

Chapter 14.

Onion, Leek, and Chive Production in Florida

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BOTANY

Nomenclature

Family - Alliaceae (Amaryllidaceae)

Onion - *Allium cepa*

Leek - *Allium ampeloprasum*

Chive - *Allium schoenoprasum*

Bunching Onion - *Allium fistulosum*

Origin

It is believed that all of the edible onions and their relatives are native to Asia.

Related Species

Garlic, shallot, and various exotic onions also are members of the Alliaceae family. Many important ornamentals also are included in this family.

VARIETIES

Onion and leek varieties grown in Florida are listed below (H=hybrid):

Onion

Caramelo (H)

Dawn (H)

Don Victor (H)

Onion (continued)

Frontier (H)

Granex 33 (H)

Prowler (H)

Sweet Caroline (H)

Sweet Deal (H)

Sweet Harvest (H)

Sweet Success (H)

Sweet Vidalia (H)

WI-3115 (H)

Bunching Onion

Perfecto Blanco

Tokyo Long White

White Portugal

Leeks (Fig. 14-1)

King Richard

Tivi

Verina

Chives

Staro

SEEDING AND PLANTING

Planting dates and seeding information are given in Table 1.

Table 1. Seeding and planting information for onion and allies.

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) ¹	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	1.0
Days to maturity	100 - 130	100 - 130 ²
Plant populations (acre)	149,343	112,123

¹ Traditionally 14 inches between rows, 4 inches between plants.

² From time of field setting.

FERTILIZER AND LIME

For unmulched onions with subsurface or sprinkler irrigation, broadcast all P₂O₅ micronutrients, and 20 to 25% of N and K₂O before planting (Fig. 14-2). Apply remaining N and K₂O in split applications through the season up to bulb initiation. Overfertilization with N during bulbing can lead to double bulbs and split bulbs.

For mulched onions, incorporate all fertilizer in bed prior to mulching (Fig. 14-3). For mulched onions with subsurface irrigation, incorporate only 20 to 25% of the N and K₂O. Place remaining N and K₂O in bands in grooves 2 to 3 inches deep between rows on bed (see Table 2).

IRRIGATION

Irrigation requirements of onions can be estimated from crop coefficients given in Tables 4 to 6 in Chapter 3, *Principles and Practices of Irrigation Management for Vegetables*. Irrigation requirements of leek and chives are expected to be similar to those shown for onions. Peak water use during rapid growth and development stages will be about 95% of ETo. Water use will continue at this rate for plants that are harvested green, while water use will drop to about 75% of ETo for onions that are allowed to dry before harvest. See Table 3 in Chapter 3, *Principles and Practices of Irrigation Management for Vegetables* for estimates of ETo in inches per day and gallons per acre per day for Florida climate conditions.

For optimum production, irrigations should be scheduled to maintain adequate soil moisture throughout the growing

season for plants that are harvested green. For onions that are to be harvested dry, irrigation can be discontinued after full growth has been obtained and the plants begin to dry. For drip and sprinkler irrigation, small, frequent applications should be scheduled to avoid water and nutrient losses below the plant root zone. For seepage irrigation, the field water table should be maintained sufficiently high that soil moisture is adequate but not excessively wet in the plant root zone throughout the growing season or until the plants are allowed to begin to dry for harvest.

PLANT TISSUE ANALYSIS

Plant tissue analysis information for onion and allies is given in Table 3. The analysis was done prior to bulbing, using the most recently matured leaf.

WEED MANAGEMENT

Herbicides labeled for weed control in onions and allies are listed in Table 4.

DISEASE MANAGEMENT

The chemicals approved for disease management in onion and leek are listed in Table 5.

INSECT MANAGEMENT

Table 6 outlines the insecticides approved for use on insects attacking onion and allies.

Table 2. Soil test and fertilizer recommendations for mineral soils for onion and allies.¹

Target pH	N lb/A ²	P ₂ O ₅ ²					K ₂ O				
		VL	L	M	H	VH	VL	L	M	H	VH
Sweet bulb											
6.5	150	150	120	100	0	0	150	120	100	0	0
Bunching onion											
6.5	120	120	100	100	0	0	120	100	100	0	0
Leek											
6.5	120	120	100	100	0	0	120	100	100	0	0

¹ See Chapter 2 section on supplemental fertilizer application and best management practices, pg 11.

