

Managing Scarf Skin on Red Strains of Gala

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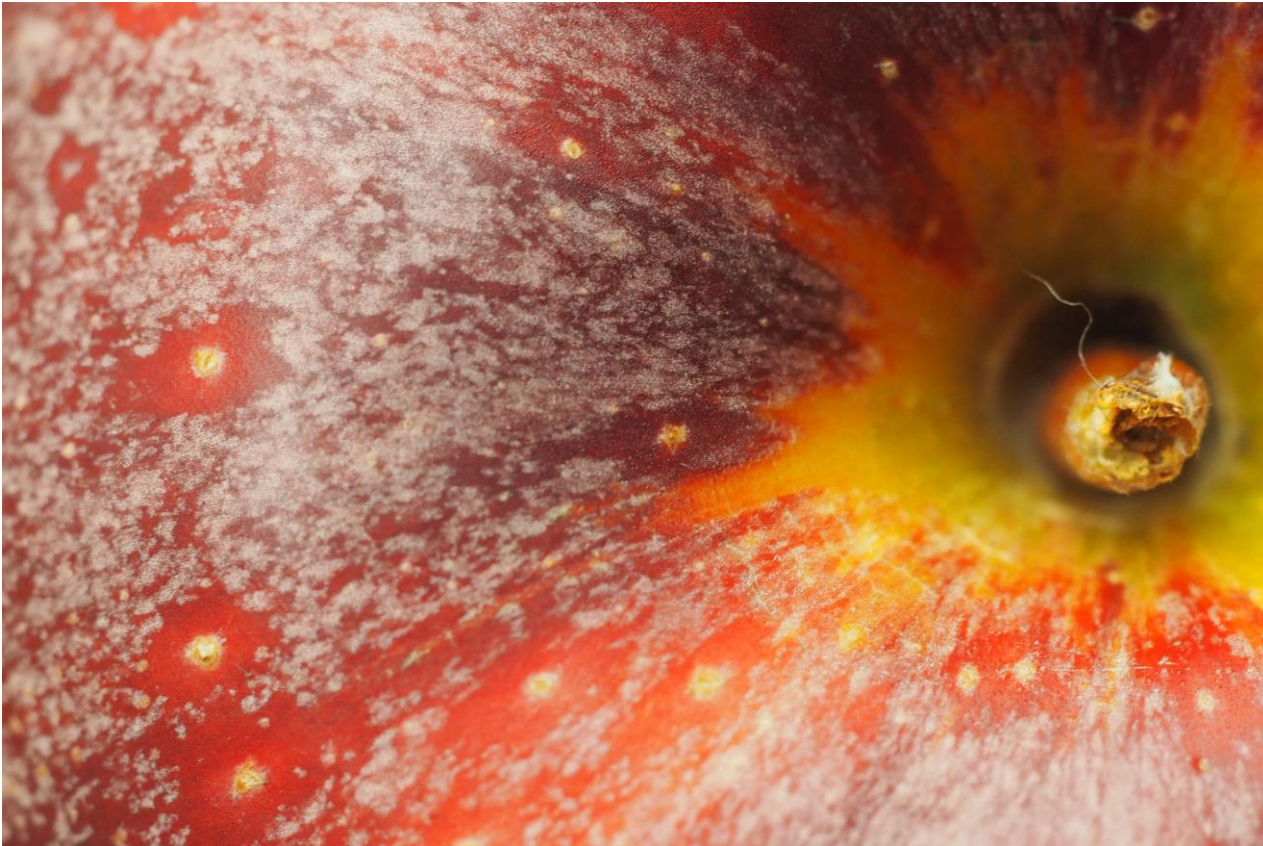
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Scarf Skin

