

Onion Fungicide Spray Programs 2022-23
Bhabesh Dutta; Extension Vegetable Pathologist – University of Georgia

The effective management of onion diseases begins prior to planting. By using integrated methods such as disease-free seed and transplants, proper crop rotation, disking and deep ploughing of plant debris, and use of resistant varieties, growers can minimize the amount of disease epidemic by either reducing the amount of initial inoculum or the rate of disease development. Integrated use of management practices reduces the weight on individual management option and provides growers disease management options at lower risk. Chemical management using fungicides should be the last resort after using the other management options. Most of the fungicides are effective when used as protectants, only handful of fungicides have curative actions.

Spray Schedule = 7-10 day (may vary based on weather conditions)

Spray No.	¹ Fungicide(s)/target disease
Two weeks after transplanting	Overhead drench application of Fontelis or Endura/RHIZ, WM, PR + Copper fungicide (foliar pathogens)
1	² Chlorothalonil or Catamaran/BNR, BLB, PB/ BLB, PB
2	Pristine or Merivon or Fontelis/BLB, BNR, SLB, PB
3	Chlorothalonil or Catamaran/BNR, BLB, PB/ BLB, PB
4	Pristine or Merivon or Fontelis/BLB, BNR, SLB, PB; ManKocide or Kocide or Nordox (Pseudomonas)
5	Chlorothalonil or Catamaran/BNR, BLB, PB/ BLB, PB
6	Pristine or Merivon or Fontelis/BLB, BNR, SLB, PB; ManKocide or Kocide or Nordox (Pseudomonas)
7	Chlorothalonil or Catamaran/BNR, BLB, PB/ BLB, PB
8	Luna tranquility/Flex or Inspire super or Omega 500 or Miravis Prime or Switch/BLB, BNR, SLB, PB (Omega 500 lacks SLB activity)
9	Chlorothalonil/BNR, BLB, PB + ManKocide or Kocide or Nordox (bacterial diseases)
10	Luna tranquility/Flex or Inspire super or Omega 500 or Miravis Prime or Switch/BLB, BNR, SLB, PB (Omega 500 lacks SLB activity)
11	Chlorothalonil or Catamaran/BNR, BLB, PB + ManKocide or Kocide or Nordox (bacterial diseases)
12	Luna tranquility/Flex or Inspire super or Omega 500 or Miravis Prime or Switch/BLB, BNR, SLB, PB (Omega 500 lacks SLB activity)
13	Chlorothalonil or Catamaran /BNR, BLB, PB + ManKocide or Kocide or Nordox (bacterial diseases)

14	Luna tranquility/Flex or Inspire super or Omega 500 or Quadris top/BLB, BNR, SLB, PB (Omega 500 lacks SLB activity)
15	Chlorothalonil/BNR, BLB, PB + ManKocide or Kocide or Nordox (bacterial diseases)
16	Luna tranquility/Flex or Inspire super or Omega 500 or Miravis Prime/BLB, BNR, SLB, PB (Omega 500 lacks SLB activity)

The fungicide spray for **downy mildew (DM)** will be based on a forecasting model or based on a calendar spray (recommended spray may start **by second or third week of March**). Alerts for the DM spray will be communicated by the Vidalia Onion and Vegetable Research Center and the UGA, Tifton. **Fungicides with moderate level of efficacy on DM are: Orondis Ultra, Omega 500, Zampro and Chlorothalonil. Use of Phosphite (irrespective of brand and type) is highly recommended as a rotation partner.**

¹Please use the labeled rate of recommended fungicide. Rotate fungicides for good disease control.

