Dry Bulb and Green Bunching Onion, Garlic, and Leek

ONION Varieties		
Bulbs	Early	Candy, Cavalier, Comanche, Norstar
	Main	Burgos, Copra, Lakota, Nitro, Spirit
	Late	Crusader, Daytona, Celtic, Sweet Sandwich, Spartan Banner 80, Walla Walla Sweet
Green		Beltsville Bunching

GARLIC Varieties	
Hardneck, Porcelain group	Georgian Crystal, Music
Hardneck, Rocambole group	Capathian, Spanish Roja
Hardneck, Purple Stripe group	Metechi, Persian Star
Softneck, Artichoke group	Inchelium Red
Softneck, Silverskin group	Idaho Silverskin

LEEK Varieties
Arkansas, Lancelot

Spacing

Onion: Raised beds with two double rows or wide rows spaced 14 inches apart on top of the bed with 12 seeds per foot within the wide (2 inches) row. Seed: 4 pounds per acre. Or transplant 4 inches apart in rows.

Garlic: Rows 12 to 36 inches apart with cloves 3 to 6 inches apart in the row. Plant bulbs 3 to 4 inches deep, with top of clove twice the depth of the clove height. For mechanical cultivation, plant flat side of clove perpendicular to the length of the row; for hand cultivation in dense plantings, plant angled side of clove parallel to the length of the row. Plant in fall 6 to 8 weeks before ground freezes.

Leek: Rows 14 to 18 inches apart with transplants 3 to 4 inches apart in the row.

Fertilizing

Onion, Garlic and Leek

Lime: Mineral soils: to maintain a soil pH of 6.0 to 6.8. Organic soils: lime if pH is less than 5.2.

Harvesting

Green onion: Harvest by pulling from soil after bulb base is thicker than a pencil but before bulbing. Optional undercutting can be used to make pulling easier. Remove dirty outer layer from bulb area. Trip roots. Trim tops as needed if allowed by state regulations. Green onions are usually sold in bunches. Harvest knob onions by pulling from soil when bulb has reached desired stage of development. Follow practices for green onions.

Dry bulb onion: Harvest dry bulb onions after tops have naturally fallen over. If a sprout inhibitor is used on storage onions, time application according to label instructions. Undercutting several days before harvest can improve keeping quality of storage onions. Dig from soil and dry in field or indoors at 75°F to 80°F and 70 percent to 80 percent relative humidity. Cut tops about 1 inch from bulb at harvest or after drying, or braid tops and hang onions to dry. Clean dry onions by gently brushing.

Leek: Harvest when stalk is 1 inch or more in diameter. Undercut plants, pull from soil, trim, and bunch.

Garlic: Harvest when tops have fallen over and partially dried. Lift from soil and dry protected from sun and rain. After drying, trim roots and remove tops, or leave tops on for braiding.

Onion and Leek

Preplant: N: for mineral soils, 70 pounds N per acre broadcast or applied to bed before planting for transplanted crops, or half broadcast preplant and half applied as a band 2 inches below the seed for direct seeded crops; for organic soils, 100 pounds N per acre broadcast and disked in. P_2O_5: 25 to 250 pounds per acre. K_2O: 0 to 250 pounds per acre. Adjust according to soil type, previous management, and soil test results for your state. At seeding, spray directly on the seed a solution of 2-6-0 at 1 pint per 100 feet of linear row. A 2-6-0 solution is equivalent to a 1:5 dilution of 10-34-0 liquid fertilizer with water. On muck soils with a pH greater than 6.0, add 1 pound of $MnSO_4$ per 1,000 feet of row at seeding, or use foliar Mn at the rate of 0.3 pound/100 gallons. Apply 2 to 3 times during the season starting 3 weeks after emergence.

Sidedress N: Mineral soils: 60 pounds N per acre to either side of the row at the 4- to 5-week stage of growth or by June 1. Muck soils: No sidedress N needed unless heavy rain occurs.

Garlic

N: 70 to 125 pounds N per acre total. Adjust according to soil organic matter content and cropping history. Broadcast and incorporate 0 to 20 pounds N per acre before planting in the fall. Apply half the remainder when garlic begins to grow in the spring, and the rest in 1 to 2 sidedressings at 3-week intervals, ending 4 to 6 weeks before harvest. P_2O_5, 25 to 250 pounds per acre. K_2O: 0 to 250 pounds per acre. Adjust according to soil type, previous management and soil test results for your state. Broadcast and incorporate before planting in the fall.

Disease Control

Alternaria Purple Blotch and Botrytis Leaf Blight (all onion types)

Practice 3-4 year crop rotation. Rotation out of onions or related vegetables reduces the threat of these diseases in future onion crops. Destroy cull piles. Reduce leaf wetness by ensuring adequate drainage, by spacing plants to promote air movement, and by using overhead irrigation sparingly.