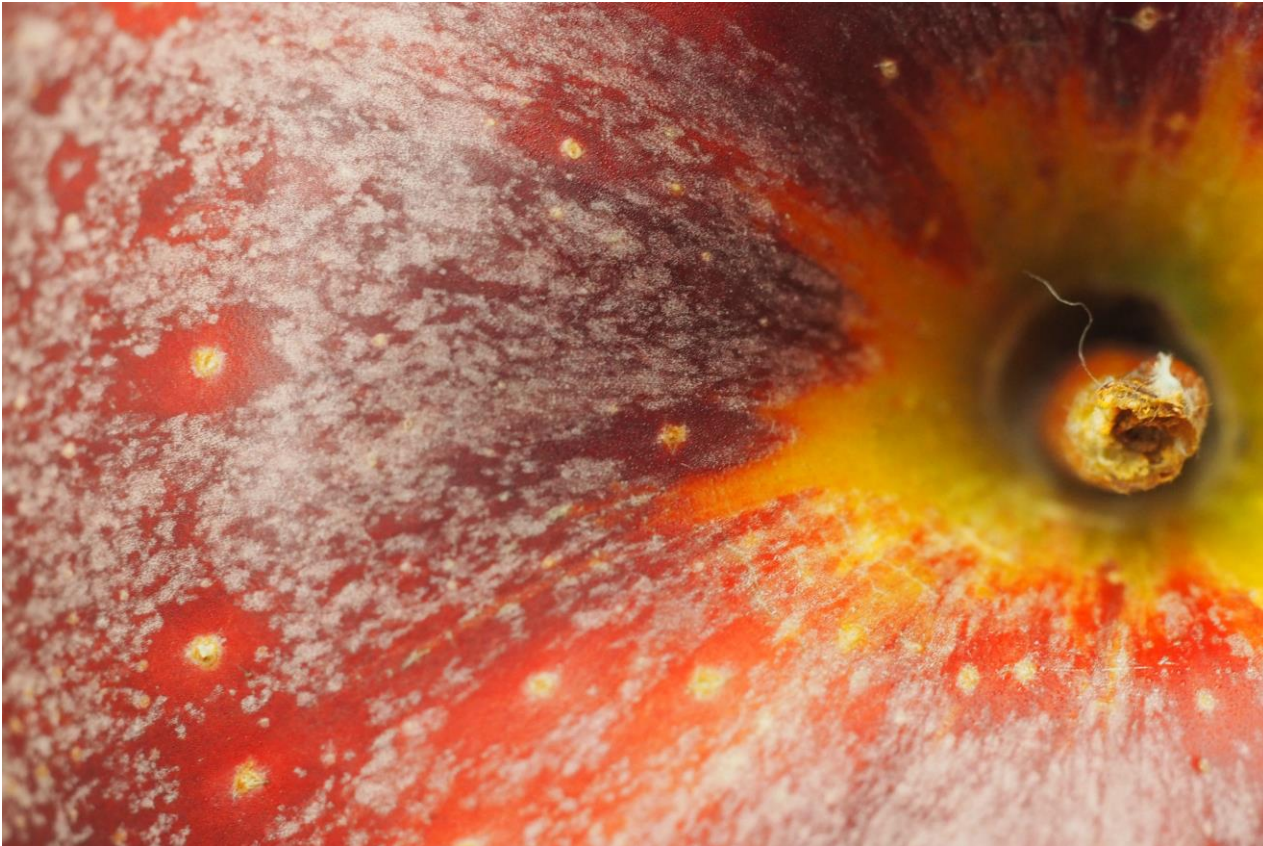


- A physiological disorder
 - Results in a dull gray appearance
 - Caused rejection of Gala by retailers
- Occurs during 60 DAFB
- Same anatomical origin as russet

Scarf Skin Factors and Impacts

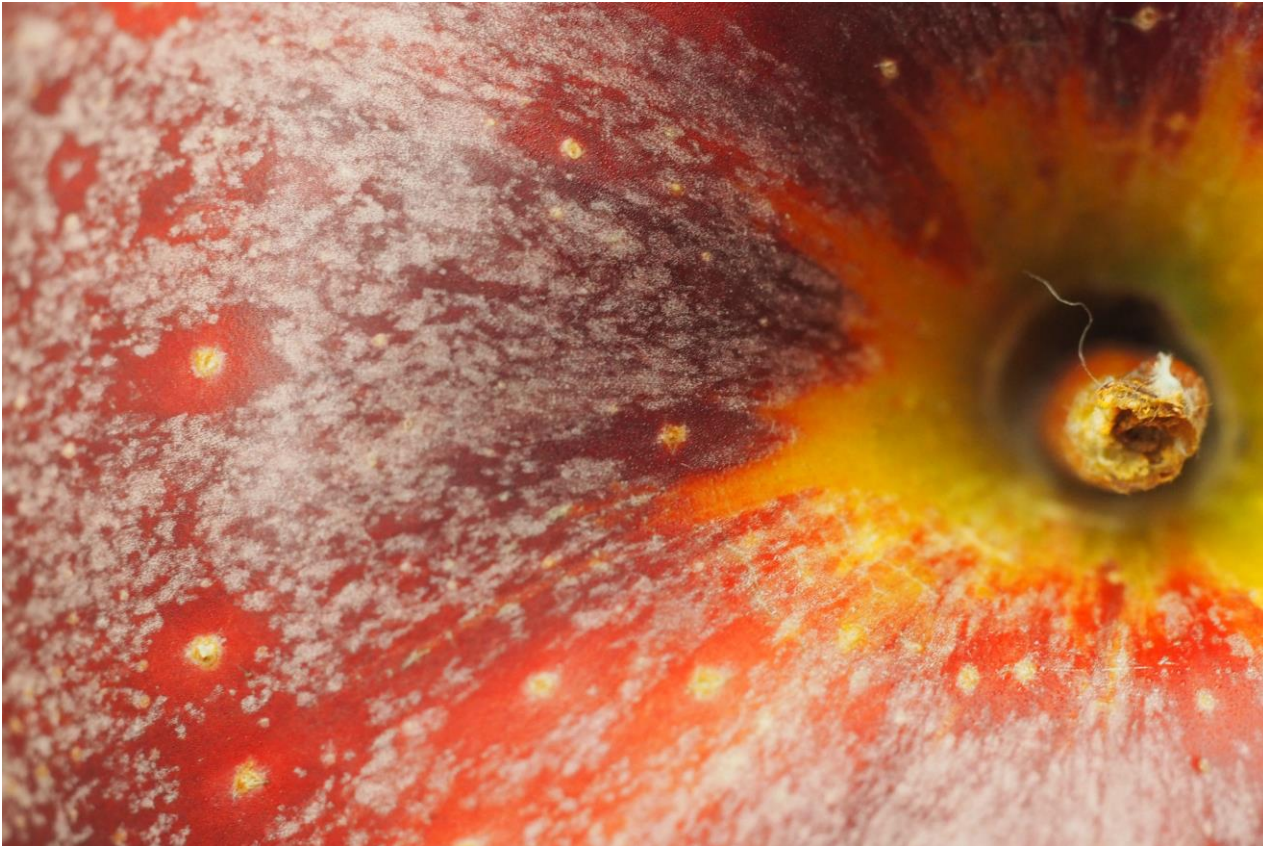
Factor	Impact and Comments
Variety	Susceptibility differs. Stayman, Rome, Delicious & Gala are susceptible.
Strain	Red strains are more likely to be downgraded. More susceptible or more visible?
Canopy position	Lower/Inner canopy more likely to have scarf skin. Lower temperature and/or slower drying conditions.
Tree vigor	Low vigor trees have less scarf skin. Possible connection to temperature/drying conditions.
Bagging	Reduces scarf. More waterproof = less scarf
Fungicides	Benlate made scarf worse. Dodine implicated by a European report, but not by a U.S. report
Foliar nutrients	No observed effect
Plant Growth Regulators	Sprays of GA ₄₊₇ from PF to PF+40 reduce scarf skin. PCa (Apogee, kudos) reduced in 2 of 3 trials (OH & NC, 2006)

