

**At harvest:** Dip or spray harvested table or seed-stock roots after cleaning and before packaging. Use 1.0 lb of Botran 75WP in 100 gallons of treating solution. Scholar 1.9SC at 16.0 to 32.0 fl oz/100 gal of dip is also an option.

### Pox (Soil Rot)

Maintain a pH between 4.8 and 5.2 to assist in control. Use crop rotation, clean seed, and lean beds. Fumigation prior to planting may also help.

### Fusarium Wilt

Use resistant varieties.

### Surface Rot

Minimize injury during harvest. Cure as soon as possible under proper storage conditions. Use clean seed for bedding.

## TOMATOES

### Recommended Market Tomatoes

Variety	Hybrid	Type	Season	Culture <sup>1</sup>	Use <sup>2</sup>	Disease Resistance <sup>3</sup>	Habit
Applause	Yes	Globe, Red	Early	Field	DM, LW	V,F	Determinate
Primo Red	Yes	Globe, Red	Early	Field	DM, LW, S	V,F,Tomv	Determinate
Sunshine	Yes	Globe, Red	Early	Field	DM, LW, S	V,F,Gls	Determinate
Sunstart	Yes	Globe, Red	Early	Field, HT	DM, LW, S	V,F,Gls	Determinate
Amelia	Yes	Globe, Red	Mid	Field	LW, S	V,F,Tswv	Determinate
BHN 1009	Yes	Globe, Red	Mid	Field	LW, S	V,F	Determinate
BHN 589	Yes	Globe, Red	Mid	Field, HT	DM, LW	V,F,Tomv	Determinate
BHN 961	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,Tomv	Determinate
BHN 964	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,Tomv,Eb	Determinate
Biltmore	Yes	Globe, Red	Mid	Field	DM, LW,	V,F,Asc,Gls	Determinate
Brandy Boy	Yes	Globe, Red	Mid	Field, HT	DM, LW		Determinate
Charger	Yes	Globe, Red	Mid	Field, HT	DM, LW, S	V,F,Gls,Asc,Tylc	Determinate
Crista	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,Tswv	Determinate
Defiant	Yes	Globe, Red	Mid	Field	DM, LW	V,F,Lb	Determinate
Floralina	Yes	Globe, Red	Mid	Field	DM, LW	V,F,Asc,Gls	Determinate
Florida 47R	Yes	Globe, Red	Mid	Field	LW, S	V,F,Asc,Gls	Determinate
Mountain Glory	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,Gls,Tswv	Determinate
Mountain Spring	Yes	Globe, Red	Mid	Field	DM, LW	V,F	Determinate
Mt. Merit	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,N,Tswv, Lb,	Determinate
Red Deuce	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,Tomv,Gls,Asc	Determinate
Red Defender	Yes	Globe, Red	Mid	Field	DM, LW, S	V,F,N,Tswv	Determinate
Red Mountain	Yes	Globe, Red	Mid	Field, HT	DM, LW,S	V,FTswv	Determinate
Rocky Top	Yes	Globe, Red	Mid	Field, HT	DM, LW, S	V,F,Gls	Determinate
Scarlet Red	Yes	Globe, Red	Mid	Field, HT	DM, LW, S	V,F	Determinate
Sunbrite	Yes	Globe, Red	Mid	Field, HT	DM, LW, S	V,F	Determinate
SunGuard	Yes	Globe, Red	Mid	Field, HT	DM, LW	V,F,Gls,Asc	Determinate
BHN 871	Yes	Globe, Yellow	Mid	Field, HT	DM, LW	V,F,Tomv	Determinate
Carolina Gold	Yes	Globe, Yellow	Mid	Field	DM, LW	V,F	Determinate
Lemon Boy	Yes	Globe, Yellow	Mid	Field, HT	DM, LW	V,F,N	Indeterminate
BHN602	Yes	Globe, Red	Mid, Late	Field	DM, LW, S	V,F,Tswv	Determinate
Florida 91	Yes	Globe, Red	Mid, Late	Field	DM, LW, S	V,F,Asc,Gls	Determinate
Mt. Fresh Plus	Yes	Globe, Red	Mid, Late	Field	DM, LW, S	V,F,N	Determinate
Phoenix	Yes	Globe, Red	Mid, Late	Field	LW, S	V,F,Asc,Gls	Determinate
Red Bounty	Yes	Globe, Red	Mid, Late	Field, HT	DM, LW	V,F,N,Gls,Tswv	Determinate

