Using Liquid Sources of Potassium Fertilizer in Highbush Blueberry

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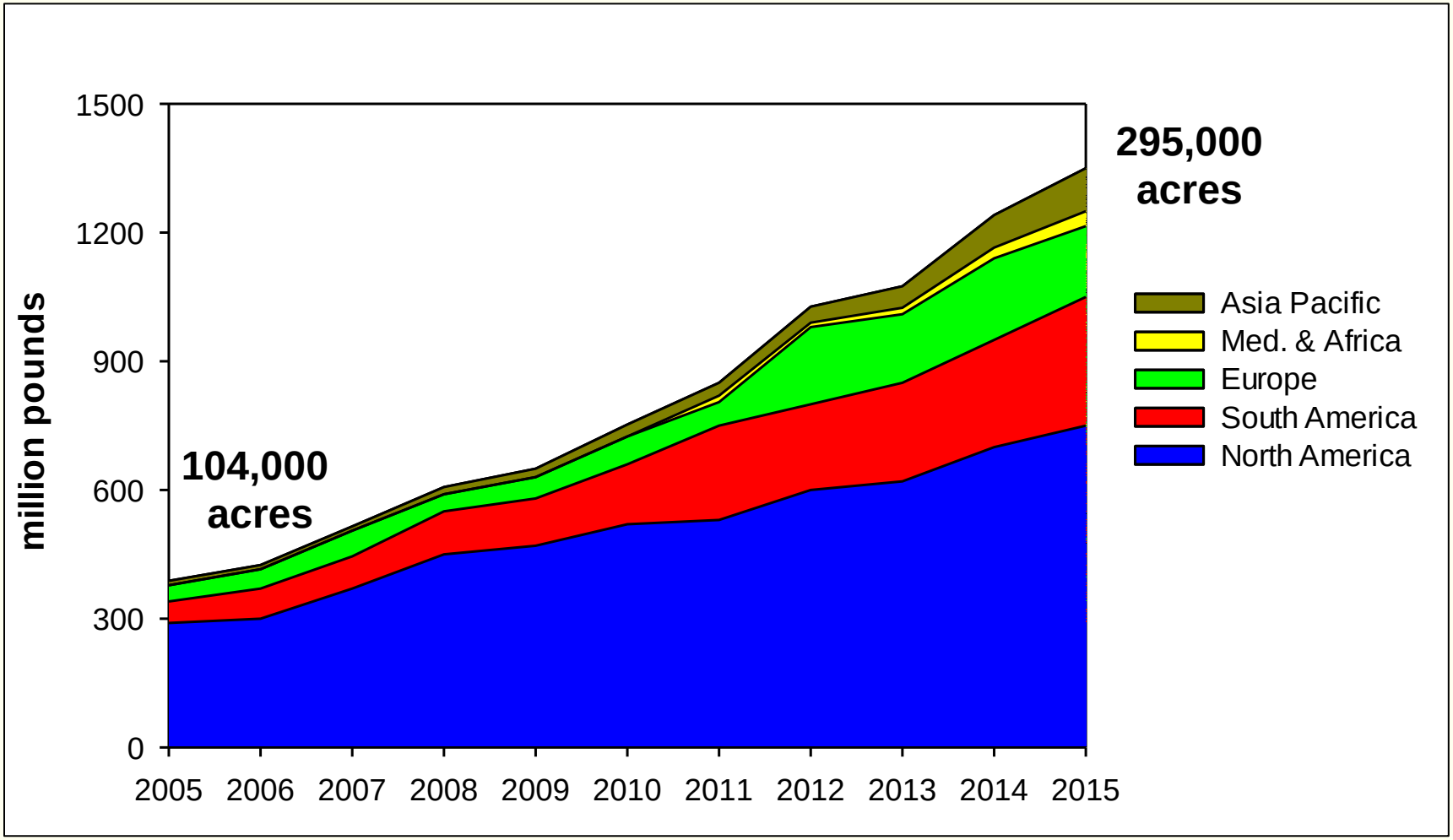
Consumer demand

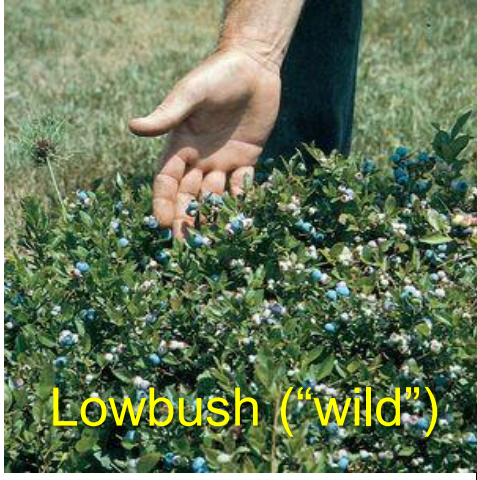
- Health benefits
- Availability year-round
- New global markets

Global blueberry production



From *U.S. Highbush Blueberry Council*

Northern highbush



Lowbush (“wild”)

Northern highbush

Lowbush

Southern highbush

Northern highbush

Southern highbush

Rabbiteye & southern highbush

Rabbiteye

Fresh Market

Processed Market


Highbush Blueberry
It takes about 6-8 years for a field to mature
Chad Finn (USDA plant breeder)
in 20-year-old ‘Bluejay’ field
Photo by B Strik, OSU