Scarf Skin



- Reduced by GA₄₊₇ starting @ PF
- 250 ppm of PCa at PF reportedly additive to GA₄₊₇
 - also reduced fruit size
- PCa is active for 2-4 weeks
 - scarf skin occurs from PF to PF+40d

2018 Study Objectives



- Do single or multiple sprays of PCa w/wo GA₄₊₇ reduce scarf skin?
 - multiple sprays / lower doses mitigate increased fruit set and reduced fruit size
- Grower trials of 2 formulations of GA₄₊₇

Methods & Materials, FREC Trial

- Uniform 'Buckeye Gala' / M.9 apple trees at FREC were selected
- Treatments were assigned in a completely random design, with five replications
- Plots were separated from adjacent plots with 1+ buffer trees



Treatments

<u>PCa^z(ppm)</u>	<u>GA₄₊₇^z (ppm)</u>
0	0
0	20 × 4 ^w
250 × 1 ^y	0
250 × 1 ^y	20 × 4 ^w
125 × 2 ^x	0
125 × 2 ^x	20 × 4 ^w
62.5 × 4 ^w	0
62.5 × 4 ^w	20 × 4 ^w

^zconc x number of sprays at 10d intervals, starting at PF.

^y At PF

^xAt PF and PF+20d.

^wAt PF, PF+10d, PF+ 20d, and PF+30d.



