

Chapter 12. Onion, Leek, and Chive Production¹

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Botany and Planting

Onion—*Allium cepa*, Alliaceae (Amaryllidaceae)

Leek—*Allium ampeloprasum*

Chive—*Allium schoenoprasum*

Bunching onion—*Allium fistulosum*

Table 1. Planting information for onion and alliums.

Planting Dates	Seeded	Transplanted
North Florida	mid-Sept–mid-Nov	Nov–Jan
Central Florida	Oct	Dec–Jan
South Florida	Oct	Dec–Jan
Planting Information		
Distance between rows (in)	14–18	14–18
Distance between plants (in)	3–4	4–6
Seeding depth (in)	0.25–0.5	-
Seed per acre (lb)	3–4	1
Days to maturity	100–130	100–130
Plant populations (acre)	149,343	112,123

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The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication do not signify our approval to the exclusion of other products of suitable composition.

Use pesticides safely. Read and follow directions on the manufacturer's label.

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Cultivars

Table 2. Onion and leek cultivars.

Onion		
Dawn (H)	Prowler (H)	Sweet Harvest (H)
Granex 33 (H)	Red Hunter	Sweet Success (H)
Pirate (H)	Savannah Sweet (H)	Vidurra (H)
Plethora (H)	Sweet Caroline (H)	
Bunching Onion		
Perfecto Blanco	Tokyo Long White	White Portugal
Leeks		
Chives	Lancelot	Tivi
Jolant	Megathon	Tornado
King Richard	Staro	Verina
H=hybrid		

The following tables list registered pesticides that should be integrated with other pest management methods. Additional information on integrated management methods can be requested from UF/IFAS Extension horticulture or agriculture Extension agents. A list of local UF/IFAS Extension offices is available at <https://sfyl.ifas.ufl.edu/find-your-local-office/>.

Table 3. Herbicides approved for managing weeds in onion, garlic, and shallot. Contact: Peter J. Dittmar, UF/IFAS Horticultural Sciences Department, Gainesville.

Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
Labels change frequently. Be sure to read a current product label before applying any chemical.				
*** PREEMERGENCE ***				
Bensulide 5.0–6.0	(Prefar) 4 E 5–6 qt	8	Dry bulb vegetables: onion, garlic, shallot	Annual broadleaf and grass control. Incorporate or irrigate 1–2 inches deep within 36 hr of application. Consult label for rotational restrictions.
Bromoxynil 0.25–0.38	(Buctril) 2 EC 1.0–1.5 pt (Buctril) 4 EC 0.5–0.75 pt	6	Onion (dry bulb)	Broadleaf weeds. Preemergence is restricted to muck soils containing greater than 10% organic matter. Apply at least 3–4 days prior to emergence. Weeds should not exceed the 4-leaf stage, 2 inches in height or 1 inch in diameter.
Carfentrazone up to 0.031	(Aim) 2 EC up to 2 fl oz	14	Onion, garlic, leek, chive, shallot	Apply as a preplant burndown for emerged broadleaf weeds. Use crop oil concentrate, methylated seed oil, or nonionic surfactant at recommended rates. Maximum rate of 0.096 lb a.i./A per season. No pretransplant interval.
Flumioxazin up to 0.06	(Chateau) 51 WDG up to 2 fl oz	14	Garlic, onion (dry bulb)	Broadleaf control. Apply to transplanted onions between the 2- and 6-leaf stage. Apply to direct seeded onions between the 3- and 6-leaf stage.
Glyphosate	(various formulations) consult label	9	Onion, garlic, leek, chive, shallot	Control of emerged broadleaf and grass weeds. Consult individual labels for restrictions.
Oxyfluorfen 2.0	(Goal 2XL) 2 EC 2.0 pt (GoalTender) 4 EC 1.0 pt	14	Onion (dry bulb), garlic (dry bulb)	Certain broadleaf weeds. Transplanted only. Apply within 2 days of transplanting. Necrotic lesions, twisting, or stunting of plants can occur if applications are made during cool, wet weather or prior to the full development of the true leaves.
Paraquat 0.5–1.0	(Gramoxone) 2 SL 2–4 pt	22	Onion (dry bulb)	Controls emerged weeds. Apply prior, during, or after planting, but before crop emergence. Only 2 applications a season. Use a nonionic surfactant.

Active Ingredient lb a.i./Acre	Trade Name Product/Acre	MOA Code	Crops	Weeds Controlled/Remarks
Paraquat 0.63–1.0	(Gramoxone) 2 SL 2.5–4.0 pt (Firestorm) 3 SL 1.7–2.7 pt	22	Onion (seeded), garlic	Emerged broadleaf and grass weeds. Apply as a preplant burndown. A maximum of 1 lb a.i./A per season.
Pelargonic acid	(Scythe) 4.2 EC 3%–10% v/v	27	Onion, garlic, leek, chive, shallot	Emerged broadleaf and grass weeds. Apply before emergence of crop. Product is a contact, nonselective, foliar-applied herbicide. There is no residual activity.
Pendimethalin Mineral 0.5–0.75 Muck 1.0–2.0	(Prowl) 3.3 EC Mineral: 1.2–1.8 pt Muck: 2.4–4.8 pt (Prowl H20) 3.8 Mineral: 1.0–1.5 pt Muck: 2.0–4.0 pt	3	Onion (dry bulb), shallot (dry bulb), garlic	Mineral soils: Apply when crop has 2–9 true leaves. Muck soils: May be applied as sequential application: preemergence through loop stage, early postemergence (2–6 true leaf stage), late postemergence (6–9 true leaf stage). Do not exceed 5.9 lb a.i./A in a growing season. PHI 45 days.
Pyraflufen ethyl 0.001–0.003	(ET Herbicide/Defoliant) 0.5–2.0 fl oz	14	Bulb vegetables	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment.
*** POSTEMERGENCE ***				
Bromoxynil 0.25–0.38	(Buctril) 2 EC 1.0–1.5 pt (Buctril) 4 EC 0.5–1.5 pt	6	Onion (dry bulb)	Broadleaf weeds. Soil and onion leaves should be dry before application. Waxy coating on leaves reduces chances for injury. Varieties vary in sensitivity, so use on a trial basis.
Bromoxynil 0.38–0.5	(Buctril) 2 EC 1.5–2.0 pt	6	Garlic	Broadleaf weeds. Apply after emergence but before 12 inches tall. Weeds are most susceptible up to the 4-leaf stage or 2 inches height or 1 inch wide. PHI 112 days.
Carfentrazone up to 0.031	(Aim) 2 EC up to 2 fl oz	14	Onion (dry bulb), garlic, leek, chive, shallot	Emerged broadleaf control. Post-direct hooded application to row middles for burndown of emerged weeds. Use crop oil concentrate or nonionic surfactant at recommended rates. PHI 0 days.
Clethodim 0.09–0.25 0.07–0.25	(Arrow) 2 EC 6–16 fl oz (Select Max) 1 EC 9–32 fl oz	1	Onion (dry bulb), garlic, shallot (dry bulb)	Annual and perennial grass control. Some labels include green onion. Consult label for use of a crop oil concentrate or nonionic surfactant. PHI 45 days.
Clethodim 0.09–0.13	(Arrow) 2 EC 6–8 fl oz (Select Max) 1 EC 12–16 fl oz	1	Chive, leek	Emerged annual and perennial grasses. Consult labels rate of COC or NIS. Do not apply more than 0.5 lb a.i./A per season. Select Max is not registered in leek. PHI 14 days.
Dimethenamid-p up to 1.0	(Outlook) 6 EC up to 21 fl oz	15	Onion (dry bulb), garlic, leek, shallot (dry bulb, green)	Broadleaf and grass weeds. Apply after the 2-true-leaf stage. Apply as a single application or split application. Split application of 10–14 fl oz, followed by 7–10 fl oz/A with 14 days between applications. Do not exceed 21 fl oz/A per growing season. PHI 30 days.
Fluazifop 0.188	(Fusilade DX) 12 fl oz	1	Onion (dry bulb), garlic	Annual and perennial grass weeds. Do not apply more than 48 fl oz/A per season. Include a COC or NIS. PHI 45 days.
Oxyfluorfen 0.5	(Goal 2 XL) 2 EC 0.5 pt direct seeded (GoalTender) 4 EC 0.25 pt direct seeded	14	Onion (dry bulb), garlic (dry bulb)	Certain broadleaf weeds. Direct seeded only. Apply after the crop has 2 true leaves. Multiple treatments can be applied and do not exceed 0.5 lb a.i./A. Necrotic lesions, twisting, or stunting of plants can occur if applications are made during cool, wet weather or prior to development of true leaves. PHI 60 days.
Sethoxydim 0.19–0.28	(Poast) 1.5 EC 1.0–1.5 pt	1	Onion (dry bulb, green), garlic, leek, shallot	Grass weeds. Include a surfactant. Do not apply more than 4.5 pt/A per season. PHI 30 days.
Treflan 0.35–0.5	(Treflan) 4 EC 0.75–1.0 pt (Treflan TR-10) 3.75–5.0 lb	3	Onion (dry bulb)	Broadleaf and grass weeds. Apply at layby to the soil surface between onion rows. Remove weeds that are present. Do not apply in muck soils. PHI 60 days.

