

Considerations for hydrogen cyanamide use in Florida blueberries

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Low-chill blueberry production systems

- Traditional deciduous production system
 - Plants enter dormancy, growth (flowering and vegetative bud break) begins in late winter after chilling is satisfied.
 - Timing of “spring” growth is dependent on many factors including winter temperatures.
 - This system often relies on hydrogen cyanamide (Dormex, BudPro) for optimal production.
- Evergreen or non-dormant production system
 - Plants retain foliage and are managed for dormancy avoidance.
 - Flowering and fruit harvest begin early and may extend over a longer time.
 - May be open field production or combined with greenhouses or tunnels.
 - Hydrogen cyanamide is not used.

Florida Winter Weather

- Winter chilling is variable and often below optimal.
- Hydrogen cyanamide (HC) is often used to improve plant responses to low chilling.
- HC use is compatible with the deciduous production system, but not with the evergreen system.

Chill accumulation (hrs.) in north and central Florida beginning November 1*

	Long-term Average		Winter 2021/2022		Winter 2022/2023	
Date	Alachua	Lake Alfred	Alachua	Lake Alfred	Alachua	Lake Alfred
Dec. 15	184	47	104	0	51	0
Dec. 31	286	86	123	0	188	74
Jan. 15	388	128	178	4	272	99

- Winter chill accumulation is highly variable by year. Chilling accumulated by December 31 is generally more effective than late winter chilling after hydrogen cyanamide applications are made and after the initiation of bud swell has occurred.

*Data taken from the AgroClimate website.

Effects of insufficient chilling

- Delayed vegetative and floral bud break
- Extended 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

Make the most of what chilling temperatures you do get

- Reduce fertilization in late summer or early fall. Terminal bud set is needed for plants to enter dormancy.
- Reduce irrigation rates in fall to encourage terminal bud set and the onset of dormancy.
- Dormant plants accumulate chill units, actively growing plants do not.
- Dormancy and some chill unit accumulation are needed for a good hydrogen cyanamide response.

What is hydrogen cyanamide? (Dormex[®]/Budpro[®])

- Commercial formulations of hydrogen cyanamide = 50% a.i.
- 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.

Engineering Controls Statement – see product label for more details.

- **CLOSED SYSTEMS:** This product must be mixed, loaded, and transferred only in a closed system.
- **ENCLOSED CAB REQUIREMENTS:** This product must be applied only with the applicator in an enclosed cab.

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
 - Slight increase in yield
 - Concentration of bloom period
 - Concentration of fruit harvest
 - Reduced plant stress by reducing poor leafing and over cropping

Potential disadvantages of hydrogen cyanamide under low-chill conditions

- Cultivar-specific response (not all cultivars respond well)
- Phytotoxicity with certain cultivars and from improper rate, timing, or very low-chill conditions.
- Phytotoxicity can reduce plant yields and cause stress.
- Erratic, responses observed during exceptionally warm, low-chill winters.

The following cautionary statements from 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.

Application rates (from Dormex/BudPro labels)

- “BLUEBERRIES To promote more uniform budbreak, particularly in areas of marginal chilling and to promote more uniform harvest, apply 1½ to 3 gallons of Dormex in 50 to 100 gallons of spray per acre to provide full coverage. Use a nonionic surfactant not to exceed 0.5% (v/v) with applications made 30 or more days prior to natural flower and vegetative budbreak.”

Note – Applications greater than 1.50 – 1.75% Dormex/Budpro have often been associated with some levels of flower bud injury in Florida.

Dormex label (higher rates)

- “It is the grower’s responsibility to identify varieties that are tolerant of the higher rates before any larger acreage is treated. To do this, take a small group of plants to be treated at the appropriate use rates (as indicated above) under the anticipated growing conditions and observe for phytotoxic symptoms before treating a large number of plants.”

In Florida, Dormex/Budpro rates above 1.50-1.75% are often associated with flower bud injury.

Cultivar susceptibility to bud injury varies considerably with cultivar. Use as a small-scale test on cultivars with unknown response to hydrogen cyanamide.

Flower bud injury may be related to cultivar sensitivity, level of dormancy at application, spray drying conditions, or other factors.