<sup>1</sup>Culture: Field = For field growing, HT = for growing in a High Tunnel (Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

<sup>2</sup>Use: DM = direct market (roadside, farmer's market); LW = Local wholesale; S = Shipping (Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

<sup>3</sup>Resistances or tolerances: V = Verticillium wilt; F = Fusarium wilt; N = Root knot nematode, Asc = Alternaria stem canker; Gls = Gray leaf spot; Tomv = Tomato mosaic virus; Tswv = Tomato spotted wilt virus; Lb = Late blight; Eb = Early blight; Tylc = Tomato Yellow Leaf Curl virus.

For information on resistance to specific disease races or species contact your seed supplier. (Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

**Recommended Plum, Cluster, Cherry, and Grape Tomatoes**

Variety	Type	Color	Hybrid	Disease Resistance <sup>1</sup>	Form
Plum Crimson	Plum	Red	Yes	V,F	Determinate
Plum Dandy	Plum	Red	Yes	V,F	Determinate
Plum Regal	Plum	Red	Yes	V,F,Lb,Tswv,	Determinate
Picus	Plum	Red	Yes	V,F,Asc,Gls,Tswv	Determinate
Pony Express	Plum	Red	Yes	V,F,N,Tomv,Bs	Determinate
Mariana	Plum	Red	Yes	V,F,N,Asc	Determinate
Victoria Supreme	Plum	Red	Yes	V,F,N,Asc,Gls	Determinate
Health Kick	Plum	Red	Yes	V,F,Asc,Tswv,Bs	Determinate
Mt. Magic	Small cluster	Red	Yes	V,F,Lb	Indeterminate
BHN 762	Cherry	Red	Yes	V,F	Determinate
Sun Sugar	Cherry	Orange	Yes	F, Tmv	Indeterminate
Mountain Bell	Cherry	Red	Yes	V,F	Indeterminate
Sweet Chelsea	Cherry	Red	Yes	V,F,N,Tomv	Indeterminate
Sun Gold	Cherry	Orange	Yes	F, Tomv	Indeterminate
Sweet Treats	Cherry	Pink	Yes	F,Tomv,Gls	Indeterminate
BHN 785	Grape	Red	Yes	F	Determinate
Mini Charm	Grape	Red	Yes	V,F,Tomv	Indeterminate
Smarty	Grape	Red	Yes	V, F	Indeterminate
Jolly Elf	Grape	Red	Yes	V,F	Determinate
Jolly Girl	Grape	Red	Yes	V, F	Determinate
Cupid	Grape	Red	Yes	F, Asc	Indeterminate
Juliet	Large Grape	Red	Yes		Indeterminate

<sup>1</sup> Resistances or tolerances: V = Verticillium wilt; F = Fusarium wilt; N = Root knot nematode, Asc = Alternaria stem canker; .

(Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

Gls = Gray leaf spot; Tomv = Tomato mosaic virus; Tswv = Tomato spotted wilt virus; Lb = Late blight; Eb = Early blight. .

(Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

Tmv = Tobacco mosaic virus. For information on resistance to specific disease races or species contact your seed supplier. .

(Abbreviations applicable to this table; not necessarily elsewhere in this guide.)

**Recommended Heirloom Tomatoes**

Variety	Maturity	Size	Shape	Color	Plant Form
Mortgage Lifter	Late	Large	Beefsteak	Pink skin, Pink flesh	Indeterminate
Hawaiian Pineapple	Late	Large	Beefsteak	Orange bicolor	Indeterminate
Prudens Purple	Mid	Large	Globe	Deep pink skin and flesh	Indeterminate, potato leaf
Mister Stripy	Late	Large	Round	Bicolor red and yellow	Indeterminate
Brandywine Red	Late	Large	Beefsteak	Red skin, red flesh	Indeterminate, potato leaf
Box Car Willie	Late	Med-large	Globe	Red skin, red flesh	Indeterminate
Eva Purple Ball	Mid	Medium	Round	Deep pink skin and flesh	Indeterminate
Arkansas Traveler	Late	Medium	Round	Red skin, red flesh	Indeterminate
Costoluto Genovese	Late	Medium	Ribbed flat globe	Red skin and flesh	Indeterminate
Snow White	Late	Small	Round cherry	Yellow skin and flesh	Indeterminate
Yellow Pear	Late	Small	Small pear	Yellow skin and flesh	Indeterminate