Table 4. Insecticides labeled for management of arthropod pests of garlic, leeks, and shallots. Contact: Xavier Martini, UF/IFAS North Florida Research and Education Center–Quincy.

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to chapter 19 for information on biopesticides, including materials labeled for certified organic production.						
Aphids	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2.5 pt 8F: 1–1.56 pt	24	3	Leeks, shallots, garlic. 3 applications per year for garlic, 2 for all others.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, and garlic.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	Do not apply more than 38 oz/A per season.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR (insect growth regulator). OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	BotaniGard ES (<i>Beauveria bassiana</i> strain GHA)	0.25–1 qt/A. Apply in sufficient water to cover foliage, typically 5–100 gal/A.	4	0	
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	Leek, garlic, shallot.
	-	M-Pede 49% EC (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
	-	Trilogy (extract of neem oil)	0.5%–2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed. ²
Beet armyworm	1A	*Lannate LV; *SP (methomyl)	LV: 1.5 pt SP: 0.5 lb	48	7	Garlic only.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	Do not apply more than 38 fl oz/A per season.
	28	Coragen (chlorantraniliprole)	3.5–5.0 fl oz	4	1	No more than 4 foliar applications or 15.4 fl oz/A per crop. For entire bulb vegetable group.
Caterpillars (includes cutworms and armyworms)	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb and garlic only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, and garlic.
	3A	*Pounce 25 WP (permethrin)	Garlic: 6.4–12.8 oz	12	1	Garlic.
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	1.92–3.20 fl oz	12	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season. Onion and garlic.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	No more than 38 fl oz per season.
	5	Entrust SC (spinosad)	3–8 fl oz	4	1	No more than 5 applications per year (29 fl oz). For leeks, garlic, and shallots. OMRI-listed. ²
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1	Use with an adjuvant.
	11A	Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	1.0–2.0 lb	4	0	Apply when larvae are small for best control.
	11A	Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. For organic production.
	11A	Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5–2.0 lb	4	0	Use high rate for armyworms. Treat when larvae are young.
	11A	Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25–1.5 lb	4	0	Use higher rates for armyworms. OMRI-listed. ²
	11A	DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25–2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. OMRI-listed. ²

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	11A	Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12–1.5 lb	4	0	Treat when larvae are young. Thorough coverage is essential. OMRI-listed. ²
	11A	Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.
	18	Intrepid 2F (methoxyfenozide)	4–12 fl oz	4	1	Slow-acting IGR that only effects larvae.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	Leek, garlic, and shallots.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Fire ants	6	Clinch (abamectin)	Broadcast application: 1 lb Per ant mound: 5–7 tablespoons	4	0	Maximal annual rate: 4 lb/A per year. Only apply when ants are active and no rain is forecast for the next 6 hr.
	7A	Extinguish (S-methoprene)	1–1.5 lb	4	0	Slow-acting IGR. Best applied early spring and fall where crop will be grown. Colonies will be reduced after 3 weeks and eliminated after 8–10 weeks. May be applied by ground equipment or aerially.
	7C	Esteem Ant Bait (pyriproxyfen)	1.5–2.0 lb	12	1	Dry bulb only.
Flea beetles	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Garlic. (Crop Groups 3-07A and 3-07B)
	5	Entrust SC (spinosad)	3–8 fl oz	4	1	No more than 5 applications per year (29 fl oz). For leeks, garlic, and shallots. OMRI-listed. ²
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
Liriomyza Leafminers	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Label is registered only for garlic. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, garlic.

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 oz	12	30	No more than 38 fl oz per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Garlic. (Crop Groups 3-07A and 3-07B)
	5	Entrust SC (spinosad)	3–8 fl oz	4	1	No more than 5 applications per year (29 fl oz). For leeks, garlic, and shallots. OMRI-listed. ²
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1	Use with an adjuvant.
	6	*Agri-Mek SC (abamectin)	1.75–3.5 fl oz	12	30	Must be used with a nonionic activator-type wetting, spreading, and/or penetrating adjuvant, not a binder-sticker-type adjuvant. Maximum of 10.25 fl oz/A per season.
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	7–10 fl oz	24	30	Maximum annual rate: 20.0 fl oz/A
	17	Trigard (cyromazine)	2.66 oz	12	7	Maximum of 6 applications per crop.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	12	1	Do not apply more than 0.4 lb a.i./A of cyantraniliprole-containing products per season. Toxic to bees. Do not allow drift to blooming crops or weeds.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Onion maggot (<i>Delia antiqua</i>)	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 2–4 qt 50W: 4–8 lb	72	preplant	Do not make more than 1 soil application per year. For leeks, garlic, and shallots.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2.5 pt 8F: 1–1.56 pt	Leeks, shallots, garlic: 24	3	Leeks, shallots, and garlic. 3 applications per year for garlic, 2 for all others.
	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Label is registered only for garlic. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, and garlic.

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A	*Pounce 25 WP (permethrin)	Onions: 6.4–19.2 oz Garlic: 6.4–12.8 oz	12	1	Garlic.
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	1.92–3.20 fl oz	12	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season. Onion and garlic.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	No more than 38 fl oz per season.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Plant bugs	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	2.56–3.84 fl oz	12	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season. Onion and garlic.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	-	M-Pede 49% EC (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
Stink bugs	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Garlic only. Label is registered only for garlic. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	Karate (lambda-cyhalothrin)	2.56–3.84 fl oz	24	14	Do not apply more than 30.72 fl oz/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, and garlic.
	3A	*Pounce 25 WP (permethrin)	Onions: 6.4–19.2 oz Garlic: 6.4–12.8 oz	12	1	Garlic.

