

Review of Hydrogen Cyanamide Use and Research in Florida Blueberries

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Low-chill blueberry production systems used in Florida

- Traditional deciduous production system
 - Plants enter dormancy, growth (flowering and vegetative bud break) begins in late winter.
 - Requires winter chilling to satisfy dormancy and often relies on hydrogen cyanamide
- Evergreen or non-dormant production system
 - Plants retain foliage and are managed for dormancy avoidance.

Challenges for the deciduous production system

- Variable winter temperatures, low chill accumulation, intermittent warm winter weather.
- Bloom periods are variable and unpredictable which complicates application of hydrogen cyanamide.
- Flower buds may begin emergence from dormancy before significant chill accumulation occurs with symptoms of insufficient chilling.

Effects of insufficient chilling

- Delayed vegetative and floral bud break.
- Protracted bloom period.
- Weak vegetative growth, poor leafing.
- Reduced leaf:fruit ratios (too few leaves to support crop).
- Plants stress can predispose plants to diseases.
- Delayed harvest, reduced yields.

Hydrogen cyanamide (Dormex™ or Budpro®)

- Classified as a plant growth regulator.
- Classified as a **restricted use pesticide**.
- **Toxic to humans.**
- **Product labels have very specific restrictions on how it must be handled and applied.**
- Growers without necessary equipment and expertise may consider custom application.

How can hydrogen cyanamide benefit southern highbush blueberry production under low-chill conditions?

- May offer certain benefits on some cultivars.
 - **Earlier fruit harvest**
 - Slight increase in fruit size and yield
 - Concentration of bloom period
 - Concentration of fruit harvest
 - Reduced plant stress by increasing leafing and reducing over cropping

Potential disadvantages of hydrogen cyanamide under low-chill conditions

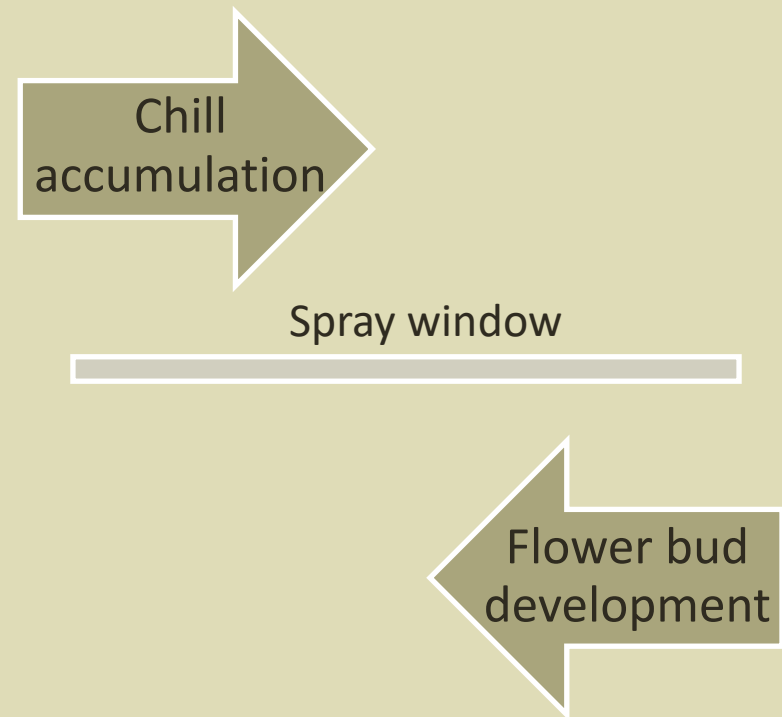
- Cultivar-specific response (not all cultivars respond well)
- Injury to flower buds from improper rate, timing, very low-chill conditions, or sensitive cultivars.
- Flower bud injury can reduce yields.
- Erratic, responses observed in locations with exceptionally warm, low-chill, winters.

The following cautionary statements are on product labels

- **DORMANCY REQUIREMENTS** – To promote the maximum effectiveness, and to avoid phytotoxicity (i.e., new wood dieback, blossom thinning), deciduous crops must be completely dormant.
- Not a substitute for a lack of dormancy. Care should be taken to monitor dormancy. This is most easily accomplished by monitoring chill hour accumulation.
- **USER NOTE:** negative chill hour accumulation, climatologically induced incomplete dormancy must be considered, both to promote the effectiveness at the recommended rates of application and to avoid phytotoxicity.

