August 14-15, 2019 at the Lee Civic Center in North Ft. Myers, FL

CITRUS EXPO | VEGETABLE & SPECIALTY CROP EXPO

Planting densities, fertilization methods and irrigation systems for sweet orange production in the Indian River District

FOR THE #GATORGOOD

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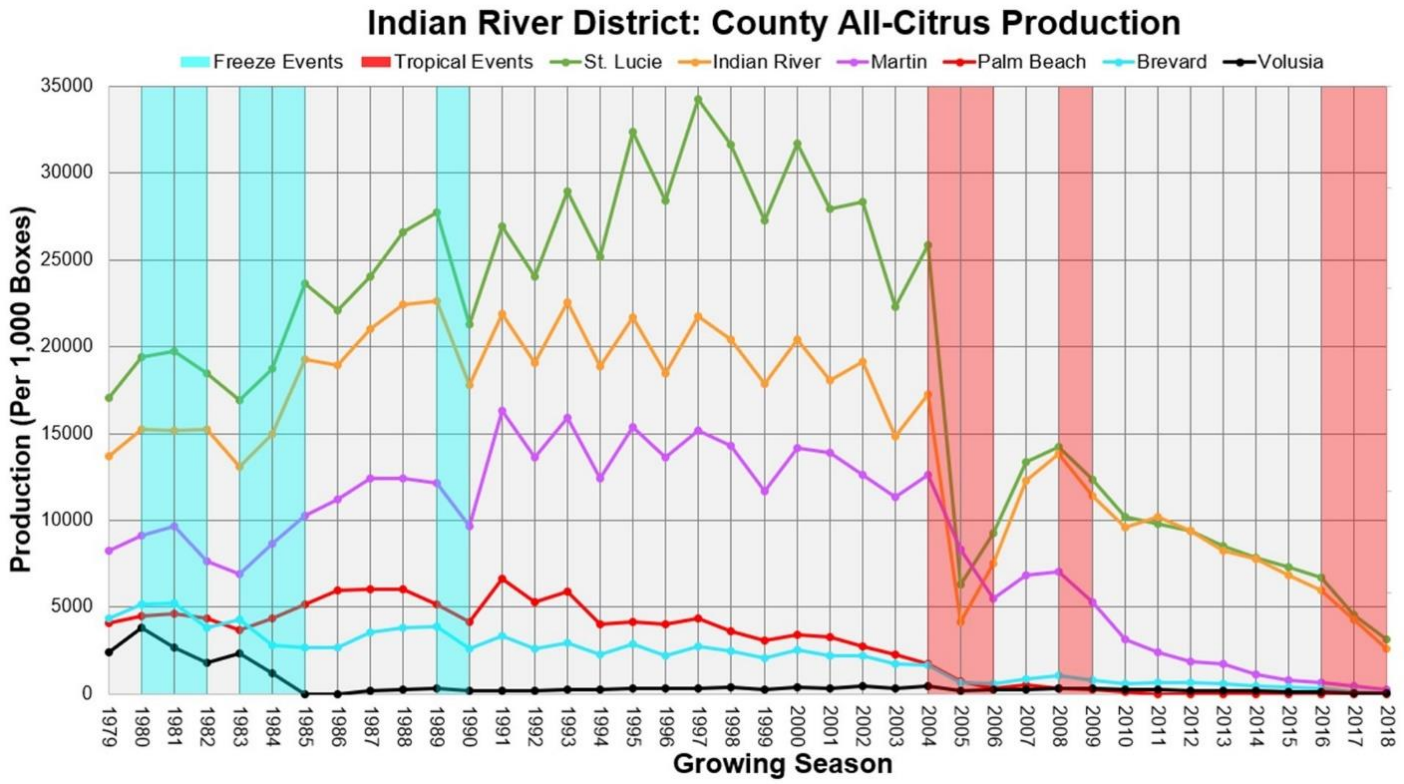
HLB is **devastating** Florida's citrus industry, causing reduction of acreage, fruit production and fruit quality – **particularly on grapefruit in the Indian River Citrus District**.

HLB effect on citrus production in the Indian River



Ferrarezi, Rodriguez and Sharp. 2019. How historical trends in Florida all-citrus production correlate with devastating hurricane and freeze events. **Weather** (in press).

https://doi.org/10.1002/wea.3512

The UF/IFAS IRREC Ferrarezi Lab works mainly with grapefruit:

- CUPS and Mini-CUPS (USDA-CDRE)
- Fertilization method/rate optimization (CRDF)
- Plant density, soil and foliar nutrient application in increasing rates (UF/IFAS Citrus Initiative and USDA-MAC)
- Biostimulants and Antimicrobials (USDA-NIFA-GEOW)
- UF/IFAS new tolerant cybrids (Dr. Grosser)
- Grower-driven grapefruit variety trials (USDA-MAC)
- Grapefruit and rootstock trials including the UFRs (CRDF)

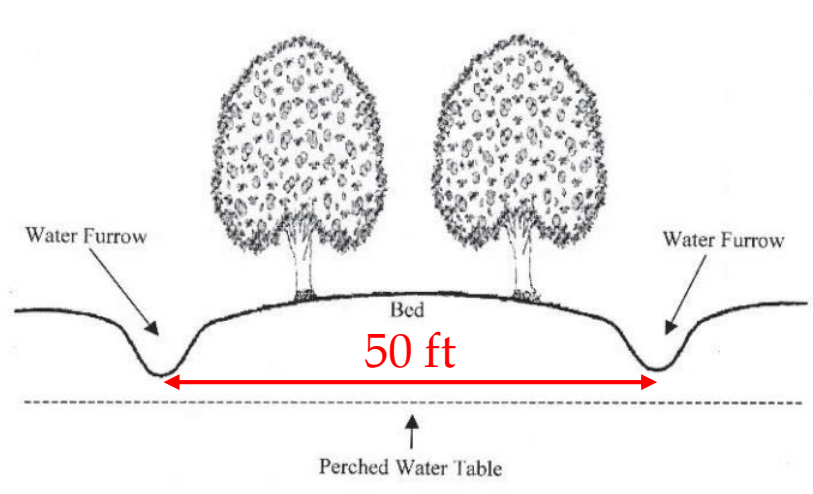
- Florida Citrus Rootstock Selection Guide (CRDF)
- Accelerating implementation of HLB tolerant hybrids as new commercial cultivars for fresh and processed citrus (USDA-CDRE)

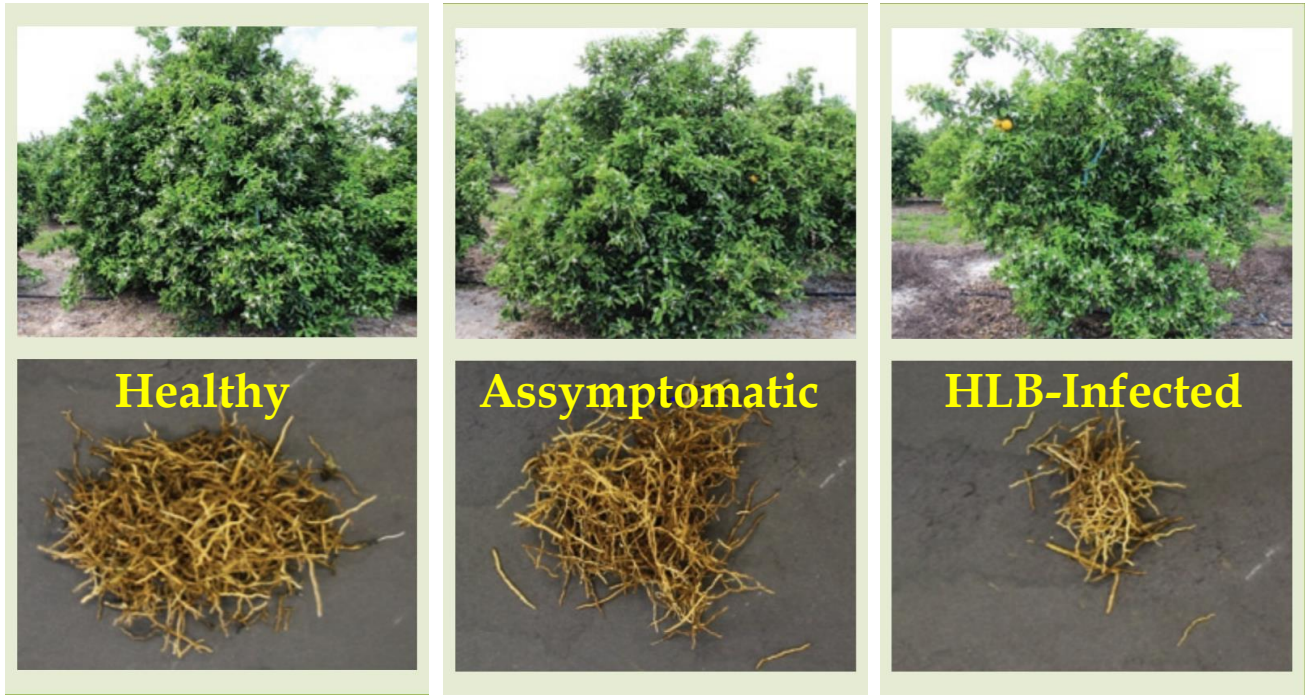
But why not also **plant round oranges in the River** to look for an alternate citrus crop to preserve the history of this prestigious region and keep the River growers in the citrus business?