**Recommended Processing Tomatoes**

Variety	Season	Hybrid	Disease Resistance <sup>1</sup>
TSH4	Early	Yes	V,F,Bs
H-3402	Mid	Yes	V,F,N,Bs
H-9704	Mid	Yes	V,F,Asc
H-9997	Early	Yes	V,F,N,Asc,Bs

Most of these plantings are contracted by processor; consult with them to determine preferred varieties

<sup>1</sup>Disease resistance or tolerance: V = F = Fusarium wilt, Asc = Alternaria stem canker,

N = Root knot nematode, Bs = Bacterial speck

### 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.

Tomatoes	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 <sub>2</sub> O <sub>5</sub> per Acre				Pounds K <sub>2</sub> O per Acre				
Bare-Ground	80-90	200	150	100	0 <sup>1</sup>	300	200	100	0 <sup>1</sup>	Total nutrient recommended.
Fresh Market	40-45	200	150	100	0 <sup>1</sup>	300	200	100	0 <sup>1</sup>	Broadcast and disk-in.
	40-45	0	0	0	0	0	0	0	0	Sidedress when first fruits are set.
Processing	50-75	200	150	100	0 <sup>1</sup>	250	150	100	0 <sup>1</sup>	Total nutrient recommended.
Marchine Harvest	25	200	150	100	0 <sup>1</sup>	250	150	100	0 <sup>1</sup>	Broadcast and disk-in.
	25-50	0	0	0	0	0	0	0	0	Sidedress at first cultivation.
Polyethylene	150-210	200	150	100	0 <sup>1</sup>	300	200	100	0 <sup>1</sup>	Total nutrient recommended.
Mulched	0	200	150	100	0 <sup>1</sup>	150	100	50	0	Broadcast and disk-in.
Fresh Market	50-85	0	0	0	0	0	0	0	0	Incorporate into the plant bed before laying polyethylene mulch.
	90-125	0	0	0	0	150	100	50	0 <sup>1</sup>	Fertigate 0.5 to 2.5 pounds per day. See chart and Drip/Trickle Fertilization section.

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

<sup>1</sup>In Virginia, crop replacement values of 50 lbs. P<sub>2</sub>O<sub>5</sub> and 50 lbs. K<sub>2</sub>O per acre are recommended on soils testing Very High.

### Suggested Fresh Market Tomato Fertigation Schedule

This table provides examples of fertigation schedules based on two common scenarios - sandy coastal plain soils and heavier upland soils. It should be modified according to specific soil tests and base fertility.

Fertigation recommendations for 150 lbs N and 150 lbs K <sub>2</sub> O <sup>1,2</sup>									
For soils with organic matter content less than 2% or coarse texture and low to medium or deficient K									
			Nitrogen			Potash			
Preplant (lbs/a) <sup>3</sup>			50			125			
			N	N	N	K <sub>2</sub> O	K <sub>2</sub> O	K <sub>2</sub> O	
Stage and Description	Weeks	Days	lbs/day	lbs/week	lbs/stage	lbs/day	lbs/week	lbs/stage	
<b>1 Early vegetative</b>	1, 2	1-14	0.5	3.5	7	0.5	3.5	7	
<b>2 Late vegetative</b>	3, 4	15-28	0.7	4.9	9.8	0.7	4.9	9.8	
<b>3 Early flowering</b>	5, 6	29-42	1.0	7	14	1	7	14	
<b>4 Flowering &amp; fruiting</b>	7, 8	43-56	1.5	10.5	21	1.5	10.5	21	
<b>5 Early harvest</b>	9, 10, 11	57-77	2.2	15.4	46.2	2.2	15.4	46.2	
<b>6 Later harvest<sup>4</sup></b>	12, 13, 14	78-98	2.5	17.5	52.5	2.5	17.5	52.5	
Fertigation recommendations for 75 lbs N and 75 lbs K <sub>2</sub> O <sup>1,2</sup>									
For soils with organic matter content greater than 2% or fine texture and high or optimum K									
			Nitrogen			Potash			
Preplant (lbs/a) <sup>3</sup>			50			50			
			N	N	N	K <sub>2</sub> O	K <sub>2</sub> O	K <sub>2</sub> O	
Stage and Description	Weeks	Days	lbs/day	lbs/week	lbs/stage	lbs/day	lbs/week	lbs/stage	
<b>1 Early vegetative</b>	1, 2	1-14	0.25	1.75	3.5	0.25	1.75	3.5	
<b>2 Late vegetative</b>	3, 4	15-28	0.35	2.45	4.9	0.35	2.45	4.9	
<b>3 Early flowering</b>	5, 6	29-42	0.5	3.5	7	0.5	3.5	7	
<b>4 Flowering &amp; fruiting</b>	7, 8	43-56	0.75	5.25	10.5	0.75	5.25	10.5	
<b>5 Early harvest</b>	9, 10, 11	57-77	1.1	7.7	23.1	1.1	7.7	23.1	
<b>6 Later harvest<sup>4</sup></b>	12, 13, 14	78-98	1.25	8.75	26.25	1.25	8.75	26.25	