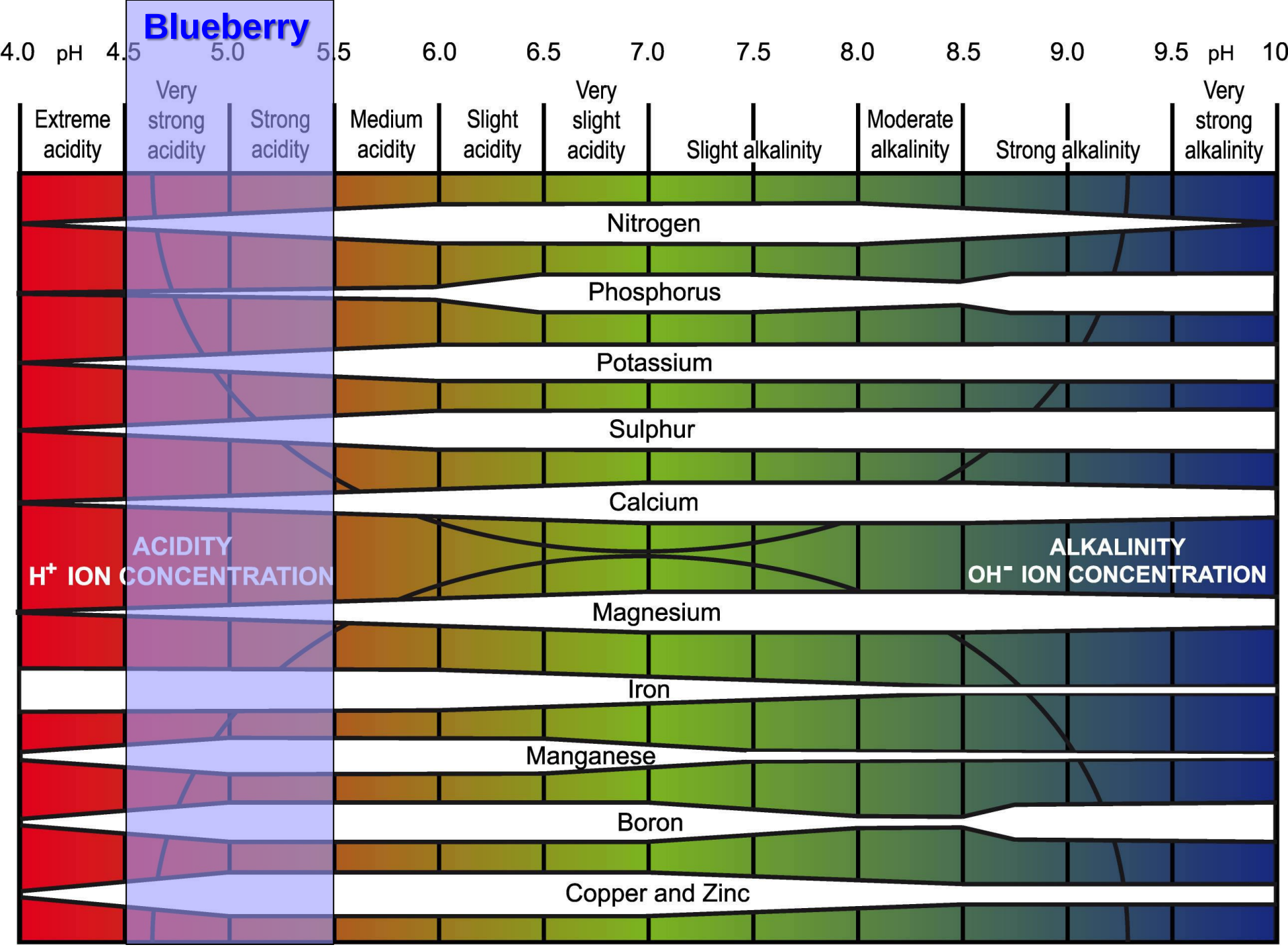
Blueberry is a Unique Crop

- **Shallow-rooted**
[extremely fine (40 – 70 μm) & concentrated in top 12” of soil]

- **“Acid loving”**
[adapted to low soil pH (4.5–5.5) & high organic matter]

- **Prefers NH_4- over NO_3-N**
[NO_3-N is mobile in soil, whereas NH_4-N is not]

- **Sensitive to salinity**
[ammonium sulfate has a high salt index]



redrawn by PDA from Troug, E. (1946)

Granular fertilization

Triple-split application (April, May & June)

Soil pH > 5.5: Ammonium sulfate (21-0-0)

Soil pH < 5.0: Urea (46-0-0)