Hypothesis: The combination of improved horticultural practices can increase fruit yield per area under high HLB pressure.

High-density planting, constant nutrient supply and more efficient irrigation systems

Tree spacing. The idea behind growing high-density plantings is to optimize the 50-ft bed space use since trees do grow slow in the first 5-6 years and have been growing even slower due to negative effects of HLB in plant physiology.





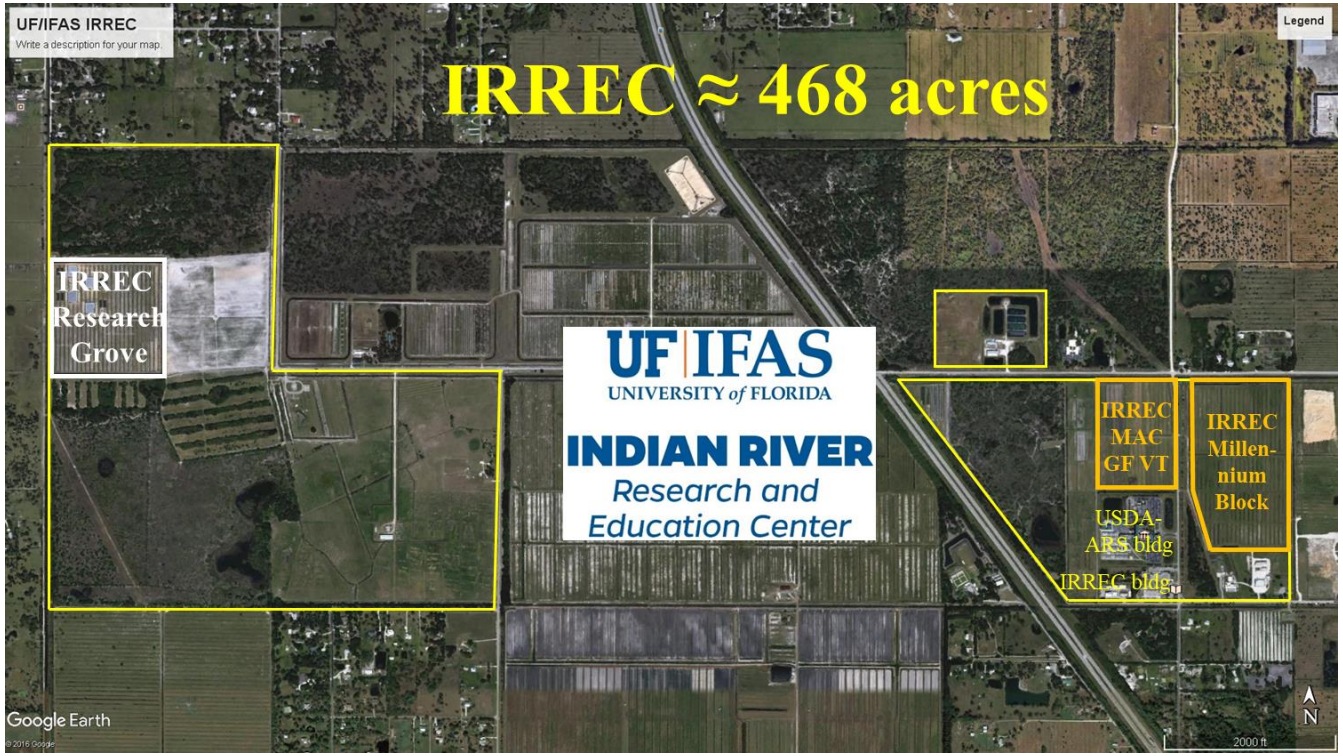
Evan Johnson and Jim Graham. 2015. Root health in the age of HLB. Citrus Industry, August 14-18.

A smaller root system has <u>limited water and nutrient uptake</u>, reducing tree growth.

Fertilization methods and irrigation systems. There is a need to improve water and fertilizer supply to increase use efficiency in the presence of HLB.

This study evaluated the effect of tree planting density, fertilization method and irrigation system combinations on round orange fruit yield and fruit quality in the Indian River District.

Materials and Methods

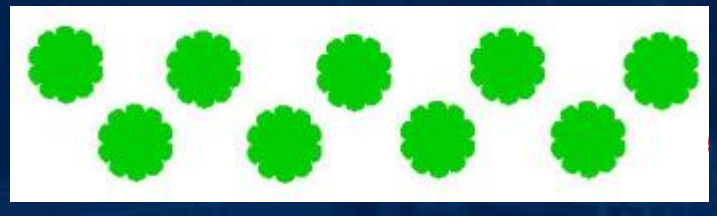


- Trial located at the UF/IFAS IRREC Research Grove
- **'Valencia'** sweet orange (*C. sinensis*) on **'Kuharske'** citrange (*C. sinensis* × *Poncirus trifoliata*)
- Trees planted in Sept/2013 (1,212 trees in 4 acres) (~6-YEAR-OLD TREES)
- Area: six 50′ × 580′ beds (two rows per bed)
- Experimental design: complete randomized block design with 4 replications
- Treatments:

(2 single-rows/bed)

- ‘STD_dry_MS: standard tree spacing (12.5’×23.5’ @ 145 trees/acre) + controlled-release fertilizer (CRF) + microsprinkler irrigation (one emitter per tree; microsprinkler 50 green nozzle, 16.7 GPH at 20 psi) (Bowsmith, Exeter, CA)

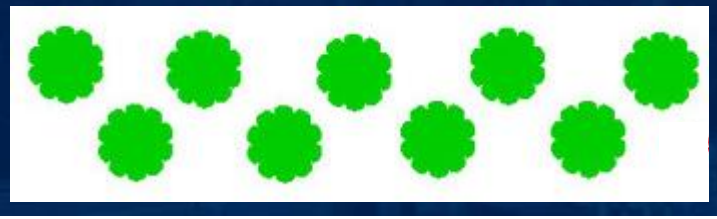
18N-1.31P-16.6K CRF fertilizer (Harrell’s 18-3-20) applied three times a year at 200 lb/acre



(2 double-rows/bed)

- HDS_fert_MS: high density staggered in diamond set ([9′ × 5′ × 3′] × 20′ @ 386 trees/acre) + fertigation + microsprinkler irrigation (one emitter per two trees; microsprinkler 50 green nozzle, 16.7 GPH at 20 psi) (Bowsmith, Exeter, CA)

15N-4.81P-25.73K water-soluble fertizer (Agrolution phLow 15-11-31 +0.75Mg, High K with Mg) applied weekly at 200 lb/acre



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- HDS_fert_DD: high density staggered in diamond set ([9′ × 5′ × 3′] × 20′ @ 386 trees/acre) + fertigation + double-line drip irrigation (two lines per row; Emitterline 0.58 GPH at 10 psi, 12-inch spacing) (Jain Irrigation, Fresno, CA)

