The identity and effectiveness of Australian crop pollinators – status and trends

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Pollination is complex – what do we need to know?

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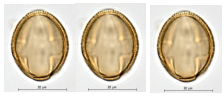
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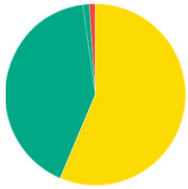

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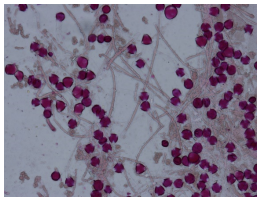
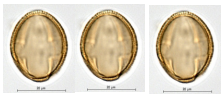



Lets start with the plant breeding system

1.   ?

Essential > great > modest > little >none

Chick peas, rice, grains – still need pollination!
Just not by insects

Insect pollinators also visit wind pollinated plants

Insect Conservation and Diversity / Volume 11, Issue 1

Major Review | Free Access

Insect pollinators collect pollen from wind-pollinated plants: implications for pollination ecology and sustainable agriculture

Manu E. Saunders

First published: 24 June 2017
https://doi.org/10.1111/icad.12243
Cited by: 2

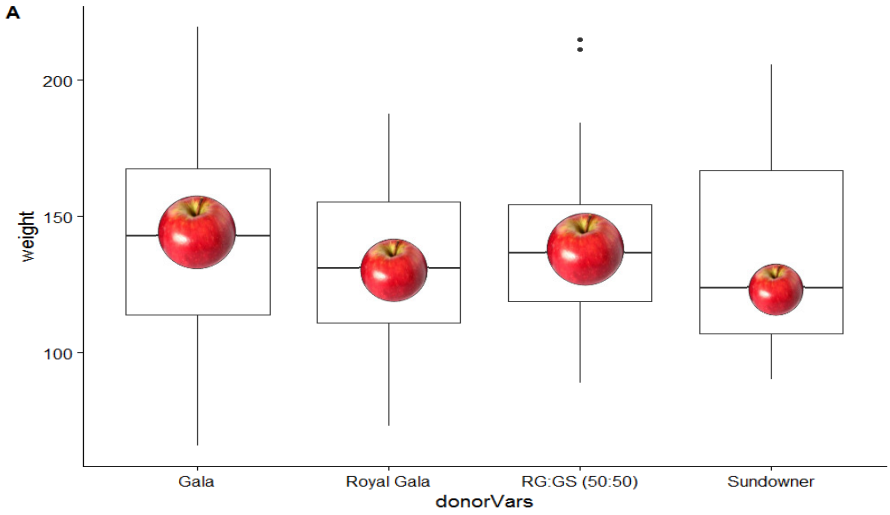
- Pollinators visit 101 wind-pollinated plant genera in 25 families
- 49% were visits to grasses and sedges
- bees and/or syrphid flies visit 10 economically important wind-pollinated crop plant species, including three major grain crops (rice, corn, and sorghum)

Differences in Pollinator dependency?

Crop species	Crop name	Breeding	Pollination without visitors	Pollinators and visitors	Positive impact by animal pollination
Vegetable crops					
Abelmoschus esculentus	Okra, Gumbo	hermaphrodite, self-compatible	passive self-pollination	honey bees (***Apis cerana***), solitary bees (***Halictus* spp.**)	**modest** in Crane 1991; Hamon 1991; in Free 1993
Cajanus cajan	Pigeon pea, Cajan pea, Congo bean	hermaphrodite, self-compatible	passive self-pollination	honey bees, solitary bees (*Megachile* sp., *Xylocopa* sp., *Chalicodoma* sp.)	**little** James *et al.* 1989; Grewal *et al.* 1990; in Free 1993; in Heard 1999
Canavalia ensiformis, C. gladiata, C. marittima, C. microcarpa, C. virosa	Jack bean, Horse bean, Sword bean	hermaphrodite, self-compatible	passive self-pollination, wind pollination	solitary bees (*Xylocopa confusa*)	**modest** in Free 1993; Gross 1993 for *C. rosea*
Capsicum annuum, C. frutescens	Chile pepper, Red pepper, Bell pepper, Green pepper	hermaphrodite, self-compatible	wind- or insect-mediated shaking necessary for self-pollination,	honey bees, stinglee bees (***Melipona favosa, M.***	**little** Jarlan *et al.* 1997a,b; Meisels & Chiasson 1997; Raw 2000; Dag & Kammer 2001; Ercan &

