

**AUSTRALIAN
MANGOES**
**SCIENTIFIC
SYMPOSIUM**

20 MAY,
CAIRNS

connect, inspire, innovate 2024

Hort Innovation MG220000
Managing mangoes for future
climates

**Manipulating flowering and
harvest timing**

Marcelo Amaral, Kerry Walsh,
Cameron McConchie and
Geoffrey Dickinson.



WHY THINK ON CONTROL OF FLOWERING?

- To match production to market
- Imagine programmed year-round production
- To avoid production in adverse weather periods (e.g. wet To avoid flood season up north).
- To adapt to climate changing



UNDERSTANDING THE MANGO CROP CYCLE



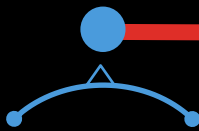
Dormancy
It's a period that happens after the flush hardening before the next bud.



Flowering
Definition of a reproductive behavior, also start of heat units' clock to harvest.



HARVEST!!



Flushing
Trees recovering after harvest putting up a vegetative growth

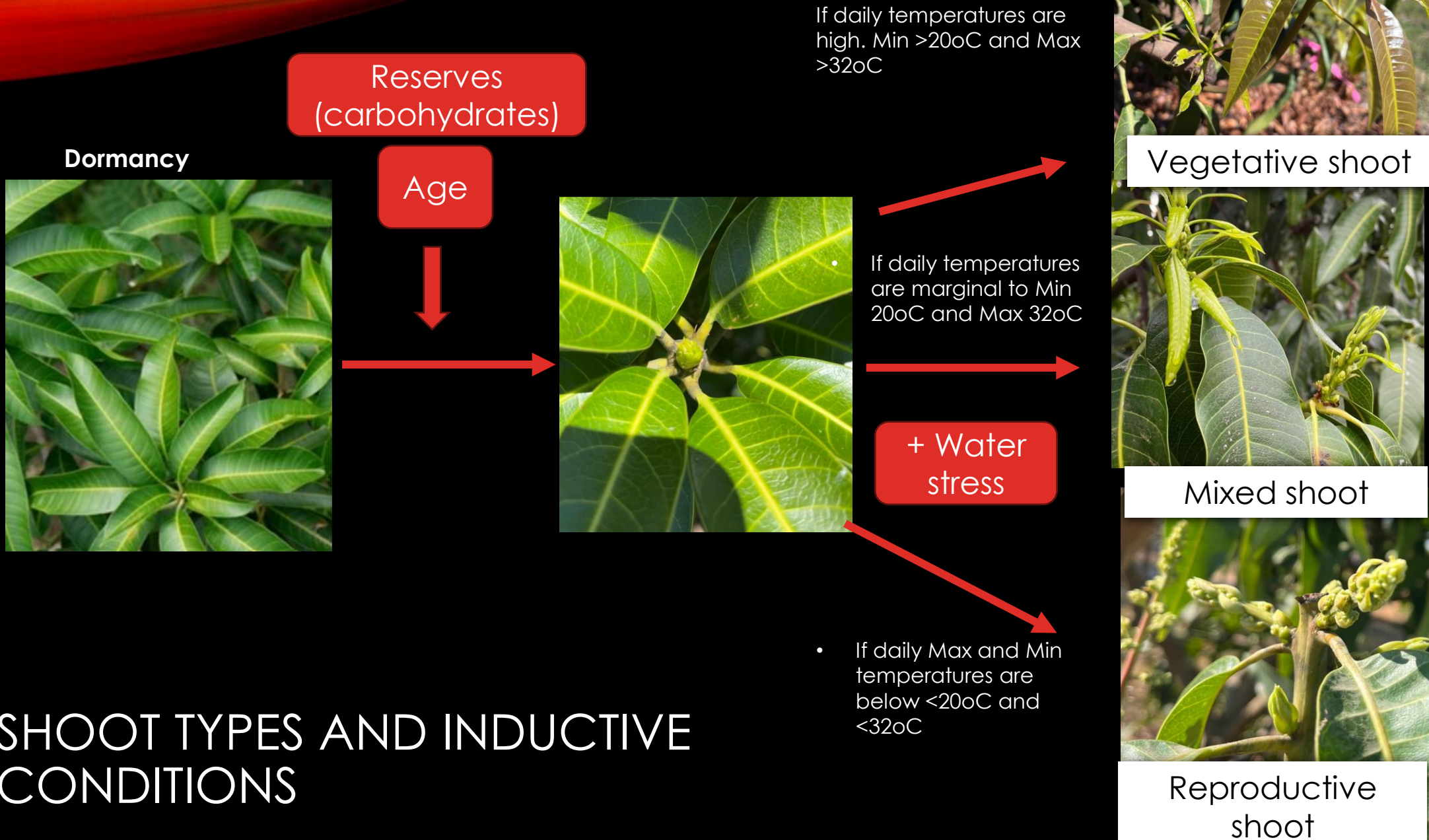


Bud emergence
It happens after dormancy and under the right circumstances it can turn into a reproductive shoot



