

Nimitz 4EC--3.5 to 5.0 pints/A. Incorporate or drip-apply 7 days before planting.

Disease Control

Seed Treatment

Use thiram 480DP at 3.0 to 4.0 oz/100 lb. of seed (2/3 tsp/lb) *plus* Apron XL LS (0.32 to 0.64 fl oz /100 lb of seed) for improved germination and stand.

Damping-Off

Use seed treated with thiram 480DP at 3.0 to 4.0 oz/100 lb of seed (2/3 tsp/lb) *plus* Apron XL LS (0.32 to 0.64 fl oz/ 100 lb of seed).

Seedling Root Rot and Basal Stem Rot (*Rhizoctonia*)

Apply azoxystrobin--0.40 to 0.80 fl oz 2.08F/1000 row ft or OLF

Leaf Spots

Apply and rotate one of the following:

azoxystrobin--6.0 to 15.5 fl oz 2.08F/A or OLF

chlorothalonil--1.5 pt 6F/A or OLF

Folicur--4.0 to 6.0 fl oz 3.6F/A or OLF

fixed coppers--0.75 to 1.75 lb/A (check label for specific rate ranges)

Fusarium and Verticillium Wilts

Avoid planting in fields where either disease is present. Rotate with non-solanaceous crops.

Fruit Rot

Choanephora is a soil-borne fungal disease which attacks senescent blossoms and fruit. There are no fungicides labeled for Choanephora control. Improving air circulation is the only effective means of reducing the chances for Choanephora development. In extreme cases, some growers remove the lower juvenile leaves to improve air circulation.

ONIONS

Recommended Bulbing Onion Varieties

Variety	Hybrid	Type ¹	Days to Maturity ²	Description ³	Color	Storage	Method ⁴	Size
Ebenezer	No	Long Day	120	Storage LD	Yellow	Long	Sets	Med-Large
Vision	Yes	Long Day	125	Storage LDSP	Yellow	Long	DS, TP	Large
Sedona	Yes	Long Day	120	Storage LDSP	Yellow	Long	DS, TP	Large
Southport Red Globe	No	Long Day	120	Storage LD	Red	Long	DS, TP	Large
Bradley	Yes	Long Day	118	Storage LDSP	Yellow	Long	DS, TP	Large
Delgado	Yes	Long Day	118	Storage LDSP	Yellow	Long	DS, TP	Med-Large
Red Wing	Yes	Long Day	118	Storage LD	Red	Long	DS, TP	Large
Talon	Yes	Long Day	110	Storage LDSP	Yellow	Long	DS, TP	Large
Fortress	Yes	Long Day	110	Storage LDN	Yellow	Long	DS, TP	Medium
Red Sky	Yes	Long Day	110	Storage LDSP	Red	Long	DS, TP	Med-Large
Montero	Yes	Long Day	110	Sweet Spanish	Yellow	Medium	DS, TP	Large
Braddock	Yes	Long Day	107	Storage LDN	Yellow	Long	DS, TP	Large
Safrane	Yes	Long Day	106	Storage LDN	Yellow	Long	DS, TP	Medium
Prince	Yes	Long Day	105	Storage LDN	Yellow	Long	DS, TP	Large
Tequila	Yes	Long Day	120	Spanish	Yellow	Medium	DS, TP	Very Large
Mesquite	Yes	Long Day	120	Spanish	Yellow	Medium	DS, TP	Very Large
Dulce Reina	Yes	Long Day	120	Sweet Spanish	Yellow	Medium	TP	Large
Scout	Yes	Long Day	118	Sweet Spanish	Yellow	Medium	TP	Very Large
SV4058NV	Yes	Long Day	115	Spanish	White	Medium	TP	Large
Great Western	Yes	Interm. Day	110	Sweet Spanish	Yellow	Medium	TP	Large
Spanish Medallion	Yes	Interm. Day	110	Sweet Spanish	Yellow	Medium	TP	Very Large

(table continued next page)

Recommended Bulbing Onion Varieties (continued)