Rating Scale



1

2

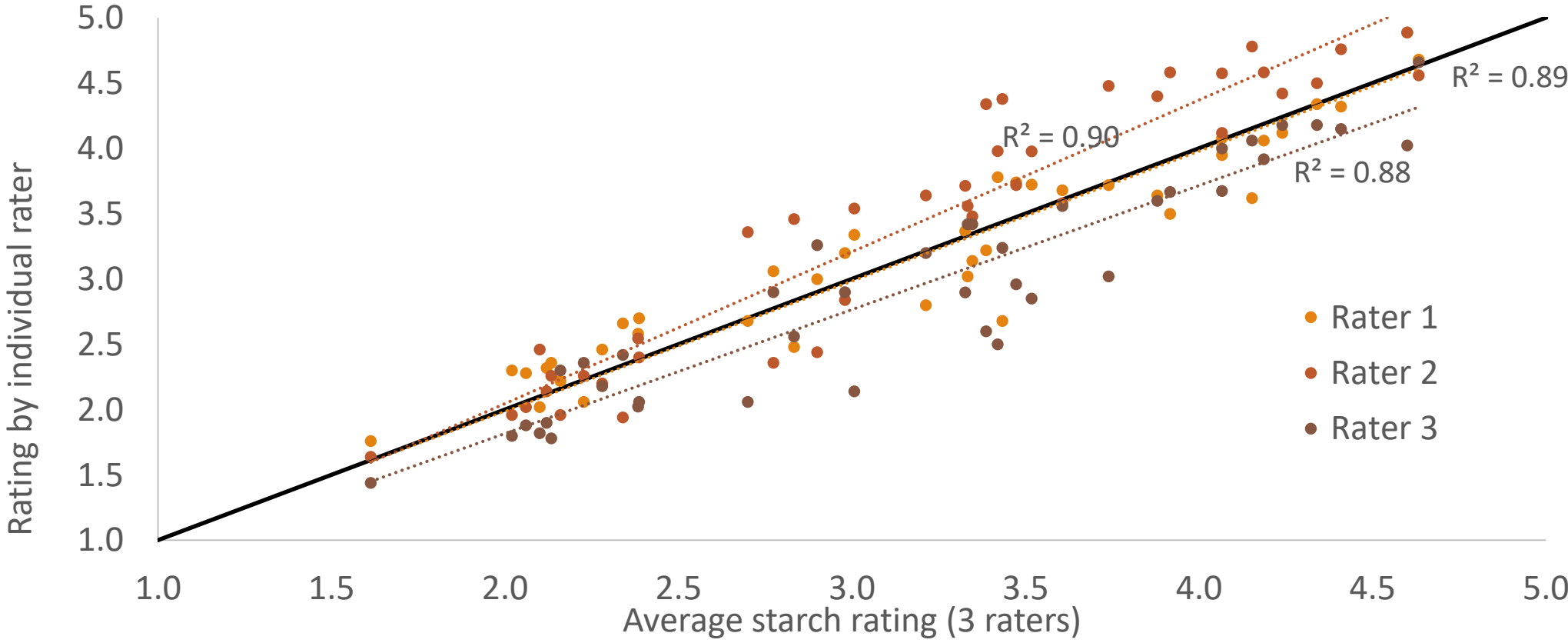
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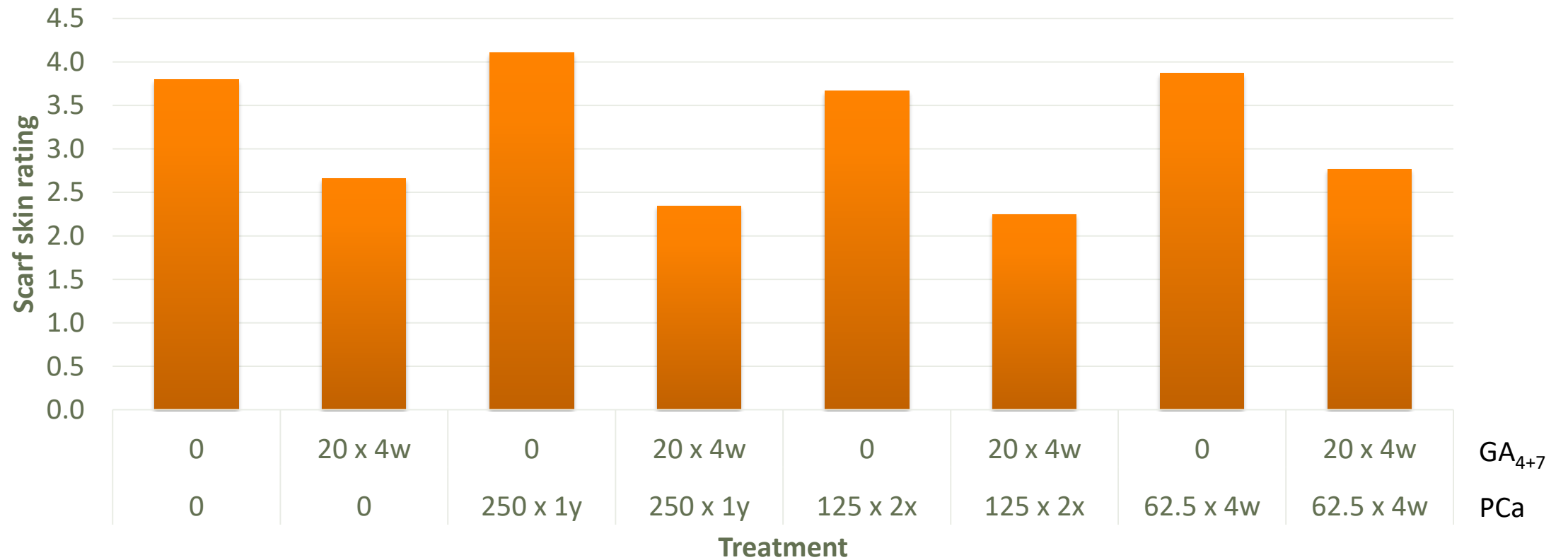
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- 1) no scarf to a trace of mild scarf;
- 2) trace to mild scarf, does not detract from commercial value;
- 3) moderate ($\leq 15\%$) scarf, does not detract from commercial value;
- 4) prominent scarf, detracts from visual clarity of color, of concern in commercial setting;
- 5) dominant scarf; a primary visual impression is of scarf; commercially unacceptable.