Fruit development
Fruit growth and development period

SHOOT TYPES AND INDUCTIVE CONDITIONS





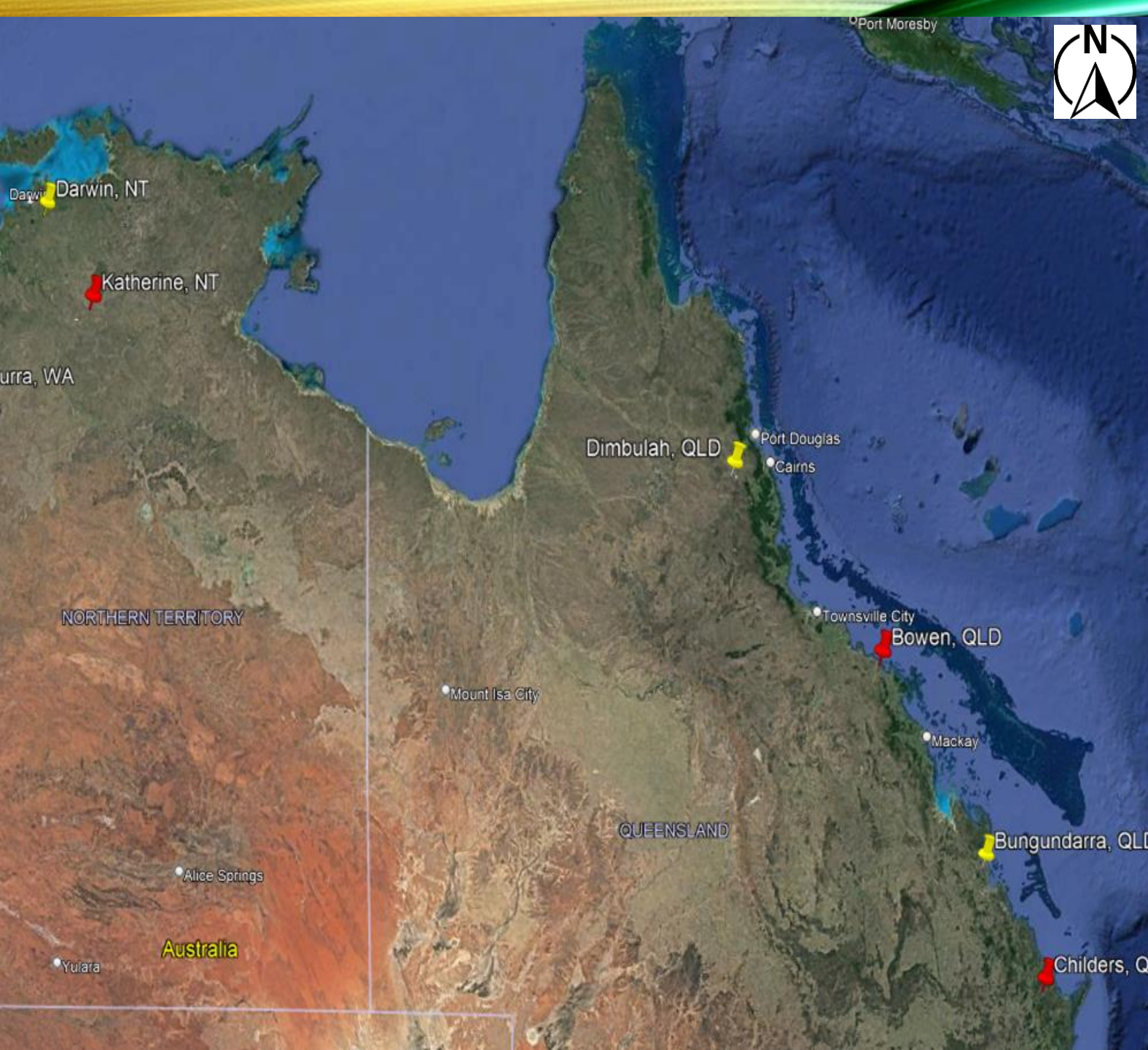
Semiárido

BACKGROUND: FLOWERING MANIPULATION IN BRAZIL

- The Brazilian Agricultural Research Corporation (**Embrapa**) recommends (for the semi-arid region):
 1. PBZ to inhibit GA synthesis induce flush dormancy.
 2. K₂SO₄ sprays (2 or 3 applications at 2.0-2.5% w/v) to halt vegetative growth