Variety	Hybrid	Type ¹	Days to Maturity ²	Description ³	Color	Storage	Method ⁴	Size
Mt. Whitney	Yes	Interm. Day	104	Sweet Spanish	White	Medium	TP	Large
Super Star	Yes	Interm. Day	100	Sweet Spanish	White	Short	TP	Large
Cimarron	Yes	Interm. Day	99	Sweet Spanish	Yellow	Medium	TP	Large
Expression	Yes	Interm. Day	98	Sweet Spanish	Yellow	Short	TP	Large
Candy	Yes	Interm. Day	95	Sweet Spanish	Yellow	Very Short	TP	Very Large
Exacta	Yes	Interm. Day	94	Sweet Spanish	Yellow	Very Short	TP	Large
Bridger	Yes	Overwinter	n/a	Storage	Yellow	Long	DS	Large
Hi-keeper	Yes	Overwinter	n/a	Storage	Yellow	Long	DS	Med-Large
T-420	Yes	Overwinter	n/a	Storage	Yellow	Long	DS	Med-Large
Toughball	Yes	Overwinter	n/a	Storage	Yellow	Long	DS	Medium

¹ Long day onions direct seeded or transplanted in early spring; Intermediate day onions normally early spring transplanted; and Overwintering onions direct seeded in later summer.

² n/a = Not available.

³ Onion descriptions: Storage = long keeping types; LD = Long Day; SP or Spanish = Spanish type; N = Northern type; Sweet Spanish = short keeping softer scale sweet types.

⁴ Method of establishment: DS = Direct Seeded, TP = Transplanted.

Recommended Green or Bunching Onions (Scallions)

Variety	Production method
Evergreen Long White Bunching	Overwinter
Kincho	Summer
Ishikura Improved	Summer
Green Banner	Fall, Overwinter, Spring, Summer
Southport White Globe	Overwinter
Feast	Summer
Parade	Summer
Tokyo Long White Bunching	Summer
White Gem	Summer-Fall
White Sweet Spanish	Spring-summer

Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state's soil test report recommendations and/or your farm's nutrient management plan supercede recommendations found below.

	Pounds N per Acre	Soil Phosphorus Level				Soil Potassium Level				Nutrient Timing and Method
		Low	Med	High Very		Low	Med	High Very		
				(Opt.)	High			(Opt.)	High	
		Pounds P ₂ O ₅ per Acre				Pounds K ₂ O per Acre				
Bulb onions	75-100	200	100	50	0 ¹	200	100	50	0 ¹	Total nutrient recommended.
	50-75	200	100	50	0 ¹	200	100	50	0 ¹	Broadcast and disk-in.
	25-50	0	0	0	0	0	0	0	0	Sidedress 4-5 weeks after planting.
Green onions	150-200	200	100	50	0 ¹	200	100	50	0 ¹	Total nutrient recommended.
	50-75	200	100	50	0 ¹	200	100	50	0 ¹	Broadcast and disk-in.
	50	0	0	0	0	0	0	0	0	Sidedress 4-5 weeks after planting.
	50	0	0	0	0	0	0	0	0	Sidedress 3-4 weeks before harvest.

Apply 1.0 to 2.0 pounds of boron (B) per acre with broadcast fertilizer. See Table B-9 for more specific boron recommendations.

¹In Virginia, crop replacement values of 25 lbs. P₂O₅ and 25 lbs. K₂O per acre are recommended on soils testing Very High.

Seed Treatment

Buy commercial fungicide treated seed, if available. See the Disease section for more information.

Transplant Production

Produce onion transplants in cell trays. The maximum cell size recommended for sweet Spanish transplants is 338 cells per tray. Grow transplants 10-12 weeks and maintain a plant height of 4 inches by trimming the plants with a sharp clean blade.

Planting and Seeding Dates

For dry bulb onions, sets or seeds can be planted as soon as soil conditions are favorable in the spring. Transplants for bulb onions can be planted March 20 to April 1.

Seed for bunching onions can be planted as soon as soil conditions are favorable in the spring. Successive plantings can be made through the summer.

Growing for the Simply Sweet Onion™ branding program is an option for Pennsylvania growers. Information on cultivars, production methods and licensing can be obtained by contacting the Pennsylvania Vegetable Growers Association at 717-694-3596 or pvga@pvga.org.