Recommended Products

Bravo®, **Echo®**, **Equus®**, and **Initiate®** are labeled for use at various rates. 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Cabrio EG® at the following rates:

Purple blotch: 8-12 oz. per acre.

Botrytis leaf blight suppression: 12 oz. per acr.

7-day PHI.

Dithane®, Manzate®, **ManKocide®**, and **Penncozeb®** are labeled at various rates for dry bulb onion and garlic. 7-day PHI.

RR **Endura®** at 6.8 oz. per acre. 7-day PHI.

RR **Fontelis®** at 16-24 fl. oz. per acre. 3-day PHI.

Inspire Super® at 16-20 fl. oz. per acre. 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Iprodione 4L AG®, **Meteor®**, or **Rovral 4 Flowable®** at 1.5 pts. per acre See labels for tank mix instructions. 7-day PHI.

Luna Experience® at 8-12.8 fl. oz. per acre. *Supplemental label expires March 2, 2019*. 7-day PHI.

Luna Tranquility® at 16-27 fl. oz. per acre. 7-day PHI.

Merivon® at the following rates:

Purple blotch: 4-11 fl. oz. per acre.

Botrytis leaf blight: 8-11 fl. oz. per acre.

7-day PHI.

RR **Omega 500F®** at 1 pt. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

Orius 3.6F® or **Tebuzol 3.6F®** at 4-6 fl. oz. per acre. 7-day PHI.

Pristine 38WG® at the following rates:

Purple blotch: 10.5-18.5 oz. per acre.

Botrytis leaf blight: 14.5-18.5 oz. per acre.

7-day PHI.

Propimax EC®or **Tilt®** at 4-8 fl. oz. per acre. See labels for tank mix instructions.14-day PHI for dry bulb onion.

RR **Quadris Flowable®** at the following rates:

Purple blotch: 6-12 fl. oz. per acre.

Botrytis leaf blight: 9-15.5 fl. oz. per acre.

0-day PHI.

Quadris Opti® at 1.6-3.2 pts. per acre. 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Quadris Top® at 12-14 fl. oz. per acre. 7-day PHI.

Quilt® at 14-27.5 fl. oz per acre. *Purple blotch only*. 0-day PHI for leek. 14-day PHI for dry bulb onion and garlic.

Quilt Xcel® at the following rates:

Purple blotch: 14-21 fl. oz. per acre.

Botrytis leaf blight: 17.5-26 fl. oz. per acre.

0-day PHI for leek. 14-day PHI for dry bulb onion and garlic.

Rovral 4 Flowable® at 1.5 pts. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

RR **Satori®** at the following rates:

Purple blotch: 6-12 fl. oz. per acre.

Botrytis leaf blight: 9-15.5 fl. oz. per acre.

0-day PHI.

RR **Scala SC®** at 18 fl. oz. per acre. See label for tank mix instructions. 7-day PHI.

RR **Switch 62.5WG®** at 11-14 oz. per acre. 7-day PHI.

Tanos® 8 oz. per acre. *Purple blotch only*. 3-day PHI.

RR **Vangard WG®** at 10 oz. per acre. 7-day PHI.

Anthracnose (Colletotrichum coccodes)

The pathogen that causes anthracnose also infects other crops, including tomato, pepper, and potato. Warmer temperatures (68-77°F) favor disease development. Irrigate when foliage can dry rapidly. Products labeled for Alternaria purple blotch may be helpful for anthracnose control.

Bacterial Diseases (bacterial leaf blight, bacterial flower stalk and leaf necrosis, slippery skin, sour rot, and bulb rot)

Use pathogen-free seed. Rotate out of *Allium* species. Avoid overhead irrigation that might spread these

RR This is a reduced-risk pesticide. See page 37 for details.

diseases. Over-fertilizing with nitrogen can make the crop more susceptible. Avoid injuring bulbs and cut only when tops are dry.

Applying fixed copper products may reduce the spread of these diseases. For emerged annuals, apply before planting or crop emergence. Products labeled for bacterial leaf blight may be helpful for other bacterial diseases, including bacterial flower stalk and leaf necrosis caused by *Pantoea agglomerans*.

Recommended Products

Several **copper** products (Badge®, Champ®, ChampI-ON++®, Cuprofix®, Kocide 2000®, Nu-Cop®) are labeled at various rates. See labels for rates. 0-day PHI.

ManKocide® at 2.5 lbs. per acre. *Dry bulb onion only.* 7-day PHI.

Botrytis Neck Rot (all types)

Rotate out of onion for 3 years, avoid injuring plants during handling and storage, destroy onion cull piles and debris, and avoid late-season fertilizer applications. Windrow plants until neck tissues are dry before topping and storage. Cure rapidly and properly. Artificial drying may be necessary (forced heated air at 93-95°F for 5 days). Treatments for Botrytis leaf blight may retard or prevent symptomless spread of Botrytis neck rot in the field prior to harvest.

