

What is TwinN?

- *Nitrogen fixing bacteria convert atmospheric nitrogen into a plant available form*
- These bacteria absorb nitrogen from the air and convert it to ***amino acids***.
- The plant uses these ***amino acids*** for its own growth.
- This activity usually provides a ***growth response*** to treated plants in comparison to untreated plants.
- These bacteria reside in native grasses on all continents.
- Delivering high concentrations to the leaf re-inoculates the plant with beneficial natural bacteria.
- This is a natural process and a source of nitrogenous compounds to the plant.



TwinN *Unique freeze dried nitrogen fixing soil improver*

What are the benefits of TwinN

- Access to atmospheric nitrogen
- Larger root systems resulting in better uptake of soil N
- Increased phosphorus/iron availability via solubilisation
- Improved soil friability
- Healthier plants and improved produce quality
- Economical, easy application, reducing agriculture's carbon footprint



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Mode of Action

PRIMARY EFFECT

- TwinN microbes act to fix atmospheric nitrogen into nitrogenous compounds that are immediately available to the plants. The nitrogen is fixed within the tissues by the endophytes and is also released by the rhizospheric microbes where it is efficiently captured by the plant roots. The ability of TwinN microbes to fix nitrogen for both leguminous and non-leguminous crops enables a reduction in the application of chemical nitrogen sources such as urea.

SECONDARY EFFECTS

- 1. *Diazotrophs* such as those provided by TwinN have been shown to produce a range of Plant Growth Factors (PGFs) some of which mimic plant hormones such as auxins. These induce increased plant growth, particularly root growth. The resultant larger root system acts to capture nutrients more effectively. Application of urea and other chemical fertilizers is well known to result in significant leaching of the fertilizers, as they are poorly bound by soil particles. This results in environmental problems as the nitrogenous compounds enter waterways and aquifers. It also results in decreased economic efficiency as expensive fertilizers are washed out of the root zone. More efficient capture of applied nitrogen and other nutrients by the larger root systems induced by the TwinN microbes is part of the mechanism by which TwinN increases plant growth and productivity.



How to Apply

- 2 applications of TwinN aims to replace 50% of a farmer's mineral nitrogen application.
- It does NOT replace P and K. The level of these applications must remain as normal.
- Apply through irrigation or boom spray to leaf and/or root zone.



Compatibilities

We are doing tests now and constantly adding to our list of inputs that can be tank mixed with TwinN.

Currently if an input is unknown or incompatible then leave a 24 hour window after applying TwinN.



Citrus

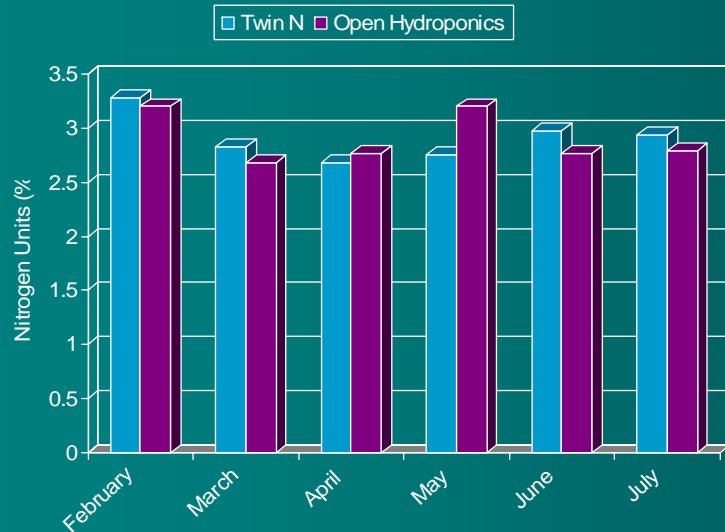
Leaf nitrogen levels are consistently over the ideal leaf analysis range for healthy citrus. No other N has been used in this program apart from TwinN twice per season. P levels have also consistently remained in the luxury range, with no soluble P inputs used -TwinN bacteria produce acidic exudates that help unlock P in the soil, and this seems to be early evidence of this.