²Chlorothalonil (Bravo, Echo, Equus etc)

Disease acronyms: BNR=Botrytis neck rot; BLB=Botrytis leaf blight; PB=Purple blotch; RHIZ=Rhizoctonia root rot; WM=White mold; PR=Pink root; SLB=Stemphylium leaf blight;

Botrytis leaf blight (BLB) was widespread and moderately severe in 2022



Efficacy of individual fungicides on Botrytis leaf Blight (BLB)

Treatments and rate per acre	Application frequency	AUDPC
Rovral 1.5 pt	4	989.6 b
Scala 18 fl oz	4	1256.8 a
Luna Tranquility 16 fl oz	4	824.6 b
Omega 500 1 pt	4	877.3 b
Miravis Prime 11.4 fl oz	4	802.9 b
Merivon 11 fl oz	4	942.4 b
Luna Flex 12 fl oz	4	846.2 b
Non-treated check	-	1380.0 a

- Scala has been consistently slipping since last two years.
- Luna Tranquility has Luna and Scala. Slipping of Scala may put pressure on Luna component of the fungicide (not good for fungicide resistance management)
- Luna Flex can be an alternative. This fungicide is labeled on onion; Luna+Difenoconazole. It has similar efficacy as Luna Tranquility.

Cevya: A novel FRAC 3 fungicide shows promise in 2021 and 2022 field trials


Treatments and rate per acre	Application frequency	AUDPC
Luna tranquility 16 fl oz Cevya 5 fl oz	4 4	735.0 b
Luna Tranquility 16 fl oz Inspire super 20 fl oz	4 4	760.0 b
Merivon 11 fl oz Cevya 5 fl oz	4 4	865.0 b
Merivon 11 fl oz Inspire super 5 fl oz	4 4	790.0 b
Non-treated check		1155.0 a

Ranking of Fungicides with Respect to their Efficacy on Botrytis

Fungicides	Efficacy
Omega 500	High-to-moderate
Miravis Prime	Moderate
Luna Tranquility/Luna Flex	Moderate
Inspire super	Moderate
Fontelis/Merivon	Moderate
Rovral	Moderate-to-low
Pristine	Moderate-to-low
Switch	Moderate-to-low
Quadris	Moderate-to-low
Quadris Top	Moderate-to-low
Scala	No efficacy/potential field resistance

Ranking of Fungicides with Respect to their Efficacy on Stemphylium

Fungicides	Efficacy
Luna Tranquility	High-to-moderate
Inspire super	Moderate
Miravis Prime	Moderate
Quadris top	Moderate-to-low
Pristine	Moderate-to-low
Switch	Moderate-to-low
Quadris	Moderate-to-low
Rovral	Low
Omega 500	No efficacy
Scala	No efficacy

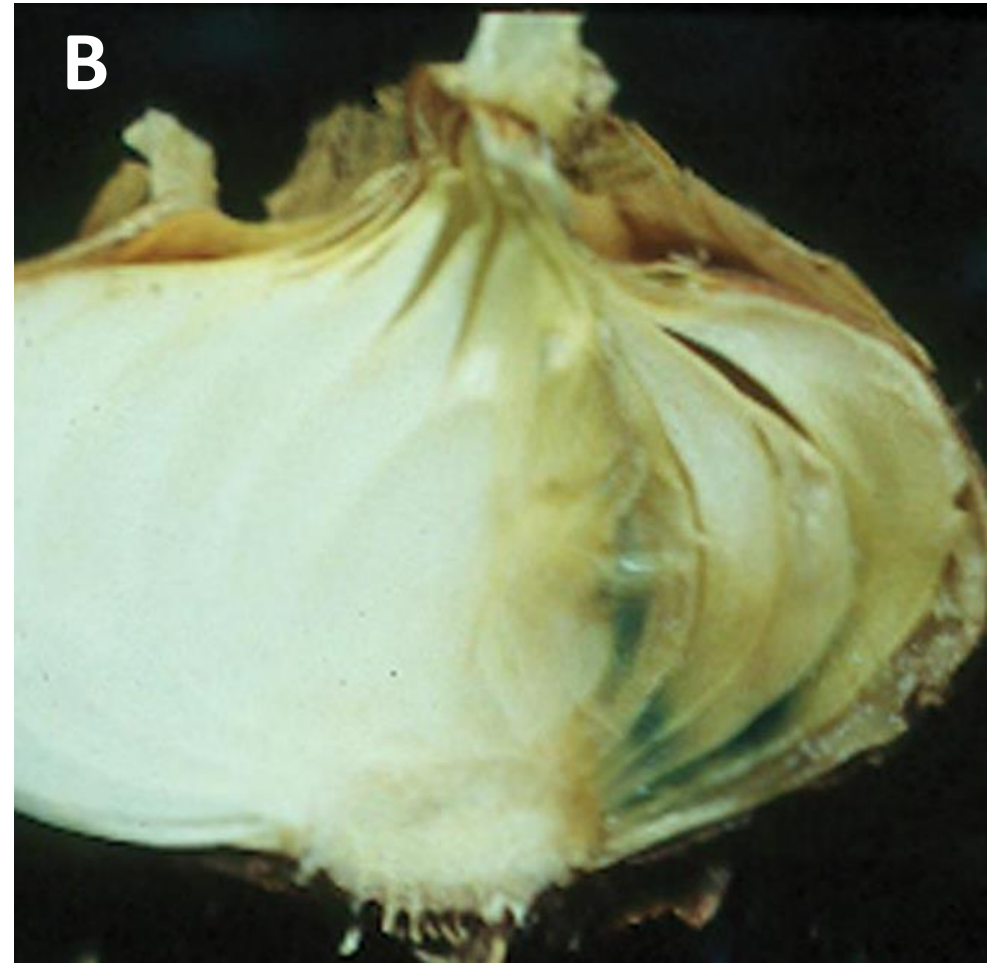
Spray No.	¹ Fungicide(s)/target disease
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At least 21 different bacterial pathogens are known to infect Vidalia onions

