NSW NOW The new state of business

Grafting cucumbers for resistance to Fusarium wilt in Australia

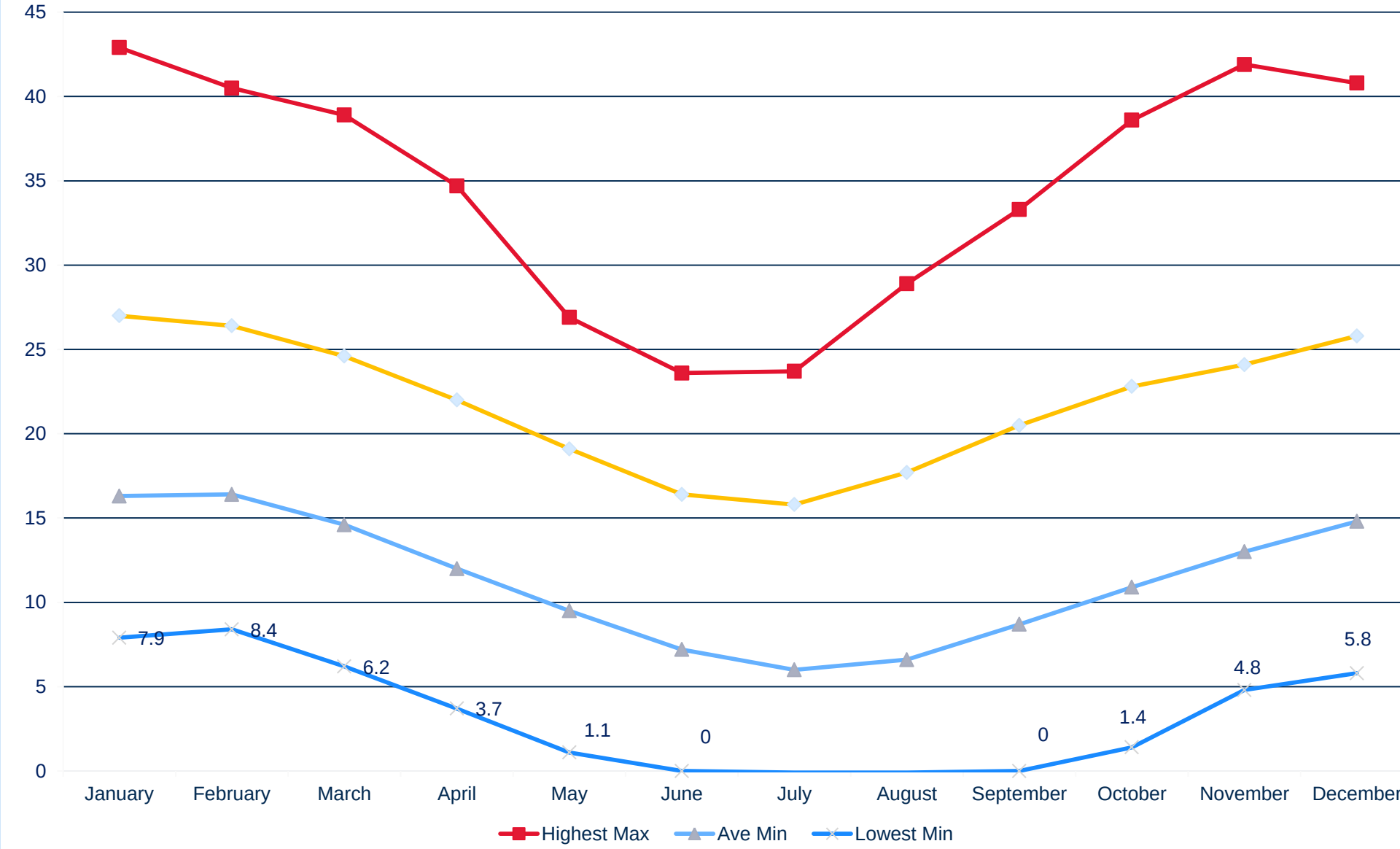
Jonathan Lidbetter, Len Tesoriero and Joshua Jarvis