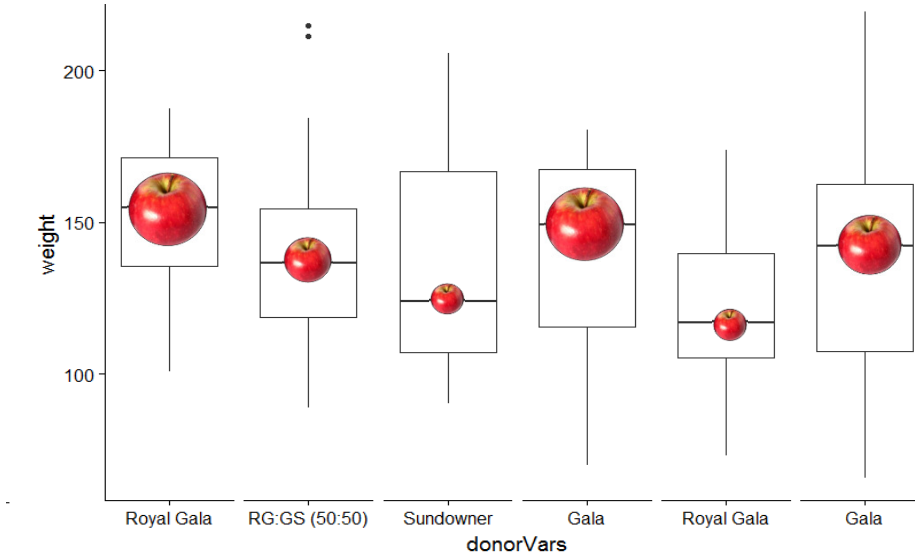
Klein et al. 2007 Proceedings of the Royal Society B: Biological Sciences

Differences in fruit weight across donor varieties



Stavert et al. (in prep.). Pollen deposition is a poor indicator of apple reproductive success

Variation in weights across donor varieties and block



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Pollination is complex – what do we need to know?

1. 

2. 

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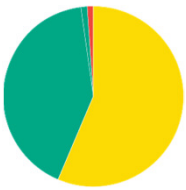

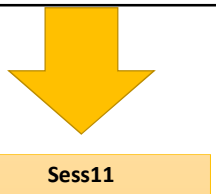

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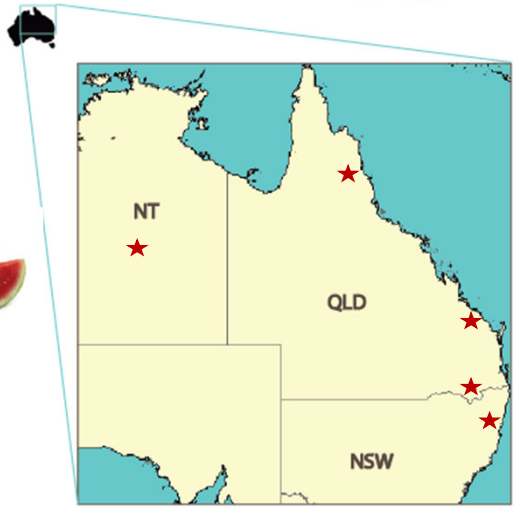
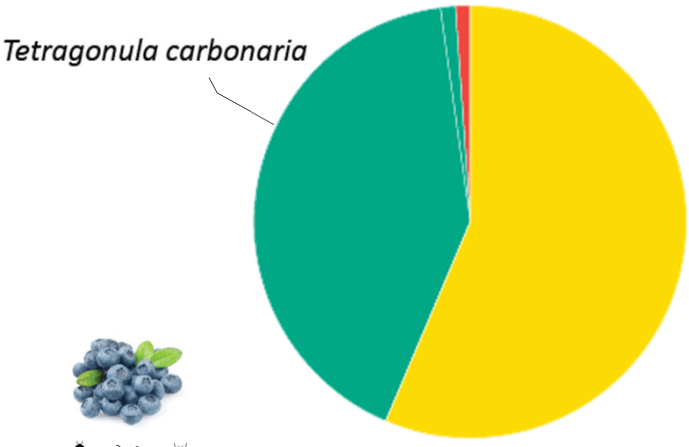
11:30-12:10 sat
The pollination contribution of stingless bees to 5 Australian crops

