UMass Extension

UMass Cranberry Station

Spring Frost Tolerances of Cranberry Buds

Cape Cod Cranberry Growers' Association

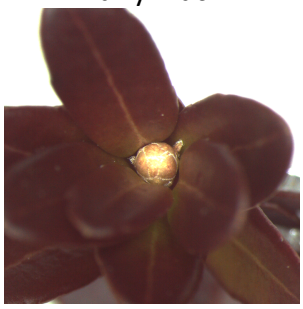
Spring Frost Tolerances - Early Black and Howes

Early Black

Howes

Spring Dormant 18°F

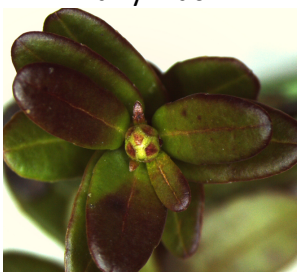
Early Black



Howes

White Bud Stage 20°F

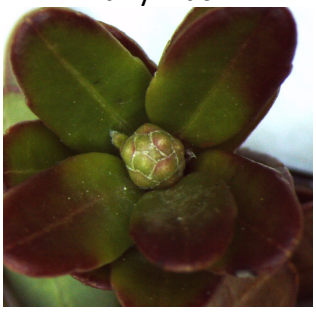
Early Black



Howes

Bud Swell Stage 22°F

Early Black



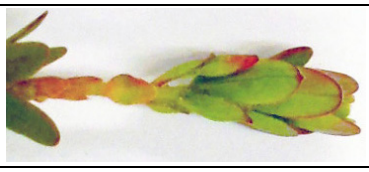
Howes

Cabbage Head Stage 25°F

Early Black

Howes

Bud Elongation 27°F

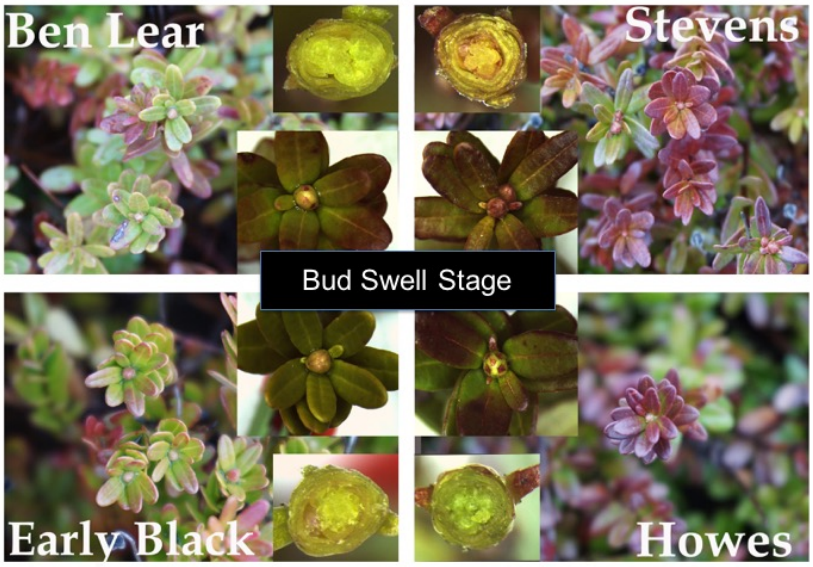


Roughneck Stage 29.5°F

Hook Stage (L), Bloom (R) 29.5°F

Spring dormant. At this stage buds are tight and red. When cut in cross-section, the interior structures in the bud have a reddish-brown cast.