Incomplete dormancy in Florida is believed to increase plant injury from HC sprays.

Information from the IFAS Blueberry IPM Guide

- Thorough spray coverage (typically minimum of 50 gpa).
- Flower buds sprayed at flower bud stage 3 or beyond may be killed or injured by HC.
- Hydrogen cyanamide should only be applied to dormant plants that have received some natural chilling.
- Applications of 1.5% (v/v) of formulated product to dormant plants of suitable cultivars that have received significant chilling and not progressed beyond stage 2 (Figure 2) of flower bud development are usually effective.
- Use as a small-scale test on cultivars with unknown response to hydrogen cyanamide. Susceptibility to injury from HC varies greatly among SHB cultivars.

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 with pre-chilling conditioning



Stage 3 – may get significant injury on tolerant cultivars



Bud scales beginning to open

Bud stage and timing of sprays

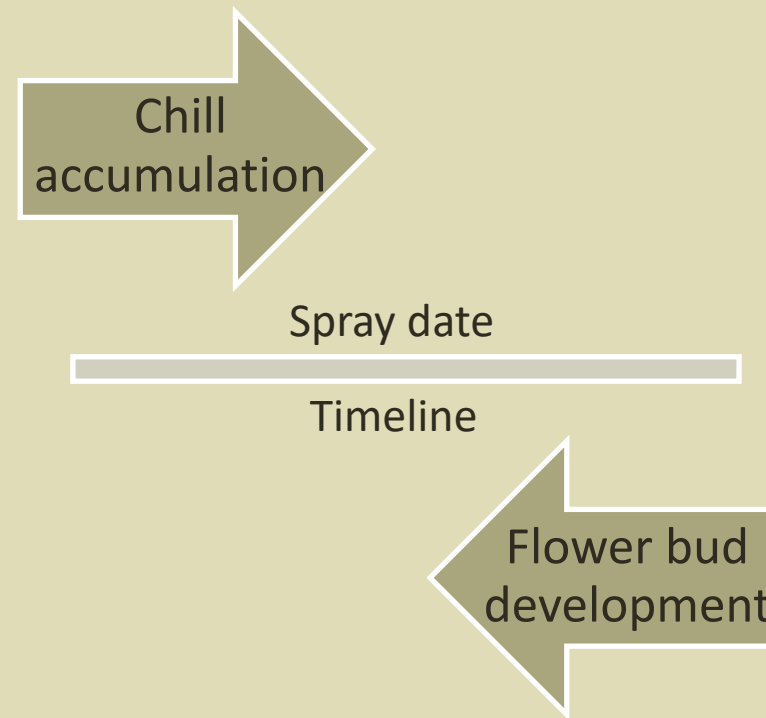
- Flower bud stage one and two and are “safe”
- It is a balancing act in Florida, since buds start to swell in late fall due to high temperatures.
- Bud development often triggers when to spray.
- Dec. 10 – Jan. 4 are typical dates of application in Florida.
- Central Florida is usually earlier than North Florida.



Courtesy of Dr. Gerard Krewer

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.



Emerald, 1.5% (photo, January 16)
Slight bronzing of buds scales is not an
indication of bud injury.



Emerald, 2.5% (photo, January 16)

Dark chocolate coloration with no further bud swell suggests flower bud death.