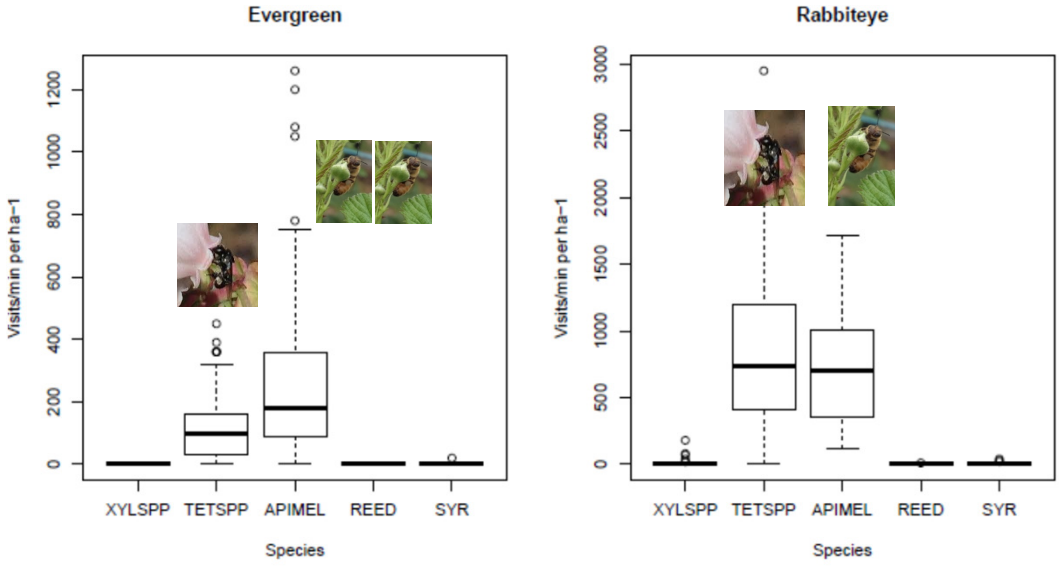
2. Who visits which crop where?



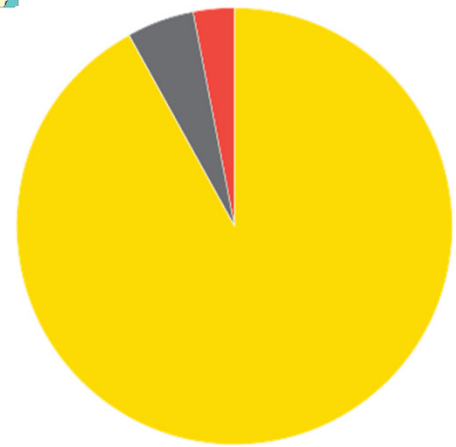
Blueberry
Coff's Harbour, NSW 2016 & 2017



Flower visits can differ by cultivar:



Apple
Stanthorpe, QLD 2017

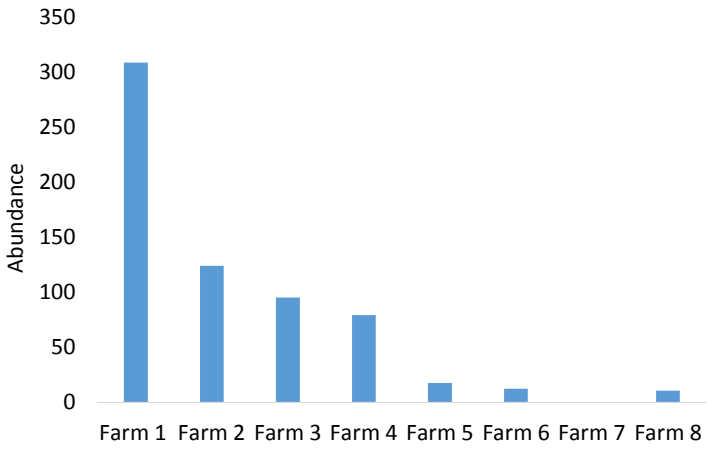


Apis mellifera

Lucillia spp.
Syrphidae

Other flower visitors

Stanthorpe – apple pollination



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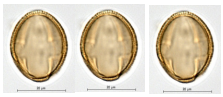
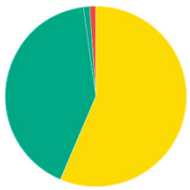
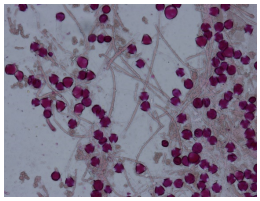
1.   ?