Background

- Favourable climate
- + Low-medium tech structures
- + Minimal environmental control
- + Low cost substrate
- + Trend to crop specialisation in monocultures
- + Recycling of water
- **+ Disease surviving in local environment**

= Greater disease pressure

Peats Ridge 30 year Climate Averages (1981 -2012)



Structures

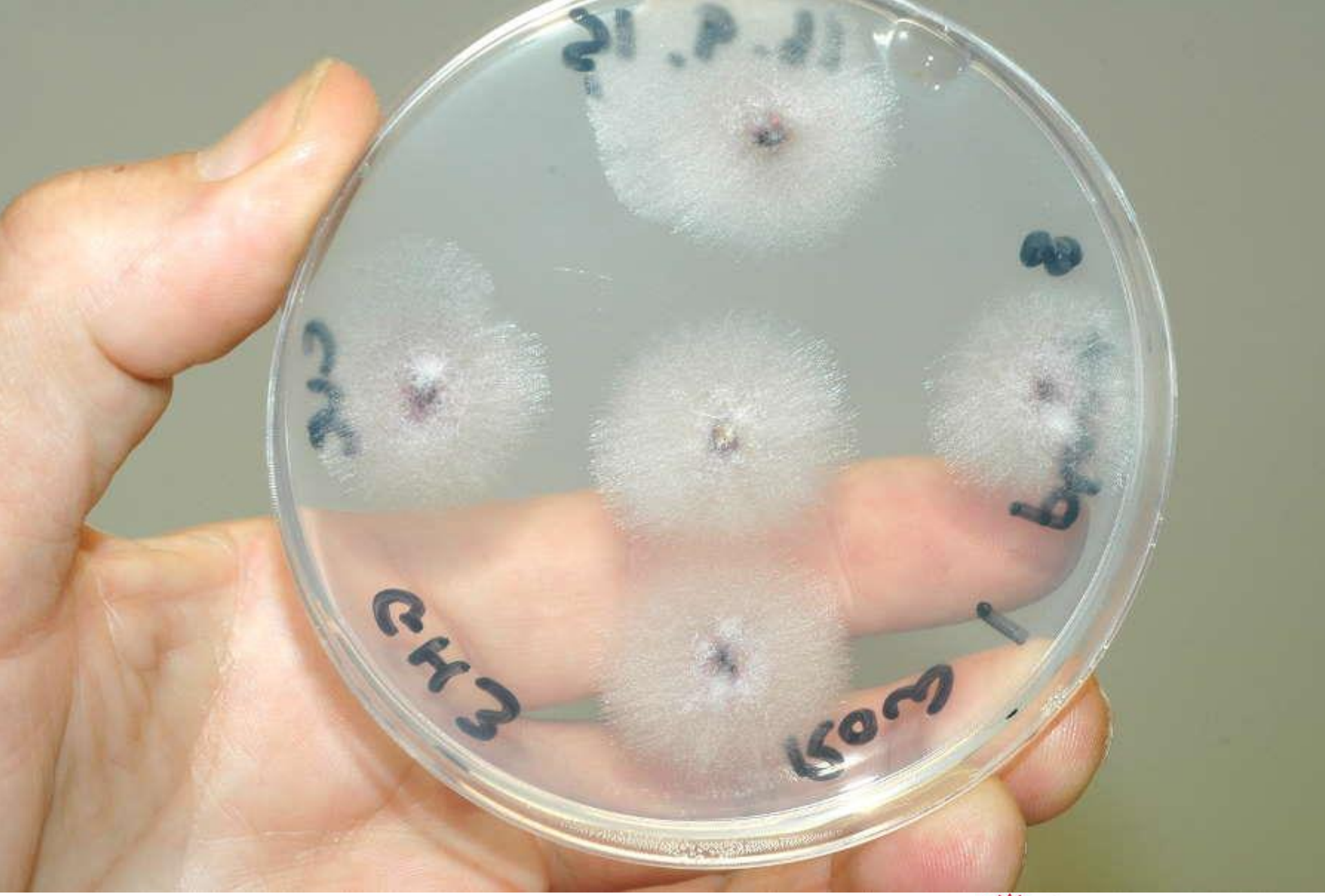
Why graft?

