UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Update from Recent Strawberry Studies: Fungicides, Biostimulants, and Nutrients

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Virtual Strawberry Field Day 28 July 2020


1. Evaluating foliar fungicides for controlling gray mold
2. Evaluating drip application of fungicides for improving plant health
3. Evaluation of biostimulants and nutrients for improving plant health and fruit yield

Botrytis cinerea in strawberry

Botrytis cinerea in strawberry

Botrytis cinerea in strawberry

Botrytis cinerea in strawberry

Botrytis cinerea in strawberry

Experimental design

14’X3.2’ plots replicated four times in RCBD

Treatments

1. Untreated control
2. Elevate 50 WDG (fenhexamid) 8 oz/ac
3. Serifel (*Bacillus amyloliquefaciens*) 8 oz/ac
4. ProBlad Verde (Banda de *Lupinus albus* doce - BLAD) 36 fl oz + Cinnerate (cinnamon oil) 0.25% followed by ProBlad Verde at 36, 43, and 43 fl oz/ac
5. ProBlad Verde 36 fl oz + Cinnerate 0.25% followed by ProBlad Verde at 32, 32, and 32 fl oz/ac

Spray volume 45 gpa

Applied on 3/26/20, 4/2/20, 4/10/20, and 4/20/20

Sampling

- Removed all fruit prior to the first application
- Harvested fruit on 4/14/20, 4/27/20, 5/2/20, and 5/10/20
- Stored the harvested fruit at room temperature and rated fungal growth 3 and 5 days after

Statistical analysis ANOVA and significant means were separated using LSD test

Botrytis cinerea in strawberry

Disease Severity Rating

- 0 No disease
- 1 1-25% of fruit covered by fungus
- 2 26-50% of fruit covered by fungus
- 3 51-75% of fruit covered by fungus
- 4 76-100% of fruit covered by fungus

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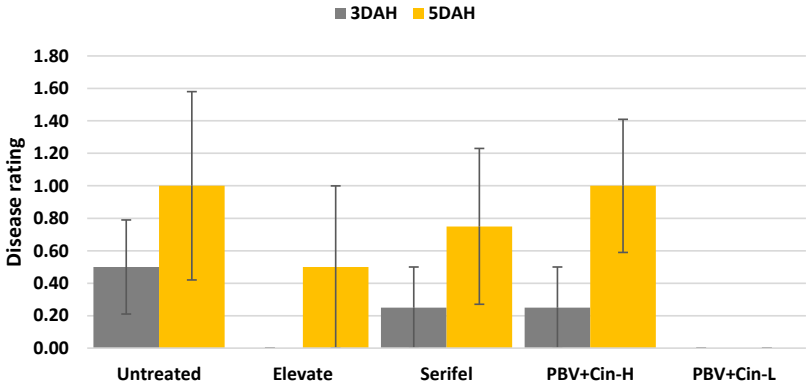
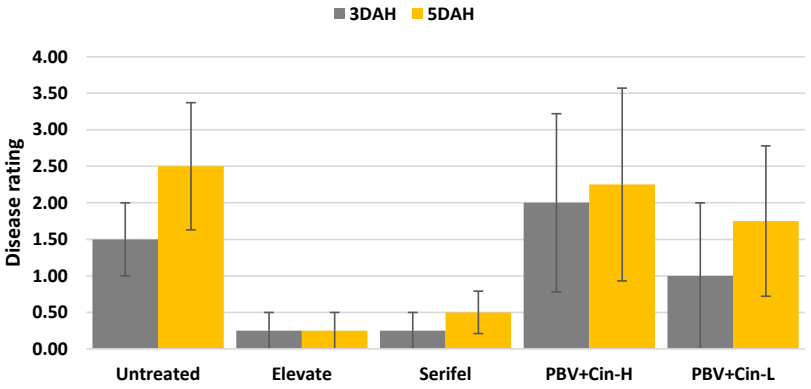
Botrytis cinerea in strawberry