2.   

3.     

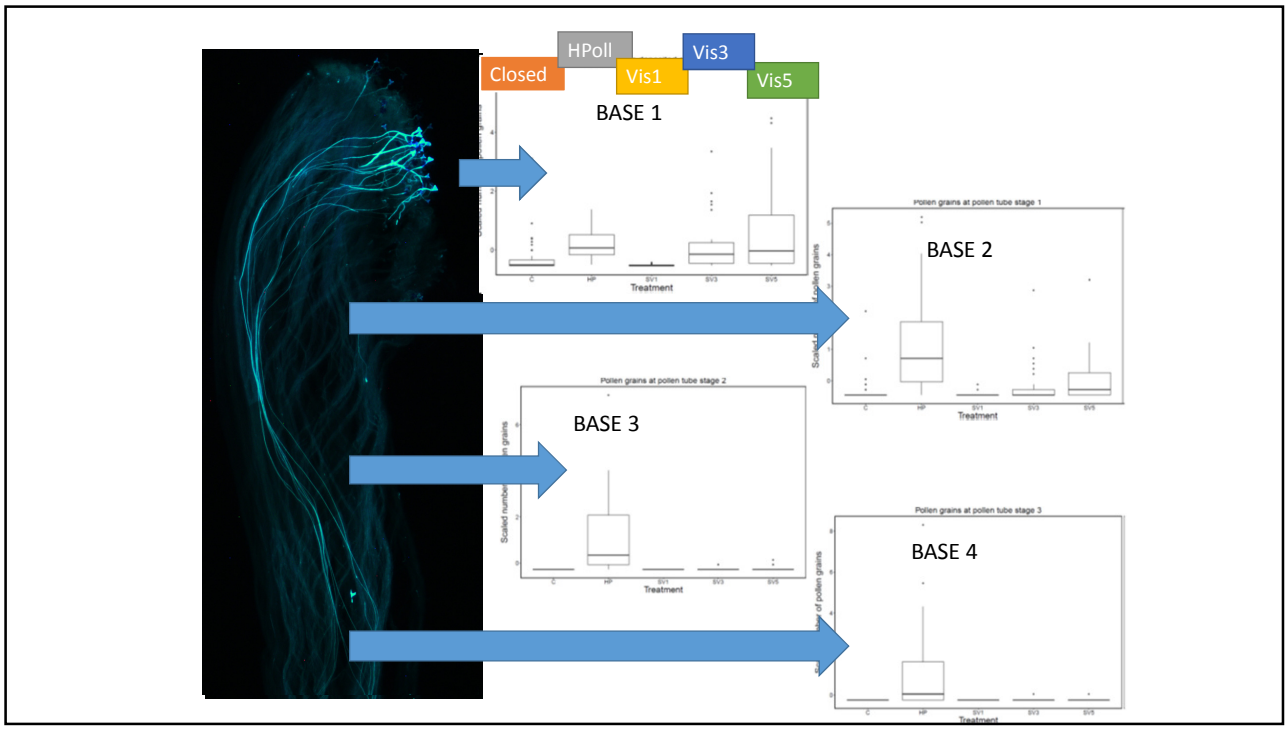
Closed

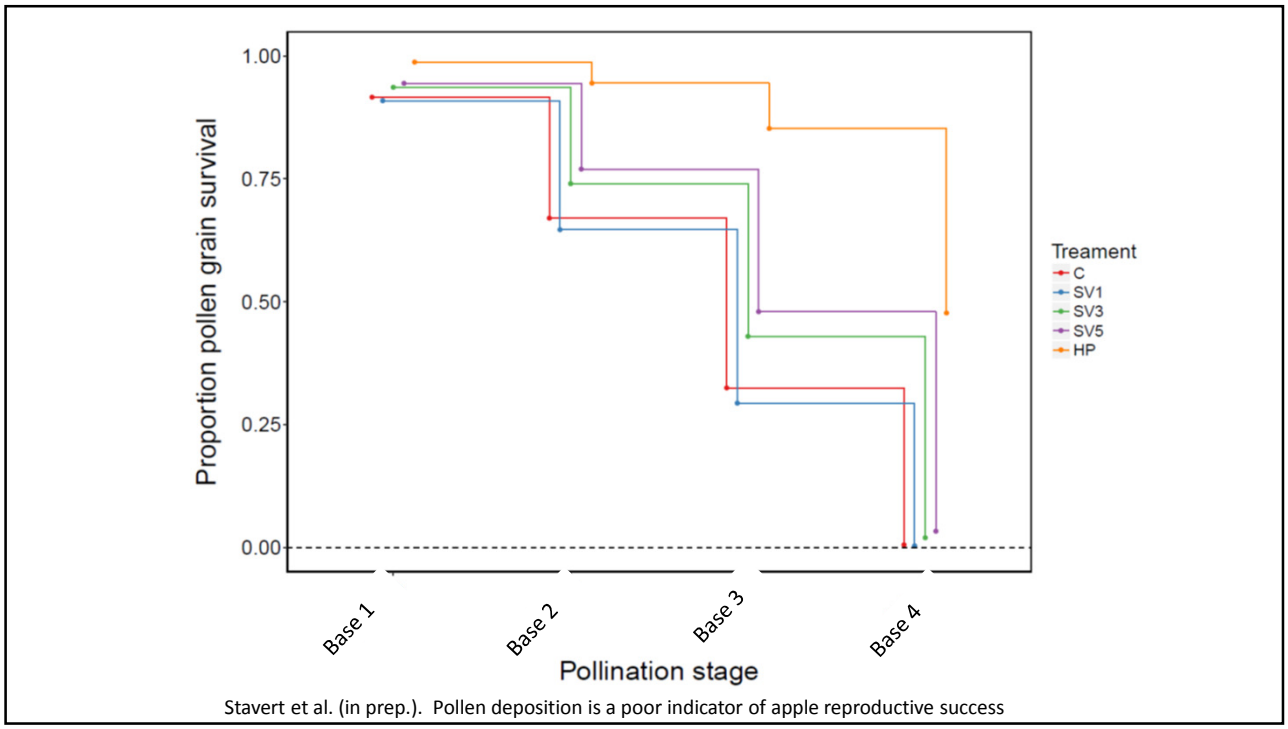
HPoll