Blueberry Irrigation

Most commercial blueberry fields are irrigated by sprinklers or drip

2003: 90% of fields irrigated by sprinklers

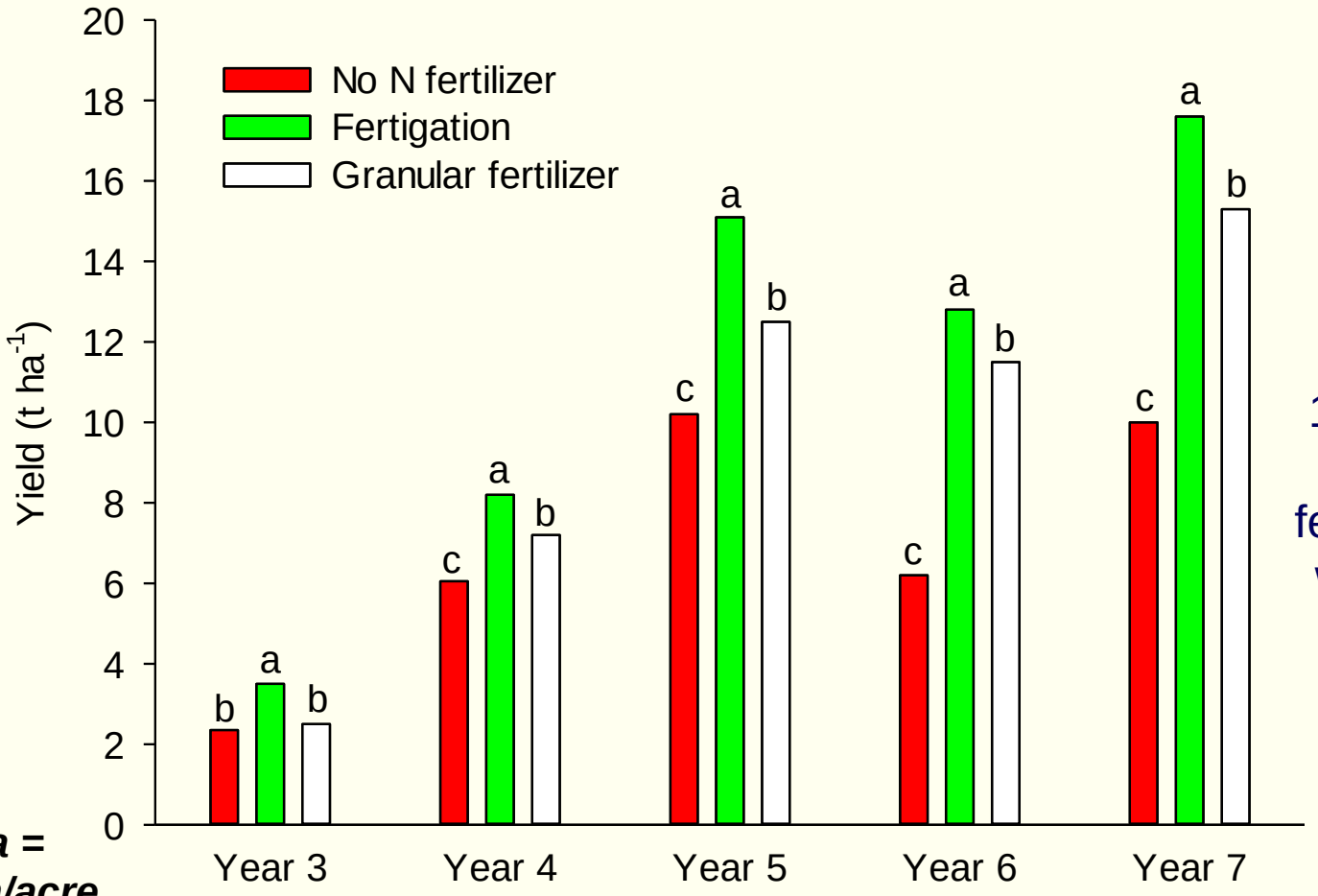
2015: 80% fields irrigated by drip

Nitrogen Fertigation Trial

Granular fertilizer
Triple-split application
(April, May & June)

Fertigation
Weekly application
(mid-April to early August)

Annual Production



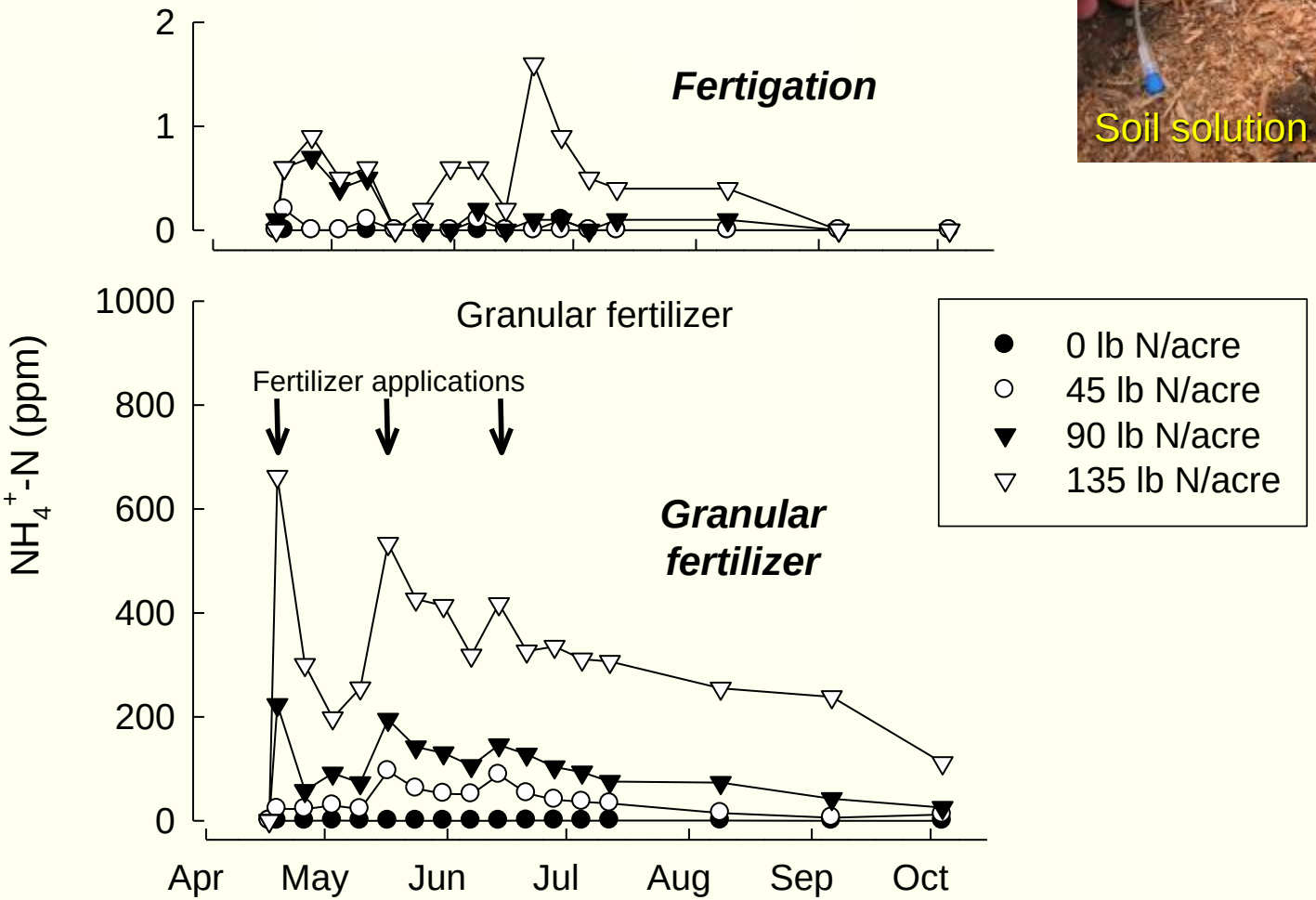
12-40% more yield with fertigation than with granular fertilizer

1 t/ha = 0.45 ton/acre

Vargas & Bryla (2015)