Fruit harvested on 4/14/20

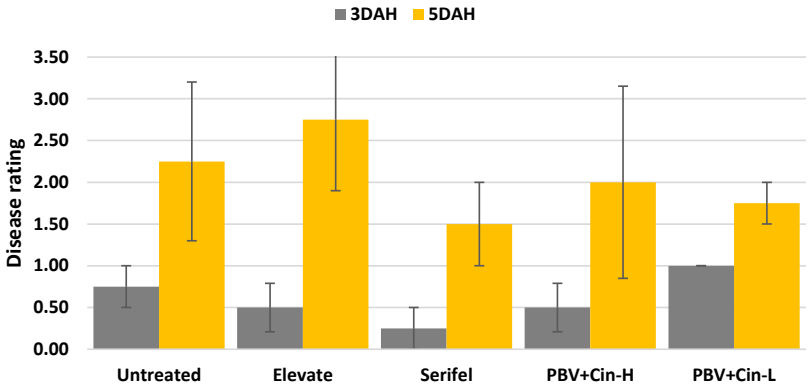


Fruit harvested on 4/27/20

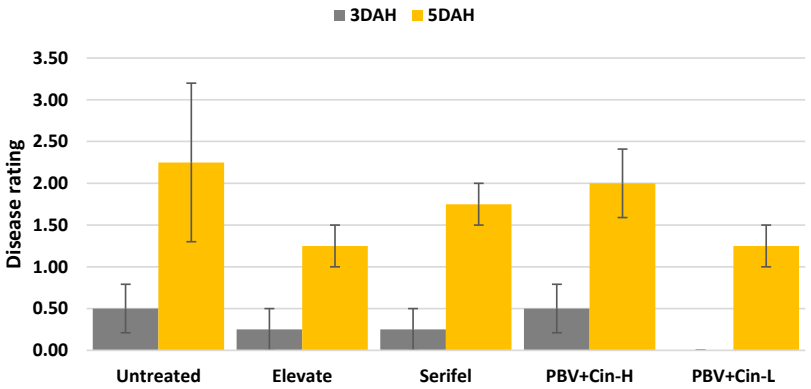


$P > 0.05$

Fruit harvested on 5/2/20



Fruit harvested on 5/10/20



$P > 0.05$

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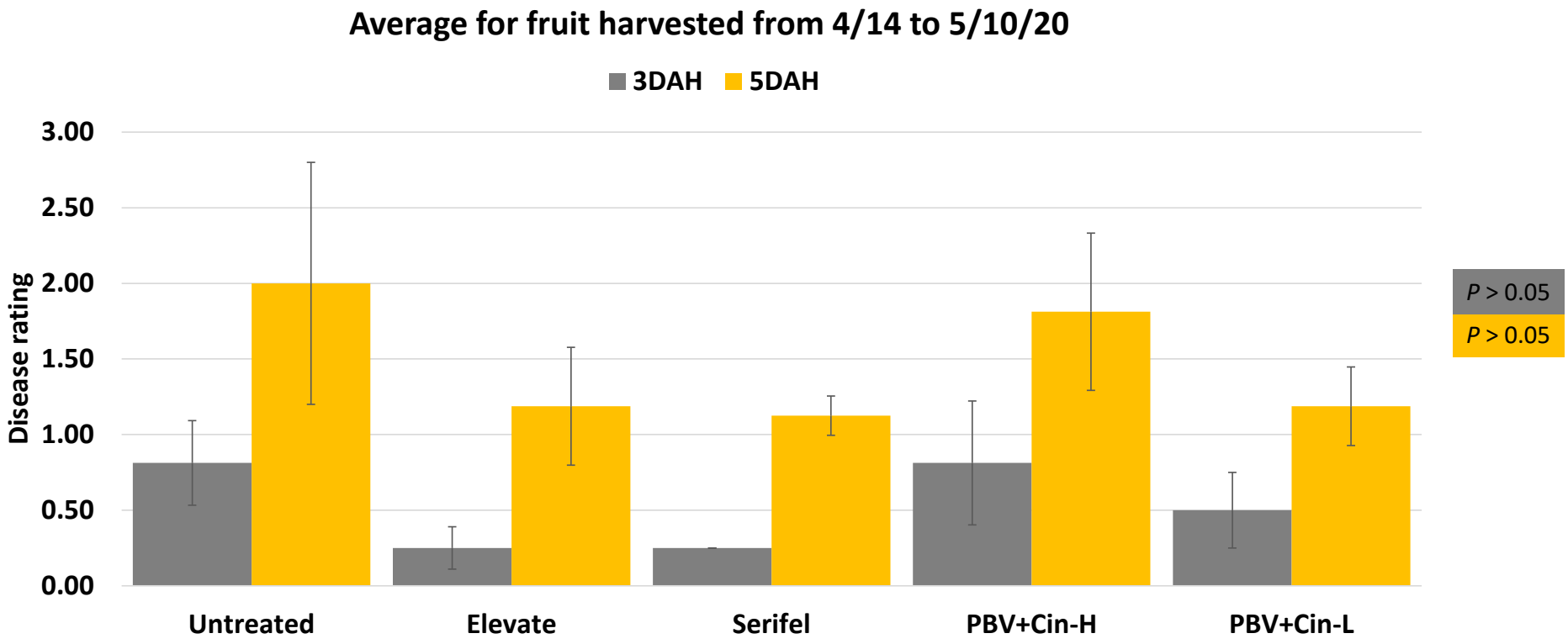
Botrytis cinerea in strawberry



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Conclusion

- Gray mold severity appeared to be lower in some treatments, but differences were not statistically significant

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Quiz

- Some of the treatments suppressed fruit diseases

A. True
B. False
C. Not sure

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Drip application of fungicides and biostimulants

Drip application of fungicides

Experimental design

30’X3.2’ plots replicated six times within a single bed

Treatments

1. Untreated control
2. Abound (azoxystrobin) 7 fl oz in 100 gal as transplant dip for 4 min
3. Rhyme (flutriafol) 7 fl oz/ac at and 30, 60, and 90 days after planting (DAP) through drip
4. Velum Prime (fluopyram) 6.5 fl oz/ac 14 and 28 DAP and Switch 62.5 (cyprodinil+fludioxinil) 14 oz/ac 42 DAP through drip
5. Rhyme 7 fl oz at 14, 28, 56, and 70 DAP and Switch 62.5 at 42 DAP through drip

Parameters measured

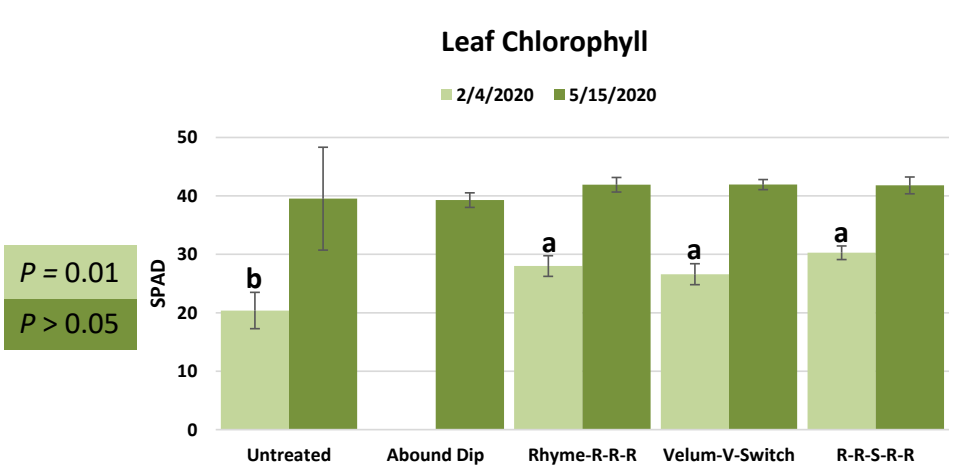
- Canopy growth
- Fruit sugar
- Fruit firmness
- Leaf nitrogen and chlorophyll
- Fruit diseases (Botrytis and others)
- Fruit yield on 11 dates between 11 March and 11 May 2020

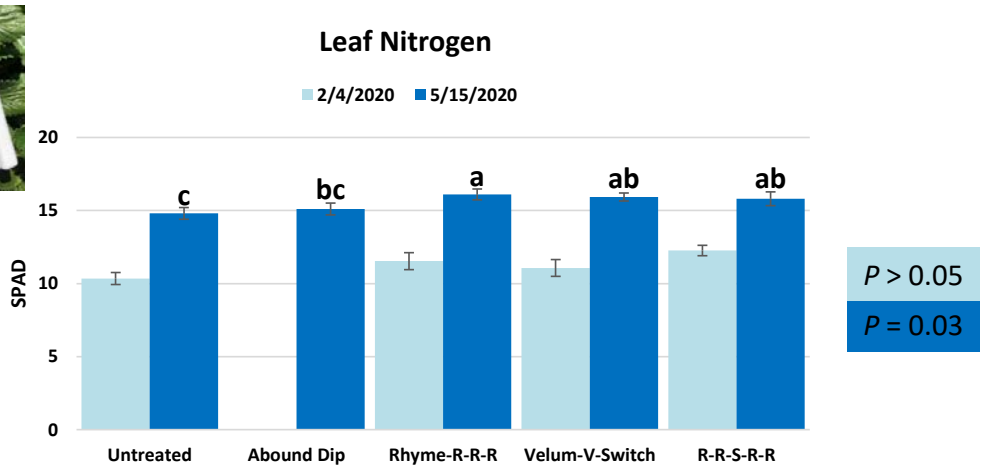
Statistical analysis ANOVA and significant means were separated using LSD test

