

# Review of Hydrogen Cyanamide Practices 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.
  - Timing of “spring” growth is dependent on many factors including winter temperatures.
  - Typically relies on hydrogen cyanamide
- Evergreen or non-dormant production system
  - May be combined with greenhouses or tunnels.
  - Plants retain foliage and are managed for dormancy avoidance.
  - Flowering and fruit harvest begin early and may extend over a longer time.

# Low-chill blueberry production challenges

- Challenges for traditional dormant production
  - Variable winter temperatures, low chill accumulation often accompanied by intermittent warm 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 (flowering before or without leaf bud emergence and protracted bloom periods).
  - In climates that experience freezing temperatures, damaging freezes are likely during and after bloom.
- Challenges for evergreen production challenges
  - Requires low-chill cultivars with “evergreen” tendencies.
  - Extended leaf disease management is needed.
  - Bloom and harvest periods are often extended.
  - Added costs of tunnels, if needed.
  - Freeze protection often needed.

# Florida Winter Weather

- Winter chilling is highly variable and unpredictable.
- Bloom time, and incidence and severity of damaging freezes are highly variable from year to year.

## Example of variable chill accumulation in north and central Florida during two consecutive years\*

|                | Long-term Average |           | Winter 2010/2011 |            | Winter 2011/2012 |           |
|----------------|-------------------|-----------|------------------|------------|------------------|-----------|
| Date           | Alachua           | Polk      | Alachua          | Polk       | Alachua          | Polk      |
| Dec. 15        | 182               | 46        | 346              | 146        | 139              | 15        |
| <b>Dec. 31</b> | <b>283</b>        | <b>85</b> | <b>520</b>       | <b>254</b> | <b>195</b>       | <b>22</b> |
| Jan. 15        | 384               | 127       | 664              | 307        | 275              | 81        |

- Winter chill accumulation is highly variable by year. Chilling accumulated by December 31 is generally more desirable than late winter chilling after hydrogen cyanamide applications are made and after the initiation of bud swell has occurred.
- Winter chilling was well above average during 2010/2011 and much below average in 2011/2012.

\*Data taken from the AgroClimate website.

# 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

# Make the most of what chilling temperatures you 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<sup>®</sup>/Budpro<sup>®</sup>/Krop Max<sup>®</sup>)

- Several 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.



# 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

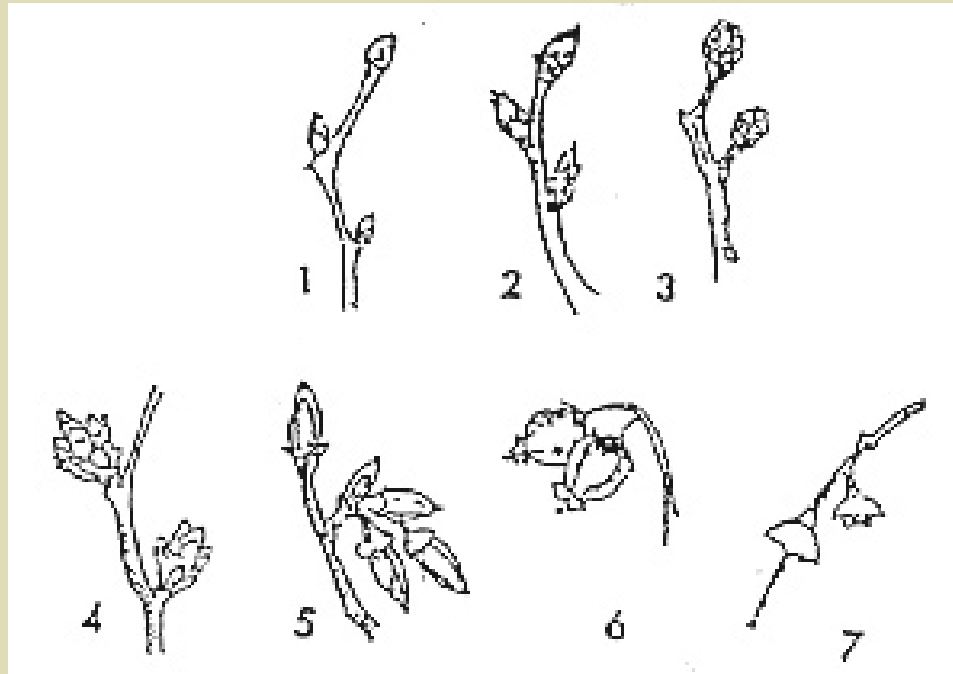
# Potential disadvantages of hydrogen cyanamide under low-chill conditions

- Cultivar-specific response (not all cultivars respond well)
- Phytotoxicity from improper rate, timing, or very low-chill conditions.
- Phytotoxicity can reduce plant yields.
- Erratic, responses observed during 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.