Determining when to spray can be a balancing act

- Dormancy and prior chill accumulation are needed.
- Sprays should be applied before flower bud development advances past stage 2.



Flower bud Stage 1



Early Stage 2 – little to no injury on tolerant cultivars with pre-chilling conditioning

Buds swollen with
bud scales still closed



Late Stage 2 – little to no injury on tolerant cultivars receiving pre-chilling

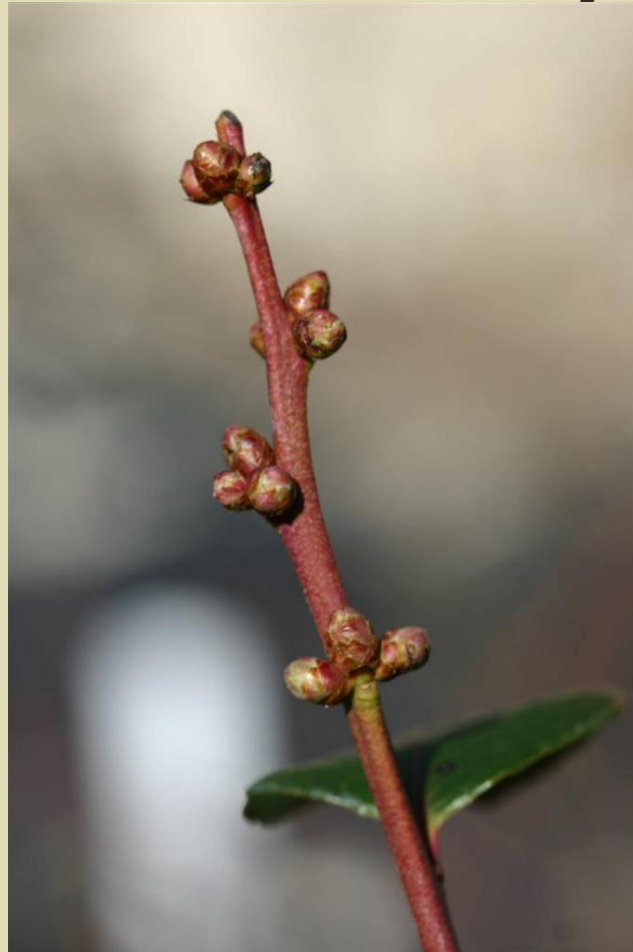


Stage 3 – may get significant injury on tolerant cultivars



Bud scales beginning to open

Slight bronzing of outer bud scales is not an indication of bud injury.



Dark “chocolate” coloration with no further bud swell suggests flower bud injury or death.



Injury to flower buds – only vegetative growth



Little to no injury to flower buds – vegetative and reproductive growth occurring together



Good result-a few old leaves left and lots of healthy flower buds emerging



Courtesy of Dr. Gerard Krever

Hydrogen Cyanamide Research Update

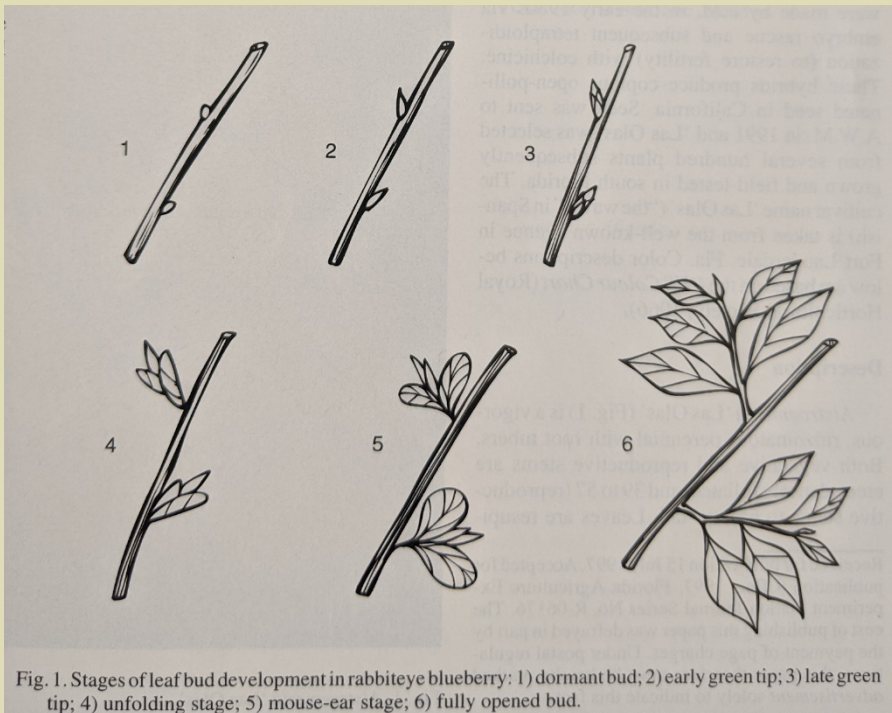
Jacob Buck (MS graduate student)