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Nitrogen Levels in Citrus Trees

	February	March	April	May	June	July
Nitrogen Levels (%) after Twin N	3.28	2.83	2.68	2.75	2.97	2.94
Nitrogen Levels (%) after Open Hydroponics	3.2	2.68	2.76	3.2	2.76	2.79



Location: Forbes NSW Australia

Crop: Citrus Trees

Treatments:

- 1) Twin N nitrogen fixing bacteria
- 2) Open Hydroponics – regular application of citrus specific hydroponic formulation including calcium nitrate and potassium nitrate

Results:

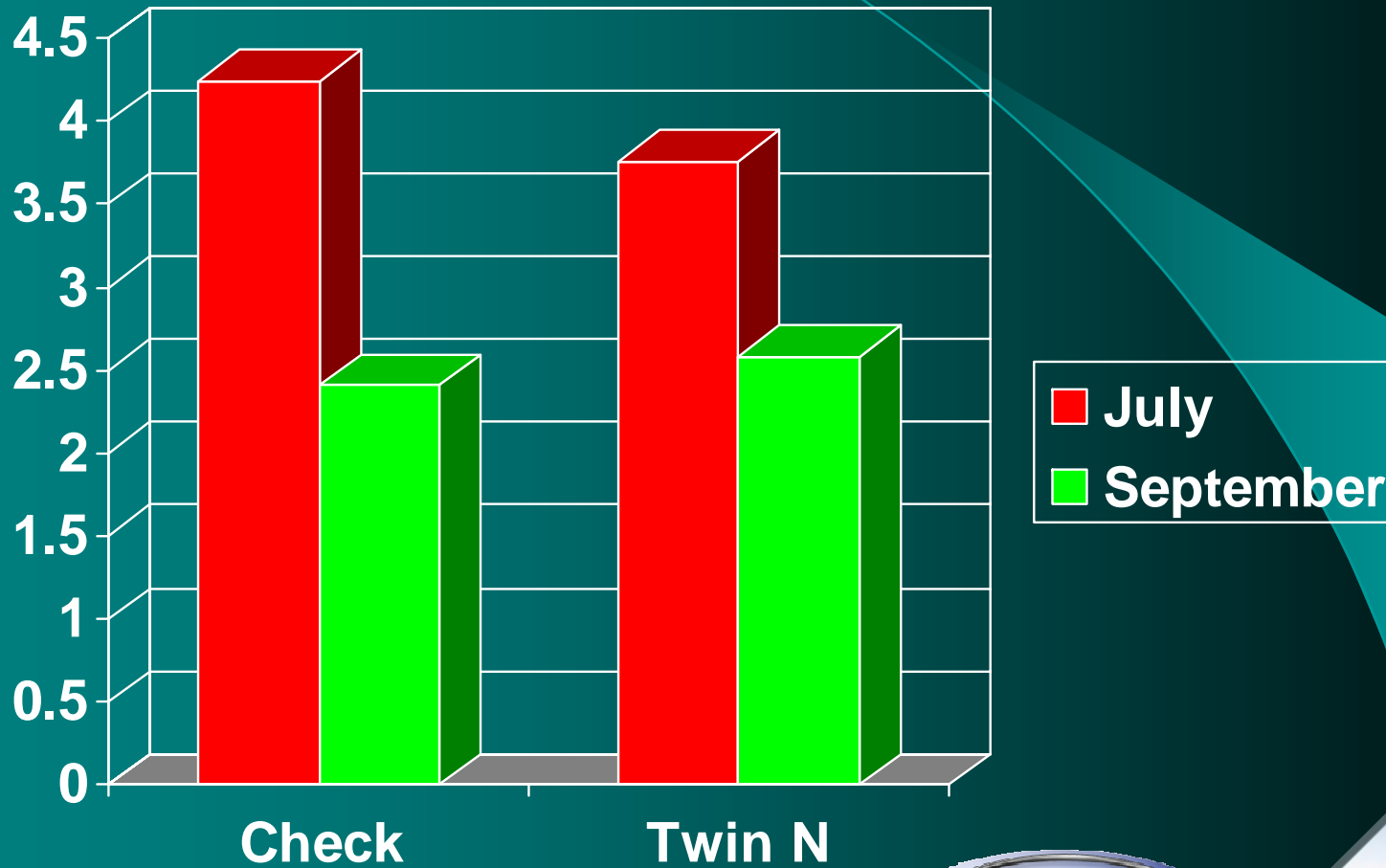
Growth parameters (trunk girth and height) – no significant difference.

