

Effects of Vineyard Floor Management Practices Soil Physical, Nutritional and Microbiological Characteristics

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Background on the Vineyard Floor Management Trial

- **The trial was conducted from 2000 to 2005. It was established in a 6 year old block of Chardonnay on Teleki Rootstock. The site was reasonably flat and the soil type was Elder Loam.**

Weed Control Treatments On Vine Row Berms

1. Preemergence (Standard):

- Simazine + Goal preemergence in winter
- Followed by post emergence applications of Roundup + Goal in summer

2. Cultivation:

- Clemens[®] cultivator used as needed (i.e. 1/month in summer)
- Hand hoeing used as needed around trunks

3. Postemergence:

- Roundup + Goal/Rely in spring and summer

Cover Crop Treatments In the Row Middles

1. 'Merced' Rye

- Tall, fast-growing, earlier maturing

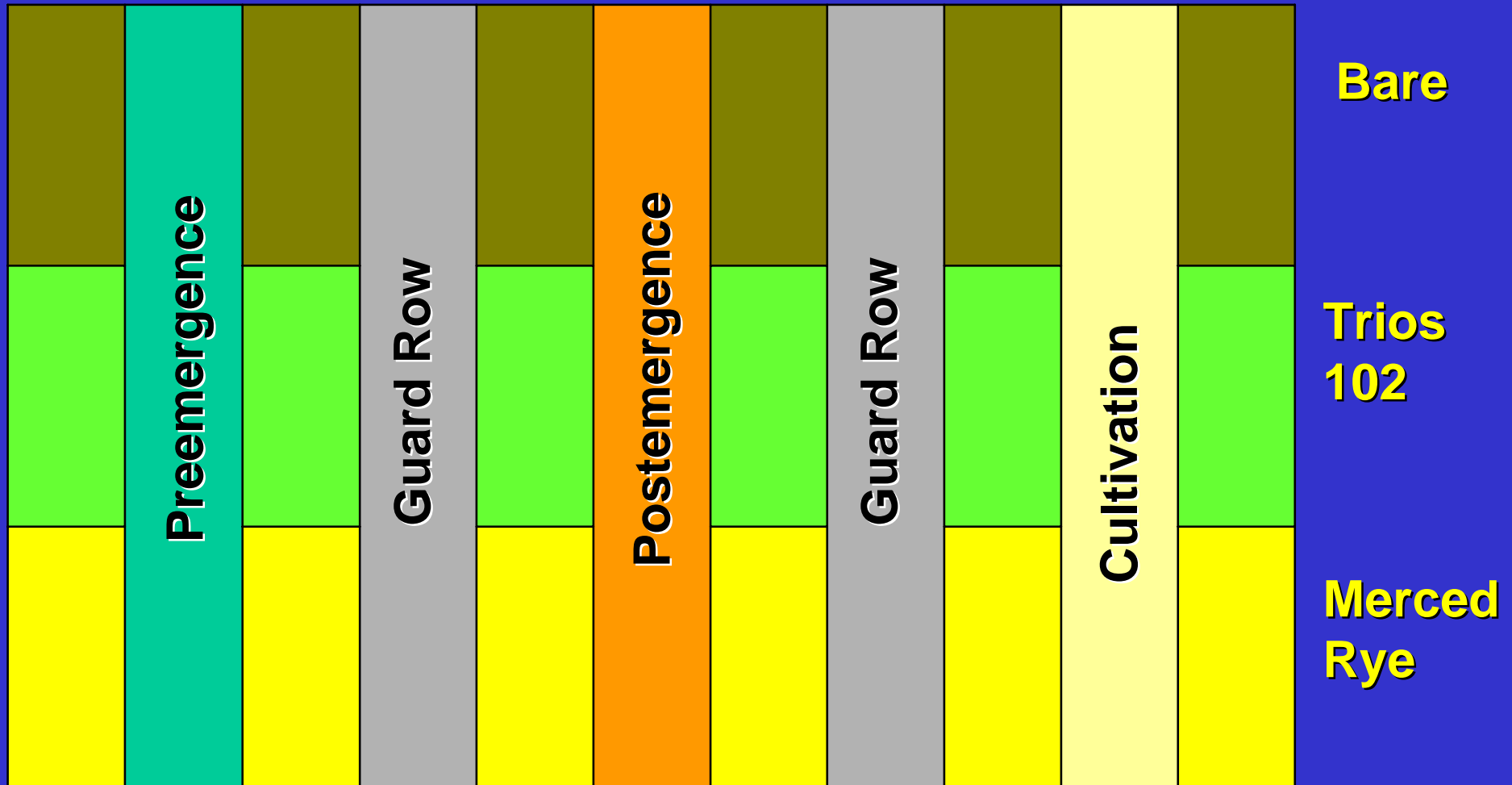
2. 'Trios 102' Triticale

- Short early in life cycle, late maturing, deep rooted

3. Bare

- Cover cropped strip is 32 inches wide
- Cover crops planted in fall and mowed in early summer

Vineyard Floor Plot Layout



Clemens[®] Cultivator



← Cultivation Knife

Cover Crop Treatments



Merced Rye

- grows vigorously fall and winter
- finishes growth by March - April
- generally more productive