Recommended Products

Bravo®, **Echo®**, **Equus®**, and **Initiate®** are labeled for use at various rates. *Dry bulb onion and garlic only. Suppression only.* 7-day PHI.

Dithane®, Manzate®, **ManKocide®**, and **Penncozeb®** are labeled at various rates. *Dry bulb onion and garlic only.* 7-day PHI.

RR **Fontelis®** at 16-24 fl. oz. per acre. 3-day PHI.

Iprodione 4L AG®, **Meteor®**, or **Rovral 4 Flowable®** at 1.5 pts. per acre. See labels for tank mix instructions. 7-day PHI.

Luna Experience® at 8-12.8 fl. oz. per acre. 7-day PHI.

Luna Tranquility® at 16-27 fl. oz. per acre. 7-day PHI.

Merivon® at 8-11 fl. oz. per acre. 7-day PHI.

RR **Omega 500F®** at 1 pt. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

Pristine 38WG® at 14.5-18.5 oz. per acre. 7-day PHI.

Quadris Opti® at 1.6-3.2 pts. per acre. 7-day PHI for dry bulb onion and garlic. 14-day PHI for leek.

RR **Scala SC®** at 18 fl. oz. per acre. See label for tank mix instructions. 7-day PHI.

RR **Switch 62.5WG®** at 11-14 oz. per acre. 7-day PHI.

RR **Vangard WG®** at 10 oz. per acre. 7-day PHI.

Damping-off

Use pathogen-free sets and seed.

Recommended Products

Dithane F45 Rainshield®, at 2.4 qts. per acre, or **Koverall®** at 3 lbs. per acre, or **Manzate Max®** at 1.6-2.4 qts. per acre, or **Penncozeb 75DF®** at 3 lbs. per acre, or **Penncozeb 80WP®** at 3 lbs. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

RR **Quadris 2.08SC®** at 0.4-0.8 fl oz per 1,000 row-feet preplant or at-plant. 0-day PHI.

RR **Ridomil Gold® SL** at 0.5-1 pt. per acre.

RR **Satori®** at 0.4-0.8 fl oz per 1,000 row-feet preplant or at-plant. 0-day PHI.

RR **Ultra Flourish®** at 1-2 pts. per acre.

Downy Mildew

Use pathogen-free sets and seed. Plant in areas with adequate drainage and air movement to reduce leaf wetness and humidity. Destroy cull piles and debris. Avoid excess nitrogen applications and overhead irrigation. Use a three-year rotation where the disease is known to be a problem. Cool, wet conditions favor the development of this disease.

Recommended Products

Bravo®, **Echo®**, **Equus®**, and **Initiate®** are labeled for use at various rates. *Suppression only.* 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Catamaran® at 4-7 pts. per acre. 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Dithane®, **ManKocide®**, **Manzate®**, and **Penncozeb®** are labeled at various rates. *Dry bulb onion and garlic only.* 7-day PHI.

Forum® at 6 fl. oz. per acre. 0-day PHI.

Gavel 75DF® at 1.5-2 lbs. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

RR **Omega 500F®** at 1 pt. per acre. *Dry bulb onion and garlic only.* 7-day PHI.

RR This is a reduced-risk pesticide. See page 37 for details.

May be acceptable for use in certified organic production. Check with your certifier before use.

Orondis Opti A® at 1.5 fl oz. per acre tank-mixed with **Orondis Opti B®** at 1.5 pt. per acre. FIFRA Section 2(ee) recommends tank mix.. 7-day PHI.

RR **Orondis Ultra A®** at 1.64 fl. oz. per acre tank-mixed with **Orondis Ultra B®** at 8 fl. oz. per acre. FIFRA Section 2(ee) recommends tank mix. 7-day PHI.

RR **Reason®** at 5.5 fl. oz. per acre. 7-day PHI.

RR **Revus 2.09SC®** at 8 fl. oz. per acre. 7-day PHI.

Ridomil Gold Bravo® at 2.5 pts. per acre. 7-day PHI for dry bulb onion and garlic. 14-day PHI for green bunching onion and leek.

Ridomil Gold Copper® at 2 lbs. per acre. 10-day PHI for dry bulb onion and garlic. 7-day PHI for green bunching onion and leek.

Ridomil Gold MZ WG® at 2.5 lbs. per acre. 7-day PHI.

Zampro® at 14 fl. oz. per acre. 0-day PHI.

Zing 4.9SC® at 30 fl. oz. per acre. 7-day PHI.

Fusarium Basal Rot

Use Fusarium-resistant varieties such as Elba Globe, Spartan Banner, and Harvestmore. Consult seed catalogs for varietal characteristics. A longer rotation of four years can help reduce disease. Managing soilborne insect pests may reduce disease incidence.