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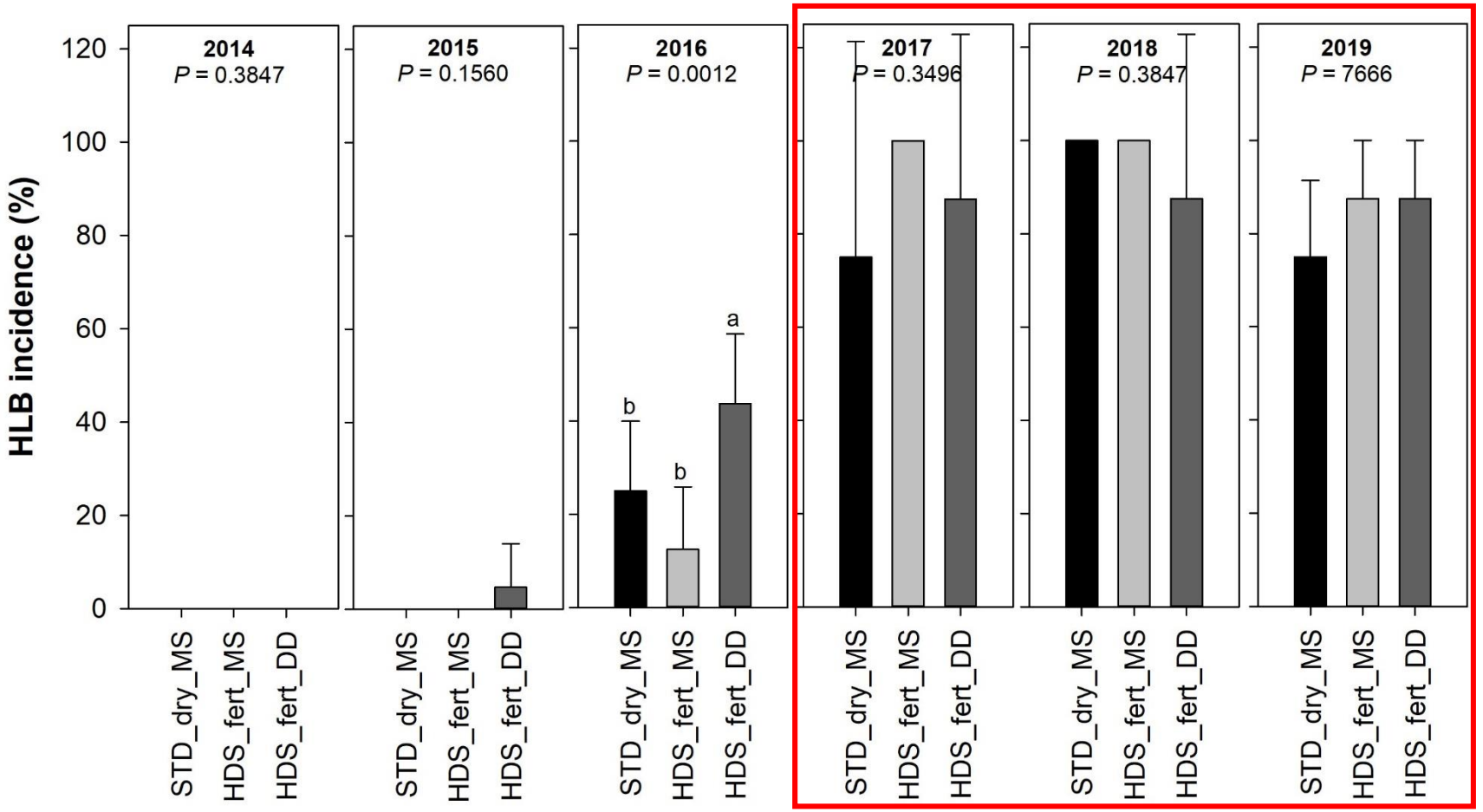
Results



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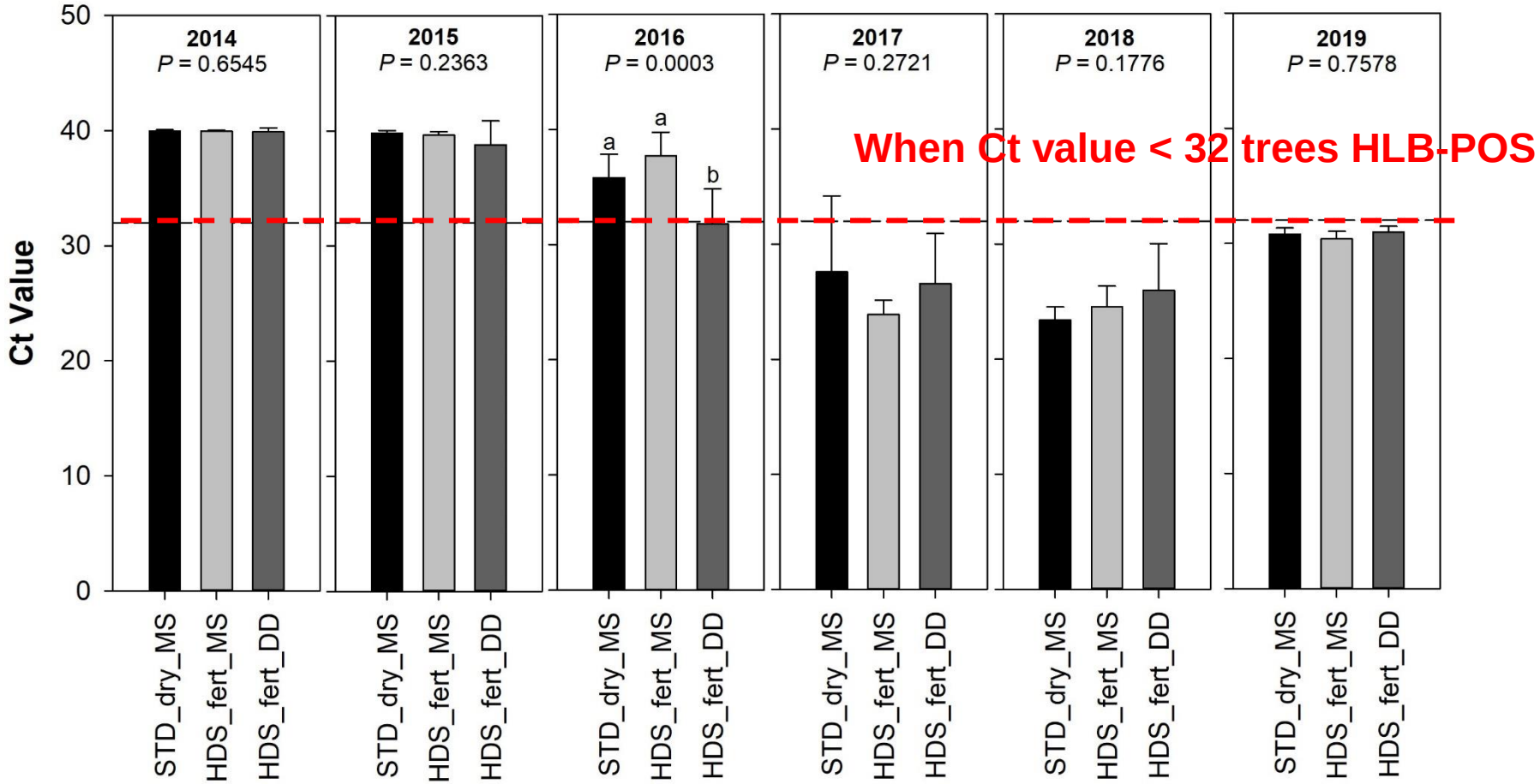