- Evaluate response of 'Optimus' and 'Colossus' to different rates of HC under field conditions in North Florida (Straughn Farms, Waldo).

Effect of Dormex spray concentration on the mean number of vegetative buds that grew per node (3/20/2020)

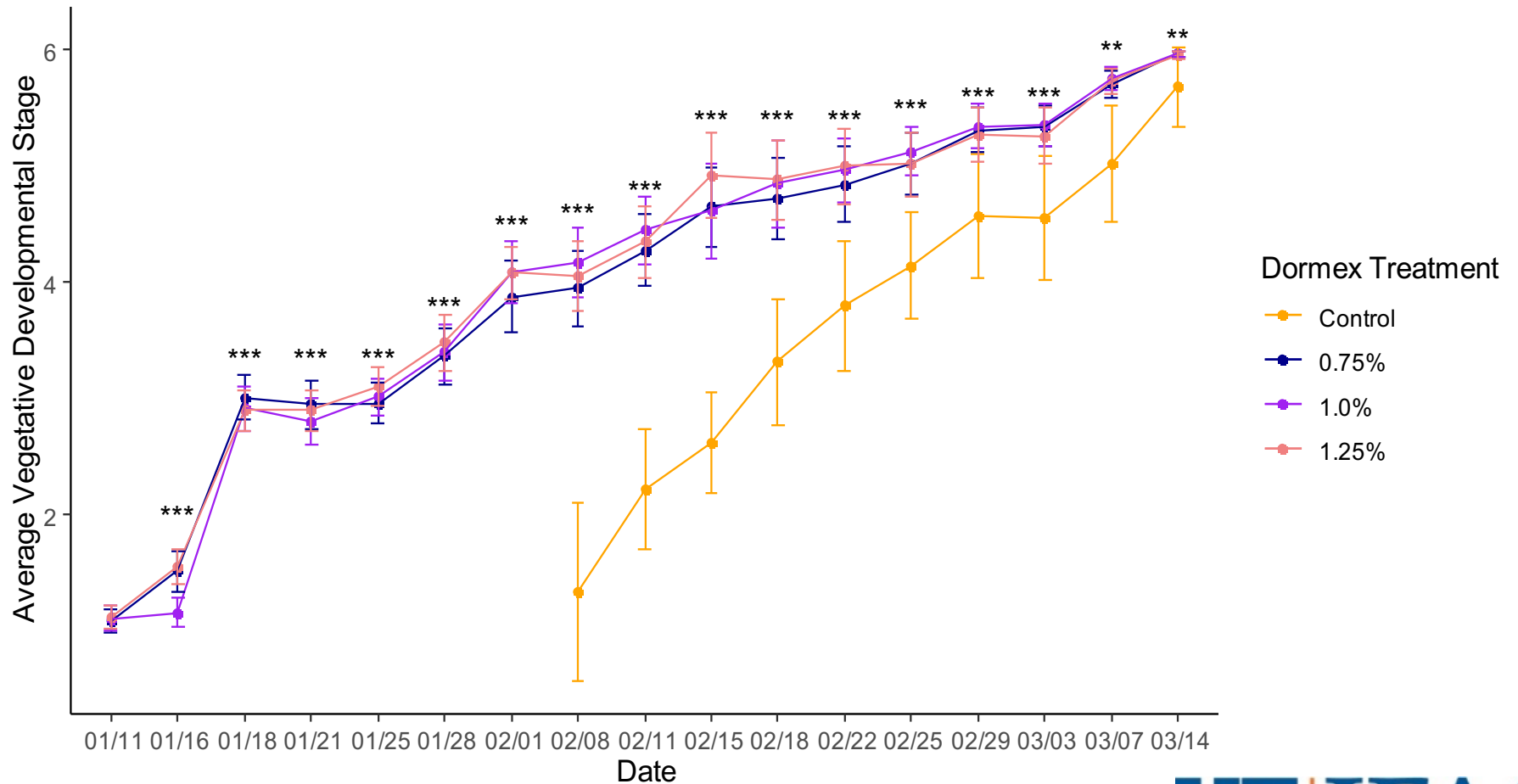
	Cultivar	
Treatment	'Optimus'	'Colossus'
Control	0.18b	0.17c
Dormex @ 0.75% (v/v)	0.37a	0.19c
Dormex @ 1.00% (v/v)	0.40a	0.22bc
Dormex @ 1.25% (v/v)	0.38a	0.28ab
Dormex @ 1.50% (v/v)	-----	0.31a