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	2.56–3.84 fl oz	12	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season. Onion and garlic.
	3A	Pyganic Crop Protection EC 5.0 (pyrethrins)	4.5–15.61 oz	12	0	OMRI-listed. ² Do not apply more than 10 times per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	Do not apply more than 38 fl oz per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Garlic. (Crop Groups 3-07A and 3-07B)
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
Thrips (check label for species controlled)	1A	*Lannate LV; *SP (methomyl)	LV: 1.5–3.0 pt SP: 0.5–1.0 lb	48	7	
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2.5 pt 8F: 1–1.56 pt	Leeks, shallots, garlic: 24	3	Leeks, shallots, and garlic. 3 applications per year for garlic, 2 for all others.
	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Garlic only. Label is registered only for garlic. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Garlic. Maximum of 0.77 pt/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Leeks, shallots, and garlic.
	3A	*Pounce 25 WP (permethrin)	Onions: 6.4–19.2 oz Garlic: 6.4–12.8 oz	12	1	Bulb onions and garlic.
	3A	*Proaxis Insecticide (gamma-cyhalothrin)	2.56–3.84 fl oz	12	14	Do not apply more than 0.12 lb a.i./A (1.92 pt/A) per season. Onion and garlic.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (garlic). Do not apply more than 15.36 fl oz/A per season.
	3A + 6	*Gladiator (zeta-cypermethrin + avermectin B1)	19 fl oz	12	30	No more than 38 fl oz per season.
	4A	Admire Pro (imidacloprid)	14.0 fl oz	12	21	Apply no more than 14 fl oz/A per season.
	4A	Assail 30SG (acetamiprid)	5.0–8.0 oz	12	7	No more than 4 applications or 32 oz/A per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Garlic (Crop Groups 3-07A and 3-07B)

Insect or Mite Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	5	Entrust SC (spinosad)	3–8 fl oz	4	1	No more than 5 applications per year (29 fl oz). For leeks, garlic, and shallots. OMRI-listed. ²
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1	Use with an adjuvant.
	6	*Agri-Mek SC (abamectin)	1.75–3.5 fl oz	12	30	Must be used with a nonionic activator-type wetting, spreading, and/or penetrating adjuvant, not a binder-sticker-type adjuvant. Maximum of 10.25 fl oz/A per season.
	6 + 28	*Minecto Pro (abamectin + cyantraniliprole)	10 fl oz	12	30	Maximum annual rate: 20.0 fl oz/A
	7C	Knack IGR (pyriproxyfen)	8 fl oz	12	3	Maximum of 2 applications, at least 14 days apart. No activity against adult insects.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	12	1	Label contains pollinator protection warnings.
	28	Verimark (cyantraniliprole)	Drip: 6.75–10 fl oz In-furrow at planting: 10–13.5 fl oz	4	1	
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	BotaniGard ES (<i>Beauveria bassiana</i> strain GHA)	0.25–1 qt/A. Apply in sufficient water to cover foliage, typically 5–100 gal/A.	4	0	
	-	Grandevo (<i>Chromobacterium subtsugae</i> strain PRAA4-1)	1–3 lb	4	0	Leek, garlic, and shallot.
	-	M-Pede 49% EC (soap, insecticidal)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Requiem EC (extract of <i>Chenopodium ambrosioides</i>)	1.5–3.0 qt	4	0	Begin as soon as thrips are seen.
	-	Trilogy (extract of neem oil)	0.5%–2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed. ²
Wireworms	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 2–4 qt 50W: 4–8 lb	72	preplant	Do not make more than 1 soil application per year. For leeks, garlic, and shallots.

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 11.1 January 2024. Number codes are used to distinguish the main insecticide mode of action groups, with additional letters for certain subgroups within each main group. All insecticides within the same group (with the same number) indicate the same active ingredient or a similar mode of action. This information must be considered for the insecticide resistance management decisions. - = unknown, or a mode of action that has not been classified yet.

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any product. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by UF/IFAS Extension nor discrimination against similar products or services not mentioned. OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

* **Restricted use insecticide.**

Table 5. Insecticides registered for managing arthropod pests of onions. Contact: Xavier Martini, UF/IFAS North Florida Research and Education Center–Quincy.

Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to chapter 19 for information on biopesticides, including materials labeled for certified organic production.						
Aphids	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2.5 pt 8F: 1.5 pt	12	3	Onions, bulb and green. 2 applications per year. Suppression only.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions and garlic), not green onions. Do not apply more than 15.36 fl oz/A per season. Suppression only.
	-	Azaguard (azadirachtin)	10–16 fl oz	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	BotaniGard ES (<i>Beauveria bassiana</i>)	0.5–2 qt/100 gal	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
	-	Grandevo (<i>Chromobacterium subsugae</i> strain PRAA4-1)	1–3 lb	4	0	Onion (bulb and green), and shallot.
	-	M-Pede (potassium salts of fatty acids)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	4	0	OMRI-listed. ²
	-	Trilogy (extract of neem oil)	0.5%–2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed. ²
Caterpillars (includes cutworms and armyworms)	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb and garlic only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Pounce 25 WP (permethrin)	6.4–19.2 oz	12	1	Bulb onions. Maximum 1 lb a.i./A per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions), not green onions. Do not apply more than 15.36 fl oz/A per season.
	5	Entrust SC (spinosad)	3–6 fl oz	4	1	No more than 5 applications per year (29 fl oz/A). For onions, bulb and green. OMRI-listed. ²
	5	Radiant SC (spinetoram)	5–10 fl oz	4	1	Use with an adjuvant. No more than 30 fl oz/A per year.
	11A	Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	1.0–2.0 lb	4	0	Apply when larvae are small for best control.

Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	11A	Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. For organic production.
	11A	Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5–2.0 lb	4	0	Use high rate for armyworms. Treat when larvae are young.
	11A	Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25–1.5 lb	4	0	Use higher rates for armyworms. OMRI-listed. ²
	11A	DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25–2.0 lb	4	0	Treat when larvae are young. Good coverage is essential. OMRI-listed. ²
	11A	Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12–1.5 lb	4	0	Treat when larvae are young. Thorough coverage is essential. OMRI-listed. ²
	11A	Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5–2.0 lb	4	0	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.
	18	Intrepid 2F (methoxyfenozide)	4–8 fl oz	4	1	Green onion subgroup only. Do not make more than 6 applications per year and do not apply more than 64 fl oz/A per year.
	28	Coragen (chlorantraniliprole)	3.5–7.5 fl oz	4	1	Beet armyworm only. No more than 4 foliar applications or 15.4 fl oz/A per crop.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	4	0	OMRI-listed. ²
Fire ants	7A	Extinguish (S-methoprene)	1–1.5 lb	4	0	Slow-acting IGR. Best applied early spring and fall where crop will be grown. Colonies will be reduced after 3 weeks and eliminated after 8–10 weeks. May be applied by ground equipment or aerially.
	7C	Esteem Ant Bait (pyriproxyfen)	1.5–2.0 lb	12	1	Dry bulb only.
Flea beetles	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz	12	Foliar: 1	Bulb and green onions (Crop Groups 3-07A and 3-07B). Do not apply more than 10.5 fl oz/A per season.
	5	Entrust SC (spinosad)	3–6 fl oz	4	1	No more than 5 applications per year (29 fl oz). For onions, bulb and green. OMRI-listed. ²
Leafminers	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.

Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Pounce 25 WP (permethrin)	Onions: 6.4–19.2 oz	12	1	Bulb onions. Maximum 1 lb a.i./A per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 5.25–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Bulb and green onions (Crop Groups 3-07A and 3-07B). Do not apply more than 10.5 fl oz/A per season.
	5	Entrust SC (spinosad)	3–6 fl oz	4	1	No more than 5 applications per year (29 fl oz/A). For onions, bulb and green. OMRI-listed. ²
	5	Radiant SC (spinetoram)	6–10 fl oz	4	1	Use with an adjuvant. No more than 30 fl oz/A per year.
	6	*Agri-Mek SC (abamectin)	1.75–3.5 fl oz	12	30	Must be used with a nonionic activator-type wetting, spreading, and/or penetrating adjuvant, not a binder-sticker-type adjuvant. Maximum of 10.25 fl oz/A per season.
	17	Trigard (cyromazine)	2.66 oz	12	7	Maximum of 6 applications per crop.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	12	1	Do not apply more than 0.4 lb a.i./A of cyantraniliprole-containing products per season. Toxic to bees. Do not allow drift to blooming crops or weeds.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Onion maggot	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 2–4 qt 50W: 4–8 lb	72	preplant	Do not make more than 1 soil application per year. For onions, bulb and green.
	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2.5 pt 8F: 1.5 pt	12	3	Onions, bulb and green. No more than 2 applications per year.
	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.28 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Pounce 25 WP (permethrin)	6.4–19.2 oz	12	1	Bulb onions. Maximum 1 lb a.i./A per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions and garlic), not green onions. Do not apply more than 15.36 fl oz/A per season.
	-	Neemix 4.5 EC (azadirachtin)	4–16 fl oz	12	0	OMRI-listed. ²
Plant bugs	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.

Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions and garlic), not green onions. Do not apply more than 15.36 fl oz/A per season.
	-	M-Pede (potassium salts of fatty acids)	1%–2% v/v	12	0	OMRI-listed. ²
Stink bugs	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.
	3A	*Mustang (zeta-cypermethrin)	2.4–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Pounce 25 WP (permethrin)	6.4–19.2 oz	12	1	Bulb onions. Maximum 1 lb a.i./A per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions), not green onions. Do not apply more than 15.36 fl oz/A per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 3.5–7.0 fl oz	12	1	Bulb and green onions (Crop Groups 3-07A and 3-07B). Do not apply more than 10.5 fl oz/A per season.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
Thrips (check label for species controlled)	1B	Malathion 5EC, 8F (malathion)	5EC: 1.5–2 pt 8F: 1.56 pt	12	3	Onions, bulb and green. No more than 2 applications per year.
	3A	*Ambush 25W (permethrin)	6.4–19.2 oz	12	1	Dry bulb only. Maximum of 2 lb a.i./A per season.
	3A	*Declare Insecticide (gamma-cyhalothrin)	0.77–1.54 fl oz	24	14	Bulb onions. Maximum of 0.77 pt/A per season.
	3A	*Mustang (zeta-cypermethrin)	3.2–4.3 oz	12	7	Do not apply more than 21.5 oz/A per season. Onions, bulb and green.
	3A	*Pounce 25 WP (permethrin)	9.6–19.2 oz	12	1	Bulb onions. Maximum 1 lb a.i./A per season.
	3A	*Warrior II (lambda-cyhalothrin)	0.96–1.92 fl oz	24	14	For bulb crops only (onions and garlic), not green onions. Do not apply more than 15.36 fl oz/A per season.
	4A	Admire Pro (imidacloprid)	14.0 fl oz	12	21	Apply no more than 14 fl oz/A per season.
	4A	Assail 30SG (acetamiprid)	5.0–8.0 oz	12	7	No more than 4 applications or 32 oz/A per season.
	4A	Scorpion 35SL (dinotefuran)	Foliar: 5.25–7.0 fl oz Soil: 8.75–10.5 fl oz	12	Foliar: 1 Soil: N/A	Bulb and green onions (Crop Groups 3-07A and 3-07B). Do not apply more than 10.5 fl oz/A per season.
	5	Entrust SC (spinosad)	3–8 fl oz	4	1	No more than 5 applications per year (29 fl oz). For onions, bulb and green. OMRI-listed. ²
	5	Radiant SC (spinetoram)	6–10 fl oz	4	1	Use with an adjuvant. No more than 30 fl oz/A per year.

Pest	MOA Code ¹	Trade Name (Active Ingredient) *Restricted	Rate Product/Acre	REI (Hours)	Days to Harvest	Remarks ²
	6	*Agri-Mek SC (abamectin)	1.75–3.5 fl oz	12	30	Must be used with a nonionic activator-type wetting, spreading, and/or penetrating adjuvant, not a binder-sticker-type adjuvant. Maximum of 10.25 fl oz/A per season.
	7C	Knack IGR (pyriproxyfen)	8 fl oz	12	3	Maximum of 2 applications, at least 14 days apart. No activity against adult insects. Onion (dry bulb only).
	23	Movento (spirotetramat)	5 fl oz	24	3	No more than 10 fl oz per season.
	28	Exirel (cyantraniliprole)	13.5–20.5 fl oz	12	1	Do not apply more than 0.4 lb a.i./A of cyazypyr- or cyantraniliprole-containing products per season. Toxic to bees. Rotate with other effective modes of action. Begin making applications when populations are low. If populations are above threshold, use an effective knockdown product prior to applying Exirel.
	28	Verimark (cyantraniliprole)	Drip chemigation: 6.75–10 fl oz	4	1	Do not apply more than 2 drip chemigation applications. Begin drip applications when populations first appear. Rotate with other effective modes of action.
	-	Aza-Direct (azadirachtin)	1–2 pt, up to 3.5 if needed	4	0	Antifeedant, repellent, IGR. OMRI-listed. ²
	-	Azatin XL (azadirachtin)	5–21 fl oz	4	0	Antifeedant, repellent, IGR.
	-	BotaniGard ES (<i>Beauveria bassiana</i>)	0.5–2 qt/100 gal	4	0	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank-mix with fungicides.
	-	M-Pede (potassium salts of fatty acids)	1%–2% v/v	12	0	OMRI-listed. ²
	-	Requiem EC (extract of <i>Chenopodium ambrosioides</i>)	1.5–3.0 qt	4	0	Begin as soon as thrips are seen.
	-	Trilogy (extract of neem oil)	0.5%–2.0% v/v	4	0	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed. ²
Wireworms	1B	*Diazinon AG500 *Diazinon 50W (diazinon)	AG500: 3–4 qt 50W: 4–8 lb	72	preplant	Do not make more than 1 soil application per year. For onions, bulb and green.

¹ Mode of Action (MOA) codes for plant pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 11.1 January 2024 Number codes are used to distinguish the main insecticide mode of action groups, with additional letters for certain subgroups within each main group. All insecticides within the same group (with the same number) indicate the same active ingredient or a similar mode of action. This information must be considered for the insecticide resistance management decisions. - = unknown, or a mode of action that has not been classified yet.

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any product. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by UF/IFAS Extension nor discrimination against similar products or services not mentioned. OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