# Application timing is based on crop phenology



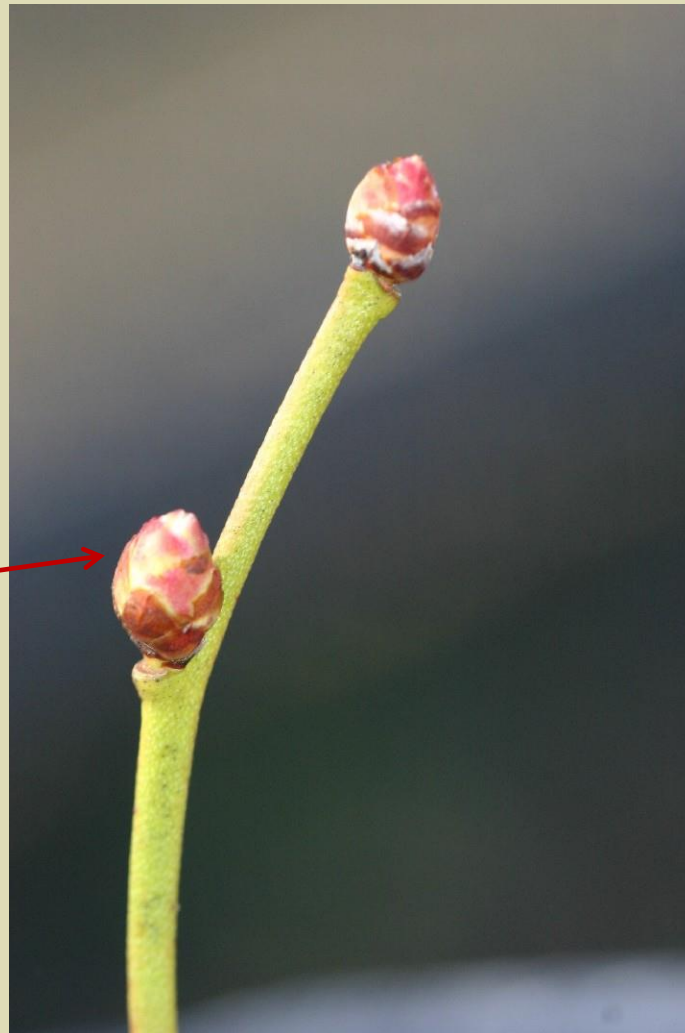
Rabbiteye flower bud stages. Adapted from J. M. Spiers, 1978, J. Amer. Soc. Hort. Sci. 103 (4): 452-454.