<sup>1</sup>Rates above are based on 7260 linear bed feet per acre (6-ft bed spacing). If beds are closer or wider, fertilizer rates should be adjusted proportionally. Drive rows should not be used in acreage calculations. See Fertigation in C-Irrigation Management for more information.

<sup>2</sup>Base overall application rate on soil test recommendations.

<sup>3</sup>Applied under plastic mulch to effective bed area using modified broadcast method.

<sup>4</sup>For extended harvest after 10 weeks continue fertigation at this rate.

## Plant Tissue Testing and Petiole Sap Testing

Plant tissue testing and petiole sap testing are valuable tools to assess crop nutrient status during the growing season, to aid with in-season fertility programs, or to evaluate potential deficiencies or toxicities. The following are critical petiole sap and tissue test values for tomatoes.

Tomato Developmental Stage	Fresh Petiole Sap Concentration (ppm)	
	NO <sub>3</sub> -N	K
First buds	1000-1200	3500-4000
First open flowers	600-800	3500-4000
Fruits one-inch diameter	400-600	3000-3500
Fruits two-inch diameter	400-600	3000-3500
First harvest	300-400	2500-3000
Second harvest	200-400	2000-2500

### Critical tomato tissue test values.

Timing	Value	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
		%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
Most recently matured leaves prior to blossom	Deficient	<3.0	0.3	3	1	0.3	0.3	<40	30	25	20	5	0.3
	Adequate range	3	0.3	3	1	0.3	0.3	40	30	25	20	5	0.2
		5	0.6	5	2	0.5	0.8	100	100	40	40	15	0.6
	High	>5.0	0.6	5	2	0.5	0.8	>100	100	40	40	15	0.6
	Toxic (>)	-	-	-	-	-	-	-	-	-	-	-	-
Most recently matured leaves at first flower	Deficient	<2.8	0.2	2.5	1	0.3	0.3	<40	30	25	20	5	0.2
	Adequate range	2.8	0.2	2.5	1	0.3	0.3	40	30	25	20	5	0.2
		4	0.4	4	2	0.5	0.8	100	100	40	40	15	0.6
	High	>4.0	0.4	4	2	0.5	0.8	>100	100	40	40	15	0.2
	Toxic (>)	-	-	-	-	-	-	-	1500	300	250	-	-
Most recently matured leaves at early fruit set	Deficient	<2.5	0.2	2.5	1	0.25	0.3	<40	30	20	20	5	0.2
	Adequate range	2.5	0.2	2.5	1	0.25	0.3	40	30	20	20	5	0.2
		4	0.4	4	2	0.5	0.6	100	100	40	40	10	0.6
	High	>4.0	0.4	4	2	0.5	0.6	>100	100	40	40	10	0.6
	Toxic (>)	-	-	-	-	-	-	-	-	-	250	-	-

### Seed Treatment

Hot water treatment is administered to eradicate bacterial pathogens from seeds. Check with your seed company to determine if seed is hot water treated. Purchase hot water treated seed if possible or request hot water seed treatment. For more information to prevent disease see Disease Management in Section E.