² Seeds and transplants may benefit from applications of a starter solution at a rate no greater than 10 to 15 lbs/acre for N and P₂O₅, and applied through the plant hole or near the seeds.

Table 3. Plant tissue analysis just prior to bulbing for onion and allies. Dry wt. basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu
	Percent						Parts per million				
Deficient	<2.0	0.2	1.5	0.6	0.15	0.2	50	10	15	10	5
Adequate range	2.0-3.0	0.2-0.5	1.5-3.0	0.6-0.8	0.15-0.30	0.2-0.6	50-100	10-20	15-20	10-25	5-10
High	>3.0	0.5	3.0	0.8	0.30	0.6	100	20	20	25	10
Toxic (>)										100	

Table 4. Chemical weed controls: onions, leek, garlic & shallot.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Bensulide (Prefar 4E)	onions (dry bulb), garlic, shallots	Preplant Preemergence	5-6	--
Remarks: Preplant incorporate to depth of 1-2 inches in well worked soil. Apply preemergence and irrigate to incorporate. With overhead irrigation, wet soil at least 2-4 inches deep. For furrow irrigation thoroughly wet the entire bed top. Controls many grass species.				
Bromoxynil (Buctril)	Onions Garlic	Preemergence Postemergence	0.25 - 0.375	---
Remarks: Apply to onions before planting until just prior to crop emergence (onions only). Postemergence apply to onions which have 2 to 5 true leaves or to garlic after emergence but before 12 inches in height. Controls several broadleaf weeds such as lambsquarter, smartweed, morningglory, spiny pigweed, ragweed, etc. (see label). When they are small, do not exceed 4 leaf stage, or less than 2 inches in height. Use at least 50 to 70 gallons of water per acre for application. Soil and onion foliage must be dry at time of applications. Waxy coating on onion leaves reduces chances for injury. Onion varieties vary in sensitivity. Use on a trial basis.				
Carfentrazone (Aim)	(All)	Preplant Directed-hooded Row-middles	0.031	0.031
Remarks: Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burndown of emerged broadleaf weeds. May be tank mixed with other registered herbicides. May be applied at up to 2 oz (0.031 lb ai). Use a quality spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Clethodim (Select Max) (Select) (Arrow) (Intensity) (Shadow)	Onions (dry bulb), Garlic, Shallots (dry bulbs)	Postemergence	0.94-.125	.094-.125
Remarks: Controls emerged annual and perennial grasses. Use a non-ionic surfactant with Select Max and crop oil concentrate with the other products. Check the labels for surfactant to use and specific rates. Several labels will include green onions; others not. Do not apply within 45 days of harvest.				
DCPA (Dacthal W-75)	Onions, Garlic	Preemergence Posttransplanting or At layby	6.0-10.5	---
Remarks: Controls germinating annuals. Incorporate 0.5 to 1.0 inch with overhead irrigation or shallow cultivation. Apply layby treatment to weed-free field up to 14 weeks after planting at rates not exceeding 10.5 lbs. ai./acre per season. In Hastings area, onions may be injured with single applications exceeding 6.0 lbs. ai./acre. Note precautions of planting non-registered crops within 8 months.				
Fluazifop-p (Fusilade)	Dry bulb onions, garlic	Postemergence	0.188	0.188
Remarks: Controls actively growing grass weeds. A total of 48 oz. product may be applied to the crop per season. Rates for the control of actively growing grass species at specific growth stages are specified on the label. Depending on the species, the growth stage for best control ranges from the 3- to 8-leaf stage. Use oil concentrates or non-ionic surfactants in the spray mixture. A pre-harvest interval of 45 days must be maintained.				