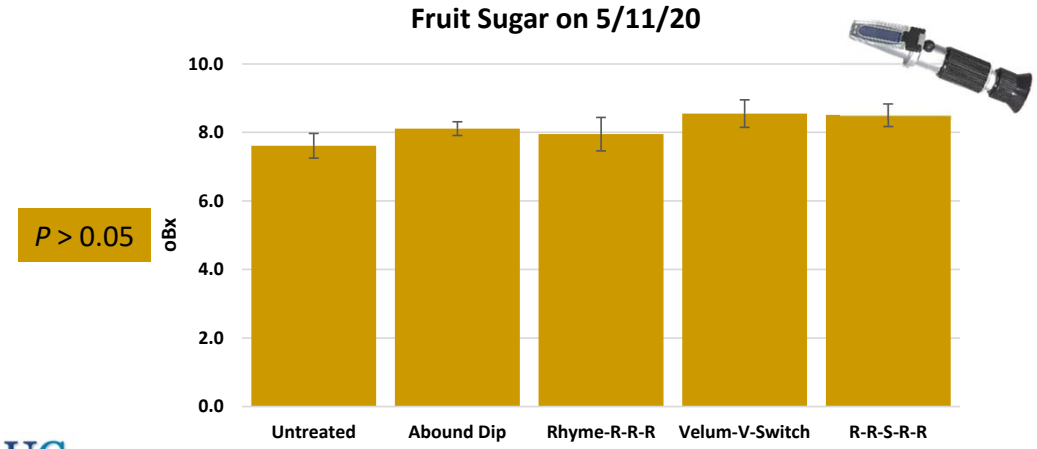
Drip application of fungicides

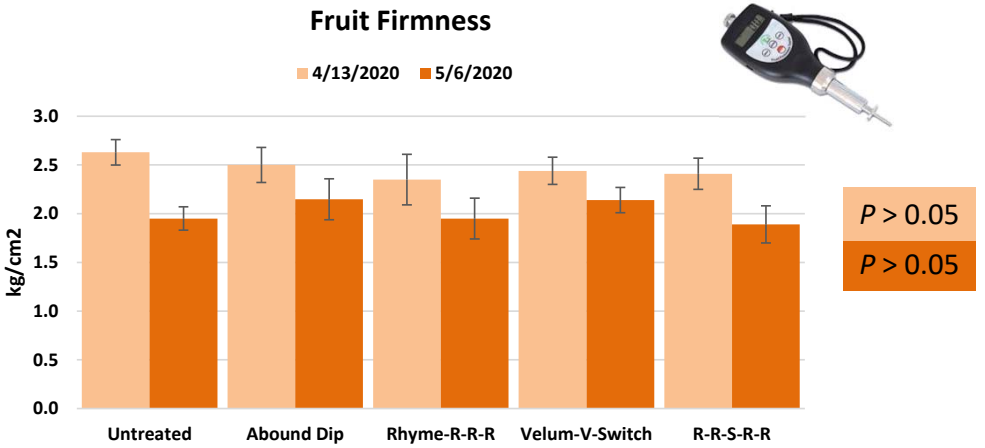
Tamas Zold and Marjan Heidarian Dehkordi

Drip application of fungicides









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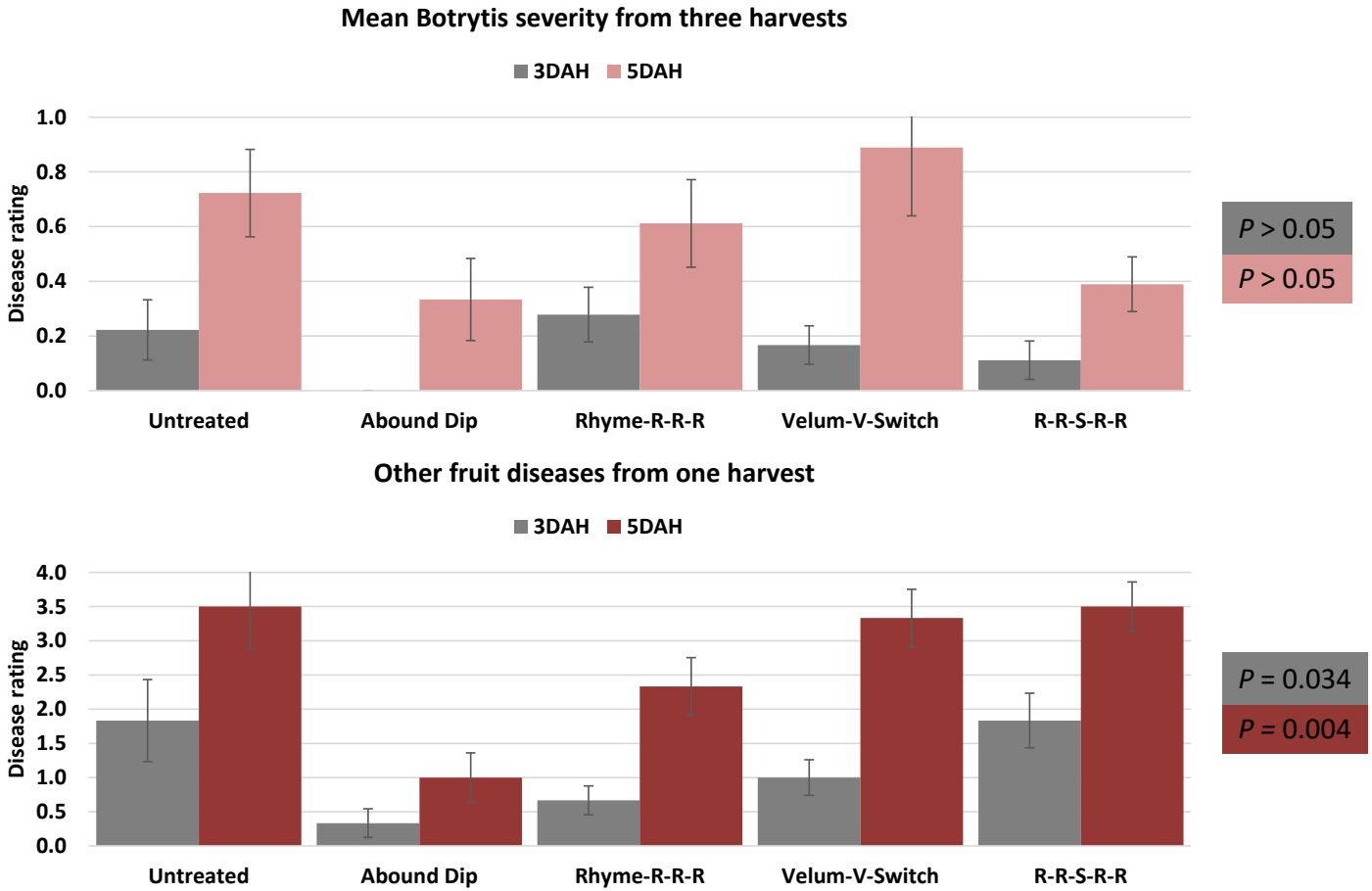
Drip application of fungicides