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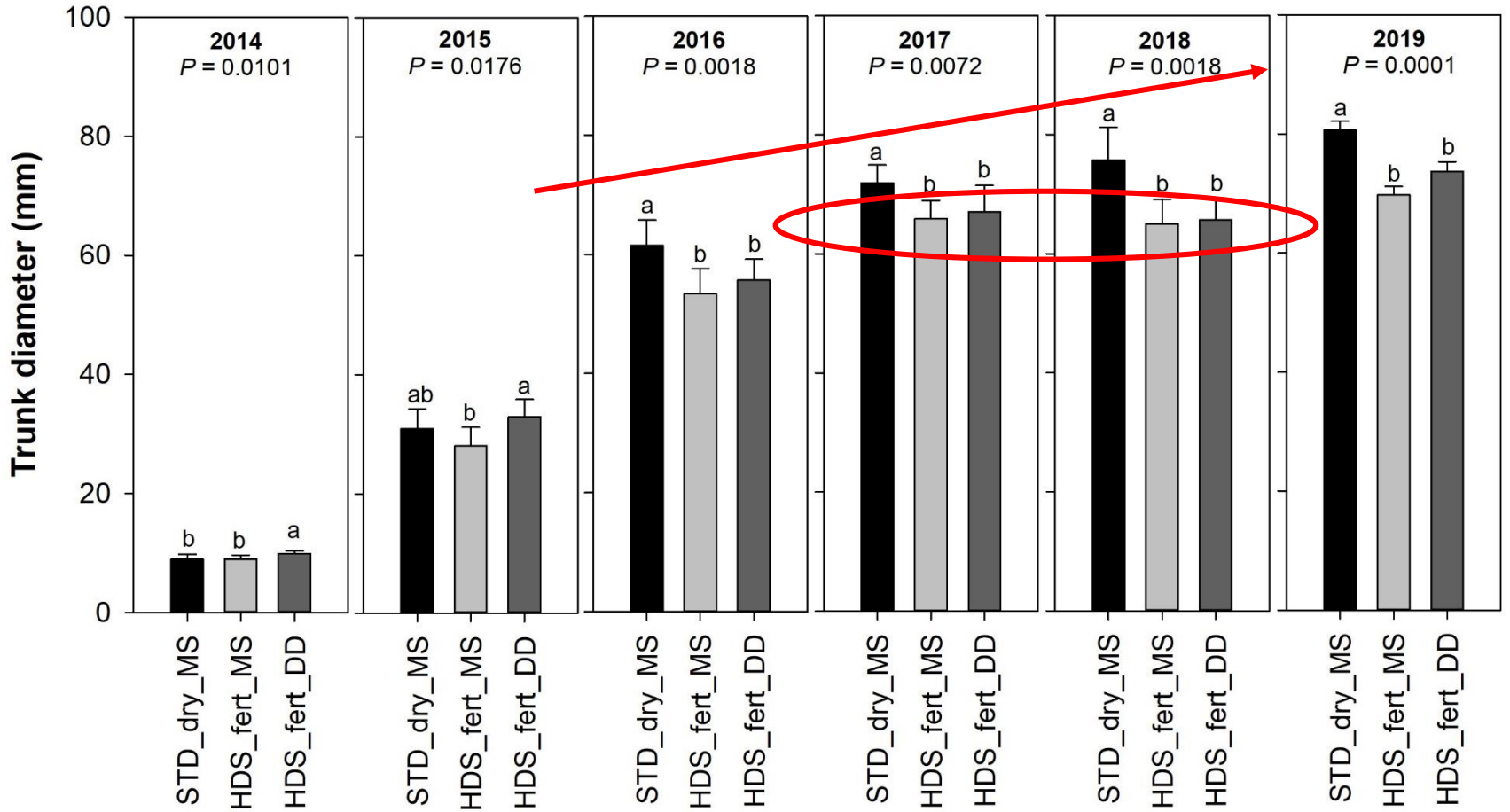

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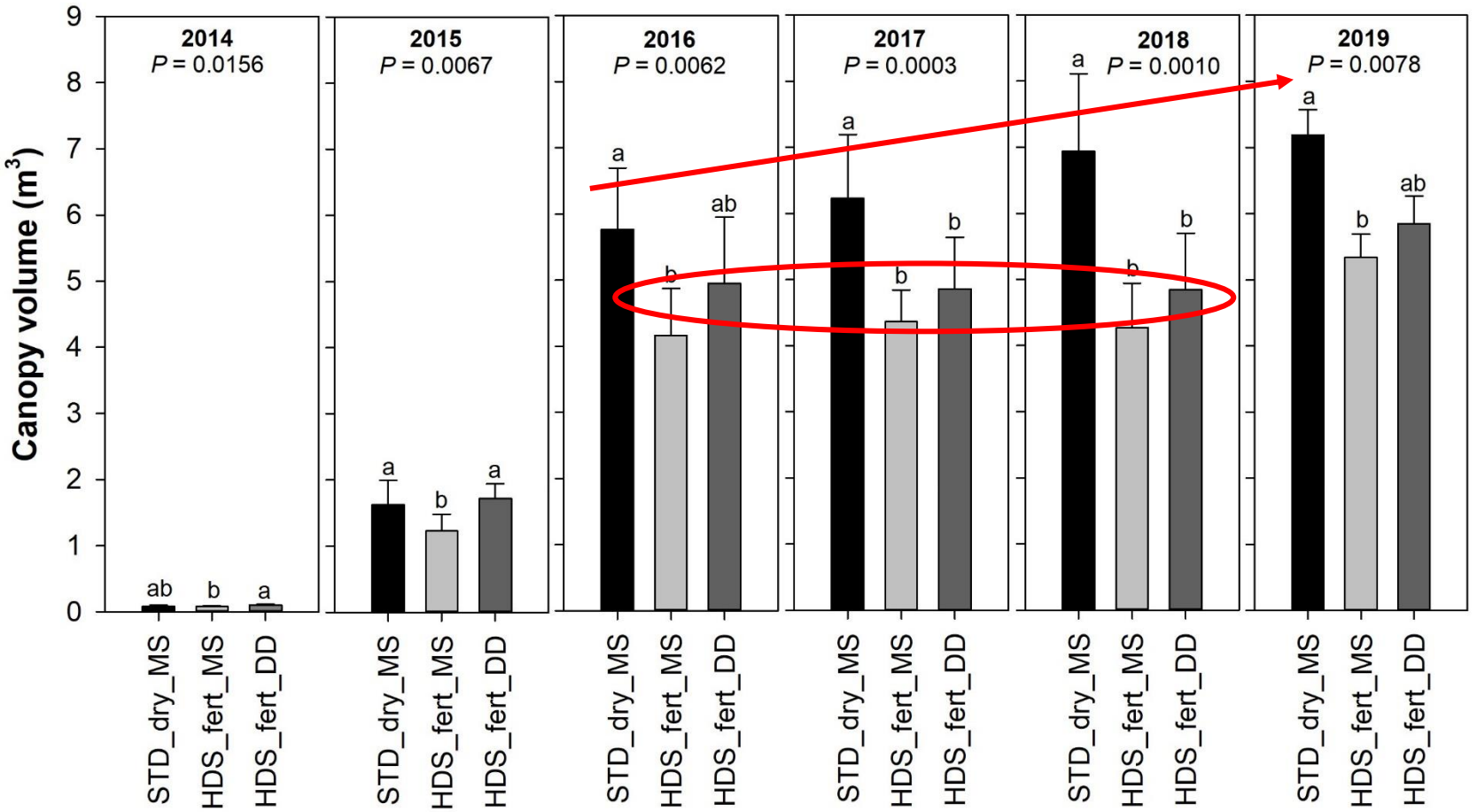

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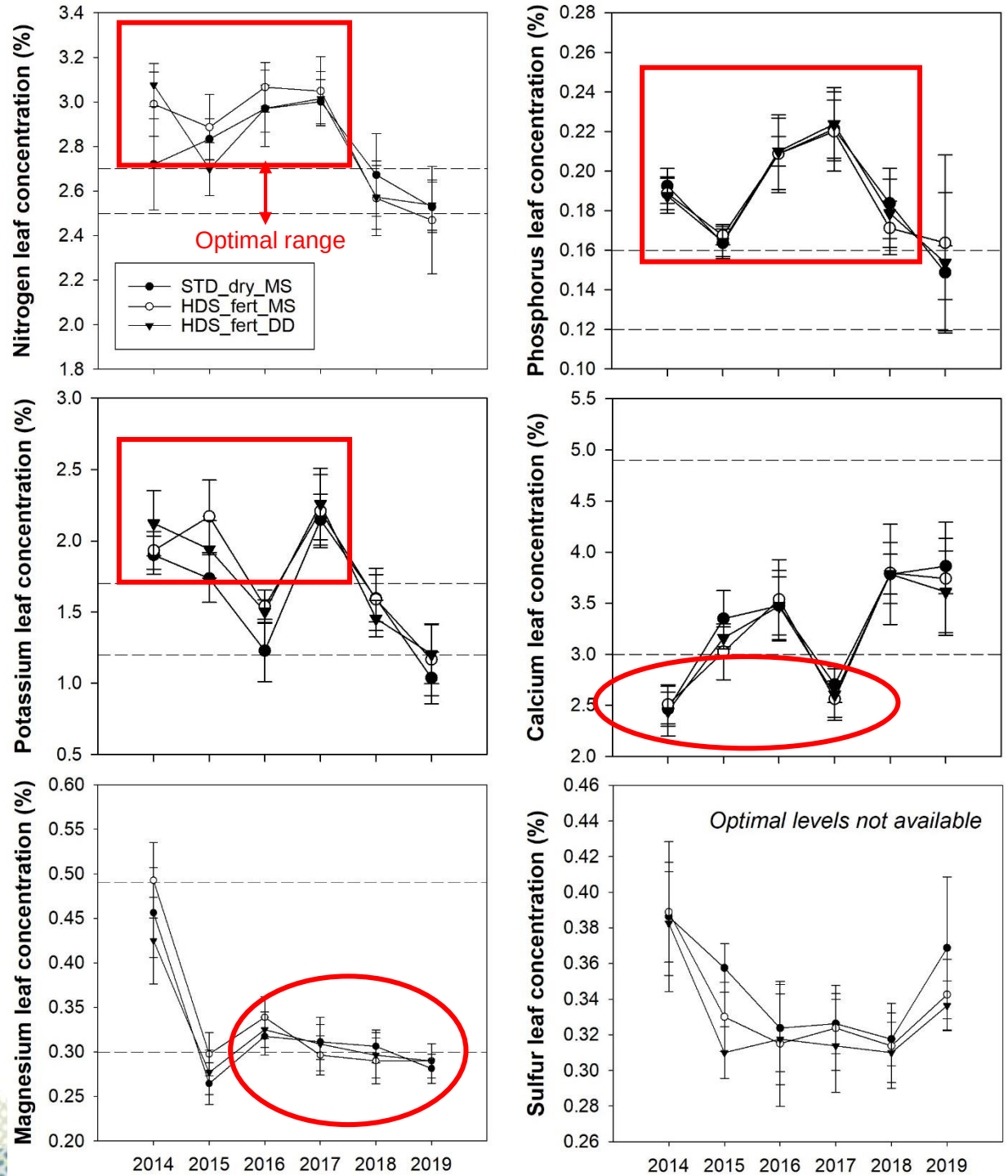