Table 4. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Flumioxazin (Chateau)	Onion (dry bulb)	Postemergence	.064	
Remarks: Apply to transplanted onions at 2oz product/A at the 2-6 true leaf stage and at the 3-6 leaf stage for direct seeded onions. Apply preemergence to weeds. Do not use surfactant. There is a 45 day pre-harvest interval.				
Glyphosate (Roundup, Durango Touchdown, Glyphomax)		Chemical fallow Preplant, pre emergence, Pre transplant	0.3 - 1.0	
Remarks: Roundup, Glyphomax and Touchdown have several formulations. Check the label of each for specific labeling directions.				
Oxyfluorfen (Goal 2XL) (Goaltender)	Dry bulb onions	Early postemergence Posttransplant	0.12 0.5	--- ---
Remarks: Spray when seeded onions have 2 fully developed true leaves. On transplanted onions spray as soon after transplanting as practical. Necrotic lesions, twisting or stunting of onion plants can occur if applications are made during cool, wet weather or prior to the full development of the true leaves on the onion plant. Multiple applications may be made. Do not apply within 60 days of harvest.				
Paraquat (Gramoxone Inteon) (Firestorm) (Parazone)	Seeded onions: Green or dry bulb & Garlic	Preplant Preemergence	0.63 - 0.94	0.63 - 0.94
Remarks: Apply as a broadcast treatment prior to, during or after seeding, but before emergence of the crop for control of emerged weeds. Weeds and grasses emerging after treatment will not be controlled. Crop plants emerged at the time of application will be damaged. Use a non-ionic surfactant with application. Do not apply within 60 days of harvest.				
Pendimethalin (Prowl 3.3 EC) (Prowl H ₂ O)	Dry Bulb Onions	Preemergence (muck only) Postemergence or post-transplant	0.5 - 0.75	1.0 - 2.0
Remarks: In mineral soils, apply as broadcast treatment when onions have 2 to 9 true leaves at a rate of 1.2 to 1.8 pts. In muck soils may be applied sequentially as follows: Preemergence through loop stage (2.4 to 4.8 pts/A); Early postemergence (2 to 6 true leaf stage) 3.6 to 4.8 pts/A; Late postemergence (6 to 9 true leaf stage) 3.6 to 4.8 pts/A. Do not apply more than 14.4 pts/A per growing season on muck soils. Do not apply preemergence through loop stage if heavy rains are expected or severe crop injury may result. If irrigating after application, do not irrigate in excess of 0.5 inch. Do not apply within 45 days of harvest.				
Sethoxydim (Poast)	Bulb vegetables: all onions, dry bulb and bunching, garlic, leeks	Postemergence	.187	.187
Remarks: For control of actively growing grass weeds. Always add a crop oil concentrate at a rate of 2 pts./acre. Do not apply within 30 days of harvest. A general use rate of 1 pt. material may be used. Do not apply more than 4.5 pts. per acre in one season.				

Table 5. Disease control for onion.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Badge SC, Badge X2, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 Flowable, Champ WG, Champion Wettable Powder, COC DF, COC WP, C-O-C-S WDG, Cueva, Copper Count-N, Cuprofix Ultra 40 Disperss, Kentan DF, Kocide 2000, Kocide 3000, Kocide DF, Nordox, Nordox 75WG, Nu Cop 3L, Nu Cop 50 DF, Nu Cop 50 WP, Nu Cop HB (copper)	M1	See label	See label	PHI 0 (REI 24 h)	Bacterial Blight Downy Mildew Purple Blotch	Frequent use of copper fungicides may cause foliar burn
Kumulus DF, Micro Sulf, Microfine sulfur, Microthiol Disperss, Sulfur 90W, Super-Six, Yellow Jacket Wettable sulfur (sulfur)	M2	See label	See label	PHI 0 (REI 24 h)	Powdery mildew	Do not use during hot weather or within 4 weeks of an oil application.
Defiant (thiram)	M3	4.0 ounces /100 lbs	N/A	N/A	Damping off	Seed Protectant
Dithane DF Rainshield, Dithane F45 Rainshield, Dithane M45, Manzate, Manzate Pro Stick, Penncozeb 4 FL, Penncozeb 75 DF, Penncozeb 80 WP, (mancozeb)	M3	See label	See label	7	Botrytis leaf blight Purple blotch	Do not apply to exposed bulbs
Maneb 75 DF, Maneb 80 WP, Manex (maneb)	M3	See label	See label	7	Botrytis leaf blight Purple blotch	Do not apply to exposed bulbs