### Hardening Transplants

It is usually desirable to harden tender tomato seedlings before planting them in the field. Recent research has shown that hardening tomato plants by exposure to cool temperatures 60° to 65°F (15.6° to 18.3°C) day and 50° to 60°F (10° to 15.6°C) night for one week or more causes catfacing. Harden plants by withholding nitrogen and reducing water. Allow plants to wilt slightly between light waterings.

### Drip/Trickle Fertilization

For any nutrient management program, begin by obtaining an accurate soil test from a certified laboratory. Choose a nutrient program as necessary to meet your individual

production system requirements based on soil and production history.

Before laying plastic mulch, adjust soil pH to 6.5 and apply enough farm-grade fertilizer to supply 50 to 85 pounds per acre of N, depending on soil and yield potential. You should also apply the balance of your needed K<sub>2</sub>O that you do not plan to apply via fertigation as a modified broadcast application that treats only the mulched area. Nitrogen fertilizer should be incorporated into the bed or split between incorporated and a surface band bed treatment immediately before laying plastic mulch.

After laying plastic mulch and installing the trickle irrigation system, apply completely soluble fertilizer through the drip system to supply additional nitrogen and potash throughout the season, depending on soil texture and yield potential (see table for suggested schedule). Nitrogen and potassium fertigation should be increased over the growing season as plants mature (see table for example). Adjust rates as necessary based on soil and tissue tests.

## Fresh Market

Yield, fruit size, and fruit quality of fresh market tomatoes is increased by the use of black plastic mulch in combination with trickle irrigation. Form raised, dome-shaped beds to aid in disease control. Lay 4-foot wide black plastic mulch tightly over the beds.

For early summer harvest of market tomatoes, start transplanting April 10 to 20 in southern or normally warmer areas, and May 10 to 25 in cooler, northern areas.

See the Drip Irrigation section of General Production Recommendations for detailed recommendations on fertilizing tomatoes grown with plastic mulch and drip irrigation.

## Ground Culture

Space *determinate* vined varieties in rows 4 to 5 feet apart with plants 15 to 24 inches apart in the row. For *indeterminate* varieties, space rows 5 to 6 feet apart with plants 24 to 36 inches apart in the row.

## Stake Culture

Staking tomatoes is a highly specialized production system. Staking improves fruit quality by keeping plants and fruit off the ground and allows for better spray coverage. Staked tomatoes are easier to harvest than are non-staked tomatoes. Recommendations below are for the short-stake cultural system using determinate cultivars that grow 3 to 4 feet in height. Row widths of 5 to 6 feet with in-row spacings from 18 to 24 inches between plants are recommended.

**Pruning.** Pruning is practiced to establish a desired balance between vine growth and fruit growth. Little to no pruning results in a plant with a heavy load of smaller fruit. Moderate pruning results in fewer fruits that are larger and easier to harvest. Pruning can result in earlier maturity of the crown fruit and improve spray coverage and pest control. Pruning method is variety and fertility dependent. Less vigorous determinate cultivars generally require less pruning. Growers should experiment with several degrees of pruning on a small scale to determine pruning requirements for specific cultivars and cultural practices.

Removing all suckers up to the one immediately below the first flower cluster is adequate for most determinate cultivars. Removing the sucker immediately below the first flower cluster or pruning above the first flower cluster can result in severe leaf curling and stunting of the plant and should be avoided. Prune when the suckers are 2 to 4 inches long. A second pruning may be required to remove suckers that are too small to be easily removed during the first pruning and to remove ground suckers that may develop. Pruning when suckers are too large requires more time and can damage the plants, delay maturity, and increase disease incidence. Do not prune plants when they are wet to avoid spread of bacterial diseases. Pruning should be done before the first stringing because the string can slow down the pruning process.

**Staking.** Staking tomatoes consists of a series of wooden stakes with twine woven around the stakes to train the plants to grow vertically off the ground. Stakes 4- to 4½-foot long by 1-inch square are driven approximately 12 inches into the soil between the plants.