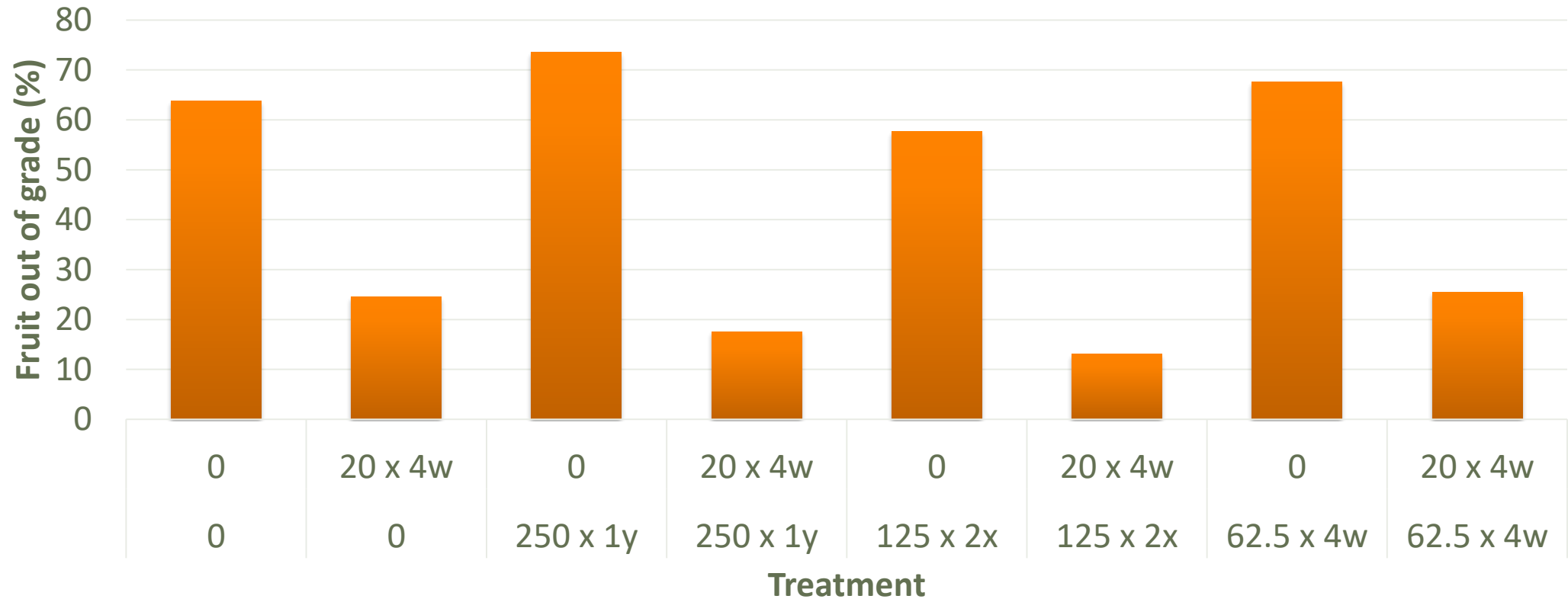
Inter-rater Agreement



Scarf Rating



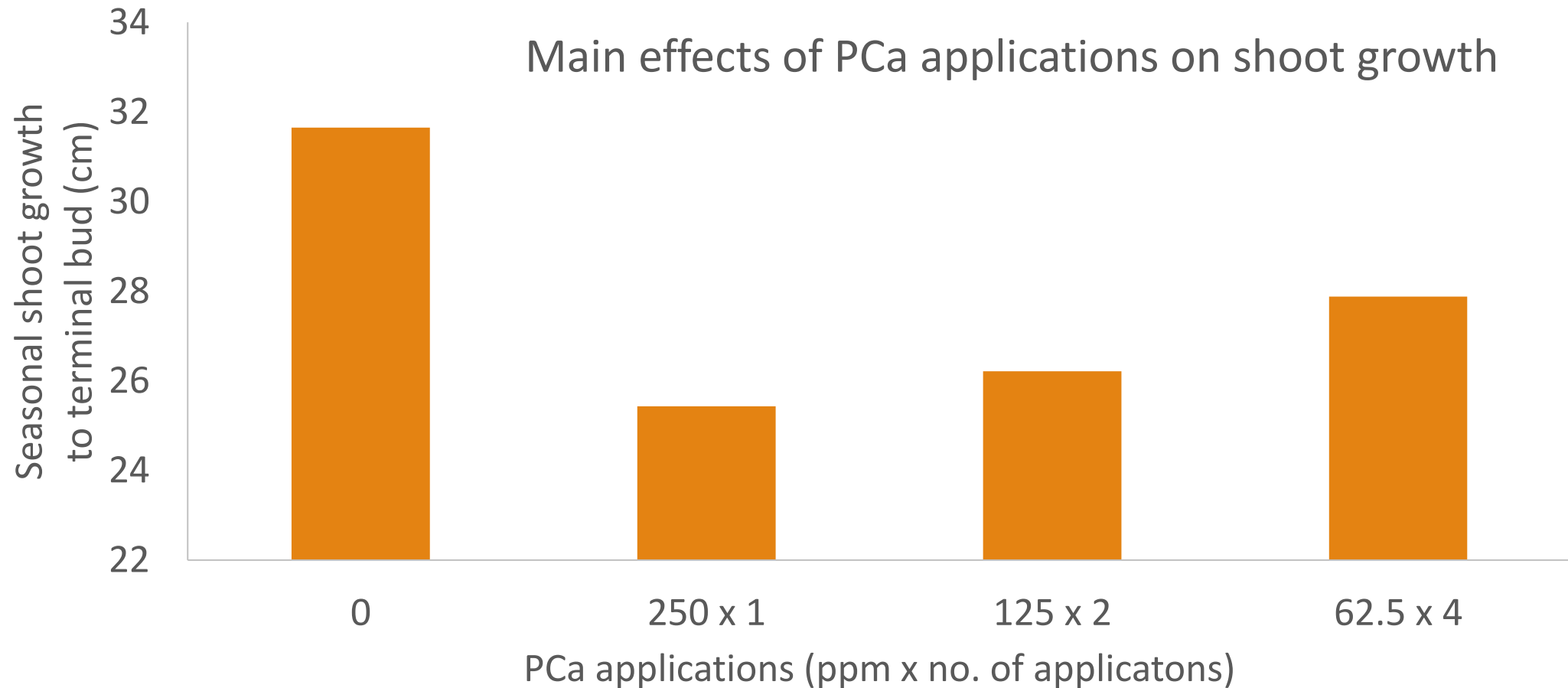
Fruit Out of Grade, Scarf



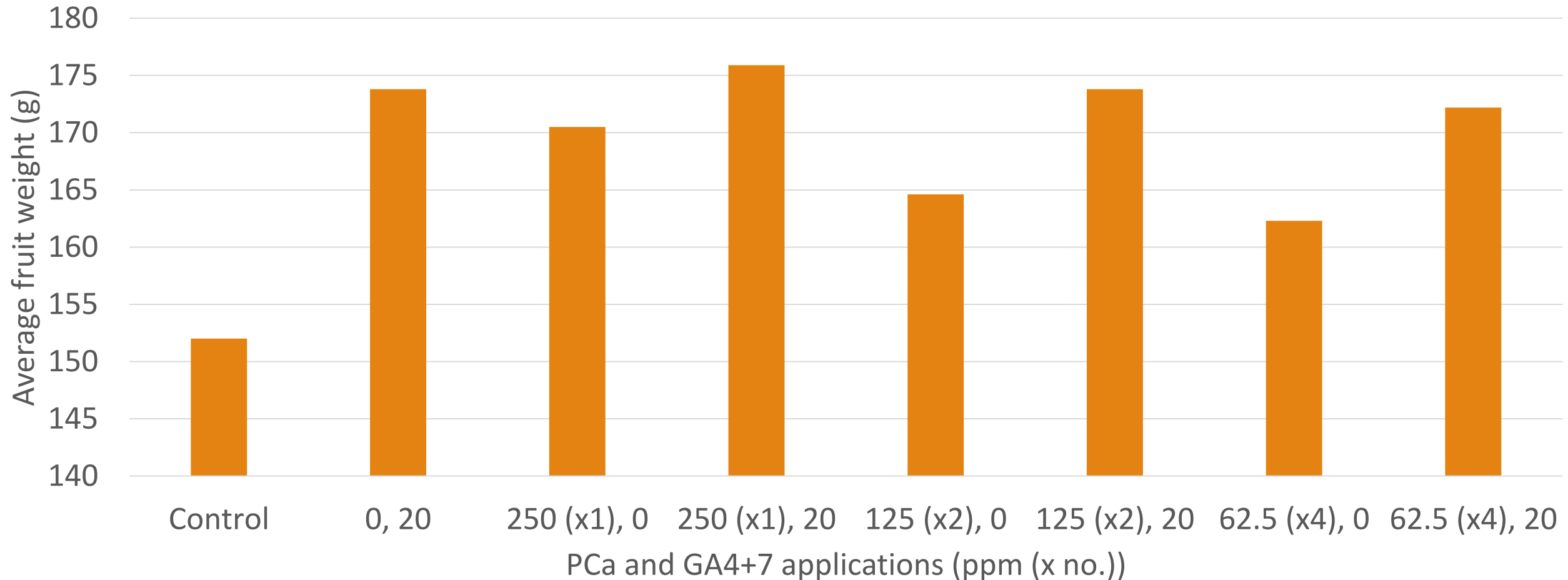
Fruit Quality:

		Fruit shape			Scarf skin	
PCa	GA ₄₊₇	Length -----	Dia -cm-	L:D -----	Rating (1-5)	Out of grade (%>3)
0	0	6.4	7.0	0.92	3.80	63.7
0	20 x 4	6.9	7.0	0.98	2.66	24.6
250 x 1	0	6.7	7.1	0.95	4.11	73.6
250 x 1	20 x 4	7.1	7.1	1.00	2.35	17.6
125 x 2	0	6.5	6.9	0.94	3.67	57.7
125 x 2	20 x 4	7.0	7.1	0.99	2.25	13.1
62.5 x 4	0	6.5	7.0	0.93	3.87	67.6
62.5 x 4	20 x 4	6.9	7.0	0.97	2.77	25.5
p-values:						
PCa		0.07	NS	0.02	0.39	0.40
GA		0.00	NS	0.00	0.00	0.00
GA x PCa		NS	NS	NS	NS	NS