# Flower bud Stage 1

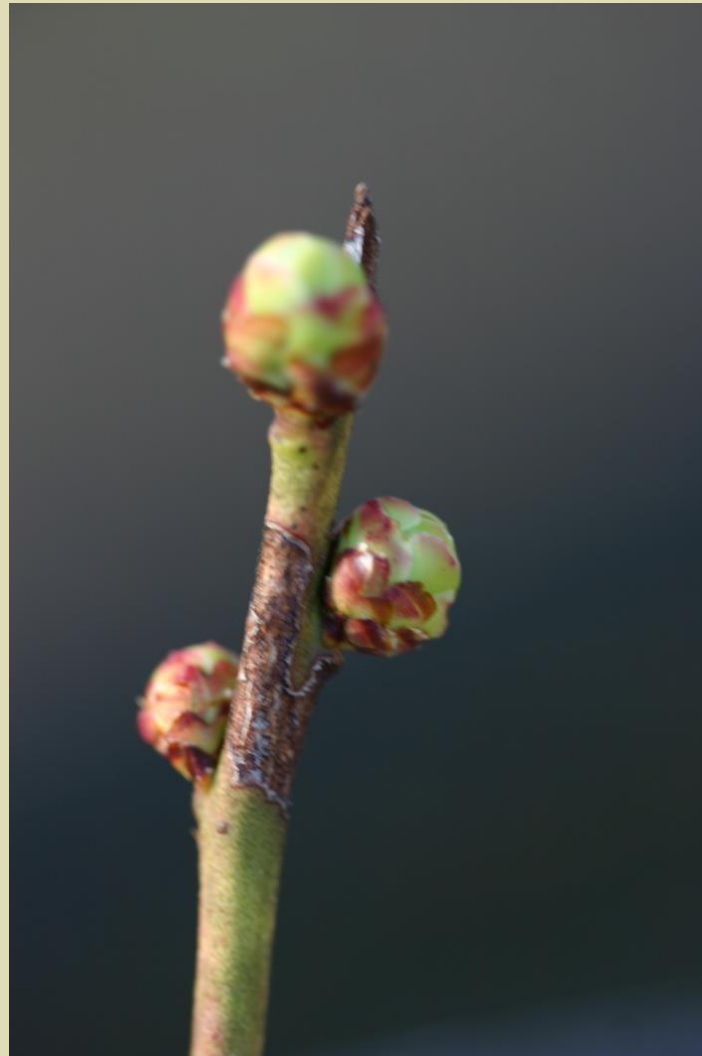


# Early Stage 2 – little to no injury on tolerant cultivars with pre-chilling conditioning

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



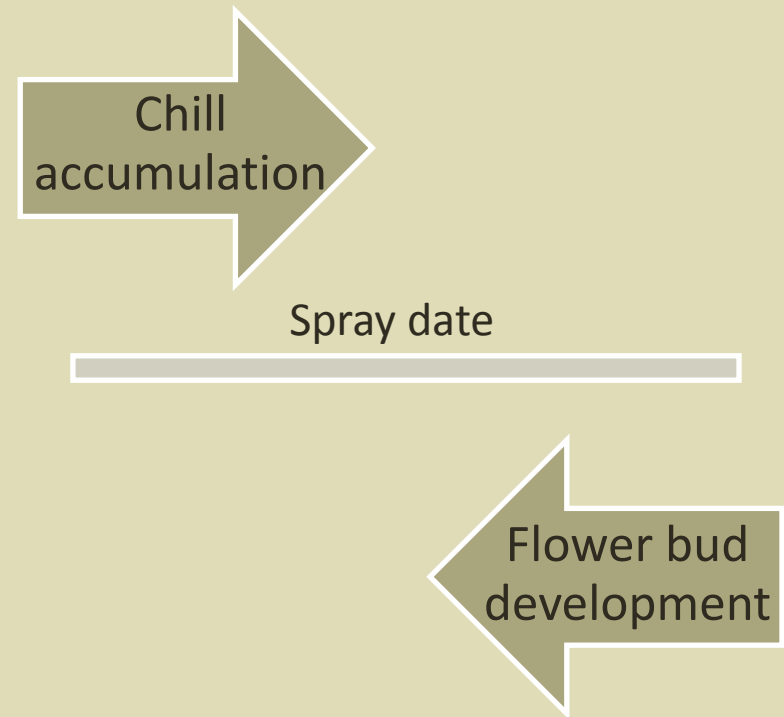
# Bud stage and timing of sprays

- 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.

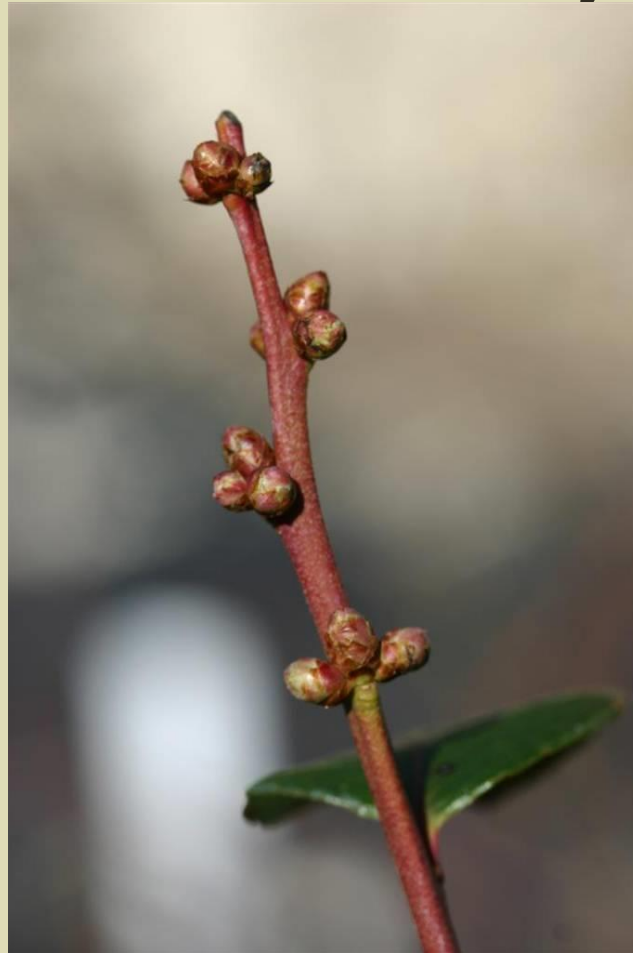


# Determining when to spray can be a balancing act

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



Courtesy of Dr. Gerard Krever

# Factors influencing hydrogen cyanamide results

- Dormancy level
- Cultivar
- Bud stage
- Spray concentration
- Spray coverage
- Winter chilling prior to application
- Weather
- Spray volume
- Application method
- Time of day - fast drying conditions.
- Surfactant



A close-up photograph of a blueberry bush. Several clusters of berries are visible, some fully ripe and dark blue, and others still green and unripe. The leaves are green and serrated.

Thank You!

Questions?