- 0 No disease
- 1 1-25%
- 2 26-50%
- 3 51-75%
- 4 76-100%



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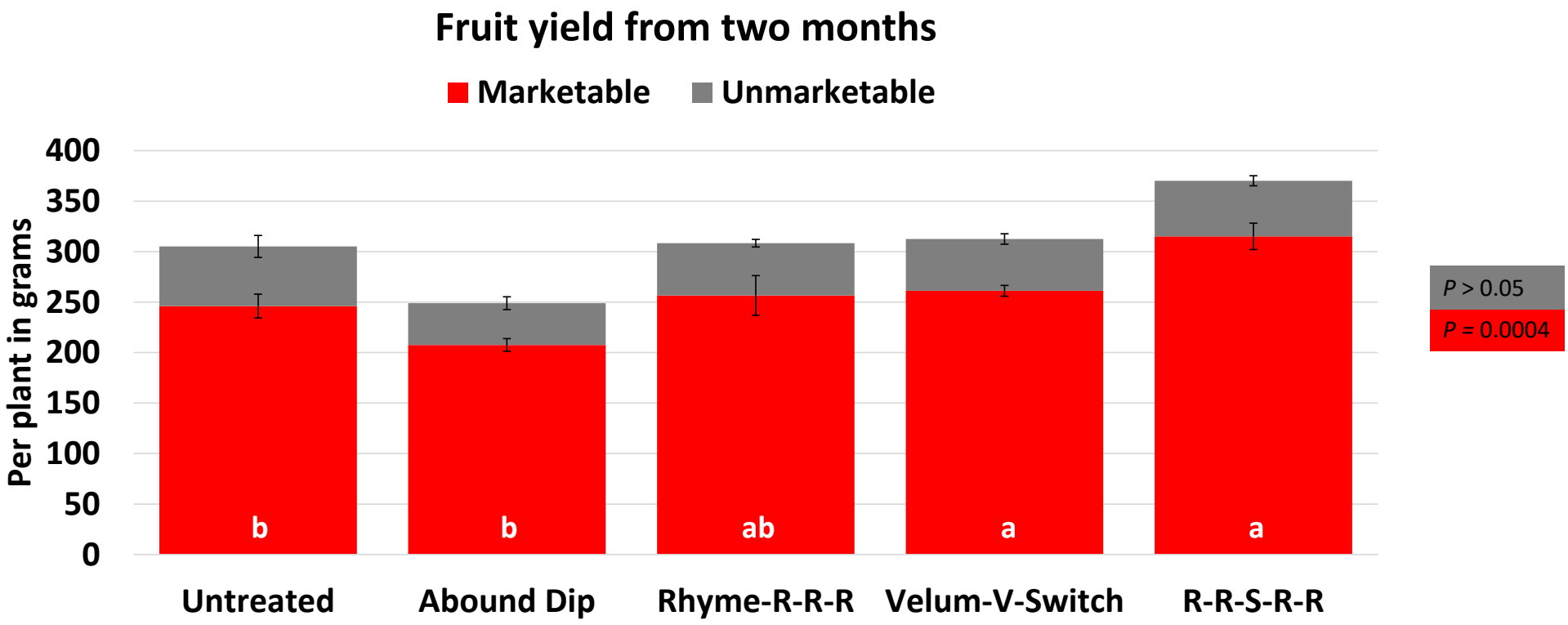
Drip application of fungicides



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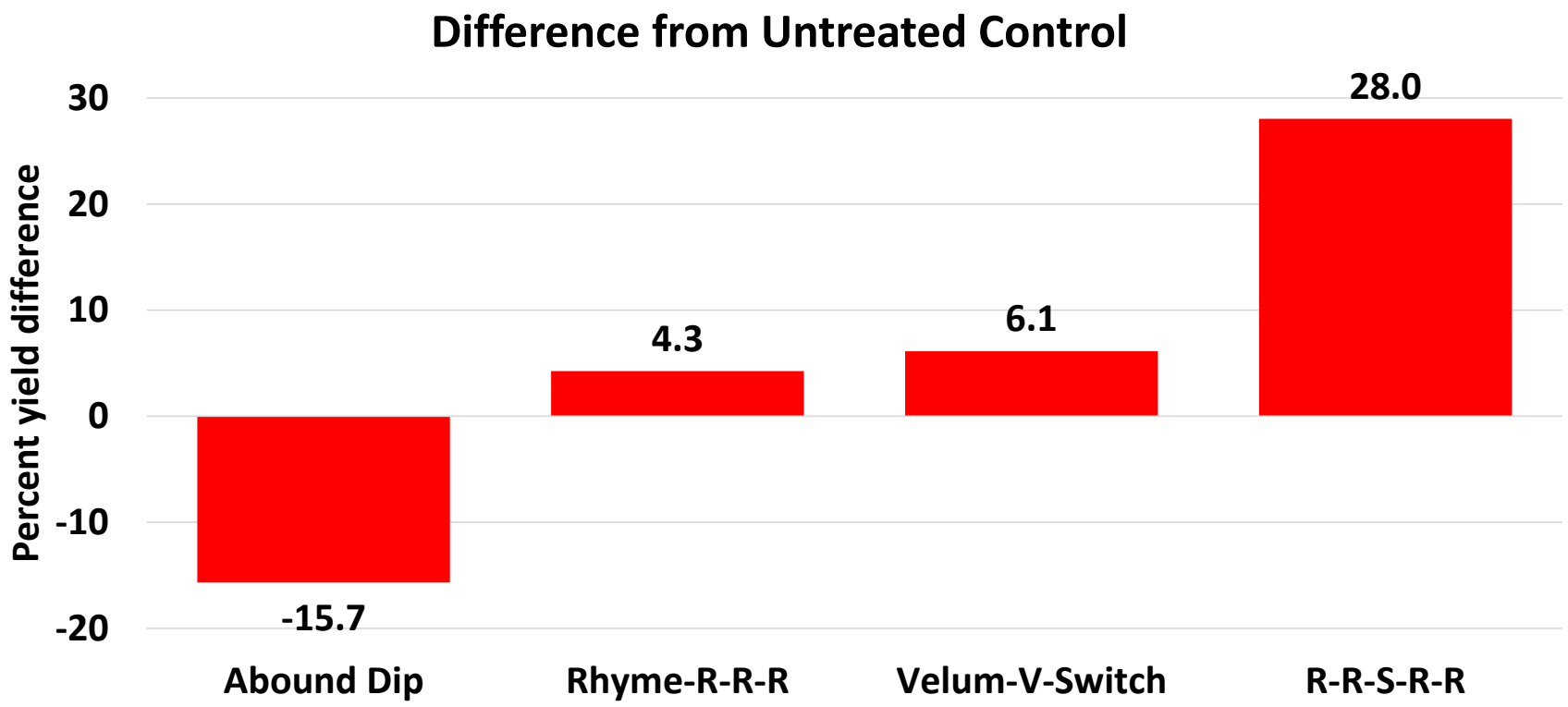
Drip application of fungicides



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Conclusions

- Multiple measured parameters did not differ among the treatments
- No visible symptoms of soilborne diseases during the study to determine how the fungicide treatments helped
- Marketable fruit yield was significantly higher in some treatments

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Quiz

- Which of the following is correct about this study?