TRIOS 102

- winter dormant
- put on most of growth in March - April

Cover Crop Treatments

TRIOS 102

BARE

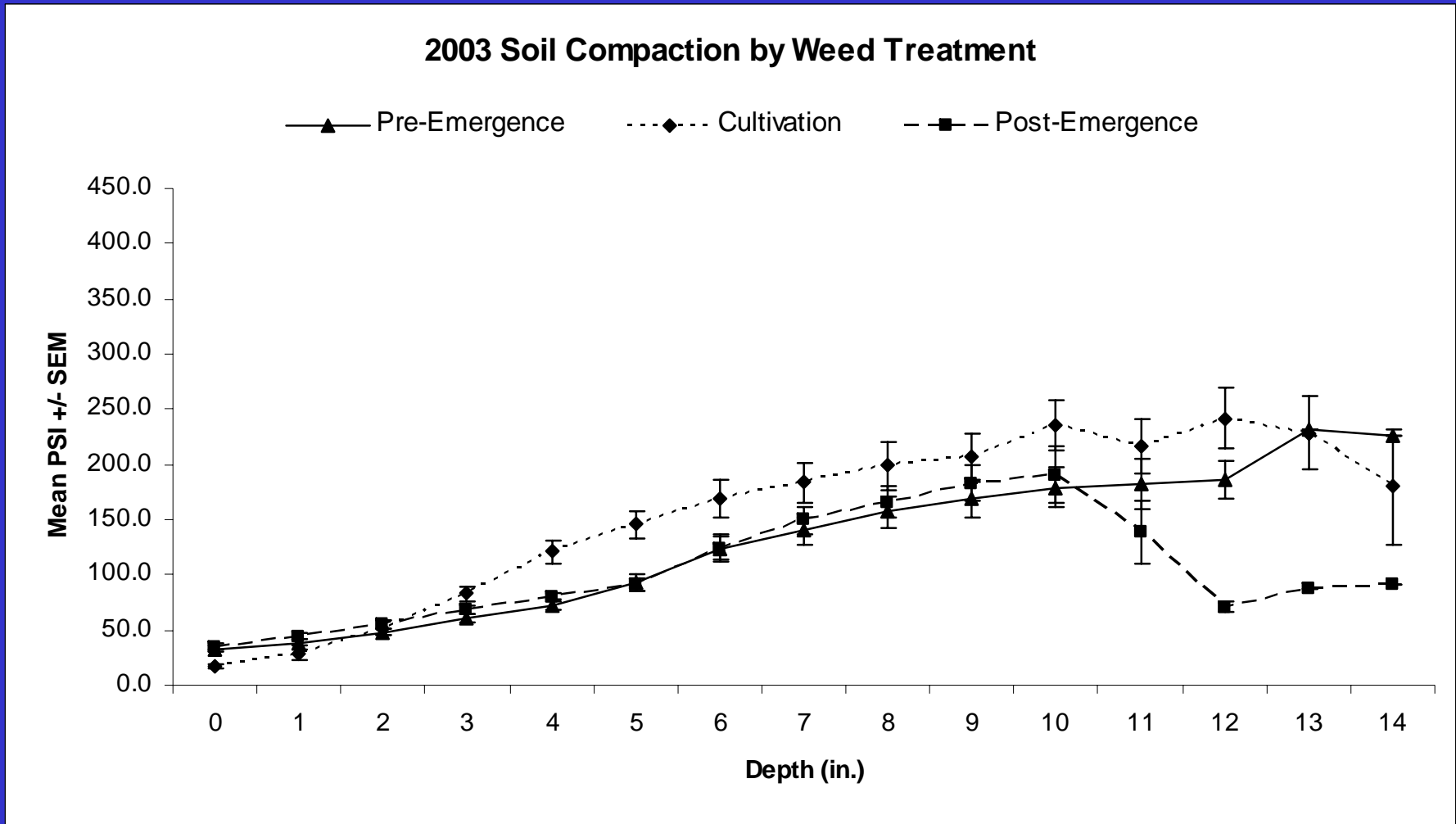
Wheel traffic

Berm

Wheel traffic

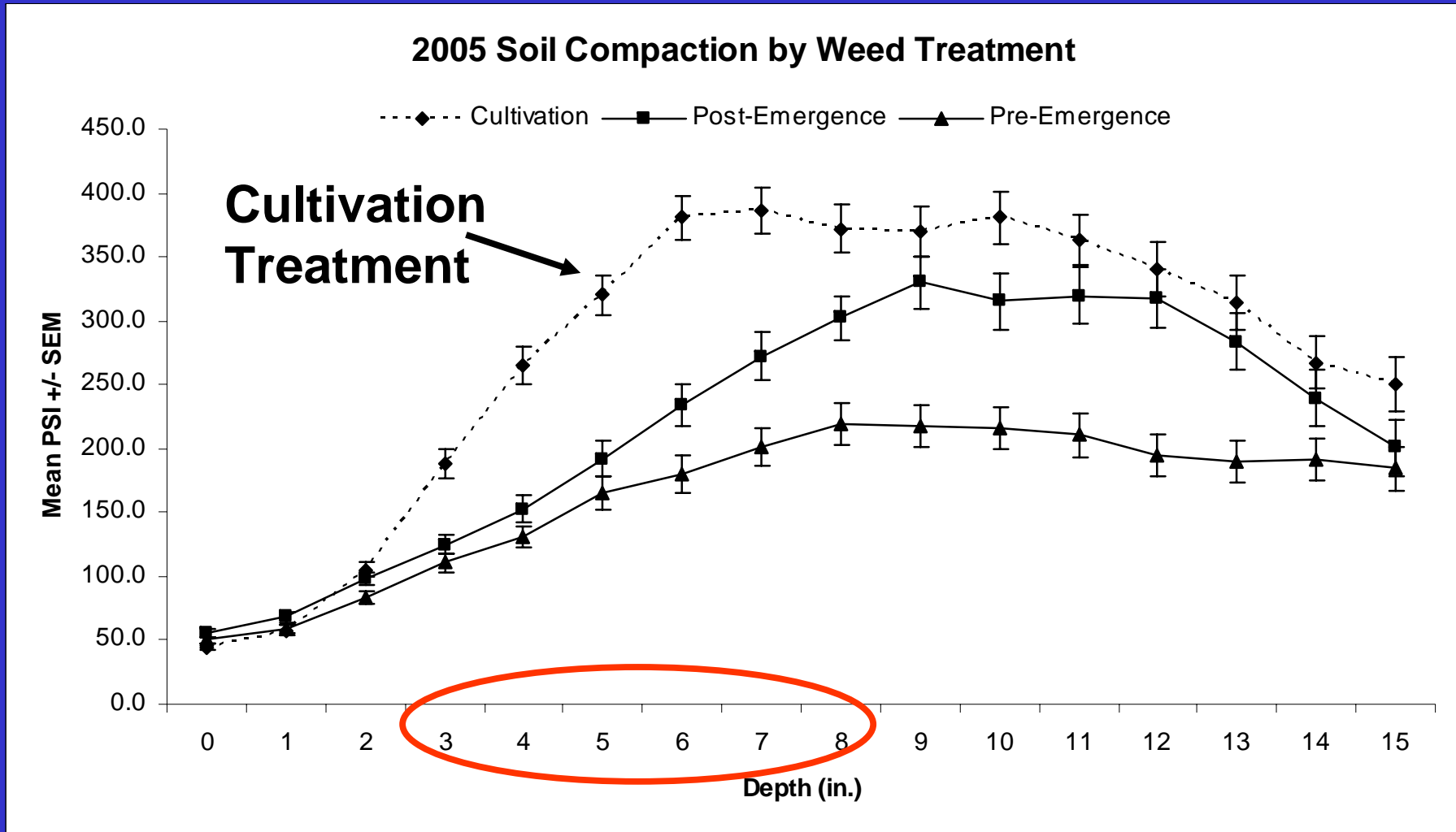


2003 Soil Compaction Evaluation



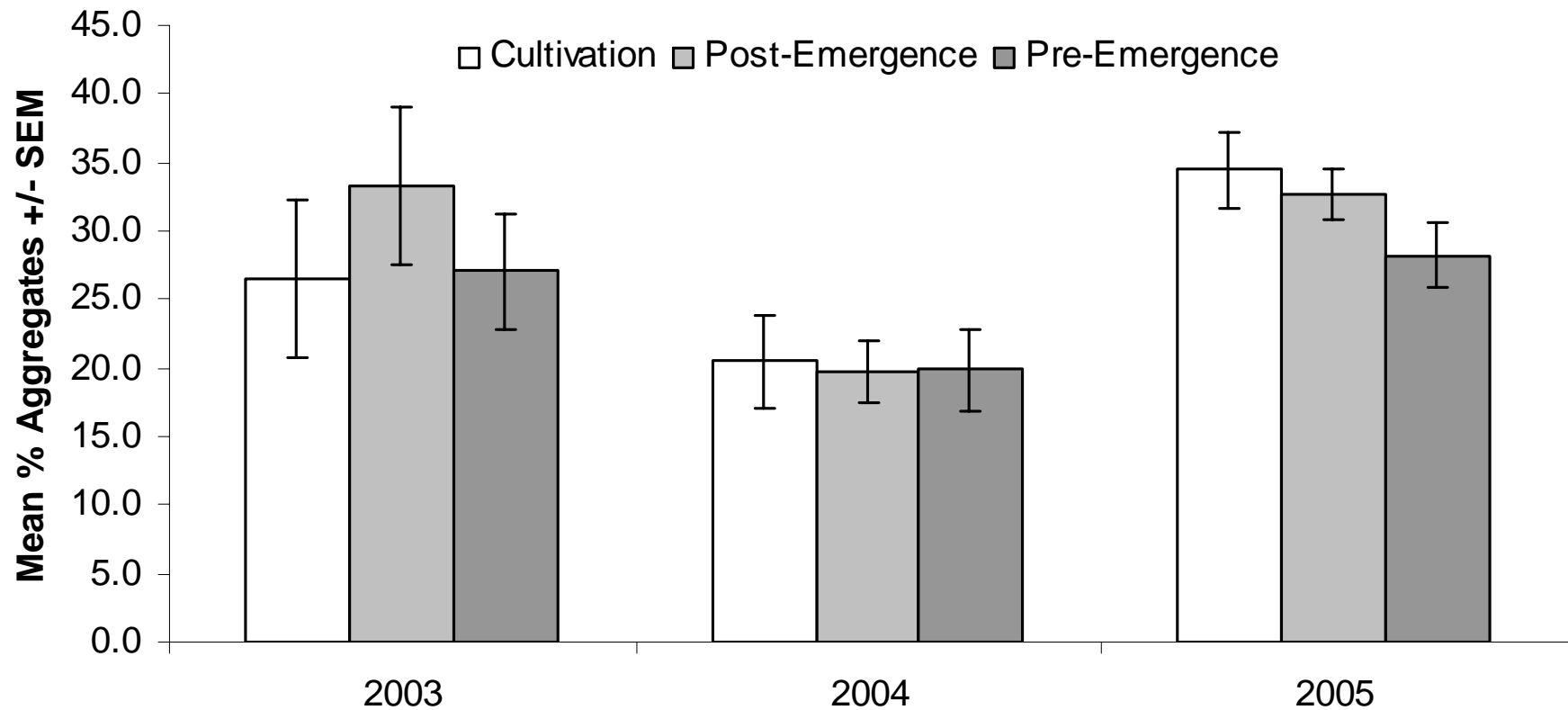
2005 Soil Compaction Evaluation

