The effect of DPA on internal browning of ‘Cripps’ Pink’ apples

Anél Botes

CA meeting – 5 November 2019

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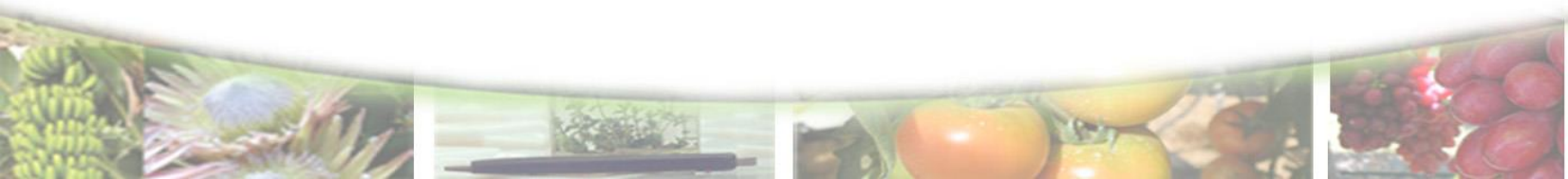
Introduction

- DPA is an antioxidant – suppress superficial scald and reduces internal browning (IB)

- DPA prevents the development of CO_2 injury during storage of 'Fuji' (Argenta *et al*., 2002) and 'Honeycrisp' apples (Cantreras, 2014)

- Fruit that was treated with 1-MCP and stored in CA, without DPA, developed internal browning and cavities (Mattheis and Rudell, 2008)

- Since 2015 higher incidence of IB on SA fruit (Fuji) which might be linked to the fact that DPA is not used



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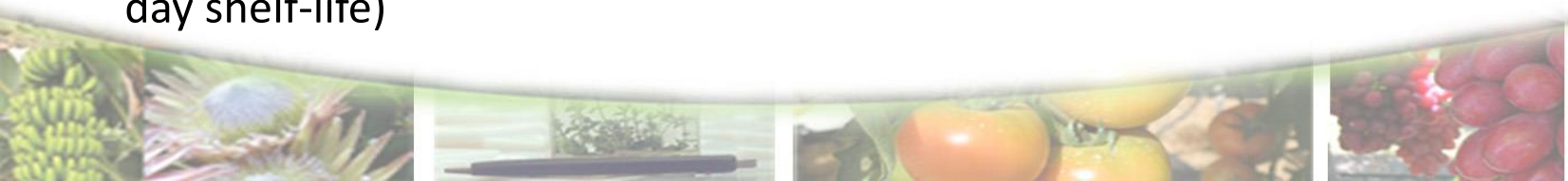
Aim and Objectives

- Aim:
  - to determine if other quality benefits can be attributed to DPA application

- From these results the current recommended gas regimes for South African pome fruit might need to be re-evaluated

Materials and Methods

- Optimum harvested Cripps' Pink (2017 and 2018)
- Production areas: Grabouw and Ceres
- Three sites from each production area
- Treatments:
  - DPA + RA
  - DPA + CA (recommended – 1.5% O_2 + 0.5% CO_2)
  - DPA + HCA (1.5% O_2 + 2.5% CO_2)
  - CA (1.5% O_2 + 0.5% CO_2)
  - RA
  - SF+CA at 1°C (2018)
- Storage temperature: -0.5^{o}C
- Fruit quality evaluations done after 3, 6 and 9 months storage (+ 6wk RA + 7 and 14 day shelf-life)



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Materials and Methods

Fruit quality parameters:

- Total soluble solids (TSS)
- Titratable acidity (TA)
- **Firmness (kg)**
- **Skin colour (scale 1-5)**

Physiological disorders:

- **Internal browning (%)**
- All other internal and external disorders

Sensory evaluation:

- Appearance (1-10)
- Taste (1-10)
- Texture (1-10)
- Off-taste (1-10)