Pink Root (Setophoma terrestris)

Plants infected with pink root may appear to be nutrient deficient or drought-stressed and stunted. Affected plants have fewer leaves and begin to form bulbs early. The pathogen can survive in soil as deep as 17.7 inches. Temperatures at 75-82°F favor disease development. The pathogen can spread by onion sets and in infested soil carried by machinery, dust storms, and surface run-off.

Recommended Products

RR **Fontelis®** at 24 fl. oz. as a broadcast spray or banded application at preplant or postplant for dry bulb onion. *Growers in Michigan must possess Section 2(ee) label*.

Smut

Rotate out of *Allium* species for three years where the disease is a problem.

Recommended Products

Dithane®, **ManKocide®**, **Manzate®**, and **Penncozeb®** are labeled at various rates. *Dry bulb onion and garlic only.* Apply as an in-furrow drench at time of seeding. 7-day PHI.

Stemphylium Leaf Blight and Stalk Rot (Stemphylium vesicarium)

Stemphylium causes leaf blight and stalk rot but rarely affects the bulb. Long warm periods with leaf wetness favor disease development.

Recommended Products

Cabrio EG® at 8-12 oz. per acre. 7-day PHI.

RR **Fontelis®** at 16-24 fl. oz. per acre. 3-day PHI.

Luna Experience® at 12.8 fl. oz. per acre. 7-day PHI.

Luna Tranquility® at 16-27 fl. oz. per acre. 7-day PHI.

Merivon® at 4-11 fl. oz. per acre. 7-day PHI.

Pristine 38WG® at 10.5-18.5 oz. per acre. 7-day PHI.

Quadris Top® at 12-14 fl. oz. per acre. 7-day PHI.

RR **Switch 62.5WG®** at 11-14 oz. per acre. 7-day PHI.

White Rot (Sclerotium cepivorum)

Dig out and destroy diseased plants as soon as you notice them. Wash equipment and footwear between fields to avoid transferring fungal propagules from infested fields.

Recommended Products

RR **Fontelis®** at the following rates:

Preplant or at planting for dry bulb onion: 1.2-1.6 fl. oz. per 1,000 row-feet.

All other labeled applications: 16-24 fl. oz. per acre. 3-day PHI.

Iprodione 4L AG®, **Meteor®**,or **Rovral 4 Flowable®** at 4 pts. per acre in-furrow spray preplant. 7-day PHI.

Luna Experience® at 12.8 fl. oz. per acre. *Suppression only*. 7-day PHI.

Luna Tranquility® at 27 fl. oz. per acre. *Suppression only*. 7-day PHI.

Orius 3.6F®, or **Tebuzol 3.6F®** at the following rates:

Preplant dry bulb onion and garlic: 20.5 fl. oz. per 4-6-inch band in-furrow.

Suppression: 4-6 fl. oz. per acre

7-day PHI.

Quadris Opti® at 1.6-3.2 pts. per acre. 7-day PHI for dry bulb onion and garlic. 4-day PHI for leek.

Quilt Xcel® at 17.5-26 fl. oz. per acre. 0-day PHI for leek. 14-day PHI for dry bulb onion and garlic.

RR **Switch 62.5WG®** at 7-14 oz. per acre. 7-day PHI.

Topsin M WSB® at 2 lbs. per acre, or **Cercobin®** at 43.6 fl. oz. per acre. *Dry bulb onion and garlic only.* 3-day PHI.

Weed Control for Garlic and Dry Bulb Onion

Onions and related crops pose challenges for weed control because the narrow leaves of the crop provide little shade to suppress weed growth, and, except for green onions, the crops grow for several months. Designing bed and row spacing to fit equipment available for mechanical control will make weed management more efficient. When herbicides are used, multiple applications are often made. Other tools include careful cultivation and hoeing, the use of plastic mulch for transplants, organic mulches, and flame weeding. A flamer can be used to control weeds that emerge after seeding and before the crop emerges. Some growers also use flaming successfully over the top of young onions or garlic, or directed toward the bases of larger plants — even though some crop injury is likely with postemergent flaming.

For specific weeds controlled by each herbicide, check Table 25 on page 66.

Rates provided in the recommendations below are given for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

Burndown or Directed/Shielded Applications Broadleaves and Grasses

Recommended Products

Gramoxone Inteon 2L® at 2.5-4 pts. per acre. *Not for transplanted onions*. Use 1 qt. of COC or 4-8 fl. oz. of NIS per 25 gals. of spray solution. Apply before planting or after planting but before crop emergence. Do not exceed 4 pts. of Gramoxone Inteon 2L® or 2 pts. of Gramoxone Max 3L® per acre. *RUP*.