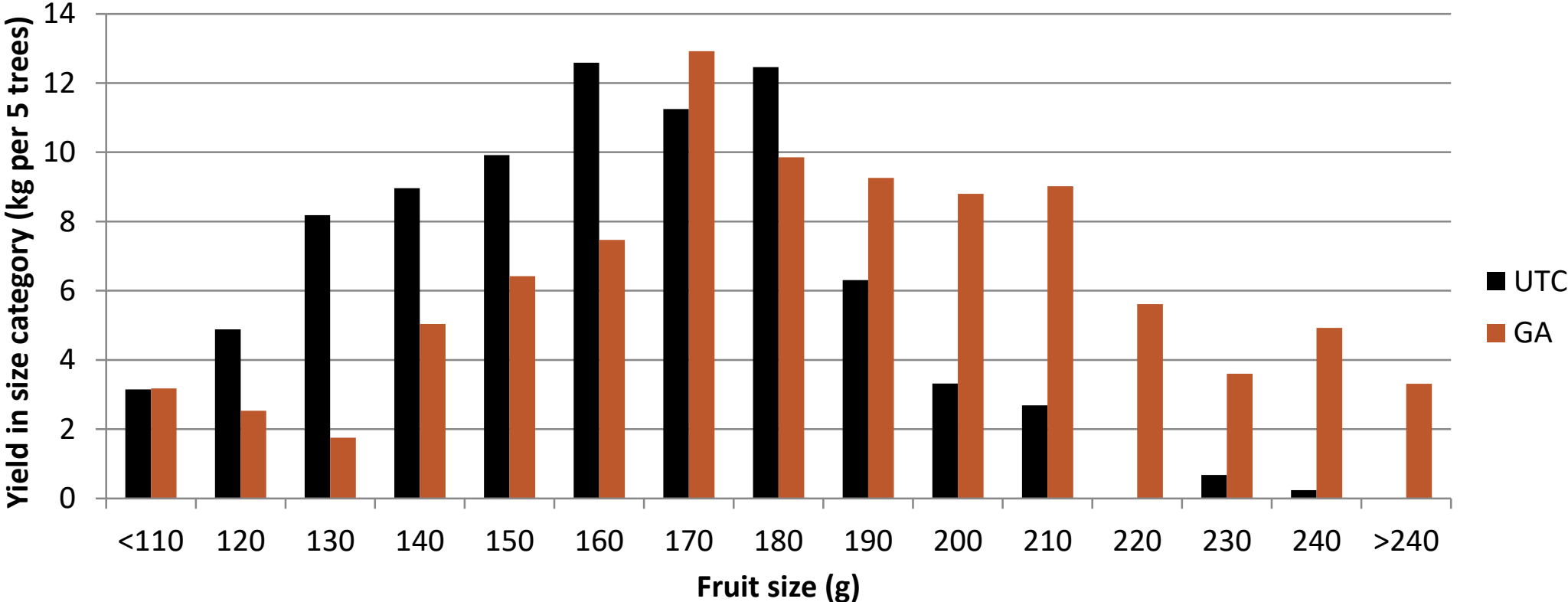
Shoot growth



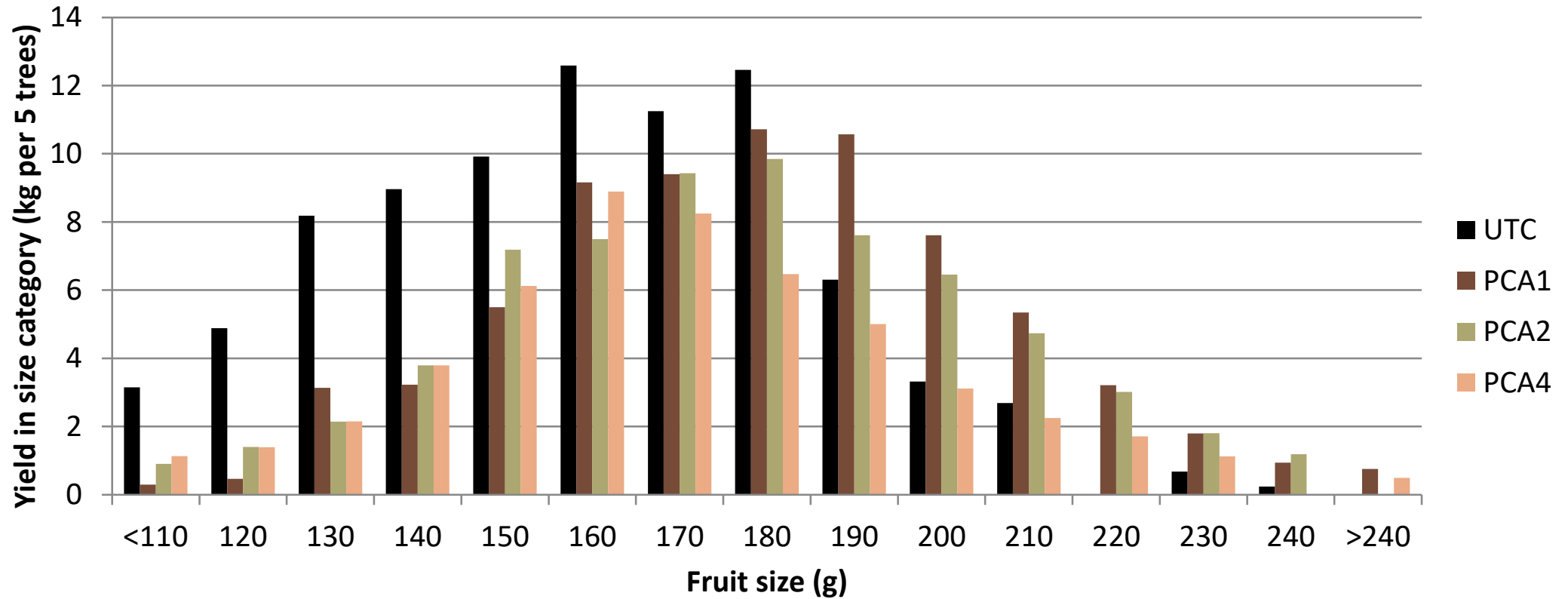
Influence of treatments on fruit size



GA4+7: Fruit Size Distribution



PCa: Fruit Size Distribution



PCa × GA: Summary

- No treatment effect on fruit set, yield, or number of fruit at harvest
- GA₄₊₇ increased the fraction of fruit that were ≥3 inch diameter
 - GA₄₊₇ gave a slight (6-7%) increase in fruit length
- Prohexadione reduced the fraction of fruit <2.5 in. in diameter
- PCa treatments reduced shoot length versus controls
- GA₄₊₇ reduced the severity of scarf skin
- PCa did not affect scarf one way or the other
- McArtney et al., (2006) reported PCa reduced scarf skin in 2 of 3 experiments
 - effect was additive with GA₄₊₇.

Discussion

- 250 ppm PCa, whether applied in total at petal fall, or as split applications spread over 20 or 40 days did not reduce scarf
- PCa reduces shoot extension growth, which can increase light penetration and foster more rapid drying conditions.
 - Scarf skin is more severe in the lower/ interior sections of canopies,
 - Scarf is more severe in lower light and slower drying conditions
 - Our trees were on M. 9 rootstock, and pruned to create narrow canopies
 - PCa effect on shoot growth was minimal in this study
- Lack of response to PCa may suggest its effect on scarf skin is influence on canopy environment.
 - Byers(1977) noted that low tree vigor strongly reduced scarf skin.