- **Crop insurance** against root diseases for a growing environment with limited control and hygiene

- Potentially a **stronger, longer lasting crop** and **higher marketable yield**

Fusarium

- A fungus infecting the roots crown and stem leading to plant yellowing and wilting
- Leading cause of plant losses variously estimated at 5-95% in NSW farms in different seasons
- Thus greatest cause of yield reduction and reduced profitability



NSW GOVERNMENT Department of Primary Industries

Fusarium wilt

Fusarium oxysporum f.sp. *cucumerinum*

Fusarium risk increased by

- High temperature stress
- Low temperature stress
- High spore load
- Poor media drainage
- High Ammonium(NH_4+): Nitrate (NO_3-)ratios

Experimental environment

- High gutters 4.5m
- Actively heated and cooled – fan/ pad system
- Set points
  - min 13 degrees C
  - max 26 degrees C
  - watering based on light levels
  - Media fresh galuku coir bags

NSW GOVERNMENT | Department of Primary Industries

Fusarium – grafted vs ungrafted

Scion

- *Cucumis sativus* ‘Deena’ RZ

Rootstocks

- *Cucumis sativus* ‘Affyne’ RZ
- *C. moschata* ‘Cobalt’ RZ

Ungrafted comparators

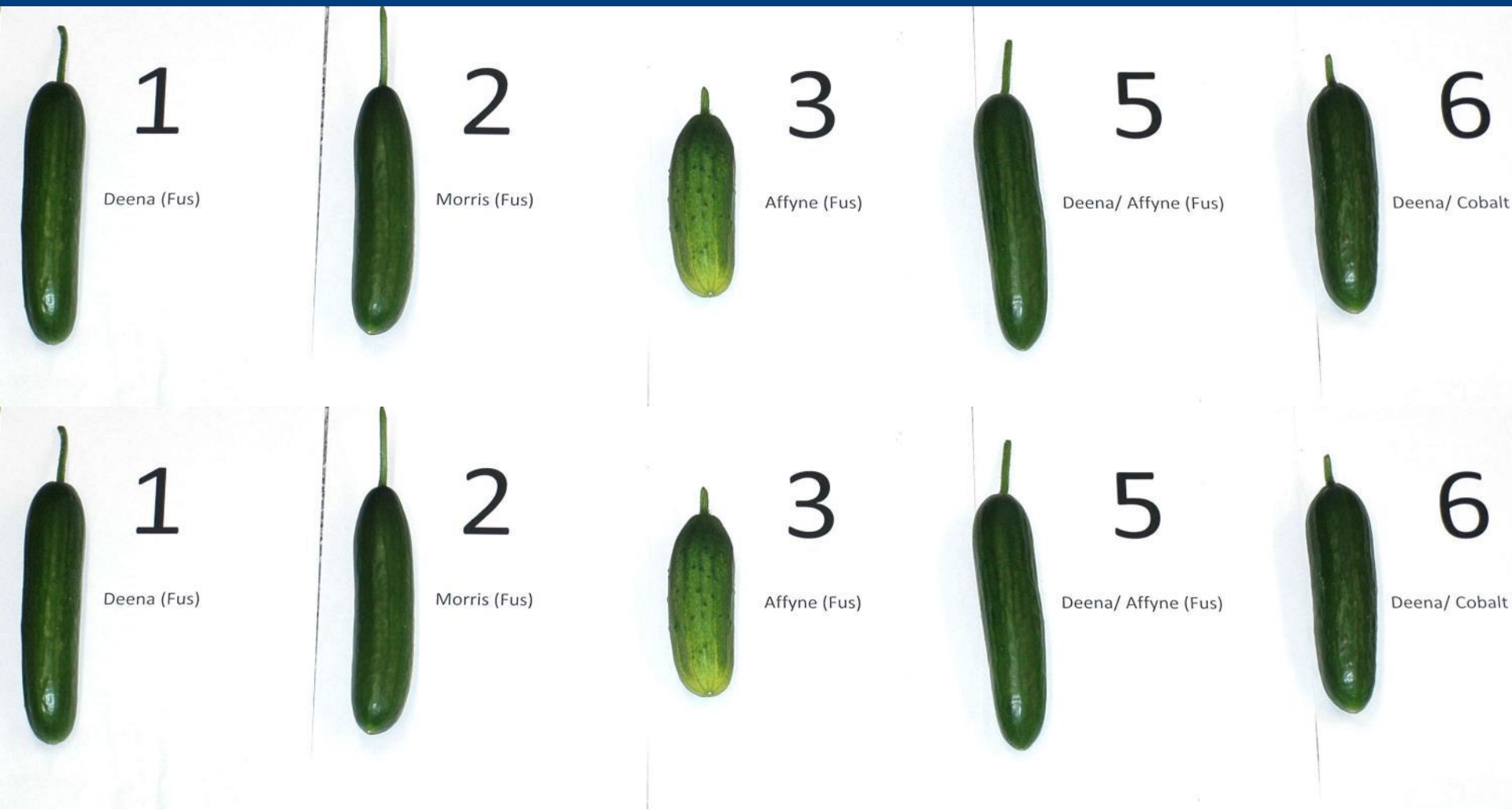
‘Deena’ RZ and ‘Morris’ RZ

Target fruit size and shapes

- 14-20cm
- 120 -240g
- Virtually straight

- 80% of all fruit made spec

Standard fruit shapes



NSW GOVERNMENT Department of Primary Industries

Experiment

Each plant inoculated with 50mL solution containing over 1,000,000 spores/ ml of

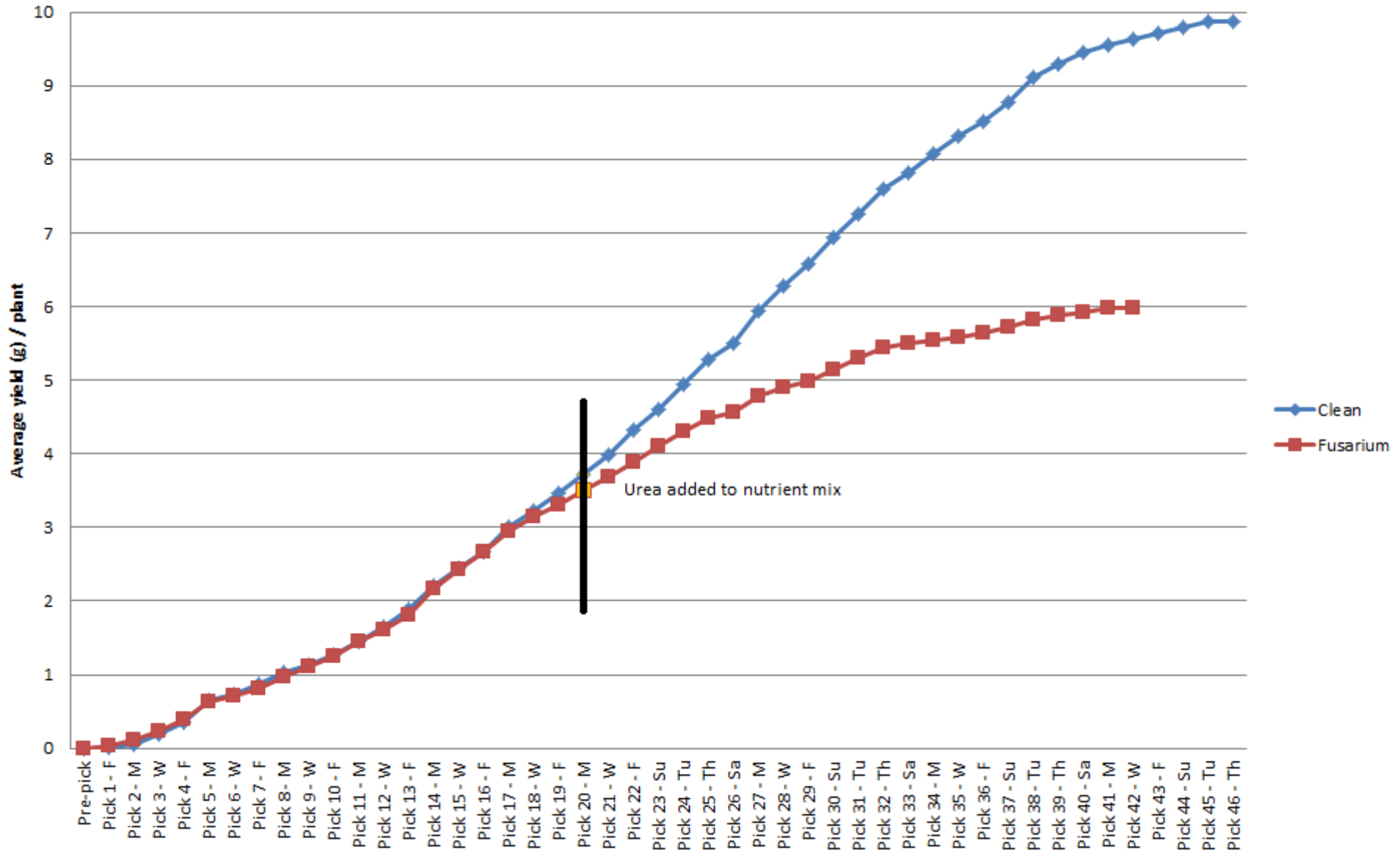
Fusarium oxysporum f.sp. *Cucumerinum (Foc)*