Leaf analysis shows Twin N is maintaining leaf nitrogen in ideal ranges, often at a higher level than the open hydroponic trees.



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% Nitrogen Hop Leaves 2008



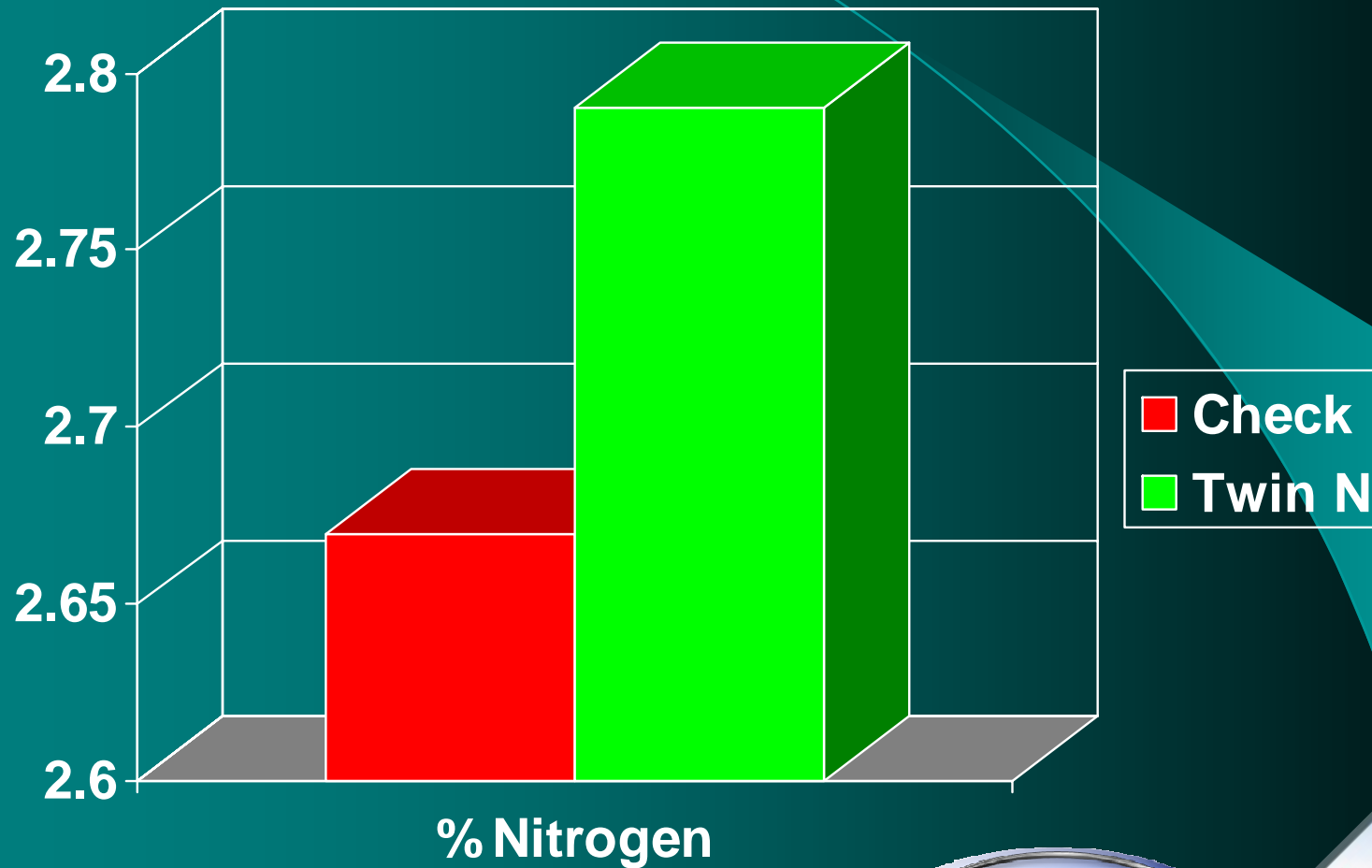
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Leaf Nitrate ppm Hop Leaves 2008