Spacing

For dry bulb onions, space rows 24 inches apart. Space eight to nine sets per foot (24 bushels per acre). For large Spanish onions, space sets 4 to 5 inches apart and seeds ½ to 2 inches in row (2 pounds per acre using split shoe). For bunching onions, space rows 12 to 16 inches apart; space seed ½ to 1½ inches apart (7 to 10 pounds per acre). Plant seed ½ to ¾ inch deep except on muck soils. On muck soils plant seed ½ to 1 inch deep. Place sets 1 to 1½ inches deep.

Plasticulture

The use of plasticulture for sweet Spanish onion production has resulted in consistent high quality, large-sized bulb onions. Raised beds (6 to 8 inches high) are generally placed on 72 to 78 inch centers; however, if equipment is adjustable and soil is friable, beds can be made on 66 inch centers. Transplants are spaced on 6 inch X 6 inch spacing with 4 rows planted across a 28 inch to 30 inch wide raised bed. In addition, 2 drip irrigation lines are placed in the bed between each of the outer two rows of onion transplants to maintain adequate soil moisture for sizing onion bulbs and producing a sweet onion taste.

For plasticulture systems, broadcast two-thirds of the recommended nitrogen prior to making raised beds and laying plastic in the field and one-third through the drip irrigation system. Apply phosphorus and potassium as well as any magnesium or calcium based on soil test results prior to making the raised beds with plastic mulch and drip tape.

If top growth appears chlorotic (yellow) or stunted, a tissue test analysis is recommended in order to make corrective measures before onion initiate bulb enlargement. Avoid using sulfur containing fertilizers. While some sulfate is required for optimum plant growth, soil sulfur levels should be less than 20 ppm; since high soil sulfur increase the pungency of onion bulbs by increasing pyruvic acid levels.

Onions are shallow-rooted, and unless moisture supply is constant, they bulb early and produce small bulbs. Light, frequent irrigations should be used when onions are small to minimize leaching of nitrogen from the root zone. It is recommended that at least 1.5 to 2.0 inches of water be applied in 3 to 5 applications every week by drip irrigation.

Soil type does not affect the amount of total water needed, but does dictate frequency of water application. Lighter soils need more frequent water applications, but less water applied per application. Irrigation should thoroughly wet the soil to a depth of 18 inches. Stop watering after bulbs have reached full size, and tops have begun to fall.

Cultivation

For bunching onions, hill 1 to 2 inches to ensure white bases.

Harvest and Postharvest Considerations

Bulb Onions

Start harvesting when at least 50% of onion tops have fallen. The tops of some sweet Spanish cultivars may not fall at maturity and should be harvested once the desired bulb size is reached. Pull bulbs by hand or undercut them (such as with a potato digger) without damaging their base. In plasticulture systems, pull bulbs through existing holes in the plastic mulch. Lay bulbs on the soil or mulch surface for 3 days if no rain is predicted. If rain is predicted, cut the tops from onion bulbs (leaving 1.5 inch necks; shorter necks increase the likelihood of disease) and place bulbs in potato burlap bags or bulk bins and bring into shelter. If bulbs are packed in burlap bags, they can be placed in a greenhouse or high tunnel for 5 to 7 days to dry. Place sheets of row cover material over burlap bags of onions to reduce/eliminate sunburn. If using bulk bins for drying onions, place them in room with high air flow and a controlled heat source (the drying temperature for onions should never exceed 90°F). Keep in dryer with moderate heat and high air flow for at least 48 hours. Before removing bulk bins from the dryer, randomly check onion necks to ensure the surface is paper dry. If storing sweet onion bulbs for a short period of time (up to 2 months), maintain cool temperatures (38°F to 45°F) and low relative humidity (75-85%) with active air movement.