1. *Pantoea ananatis* – center rot
2. *Pantoea agglomerans* – bacterial leaf necrosis
3. *Pantoea allii* – center rot
4. *Pantoea stewartii* subsp. *indologenes**- center rot
5. *Burkholderia gladioli* pv. *alliicola* – slippery skin
6. *Burkholderia cepacia* – sour skin
7. *Pseudomonas viridiflava* and *Pseudomonas allivorans**– leaf streak/bulb rot
8. *Dickeya chrysanthemi* (*Erwinia chrysanthemum*) - soft rot
9. *Enterobacter cloacae* – Enterobacter bulb decay
10. *Erwinia rhapontici* – soft rot
11. *Eschericia* sp. – soft rot
12. *Klebsiella* sp. – soft rot
13. *Lactobacillus* sp. – soft rot
14. *Bacillus cereus* – soft rot
15. *Pectobacterium carotovorum* subsp. *carotovorum* - soft rot
16. *Pseudomonas coronafaciens* – brown rot
17. *Pseudomonas marginalis* pv. *marginalis* – soft rot
18. *Pseudomonas syringae* – bacterial leaf spot
19. *Serratia marcescens* – soft rot
20. *Xanthomonas axonopodis* pv. *allii* – Xanthomonas leaf blight
21. *Rouxiella badensis* *– bacterial bulb rot



Center rot of onion: *Pantoea* spp.



Bacterial streak and bulb rot caused by *Pseudomonas viridiflava*



Sour skin of onion: *Burkholderia cepacia*



Yellow bud of onion *Pseudomonas coronafaciens*



Bacterial leaf blight of onion caused by *Xanthomonas axonopodis* pv. *allii*.



Onion bulb decay: *Enterobacter cloacae*



Slippery skin: *Burkholderia gladioli* pv. *alliicola*

Bacterial bulb rots: Chemical Management Depends on Copper-based

Treatment and rate of product/acre	Active ingredient(s)	Internal rot (%)
Mankocide 2.5 lb	Mancozeb + CuOH	8.3 b
Kocide 3000 1.5 lb	CuOH	9.0 b
Champ 1.5 lb	CuOH	10.3 b
Oxidate 5.0 1.28 fl oz/gal	H ₂ O ₂ + peroxyacetic acid	9.5 b
Forticept 1.28 fl oz/gal	Thyme oil	13.4 b
Agrititan 800 ppm	TiO ₂ /Zn	10.7 b
LifeGard 2 fl oz	<i>Bacillus mycoides</i> strain J	7.0 b
Nordox 1 lb	Cu ₂ O	4.7 b
Mastercop 1 pt	CuSO ₄	14.3 b
Howler 5 lb	<i>Pseudomonas chlororaphis</i> strain AFS009	8.6 b
Theia 3 lb	<i>Bacillus subtilis</i> strain AFS032321	18.6 ab
NUCop 1.5 lb	Cupric Hydroxide	5.5 b
Non-treated check		37.3 a