* **Restricted use insecticide.**

Table 6. Onion fungicides ordered by disease and then FRAC group according to their mode of action. Contact: Pamela Roberts, UF/IFAS Southwest Florida Research and Education Center.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Labels change frequently. Be sure to read a current product label before applying any chemical. Please refer to chapter 19 for information on biopesticides, including materials labeled for certified organic production.							
Bacterial blight (<i>Xanthomonas axonopodis</i> pv. <i>allii</i>)	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Champ DP, Champ F2 FL, Champ WG, Cuprofix Ultra 40D, Cuproxat, Cueva, Kentan DF, Kocide 2000, Kocide 3000, Kop-hydroxide, Master Cop, Nu-Cop 50WP, Nu-Cop 50DF, Nu-Cop HB, Previsto	SEE INDIVIDUAL LABEL		0	Varies by product from 4 hr to 2 days	Frequent use of copper fungicides may cause foliar burn.
		Mankocide (copper hydroxide + mancozeb)	2.25 lb	160 lb (per crop)	7	2	Do not apply to exposed bulbs.
(Suppression only)	P01	Actigard 50WG (acibenzolar-5-methyl)	1 oz	4 oz	7	0.5	Do not apply to plants that are stressed or prior or within 5 days of transplanting. Suppression only.
(Suppression only)	27 + 11	Tanos (cymoxanil + famoxadone)	8 oz	84 oz	3	0.5	See label.
Black mold (<i>Aspergillus niger</i>)	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application.
(suppression only)	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	20 fl oz	See label			See label
(suppression only)	7 + 3	Luna Flex (fluopyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
(suppression only)	9 + 12	Alterity 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz per year	7	0.5	
Botrytis leaf blight (<i>Botrytis squamosa</i>)	M1 + M3	(copper hydroxide + mancozeb)	2.25 lb	160 lb (per crop)	7	2	Do not apply to exposed bulbs.
		(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP, Roper DF	SEE INDIVIDUAL LABEL		7	1	Do not apply to exposed bulbs.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo Zn, Chloronil 720, Chlorothalonil 720 EC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 Zn, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN	SEE INDIVIDUAL LABEL		Dry bulb: 7 Green: 14	1	
	2	(iprodione) Many brands available: Enclosure 4, Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4 Flowable	SEE INDIVIDUAL LABEL		7	1	
(Suppression only)	3	(propiconazole) Many brands available: Amtide Propiconazole 41.8% EC, Bumper 41.8 EC, Bumper ES, Fitness, Propicure, Propimax EC, Propistar EC, Shar-Shield PPZ, Tide Propiconazole EC, Tilt	SEE INDIVIDUAL LABEL		See label	0.5	
	3 + 7	Luna Experience (fluopyram + tebuconazole)	12.8 fl oz	25.6 fl oz	7	0.5	Alternate with fungicides of dissimilar modes of action.
	4 + M5	Ridomil Gold Bravo SC (mefenoxam + chlorothalonil)	See label		Dry bulb: 7 Green: 14/21	2	
	7	Endura (boscalid)	6.8 oz	41 oz	7	0.5	Alternate applications with a different fungicide group.
	7	Fontelis (penthioopyrad)	24 fl oz	72 fl oz	3	0.5	See label.
	7 + 3	Aprovia Top (difenoconazole + benzovindiflupyr)	10.5 fl oz	54.0 fl oz	7	0.5	Adjuvant recommended. Do not exceed 4 applications per year.
	7 + 9	Luna Tranquility (fluopyram + pyrimethanil)	27 fl oz	54.7 fl oz	7	0.5	Do not make more than 2 applications per year.
	7 + 11	Merivon Xemium (fluxapyroxad + pyraclostrobin)	11 fl oz	33 fl oz	7	0.5	Alternate with fungicides of dissimilar modes of action.
	9	Scala SC (pyrimethanil)	18 fl oz	54 fl oz	7	0.5	Do not make more than 2 consecutive applications.
	9	Vanguard WG (cyprodinil)	10 oz	28 oz	7	0.5	Do not make more than 2 consecutive applications.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	9 + 12	Switch 62.5WG Alerity (cyprodinil + fludioxonil)	14 oz	56 oz per year	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last applications.
(Suppression only)	11	Cabrio EG (pyraclostrobin)	12 oz	72 oz	7	0.5	Alternate applications with a different fungicide group. Make no more than 5 applications per crop.
	11	Quadris Aframe Many products: see label (azoxystrobin)	See label	See label	See label	4 hr	Alternate applications with a different fungicide group.
	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with different fungicide groups. Make no more than 3 applications per crop. Do not tank-mix with COC, MSO, or silicon adjuvant.
	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole)	14 fl oz	42 fl oz per year	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-Qol (Group 11) mode of action.
	11 + 3	Quilt Xcel (azoxystrobin + propiconazole)	Dry bulb: 21 fl oz Green: 26 fl oz	56 fl oz	Dry bulb: 14 Green: 0	0.5	Make only 1 application before alternating to a non-group 11 fungicide.
	11 + 7	Pristine (pyraclostrobin + boscalid)	18.5 oz	111 oz	7	0.5	Do not make more than 2 consecutive applications. No more than 6 applications per crop.
	14	Botran 5F (DCNA dicloran)	2–3.2 lb	See label	14	See label	See label.
	22 + M5	Zingi (zoxamide + chlorothalonil)	30 fl oz	7.5 qt	7	0.5	Do not make more than 8 applications per year.
	29	Omega 500F (fluzinam)	1 pt	6 pt	7	2	
Botrytis neck rot (<i>Botrytis allii</i>)	M3	(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP, Roper DF	SEE INDIVIDUAL LABEL		7	1	Do not apply to exposed bulbs.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo Zn, Chloronil 720, Chlorothalonil 720 EC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 Zn, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN	SEE INDIVIDUAL LABEL	Dry bulb: 7 Green: 14	1		
	2	(iprodione) Many brands available: Enclosure 4, Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4 Flowable	SEE INDIVIDUAL LABEL	7	1		
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	
	7 + 3	Aprovia Top (difenoconazole + benzovindiflupyr)	10.5 fl oz	54.0 fl oz	7	0.5	Adjuvant recommended. Do not exceed 4 applications per year.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl/oz	34.2 fl oz	7	12 hr	
	9	Scala SC (pyrimethanil)	18 fl oz	54 fl oz	7	0.5	Do not make more than 2 consecutive applications.
(Suppression only)	9	Vanguard WG (cyprodinil)	10 oz	28 oz	7	0.5	Do not make more than 2 consecutive applications.
(Suppression only)	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application.
(Suppression only)	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with different fungicide groups. Make no more than 3 applications per crop. Do not tank-mix with COC, MSO, or silicon adjuvant.
	11 + 7	Pristine (pyraclostrobin + boscalid)	18.5 oz	111 oz	7	0.5	Do not make more than 2 consecutive applications. No more than 6 applications per crop.
	14	Botran 5F (DCNA dicloran)	3.5 lb	See label	14	See label	
	29	Omega 500F (fluazinam)	1 pt	6 pt	7	2	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	49 + M5	Orondis Opti (oxathiapiprolin + chlorothalonil)	2.5 pt	10 pt	7	0.5	Do not make more than 2 sequential applications, and do not exceed more than 33% of all fungicide applications with Orondis.
Cercospora leaf spot (<i>Cercospora duggiae</i>)	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole)	14 fl oz	42 fl oz	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-QoI (Group 11) mode of action.
	7 + 3	Luna Flex (fluopyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
Cladosporium leaf blotch (<i>Cladosporium allii</i>)	3 + 7 + 11	Trivapro (propiconazole + benzovindiflupyr + azoxystrobin)	27.7 fl oz	55.4 fl oz per year	Dry bulb: 7 Green: 14	0.5	Alternate applications with a different fungicide group not in 7 or 11.
	7 + 3	Aprovia Top (difenoconazole + benzovindiflupyr)	10.5 fl oz	54.0 fl oz	7	0.5	Adjuvant recommended. Do not exceed 4 applications per year.
	7 + 3	Luna Flex (fluopyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl/oz	34.2 fl oz	7	12 hr	
	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	11	Quadris Aframe Many products available (azoxystrobin)	See label	See label	See label	4 hr	Alternate applications with a different fungicide group.
	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with different fungicide groups. Make no more than 3 applications per crop. Do not tank-mix with COC, MSO, or silicon adjuvant.
	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole)	14 fl oz	42 fl oz	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-QoI (Group 11) mode of action.
	11 + 3	Quilt Xcel (azoxystrobin + propiconazole)	Dry bulb: 21 fl oz Green: 2.6 fl oz	56 fl oz	Dry bulb: 14 Green: 0	0.5	Make only 1 application before alternating to a non-group 11 fungicide.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Damping-off	M3	(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP	SEE INDIVIDUAL LABEL	7	1	Do not apply to exposed bulbs.	
	2	(iprodione) Many brands available: Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4 Flowable	SEE INDIVIDUAL LABEL	7	1		
	4	Ridomil Gold Subdue Maxx (mefenoxam)				See individual label.	
	4 + 11	Uniform (mefenoxam, azoxystrobin)	0.34 fl oz/1000 ft of row			See label.	
	12	Cannonball WG (fludioxonil)	7 oz	32 oz	0.5		
	12	Maxim 4FS (fludioxonil)	0.16 fl oz/100 lb seed			Seed treatment only.	
Downy mildew (Peronospora destructor)	M1	(copper compounds) Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ F2 FL, Champ WG, C-O-C DF, C-O-C-5 WDG, C-O-C WP, Copper Count N, Cuprofix Ultra 40D, Cueva, Kentan DF, Kocide 2000, Kocide 3000, Kocide DF, Nordox, Nordox 75WP, Nu Cop 3L, Nu Cop 50DF, Nu Cop HB	SEE INDIVIDUAL LABEL	0	Varies from 4 hr to 2 days.	Frequent use of copper fungicides may cause foliar burn.	