For harvesting storage-type onions, bulbs are undercut, lifted and windrowed for field curing. Rod-weeder diggers and knife undercutters are most commonly used. After an appropriate interval, the undercut onions are lifted and windrowed. This may be done with tops on to prevent sunscald or tops may be removed in the windrowing operation. Topping may be done by hand or by machine. With good air movement and proper placement of onions in storage, onions have been found to store best with tops on; however, this may complicate removal of onions from bulk storage and necessitates extra handling at packing time. Onions should be adequately cured in the field, in open sheds, or by forced air before storage. Adequate curing in the field or in open sheds may require 2 to 4 weeks, depending on the weather. The best skin color develops at 75° to 90° F and 60-75% relative humidity.

The most common method of curing is by forced ventilation in the storage by blowing heated air at 75° to 85°F through the onions at 2 cf./m. air flow per cubic foot of onions. Onions are considered cured when the neck is tight and the outer scales are dry and brittle. This condition is reached when onions have lost 3 to 5% of their weight. If not adequately cured, onions are likely to decay in storage. Refrigerated storage is often used for onions to be marketed late in the spring. Onions to be held in cold storage should be placed there immediately after curing. A temperature of 32° F will keep onions dormant and reasonably free from decay, provided the onions are sound and well cured when stored.

Air circulation should be sufficient to prevent heating and to remove moisture from within bins or sacks. Storage onions can be held for 6 to 8 months at 32° F.

Green Onions and Scallions

Harvest should begin when green onions are ¼ to ½ inch in diameter at the base. Semi-bulbing types will be slightly enlarged at the base (up to 1 inch). Onions are hand pulled and bunched with 6-9 onions, or ¼ lb, held together with rubber bands. Pulling is usually done without undercutting and bunching is usually done in the field. Field boxes are moved to packing areas within two to three hours of being harvested. It is recommended that bunched green onions are run through a washer/cooler machine that washes them in 33° to 35° F water. Green tops are usually trimmed to 12 inches. In some cases harvested onions are bunched in the packing shed. Chilling the wash water removes field and ambient heat from the onions. They are then immediately packed in waxed boxes. Hold green onions at 32° F and 95 to 100 % relative humidity. Green onions are normally marketed promptly. They can be stored 3 to 4 weeks at 32° F if moisture loss is prevented. Crushed ice spread over the onions aids in supplying moisture. Packaging green onions in perforated polyethylene film also will aid in preventing moisture loss.

Weed Control

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-3 and E-4.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Apply postemergence herbicides when crop and weeds are within the recommended size and/or leaf stage.

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee's (HRAC) **Herbicide Site of Action Table E-8** and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

Preemergence

DCPA--6.0 to 10.5 lb/A. Apply 8.0 to 14.0 pints per acre Dacthal 6F at time of seeding or immediately after planting sets. A second application may be needed for longer season seed onions.

Preplant Incorporated or Preemergence

Bensulide--5.0 to 6.0 lb/A. Apply 5.0 to 6.0 quarts per acre Prefar 4E before planting and incorporate 1 to 2 inches deep with power-driven rotary cultivators, or apply preemergence and activate with one-half inch of sprinkler irrigation within 36 hours to control most annual grasses. Use the maximum recommended rate preemergence followed by irrigation to suppress certain annual broadleaf weeds including common lambsquarters, smooth pigweed, and common purslane.

Postemergence

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12.0 to 16.0 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray

solution (1 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 45 days and apply no more than 32 fluid ounces per acre in one season. Labeled for dry bulb onions only.

Fluazifop--0.125 to 0.188 lb/A. Apply 0.50 to 0.75 pints per acre Fusilade DX 2E with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or a nonionic surfactant to be 0.25 percent of the spray solution (1 quart per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. It will not control yellow nutsedge, wild onion, or any broadleaf weed. Do not tank-mix with any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 45 days and apply no more than 6 pints per acre in one season. Do not plant corn, sorghum, cereals, or any other grass crop within 60 days of the last application. Labeled for dry bulb onions only.