Vigorous cultivars may require larger and longer stakes. A stake placed between every other plant is adequate to support most determinate varieties. Placing an additional stake at an

angle and tied to the end stake of each section or row will strengthen the trellis system. Stakes can be driven by hand with a homemade driving tool or with a commercially available, power-driven stake driving tool. Drive stakes to a consistent depth so that spray booms can be operated in the field without damaging the trellis system. Select "tomato twine" that is resistant to weathering and stretching and that binds well to the wooden stakes. Tomato twine is available in 3- to 4-pound boxes, and approximately 30 pounds per acre are required. To make tying convenient, use a homemade stringing tool. This tool can be made from a length of metal conduit, PVC pipe, broom handle, or wooden dowel. With conduit or PVC pipe, the string is fed through the pipe. With a broom handle or wooden dowel, two small parallel holes, each approximately ½ to 1 inch from the end, must be drilled to feed the string through one hole along the length of the tool and through the other hole. The tool serves as an extension of the worker's arm (the length cut to the worker's preference) and helps to keep the string tight.

Proper stringing consists of tying the twine to an end stake passing the string along one side of the plants, looping the twine around each stake until you reach the end of a row or section (100-foot sections with alleys may be helpful for harvesting). The same process is continued on the other side of the row. The string tension must be tight enough to hold the plants upright but harvest can be difficult and strings can scar fruit if they are too tight.

The first string should be strung 8 to 10 inches above the ground when plants are 12 to 15 inches tall and before they fall over. Run the next string 6 to 8 inches above the preceding string before plants start to fall over. Three to 4 stringings are required for most determinate varieties. Stringing should be done when the foliage is dry to prevent the spread of bacterial diseases.

## Processing Tomatoes

### Transplanting

Processing tomatoes can be transplanted starting April 15 to 20 in warmer, southern areas to May 5 to 10 in Pennsylvania and normally cooler areas. Successive plantings can be made through early June.

Space transplants 9 to 12 inches apart in single rows 5 feet apart or to accommodate machine harvesters. Small, determinate varieties may be grown in double rows. Space double rows 12 inches apart and space plants 12 to 18 inches apart in each of the double rows. Plant spacing appears to affect fruit size and yield, but research is not yet complete.

### Fruit Ripening

Ethephon is a growth regulator labeled for use on processing tomatoes. Proper application increases earliness and yield and decreases sorting of green fruit in machine-harvested tomatoes. Rate and time of application are critical for successful use of ethephon. See state fact sheets or product label for details on rates, time of application, and temperature effects.

### Harvest and Post Harvest Considerations

Tomatoes may be harvested at the mature green stage (when and after which the fruit cavity is filled by gel), breaker stage (just showing pink at the bottom of the fruit), semi-ripe (with different amounts of red pigmentation) or fully ripe, depending on marketing requirement. Tomato fruits are very perishable and subject to surface and internal damage, and must be handled with care. If tomatoes are to be harvested at

breaker, partially ripe, or vine-ripe stages, fields should be harvested often and thoroughly to hasten the ripening of later fruits and reduce the overall range of ripeness. Harvesting every day may be desirable during the peak of the season. Remove all diseased, misshapen, and otherwise cull tomatoes from the vines as soon as they are discovered. Remove discarded tomatoes from the field to avoid the spread and buildup of diseases and insect pests. For standard slicing tomatoes, cherry tomatoes, and plum tomatoes, remove the stem during picking. Cluster tomatoes are harvested with the whole truss attached to fruits.

Tomatoes should be washed sufficiently to remove dust and foreign material by hand with clean cloths or mechanically by spraying them with a small amount of chlorinated water as they move over a set of soft brush rolls. The small amount of retained water may be removed by absorbent rollers alone or in combination with an overhead air-blast drier. The wash water should be several degrees warmer than the pulp temperature of the tomatoes to avoid drawing water and disease organisms into the fruit. The water should be chlorinated at the rate of 125 ppm. The chlorine level and pH (6.0 – 7.0) of the wash water should be checked at least hourly during the day with test papers or a meter.

Tomatoes are then sized and separated by color and grade and carefully packed into 25 lb. boxes.

### Size Classification of Tomatoes

Size Designation	Diameter (inches)	
	Minimum*	Maximum**
Extra small	1-28/32	2-4/32
Small	2-4/32	2-9/32
Medium	2-9/32	2-17/32
Large	2-17/32	2-28/32
Extra large	2-28/32	3-15/32

### Color Classification of Tomatoes

Tomatoes may be graded into the following color classes (some classes may be combined):

**Green** - The surface of the tomato is completely green. The shade of green may vary from light to dark. Mature green fruits are typically ripened at the terminal market or by the repacker with ethylene gas.