Injury to flower buds – only vegetative growth



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



Good results - lots of healthy flower buds emerging

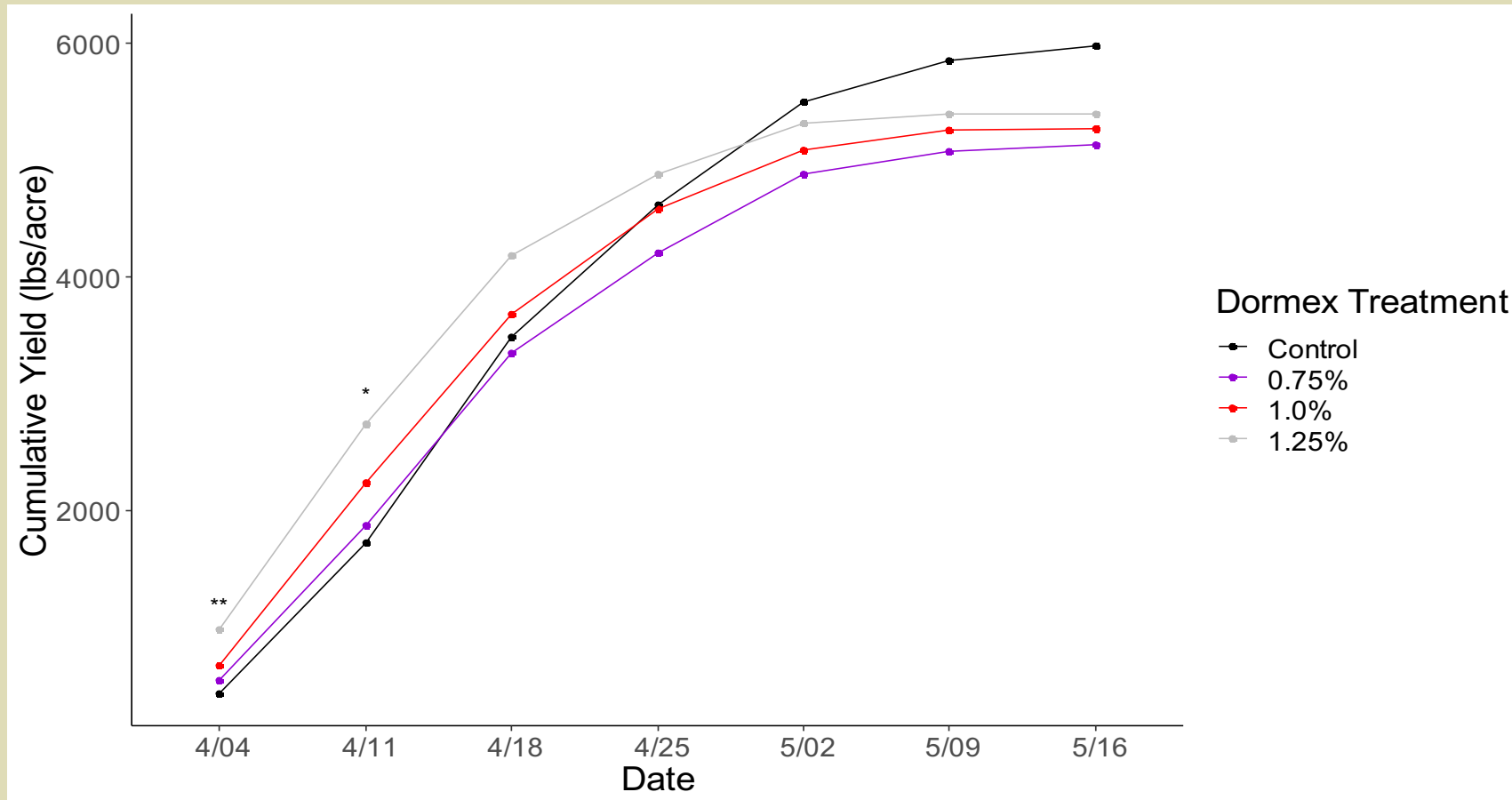


Courtesy of Dr. Gerard Krever

HC benefits to Newer cultivars are largely unknown

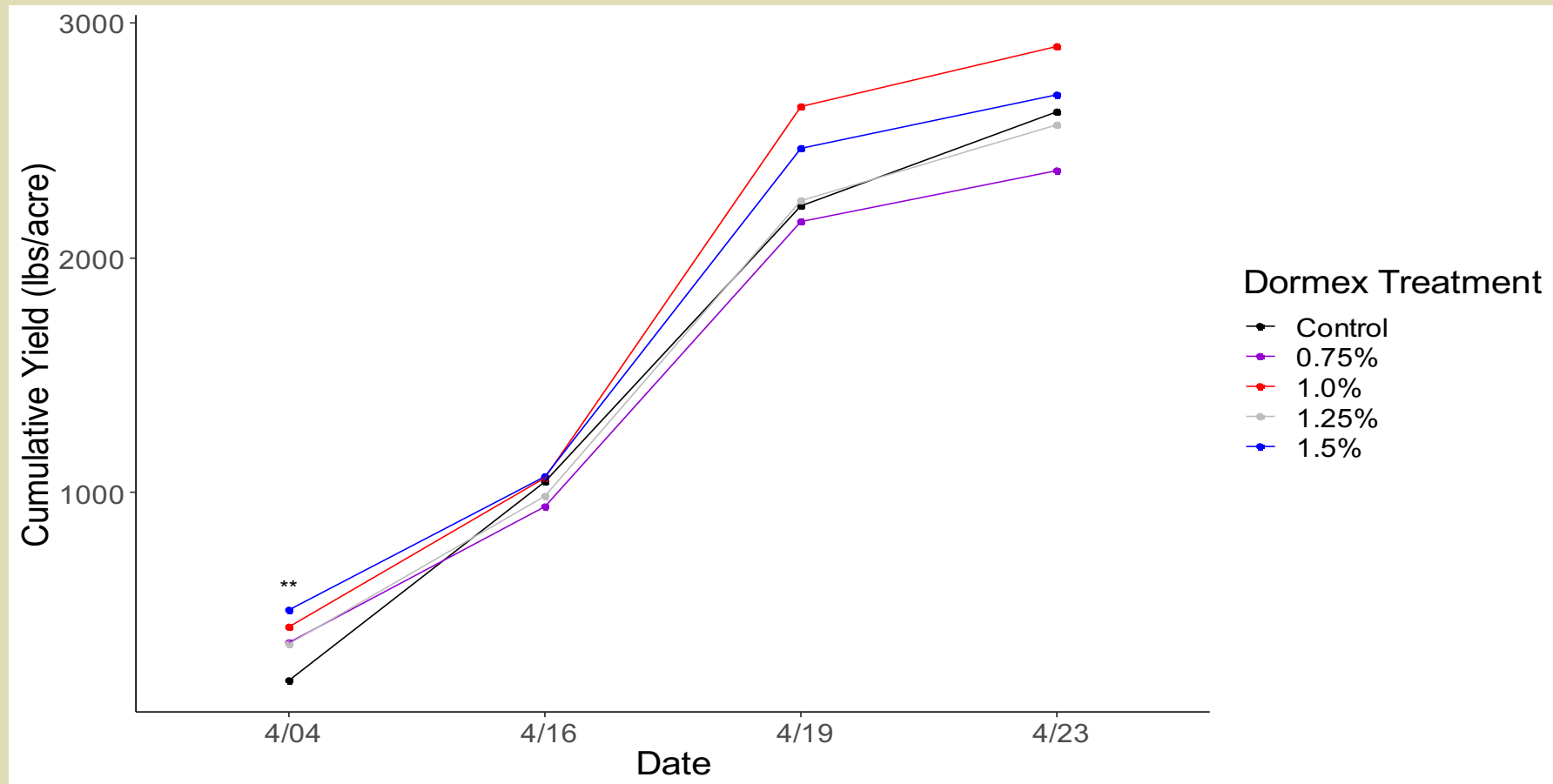
- The UF blueberry breeding program does not rely on HC to evaluate potential cultivars. Selections are made without using of HC in the screening process.
- Current emphasis is on evergreen production and deciduous production without the need for HC.
- However, newer cultivars should be evaluated for potential benefits from HC.

2019 'Optimus' Yield



Only modest advancement in fruit ripening for HC. Not a strong HC response.

2019 'Colossus' Yield



Colossus is an early ripening cultivar without HC. It often has low flower bud numbers. HC is probably not beneficial on this cultivar.

Factors influencing plant response to hydrogen cyanamide

- Cultivar (some newer cultivars may not benefit from HC)
- Plant dormancy level
- Winter chilling prior to application
- Bud stage at spraying
- Spray concentration
- Spray coverage/volume
- Weather
- Application method
- Time of day - fast vs slow drying conditions.
- Surfactant

References

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A close-up photograph of a blueberry bush with several clusters of ripe, dark blue berries and some lighter, unripe ones. The leaves are green and serrated.

Thank You!

Questions?

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