S-metolachlor--0.64 to 1.27 lb/A. A **Special Local-Needs Label 24(c)** has been approved for the use of **Dual Magnum 7.62E to control weeds in dry bulb onions in New Jersey, Pennsylvania, and Virginia, and in green onions in New Jersey. The use of this product is legal ONLY if a waiver of liability has been completed. The waiver of liability can be completed on the Syngenta website, "farmassist.com". Go to the website "farmassist.com" and register (or sign in if previously registered), then under "products" on the toolbar, click on indemnified labels and follow the instructions.** Apply 0.67 to 1.33 pints per acre after the onions have reached the two true leaf stage of growth. Use lower rate on lighter coarse-textured sandy soils and the higher rate on heavier fine-textured soils. Follow with overhead irrigation if rainfall does not occur. On soils with an organic matter content greater than 5 percent, one additional treatment may be applied 3 to 4 weeks after the first treatment. Primarily controls annual grass and certain broadleaf weeds, including galinsoga preemergence. Use other methods to control emerged weeds prior to application. Observe a 60-day preharvest interval. DO NOT exceed a total of 2.65 pints per acre per season. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.** For use on dry bulb onions only.

Oxyfluorfen--0.025 to 0.060 lb/A. Apply 1.6 to 3.2 fluid ounces per acre Goal 2XL or 1.0 to 2.0 fluid ounces of GoalTender 4F postemergence when onions have a minimum of three true leaves to control seedling broadleaf weeds with four true leaves or less. Repeat the application but do not exceed a total of 0.5 pound per acre (32 fluid ounces per acre of Goal 2XL or 16.0 fluid ounces of GoalTender) and do not apply within 60 days of harvest.

Goal may cause injury to onion foliage. The injury will appear as necrotic spots on leaves and/or twisted leaves. Heed the following precautions to avoid or minimize injury: Use flat fan nozzles, 20 to 40 psi and 20.0 to 40.0 gallons of water per acre. DO NOT tank-mix with any other pesticide. DO NOT use surfactant, oil concentrates, or any other additive. DO NOT apply during extended periods of cool, wet, cloudy weather. DO NOT exceed 0.05 pound per acre (3.2 fluid ounces) per application. DO NOT apply to onions with less than three true leaves (do not count the flag leaf).

Bromoxynil--0.125 to 0.188 lb/A. Apply 4.0 to 6.0 fluid ounces Buctril 4EC to dry bulb onions with a minimum of 3 true leaves (do not count the flag leaf) to suppress or control many seedling broadleaf weeds with 4 true leaves or less in 50.0 to 70.0 gallons of water per acre. Water volume is important. Concentrated spray solutions kill onions. Repeat applications can be made, but do not apply more than 12.0 fluid ounces in a single growing season. Buctril may cause injury to onions. The injury will appear as necrotic spots on the leaves. To minimize the risk of injury, heed the following warnings. DO NOT tank-mix with any other pesticides or apply within 3 days of any other pesticide. DO NOT add surfactants, oil concentrates, or other additives. DO NOT treat onions injured by sand, insects, or disease. DO NOT treat onions growing during periods of cloudy weather with high humidity or other low light intensity conditions that could result in "soft" foliage with a thinner-than-normal waxy layer on the leaf surface. DO NOT treat onions with less than 3 true leaves. DO NOT count the flag leaf.

Sethoxydim--0.2 to 0.3 lb/A. Apply 1.0 to 1.5 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. **The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail.** To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 30 days and apply no more than 3.0 pints per acre in one season.

Postharvest

Paraquat--0.6 lb/A. **A Special Local-Needs 24(c) label has been approved for the use of Gramoxone SL 2.0 or OLF for postharvest desiccation of the crop in Delaware and Virginia.** Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a broadcast spray after the last harvest. Add nonionic surfactant according to the labeled instructions. See

the label for additional information and warnings.

Insect Control

THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS.

NOTE: Copies of specific insecticide product labels can be downloaded by visiting the websites www.CDMS.net or www.greenbook.net. Also, specific labels can be obtained via web search engines.

Soil Pests:

Onion Maggot

Continuous planting of onions on the same ground will increase onion maggot problems. Flies migrate up to one-half mile. Rotation is extremely important to reduce onion maggot damage. Avoid mechanical injury to bulbs in the field or during harvesting. Damaged plants encourage maggot infestation. Bury cull piles.

Seed Treatment

Onion seed commercially-treated with cyromazine (Trigard ST) is available (pelleted). Growers must purchase seed treated by seed company.