Pounds per Square Inch



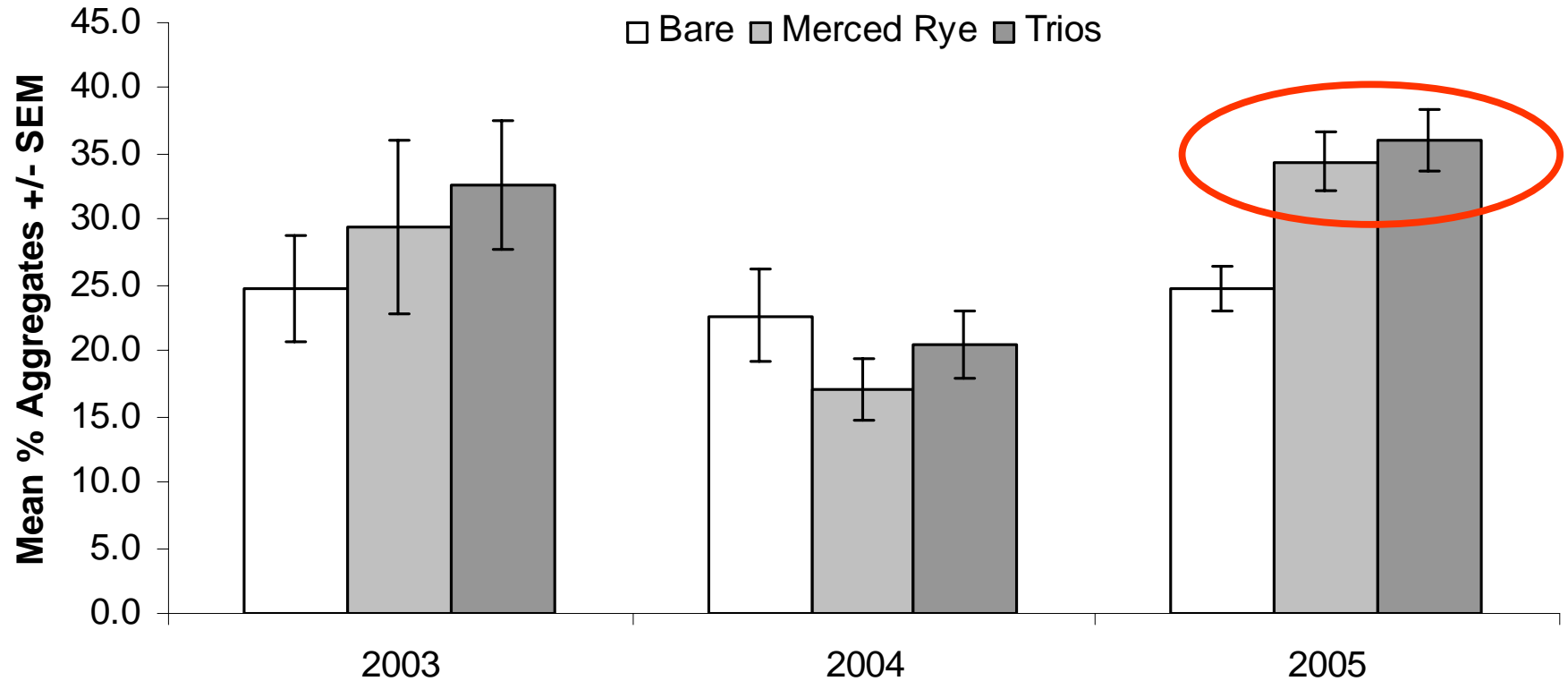
Effect of Weed Treatments on Water Stable Aggregates in Vine Row

Soil Stable Aggregates by Weed Treatment (NS)



Effect of Cover Crop Treatments on Water Stable Aggregates in Row Middles

Soil Stable Aggregates by Cover Crop Treatment (NS)