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Results and Discussion

2017

Maturity index	Site 1	Site 2	Site 3
Skin background colour (scale 1-5)	2.94 ± 0.15	2.86 ± 0.02	2.73 ± 0.09
Firmness (kg)	8.33 ± 0.37	8.52 ± 0.18	8.26 ± 0.25
TSS (°Brix)	14.62 ± 0.24	14.10 ± 0.25	13.68 ± 0.30
TA (g/100mL)	0.84 ± 0.07	0.82 ± 0.04	0.92 ± 0.01
Starch conversion (%)	48.6 ± 7.1	52.4 ± 14.6	44.0 ± 6.82

2018

Maturity index	Site 1	Site 2	Site 3
Skin background colour (scale 1-5)	2.76 ± 0.09	2.83 ± 0.07	2.43 ± 0.22
Firmness (kg)	8.50 ± 0.37	7.78 ± 0.07	8.20 ± 0.33
TSS (°Brix)	13.7 ± 0.4	13.9 ± 0.5	14.2 ± 0.2
TA (g/100mL)	0.90 ± 0.20	0.88 ± 0.12	1.13 ± 0.18
Starch conversion (%)	47.6 ± 14.0	46.38 ± 12.69	25.75 ± 8.23

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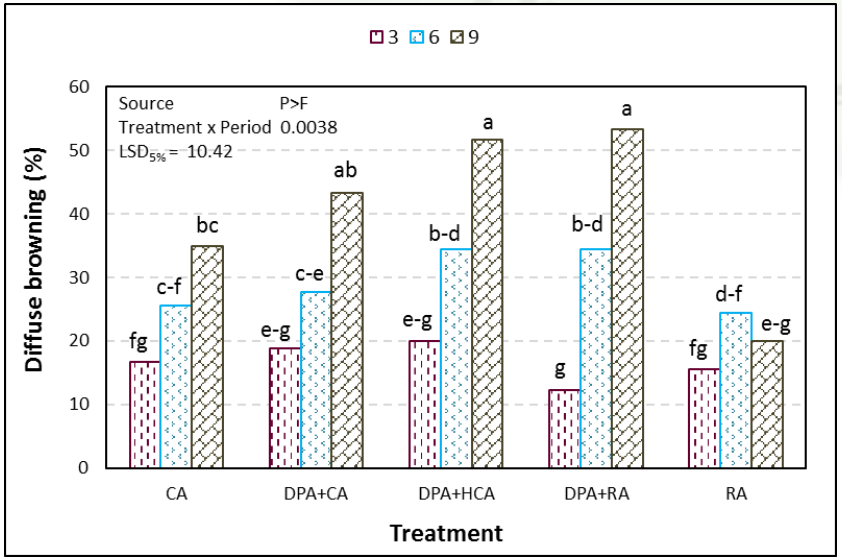
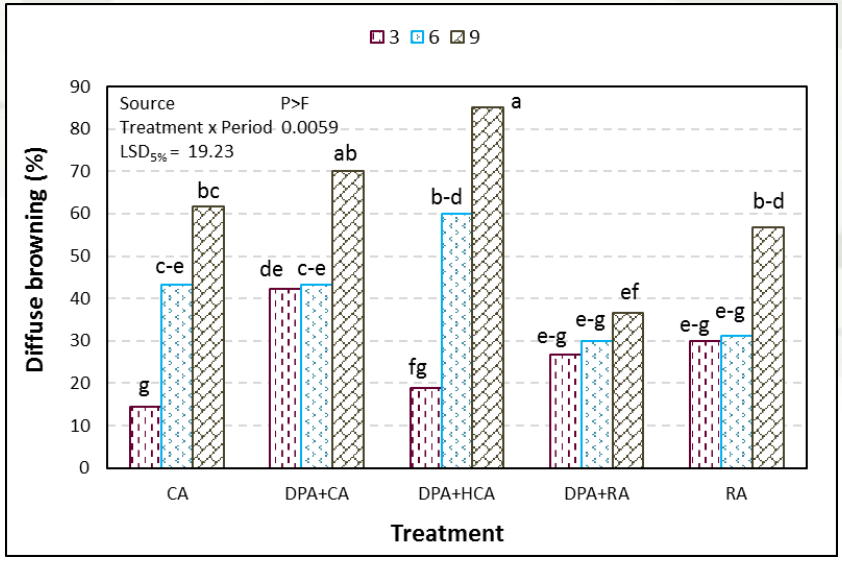
Results and Discussion (2017)

