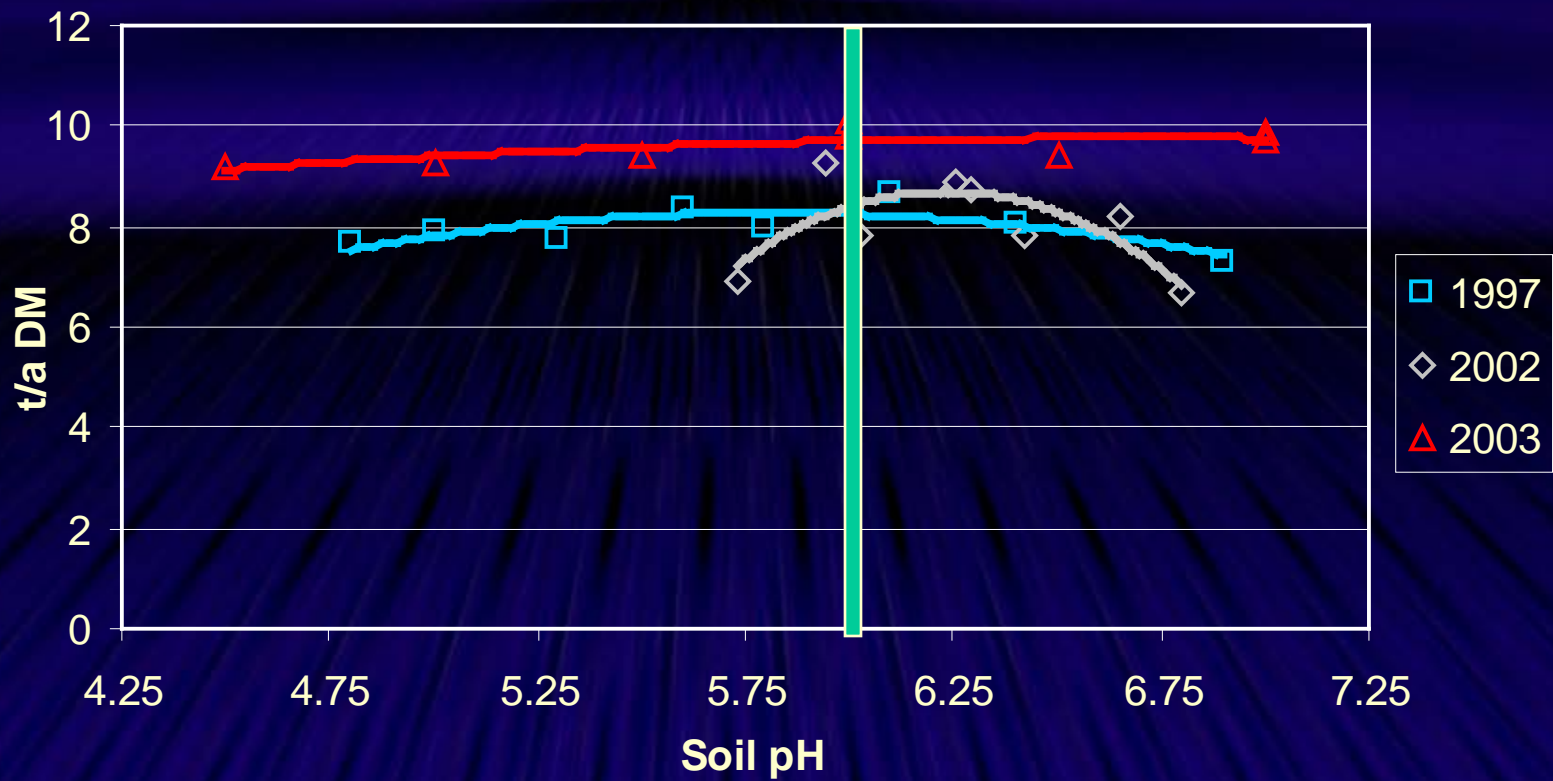
# Arlington Grain



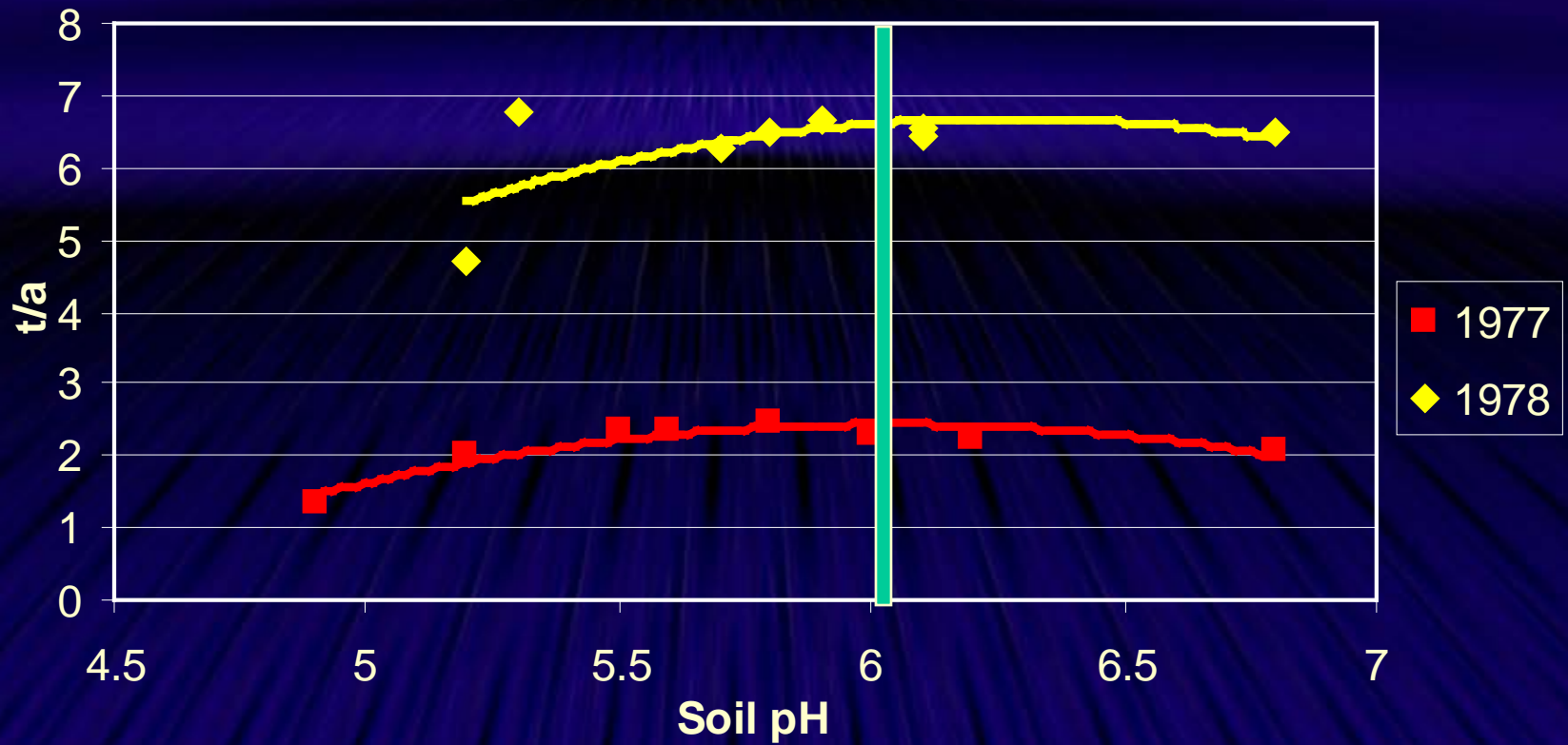
# Hancock Grain



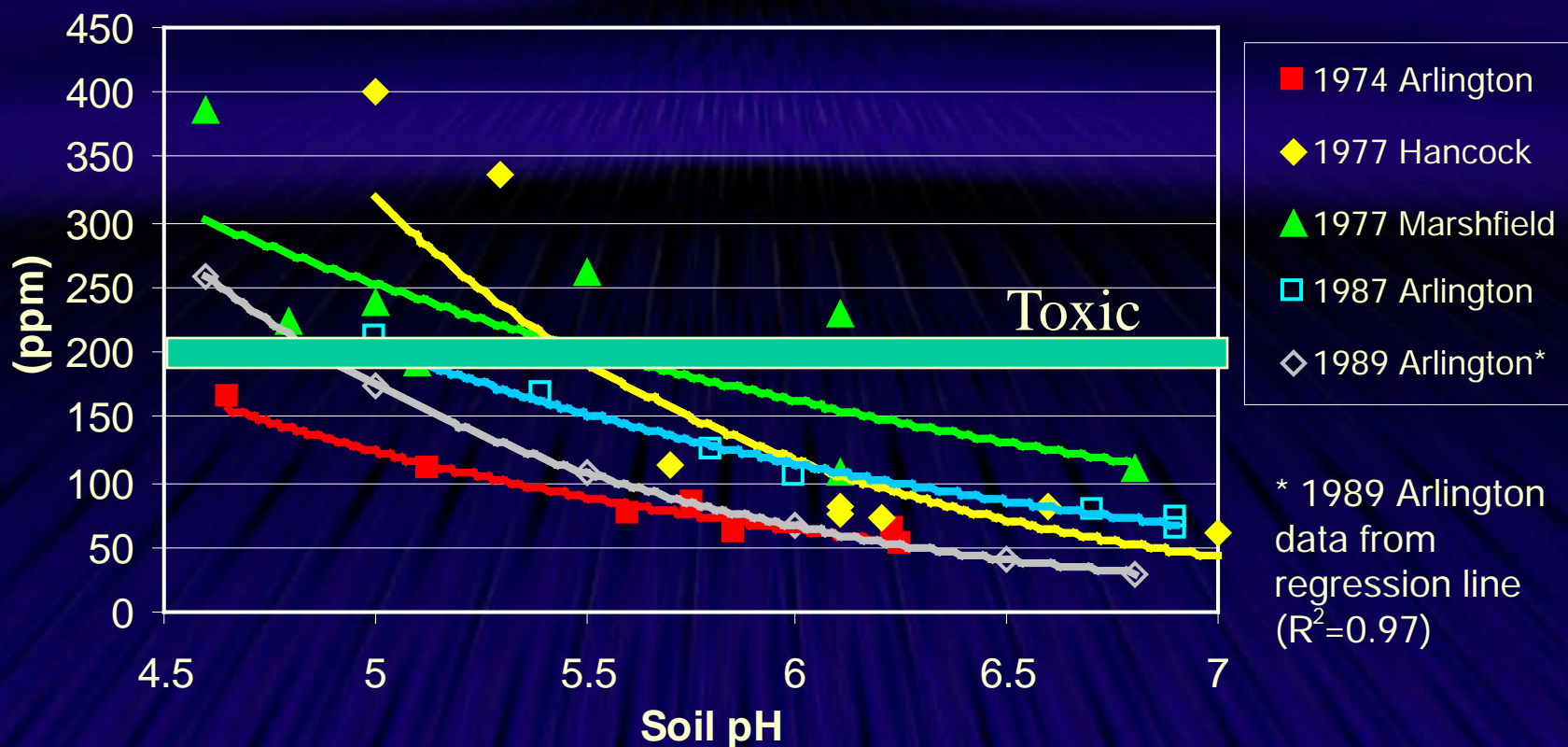
# Hancock Silage



# Hancock Sweet Corn



# Earleaf Mn content at silking



# Summary of corn response to liming

- Central and northern silt loam and sandy loam soils show little yield benefit to liming above pH 6.5
- Influence on maturity may be a factor on somewhat poorly drained soils
- Little response seen on the sandy soils or the southern silt loams– Mn toxicity is less of a concern on these soils