Plant and Soil Nutrition Evaluations

Summary of 2003 to 2005 Results

Plant Nutritional Effects

Weed Treatment Effects

- **Weed treatments had no effect on leaf blade or petiole nutrient levels**

Plant Nutritional Effects

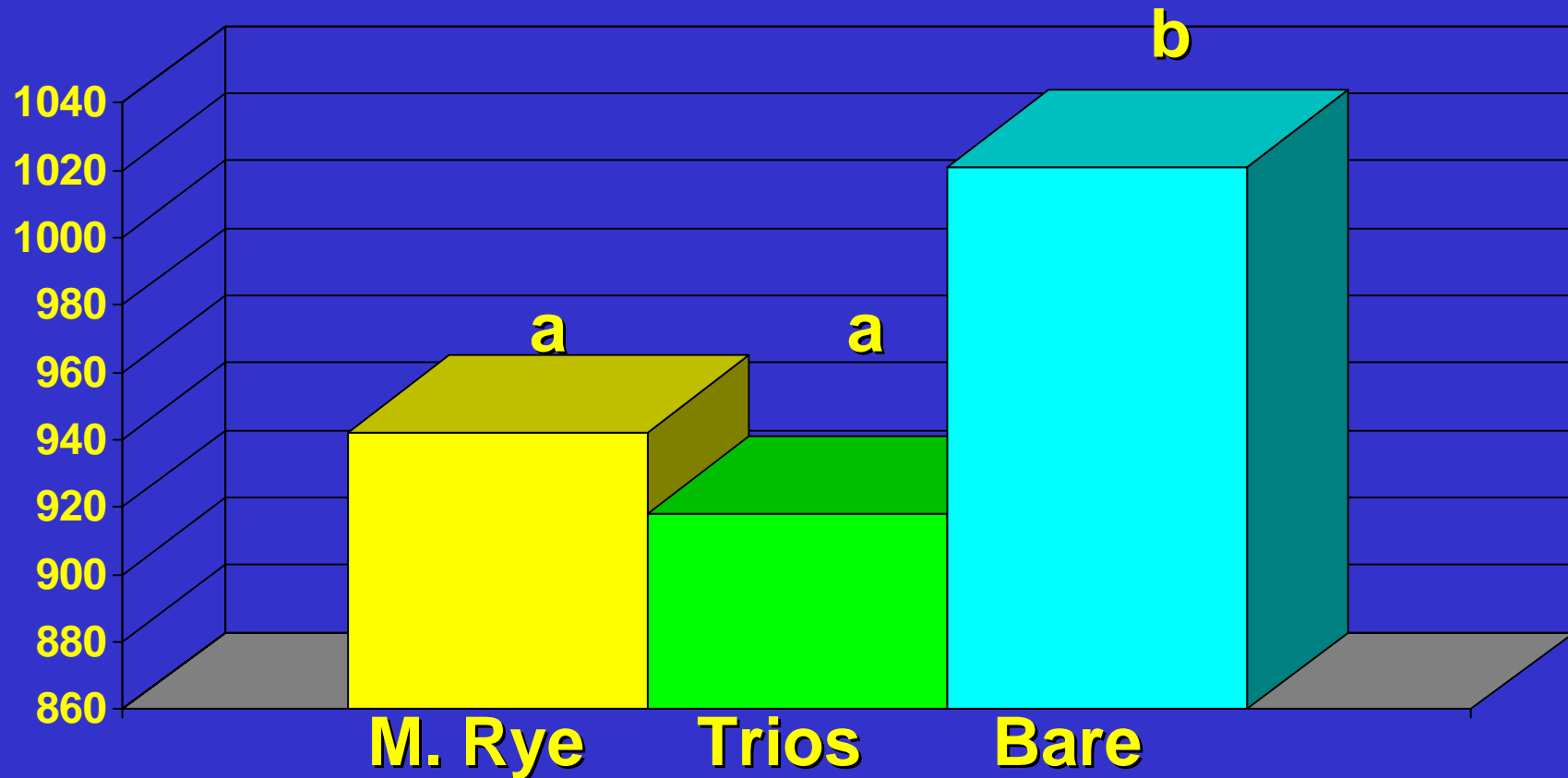
Cover Crop Treatment Effects

- **Phosphate levels in the leaf blades were lower in the cover crop treatments; however, total phosphorus was not affected.**
- **Boron was slightly lower in the cover crop treatments**

Plant Nutritional Effects

Cover Crop Treatment Effects

Phosphate in Leaf Blades



Soil Nutritional Effects

Soil Nutritional Effects

Vine Row

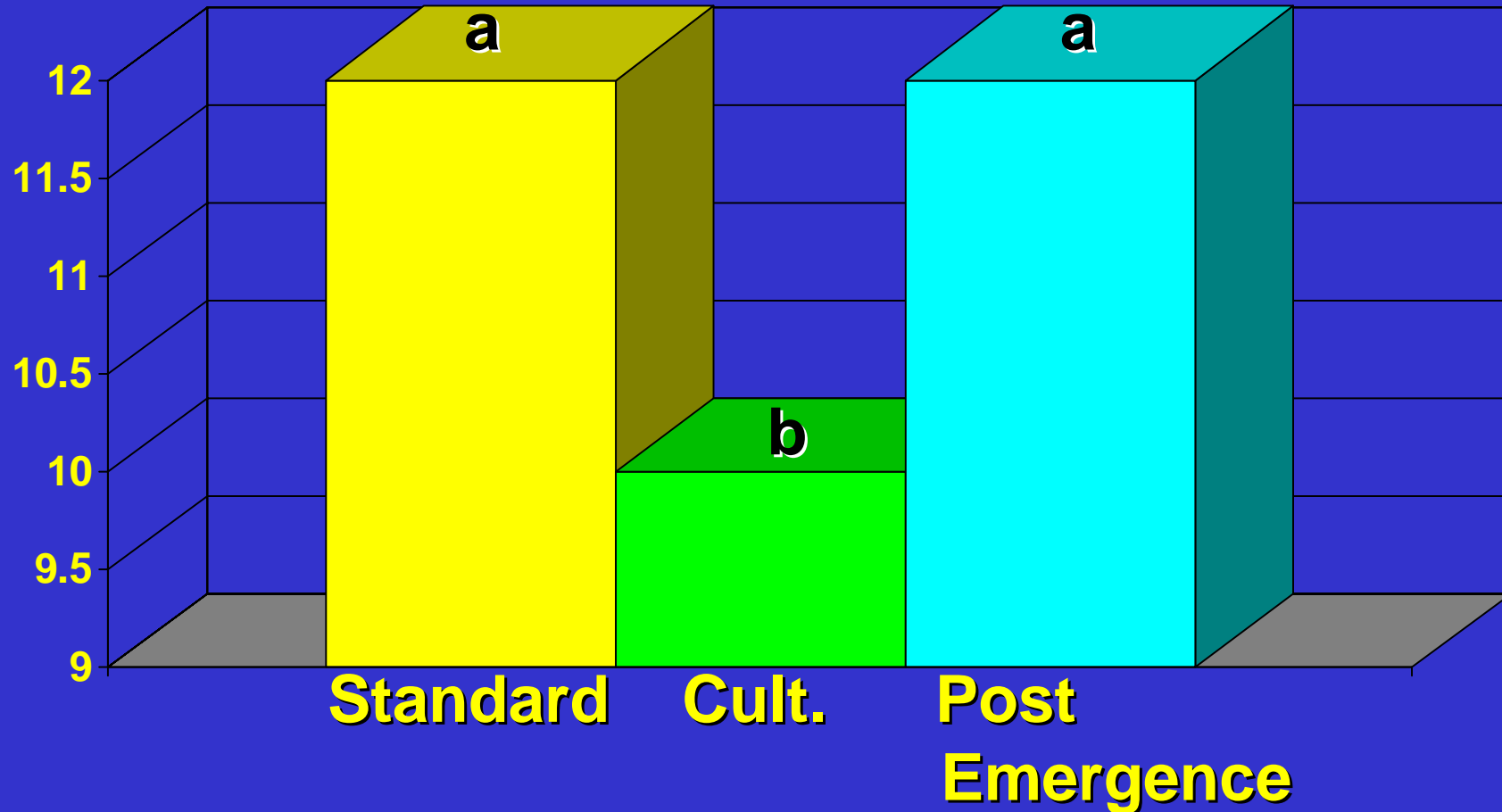
Weed Treatment Effects

- **Soil nitrate levels were slightly lower in the cultivation treatment in the vinerows**

Vine Row

Weed Treatment Effects

Nitrate-N



Vine Row

Cover Crop Treatment Effects

- In general there were no impacts of cover crops on the adjacent vine row, except that the CEC was higher in the vine row adjacent to the Trios 102 treatment