Plants grafted vs ungrafted

Summary

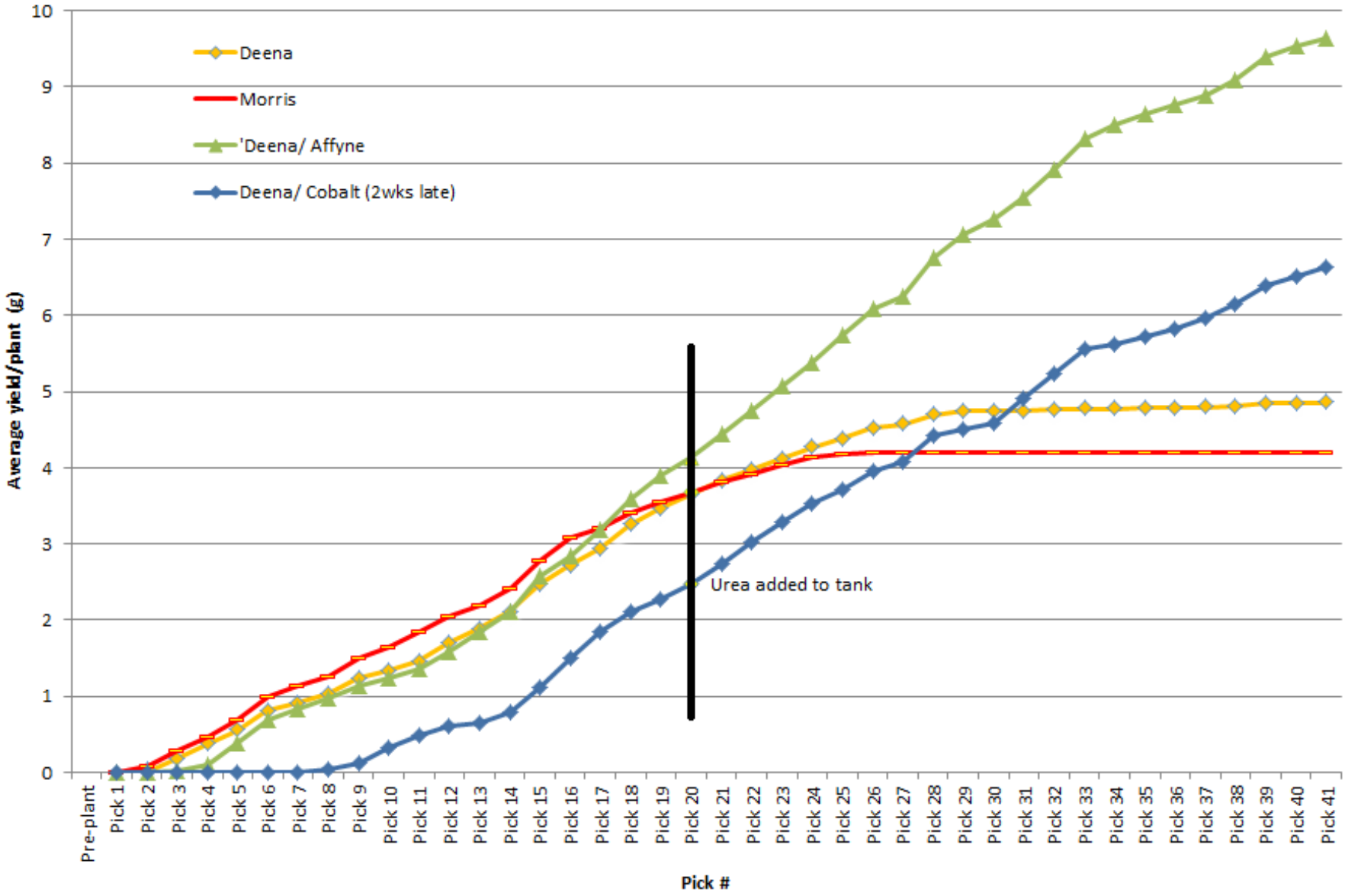
- Plant 10th July – Day 0
- Deena/ Cobalt planted late 24th July– Day 14
- Fusarium inoculation 30th July – Day 20
- 1st pick 14th August – Day 35
- Urea added 28th September (P20) – Day 80
- First Deaths – Day??
- Last pick (P41) 9th November – Day 122 (17 wks)