Glyphosate products at 0.75-3.75 lbs. acid equivalent (ae) per acre. Use formulations containing 3 lbs. ae per gal. (4 lbs. isopropylamine salt per gal.) at 1-5 qts. per acre, or formulations containing 4.5 lbs. ae per gal. (5 lbs. potassium salt per gal) at 0.66-3.3 qts. per acre. Broadcast before planting, after planting but before crop emergence, or apply between crop rows with hooded or shielded sprayers. Use low rate for annuals and higher rates for perennials. See label for suggested application volume and adjuvants. 14-day PHI.

Postemergence Directed/Shielded Applications Broadleaves

Recommended Products

Aim EC® at 0.5-2 fl. oz. per acre. Apply with hooded sprayers as a directed application between crop rows. Use COC or NIS. Weeds must be actively growing and less than 4 inches tall. Do not allow spray to contact crop. Do not exceed 6.1 fl. oz. per acre per season.

Preemergence Broadleaves and Grasses

Recommended Products

Dual Magnum® at 0.67-1.3 pts. per acre. *Onions in Indiana, Michigan and Ohio only. Garlic in Indiana and Ohio only.* Apply postemergence starting when the crop has 2 true leaves. For dry bulb onions, a second application may be applied 21 or more days after the first. Garlic: Do not exceed one application and 1.3 pts. per acre per season. 21-day PHI. *Dry bulb onions:* Do not exceed 1.3 pts. per acre per application and 2.6 pts. per acre per crop and two applications per crop. 60-day PHI.

Nortron SC® at 16-32 fl. oz. per acre. *Dry bulb onions only*. *Not for garlic*. Apply preemergence or soon after seeding before weeds germinate. May also be used postemergence, see below. Use on mineral soils only. Do not exceed 48 fl. oz. per acre per season on coarse soils and 96 fl. oz. per acre per season on medium and fine soils.

Outlook® at 12-21 fl. oz. per acre. Apply after crop plants have 2 true leaves. For transplants, apply after transplanting when soil has settled around plants. May be tank-mixed with other herbicides, see label. 30-day PHI.

Pendimethalin products. Use 3.3EC formulations at 1.2-3.6 pts. per acre, or Prowl H2O® at 1.5-3 pts. per acre. *Garlic*: apply after planting before crop and weeds emerge, and/or apply when garlic has 1-5 true leaves. *Dry bulb onions*: apply when onions have 2-9 true leaves. *Onions on muck soils only*: apply 3.3EC formulations at up to 4.8 pts. per acre, or Prowl H2O® at 4 pts. per acre after seeding and before crop emerges, after onions have 2 leaves, and if needed at 6-9 leaves. Do not exceed 14.4 pts. per acre of 3.3EC formulations or 12.5 pts. per acre of Prowl H2O® on muck soils. Use low rates on coarse soils. 45-day PHI.

Trifluralin products at 0.375-0.625 lb. a.i. per acre. Use 4EC formulations at 0.75-1.25 pts. per acre. *Dry bulb onions only*. *Not for garlic*. Use the lowest rate on coarse soils. Apply at layby as directed spray between onion rows and incorporate. Mineral soils only. 60-day PHI.

RR This is a reduced-risk pesticide. See page 37 for details.

Preemergence Broadleaves

Recommended Products

Chateau WDG® at the following rates:

Garlic: 6 oz. per acre. Apply within 3 days after planting and before garlic emerges. Do not exceed 6 oz. per acre per growing season.

Dry bulb onions: 2 oz. per acre. Apply to transplanted onions between the 2- and 6-leaf stage or to direct-seeded onions between the 3- and 6-leaf stage. Will not control emerged weeds. Wait at least 14 days between applications.

Do not exceed 2 oz. per acre per application, or 3 oz. per acre per growing season. 45-day PHI for dry bulb onions.

Preemergence Grasses

Recommended Products

Dacthal W-75® at 6-14 lbs. per acre, or **Dacthal Flowable**® at 6-14 pts. per acre. *Onions only*. Apply at seeding, transplanting, and/or layby. Preplant incorporation not recommended. May be sprayed over transplants.

Prefar 4E® at 5-6 qts. per acre. Use low rate on soils with less than 1% organic matter. Apply and incorporate before planting. Or apply after seeding, before crop emerges and irrigate within 24 hours. Mineral soils only.

Postemergence Broadleaves

Recommended Products

Goal 2XL® at the following rates:

Seeded crops: 0.5 pt. per acre.

Transplanted crops: 1-2 pts. per acre. Use lower rate on coarse soils. Apply after direct-seeded crop has 2 true leaves, or prior to transplanting onions, or within 2 days after transplanting.

Do not exceed 2 pts. per acre. 45-day PHI for onions. 60-day PHI for garlic.

Moxy 2E® at the following rates:

Garlic: 1.5-2 pts. per acre. Apply after garlic emerges and before it is 12 in. tall. 112-day PHI for garlic.