Row Middles

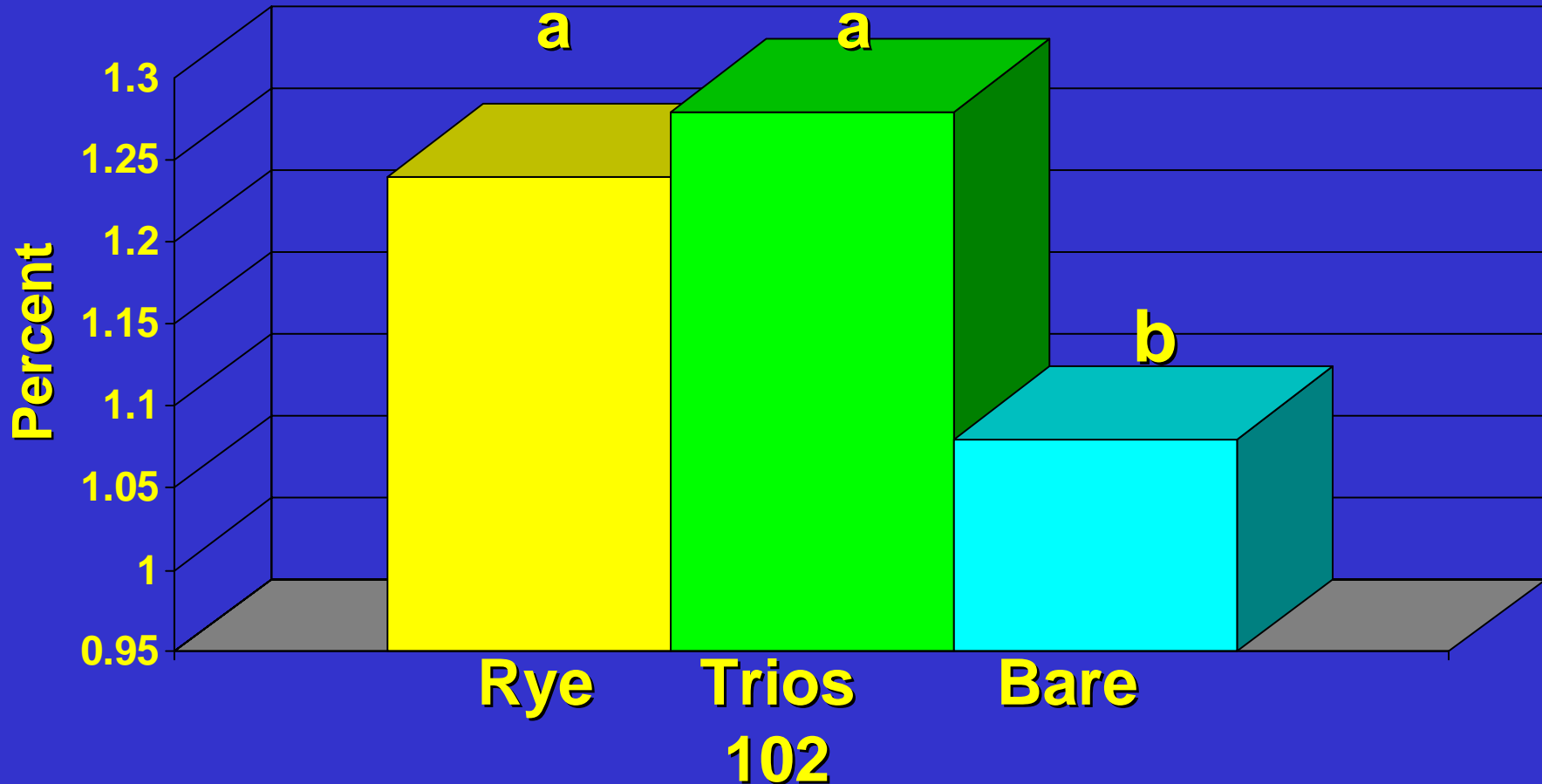
Cover Crop Treatment Effects

- **There were numerous cover crop effects on soil nutrition in the row middles.**