Methods & Materials, Grower Trials

- Uniform blocks of “red strain” Gala at 3 commercial orchards were selected
- One or two GA formulations were applied by grower to quarter acre plots and compared to UTC

Novagib® 5L	ProVide® 10SG
Fluid oz per acre	Dry oz (g) per acre
0	0
4 × 4	0
0	3.5 (100) × 4

Rating 1 – none to trace



Rating 5 - severe



Results Grower 1

Treatment	Scarf skin rating	Fraction out of grade (% with >3 score)
Control	3.60 a	58 a
Novagib [®]	3.08 b	37 b
p-value	0.002	0.005

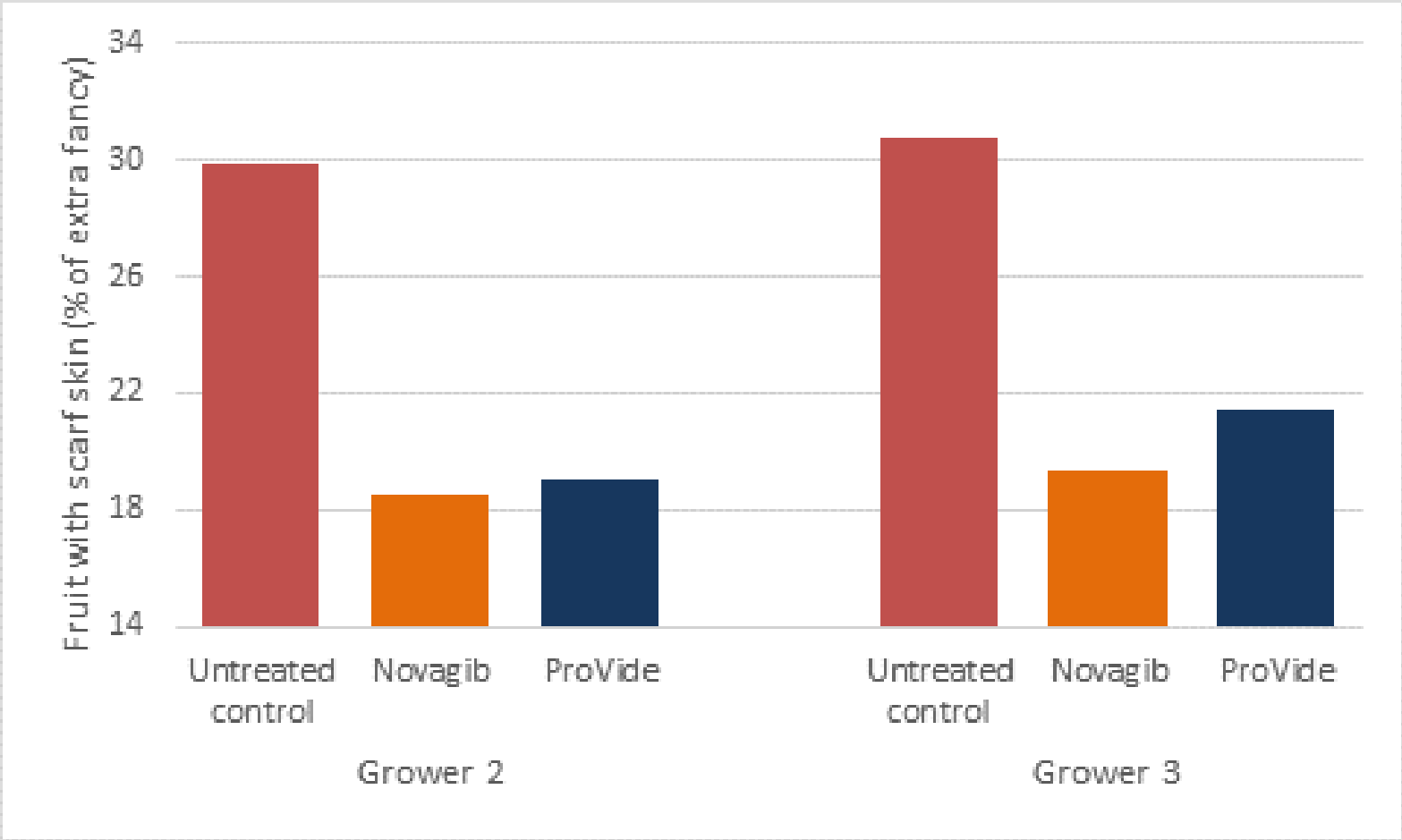
Results Grower 2

Treatment	Scarf skin rating	Fraction out of grade (% with rating >3)
Control	4.40 a	42.1 a
Novagib [®]	3.67 b	29.3 c
ProVide [®]	4.03 ab	35.6 b
p-value	0.01	0.00

Results Grower 3

Treatment	Scarf skin rating		Fraction out of grade (% with rating >3)	
Control	3.68	a	29.8	a
Novagib [®]	3.04	b	15.6	b
ProVide [®]	3.05	b	16.2	b
p-value	0.02		0.01	

Gala Fruit With Scarf- Rice Fruit Co.



Grower Trial Summary:

- Both GA₄₊₇ formulations reduced the severity of scarf skin
- Good results in Orchard 2, where sprays started at 1st cover
 - Not ideal practice, but can be effective
- GA gave a slight increase in fruit elongation – on the order of 2-5%
 - Proprietary 6BA+GA products at bloom are recommended practice for L:D

Summary:

- PCa was not effective in this trial
- Both GA₄₊₇ formulations reduced the severity of scarf skin
- Both GA₄₊₇ formulations reduced the detection of scarf skin on the packing line

Conclusions:

- Scarf skin has been referred to as “smooth russet”
 - caused when cuticle and epidermis layers separate from the highly pigmented layers of cells below
 - Scarf and russet are physiologically related
 - have essentially the same anatomical origin
- GA₄₊₇ is effective for reducing both defects.



Acknowledgments

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