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Bravo Ultrex, Bravo Weather Stik, Bravo ZN, Chloronil 720, Chlorothalonil 720 SC, Echo 720, Echo 90 DF, Echo ZN, Equus 500 ZN, Equus 720 SST, Equus DF, Initiate 720, Initiate ZN (chlorothalonil)	M5	See label	See label	7 (dry bulb onion) 14 (green onion)	Botrytis leaf blight Purple blotch Downy Mildew (suppression) Botrytis Neck Rot (suppression)	
Top cop with sulfur (basic copper sulfate + sulfur)	M1 + M2	2-3 qts	See label	PHI 0 (REI 24 h)	Purple blotch and Downy mildew	Do not use during hot weather or within 4 weeks of an oil application.
Mankocide (copper hydroxide + mancozeb)	M1 + M3	2.25 lbs	160 lb (per crop)	7	Botrytis Leaf Blight, Downy Mildew, Purple Blotch and Bacterial Blight.	Do not apply to exposed bulbs.
Cuprofix-MZ Disperss (basic copper sulfate + mancozeb)	M1 + M3	7.25 lbs	78.9 lbs (24 lbs a.i. mancozeb)	7	Botrytis Leaf Blight Downy Mildew Purple Blotch Bacterial Blight	Do not apply to exposed bulbs.
Ridomil Gold/Copper (copper hydroxide + mefenoxam)	M1 + 4	2 lbs	3 appl. green onion 4 appl. dry bulb onion	7 (green onion) 10 (dry bulb onion)	Downy Mildew	Maximum 0.4 lbs/A a.i. of metalaxyl or mefenoxam
Ridomil Gold MZ WG (mancozeb + mefenoxam)	M3 + 4	2.5 lbs	4 appl.	7 (dry bulb onion)	Downy Mildew	
Ridomil Gold Bravo SC, (chlorothalonil + mefenoxam)	M5 + 4	See label	3 appl. green onion 4 appl. dry bulb onion	7 (dry bulb onion) 14/21 (green onion)	Downy Mildew Botrytis Leaf Blight Purple Blotch	
Thiophanate-methyl 85 WDG, T-Methyl 70 W WSB, T-Methyl E-AG 4.5 F, T-Methyl E-AG 70 WSB, Topsin 4.5 FL, Topsin M 70 WP, Topsin M 70 WDG, Topsin M WSB (thiophanate-methyl)	1	See label	Apply at planting	N/A	White Rot	

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Enclosure 4, Iprodione 4L AG , Nevado 4F, Rovral 4 Flowable (iprodione)	2	1.5 pt	5 appl. (10 appl. in tank mix pro- gram)	7	Botrytis Leaf Blight Botrytis Neck Rot Purple Blotch Stemphylium Blight	
Bumper 41.8 EC, Propiconazole E-AG 41.8 EC Propimax EC, Tilt (propiconazole)	3	4 fl oz	16 fl oz	0 (green onion) 14 (dry bulb onion)	Purple Blotch Botrytis Leaf Blight (suppression only)	
Folicur 3.6 F, Monsoon, Orius 3.6 F, Tebustar 3.6 L, Tebuzol 3.6, Toledo (tebuconazole)	3	See label	See label	7	White rot Rust Purple Blotch	
MetaStar 2E AG (metalaxyl)	4	2 qts	1 appl. preplant or at planting	N/A	Pythium Damping-off	
Allegiance Sebring 2.65 ST (metalaxyl)	4	0.75 oz per 100 lbs of seed		N/A	Pythium Damping-off	Seed treatment
Apron XL LS, Ridomil Gold EC, Ridomil Gold SL, Ultra flourish (mefenoxam)	4	1 pt	1 appl. preplant or at planting	N/A	Pythium Damping-off	
Endura (boscalid)	7	6.8 oz	41 oz (6 applica- tions)	7	Purple blotch Rust Downy mildew Cladosporium leaf blight Botrytis Leaf Blight	Alternate applications with a different fungicide group.
Vanguard WG (cyprodinil)	9	10 oz	28 oz	7	Botrytis Leaf Blight Purple blotch Botrytis neck rot (suppression only)	Do not make more than 2 con- secutive applications.
Scala SC (pyrimethanil)	9	18 fl oz	54 fl oz	7	Botrytis Leaf Blight Purple blotch Botrytis neck rot	Do not make more than 2 con- secutive applications. Do not use more than 2 of 6 appl. In any one season
Heritage, Quadris, (azoxystrobin)	11	0.25 lbs a.i.	1.5 lbs a.i.	7	Cladosporium leaf blotch Purple blotch Rust White rot Downy mildew Botrytis leaf blight Rhizoctonia damping-off	Alternate applications with a different fungicide group.