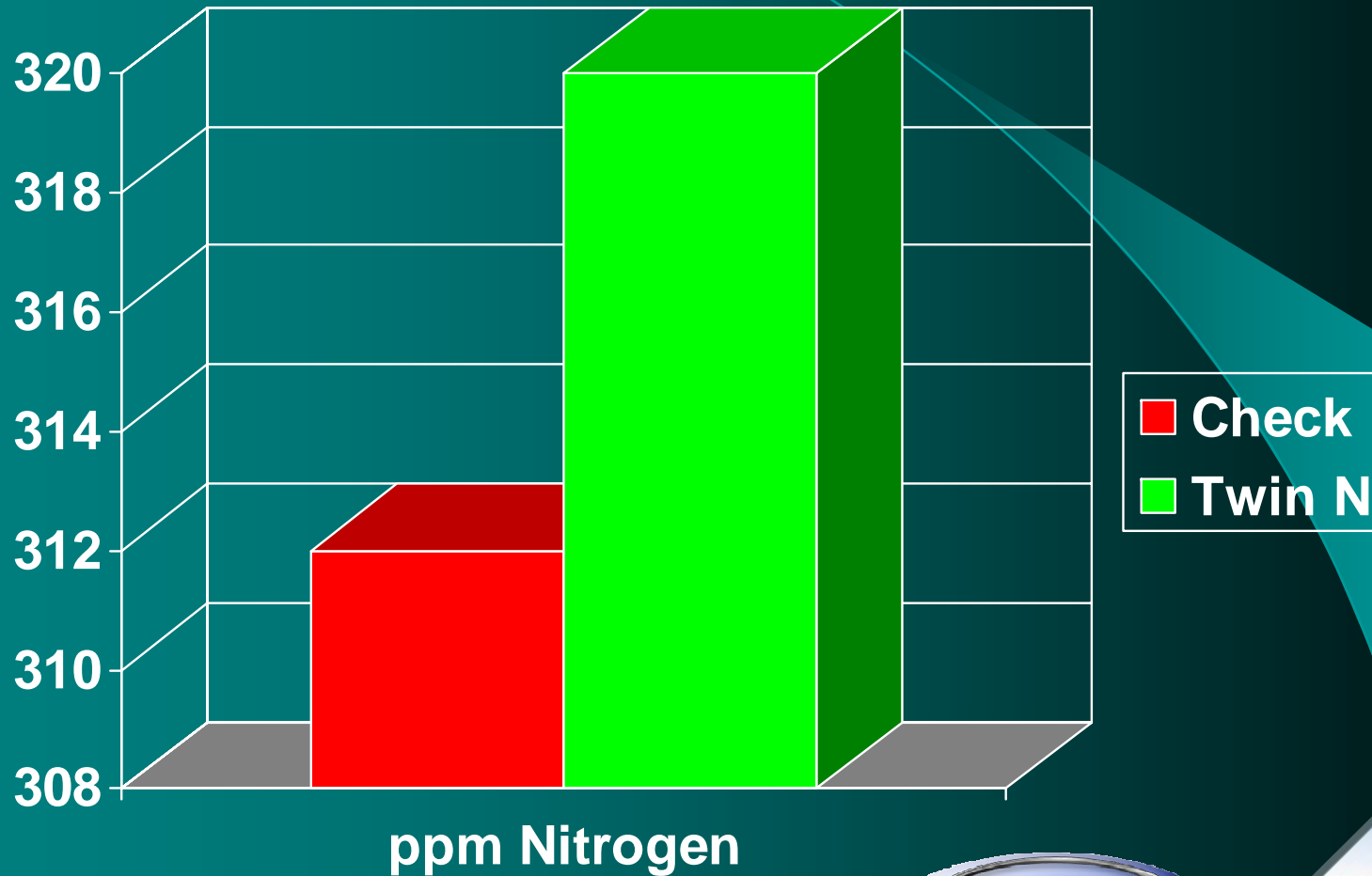
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Organic Blueberry % Leaf Nitrogen 2008