A. Soil application of fungicides improves fruit yields
B. Although visible disease symptoms were not seen to know the treatment effect, fruit yields were higher in some fungicide treatments
C. Both are correct
D. Neither one is correct

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Biostimulants and nutrients in strawberry

Experimental design

30’X3.2’ plots replicated six times within a single bed

Treatments*

1. Grower standard (20-10-0 and 0-0-25)
2. Grower standard with transplant dip in Abound 7 fl oz
3. Locus: Rhizolizer (*Trichoderma harzianum* and *Bacillus amyloliquefaciens*) 3 fl oz/ac 6 fl oz and Str10 5 fl oz with molasses 10 fl oz through drip
4. Redox: diKaP 2 lb/ac foliar spray
5. Bio Huma Netics: Transplant dip in Promax 1.28 fl oz/ac, Zap 1.28 fl oz, Breakout 6.4 fl oz, Vitol 1.28 fl oz and drip application Ultra Precision A or B 204 fl oz
6. BioWorks 1: ON-Gard (botanical proteins) 32 fl oz/ac foliar spray
7. BioWorks 2: ON-Gard 32 fl oz/ac foliar spray and RootShield Plus WP (*Trichoderma harzianum* and *T. virens*) 2 lb or 1 lb through drip
8. CropSignal: 10 gpa and 5 gpa through drip
9. Stoller 1: STO-540 10 lb/ac and STO-1123 8 fl oz through drip
10. Stoller 2: STO-2005 8 fl oz/ac with STO-510 10 lb and STO-1123 through drip

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*Except for Bio Huma Netics treatment, the rest were applied on top of the grower standard fertility program

Biostimulants and nutrients in strawberry

Parameters measured

- Canopy growth
- First flower and fruit count
- Fruit sugar
- Fruit firmness
- Leaf nitrogen and chlorophyll
- Fruit diseases (Botrytis and others)
- Fruit yield on 11 dates between 11 March and 11 May 2020
- Heat stress on plants

Statistical analysis ANOVA and significant means were separated using LSD test

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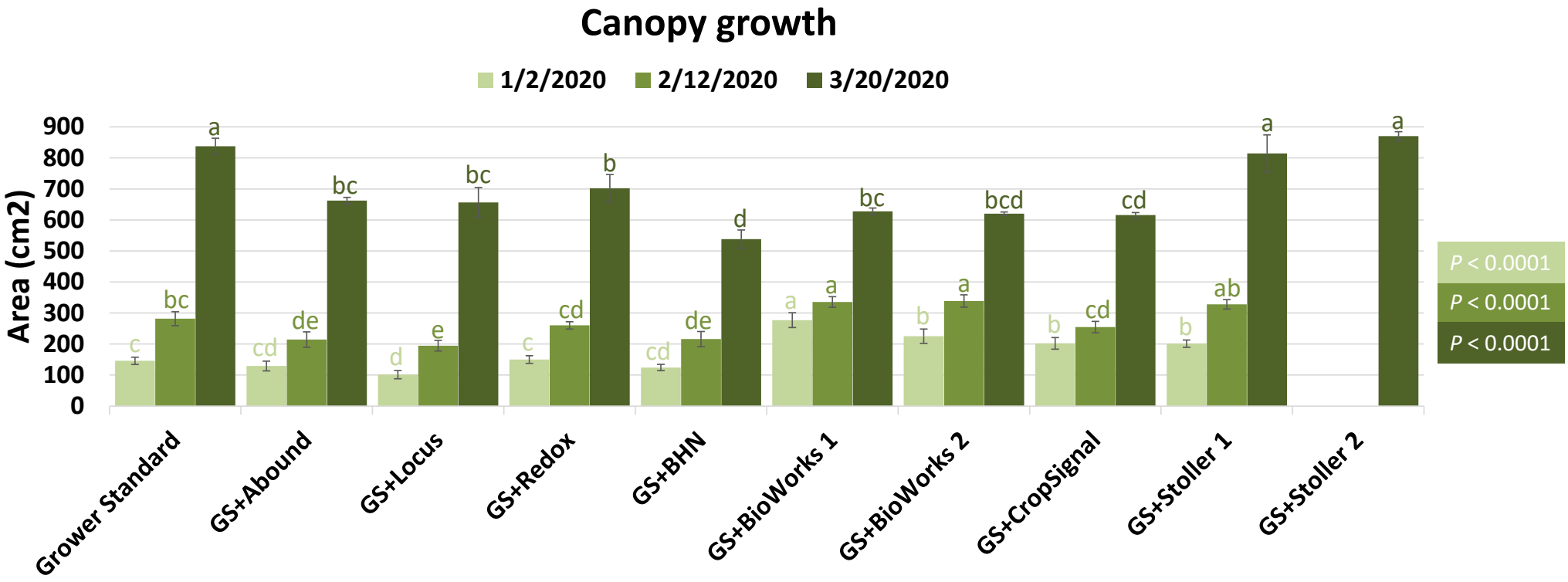
Biostimulants and nutrients in strawberry