Onions: 1-1.5 pts. per acre. Apply when onions have 2-5 true leaves, using 50-70 gals. of water per acre, or on muck soils east of the Mississippi River only, apply 3-4 days before onions emerge. To minimize onion injury apply after 2 days of sunny weather when onion leaves are dry and temperatures are 70-80°F.

Postemergence Broadleaves and Grasses

Recommended Products

Nortron SC® at 16 fl. oz. per acre. *Dry bulb onions only*. *Not for garlic*. Apply postmergence up to 4 times, ending 30 days before harvest. May cause temporary leaf fusion. May injure stressed plants. Use on mineral soils only. Do not exceed 48 fl. oz. per acre per season on coarse soils and 96 fl. oz. per acre per season on medium and fine soils.

Postemergence Grasses

Recommended Products

Clethodim products at the following rates:

Garlic: **Select Max**® at 9-16 fl. oz. per acre, or **2EC formulations of clethodim products** at 6-8 fl. oz. per acre. Use Select Max® with 8 fl. oz. of NIS per 25 gals. of spray solution (0.25% v/v).

Dry bulb onions: **Select Max**® at 12-32 fl. oz. per acre, or **2EC formulations of clethodim products** at 6-16 fl. oz. per acre. Use 2EC formulations with 1 qt. COC per 25 gals. of spray solution (1% v/v).

Spray on actively growing grass. Wait at least 14 days between applications. Do not exceed 2 applications per season for garlic or shallots. 45-day PHI for dry bulb crops.

Fusilade DX 2E® at 10-12 fl. oz. Use 1-2 pts. of COC or 0.5-1 pt. of NIS per 25 gals. of spray solution. Apply to small actively growing grass. Do not exceed 48 fl. oz. per acre. 45-day PHI.

Poast 1.5E® at 1-1.5 pts. per acre. Use 1 qt. of COC per acre. Spray on actively growing grass. Use high rate on quackgrass. Do not exceed 4.5 pts. per acre per season. 30-day PHI.

Weed Control for Leek and Green Onion

Onions and related crops pose challenges for weed control because the narrow leaves of the crop provide little shade to suppress weed growth, and, except for green onions, the crops grow for several months. Designing bed and row spacing to fit equipment available for mechanical control will make weed management more efficient. When herbicides are used, multiple applications are often made. Other tools include careful cultivation and hoeing, the use of plastic mulch for transplants, organic mulches, and flame weeding. A flamer can be used to control weeds that emerge after seeding and before the crop emerges. Some growers also use flaming successfully over the top of young onions or garlic, or directed toward the based of larger plants — even though some crop injury is likely with postemergent flaming.

For specific weeds controlled by each herbicide, check Table 25 on page 66.

Rates provided in the recommendations below are given for overall coverage. For band treatment, reduce amounts according to the portion of acre treated.

Burndown or Directed/Shielded Applications

Broadleaves and Grasses

Recommended Products

Gramoxone Inteon 2L® at 2.5-4 pts. per acre. *Direct-seeded onions only*. *Not for transplants or sets*. Use 1 qt. of COC, or 4-8 fl. oz. of NIS per 25 gals. of spray solution. Apply before planting or after planting but before crop emergence. Do not exceed 4 pts. of Gramoxone Inteon 2L® or 2 pts. of Gramoxone Max 3L® per acre. *RUP*.

Glyphosate products at 0.75-3.75 lbs. acid equivalent (ae) per acre. Use formulations containing 3 lbs. ae per gal. (4 lbs. isopropylamine salt per gal.) at 1-5 qts. per acre, or formulations containing 4.5 lbs. ae per gal. (5 lbs. potassium salt per gal) at 0.66-3.3 qts. per acre. Broadcast before planting, after seeding but before crop emergence, or apply between crop rows with hooded or shielded sprayers. Use low rate for annuals and higher rates for perennials. See label for suggested application volume and adjuvants. 14-day PHI.

Premergence Broadleaves and Grasses

Recommended Products

Dual Magnum® at 0.67-1.3 pts. per acre. *Green onions in Indiana, Michigan, and Ohio only.* Not for leeks. Apply postemergence starting when the crop has 2 true leaves. Do not exceed one application and 1.3 pts. per acre per season. 21-day PHI.

Outlook® at 12-21 fl. oz. per acre. Apply after crop plants have 2 true leaves. For transplants, apply after transplanting when soil has settled around plants. May be tank-mixed with other herbicides, see label. 30-day PHI.

Prowl H2O® at 2 pts. per acre. *Use only on muck soils (organic matter greater than 20%) or on mineral soils with greater than 3% organic matter.* Apply after seeding before crop emerges, or apply when crop has 2 to 3 true leaves. If both pre and post applications are used, wait 30 days after preemergence application before applying postemergence. Do not exceed 2 pts. per acre per application or 4 pts. per acre per season. 30-day PHI.