Preplant

diazinon--2.0 to 4.0 qts/A Diazinon AG 500 (or OLF) preplant or in-furrow broadcast just before planting and mix into the top 3-4 inches of soil

Postplant Soil Drench

chlorpyrifos (**dry bulb only**)--1.0 qt/A Lorsban Advanced (or OLF)

Postplanting Spray Treatment

First-brood adult flies first appear in early to mid-May. Second brood occurs in July, and third brood occurs in August to September. The fall maggots are most important, because maggots may end up in stored onions, causing onion rot. Crushed onions or culls attract onion maggot flies. Rotate fields if possible and eliminate culls. Foliar applications of insecticides are not likely to control maggot flies. Flies spend most of their time outside onion fields and must be contacted with the insecticide during application for control to occur. If a spray is applied, apply directly over the row. Soak soil around base of seedlings. Apply one of the following formulations:

Note: Permethrin also has a repellent effect.

gamma-cyhalothrin (**bulb only**)--1.92 to 3.20 fl oz/A Proaxis
malathion--2.5 pts/A Malathion 57EC (or OLF)
permethrin--4.0 to 12.0 fl oz/A Perm UP 3.2EC (or OLF)
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)

Aboveground Pests:

Cutworms

(Also see "Cutworms" section in Soil Pests--Their Detection and Control.)

Apply one of the following formulations:

gamma-cyhalothrin (**bulb only**)--1.92 to 3.20 fl oz/A Proaxis
lambda-cyhalothrin (**bulb only**)--0.96 to 1.60 fl oz/A Warrior II or 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)
methomyl--1.5 to 3.0 pts/A Lannate LV (or OLF)
zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)

Leafminers

Apply one of the following formulations:

cyromazine--2.66 oz/A Trigard 75WP
 dinotefuran--5.25 to 7.00 fl oz/A **foliar** Scorpion 35SL or
 3.0 to 4.0 fl oz/A **foliar** Venom 70 SG or 8.75 to 10.50
 fl oz/A **soil** Scorpion 35SL or 5.0 to 6.0 fl oz/A **soil**
 Venom 70SG
 spinosad--3.0-6.0 fl oz/A Entrust SC **OMRI-listed**
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC

Thrips

Frequently, thrips populations increase following adjacent alfalfa or grain harvest. Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek SC (or OLF)
 acetamiprid--5.0-8.0 fl oz/A Assail 30G (or OLF)
 dinotefuran--5.25 to 7.00 fl oz/A **foliar** Scorpion 35SL or
 3.0 to 4.0 fl oz/A **foliar** Venom 70 SG or 8.75-10.50 fl
 oz/A **soil** Scorpion 35SL or 5.0 to 6.0 fl oz/A **soil**
 Venom 70SG
 lambda-cyhalothrin (**bulb only**)--1.28 to 1.92 fl oz/A Warrior
 II or 2.56 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)
 methomyl--3.0 pts/A Lannate LV
 permethrin--6.0 to 12.0 oz/A Perm-UP 3.2 EC (or OLF)
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC
 spirotetramat--5.0 fl oz/A Movento (larvae) (or OLF)
 zeta-cypermethrin--2.88 to 4.00 fl oz/A Mustang Maxx (or
 OLF)

Note: Use of spinosad for leafminer control will suppress thrips population.

Pesticide	Use Category ¹	Hours to Reentry ²	Days to Harvest ³
INSECTICIDE			
abamectin	R	12	30
acetamiprid	G	12	7
chlorpyrifos	R	24	60(AP)
cyromazine	G	12	60(AP) 7(foliar)
diazinon	R	72	60(AP)
dinotefuran	G	12	1
gamma-cyhalothrin	R	24	14
lambda-cyhalothrin	R	24	14
malathion	G	12	3
methomyl	R	48	7
permethrin	R	12	1
spinetoram	G	4	1
spinosad	G	4	1
spirotetramat	G	24	3
zeta-cypermethrin	R	12	7
FUNGICIDE (FRAC code)			
azoxystrobin (Group 11)	G	4	0
Cabrio (Group 11)	G	12	7
chlorothalonil, dry onions (Group M5)	G	12	7
copper, fixed (Group M1)	G	see label	0
Endura (Group 7)	G	12	7
Fontelis (Group 7)	G	12	3
iprodione (Group 2)	G	24	7
Inspire Super (Groups 3+9)	G	12	7
mancozeb (Group M3)	G	24	7