**Breakers** - There is a definite break in the color from green to tannish yellow with pink or red skin covering not more than 10% of the surface.

**Turning** - More than 10% but not more than 30% of the surface, shows a definite change in color from green to tannish yellow, pink, red, or a combination of those colors.

**Pink** - More than 30% but not more than 60% of the surface shows pinkish red or red color.

**Light Red** - More than 60% but not more than 90% shows pinkish red or red color.

**Red** - More than 90 percent of the surface shows red color.

For long distance shipping, mature green harvest is the common practice. For local wholesale, harvest is usually at the breaker stage. For direct market, harvest is at the ripe stage. Store mature-green tomatoes at 55 to 70°F; breakers, partially ripe, and ripe fruit at 50°F and a relative humidity of 90 to 95%. Exposing tomatoes to temperatures below 50°F results in loss of color, shelf life, firmness and flavor.

## Tomato Disorders

### Catfacing

Fruits are malformed and scarred, usually at the blossom end. Catfacing is caused by one week of exposure of seedlings to day temperatures in the range 60° to 65°F (15.6° to 18.3°C) and night temperatures at 50° to 60°F (10° to 15.6°C) approximately 4 weeks before pollination. The first flower cluster is susceptible to low temperature-induced catfacing when seedlings have 4 to 5 true leaves. Fruits on later clusters will show catfacing if exposed to low temperatures in the field. Avoid hardening seedlings by exposure to low temperatures. Varieties differ in their susceptibility to the disorder.

### Internal Browning (IB), Graywall (GW), and Blotchy Ripening (BR)

These problems are a complex of physiological disorders and pathological diseases. Green fruit with IB have brown necrotic areas in the walls and internal tissues. Areas around necrotic tissue ripen slowly and unevenly, resulting in a mottled, greenish-yellow and red fruit color. IB can be caused by tobacco mosaic virus (TMV).

Irregular, grayish-brown blotchy areas (GW) can occur on the upper half of fruit free of TMV. On ripening, fruit with GW or BR have blotchy areas of green and yellow tissue surrounded by areas of normal red tissue. Greenish-white and white tissue is usually present in the fruit walls, and brown necrotic areas may be located around the vascular system of the fruit. Yellow-eye, a ring of yellow tissue surrounding the stem scar, often occurs in fruit with BR and internal white tissue.

GW and BR symptoms often appear on shaded fruit growing in the interior of dense, vegetative plants. Cloudy, moist, cool weather; high soil moisture; high nitrogen; soil compaction; and low potassium increase the incidence and severity of GW and BR.

### Yellow Shoulders

Yellowing may occur on the shoulders of the fruit exposed to the sun, especially on varieties having darker green shoulders when immature (those lacking the uniform ripening gene). The tissue beneath the yellow shoulder is usually corky and may vary from greenish white to pale yellow. This disorder can be overcome by selection of varieties with the uniform ripening gene. Provide good fruit cover as described below.

### Sunburn and Suncald

Sunburn and suncald result from exposure to direct sunlight. Mild sunburn appears as yellowish or yellow-red color of fruit on the side exposed to the sun. Severe symptoms appear as whitish, water-soaked, scalded, or blistered areas. Suncald is more severe on fruit growing in shaded conditions, followed by exposure to direct sunlight due to defoliation or exposure during harvesting. Under dry conditions, the white areas can become dry and leathery. Secondary infection can produce a dark, dry rot. Under moist conditions, scalded areas can decay from secondary infections. To control sunburn and suncald, select varieties with good fruit cover, supply sufficient water and nutrients to provide good vegetative growth and manage pests. Train workers to avoid turning vines during harvesting or to reposition vines to shade fruit.

### Blossom-End Rot (BER)

This physiological disorder is caused by inadequate movement of calcium into the fruit. BER occurs when soil moisture is low and is more severe when plants have small, shallow root systems. Plastic mulch can restrict the movement of water to the root zone and increase BER. Hot, windy conditions increase water loss from the plant and increase the incidence of BER.

Be sure soil calcium is sufficient and in balance with other essential plant nutrients. Test the soil and apply lime and fertilizer according to recommendations, then lay plastic mulch when soil moisture is optimum for planting. Apply irrigation to wet the root zone and encourage deep root development.