Vis1

Vis3

Vis5





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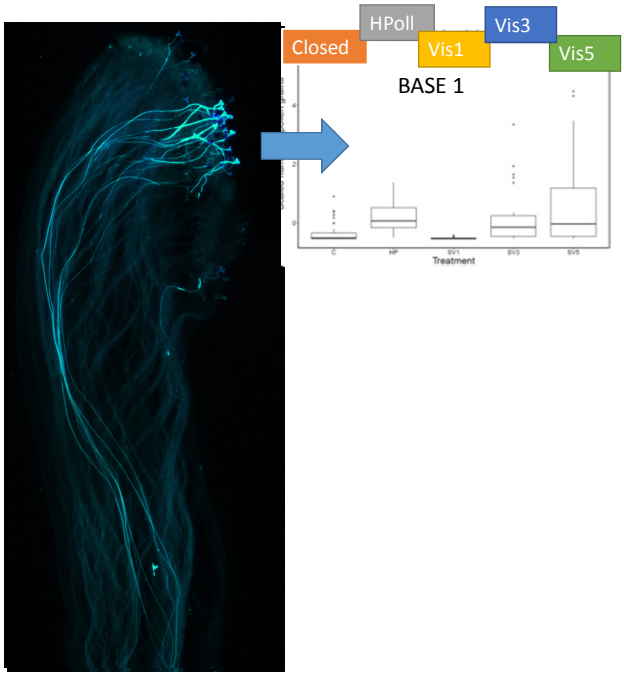