Row Middles

Cover Crop Effects

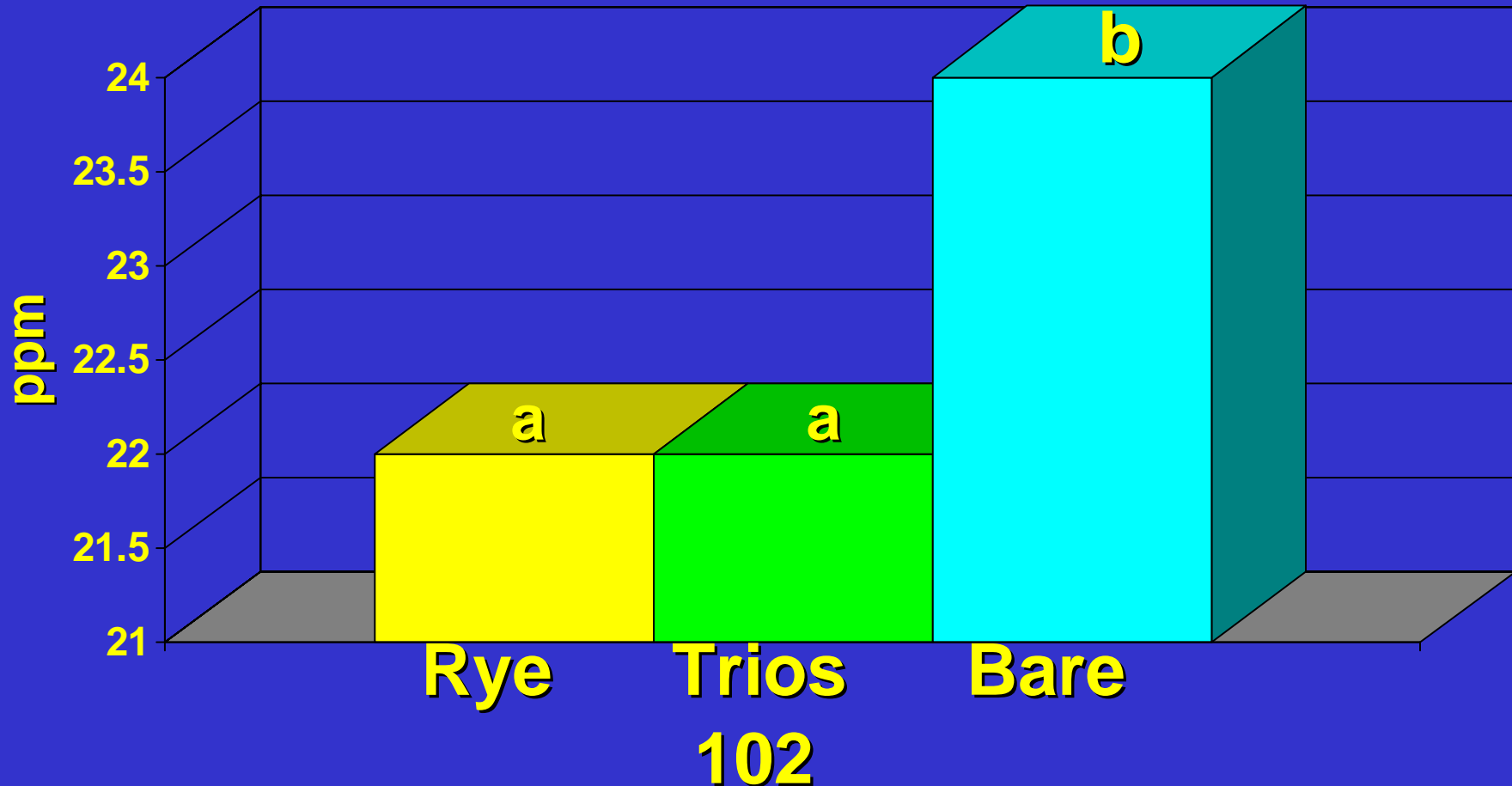
Organic Matter



Row Middles

Cover Crop Effects

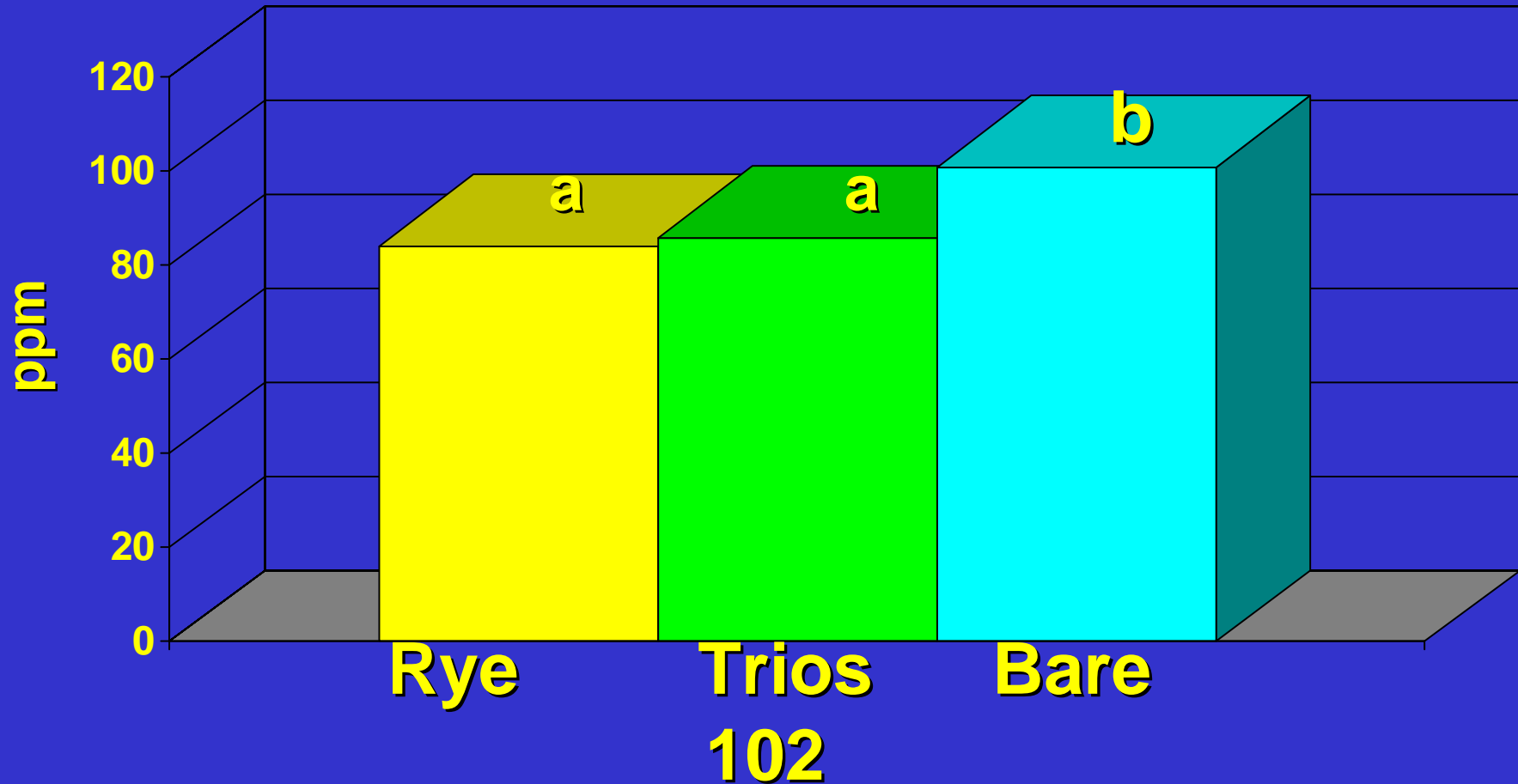
Bicarbonate Extractable Phosphorus



Row Middles

Cover Crop Effects

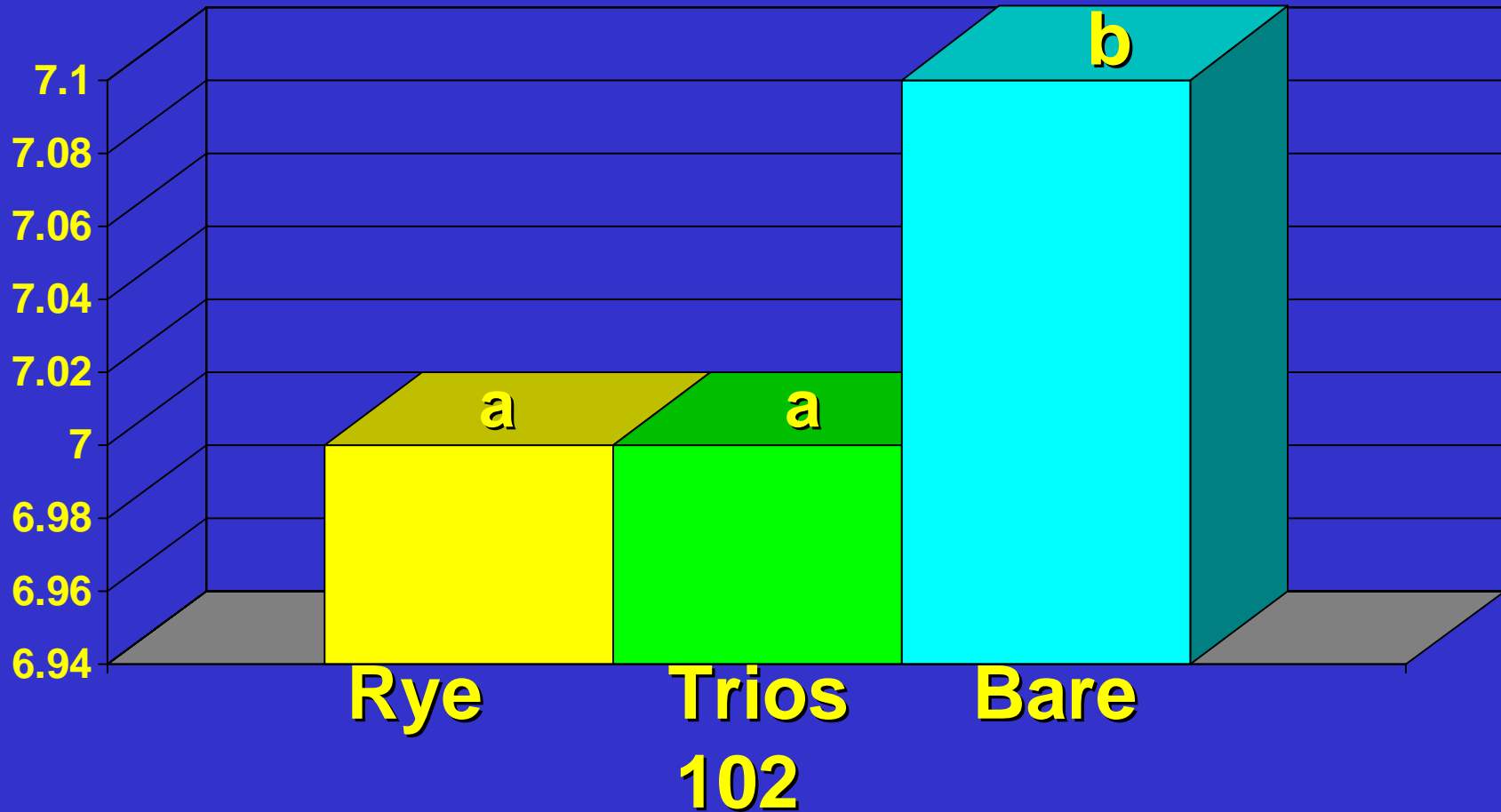
Sodium



Row Middles

Cover Crop Effects

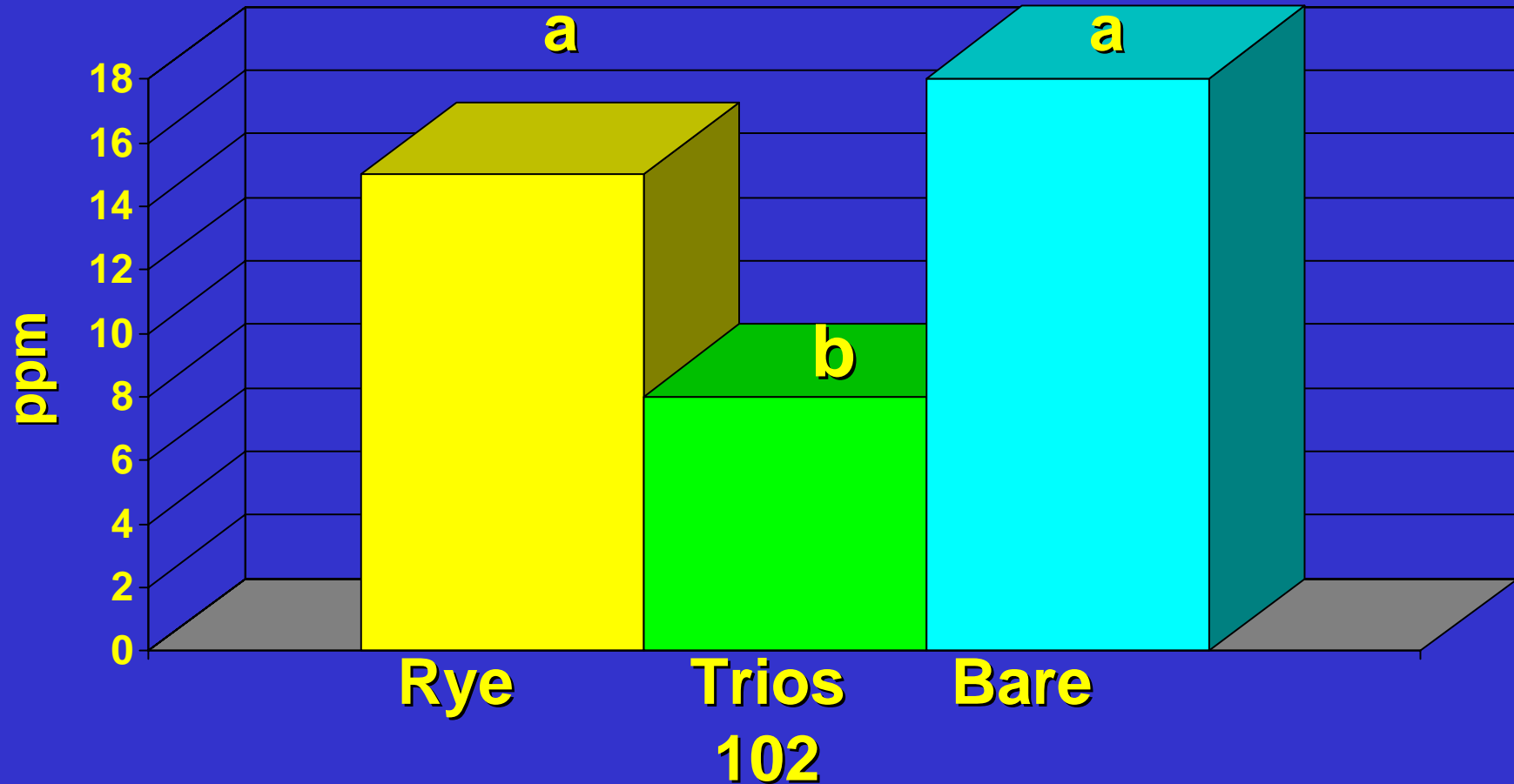
Soil pH



Row Middles

Cover Crop Effects

Nitrate-N



Summary of Impact of Cover Crops

- **Cover crops competed to a limited extent with the vines for phosphorus and boron**
- **Cover crops dramatically affected the soil nutritional status of the row middles**
- **Their impact was due to various dynamics: uptake of nutrients, improved water infiltration and subsequent leaching, and cycling of nutrients back to the soil surface**