Premergence Grasses

Recommended Products

Dacthal W-75® at 6-14 lbs. per acre, or **Dacthal Flowable®** at 6-14 pts. per acre. Apply at seeding, transplanting, and/or layby. Preplant incorporation not recommended. May be sprayed over transplants.

Postemergence Broadleaves and Grasses

Recommended Products

Glyphosate products. See details above for Burndown or Directed/Shielded Applications.

Postemergence Broadleaves

Recommended Products

Aim EC® at 0.5-2 fl. oz. per acre. Apply with hooded sprayers as a directed application between crop rows. Use COC or NIS. Weeds must be actively growing and less than 4 inches tall. Do not allow spray to contact crop. Do not exceed 6.1 fl. oz. per acre per season.

Moxy 2EC® at 1-1.5 pts. per acre. *Onions only. Not for leeks.* Apply when onions have 2-5 true leaves, using 50-70 gals. of water per acre, or on muck soils east of the Mississippi River only, apply 3-4 days before onions emerge. To minimize onion injury apply after 2 days of sunny weather when onion leaves are dry and temperatures are 70-80°F.

Postemergence Grasses

Recommended Products

2EC formulations of clethodim products at 6-8 fl. oz. per acre. Use with 1 qt. COC per 25 gals. of spray solution (1% v/v). Spray on actively growing grass. Wait at least 14 days between applications. 14-day PHI.

Poast 1.5E® at 1-1.5 pts. per acre. Use 1 qt. of COC per acre. Spray on actively growing grass. Use high rate on quackgrass. Do not exceed 4.5 pts. per acre per season. 30-day PHI.

Herbicides for All Garlic, Onions, and Leeks[1]

Product (REI/PHI)	Common Name	Timing and Application Location Relative to Crop[2]					Incorporated	Timing Relative to Weeds		Weed Groups Controlled			Crops[3]			
		Before seeding	After seeding before emergence	Before transplanting	Post emergence -between rows only	Postemergence		Preemergence	Postemergence	Annual grasses	Small-seeded broadleaves	Broadleaves	Garlic	Onion, dry bulb	Onion, green	Leek
Aim EC® (12h/-)	carfentrazone								X		X	X	X	X	X	X
Chateau® (24h/ 45d)	flumioxazin					X		X			X	X	X	X		
Dacthal W-75®, Dacthal® flowable (12h/-)	DCPA	X		X		X		X		X				X	X	X
Dual Magnum® (24h/21d)	s-metolachlor					X		X		X	X		X	X	X	
Fusilade® (12h/45d)	fluazifop					X			X	X			X	X		
Goal® (12h/45d to 60d)	oxyfluorfen			X		X			X			X	X	X		
Gramoxone Inteon 2L® (12h to 24h/-)	paraquat	X	X						X	X	X	X	X	*	*	
Moxy® (12h/112d)	bromoxynil		X		X	X			X		X	X	X	X	X	
Nortron® (12h/)	norflurazon	X	X			X		X	X	X	X		X	X		
Outlook® (12h/30d)	dimethenamid-P					X		X		X	X	X	X	X	X	X
Prowl H2O® (24h/30d)	pendimethalin		X			X		X		X	X		X	X	X	X
Poast® (12h/30d)	sethoxydim					X			X	X			X	X	X	X
Prefar 4E (12/-)	bensulide	X	X	X			yes	X		X			X	X		
Roundup®, others (12h/)	glyphosate	X	X	X	X				X	X	X	X	X	X	X	X
Select Max®, others (12h/14d to 45d)	clethodim					X			X	X			X	X	X	X
Treflan®, others (12h/ 60d)	trifluralin				X		yes	X		X	X			X		

[1]For effectiveness against specific weeds, see Table 25 on page 66, and read label. This table does not include all label information. Be sure to read and follow all instructions and precautions on the herbicide label. Herbcides can cause serious crop injury and yield loss if not used properly.
[2]X=permitted for at least one crop.
[3]X=may be used for that crop. *=Direct-seeded crops only.

Insect Control

Onion Maggots (dry bulb)

Recommended Products

FarMore FI500® commercial seed treatment.

Sepresto® commercial seed treatment is part of the CAPS treatment, which is available only on Nunhems varieties.

Lorsban 4E® at 1.1 fl. oz. per 1,000 linear ft. of row, or Lorsban 75WG® at 0.73 oz. per 1,000 linear ft. of row as an in-furrow drench at planting. Use a minimum of 40 gals. of total drench per acre. Limit of 1 application per year. *RUP*.