	M1 + M2	Top Cop with sulfur (basic copper sulfate + sulfur)	2-3 qt	See label	1	Do not use during hot weather or within 4 weeks of an oil application.	
	M1 + M3	Mankocide (copper hydroxide + mancozeb)	2.25 lb	160 lb (per crop)	2	Do not apply to exposed bulbs.	
	M3	(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP	SEE INDIVIDUAL LABEL	7	1	Do not apply to exposed bulbs.	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
(Suppression only)	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo Zn, Chloronil 720, Chlorothalonil 720 EC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 Zn, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN	SEE INDIVIDUAL LABEL		Green: 14 Dry bulb: 7	1	
	4 + M1	Ridomil Gold/Copper (mefenoxam + copper hydroxide)	2 lb		Green: 7 Dry bulb: 10	2	Maximum 0.4 lb a.i./A of metalaxyl or mefenoxam.
	4 + M3	Ridomil Gold MZ WG (mefenoxam + mancozeb)	2.5 lb		Dry bulb: 7	2	
	4 + M5	Ridomil Gold Bravo SC (mefenoxam + chlorothalonil)	See label		Dry bulb: 7 Green: 14/21	2	
	11	Cabrio EG (pyraclostrobin)	12 oz	72 oz	7	0.5	Alternate applications with a different fungicide group. Make no more than 5 applications per crop.
	11	Quadris Aframe (azoxystrobin)	See label	See label	See label	4 hr	Alternate applications with a different fungicide group.
	11	Reason 500SC (fenamidone)	5.5 fl oz	22 fl oz	7	0.5	Alternate applications with a different fungicide group.
	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with a different fungicide group. Make no more than 3 applications per crop. Do not tank-mix with COC, MSO, or silicon adjuvant.
	11 + 3	Quilt Xcel (azoxystrobin + propiconazole)	Dry bulb: 21 fl oz Green: 26 fl oz	56 fl oz	Dry bulb: 14 Green: 0	0.5	Make only 1 application before alternating to a non-group 11 fungicide.
(Suppression only)	11 + 7	Pristine (pyraclostrobin + boscalid)	18.5 oz	111 oz	7	0.5	Do not make more than 2 consecutive applications. No more than 6 applications per crop.
(Suppression only)	21	Actigard 50WG (acibenzolar-S-methyl)	1 oz	4 oz	7	0.5	Do not apply to plants that are stressed or prior or within 5 days transplanting.
	21	Ranman (cyazofamid)	3 fl oz	16.5 fl oz	0	0.5	Alternate with fungicides of dissimilar modes of action. Do not make more than 3 sequential applications.
	22 + M5	Zing! (zoxamide + chlorothalonil)	30 fl oz	7.5 qt	7	0.5	Do not make more than 8 applications per year.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to			Remarks ²
			Appl.	Season	Harvest	Reentry		
	27 + 11	Tanos (cymoxanil + famoxadone)	8 oz	84 oz	3	0.5		
	29	Omega 500F (fluazinam)	1 pt	6 pt	7	2		
	33	Aliette WDG Linebacker WDG (fosetyl-Al)	3 lb	7 applications	See label	See label	Do not tank mix with copper fungicides, adjuvants, or foliar fertilizers.	
	33	(mono- and dipotassium salts of phosphorous acid) Many brands available: Alude, Confine Extra, Fosiphite, Fungi-Phite, K-Phite 7LP, Oxiphos, Phiticide, Prophyt, Phostrol, Rampart, Reveille	SEE INDIVIDUAL LABEL				4 hr	See label for details.
	40	Forum (dimethomorph)	6 oz	30 oz	0	0.5	Must be applied in a tank mix with another fungicide active against downy mildew. Do not make more than 2 sequential applications.	
	40	Revus (mandipropamid)	8 fl oz	Dry: 32 fl oz Green: 24 fl oz	7	4 hr	Make no more than 2 consecutive applications before switching to a non-group 40 fungicide. A silicon-based adjuvant must be added at recommended rates.	
	40 + 45	Zampro (dimethomorph + ametoctradin)	14 fl oz	42 fl oz	0	0.5	See label.	
	43	Presidio (fluopicolide)	4 fl oz		2	0.5	Do not make more than 4 applications of Presidio per season.	
	49 + M5	Orondis Opti (oxathiapiprolin + chlorothalonil)	2.5 pt	10 pt	7	0.5	Do not make more than 2 sequential applications and do not exceed more than 33% of all fungicide applications with Orondis.	
	49 + 40	Orondis Ultra (oxathiapiprolin + mandipropamid)	8 fl oz	Dry: 32 fl oz Green: 24 fl oz	7	4 hr	Do not make more than 2 sequential applications and do not exceed more than 33% of all fungicide applications with Orondis.	
Iris Yellow Spot (Iris yellow spot virus) (Suppression only)	21	Actigard 50WG (acibenzolar-S-methyl)	1 oz	4 oz	7	0.5	Do not apply to plants that are stressed or prior or within 5 days transplanting. Suppression only.	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Powdery mildew	M2	(sulfur) Many brands available: Kumulus DF, Microfine Sulfur, Micro Sulf, Microthiol Disperss, Sulfur 90W, Yellow Jacket Wettable Sulfur	SEE INDIVIDUAL LABEL		0	1	Do not use during hot weather or within 4 weeks of an oil application.
			27.7 fl oz	55.4 fl oz per year	Dry bulb: 7 Green: 14	0.5	
	3 + 7 + 11	Trivapro (propiconazole + benzovindiflupyr + azoxystrobin)	24 fl oz	72 fl oz	3	0.5	Alternate applications with a different fungicide group not in 7 or 11.
	7	Fontelis (penthiopyrad)	10.5 fl oz	54.0 fl oz	7	0.5	Adjuvant recommended. Do not exceed 4 applications per year.
	7 + 3	Aprovia Top (difenoconazole + benzovindiflupyr)	13.6 fl oz	27.2 fl oz	7	0.5	
	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	11	Cabrio EG (pyraclostrobin)	12 oz	72 oz	7	0.5	Alternate applications with a different fungicide group. Make no more than 5 applications per crop.
	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole) (copper compounds)	14 fl oz	42 fl oz	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-QoI (Group 11) mode of action.
Purple blotch (<i>Alternaria porri</i>)	M1	Many brands available: Badge SC, Badge X2, Basic Copper 53, Champ DP, Champ F2 FL, Champ WG, C-O-C DF, C-O-C-S WDG, C-O-C WP, Copper Count N, Cueva, Cuprofix Ultra 40D, Cuproxat, Kentan DF, Kocide 2000, Kocide 3000, Kocide DF, Kop-hydroxide, Nordox, Nordox 75WP, Nu Cop 3L, Nu Cop 50DF, Nu Cop HB	SEE INDIVIDUAL LABEL		0	Varies from 4 hr to 2 days.	Frequent use of copper fungicides may cause foliar burn.
	M1 + M2	Top Cop with sulfur (basic copper sulfate + sulfur)	3 qt	See label	0	1	Do not use during hot weather or within 4 weeks of an oil application.
	M1 + M3	Mankocide (copper hydroxide + mancozeb)	2.25 lb	160 lb (per crop)	7	2	Do not apply to exposed bulbs.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	M3	(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP, Roper DF	SEE INDIVIDUAL LABEL		7	1	Do not apply to exposed bulbs.
	M5	(chlorothalonil) Many brands available: Bravo Ultrex, Bravo Weather Stik, Bravo Zn, Chloronil 720, Chlorothalonil 720 EC, Echo 720, Echo 90 DF, Echo Zn, Equus 500 Zn, Equus 720 SST, Equus DF, Initiate 720, Initiate Zn	SEE INDIVIDUAL LABEL		Green: 14 Dry bulb: 7	1	
	2	(iprodione) Many brands available: Enclosure 4, Iprodione 4L AG, Meteor, Nevada 4F, Rovral 4 Flowable	SEE INDIVIDUAL LABEL		7	1	
	3	(propiconazole) Many brands available: Am tide Propiconazole 41.8% EC, Bumper 41:8 EC, Bumper ES, Fitness, Propimax EC, Propistar EC, Shar-Shield PPZ, Tide Propionazole EC, Tilt	SEE INDIVIDUAL LABEL		See label	0.5	
	3	(tebuconazole) Many brands available: Monsoon, Onset 3.6L, Orius 3.6 F, Tebu-Crop 3.6F, Tebustar 3.6 L, Tebuzol 3.6F, Toledo	SEE INDIVIDUAL LABEL		7	0.5	
	3 + M5	Muscle ADV (tebuconazole + chlorothalonil)	1.6 pt	3.2 pt	7	0.5	Apply in a protective fungicide schedule.
	3 + 7	Luna Experience (fluopyram + tebuconazole)	12.8 fl oz	25.6 fl oz	7	0.5	Alternate with fungicides of dissimilar modes of action.
	7 + 3	Luna Flex (fluopyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
	3 + 7 + 11	Trivapro (propiconazole + benzovindiflupyr + azoxystrobin)	27.7 fl oz	55.4 fl oz per year	Dry bulb: 7 Green: 14	0.5	Alternate applications with a different fungicide group not in 7 or 11.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	4 + M5	Ridomil Gold Bravo SC (mefenoxam + chlorothalonil)	See label		Dry bulb: 7 Green: 14/21	2	
	7	Endura (boscalid)	6.8 oz	41 oz	7	0.5	Alternate applications with a different fungicide group.
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	3	0.5	See label.
	7 + 3	Aprovia Top (difenoconazole + benzovindiflupyr)	10.5 fl oz	54.0 fl oz	7	0.5	Adjuvant recommended. Do not exceed 4 applications per year.
	7 + 9	Luna Tranquility (fluopyram + pyrimethanil)	27 fl oz	54.7 fl oz	7	0.5	Do not make more than 2 applications per year.
	7 + 11	Merivon Xemium (fluxapyroxad + pyraclostrobin)	11 fl oz	33 fl oz	7	0.5	Alternate with fungicides of dissimilar modes of action.
	7 + 12	Miravis Prime (pydiflumetofen + fludioxonil)	11.4 fl/oz	34.2 fl oz	7	12 hr	
	9	Scala SC (pyrimethanil)	18 fl oz	54 fl oz	7	0.5	Do not make more than 2 consecutive applications.
	9	Vangard WG (cyprodinil)	10 oz	28 oz	7	0.5	Do not make more than 2 consecutive applications.
	9 + 3	Inspire Super (cyprodinil + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application.
	11	Cabrio EG (pyraclostrobin)	12 oz	72 oz	7	0.5	Alternate applications with a different fungicide group. Make no more than 5 applications per crop.
	11	Quadris (azoxystrobin)	See label	92.3 fl oz	See label	4 hr	Alternate applications with a different fungicide group.
	11	Reason 500SC (fenamidone)	5.5 fl oz	22 fl oz	7	0.5	Alternate applications with a different fungicide group.
	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with different fungicide groups. Make no more than 3 applications per crop. Do not tank-mix with COC, MSO, or silicon adjuvant.
	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole)	14 fl oz	42 fl oz	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-Qol (Group 11) mode of action.