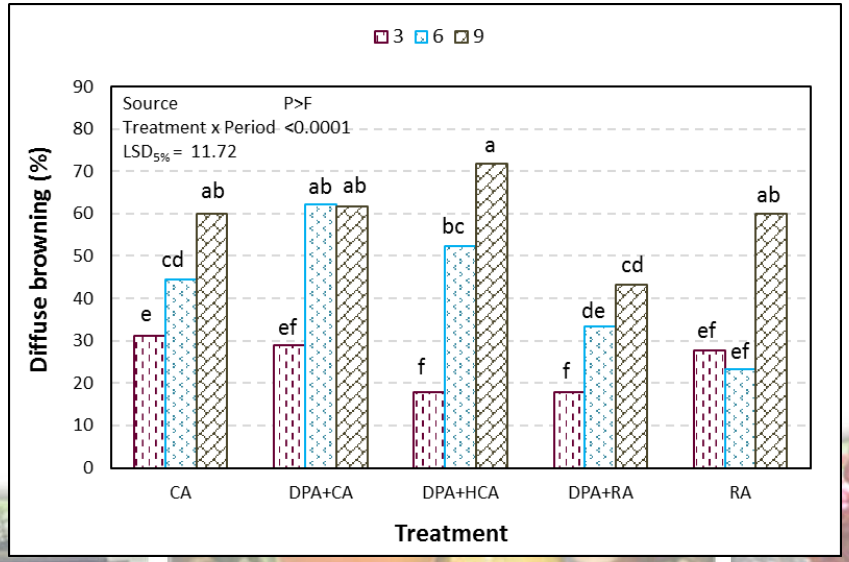
IB from Site 1



IB from Site 2



IB from Site 3



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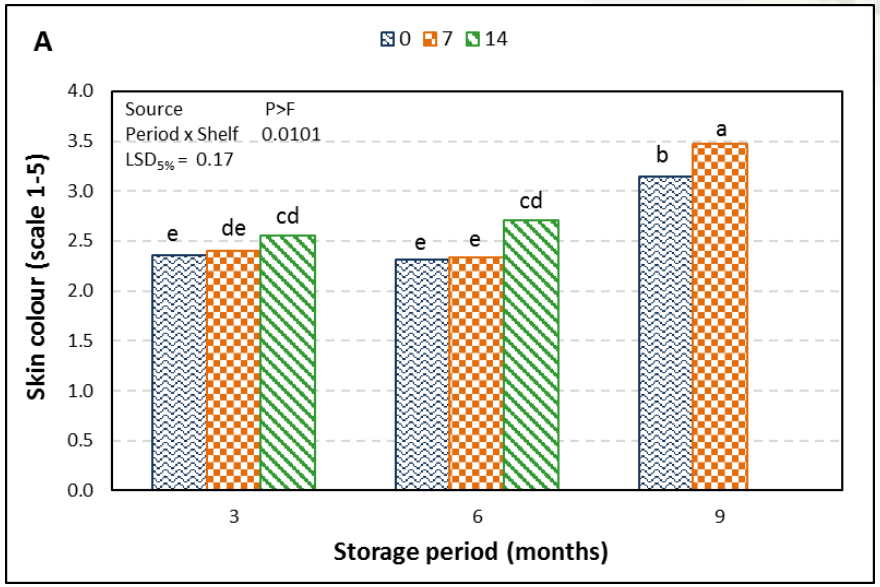
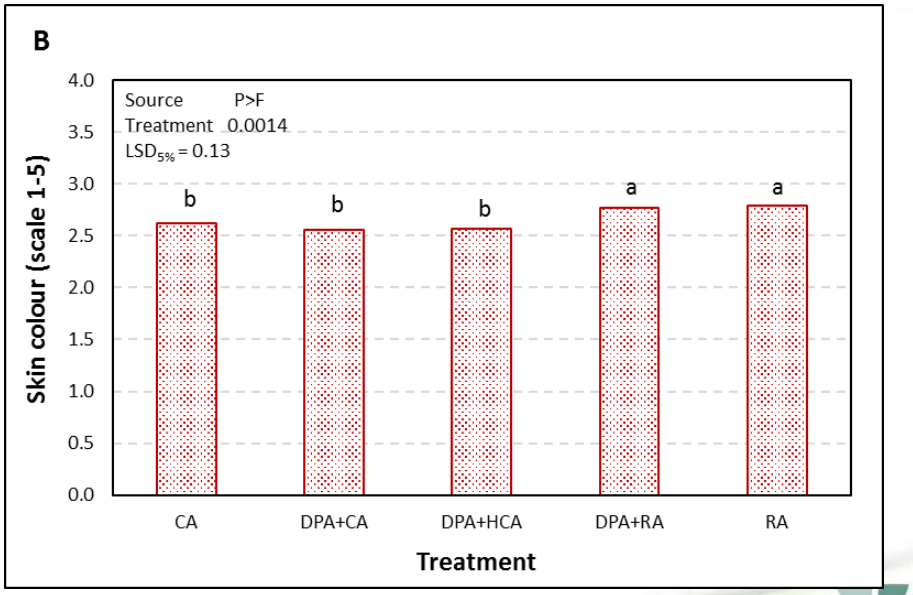
Results and Discussion (2017)