Vegetative Scale

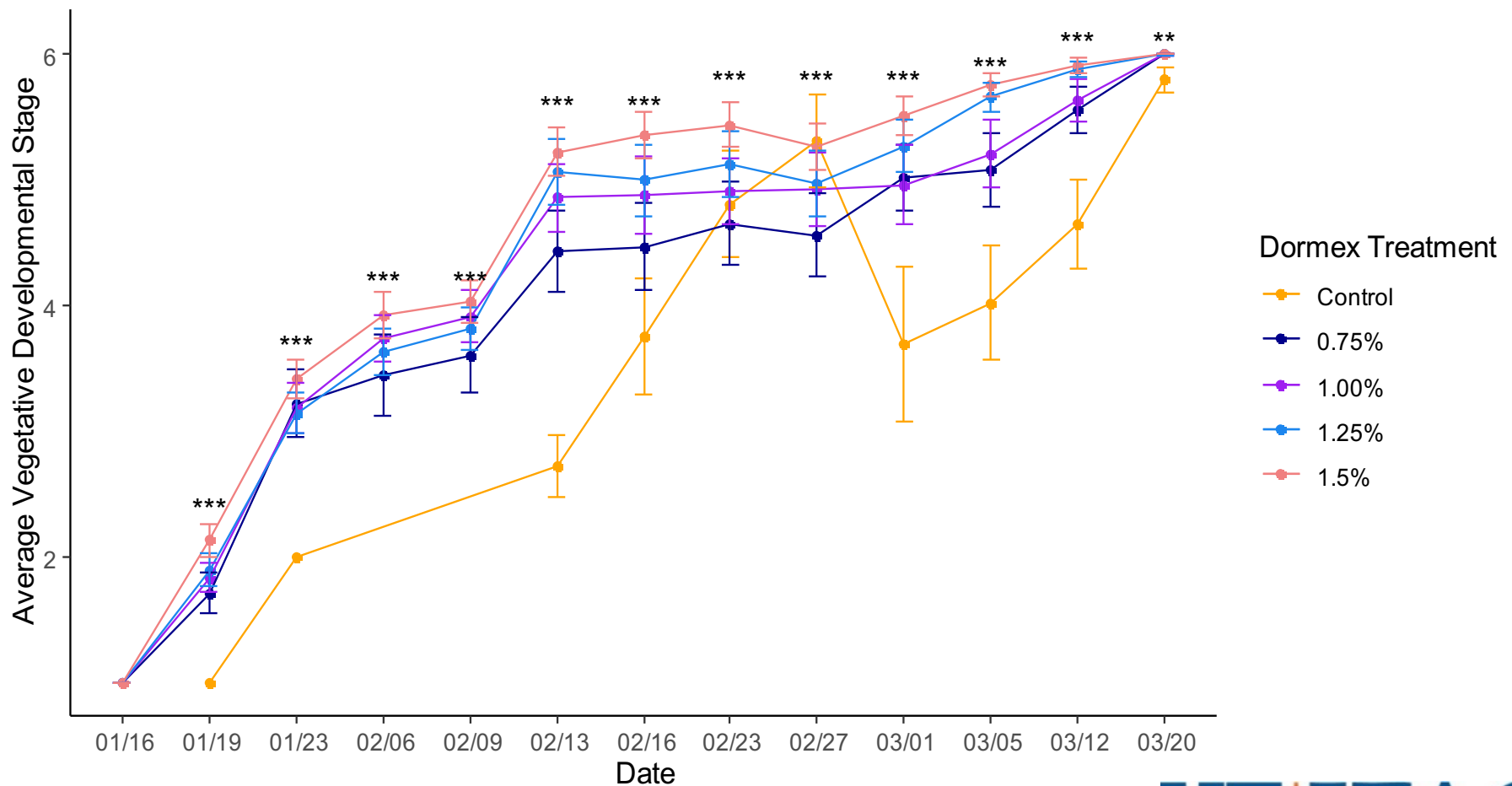


- Vegetative buds were assigned values based on a development scale from Nesmith and Williamson (1998).