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Reason 500 SC (fenamidone)	11	5.5 fl oz	22 fl oz	7	Downy mildew Purple blotch	Alternate applications with a different fungicide group
Cabrio EG (pyraclostrobin)	11	12 fl oz	72 fl oz	7	Botrytis leaf blight Purple blotch Rust White rot Rhizoctonia damping-off Stemphylium Blight Downy mildew (suppression only)	Alternate applications with a different fungicide group. Make no more than 5 applications/crop.
Inspire Super (Cyprodinil + Difenconazole)	9 + 3	16 to 20 oz	60 oz (green onions) 80 oz (dry bulb)	14 (green onions) 7 (dry bulb)	Cercospora leaf spot Leaf blotch Powdery Mildew Purple blotch Stemphylium Blight Botrytis leaf blight	Do not make more than 2 applications before alternate with a different fungicide group
Quadris Opti (azoxystrobin + chlorothalonil)	11 + M5	3.7 pt	1.5 lbs a.i. azoxy. & 6.75 lbs a.i. chlorothalonil	14	Purple blotch Botrytis leaf blight Botrytis Neck rot Cladosporium leaf blotch Downy Mildew White Rot	Alternate applications with different fungicide groups. Make no more than 3 applications/crop. Do not tank mix with COC, MSO or silicon adjuvant.
Quilt (azoxystrobin + propiconazole)	11 + 3	27.5 fl oz	55.3 fl oz	14 dry bulb 0 green (REI 12 h)	Cladosporium leaf blotch Purple blotch Rust Botrytis leaf blight (Suppression only)	Make only 1 appl. before alternating to a non-group 11 fungicide.
Quilt Xcel (azoxystrobin + propiconazole)	11 + 3	14 – 21 oz (dry) 17.5-26 (green)	56 oz	14 dry bulb 0 green (REI 12 h)	Cladosporium leaf blotch Purple blotch Rust Downy mildew Botrytis leaf blight (Suppression only)	Make only 1 appl. before alternating to a non-group 11 fungicide
Pristine (pyraclostrobin + boscalid)	11 + 7	18.5 oz	111 oz	7	Botrytis leaf blight Purple blotch Stemphylium leaf Blight Downy Mildew (suppression)	Do not make more than 2 consecutive applications. No more than 6 applications/crop
Switch 62.5 WG (cyprodinil + fludioxonil)	9 + 12	14 oz	56 oz	7	Botrytis leaf blight Purple blotch Stemphylium leaf Blight White rot Botrytis Neck Rot & Black Mold (suppression)	Do not make more than 2 consecutive appl. Do not plant crops not on the label for 30 days after last appl.
Maxim 4FS (fludioxonil)	12	0.16 fl oz/100 lbs seed	N/A	N/A	Damping off Seedling blight	Seed Protectant

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Botran 75-W (dicloran)	14	2 2/3 lb (spray) 5 1/3 lb (soil appl.)	5 1/3 lb	14	Botrytis leaf blight White Rot	
Botran SF (dicloran)	14	2 to 3 1/5 lbs (white rot) 1 to 2	3 1/5 lbs	N/A		
Actigard 50 WG (Acibenzolar-s-methyl)	21	0.75 – 1 oz.	4 oz	7	Downy Mildew Iris Yellow Spot Leaf blight	Do not apply to plants that are stressed or prior or within 5 days transplanting.
Tanos (cymoxanil + famoxadone)	27 + 11	8 oz	84 oz	3	Downy Mildew Purple Blotch	
Phostrol (phosphorus acid, mono- and dibasic sodium, potas- sium, and ammonium salts)	33	3.75 pt	7 applica- tions	PHI 0 (REI 4 h)	Downy Mildew	Do not exceed seven applica- tions per crop season.
Alude, Fosphite, Fungi-Phite, Helena Prophyt, Phorcephite, Rampart, Reveille Topaz (potassium phosphate)	33	See label	See label	PHI 0 (REI 4 h)	Downy Mildew Powdery mildew	May cause foliar burn if applied with copper based products
Aliette WDG, Legion 80WDG, Linebacker WDG (fosetyl-Al)	33	3 lb	7 applica- tions	7	Downy mildew Purple Blotch	Do not tank mix with copper fungicides, adjuvants or foliar fertilizers
Acrobat 50 WP, Forum (dimethomorph)	40	See label	See label	PHI 0 (REI 12 h)	Downy mildew	Must be applied in a tank mix with another fungicide active against downy mildew. Do not make more than 2 sequential applications.
Revus (mandipropamid)	40	8 fl oz	32 fl oz (dry bulb) 24 fl oz (green)	7	Downy mildew	Make no more than 2 consecu- tive appl. before switching to a non-group 40 fungicide. A silicon-based adjuvant <u>must</u> be added at recommended rates
Presidio (fluopicolide)	43	4 fl oz.	12 fl oz.	2	Downy Mildew Botrytis rot	Do not make more than 4 applications of Presidio per season.
Cease Serenade Max, Serenade ASO, Rhapsody (<i>Bacillus subtilis</i>)	44	See label	See label	PHI 0 (REI 4 h)	Botrytis leaf blight Botrytis neck rot Downy Mildew Purple Blotch Powdery mildew Rust (suppression)	Should to be used in combina- tion with other fungicides