Skin background colour for Site 1





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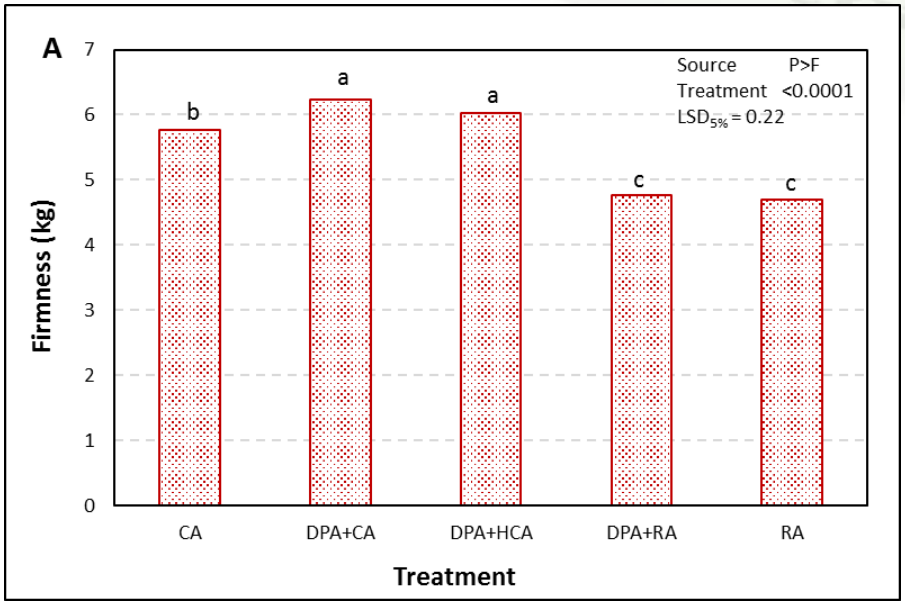
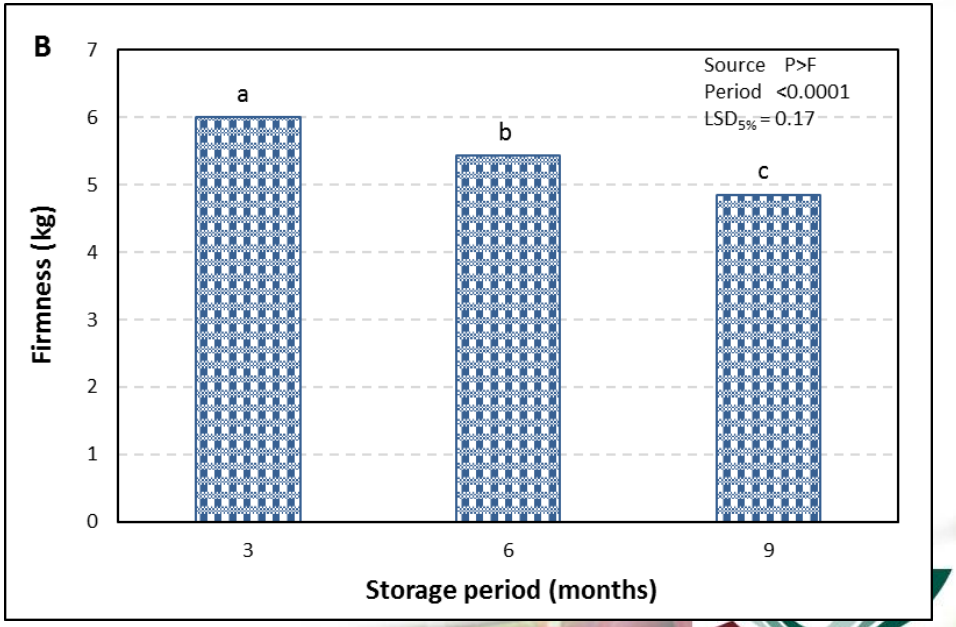
Results and Discussion (2017)