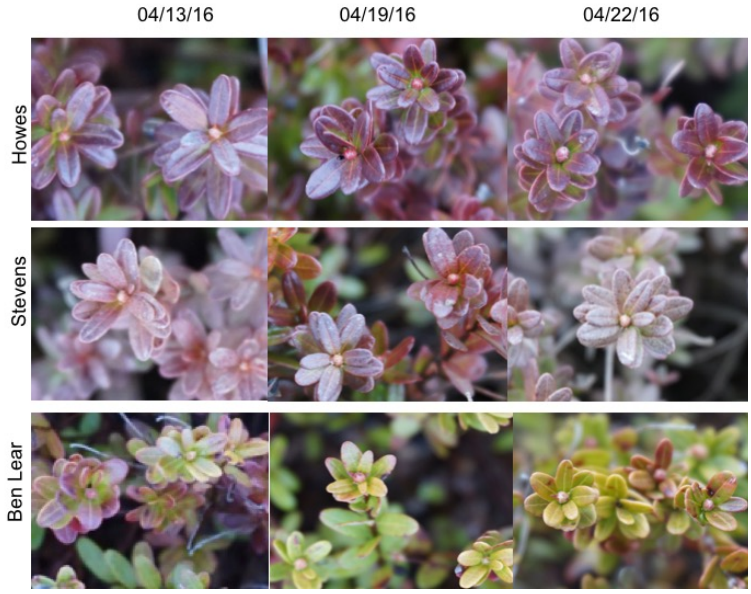
White bud stage. At this stage, the buds are visibly lighter, appearing white when looking into the canopy. Interior bud structures are becoming green.



Bud swell stage. At this stage, the buds are beginning to enlarge, the surface scales are separating (this is well illustrated in the close-up photo of Howes to the left).

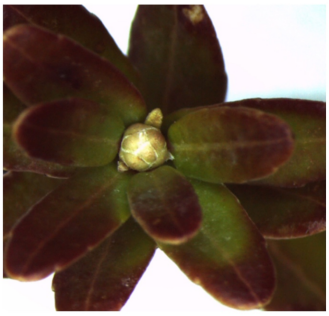
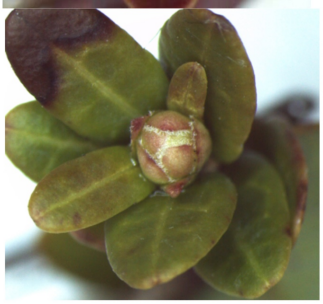
Cabbage head stage. The bud is visibly rounded, about 2 mm across. When looking down into the canopy, the bud covers the bases of the surrounding leaves. In a cut bud, the floral initials are well defined and turning pink. Once the bud reaches this stage, frost tolerance is quickly lost – the next stage occurs in no more than 5-7 days.

Bud elongation stage. When looking into the canopy, the buds may still appear to be cabbage heads, but looking from the side, it is apparent that the bud is now growing up (out). As with the previous stage, this tolerance stage lasts no more than 5-7 days, after which all frost tolerance is lost (the critical temperature is now 29.5°F for all varieties).

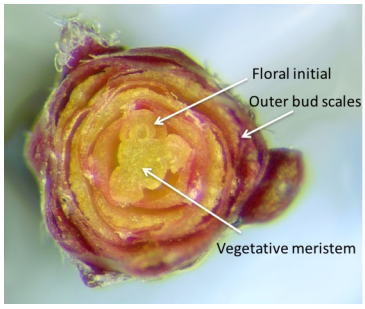


A comparison of buds in the field. On the far left, the buds are spring dormant; in the center column, buds are at the white bud stage; and on the right, bud swell has begun. As can be seen here, the changes can be subtle. On the next page, close-up photos of buds at these stages and the cabbage head stage are shown.

Comparison of Cranberry Bud Appearance at Early Spring Stages

Spring dormant	White bud stage	Bud swell stage	Cabbage Head stage
			
			
Buds are tight and red.	Buds are still tight but losing red color, giving a 'white' appearance against the leaves.	Bud has expanded to cover leaf bases, increase in size from 'white bud'.	More of the leaf base is covered. Bud is rounder, scales are parting.

A Selection of Buds Cut in Cross-section



Structures in a bud (cross section)

Ben Lear: damaged initials, late April.

Ben Lear: early May
Top normal bud, bottom damaged initials.