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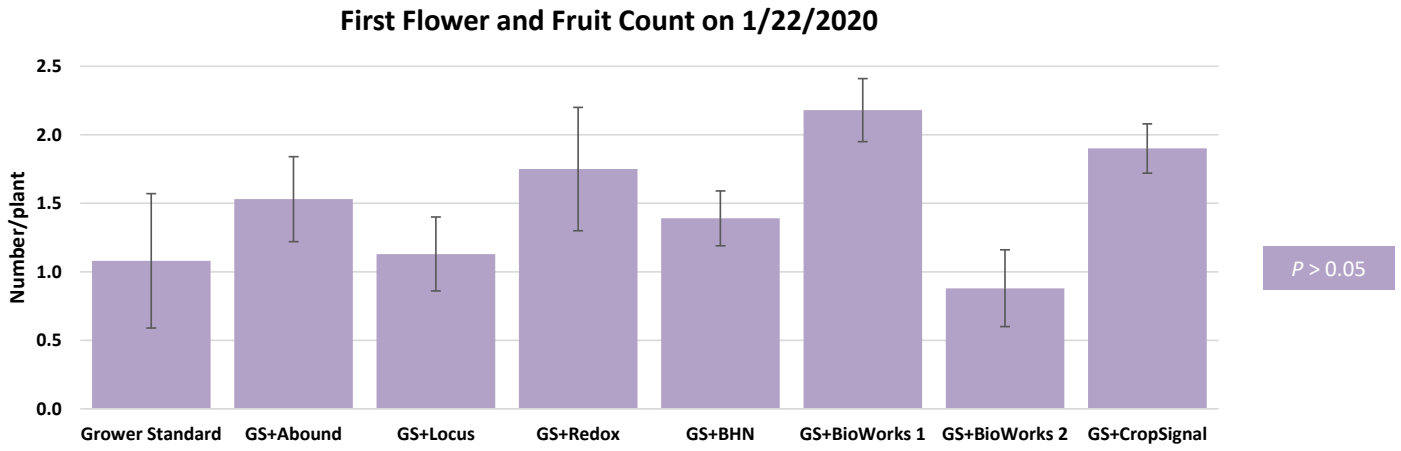
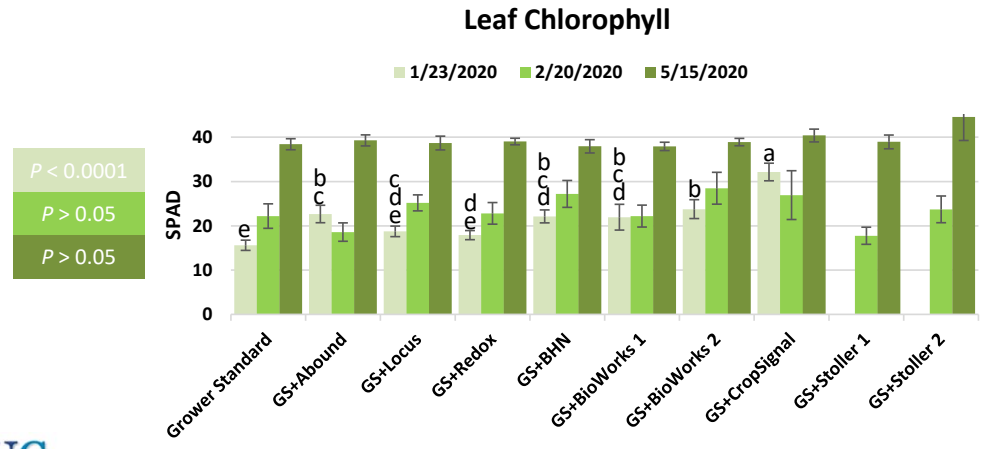
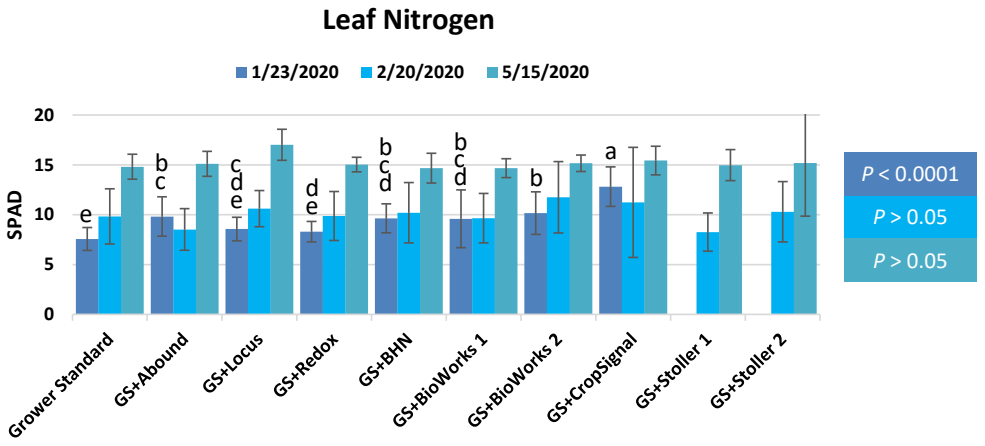
Biostimulants and nutrients in strawberry







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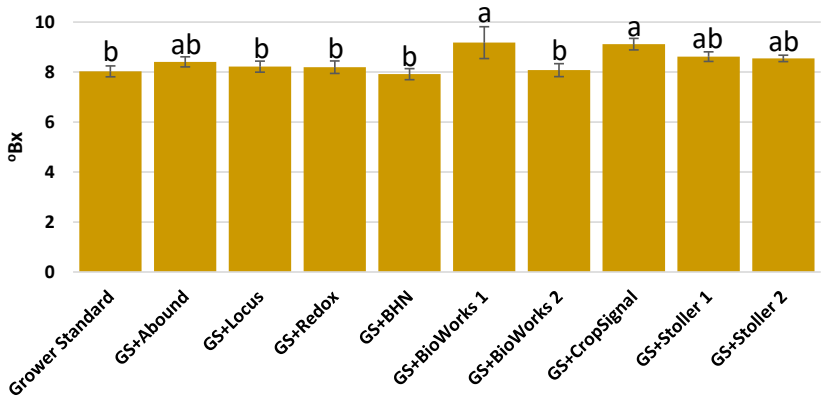
Biostimulants and nutrients in strawberry