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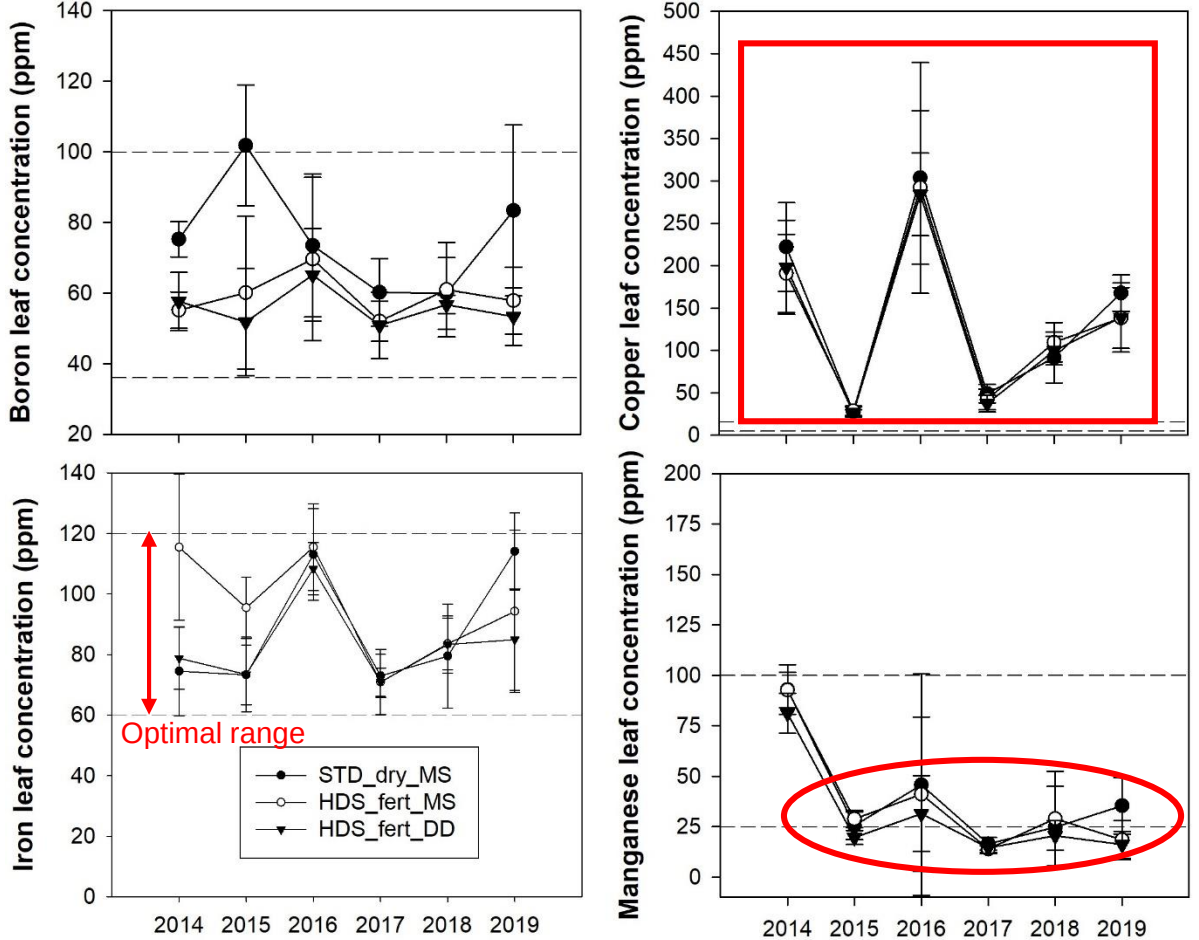

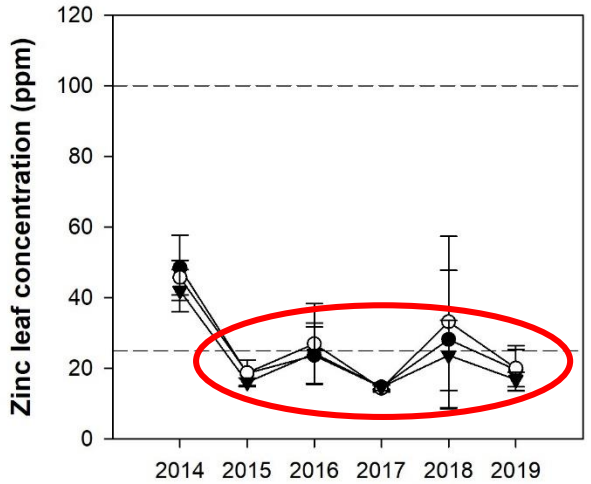

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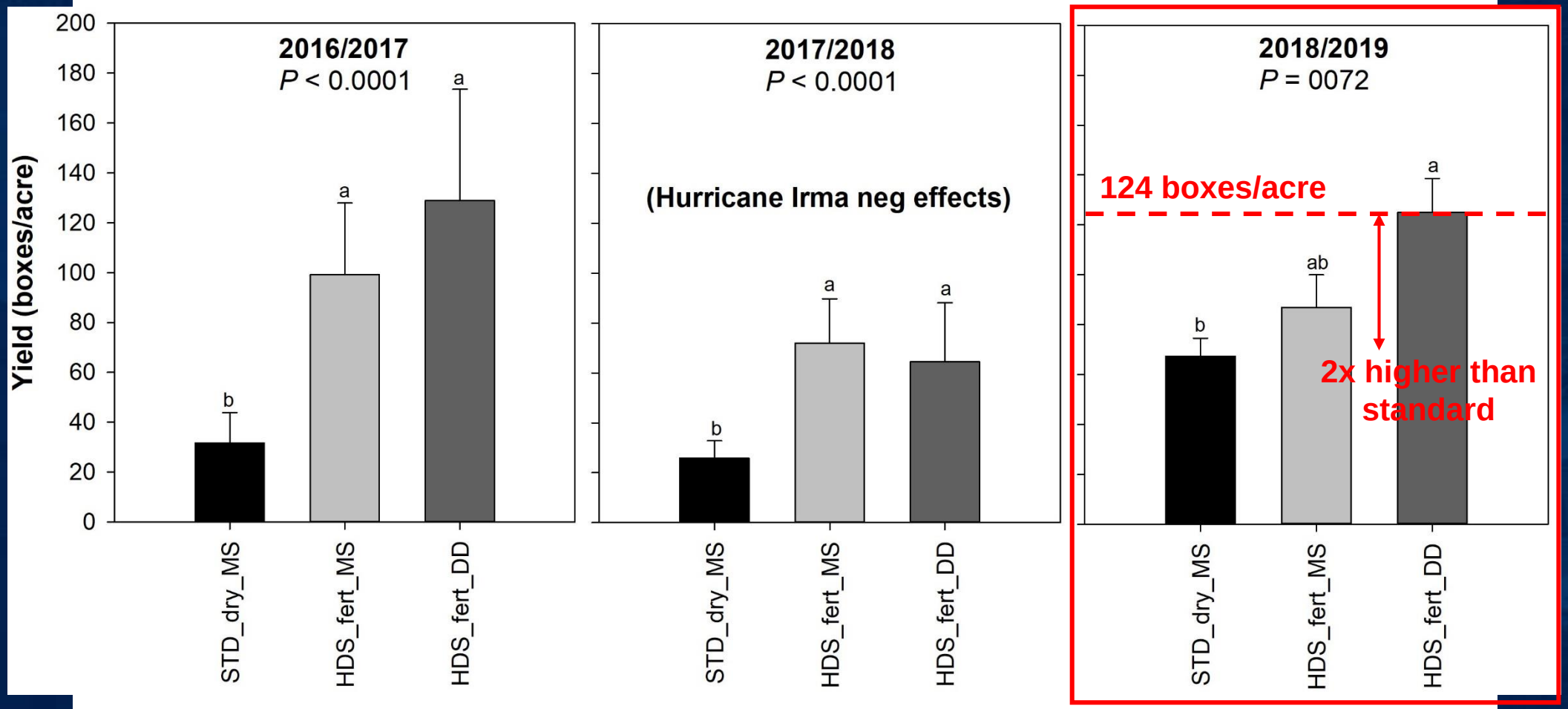