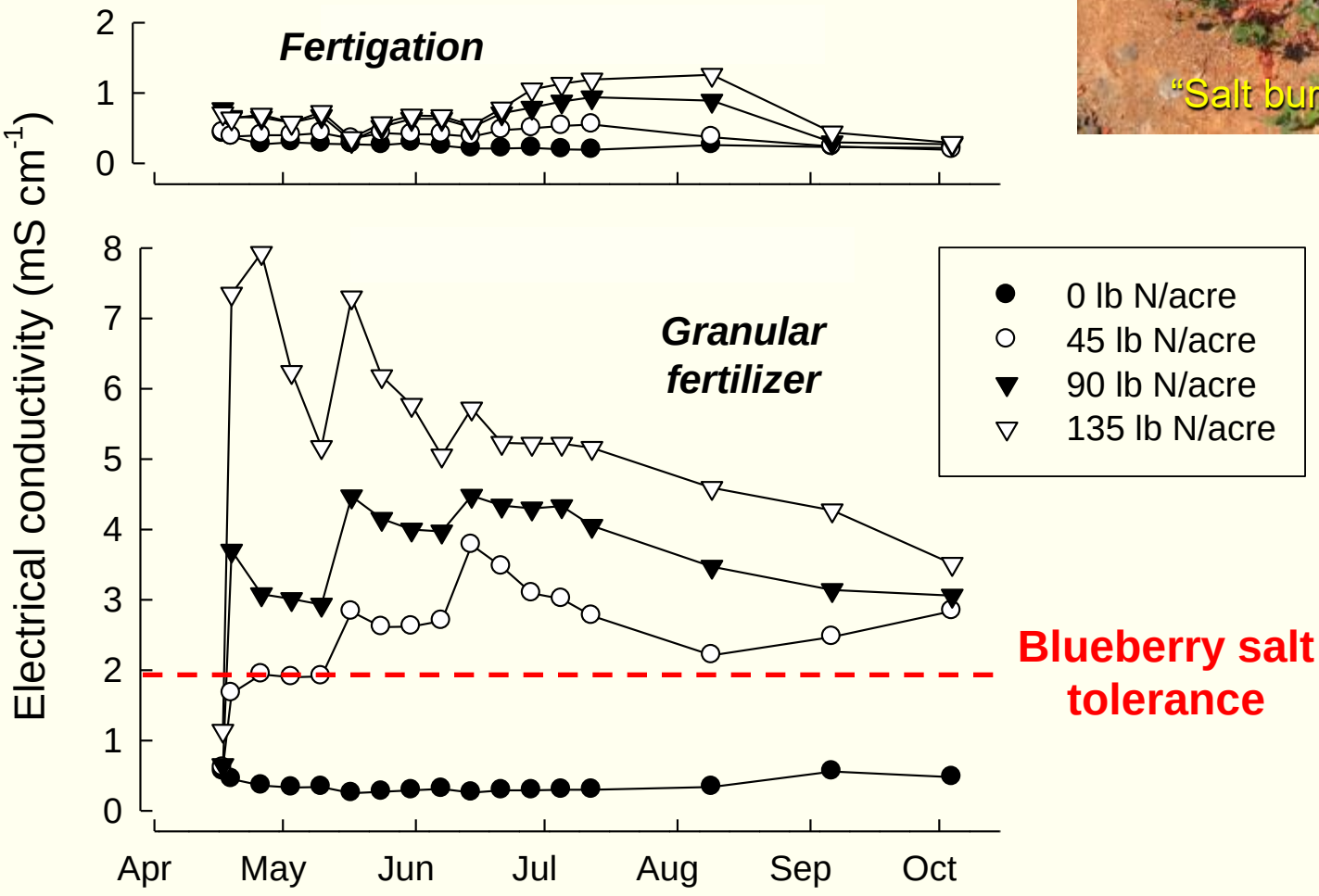
Soil solution sampler

Soil N availability



Bryla & Machado (2011)

Soil salinity

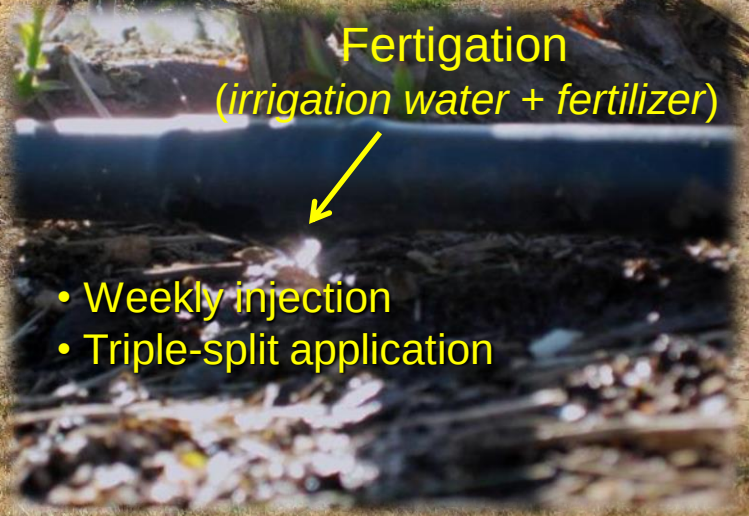


Bryla & Machado (2011)

Nitrogen Fertigation is the Way to Go

Fertigation produces:
- Larger plants
- Higher yields

*About 150 lb/acre N was needed in mature plants



Current K Guidelines

75-100 lb/acre K

- Soil K < 100 ppm
- Leaf K < 0.2%

0-75 lb/acre K

- Soil K = 100-150 ppm
- Leaf K = 0.2-0.4%


K Deficiency
Drought
Poor drainage
Very low soil pH
Heavy crop loads
Sandy soil / low organic matter


K Toxicity

Using Liquid Sources of K Fertilizer

Treatments:

- Two K sources (K_2SO_4 and KTS)
- Five N sources (AS, urea, ATS, UAN, urea-triazone)
- Five K rates (0-0.2 g/L)
- Two soil types

Measurements:

- Dry weights
- Leaf nutrients
- Soil nutrient availability

Why KTS?