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Regalia (<i>Reynoutria sachalinensis</i>)	P	See label	See label	N/A	Botrytis leaf blight Botrytis neck rot Downy Mildew Purple Blotch Powdery mildew	Should to be used in combination with other fungicides
Kaligreen (potassium bicarbonate)	NC	3 lbs	-	1	Powdery mildew	Do not mix with highly acid products
Actinovate AG (<i>Streptomyces lydicus</i>)	NC	12 oz.	-	0 (REI 1 h)	Botrytis Damping-off Downy mildew Powdery mildew	The use of a spreader-Sticker is recommended. Should be integrated into an overall disease management strategy
Oxidate (hydrogen dioxide)	NC	128 fl. Oz.	-	0 (REI 1 h)	Botrytis Downy Mildew Powdery mildew	Conduct a compatibility test before tank mixing with fertilizers, fungicides or bactericides
Soilgard 12G (<i>Gliocladium virens</i> GL- 21)	NC	2-10 lbs	N/A	N/A	Pythium damping-off Rhizoctonia	Apply at planting
Sonata (<i>Bacillus pumilus</i>)	NC	4 qt	-	0	Downy Mildew Powdery mildew Rust (suppression)	Use in a tank mix or rotational program with other registered fungicides
Trilogy (neem oil)	NC	2%	2 gal	PHI 0 (REI 4 h)	Downy Mildew	Do not use during hot weather.
Sporatec (Clove Oil; Rosemary Oil; Thyme Oil)	NC	1 – 3 pt	N/A	0	Alternaria Leaf Spot Downy Mildew Gray Mold, Powdery Mildew Black Root Rot Rust Botrytis Neck Rot	See label for additional information

Table 6. Selected insecticides approved for use on insects attaching onions and allies.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Admire Pro (imidacloprid)	14.0 fl oz	12	21	Foliage-feeding thrips	4A	See supplemental label for application methods. For entire Bulb Vegetable (<i>Allium</i> sp.) Group
Agree WG (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	1.0-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11	Apply when larvae are small for best control. OMRI-listed ² .
*Ambush 25W (permethrin)	6.4-19.2 oz	12	1	armyworms, cutworms, leafminers, onion maggot (adults), onion thrips, stink bugs	3	Dry bulb and garlic only. Maximum of 2 lb ai/acre per season.
*Ammo 2.5 EC (cypermethrin)	2.0-5.0 fl oz	12	7	aphids, armyworms, cutworms, leafminers, onion maggot adults, stink bugs	3	Maximum of 25 oz product/acre per season.
Assail 30SG Assail 70WP	5.0-8.0 oz 2.1-3.4 oz	12	7	thrips	4A	No more than 32 oz 30SG or 13.7 oz 70WP per acre per season.
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator. OMRI-listed ² .
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Antifeedant, repellent, insect growth regulator.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	WP: 0.5-2 lb/100 gal ES: 0.5-2 qt/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
Crymax WDG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for armyworms. OMRI-listed ² .
*Diazinon AG500, *Diazinon 50W (diazinon)	preplant - AG500: 2-4 qt 50W: 4-8 lb	72	preplant	onion maggots, wireworms	1B	Do not make more than one soil application per year.
DiPel DF (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed ² .
Entrust (spinosad)	1-2.5 oz	4	1	armyworms, dipteran leafminers, flea beetle, loopers, suppression of thrips	5	No more than 5 applications per year (9 oz product). OMRI-listed ² .
Esteem Ant Bait (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7C	Dry bulb only.