Negative effect of rootstock and extremely high-density planting

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Graves Brothers groves in Fort Pierce, FL (thanks David Howard!)

Valencia on **Swingle** staggered @ 290 trees/acre
Planted 2012
1 hedging/topping
6th year 231 boxes/acre

Valencia on **x639** staggered @ 290 trees/acre
Planted 2012
2 hedging/topping
6th year 297 boxes/acre

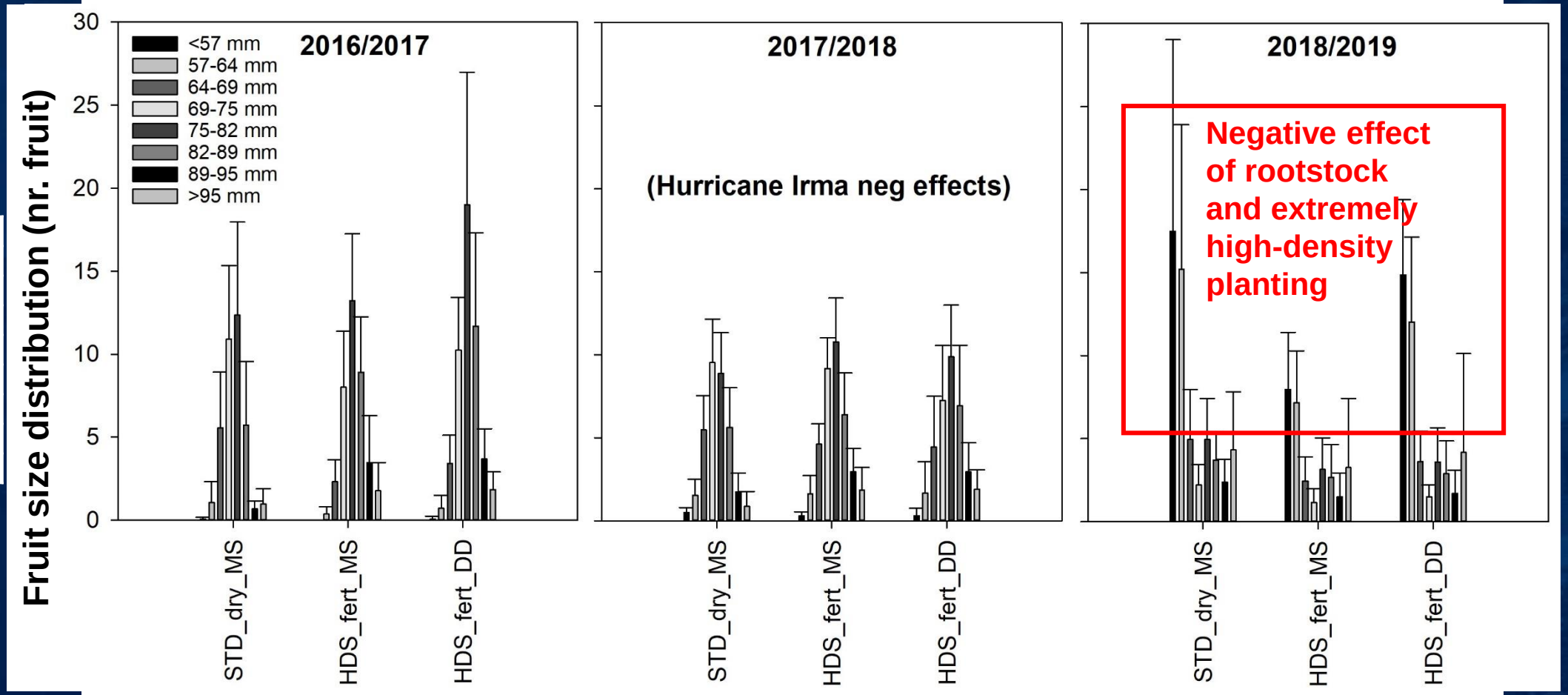
Valencia on **US-802** staggered @ 290 trees/acre
Planted 2012
2 hedging/topping
6th year 250 boxes/acre

Valencia on **US-802**
single @ 227
trees/acre
Planted 2012
No production record

Valencia on **Kuharske**
staggered @ 386
trees/acre
Planted 2013
6th year 125 boxes/acre

(5th year)

fruit (size)
<163 (<57 mm)
163 (57-64 mm)
125 (64-69 mm)
100 (69-75 mm)
80 (75-82 mm)
64 (82-89 mm)
50 (89-95 mm)
>50 (>95 mm)



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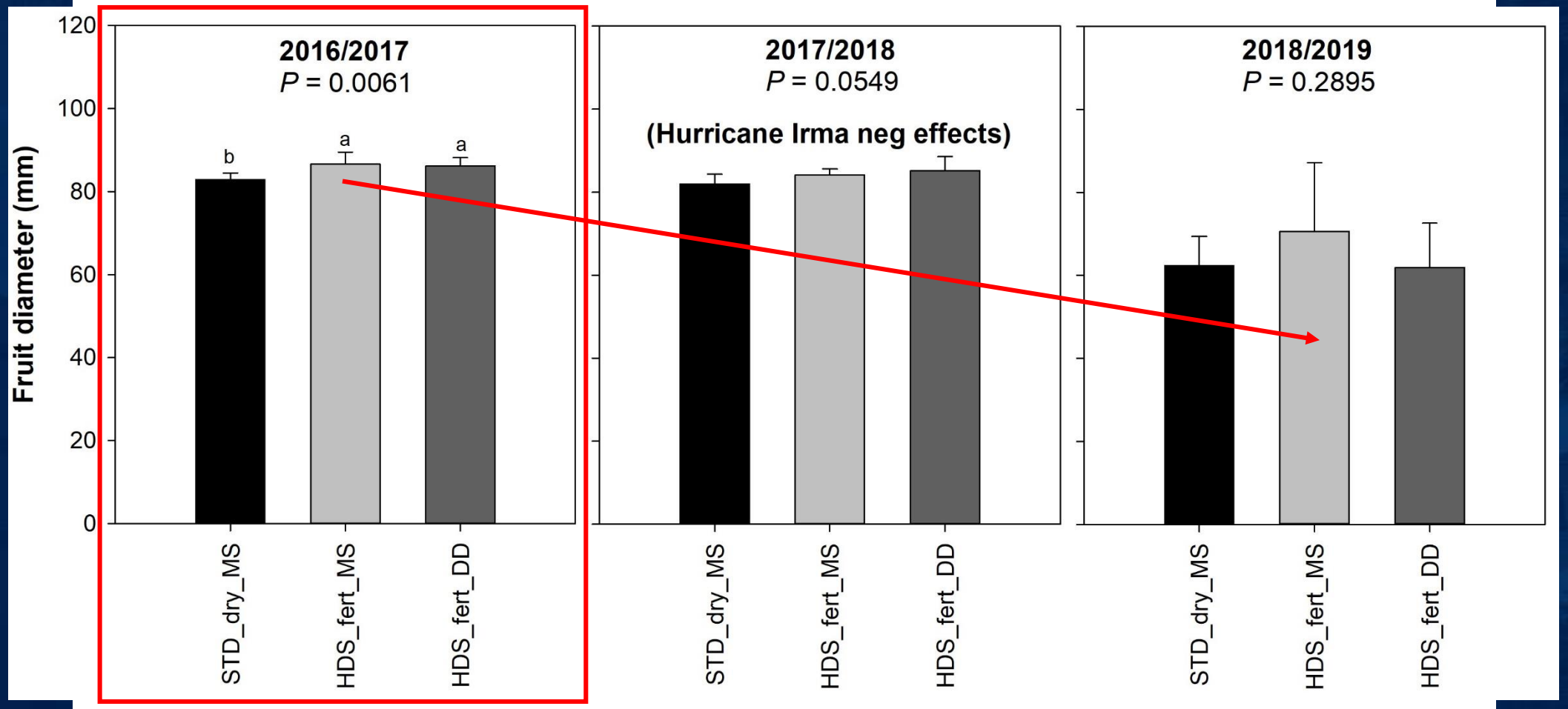