Soil Microbiological Properties

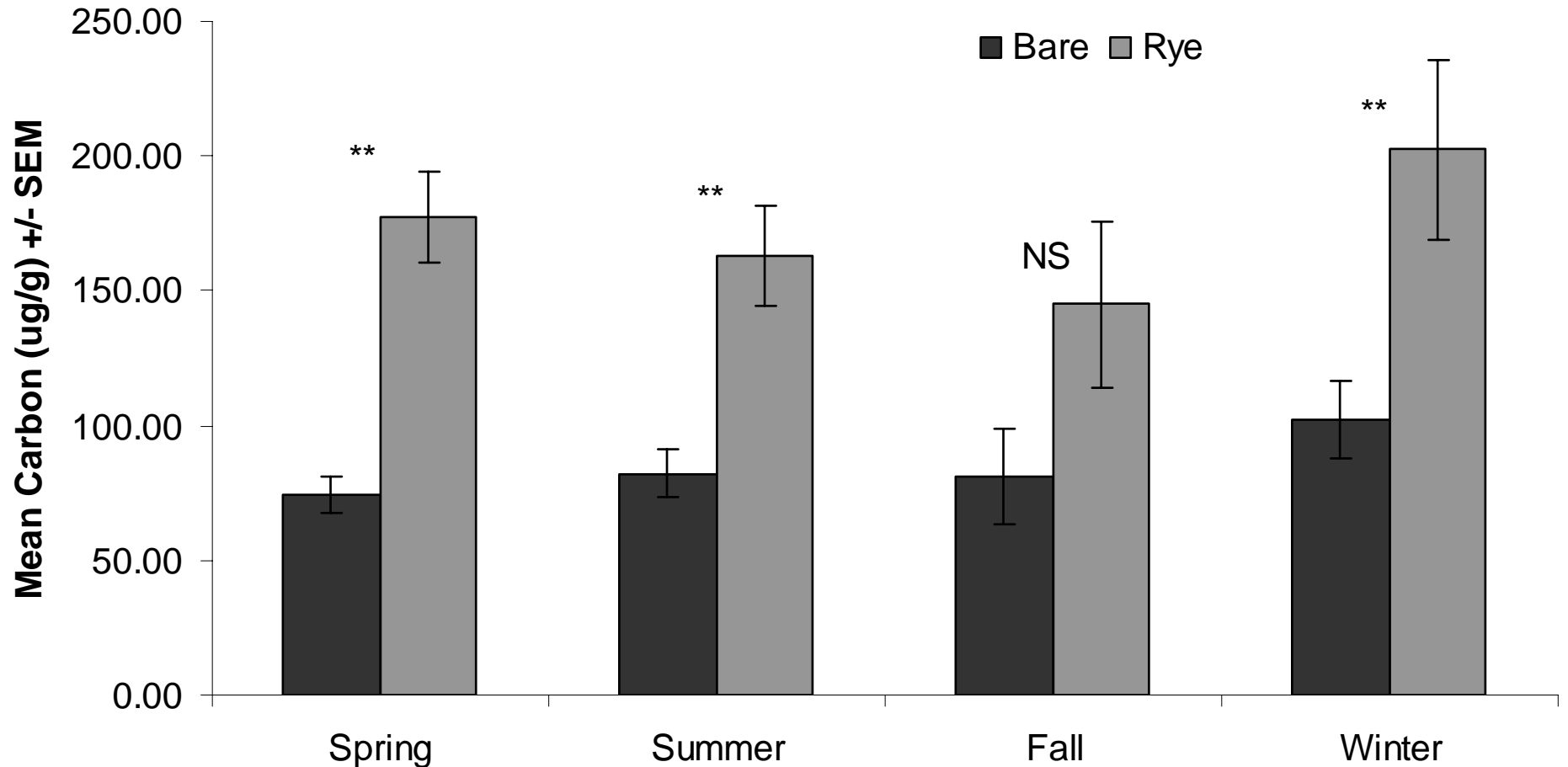
Mycorrhizal Colonization

- **Mycorrhizae were measured over three years in this study.**
- **The level of infection by mycorrhizae varied by weed control treatment, but the results were not consistent over the years**

Microbial Biomass

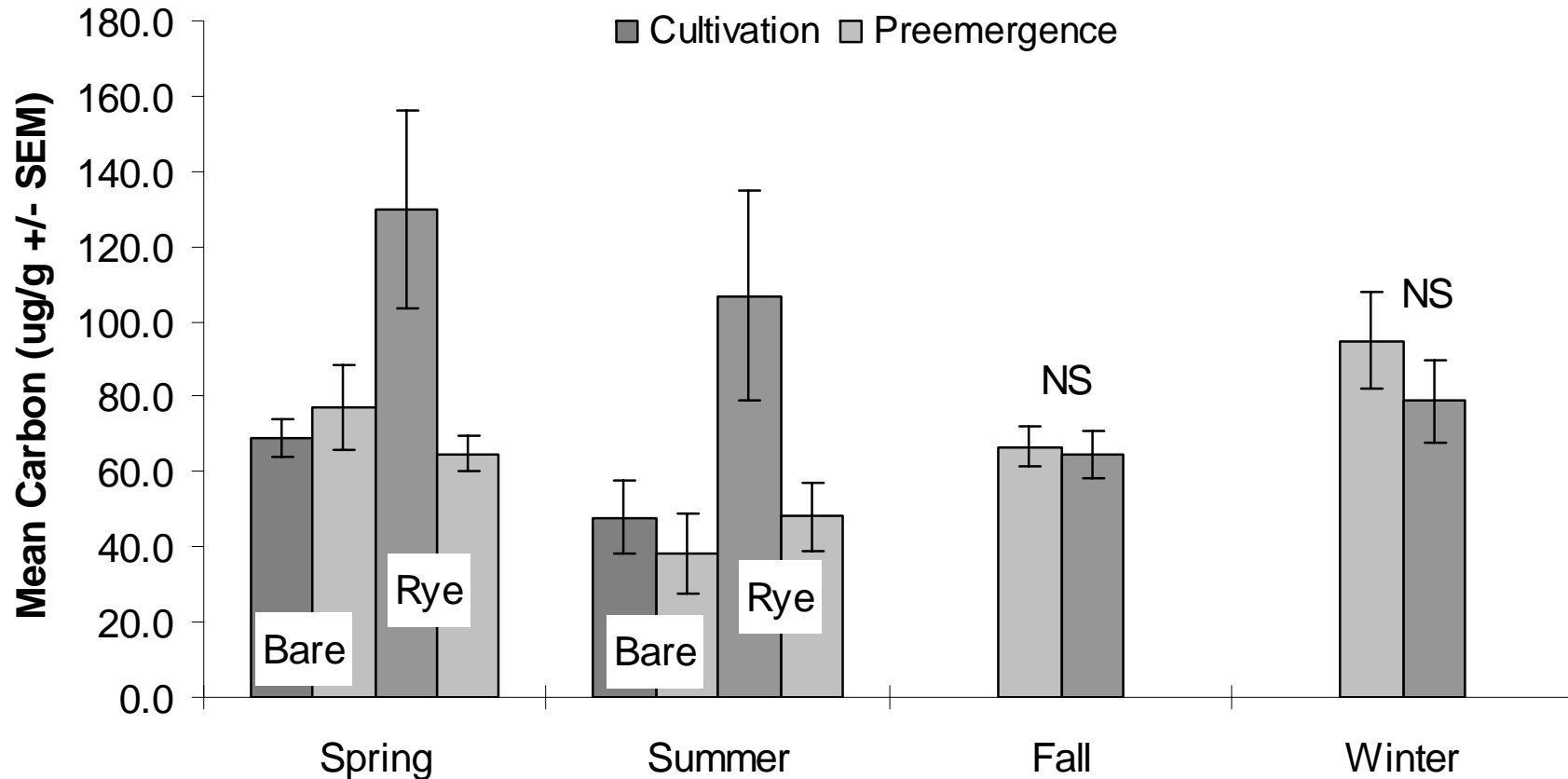
Microbial Biomass In Row Middles

Microbial Biomass, Middles (2001-2005)



Microbial Biomass In Vine Rows

Microbial Biomass, Vine Rows (2001-2005)



Summary of Soil Microbiological Evaluations

- There were not clear mycorrhizal impacts of the treatments in these studies**
- Soil microbial biomass was dramatically higher in the cover cropped row middles**
- There may even have been some increase in soil microbial activity in the adjacent cultivated row middles**

Overall Impacts of Vineyard Floor Practices

- **Weed management practices such as cultivation increased soil compaction**
- **Cover crops had significant impacts on soil health parameters**
- **Cover crops competed with the crops to a limited extent for some nutrient (i.e. P)**
- **Cover crops reduced N and P levels in the soil which has beneficial implications for water quality concerns**

Overall Impacts of Vineyard Floor Practices


- The benefits observed on soil health parameters did not translate to higher yield in this study**
- Most of the soil health benefits occurred in the row middles where there are few vine roots**

Overall Impacts of Vineyard Floor Practices

- **Clearly cover crops are adding much
need biomass to the soil and ideally
this would occur under the vinerows
where most of the vine roots occur**



**A wider cover
crop strip may be
beneficial in the
long-term**



**This practice
would need to be
carefully managed
to minimize
competition with
the vines for water
and nutrients**



Acknowledgements:

Growers:

Jason Smith and Daryl Salm

Research Assistants:

Pat Headley and Dave Miltz

Funding:

Western SARE

American Vineyard Foundation