Average vegetative developmental stage of 'Optimus' in 2020



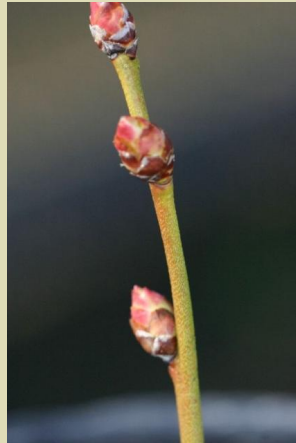
Average vegetative developmental stage of 'Colossus' in 2020



Commonly recognized blueberry flower development stages (Spiers, 1978)



Stage 1



Stage 2



Stage 3



Stage 4



Stage 5



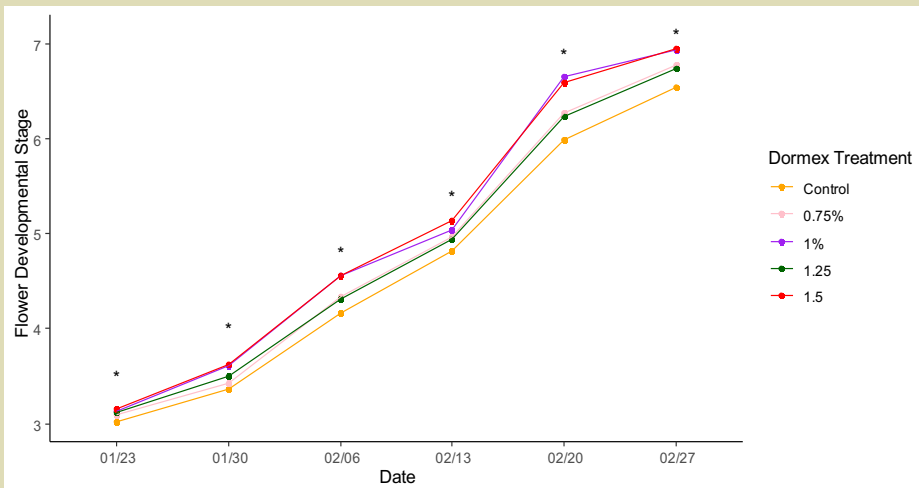
Stage 6



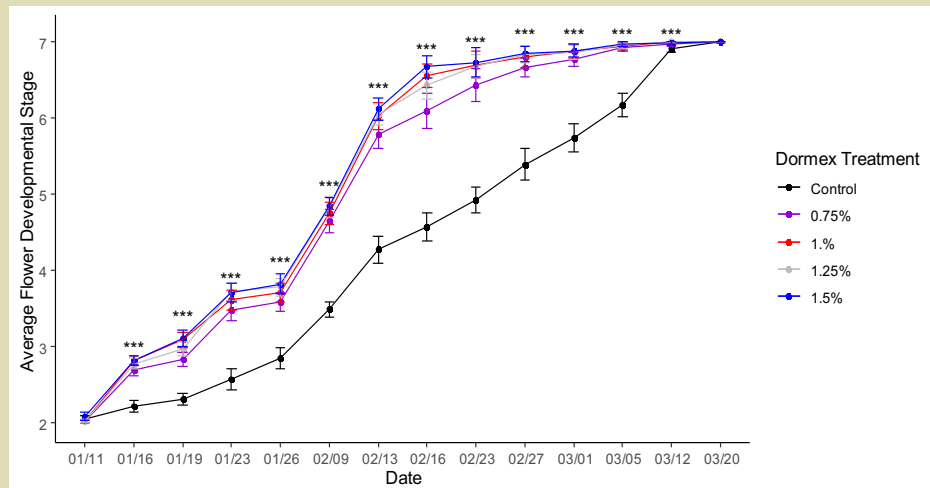