Onion Maggots (dry bulb and green bunching)

Recommended Products

Ambush 2EC® at 6.4-19.2 fl. oz. per acre. *Adult control.* Do not exceed 2 lbs. a.i. per acre per season. 1-day PHI. *RUP.*

Diazinon AG500® at 2-4 qts. per acre, or Diazinon 50W® at 4-8 lbs. per acre. Broadcast just before planting and mix into the top 3-4 inches of soil. Apply in sufficient water to drench seed furrow planting. Do not exceed 3 foliar applications per season. 14-day PHI. *RUP.*

Mustang Maxx® (0.8EC) at 2.24-4 fl. oz. per acre. *Adult control*. Do not exceed 20 fl. oz. per acre per season. Add COC at 16 fl. oz. per acre. 7-day PHI. *RUP.*

Pounce 25WP® at 6.4-19.2 fl. oz. per acre. *Adult control.* Do not exceed 8 lbs. per acre per season. 1-day PHI. *RUP.*

Warrior II® (2.08EC) at 0.96-1.6 fl. oz. per acre. *Adult control.* Do not exceed 15.36 fl. oz. per acre per season. 14-day PHI. *RUP.*

Onion Thrips (dry bulb, green bunching, garlic, and leeks)

Field site selection. Onion thrips build to high levels in small grains and move to onions when small grains dry down or are harvested. Avoid planting next to small grains.

Plant resistant/tolerant varieties. Tolerant varieties include White Keeper, El Charro, Snow White, Vega, X201, and Zapotec.

Recommended Products

RR **Assail 30SG®** at 5-8 oz. per acre. Do not exceed 4 applications per season. Many onion thrips populations have developed resistance to this insecticide so efficacy will vary. 7-day PHI.

Entrust® (2SC) at 4.8 fl. oz. per acre. 1-day PHI.

Exirel® (0.83E) at 13.5-20.5 fl. oz. per acre. 1-day PHI.

Movento® (2SC) at 5 fl. oz. per acre. Do not exceed 2 applications per year. Apply with a nonionic surfactant (0.25-0.5% v/v). Apply in June or early July, when thrips threshold reaches 1 thrips per leaf in the field for the first time in the season. After making two applications about 7 days apart, rotate to an insecticide with a different mode of action for managing insecticide resistance. 3-day PHI.

RR **Radiant SC®** at 6-10 fl. oz. per acre. Do not exceed 30 fl. oz. per acre per season. Do not make more than 5 applications per calendar year. Do not make more than 2 consecuctive applications for insecticide resistance management purposes. Apply when onion thrips reach 3 thrips per leaf.

Onion Thrips (dry bulb and garlic)

Recommended Products

Agri-Mek® (0.15 EC) at 8.16 fl. oz. per acre. Do not exceed 48 fl. oz. per acre per season. Use when thrips reach 1 thrips per leaf threshold. Make 2 consecutive applications 7-days apart, then rotate to an insecticide with different mode of action. 30-day PHI. *RUP.*

Ambush 2EC® at 9.6-19.2 fl. oz. per acre. Use when thrips first appear. *Not for rescue treatments.* Do not exceed 2 lbs. a.i. per acre per season. Many onion thrips populations have developed resistance to this insecticide so efficacy will vary. 1-day PHI. *RUP.*

Pounce 25WP® at 9.6-19.2 oz. per acre. Many onion thrips populations have developed resistance to this insecticide so efficacy will vary. 1-day PHI. *RUP.*

Warrior II® (2.08EC) at 1.28-1.92 fl. oz. per acre. Do not exceed 15.36 fl oz. per acre per season. Many onion thrips populations have developed resistance to this insecticide so efficacy will vary. 14-day PHI. *RUP.*

Onion Thrips (dry bulb and green bunching)

Recommended Products

Lannate LV® (2.4WSL) at 3 pts. per acre. *Green onion*: Do not exceed 18 pts. per acre. *Dry bulb:* Do not exceed 12 pts. per acre. 7-day PHI. *RUP.*

RR This is a reduced-risk pesticide. See page 37 for details.

May be acceptable for use in certified organic production. Check with your certifier before use.

Example of Insecticide Rotation for Onion Thrips Management

The table below provides an example of an insecticide rotation growers can use to manage onion thrips in dry bulb onion. It provides thresholds for use with each product. Note: Only apply Exirel® a maximum of two back-to-back applications during the season.

Week	Product	Action Threshold
1	Movento®	1 thrips/leaf
2	Movento®	1 thrips/leaf
3	Agri-Mek® or Exirel®	1 thrips/leaf
4	Agri-Mek® or Exirel®	1 thrips/leaf
5	Radiant®	3 thrips/leaf
6	Radiant®	3 thrips/leaf
7	Lannate® or Exirel®	1 thrips/leaf
8	Lannate® or Exirel®	1 thrips/leaf

IRAC Codes for Onion Thrips Control Products

The table below lists products labeled for onion thrips control and the Insecticide Resistance Action Code (IRAC) for each product.

Product	Active Ingredient	IRAC
Radiant SC®	spinetoram	5
Lannate LV®	methomyl	1A
Agri-Mek SC®	abamectin	6
Movento®	spirotetramat	23
Exirel®	cyantraniliprole	28