(table continued)

Pesticide	Use Category ¹	Hours to Reentry ²	Days to Harvest ³
FUNGICIDE (FRAC code) (continued)			
Merivon (Groups 7 + 11)	G	12	7
Omega (Group 29)	G	48	7
Pristine (Groups 11 + 7)	G	12	7
Quadris Opti (Groups 11 + M5) (dry bulb)	G	12	7
Quilt (Groups 3 + 11)	G	12	14
Quilt Xcel (Groups 3 + 11)	G	12	14
Reason (Group 11)	G	12	7
Ridomil Gold (Group 4)	G	48	7
Scala (Group 9)	G	12	7
Switch (Groups 9 + 12)	G	12	7
tebuconazole (Group 3)	G	12	7
Ultra Flourish (Group 4)	G	48	AP
Uniform (Groups 4 + 11)	G	0	AP
Zampro (Groups 45 + 40)	G	12	0

See Table D-6.

¹ G = general, R = restricted.

² Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL.

³ AP = At planting

Disease Control**Seed Treatment**

Buy commercial fungicide treated seed, if available. Multiple fungicides are often needed to manage the diversity of soilborne fungi that cause seed decay. Check with your seed company to determine what seed treatment technology is available.

Damping-Off

mefenoxam--(Ridomil Gold at 0.5 to 1.0 pt 4SL/A or Ultra Flourish 1.0 to 2.0 pt 2E/A) applied as a broadcast or banded immediately after seeding the field for *Pythium* only
 Uniform--0.34 fl oz 3.66SE/1000 ft of row in-furrow (see label for specific details) or apply 4.5 fl oz/A to the bed during shaping for transplanted onions for *Pythium* and/or *Rhizoctonia*

Downy Mildew (*Peronospora destructor*)

The pathogen can survive as oospores in the soil, or on bulbs, sets and seed. Downy mildew development is promoted by cool, moist conditions. Management begins with planting pathogen-free seed or sets and crop rotations of at least 3 years without related crops. Be sure to eliminate culls and volunteers from the field. Apply one of the following fungicides accordingly and rotate between different FRAC codes:

mancozeb--3.0 lb 75DF/A or OLF
 chlorothalonil--1.0 to 3.0 pt 6F/A or OLF (suppression only)
 Cabrio--12.0 oz 20EG/A
 Omega--1.0 pt 500F/A
 Quadris Opti--2.4 to 3.6 pt 5.5SC/A (dry bulb)
 Quilt Xcel--14.0 to 21.0 fl oz 2.2SE/A
 Reason--5.5 fl oz 500 SC/A
 Zampro--14.0 fl oz 525SC/A

Purple Blotch (*Alternaria porri*) and Stemphylium Leaf Blight

The pathogen overwinters in plant residue from onion-related plants. Purple blotch and Stemphylium development

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are favored by warm, moist conditions. Grow onions in well drained soil and rotate with non-related crops. Sweet Spanish types are especially susceptible to purple blotch.

Several of the most effective fungicides are listed below. Applications may be needed every 7 days for proper management. Rotate fungicides in different FRAC codes to slow the development of fungicide resistance (**NOTE:** iprodione applied at the high rate, and Pristine are labeled for use at 14-day intervals) Apply one of the following:

Pristine--10.5 to 18.5 oz 38W/A at 14-day intervals (also will provide suppression of downy mildew)
azoxystrobin--6.0 to 12.0 fl oz 2.08F/A or OLF
chlorothalonil--1.0 to 3.0 pt 6F/A or OLF (purple blotch only)
Cabrio 8.0 to 12.0 oz 20 EG/A (Stemphylium only)
Endura--6.8 oz 70WG/A
Fontelis--16.0 to 24 fl oz SC/A
iprodione (Rovral)--1.5 pt 4F/A or OLF
Inspire Super--16.0 to 20.0 fl oz 2.82EC/A
Quadris Opti--1.6 to 3.2 pt 5.5SC/A
Omega--1.0 pt 500F/A
Quilt--14.0 to 27.5 fl oz 1.66F/A
Quilt Xcel--14.0 to 21.0 fl oz 2.2SE/A
Reason--5.5 fl oz 500SC/A
Scala--9.0 fl oz SC/A
Switch--11.0 to 14.0 oz 62.5 WG/A (Stemphylium only)