 3. Ethephon or ethylene (200-300 ppm) release to promote vegetative bud maturation and flower induction (not effective in isolation)
 4. NO₃ (sprays at 2-4% w/v) to promote bud emergence.

<https://www.embrapa.br/agencia-de-informacao-tecnologica/cultivos/manga/producao/tratos-culturais/manejo-da-floracao>. [Pt-br]





FIELD SITES

Season 1 2023-24

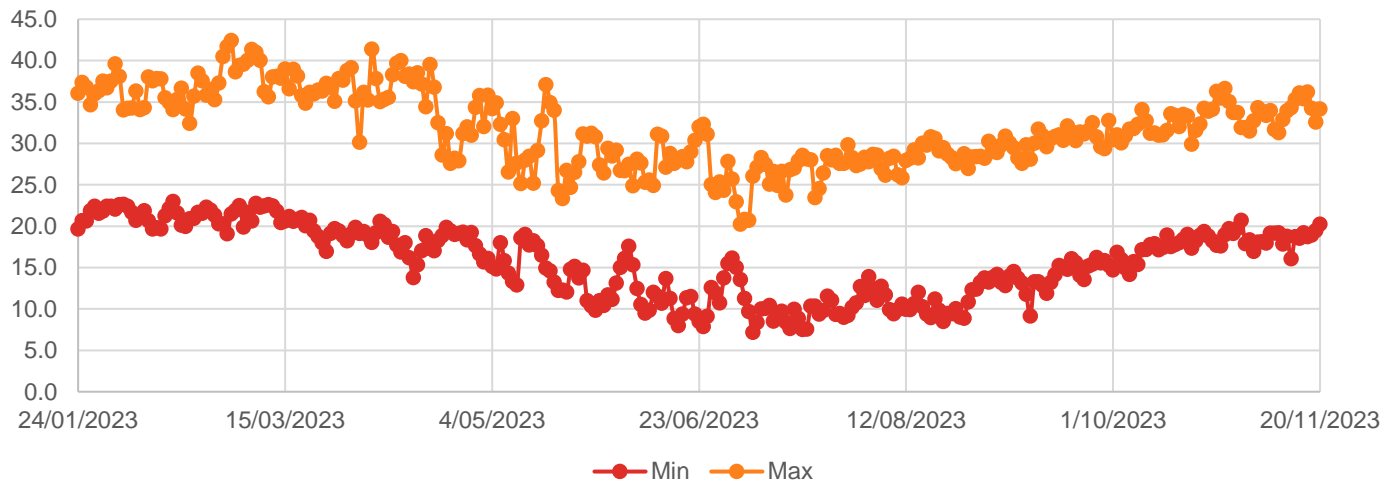
- Darwin NT << cv B74 "Calypso"
- Dimbulah, Far North QLD <<cv B74 "Calypso"
- Rockhampton, Yeppoon Central QLD < cv HoneyGold

Season 2 and 3 2024-25, 2025-26.