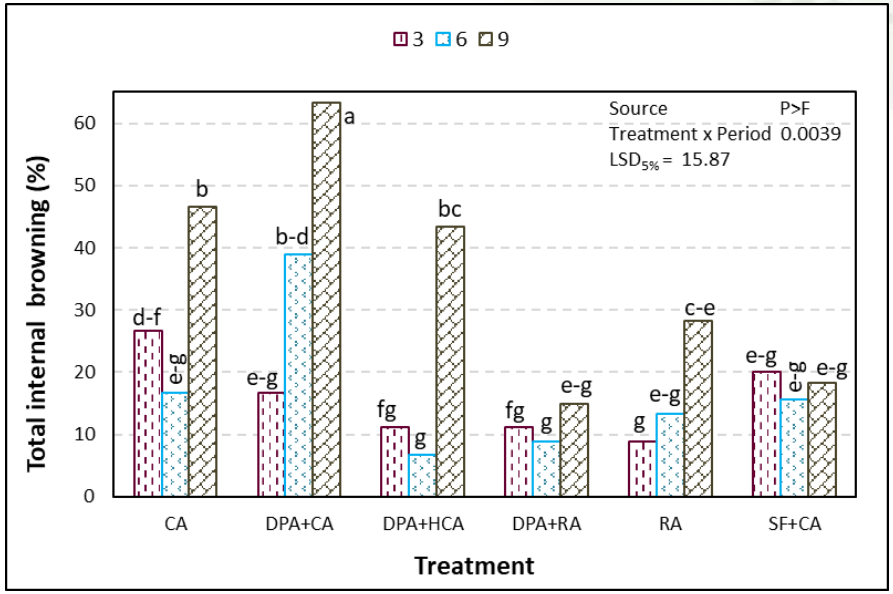
Firmness for Site 1



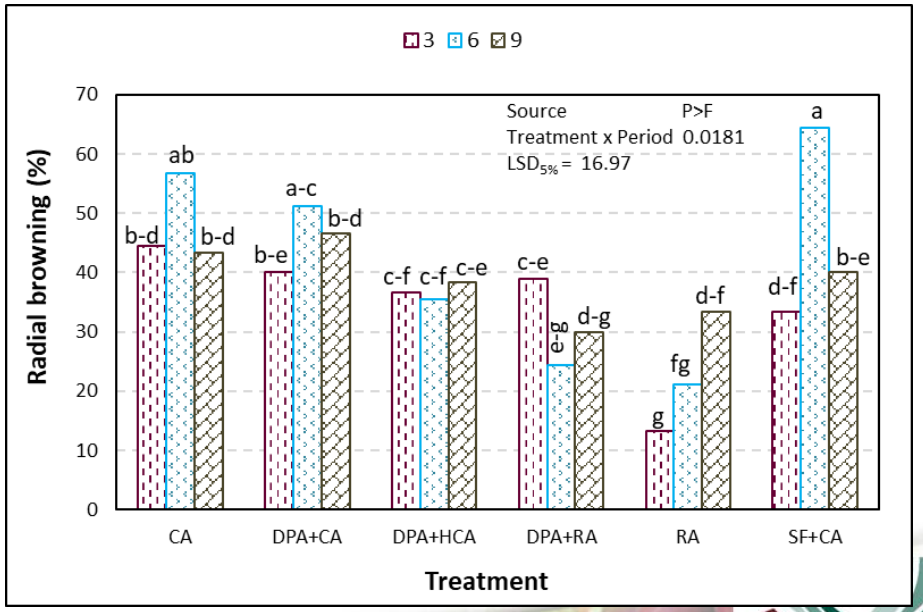


Results and Discussion (2018)

IB from Site 2



IB from Site 3