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	11 + 3	Quilt Xcel (azoxystrobin + propiconazole)	Dry bulb: 21 fl oz Green: 26 fl oz	56 fl oz	Dry bulb: 14 Green: 0	0.5	Make only 1 application before alternating to a non-group 11 fungicide.
	11 + 7	Pristine (pyraclostrobin + boscalid)	18.5 oz	111 oz	7	0.5	Do not make more than 2 consecutive applications. No more than 6 applications per crop.
	22 + M5	Zing! (zoxamide + chlorothalonil)	30 fl oz	7.5 qt	7	0.5	Do not make more than 8 applications per year.
	27 + 11	Tanos (cymoxanil + famoxadone)	8 oz	84 oz	3	0.5	
	29	Omega 500F (fluzinam)	1 pt	6 pt	7	2	
(Suppression only)	33	Aliette WDG Linebacker WDG (fosetyl-AI)	3 lb	7 appl.	See label	See label	Do not tank mix with copper fungicides, adjuvants, or foliar fertilizers.
	49 + M5	Orondis Opti (oxathiapiprolin + chlorothalonil)	2.5 pt	10 pt	7	0.5	Do not make more than 2 sequential applications, and do not exceed more than 33% of all fungicide applications with Orondis.
Pythium damping-off	4	(mefenoxam) Many brands available: Apron XL, Ridomil Gold EC, Ridomil Gold SL, Ultra Flourish	SEE INDIVIDUAL LABEL		N/A	2	
	4	(metalaxyl) Many brands available: Allegiance, Aquire, MetaStar 2E, Sebring 2.65 ST, Sebring 318 FS, Sebring 480 FS					
	11 + 4	Uniform (azoxystrobin + mefenoxam)	See label				
Rhizoctonia damping off	11	Dynasty (azoxystrobin)	0.38 fl oz/100 lb seed	See label	See label	4 hr	Seed treatment only.
	11	Quadris (azoxystrobin)	0.8 fl oz/1000 row feet	See label	0	4 hr	
	11 + 4	Uniform (azoxystrobin + mefenoxam)	See label				