- Darwin NT
 - Katherine NT
 - Bowen, Ayr or Burdekin (NQLD)
 - Dimbulah, Mareeba (FNQLD)
 - Bungundarra, Yeppoon (CQLD)
- Other cultivars involved in smaller exercises:
- KP
 - R2E2
 - Keitt
 - NMBP
 - Agams

EXPERIMENTATION: TIP PRUNING AND TEMPERATURE


Figure 1. Maximum and Minimum (on-farm) temperatures in Dimbulah, FNQ region



Build a cv specific model on required temperatures for floral induction



SHOOT DIFFERENTIATION FROM TIP PRUNING

Vegetative shoots >60% 

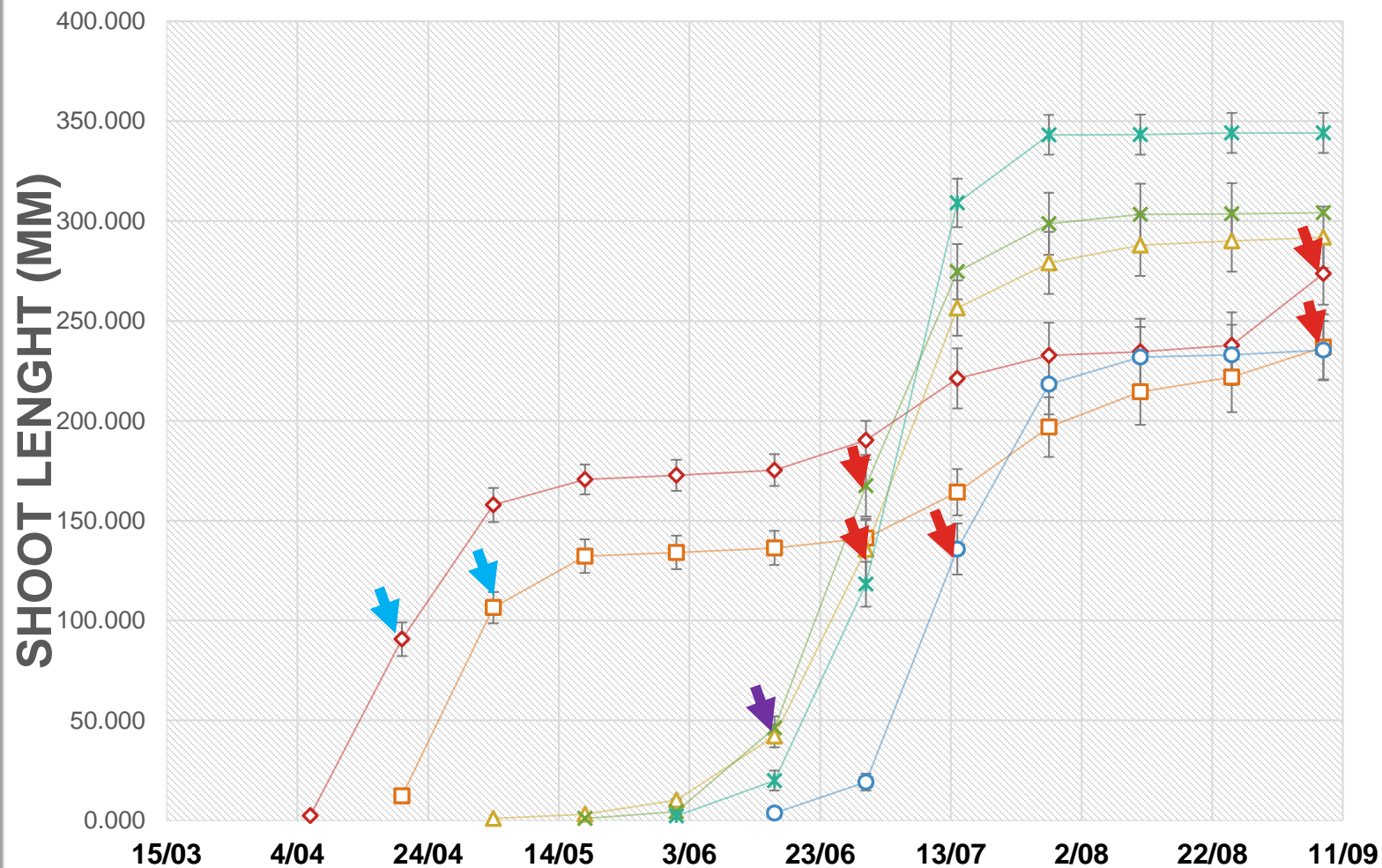
Mixed shoots >60% 

Reproductive >60% 

Shoot re-growth (vegetative and reproductive) following tip pruning of cv Calypso at six times

Different shoot types are represented by different coloured arrows

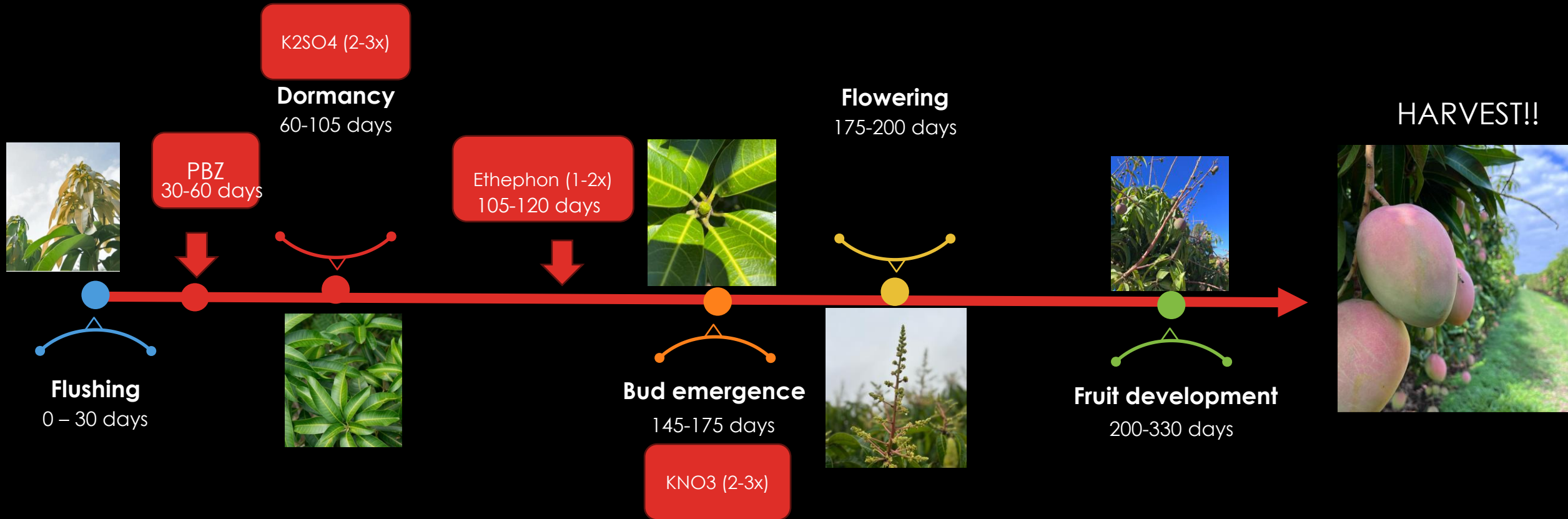
 23-Mar
  6-Apr
  20-Apr
  4-May
  18-May
  1-Jun