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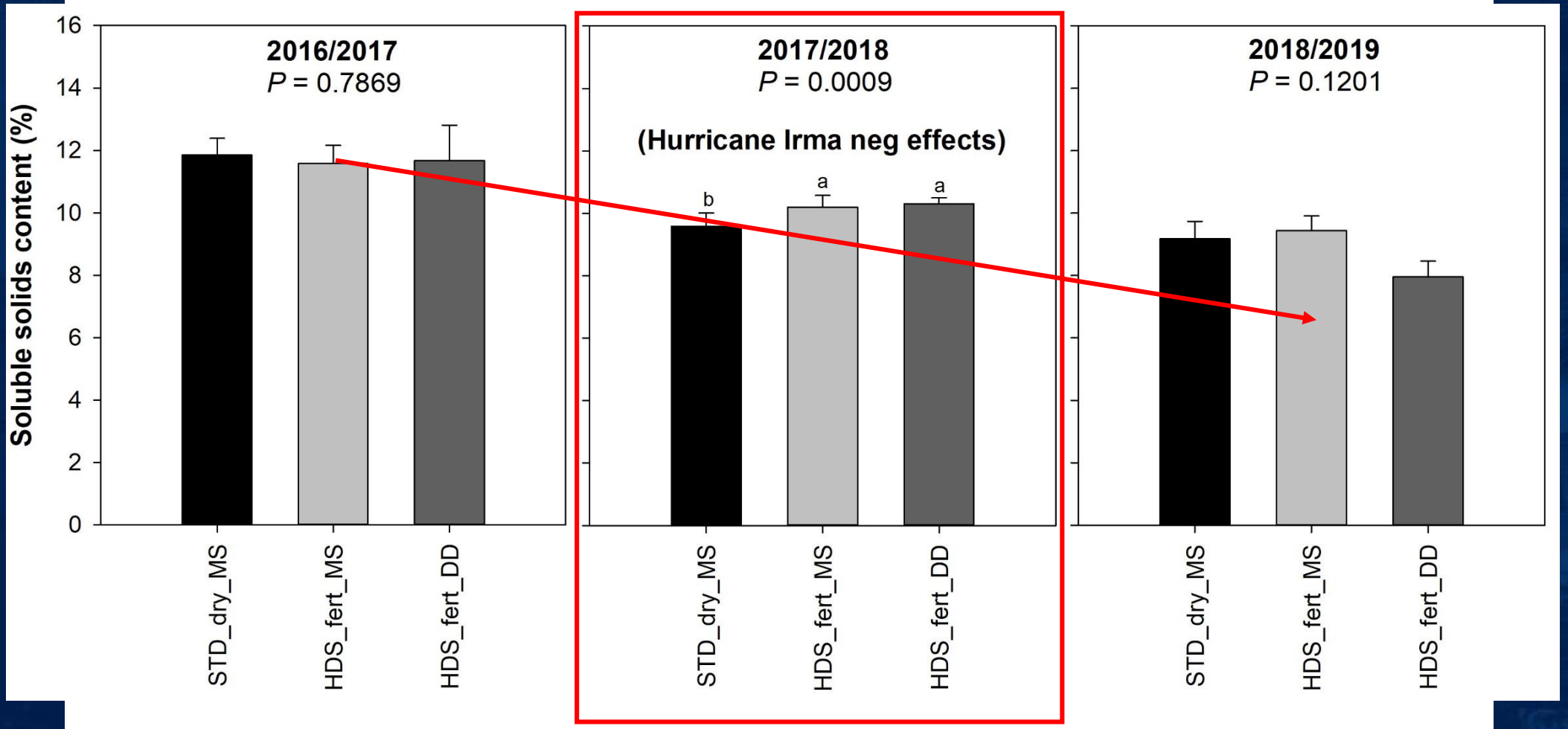

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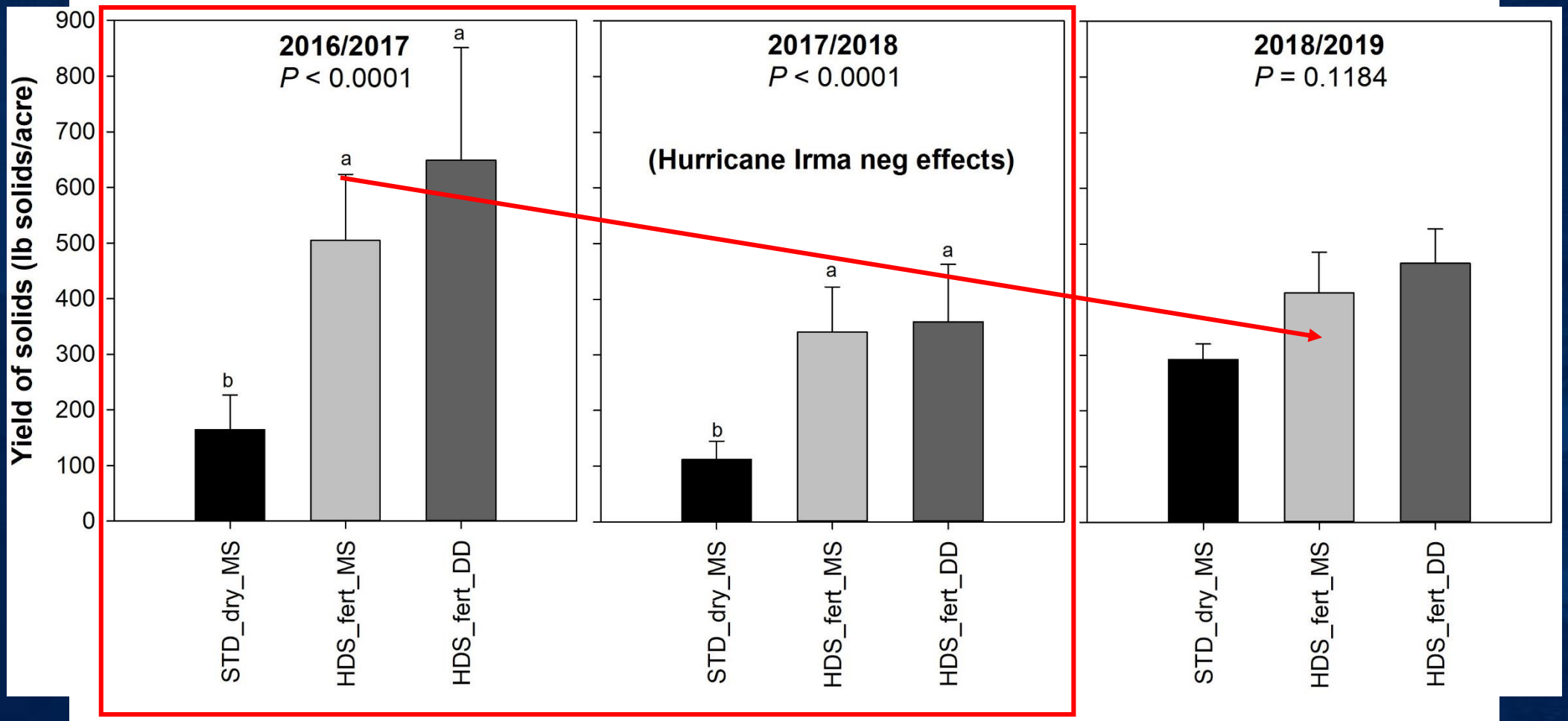
Acidity and ratio data not shown



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Take-home messages

- Staggered, high-density plantings resulted in higher fruit yield and quality, producing more soluble solids per area.