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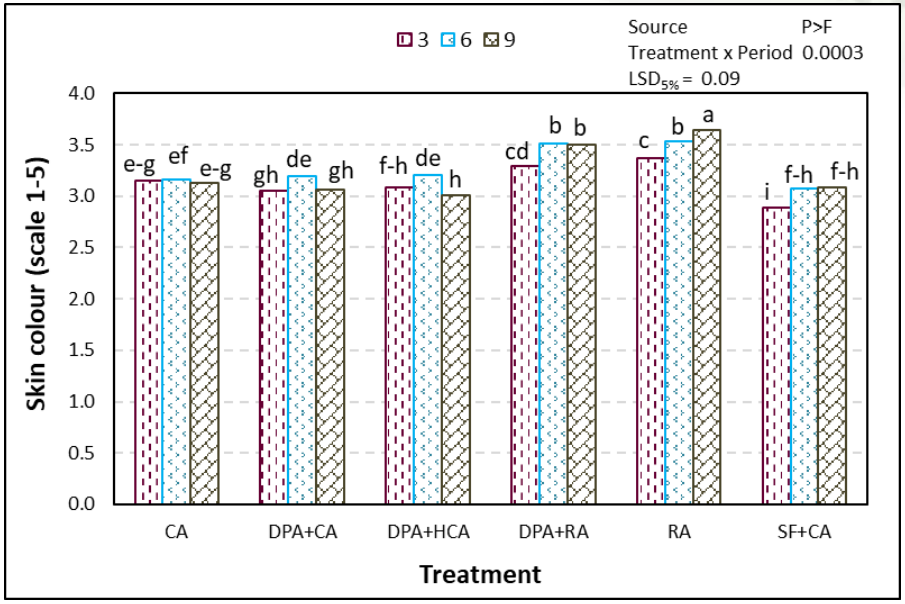
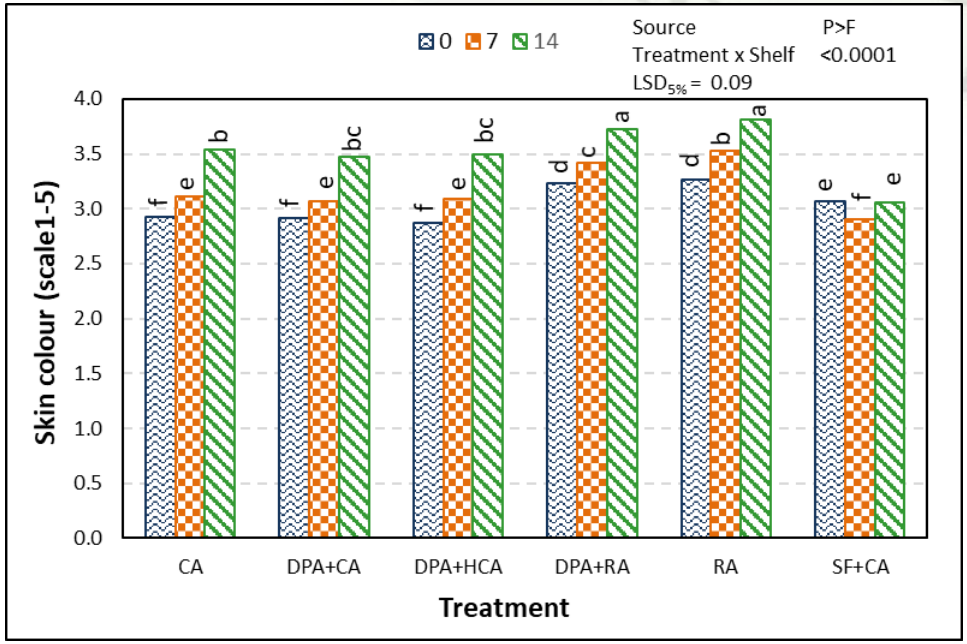
Results and Discussion (2018)

