DRY BULB ONION (*Allium cepa* 'Redwing')
Bacterial bulb rot; *Burkholderia cepacia, Pantoea ananatis*, *P. agglomerans*

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Evaluation of selected pesticides for control of bacterial bulb rot in onion, 2020.

Two trials were conducted in a commercial onion field in 'muck' soil in Elba, NY. Red onions 'Redwing' were direct seeded on 28 Apr. One trial relied on natural bacterial infection, while the other received two artificial bacterial inoculations. Each trial consisted of 12 pesticide treatments and a non-treated control arranged as a randomized complete block design with five replications. Each plot consisted of two 2-row onion beds 5-ft in width and 10-ft in length, with onion rows spaced 10-in. and 20-in apart on the bed and between beds, respectively. Pesticides were applied with a CO_2-pressurized backpack sprayer at 40 gpa and 31-33 psi using three TeeJet 8005 VS flat fan nozzles spaced 19-in. apart. Treatments were initiated at the first sign of leaf senescence when onions had 1-1.5-in. bulbs on 30 Jul and continued every 6-9 days for 6 weeks until onions were 60% lodged on 6 Sep. Onions 20-30% lodged were artificially inoculated on 25 Aug 3 days after the fourth spray and on 4 Sep 7 days after the fifth spray when onions were 60-70% lodged with 40% leaf dieback. Using a manual backpack sprayer, onions were sprayed to runoff with a mixture of 10^6 cfu/ml each of *Pantoea ananatis* and *P. agglomerans* at dusk during calm conditions to encourage leaf moisture through the night to favor bacterial disease. On 28 Sep, 85 bulbs were harvested per plot and then stored in mesh onion bags in a ventilated barn. Onions were topped, size-graded, weighed, and inspected for rot on 3-4 Dec and 8-11 Dec for the artificially inoculated and naturally infected trials, respectively. All soft bulbs were cut open to confirm presence of bacterial bulb rot. The remaining healthy onions were re-bagged and put into commercial cold storage on 15 Dec. After 3 months in storage, the onions were inspected for bulb rot again on 11 Mar 21. A sub-sample of 30 seemingly healthy bulbs per plot were also cut open and inspected for bacterial rot; the percentage of bulb rot in this sample was extrapolated to the remaining healthy bulbs. Differences among treatments were determined using General Analysis of Variance and treatment means separated using Fisher's Protected Least Significant Difference test with 5% significance (Statistix 10).

In 2020, the period from 30 Jul to 28 Sep had average, minimum, and maximum temperatures of 65°F, 34°F, and 87°F, respectively, and 2.68 inches of total rainfall. Incidence of bacterial bulb rot was moderate and ranged from 9.8% to 23.7% in the naturally infested trial and from 12.0% to 22.5% in the artificially inoculated trial. Unfortunately, artificial spray inoculation did not increase the incidence of bulb rot in this study. There were no significant differences among treatments for incidence of bulb rot in either trial. Mastercop in the naturally infected trial was the only treatment in the two trials that had numerically less than 50% bulb rot compared to the non-treated control. In addition to Mastercop, Mankocide and Cuprofix consistently ranked within the top four best treatments in both trials. Alternatively, the non-treated control, Kocide 3000 A-F + Lifegard ACE, Kocide 3000 and Harbour consistently ranked in the bottom six (rank 8-12). Actigard was inconsistent and ranked second in the naturally infested trial and 11th in the artificially inoculated trial. Similarly, Oxidate ranked fifth in the artificially inoculated trial and 13th in the naturally infected trial. The other plant defense activator, Lifegard consistently ranked fifth and sixth in the naturally infected and artificially inoculated trials, respectively. Although lack of statistically significant results in this study made it difficult to draw conclusions, the copper sulfate pesticides Mastercop and Cuprofix were the closest to having activity on bacterial bulb rot.

Product and Rate/A in 40 gpa A-F[z]	Total Bacterial Bulb Rot (%) and Rank[y]				Estimated Yield (cwt/A)	
	Naturally Infected		Artificially Inoculated		Naturally Infected	Artificially Inoculated
Non-treated (water)	21.7	11	22.5	13	372	415
Copper bactericides[x]:						
Mastercop 1 pt	9.8	1	14.2	3	354	411
Badge SC 2.75 pt	18.7	7	17.5	7	327	382
Kocide 3000 1.5 lb	20.8	10	17.9	8	335	398
Mankocide 2.5 lb	15.1	3	12.0	1	353	391
Kocide 3000 1.5 lb + Manzate Max 2.4 qt	19.2	8	14.6	4	340	371
Cuprofix Ultra 40 Disperss Dry Flowable 2.5 lb	17.3	4	12.7	2	347	425
Nordox 2.5 lb	17.6	6	20.9	12	345	391
Sanitizer: Oxidate 2.0 0.2 fl oz (= 0.5% v/v)	23.7	13	14.8	5	360	418
Plant Defense Activators:						
Lifegard WG 1.8 oz (= 4.5 oz/100 gal)	17.5	5	16.9	6	351	434
Actigard 50WG 0.5 oz	14.1	2	20.0	11	362	406
Antibiotic: Harbour 6.4 oz (= 200 ppm)	19.4	9	18.2	9	319	421
Combination:						
Lifegard WG 1.8 oz ACE + Kocide 3000 1.5 lb A-F	22.3	12	18.6	10	355	388
P value ($\alpha = 0.05$)	0.6057		0.6325		0.7152	0.5832

[z] Treatments applied weekly A-F: A: 30 Jul; B: 6 Aug; C: 13 Aug; D: 22 Aug; E: 28 Aug; F: 6 Sep.

[y] Rank: Treatments are ranked in order from lowest bulb rot to highest bulb rot.

[x] Active ingredients (metallic copper equivalent) in copper bactericides presented in order of increasing metallic copper equivalent: copper sulfate pentahydrate (5%) in Mastercop; copper hydroxide + copper oxychloride (20%) in Badge; copper hydroxide (30%) in Kocide and Mankocide; basic copper sulfate (40%) in Cuprofix; cuprous oxide (75%) in Nordox.