Stage 7

'Colossus' Floral Developmental Stage

2019



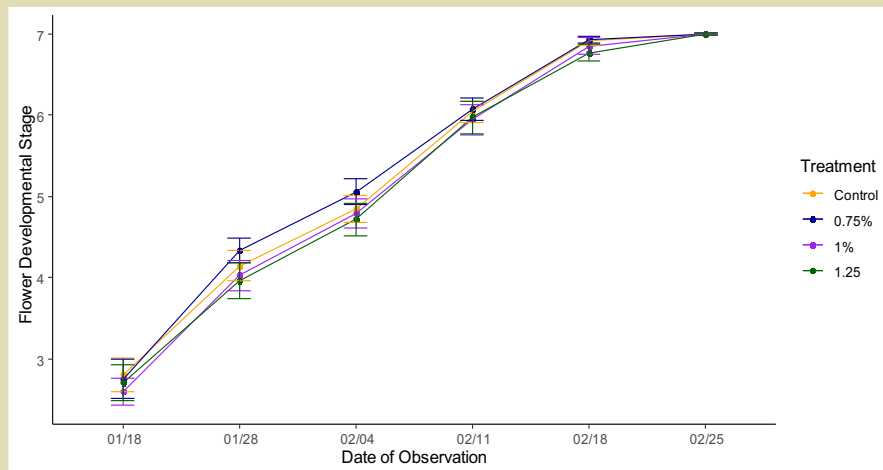
2020



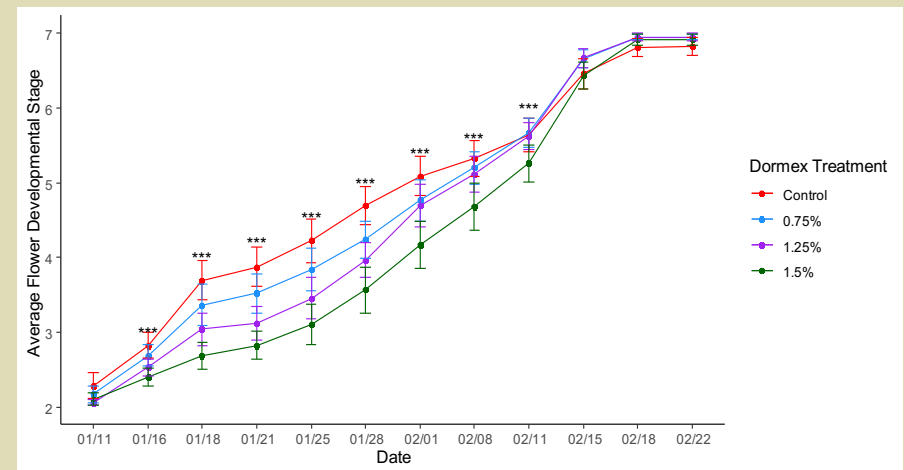
In both years floral bud development was accelerated by the application of Dormex.

'Optimus Floral Developmental Stage

2019



2020



Dormex treatments did not accelerate floral bud development. In 2020, Dormex slowed floral bud development.