RESULT: PRUNING FOR UNIFORM FLOWERING

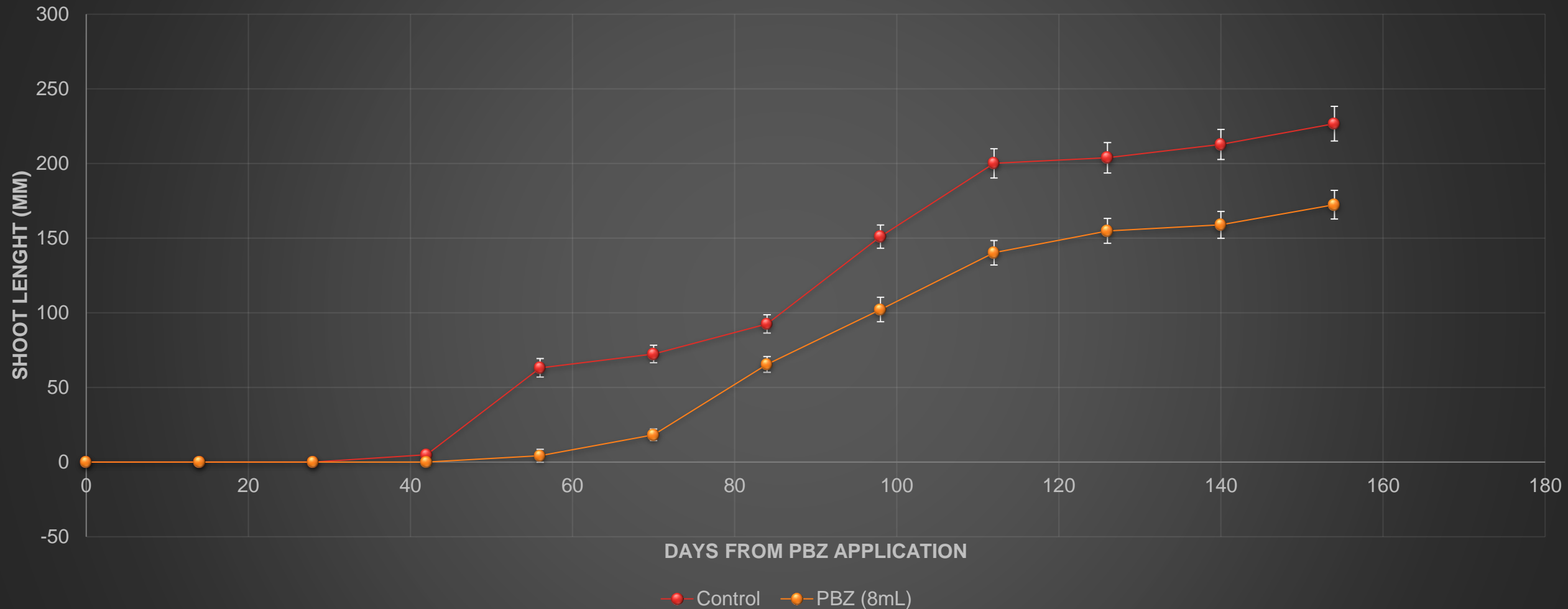


EXPERIMENTATION : CHEMICAL MANIPULATION



CHEMICALS TO CONTROL FLOWERING

PBZ application (via irrigation) on cv B74 'Calypso' in Darwin region...effect on vegetative shoot length (mm) (n=420)