- However, yield is too low as consequence of rootstock performance/choice (Kuharske citrange) and extremely high planting density (386 trees/acre).

- A field trial in a commercial grove indicates that better rootstocks and lower tree densities resulted in economical yield at the Indian River ~ THE SWEET SPOT (Spike, Castle & Stover, 2018).

- A large-scale field test will be performed with multiple rootstocks and tree densities at Graves Brothers in the near future.

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Acknowledgements

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SNEAK PEEK:
UF/IFAS **Florida Citrus Rootstock Selection Guide 4th edition** released for computer browsers
https://crec.ifas.ufl.edu/extension/citrus_rootstock/index.html

(by Drs. Bill Castle, Kim Bowman, Jude Grosser, Johnny Ferrarezi, Steve Futch and Steve Rogers)

USDA Super Sours included and info about UFRs updated!

Mobile-friend version in the works!

Thanks!

Questions?

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Assistant Professor of Citrus Horticulture

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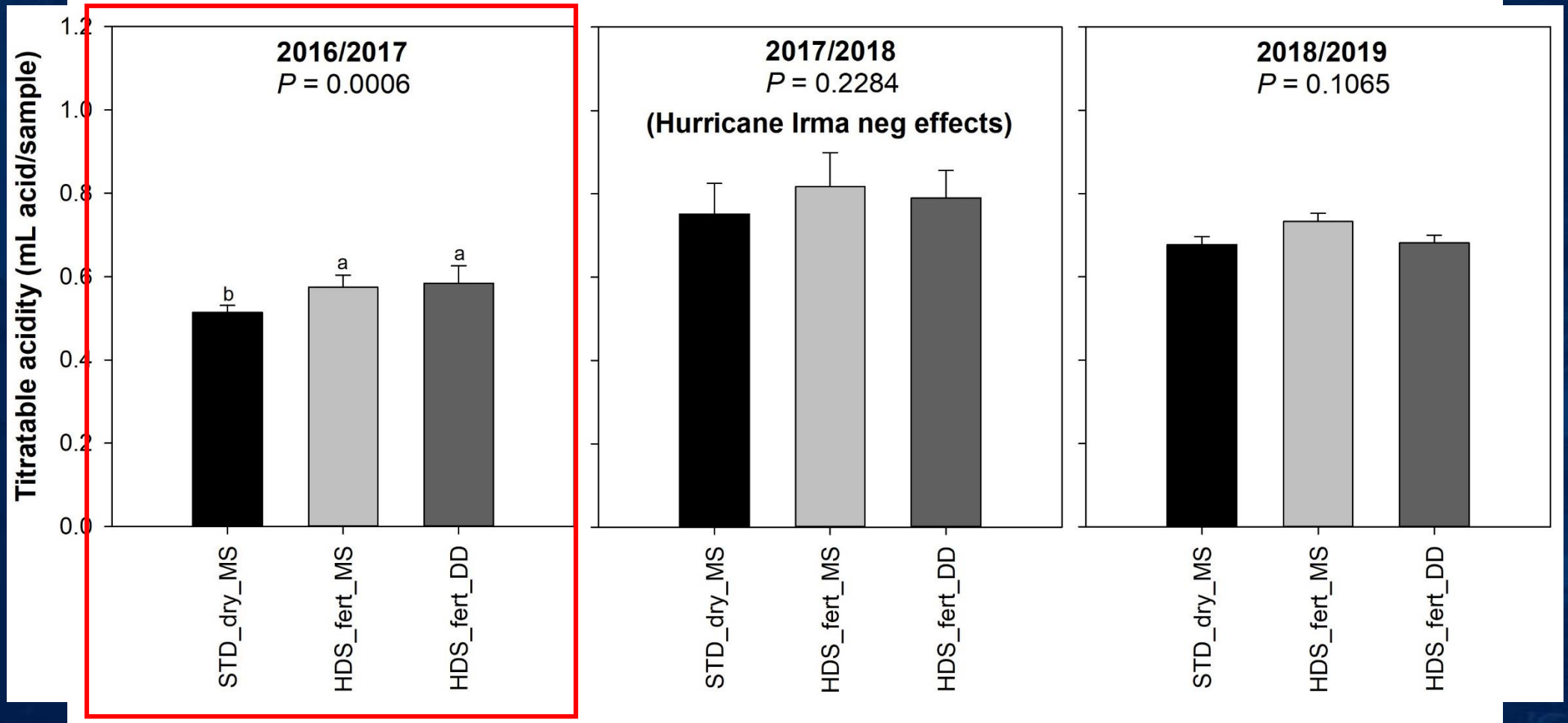

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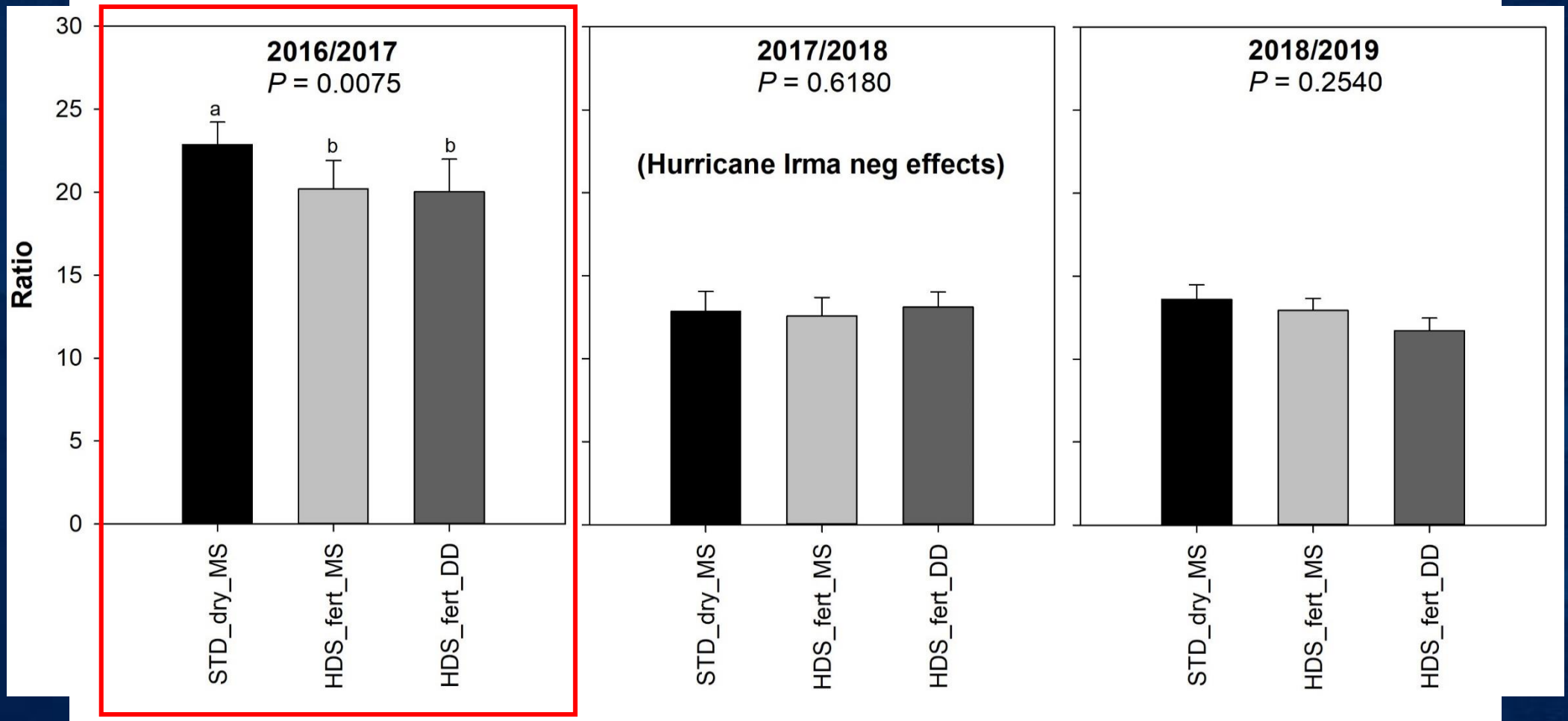

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