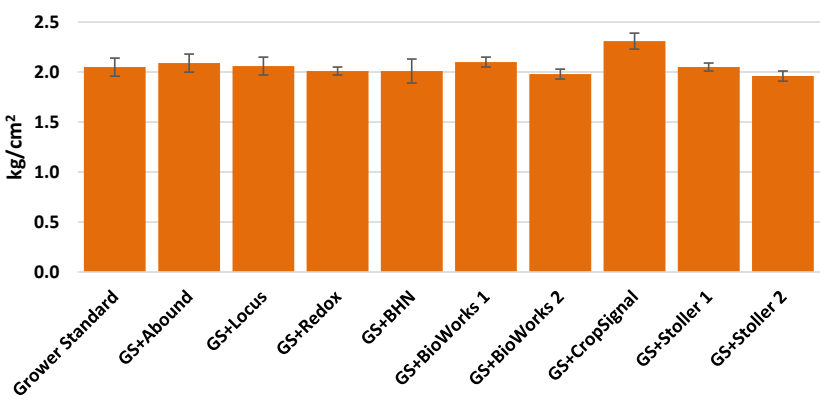
Fruit Sugar from two harvests

P = 0.03



Fruit Firmness from three harvests

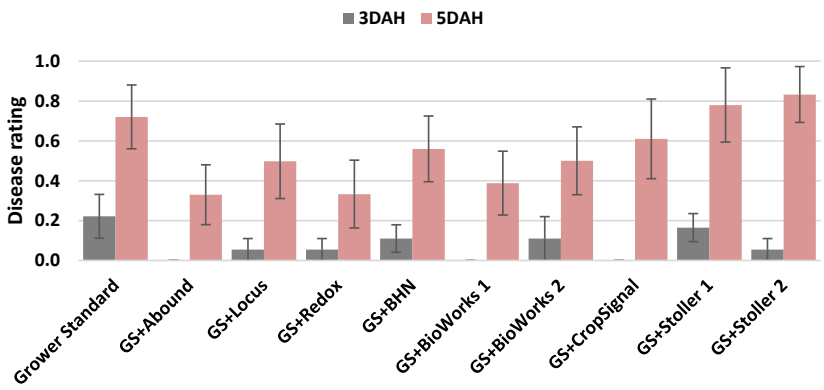
P > 0.05



Mean Botrytis from three harvests

P > 0.05

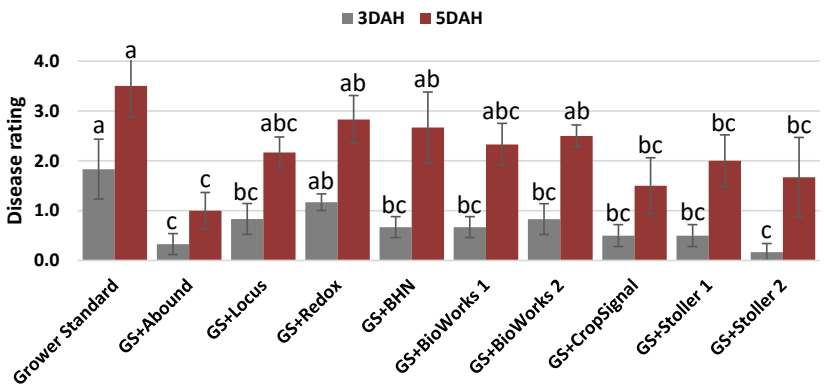
P > 0.05



Other fruit diseases from one harvest

P = 0.01

P = 0.04



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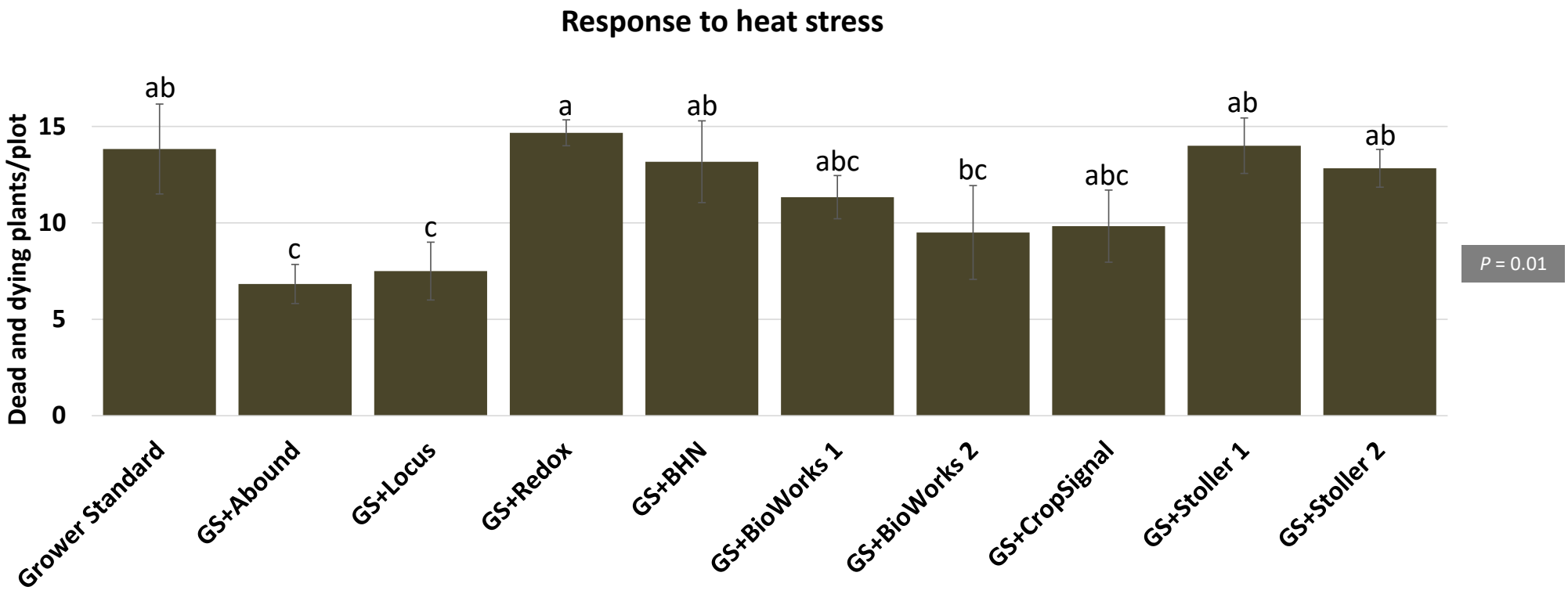
Biostimulants and nutrients in strawberry