- Acidifying agent

$$S_2O_3^{2-} \xrightarrow[\text{reductase} - 2[H]]{\text{Thiosulfate}} H_2S + SO_3^{2-}$$

- Inhibits nitrification & urease activity

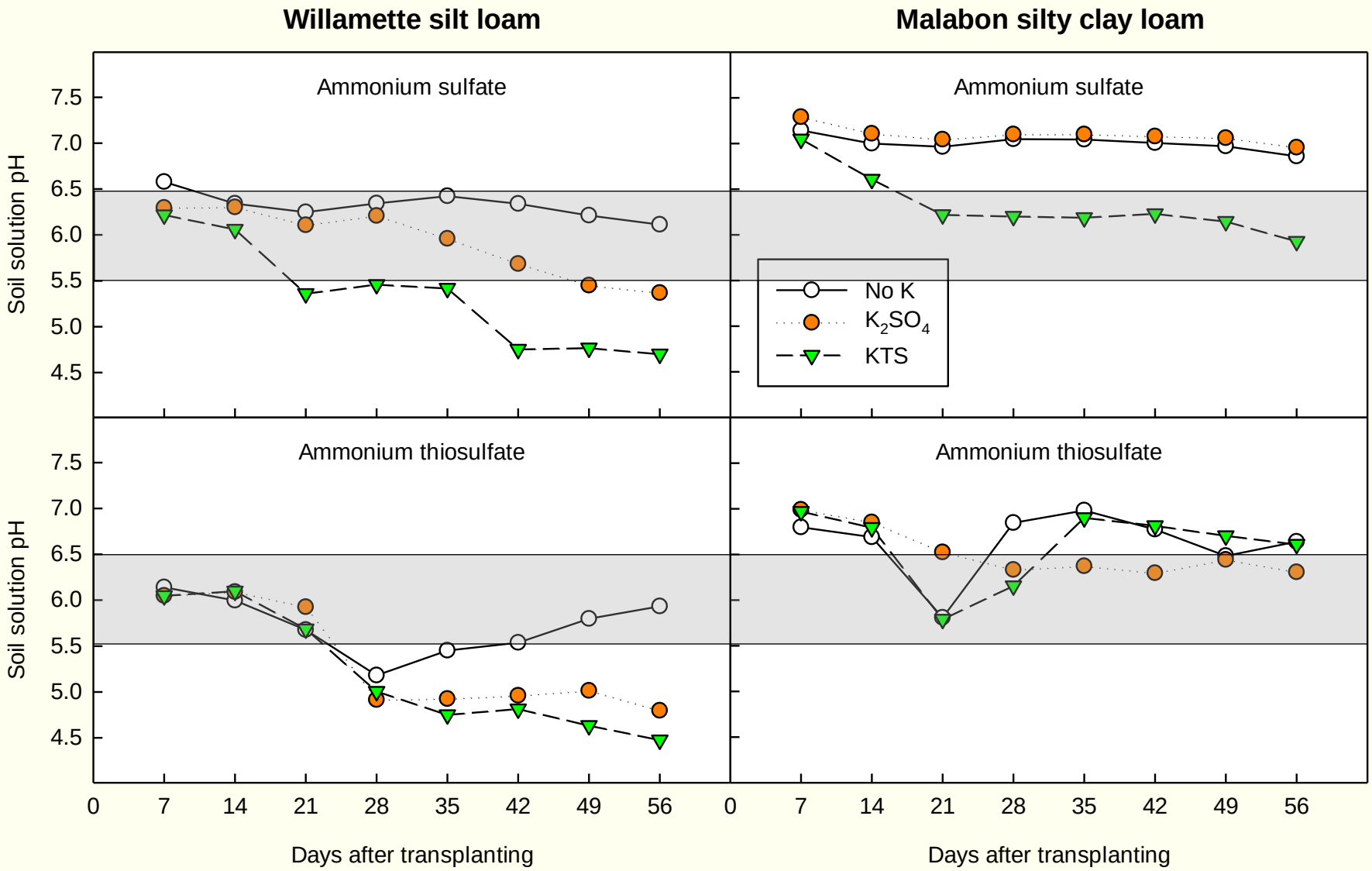
Soil Types

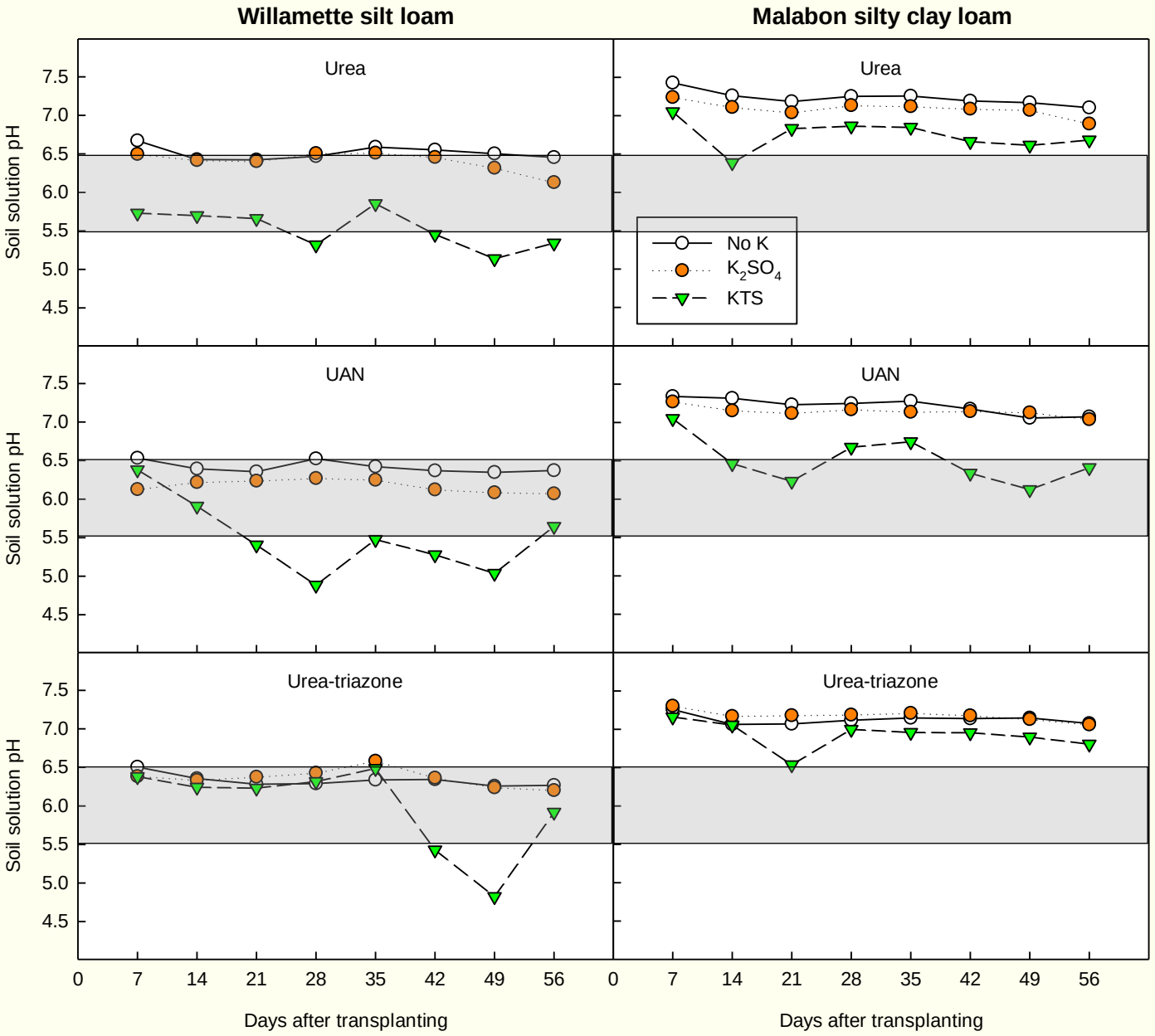
Willamette silt loam (excellent)	
Soil pH	4.9
OM (%)	3.7
Nutrients (g/kg)	
Total N	1.0
P	0.1
K	0.3
Ca	0.5
Mg	0.1