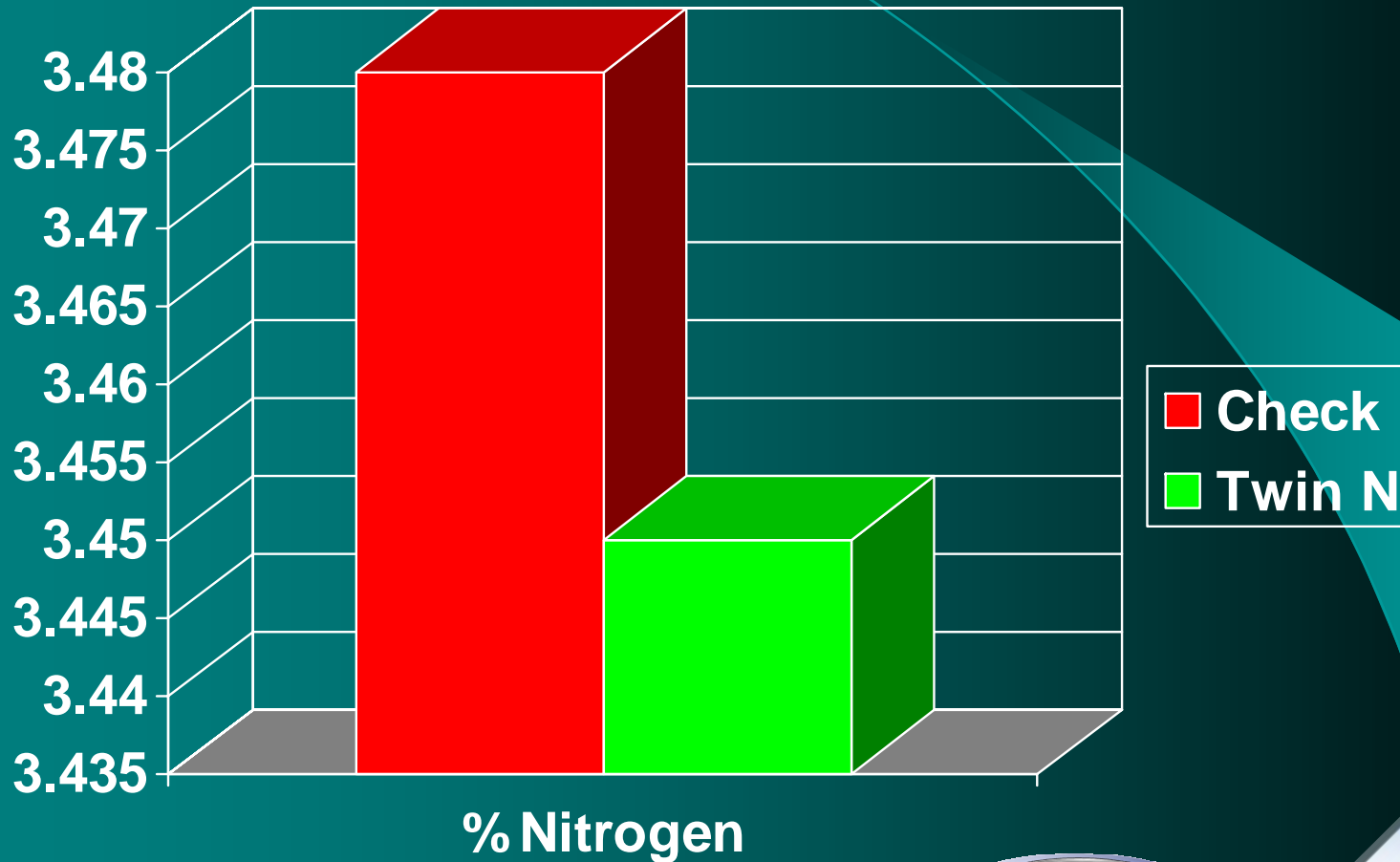
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Organic Blueberry ppm Leaf Nitrate 2008