Skin background colour for Site 1





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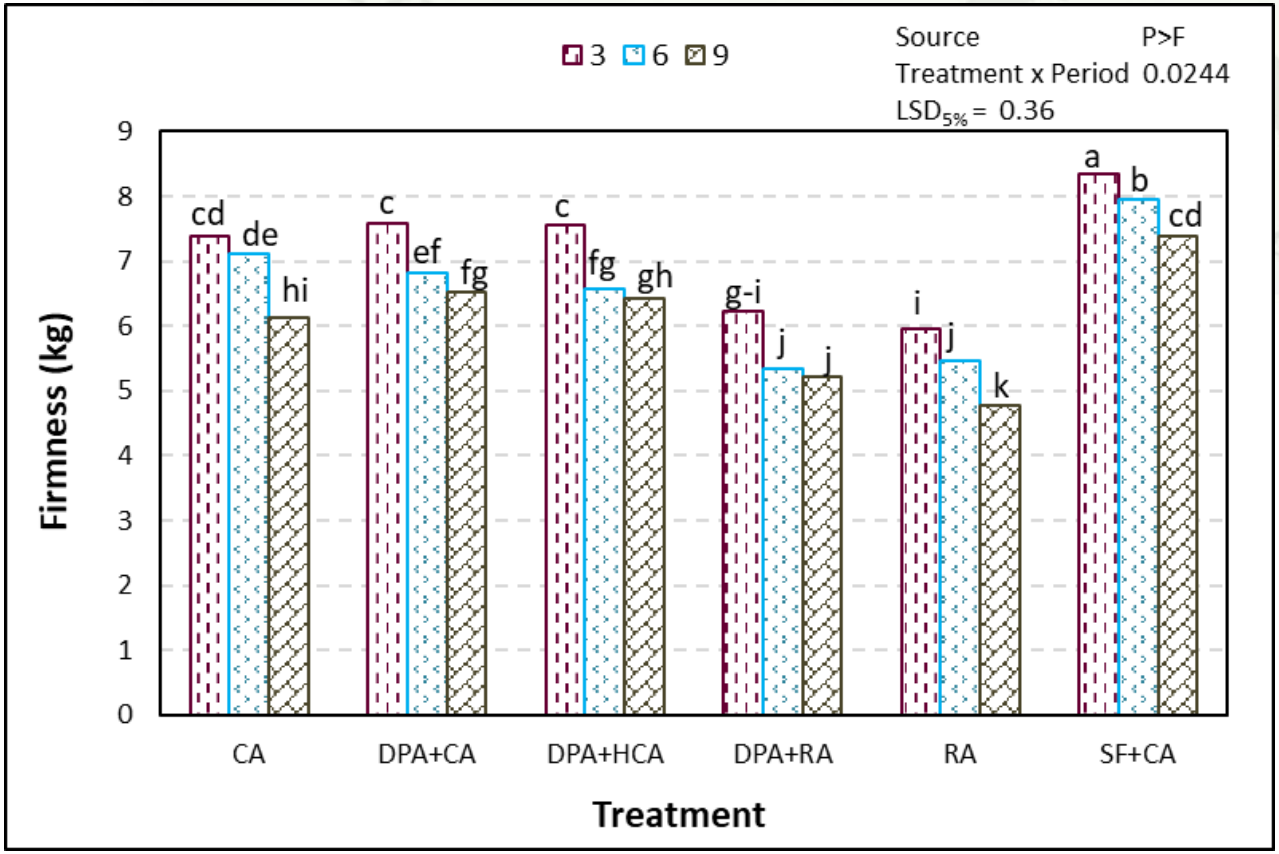
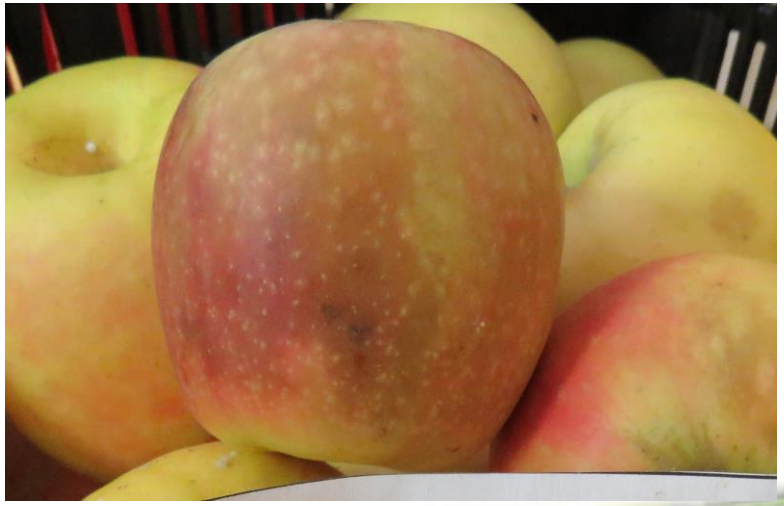
Results and Discussion (2018)