House average comparison

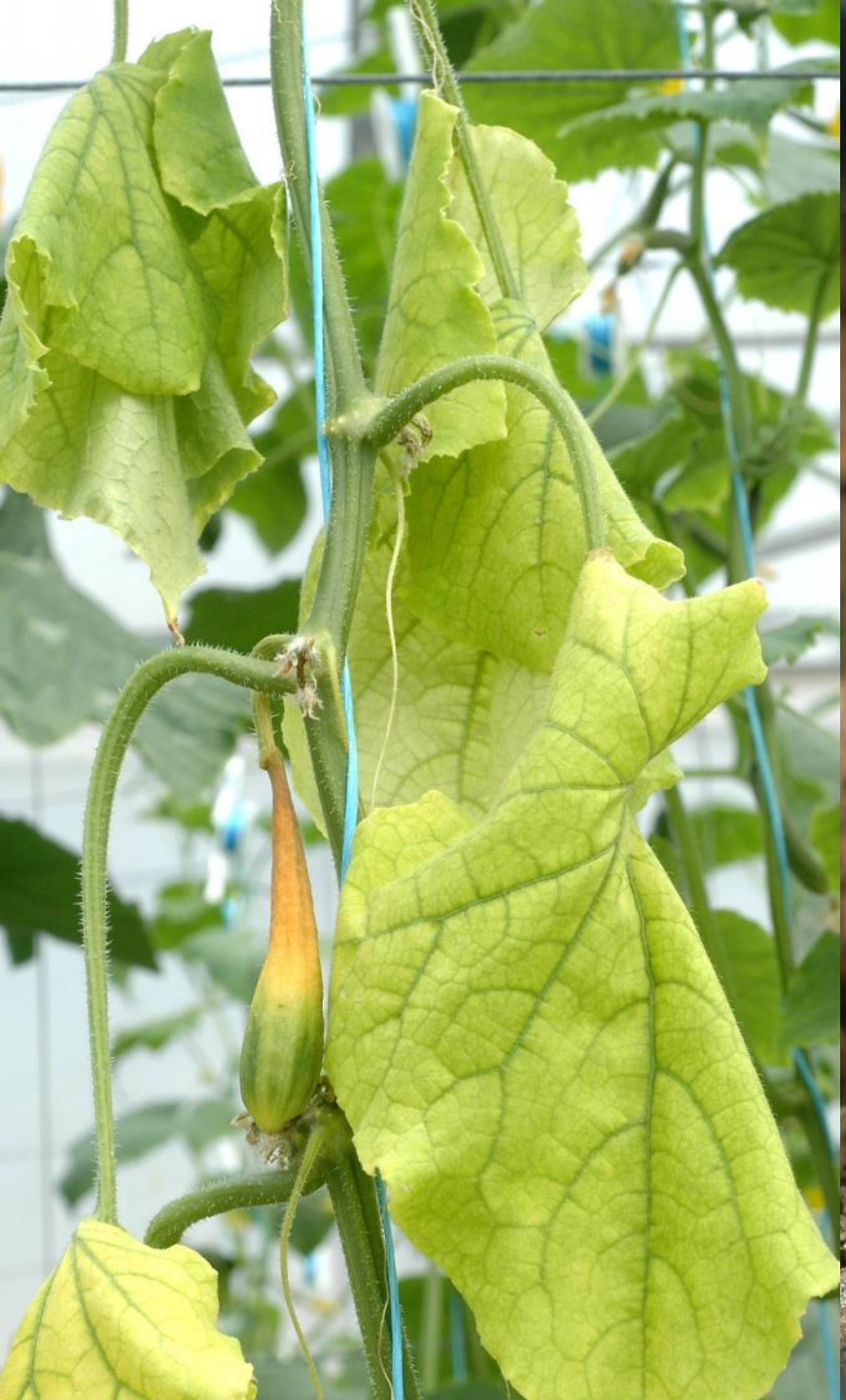


NSW GOVERNMENT Department of Primary Industries

Average yield/plant of treatments in Fusarium house



NSW GOVERNMENT Department of Primary Industries



Plant mortality (deaths) after urea addn

- Morris
- 30% by pick 22
- 100% by pick 27
- (15 days later)

Deena/ Affyne
0% by pick 41!!!

- Deena
- 30% by pick 26
- 95% by pick 30
- (21 days later)

Deena/ Cobalt
15% by pick 30
25% by pick 41
(43 days later)

Summary

- Significant losses in ungrafted Deena and Morris
- Fusarium (Foc) was isolated from all of these plants
- Few losses of grafted plants

Economics

- Grafted plants – extra up front costs

- Benefits
- Increased yield under high Fusarium pressure

- In this extreme case AVERAGE yield was DOUBLED

Discussion

- Foc appears to be a much stronger pathogen in the presence of high Ammonium (NH_4+) levels
- Individual economic and physical considerations of operations will determine the benefit for growers
- Propagator quality will determine if other problems are a potential problem

Thanks

- Phill Ritchie from Rijk Zwaan

NSW GOVERNMENT Department of Primary Industries