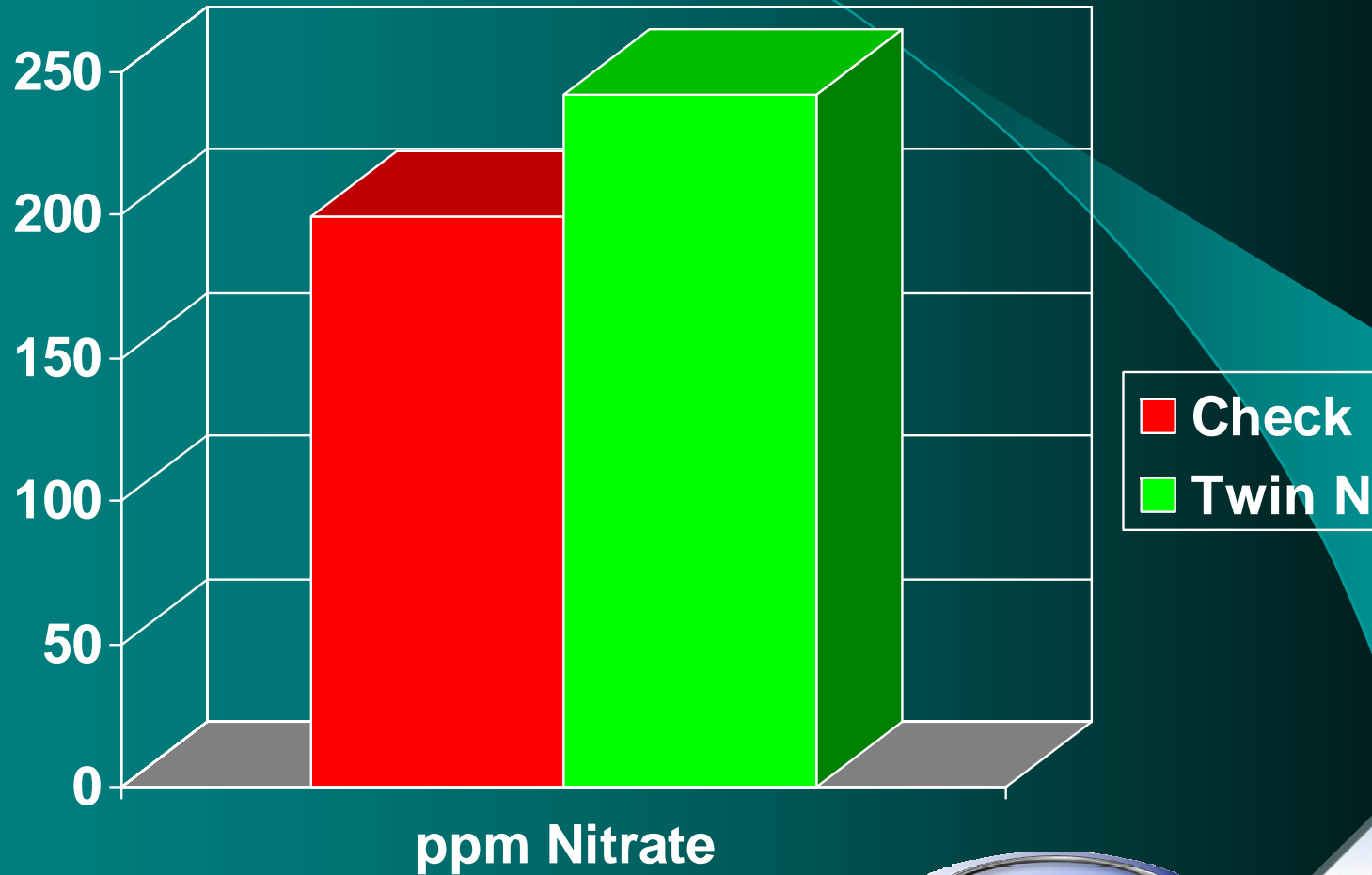
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Wine Grapes % Leaf Nitrogen 2008



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Wine Grapes ppm Leaf Nitrate 2008



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THANK YOU



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