Stevens: late April
Central vegetative meristem damage. This bud may develop into an umbrella bloom, an upright with flowers but no leafy stem above the flowers.

Cold hardiness and frost tolerance of cranberry buds. During the winter, cranberry buds are cold hardy to temperatures below 0°F. Terminal buds containing the floral initials, the structures that become flowers, are round and tight. As the plants break dormancy in the spring, the buds become more sensitive to freezing temperatures; their tolerance temperatures begin to rise. Buds exposed to temperatures below the tolerance temperature can sustain frost damage.

Starting in early spring, we use the appearance of the bud to estimate it's frost tolerance. These tolerance estimations are based on research in which buds were exposed to various temperatures and then evaluated for damage.

By the time the foliage is beginning to green, the tolerance has risen to 18°F or higher, with the buds remaining tight and red (winter dormant color). As the buds swell and the bud scales pull open, sensitivity to cold increases. The frost tolerance for each spring stage varies by cultivar. Those with large buds (and large fruit) tend to become sensitive earlier in their development compared to small-budded cultivars. For example, Ben Lear and Stevens tolerate temperatures no lower than 29.5°F once the terminal bud begins to elongate, while at that same stage, Early Black and Howes will tolerate 27°F. Based on research comparisons, the tolerances of the newer hybrid cultivars appear to be similar to tolerances of Ben Lear and Stevens for any given stage.

Spring Frost Tolerances

Stage - Appearance of the bud	Early Black and Howes	Ben Lear, Stevens, new hybrids
Spring Dormant (bud red or red tinged)	18°F	20°F
White Bud Stage (loss of dormant color in the bud)	20°F	22°F
Bud Swell Stage (bud scales loosening)	22°F	25°F*
Bud Break – Cabbage Head Stage (also popcorn stage or 2 mm bud; bud is very round and expanded)	25°F*	27°F**
Bud Elongation Stage (bud is growing out, upward)	27°F**	29.5°F to 30°F
Roughneck Stage (more than 0.5 inches of new growth)	29.5°F to 30°F	29.5°F to 30°F
Hook Stage and Bloom (flower buds fully expanded, open)	29.5°F to 30°F	29.5°F to 30°F

*After 5-7 days, tolerance increases to 27°F **even if there is no change** in appearance.
After 5-7 days, tolerance increases to 29.5°F to 30°F **even if there is no change in appearance.

Spring Frost Tolerances – Ben Lear and Stevens
Newer hybrid cultivars are similar in appearance and stage to these.

Ben Lear

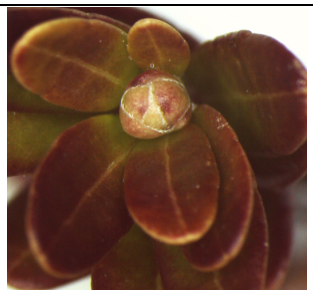
Stevens

Spring Dormant 20°F

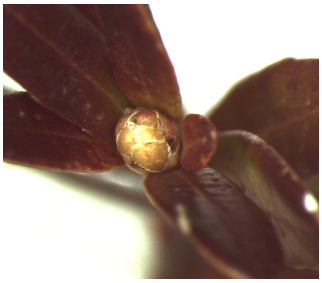
Ben Lear

Stevens

White Bud Stage 22°F

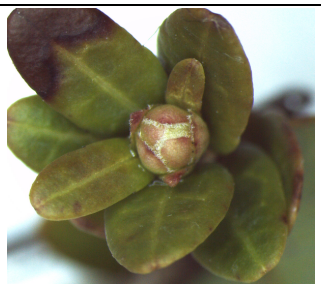


Ben Lear



Stevens

Bud Swell Stage 25°F



Ben Lear

Stevens

Cabbage Head Stage 27°F

Ben Lear

Stevens

Bud Elongation 29.5°F

Roughneck Stage 29.5°F

Hook Stage (L), Bloom (R)
29.5°F

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