Firmness for Site 1



Results and Discussion

- Senescent scald
- 2017
  - all sites DPA+RA and RA – 6 months + 6wk RA + 14 d
  - at two sites all treatments - 9 months + 6wk RA + 7 d
  - also found DPA+HCA after various periods
- 2018
  - all sites DPA+RA and RA – 6 months + 6wk RA + 14 d



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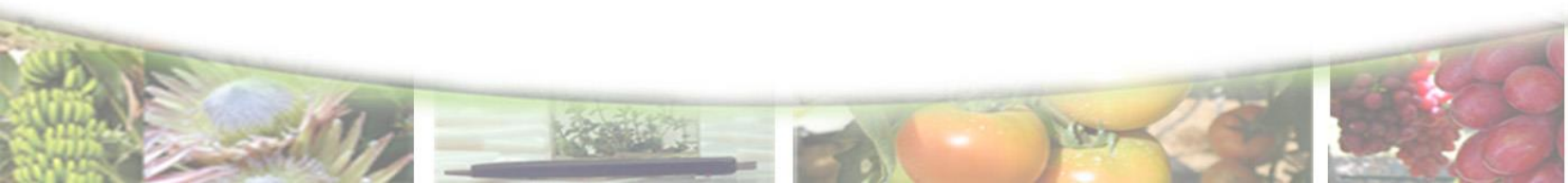
Conclusions

- Application of DPA did not prohibit IB development – diffuse browning nor radial browning
- High CO_2 levels did not cause IB related to CO_2 damage
- Variables were included that would induce IB
  - sites with a historic browning problem
  - store fruit at -0.5^{o}C instead of the recommended 1^{o}C
- Importance of step-wise cooling is evident



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Acknowledgements

- Funders – ARC, HortgroScience
- Howard, Viole and Vanessa for their technical assistance

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