- Six applications at a 10- to 14-day interval; first application coincided with first leaf senescence (first week of March 2021)
- Spring 2021 in Vidalia, GA was relatively cool and drier than 2020, and bacterial foliar symptoms did not appear until a week prior to harvest
- **2021 trial results:** More bulb rot (37.5% incidence in check plots); ManKocide was the most effective, then other copper products, AgriTitan, & Lifegard



Copper-based bactericide rotated with LifeGard significantly reduced bacterial bulb rot

Copper-based program alternated with LifeGard	Percent bulb rot (%)
Mankocide 2.5 lb (3 app) LifeGard 2 oz wt (3 app)	5.8 b
Nordox 1 lb (3 app) LifeGard 2 oz wt (3 app)	5.3 b
Mastercop 1 pt (3 app) LifeGard 2 oz wt (3 app)	12.4 b
NUCop 1.5 lb (3 app) LifeGard 2 oz wt (3 app)	4.3 b
Oxidate 5.0 1.28 fl oz (3 app) LifeGard 2 oz wt (3 app)	8.8 b
Champ 1.5 lb (3 app) LifeGard 2 oz wt (3 app)	20.0 ab
LifeGard 2 oz wt (6 app)	9.6 b
Non-treated check	28.5 a

Tank-mixing biologicals (LifeGard or Serenade ASO) with Copper-based products; a possibility

Treatments	Foliar disease AUDPC
Serenade ASO+Nordox (6 app)	165.3 b
LifeGard+Nordox (6 app)	145.8 b
Serenade ASO+Nordox (6 app)	178.8 b
LifeGard+Nordox (6 app)	151.7 b
Serenade ASO (6 app)	156.0 b
LifeGard (6 app)	183.6 b
Nordox (6 app)	146.5 b
Non-treated check	219.06 a

Evaluation of digging methods on post-harvest incidence of bacterial rot (2021 and 2022)

Methods of onion digging	Internal rot (%) (2021)	Internal rot (%) (2022)
Chain digger	9.0 B	1.3 B
Straight-blade undercutter	20.5 A	10.7 A
P-value	<0.001	<0.001



Dutta et al., 2022 and 2023 PDMR

Field Curing for at least 48 hours is recommended to aid in drying of neck



Evaluation of harvesting methods on post-harvest incidence of bacterial rot (2021 and 2022)

Methods of onion harvest	Internal rot (%) (2021)	Internal rot (%) (2022)
Mechanical harvest (Top Air Onion harvester)	4.5 B	3.0 B
Manual harvest	14.5 A	12.5 A
P-value	<0.001	0.002



Mr. Chris Tyson

Dutta et al., 2022 and 2023 PDMR



Evaluation of neck clipping length on post-harvest incidence of bacterial rot (2021)

Neck length clipped	External rot (%)	Internal rot (%)
5-inches	10.0 a	4.5 B
3-inches	9.5 a	4.0 B
1-inch	14.2 a	19.0 A

- Field curing was done prior to clipping
- Internal rot was associated with mainly *Pantoea* spp., and external rot was associated with *Burkholderia* spp. and *Pectobacterium* spp. based on arbitrarily-collected symptomatic samples.

Dutta et al., 2022 PDMR



Optimized neck length that improves storability of onions (2022) (Ross Greene)

Neck length clipped	Bacterial rot (center rot) after 30-day of storage (%)
Neck clipped at flush green stage	18.5 A
Neck clipped after field curing (1")	18.0 A
Neck clipped after field curing (2")	13.0 B
Neck clipped after field curing (3")	13.0 B



Dutta et al., 2023 PDMR