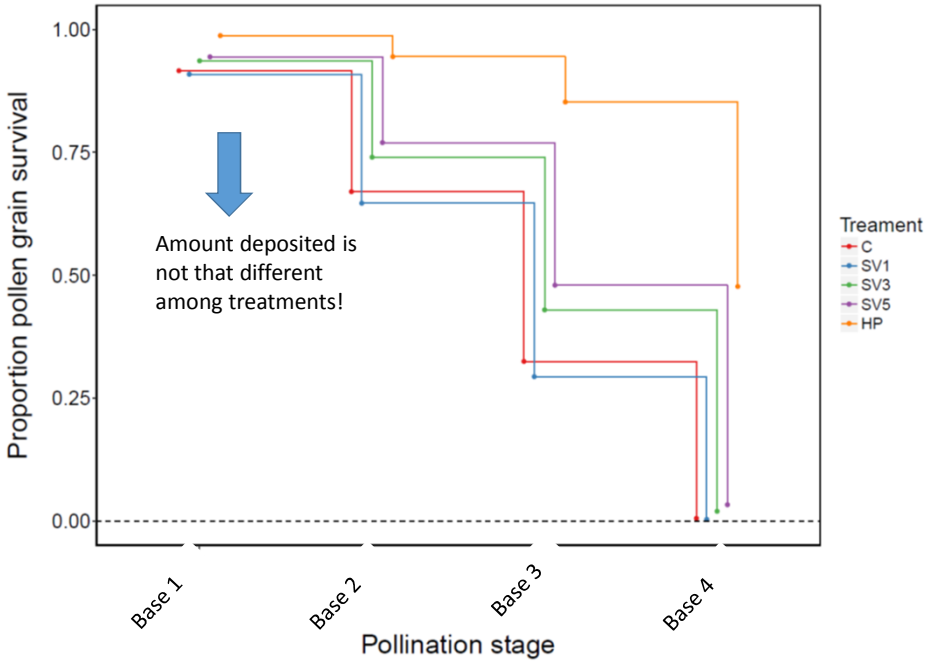

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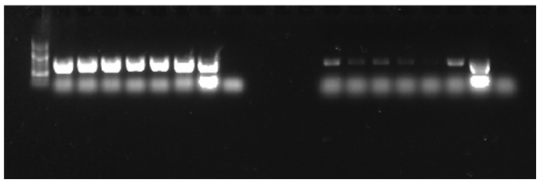
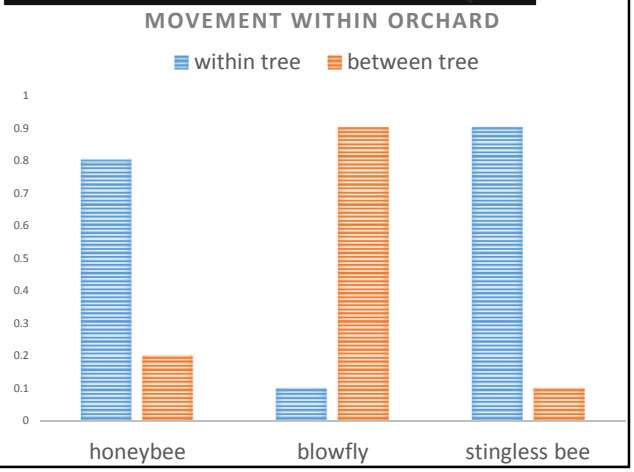
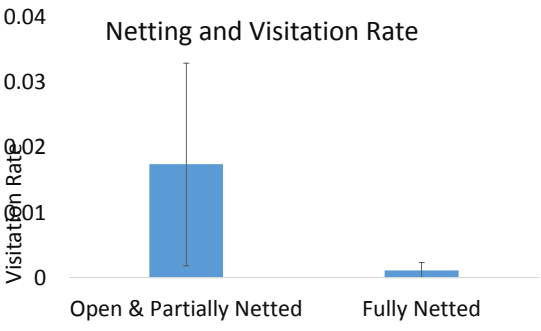
Understanding more about pollinator x plant...





Understanding more about pollinator x plant...



Conclusions:

1. Pollination is complex !
2. Need to understand plant needs as well as pollinator to maximize yield
3. Pollinator efficiency important as it impacts fruit set and quality (more on this tomorrow….)
4. Need to look more at:
   - pollinator behaviour
   - movement patterns,
   - configuration of orchard,
   - surrounding landscape,
   - local management (netting, pesticides etc.)

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Questions?…

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The Ian Potter Foundation
Plant & Food RESEARCH
Australian Government Department of Agriculture and Water Resources

Managed and Wild Bees Found in Our Focal Crops

	Bundaberg, QLD	Coff's Harbour, QLD		Katherine, NT		Mareeba, QLD	Stanthorpe, QLD
Apis cerana						✓	
Apis mellifera	✓	✓	✓	✓	✓	✓	✓
Braunsapis spp.				✓			
Ceylalictus perditellus				✓			
Homalictus spp	✓		✓	✓	✓	✓	
Hylaeus spp						✓	
Lasioglossum spp.							✓
Megachile micrythrura				✓			
Tetragonula spp	✓	✓	✓	✓	✓	✓	
Xylocopa spp	✓					✓	
Unknown Small Native Bees	✓					✓