Malabon silty clay loam (marginal)	
Soil pH	6.2
OM (%)	2.3
Nutrients (g/kg)	
Total N	--
P	<0.1
K	0.3
Ca	2.2
Mg	0.6

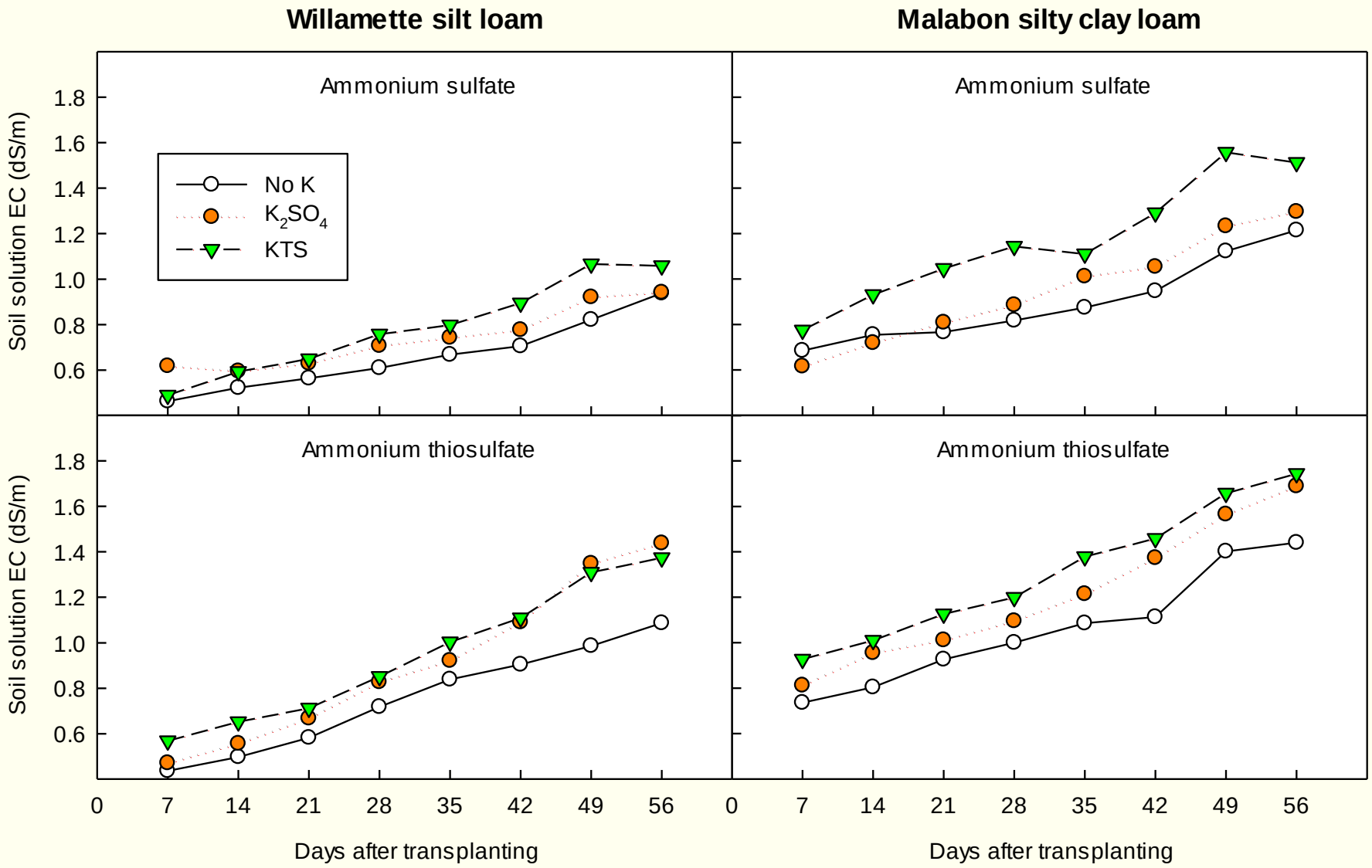

Soil solution sampler

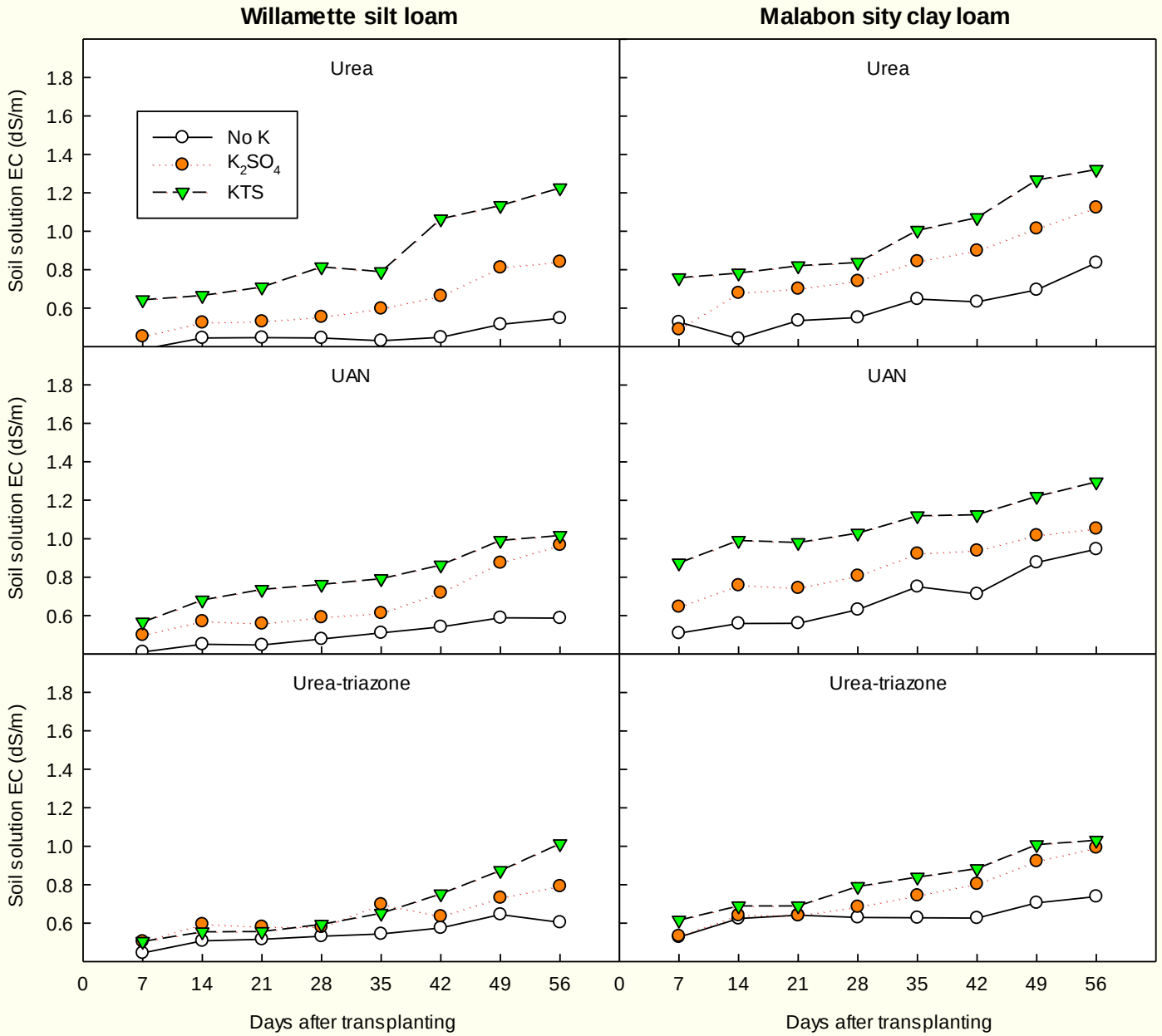
Soil acidity



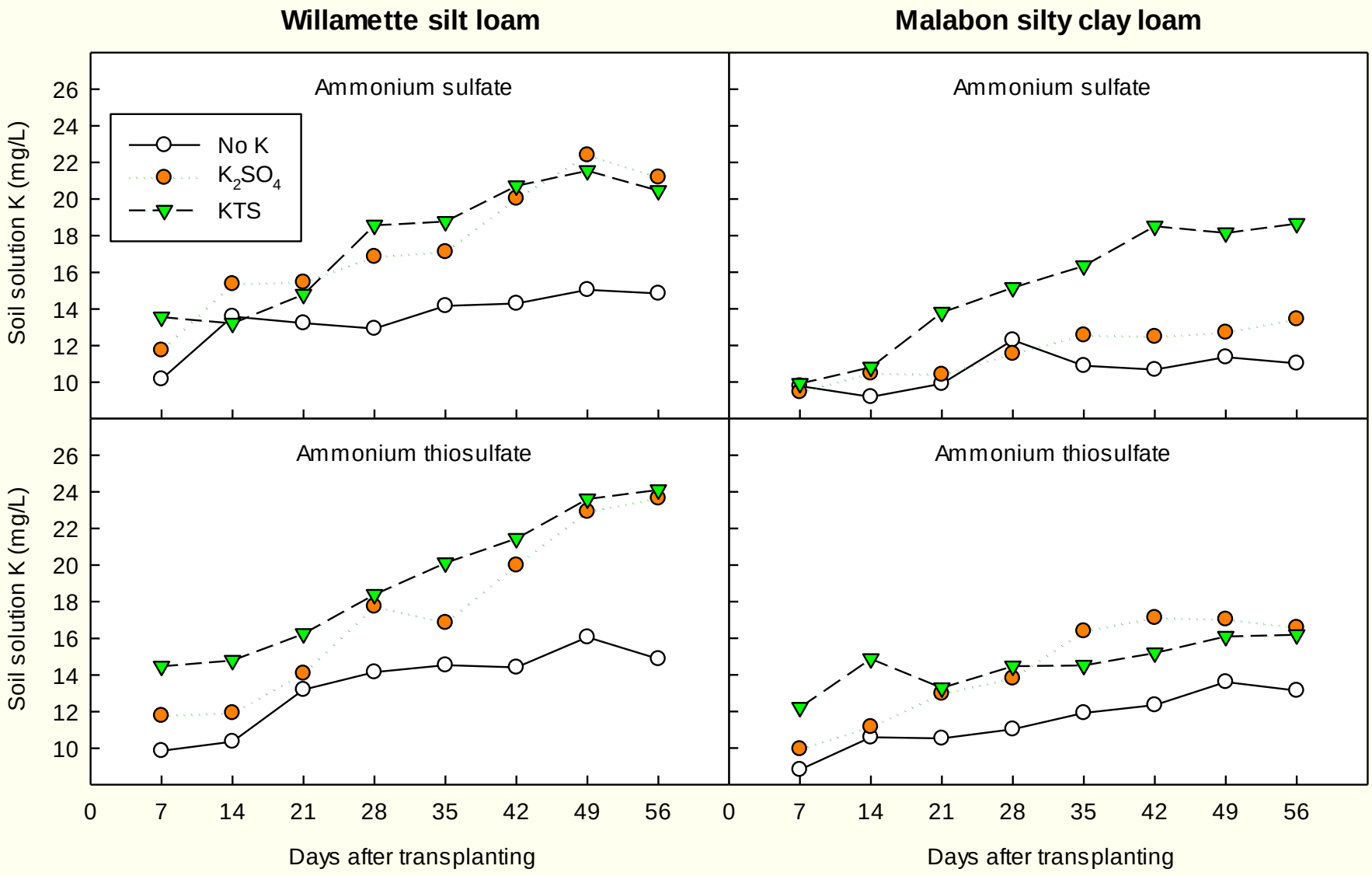

Willamette silt loam
Malabon silty clay loam
Urea
UAN
Urea-triazone
No K
K_2SO_4
KTS
Soil solution pH
7.5
7.0
6.5
6.0
5.5
5.0
4.5
0
7
14
21
28
35
42
49
56