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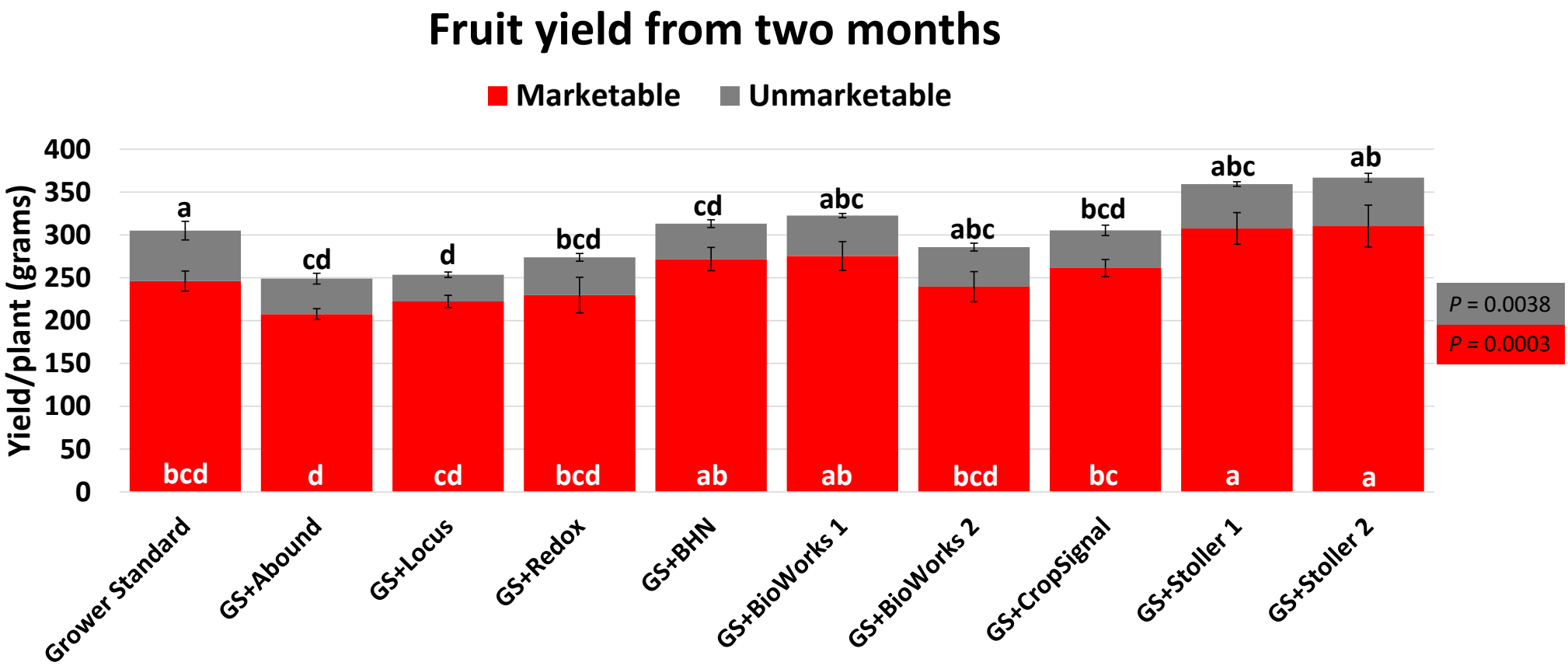
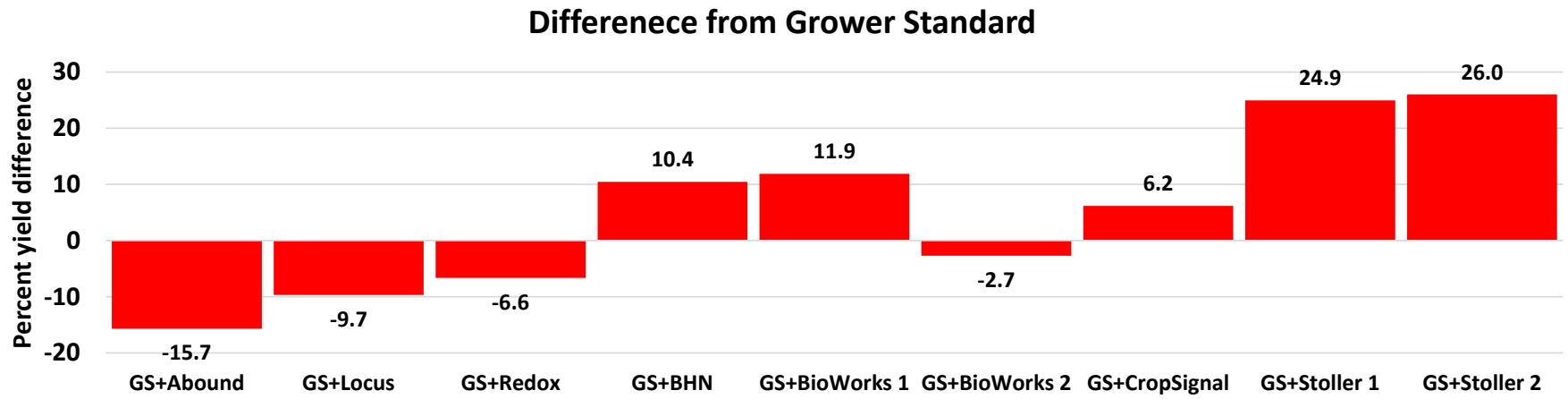
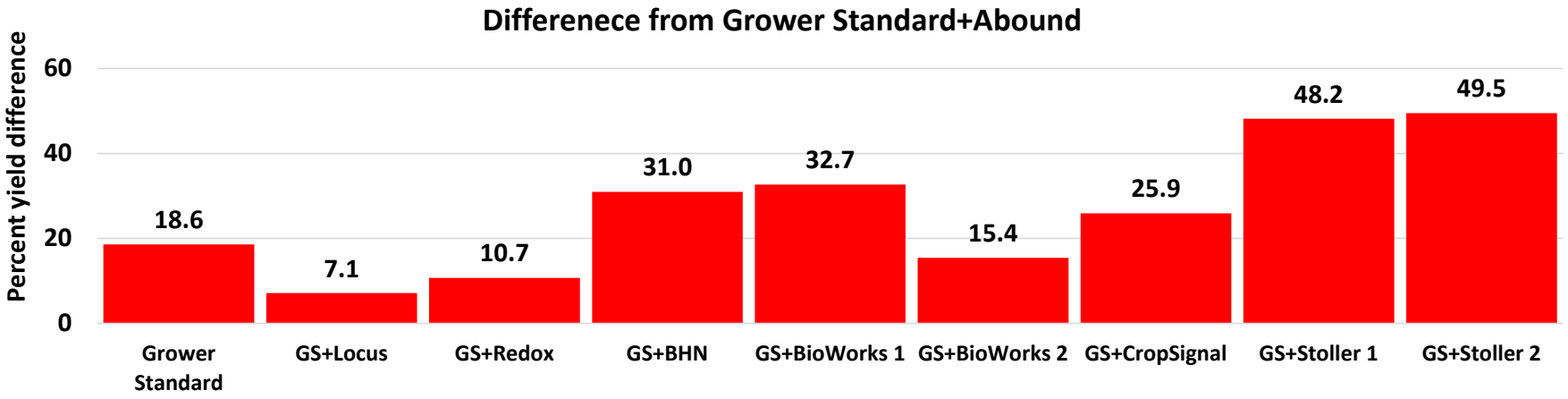
Biostimulants and nutrients in strawberry



Biostimulants and nutrients in strawberry





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Conclusions

- Impact of some treatments on measured parameters varied
- Marketable fruit yield significantly improved by some biostimulants or nutrients
- It is important to consider the impact of these inputs on each parameter and develop an appropriate strategy that meets the needs

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Quiz

- What I can learn from this study is that

A. Treatment effect on some parameters was variable
B. Fruit yield was significantly improved by some treatments
C. Treatments had no effect on Botrytis but significantly reduced other fruit diseases
D. All of the above

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