DRY BULB ONION, YELLOW (*Allium cepa 'Hamilton'*)
Bacterial bulb rot; *Burkholderia cepacia*

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Effect of pulling onions early and fast curing with artificially heated forced air via a drying wall in a box storage on bacterial bulb rot in onion, 2023.

The objective of this study was to determine whether pulling onions early and then quickly curing them on a drying wall with artificially heated forced air in a box storage, or pulling onions early would reduce bacterial bulb rot in onion. Theoretically, fast curing could dry down the green neck tissue, making it impassable to bacterial disease before the disease progressed into the bulb and deeming it unmarketable. Similarly, pulling onions early could speed up the drying of foliage/neck and reduce risk of bacterial disease from progressing into the bulb. The study was conducted in a commercial field of yellow onion 'Hamilton'. On 29 Aug, 79% of the plants exhibited foliar symptoms of bacterial disease, but the bacterial pathogen had entered into the bulb in only 19% of the plants. On 29 Aug, the onion plants were firmly rooted (roots holding on) indicating that the bulbs were still increasing in size. The foliage had excessive leaf dieback (35%) and the field was beginning to "die standing up", and therefore the foliage would not have enough weight for the plants to lodge properly. Previous research demonstrated increased risk of bacterial bulb rot when onions "die standing up". Treatments included the industry standard which followed the grower's procedures, pulling the onions 15 d earlier than the grower's practice, and pulling and topping (= harvesting) 15 d early and immediately fast curing the onions on a drying wall. In the field, the three treatments were set up in plots that were 1 bed (= 4 onion rows) wide by 15-ft long and adjacent to each other within the same 4-row bed in eight locations spaced ~100 ft apart. When the onions were harvested, they were topped manually to leave 3-4-in. neck length, rolled in soil to simulate dusty mechanical harvesting conditions and then as many bulbs as would fit were placed in a 50-lb mesh bag from each plot. Immediately after harvest, the fast-curing samples were transported to a commercial onion storage facility with a drying wall, placed in a 1000-lb wooden box along with several hundred other boxes, and artificially cured using heated forced air for 8 d. The air was heated to 5 °F above the ambient air temperature, regulated to 60-70% relative humidity, treated with ozone, and forced through the stacked 1000-lb boxes at 60-80 cubic feet per minute /ton. The harvest samples from the other two treatments were removed from the field and placed in an open-sided barn in a single layer to cure naturally. On 27, 31 Oct - 3 Nov, onions were size-graded, counted, and weighed. All soft bulbs were cut longitudinally and inspected for bacterial rot. A sub-sample of 30 asymptomatic bulbs per sample was cut longitudinally and inspected for bacterial rot and internal dry scale; the percentage of each in this sample was extrapolated to the remaining asymptomatic bulbs. Each sample was corrected to 100 bulbs. Data were analyzed using General Analysis of Variance (ANOVA) and treatment means separated using Fisher's Protected Least Significant Difference test with 5% significance (Statistix 10).

During the 8-d period that the samples were on the drying wall, the average, minimum and maximum temperatures and relative humidity were 78.5 °F, 74 °F, and 86.5 °F and 66.7 %, 51.7 %, and 81.2 %, respectively. During the same 8-day period, the conditions in the field included average, minimum, and maximum temperatures, and relative humidity of 70.2 °F, 41.3 °F, and 95.7 °F and 78 %, 38 %, and 100%, respectively. The fast-curing treatment had the highest incidence of bacterial bulb rot (32%), which was significantly 36% and 49% higher than standard (23.5%) and pulled early (21.5%) treatments, respectively, which were not significantly different from each other. These levels of bulb rot were similar to the incidence of bulb rot on 29 Aug (19%), indicating that in most of the plants with foliar symptoms of bacterial disease on 29 Aug, the bacterial disease did not progress into bulb rot, no matter the harvest treatment. There were no differences in internal dry scale among treatments, which ranged from 2.9% to 5.6% (data not shown). There were no significant differences in yield among treatments, although numerically the fast-curing treatment had 9-11% lower yield by 58-74 cwt/A than the naturally cured treatments. In this study, pulling onions 15 d early did not reduce yield compared to the standard pulling timing. Since the onions in this field had excessive leaf dieback, the time it took for the foliage/neck tissue to dry down in the field differed by only 5 days between the pull early and standard treatments. Had the onions in the field not had excessive leaf dieback, the pulling early treatment may have resulted in lower yield compared to the standard. It is suspected that the reason that the fast-curing treatment resulted in more bulb rot than the naturally cured treatments was because, unlike in the pulled early and standard treatments, in the fast-curing treatment the neck tissue was very green during topping, and the average temperature was 8.3 °F warmer during artificial curing. These two factors are favorable for progression of this bacterial disease. This trial was funded by Specialty Crops Research Initiative Award 2019-51181-30013 of the USDA National Institute of Food and Agriculture.

Treatment	Date Pulled Plant Condition	Date Harvested and Topped Plant Condition	27 Oct – 3 Nov Bacterial Bulb Rot (%)	 Marketable Yield (cwt/A)
Standard Practices	13 Sep 2% green foliage roots letting go	21 Sep (8 d after pulling) 0% green foliage necks dry	23.3 b[z]	641
Pull 15 d early	29 Aug 35% leaf dieback roots holding on	16 Sep (18 d after pulling) 0% green foliage necks dry	21.5 b	657
Artificial Fast Curing (8 d)	29 Aug 35% leaf dieback roots holding on	29 Aug (same day as pulling) 65% green foliage necks green	32.0 a	583
p value			0.0327	0.1959

[z] Numbers in a column followed by the same letter are not significantly different, Fisher's Protected Least Significant Difference test, $p < 0.05$.