Table 6. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Extinguish (S)-methoprene)	1-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Javelin WG (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.12-1.5 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (army- worms)	11	Treat when larvae are young. Thorough coverage is essential. OMRI-listed ² .
Knack IGR (pyriproxyfen)	8 fl oz	12	3	onion thrips	7C	Maximum of 2 applications, at least 14 days apart. Dry bulb only.
*Lannate LV; *SP (methomyl)	LV: 1.5-3.0 pt SP: 0.5-1.0 lb	48	7	beet armyworm, black cutworm, thrips, variegated cutworm	1A	Dry bulb and green onions only. Add a wetting agent to improve coverage.
Lorsban 15G; 75WG (chlorpyrifos)	15G: 3.7 oz/1000 ft of row 75WG: 1.33 lb	24	at plant- ing	onion maggot	1B	Dry bulb only.
Malathion 8F (malathion)	1-2 pt	12	3, 7 for shallots	onion maggot, thrips on onions, aphids and thrips on garlic, leeks, shallots	1B	
M-Pede 49% EC Soap, insecticidal	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed ² .
*Mustang (zeta-cypermethrin)	2. 4-4.3 oz	12	7	aphids, armyworms, cut- worms, leafminer adults, onion maggot adults, onion thrips, stink bugs	3	Do not apply more than 21.5 oz per acre per season.
Neemix 4.5 EC (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, cab- bage looper, cutworms, leafminers, onion maggot, thrips, whiteflies	un	OMRI-listed ² .
*PennCap-M (methyl parathion)	2 pt	13 days	15	thrips	1B	Do not apply when onions are blooming and bees are foraging. Onions only.
*Pounce 25 WP (permethrin)	6.4-19.2 oz—onions 6.4-12.8 oz—garlic	12	1	Armyworms, cutworms, leafminer adults, onion maggot adults, onion thrips, , stink bugs	3	Bulb onions and garlic
*Proaxis Insecticide (gamma-cyhalothrin)	1.92-3.84 oz	24	14	Armyworms (1 st and 2 nd instar), cutworms, leafminer adults, onion and seedcorn maggot adults, onion thrips, plant bugs, stink bugs, tobacco thrips, suppression of aphids, flower thrips, western flower thrips	3	Bulb onions and garlic
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, leafhoppers, loop- ers, mites, plant bugs, stink bugs, thrips, whiteflies	3, 21	
Radiant SC (spinetoram)	5-10 fl oz	4	1	armyworms, dipterous leafminers, loopers, thrips	5	Use with an adjuvant.
Requiem 25EC (extract of <i>Chenopodium ambro- sioides</i>)	1.5-3.0 qt	4	0	western flower thrips	un	Begin as soon as thrips are seen.

Table 6. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
SpinTor 2SC (spinosad)	3.0-8.0 fl oz	4	1	armyworms, dipteran leafminers, flea beetle, loop- ers, suppression of thrips at high rate	5	Do not apply more than 29 oz per acre per crop or make more than 5 applications per year.
*Telone C-35 (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
*Telone II (dichloropropene)						
Trigard (cyromazine)	2.66 oz	12	7	leafminers	17	Maximum of 6 applications per crop.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
*Warrior II (lamb- da-cyhalothrin)	0.96-1.92 fl oz	24	14	aphids, armyworms, cut- worms, onion maggot adults, onion thrips, plant bugs, stink bugs, tobacco thrips, suppression of flower thrips, western flower thrips	3	For bulb crops only (onions and garlic), not green onions. Do not apply more than 0.24 lb ai/acre per season.
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

¹Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.

- 1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)
- 1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)
- 2A. GABA-gated chloride channel antagonists (nerve action)
3. Sodium channel modulators (nerve action)
- 4A. Nicotinic acetylcholine receptor agonists (nerve action)
5. Nicotinic acetylcholine receptor allosteric activators (nerve action)
6. Chloride channel activators (nerve and muscle action)
- 7A. Juvenile hormone mimics (growth regulation)
- 7C. Juvenile hormone mimics (growth regulation)
- 9B and 9C. Selective homopteran feeding blockers
10. Mite growth inhibitors (growth regulation)
11. Microbial disruptors of insect midgut membranes
- 12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)
15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)
16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)
17. Molting disruptor, dipteran (growth regulation)
18. Ecdysone receptor agonists (growth regulation)
22. Voltage-dependent sodium channel blockers (nerve action)
23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)
28. Ryanodine receptor modulators (nerve and muscle action)
- un. Compounds of unknown or uncertain mode of action

²OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Only.**