RESULT: CHEMICALS TO CONTROL FLOWERING

ADVANTAGES: BETTER UNIFORMITY, EARLY HARVEST, HIGHER YIELDS

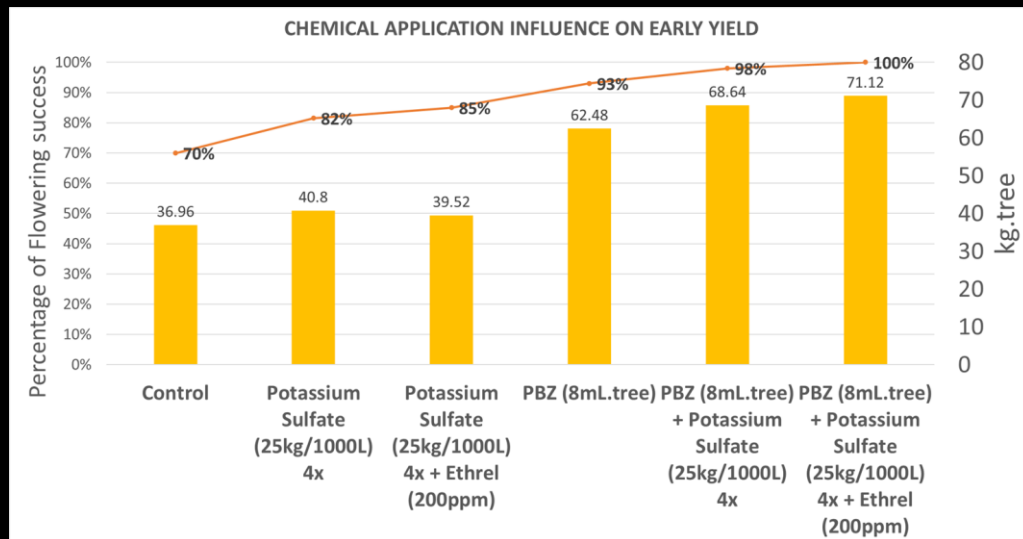
DISADVANTAGES: POTENTIAL NEGATIVE EFFECTS IF ABUSED

Effect of PBZ, Potassium sulfate (K₂SO₄) and Ethephon on the "number of days until terminals reached 50% flowering" for 'B74 Calypso' in Darwin and Far North Queensland regions.

Treatment/Location	Days to 50% of flowering		
	Mango cv B74		
	Dimbulah	Darwin	Avg
Control	102 (±5)	81 (±5)	92
PBZ 8mL	85 (±3)	64 (±2)	75
PBZ 8mL + 2% K ₂ SO ₄	92 (±3)	74 (±3)	83
PBZ 8mL + Ethephon 200ppm + 2% K ₂ SO ₄	87 (±6)	75 (±3)	81

Chemical side-effects on tree health (a) paclobutrazol application, (b) Ethephon thinning effect on foliage (c) ethephon burn in shoots If used under high temperatures.

For an B74 orchard in Dimbulah, Far North QLD - harvested on 16 Nov



HEAT UNITS FOR FRUIT DEVELOPMENT

Summary of DMC (mean \pm SD) and flesh colour in cultivars ordered by GDD

Cultivar	GDD	DMC (% w/w)	Flesh colour
KP	1578 (\pm 91)	16.4% (\pm 0.1)	7 (\pm 1.6)
NMBP 1243	1589 (\pm 67)	16.5% (\pm 1.2)	12 (\pm 0.9)
Agam	1591 (\pm 94)	18.0% (\pm 1.4)	10 (\pm 1.2)
NMBP 1201	1602 (\pm 67)	15.3% (\pm 0.1)	11 (\pm 1.8)
Calypso	1710 (\pm 40)	15.2% (\pm 1.3)	7 (\pm 1.0)
HoneyGold	1756 (\pm 61)	16.4% (\pm 1.1)	9 (\pm 0.6)
R2E2	1759 (\pm 49)	15.9% (\pm 0.1)	9 (\pm 0.9)
NMBP 4069	1798 (\pm 68)	16.0% (\pm 0.1)	11 (\pm 1.4)
Keitt	2156 (\pm 118)	14.6% (\pm 0.9)	11 (\pm 1.7)
Palmer	2238 (\pm 63)	14.5% (\pm 0.7)	8 (\pm 1.4)



CONCLUSION AND FUTURE RESEARCH

- Repeat tip pruning trials in different regions and cultivars with the aim to better understand Australian cultivars under different growing conditions.
- Propose temperature “chill units” models for flowering induction
- Trial combination package of PBZ + K₂ SO₄ + Ethephon + KNO₃ with timing and doses adjusted to the cultivars and growing conditions.
- Recommendation on PBZ timing
- Support molecular work on understanding buds' differentiation QUT
- Repeat GDD work on other cultivars (R2E2, Agam, NMBPs, Lady Gracie, Lady Jane and NDM) and regions