Days after transplanting

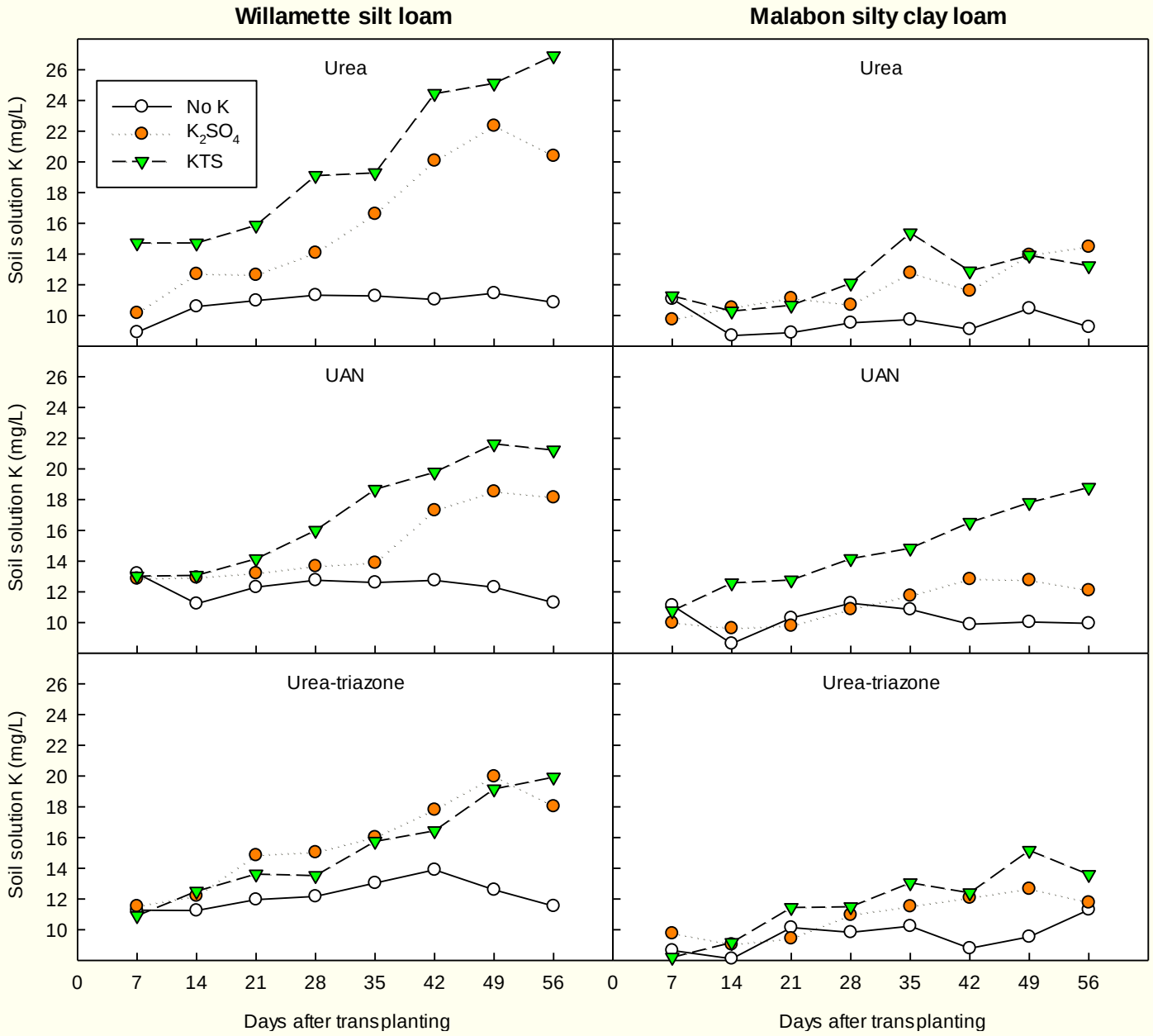
Soil salinity




Willamette silt loam
Malabon sity clay loam
Urea
UAN
Urea-triazone
No K
K_2SO_4
KTS
Soil solution EC (dS/m)
Days after transplanting
0
7
14
21
28
35
42
49
56
0.6
0.8
1.0
1.2
1.4
1.6
1.8

Concentration of K




Willamette silt loam
Malabon silty clay loam
Urea
UAN
Urea-triazone
No K
K_2SO_4
KTS
Soil solution K (mg/L)
Days after transplanting
0
7
14
21
28
35
42
49
56
10
12
14
16
18
20
22
24
26

Preliminary Conclusion

KTS appears promising

- *Use with ammonium sulfate on high pH soils*
- *Use with urea on soil with optimum pH*

What's Next?

- Two fields (good and weak)
- Three K sources
  - KTS
  - K_2SO_4 (liquid)
  - K_2SO_4 (granular)
  - No K control
- Measurements:
  - Plant and soil nutrients
  - Yield
  - Fruit quality and storage

Thank you

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