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Rust (<i>Puccinia allii</i>)	3	(tebuconazole) Many brands available: Monsoon, Onset 3.6L, Orius 3.6 F, Tebu-Crop 3.6F, Tebustar 3.6 L, Tebuzol 3.6F, Toledo	SEE INDIVIDUAL LABEL	7	0.5		
	3 + M5	Muscle ADV (tebuconazole + chlorothalonil)	1.6 pt	3.2 pt	7	0.5	Apply in a protective fungicide schedule.
	3 + 7 + 11	Trivapro (propiconazole + benzovindiflupyr + azoxystrobin)	27.7 fl oz	55.4 fl oz per year	Dry bulb: 7 Green: 14	0.5	Alternate applications with a different fungicide group not in 7 or 11.
	7 + 3	Luna Flex (flupyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	11	Cabrio EG (pyraclostrobin)	12 oz	72 oz	7	0.5	Alternate applications with a different fungicide group. Make no more than 5 applications per crop.
	11	Quadris (azoxystrobin)	See label	92.3 fl oz	See label	4 hr	Alternate applications with a different fungicide group.
	11 + 3	Quilt Xcel (azoxystrobin + propiconazole)	Dry bulb: 21 fl oz Green: 2.6 fl oz	56 fl oz	Dry bulb: 14 Green: 0	0.5	Make only 1 application before alternating to a non-group 11 fungicide.
Seedling blight	M3	(mancozeb) Many brands available: Dithane DF, Dithane F45, Dithane M45, Koverall, Manzate, Manzate Pro-Stik, Penncozeb 4FL, Penncozeb 75DF, Penncozeb 80WP, Roper DF	SEE INDIVIDUAL LABEL		7	1	Do not apply to exposed bulbs.
	11	Dynasty (azoxystrobin)	0.38 fl oz/100 lb seed	See label	See label	4 hr	
	12	Maxim 4FS Spirato 480 FS (fludioxonil)	0.16 fl oz/100 lb seed	-	-	0.5	
	14	Botran 5F (DCNA dicyloran)	3.5 lb	See label	14	See label	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
Stemphylium blight (<i>Stemphylium vesicarium</i>)	2	(iprodione) Many brands available: Enclosure 4, Iprodione 4L AG, Meteor, Nevado 4F, Rovral 4 Flowable	SEE INDIVIDUAL LABEL		7	1	
			27.7 fl oz	55.4 fl oz per year	Dry bulb: 7 Green: 14	0.5	Alternate applications with a different fungicide group not in 7 or 11.
	3 + 7 + 11	Trivapro (propiconazole + benzovindiflupyr + azoxystrobin)	24 fl oz	72 fl oz	3	0.5	
	7	Fontelis (penthiopyrad)	13.6 fl oz	27.2 fl oz	7	0.5	
	7 + 3	Luna Flex (fluopyram + difenoconazole)	20 fl oz	See label	Green: 14 Dry bulb: 7	0.5	Do not make more than 2 applications before alternating with a different fungicide group.
	9 + 3	Inspire Super Vango (cyprodinil + difenoconazole)	14 oz	56 oz	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application.
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 fl oz	42 fl oz	7	0.5	Make no more than 1 application before alternating to another fungicide with a non-Qol (Group 11) mode of action.
	11 + 3	Quadris Top Acadia (azoxystrobin + difenoconazole)	18.5 oz	111 oz	7	0.5	Do not make more than 2 consecutive applications. No more than 6 applications per crop.
	11 + 7	Pristine (pyraclostrobin + boscalid)	1 pt	6 pt	7	1	Begin sprays at first development and continue on 7- to 14-day schedule.
	29	Omega 500F (fluzinam)	SEE INDIVIDUAL LABEL			3	
White rot (<i>Sclerotium cepivorum</i>)	1	(thiophanate-methyl) Many brands available: Incognito 4.5 F, NuFarm T-Methyl 4.5 F, NuFarm T-Methyl 70 WSB, Thiophanate-methyl 85 WDG, Topsin 4.5 FL, Topsin M 70 WDG, Topsin M 70 WP, Topsin M WSB	SEE INDIVIDUAL LABEL				
			24 fl oz	72 fl oz	7	0.5	Spray into empty furrow at time of planting.
	3	(tebuconazole) Many brands available: Onset 3.6L, Orius 3.6 F, Tebu-Crop 3.6F, Tebustar 3.6 L, Tebuzol 3.6F, Toledo	SEE INDIVIDUAL LABEL		7	0.5	
	7	Fontelis (penthiopyrad)	24 fl oz	72 fl oz	7	0.5	

Pertinent Diseases or Pathogens	Fungicide Group ¹	Chemical (Active Ingredients)	Max Rate/Acre		Min. Days to		Remarks ²
			Appl.	Season	Harvest	Reentry	
	7 + 3	Luna Flex (fluoopyram + difenoconazole)	13.6 fl oz	27.2 fl oz	7	0.5	
	9 + 12	Switch 62.5WG (cyprodinil + fludioxonil)	14 oz	56 oz	7	0.5	Do not make more than 2 consecutive applications. Do not plant crops not on the label for 30 days after last application.
	11 + M5	Quadris Opti (azoxystrobin + chlorothalonil)	3.7 pt	See label	14	0.5	Alternate applications with different fungicide groups. Make no more than 3 applications per crop. Do not tank mix with COC, MSO, or silicon adjuvant.
	12	Cannonball WG (fludioxonil)	7 oz	32 oz	7	0.5	
	12	Maxim 4FS (fludioxonil)	0.16 fl oz/100 lb seed	-	-	0.5	
	14	Botran 5F (DCNA dicloran)	3.5 lb	See label	14	0.5	

¹ FRAC code (fungicide group); Number (1–54) and letters (U and P) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with the same number or letter) indicate the same active ingredient or a similar mode of action. This information must be considered for the fungicide resistance management decisions. U = unknown, or a mode of action that has not been classified yet and is typically associated with another number; P = host plant defense inducers. Source: FRAC Code List 2024; <http://www.frac.info/> (FRAC = Fungicide Resistance Action Committee).

² Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by UF/IFAS Extension nor discrimination against similar products or services not mentioned. OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

Table 7. Nonfumigant nematicides for onion and alliums.

Product	Application Directions
Velum (a.i. fluopyram)	Apply 6.5–6.8 fl oz/A either (1) preplant banded or broadcast spray directed to the soil and incorporated into the planting bed or (2) via chemigation into root zone through low-pressure drip, trickle, microsprinkler, or equivalent irrigation. Minimum 14-day interval between applications. Do not apply more than 13.7 fl oz/A of Velum (0.446 lb/A fluopyram) per year, regardless of formulation or method of application (soil or foliar). Do not apply within 30 days of harvest.
Biological nematicides	See chapter 19

Table 8. Fumigant nematicides for onion and alliums.

Nematicide	Broadcast Application ¹		In-the-Row Applications
	Gallons per Acre	fl oz/1000 ft/chisel spaced 12" apart	
Telone II ^{2,3}	9–12	26–35	For any row spacing, application rates given may be concentrated in the row but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-17 ^{2,3}	10.8–17.1	31.8–50.2	For any row spacing, application rates given may be concentrated in the row but shall never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Telone C-35 ^{2,3}	13–20.5	38–60	For any row spacing, application rates given may be concentrated in the row but shall never exceed labeled maximum for broadcast applications. Consult the product label for additional detail.
Pic-Clor 60 ^{2,3}	19–31.5	57–90	For any row spacing, application rates should never exceed the labeled maximum for broadcast applications. Consult the product label for additional detail.
Vapam HL	75	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration, and flow-modifying directions.
KPam HL	60	-	For drip or in-row chisel fumigation, consult product label for proportionately reduced overall rates, drip concentration, and flow-modifying directions.
Allyl Isothiocyanate (AITC) Dominus	40	-	For drip or in-row fumigation and crop termination, consult product label for overall rates, drip concentration, and flow-modifying directions.

¹ Gallons/acre and fl oz/1000 feet provided only for mineral soils. Higher rates may be possible for heavier-textured (loam, silt, clay) or highly organic soils.

² All of the fumigants mentioned are for retail sale and use only by state-certified applicators or persons under their direct supervision. New supplemental labeling for the Telone products must be in the hands of the user at the time of application. See new label details for additional use restrictions based on soil characteristics, buffer zones, requirements for Fumigant Management Plans (FMP) and Personal Protective Equipment (PPE), mandatory good agricultural practices (GAPs), product and applicator training certification, and other use and rate-modifying recommendations and restrictions.

³ Higher application rates are possible in the presence of cyst-forming nematodes.

Rates are believed to be correct for products named, and similar products of other brand names, when applied to mineral soils. Higher rates are required for muck (organic) soils. However, the **grower** has the final responsibility to see that each product is used legally; **read the label** of the product to be sure that you are using it properly.