Botrytis Leaf Blight (*Botrytis squamosa*)

The pathogen overwinters in cull piles, on onion debris in the soil, and as sclerotia where related crops were recently grown. Botrytis leaf blight is promoted by moist, cool to mild conditions. Eliminate sources of inoculum and rotate 2 or 3 years between onion-related crops. Fungicide applications can be delayed until there is an average of 1 lesion on 10 leaves.

Apply and alternate between one of the following:

azoxystrobin--9.0 to 15.5 fl oz 2.08F/A or OLF
chlorothalonil--1.0 to 3.0 pt 6F/A or OLF
Endura--6.8 oz 70WG/A
Fontelis--16.0 to 24 fl oz SC/A
Inspire Super--16.0 to 20.0 fl oz 2.82EC/A
iprodione--1.5 pt 4F/A or OLF at 14-day intervals (for dry bulb onions only)
Merivon--8.0 to 11.0 fl oz 2.09SC/A
Omega--1.0 pt 500F/A
Pristine--14.5 to 18.5 oz 38WG/A
Quadris Opti--1.6 to 3.2 pt 5.5SC/A,
Quilt Xcel--14.0 to 21.0 fl oz 2.2SE/A
Scala--9.0 oz SC/A (also effective against purple blotch)
Switch--11.0 to 14.0 oz 62.5WG/A

Always alternate between materials from different FRAC codes to reduce chances for fungicide resistance development.

White Rot (*Sclerotium cepivorum*)

White rot is most limiting in cool, moist soils and most severe on overwintered onions. The sclerotia can be long lived (over 20 years) in the soil in the absence of an Allium host. White rot development is very dependent on soil temperatures with the optimum temperatures being between 60 and 65°F. Apply one of the following:

Apply tebuconazole--20.5 oz 3.6F/A or OLF in a 4 to 6 inch

band over or into the furrow at planting or may also be applied by chemigation. Two additional foliar applications 4.0 to 6.0 fl oz/A may also be applied (dry bulb onion only).

Bacterial diseases (Soft rot, Slippery Skin, Sour Skin and Center Rot)

Plant seed and transplants that are pathogen free. Rotate to a non-host for 2 or more years and eliminate volunteer onions and weeds. Avoid overhead irrigation especially with water that may be contaminated with pathogen(s). Minimize injury to maturing or harvested bulbs consider harvesting early. Dry mature bulbs as soon as possible after harvest.

Initiate a preventative fixed copper tank mixed with mancozeb program when conditions become favorable for bacterial diseases, typically warm and wet weather. Not all copper-based products are created equal and vary by copper content as well as active ingredient(s) (see Table E-12 for a list of available fixed-copper products and check label for rates).

Botrytis Neck Rot (*Botrytis alli*)

Infection is favored by cool, wet conditions and poor drying and curing of onions at harvest and often develops on injured bulbs in storage. Minimize nitrogen late in the season to promote drying of the necks at harvest. Windrow plants to ensure dry tops before topping operation.

Fontelis--16.0 to 24.0 fl oz 1.67SC/A
iprodione--1.5 pt 4F/A or OLF at 14-day intervals (for dry bulb onions only)
Merivon--8.0 to 11.0 fl oz 2.09SC/A
Omega--1.0 pt 500F/A
Scala--9.0 fl oz SC/A

Black Mold (*Aspergillus niger*)

This fungus is common in the soil and crop residue and affects a large number of vegetables. Manage by promptly and adequately drying bulbs after harvest. Heated air favors disease development. Storing bulbs at low temperature and humidity with help manage black mold if cured properly when harvested.