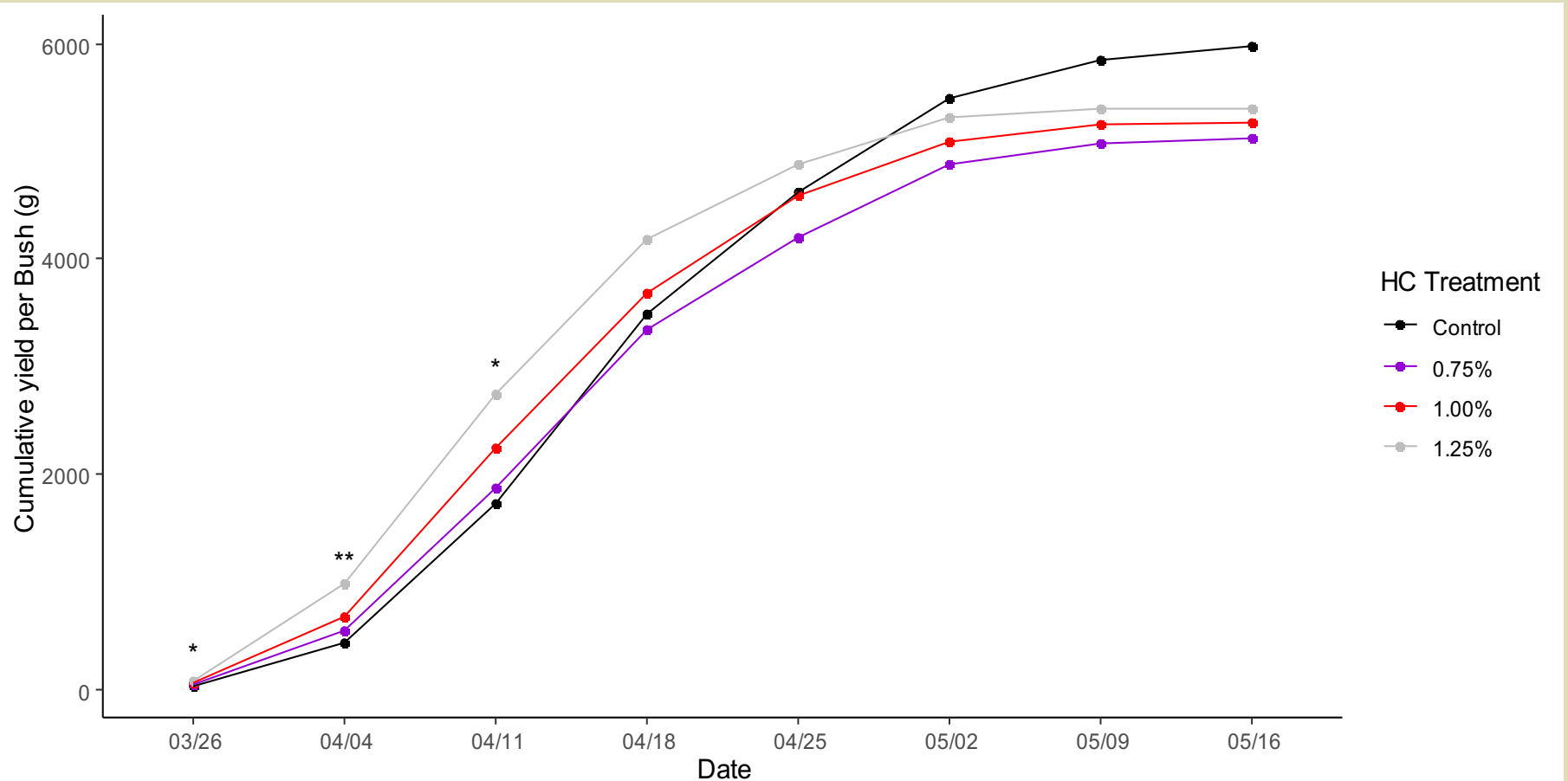
Effect of Dormex spray concentration on fruit set (fruit/flower bud) on 'Optimus' and 'Colossus' blueberry

	Cultivar	
Treatment	'Optimus'	'Colossus'
Control	4.22a	3.91a
Dormex @ 0.75% (v/v)	3.87a	3.11a
Dormex @ 1.00% (v/v)	4.66a	3.48a
Dormex @ 1.25% (v/v)	3.87a	3.72a
Dormex @ 1.50% (v/v)	-----	3.31a

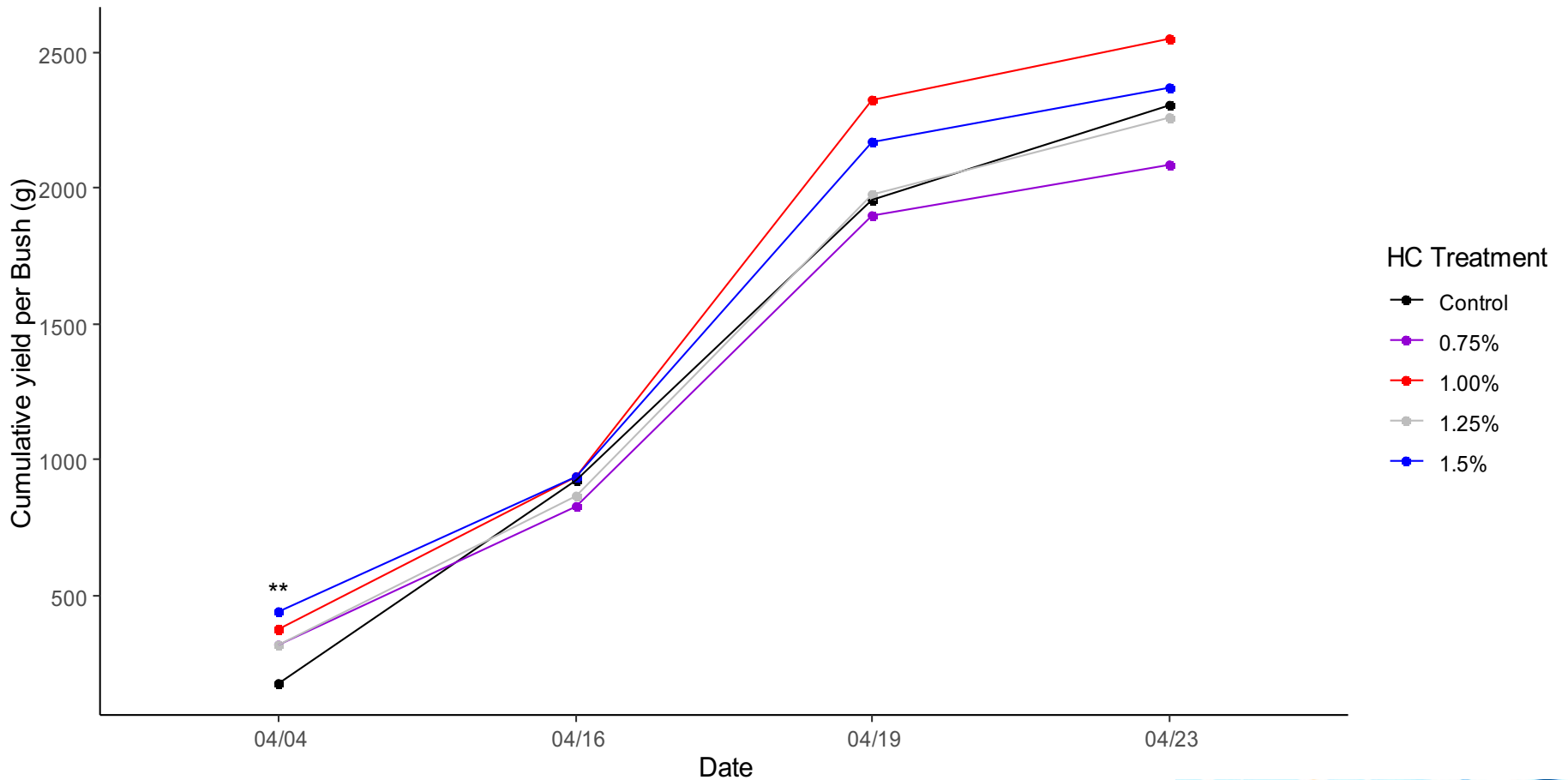
Effect of Dormex on flower bud mortality (%)

	Optimus		Colossus	
	Year		Year	
Dormex (%)	2019	2020	2019	2020
0.00%	9b	7b	11a	9a
0.75%	13ab	23ab	10a	11a
1.00%	26a	27a	14a	19a
1.25%	27a	36a	11a	12a
1.50%	-	-	13a	15a

'Optimus' yield, 2019



'Colossus' yield, 2019



Future field research with hydrogen cyanamide
Jacob Buck (MS graduate student)

- Continue HC trials using one rate (1.25%) applied at approximately 50, 100, 150 and 200 chill hours on 'Optimus', 'Colossus', 'Sentinel', and 'Magnus'.

Growth chamber experiment

Jacob Buck (MS graduate student)

- 8 weeks of acclimation at 21°C (8h day/ 16 h nights) and 400 $\mu\text{mol}/\text{m}^2 \cdot \text{s}^{-1}$ PAR.
- Acclimated 'Optimus' plants will receive one of five chill treatments (0, 50, 100, 150, 200 chill hours)
- Chilled plants will be removed from the cooler and sprayed with 1.0% Dormex.

Summary and Conclusions

- Plants should be dormant and receive some chilling before treatment.
- Apply HC before a significant number of flowers buds pass stage 2 in their development.
- If cultivar tolerance to HC is unknown, test on a small number of plants before larger applications are made.
- Preliminary research suggests that 'Optimus' is sensitive to HC. More research is needed to determine HC tolerance.
- Preliminary research suggests that 'Colossus' is relatively tolerant to HC, but ripening tends to be early and concentrated without HC.
- Research on HC use is continuing with 'Optimus', 'Colossus', 'Magnus' and 'Sentinel' at different levels of chilling.

Acknowledgements

- Straughn Farms, Waldo, FL.
- University of Florida Blueberry Breeding Program

A close-up photograph of a blueberry bush. The branches are covered with vibrant green, oval-shaped leaves. Several clusters of blueberries are visible, some fully ripe and dark blue with a white bloom, and others still green and unripe. The text "Thank You!" is overlaid in white, bold, sans-serif font in the upper left quadrant.

Thank You!

Questions?