### Fruit Cracking and Russeting

Fruit cracking is due to rapid uptake of water by the fruit, resulting in enlargement of cells and separation of the epidermis of the fruit. Water can be taken up by the fruit through the roots and vascular system or through the fruit tissue around the stem scar.

The type of cracking (*concentric* cracks around the stem, *radial* cracks radiating out from the stem, or *diagonal* or *transverse* cracks across the fruit) is determined primarily by fruit structure and variety. More than one type of cracking may be present in a variety or an individual fruit.

The severity of cracking is determined by rainfall and irrigation amounts, variety and stage of maturity. As the fruit ripens, the strength of bonding between cells progressively decreases, resulting in more severe cracking. Severity of cracking is increased by high rainfall and irrigation, or frequent low to moderate rainfall, especially following a period of low soil moisture.

To minimize cracking, select a crack-resistant variety. Maintain a high level of calcium in the soil. Keep fruit growing at a uniform rate by maintaining uniform soil moisture levels. Maintain good fruit cover by proper fertilization and fungicide applications. Harvest fruit at the earliest stage of maturity that is acceptable by your market. Russeting or weather checking of the surface of the fruit is caused by the presence of water on the fruit surface for extended periods of time when there are frequent light rainfalls, mist, fog, and dew. Wide fluctuations in temperature of exposed fruit also contribute to russeting. Russeting can cause fruit to be unmarketable. Maintain good fruit cover by proper fertilization and fungicide applications. Use varieties that feature a dense canopy and resistance to foliar diseases.

### Weed Control

Section 18 Emergency Label requests may be submitted to supplement weed control recommendations in tomatoes.

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.

See "Mulching" section above for further information on weed control under plastic mulch.

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.

### For Weed Control Under Plastic Mulch

Black plastic mulch effectively controls most annual weeds by preventing light from reaching the germinated seedling. Herbicides are used under plastic mulch to control weeds around the planting hole, and under the mulch when plastic mulch is used. Trickle irrigation tubing left on the soil surface may cause weed problems by leaching herbicide away at the emitters. The problem is most serious when clear plastic mulch is used. Bury the trickle tubing several inches deep in the bed to reduce this problem.

1. Complete soil tillage, and form raised beds, if desired, prior to applying herbicide(s). Do not apply residual herbicides before forming beds, or herbicide rate and depth of incorporation may be increased, raising the risk of crop injury. When beds are formed and plastic mulch laid in a single pass, the herbicide should be applied after the bed is formed, as a part of the same operation.
2. Apply herbicide(s) recommended for use under plastic mulch in a band as wide as the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Use the trickle irrigation to provide moisture if the soil is too dry for condensation to form on the underside of the mulch.
3. Complete by laying the plastic mulch and trickle irrigation tubing, if used, immediately after the herbicide application. Delay punching the planting holes until seeding or transplanting.

**Note:** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### Pretransplant Incorporated or Pretransplant

Metribuzin--0.25 lb/A. Apply 0.33 pounds per acre metribuzin (or OLF) in a band under the plastic, immediately before laying the mulch. Mechanically incorporate before laying the mulch, or apply to the soil surface and incorporate with the condensation that forms on the underside of the mulch. Primarily controls broadleaf weeds. Tank-mix with Devrinol control annual grasses.

### Pretransplant

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted tomatoes in New Jersey and Virginia only. 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 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey after the final bed is formed and the drip tape is laid and immediately prior to laying plastic mulch. Soil must not be disturbed by any mechanical process after application. Unless restricted by other products (e.g. soil sterilants or fumigants), crops may be transplanted immediately following the Reflex application. Tomato transplants must have a minimum of 5 true leaves when planted into soil

treated with Reflex. Transplants with fewer than 5 true leaves have a greater risk of injury. Tomato varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety.

New Jersey: A maximum of 1.25 pint of Reflex (**or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen**); Virginia: A maximum of 1.5 pint of Reflex (**or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen**) may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24c label for specifics. Do not harvest within 70 days of application.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG in a band under plastic mulch to suppress or control broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Condensation that forms on the underside of the mulch will activate the herbicide. Delay transplanting for seven days after application. Occasionally, slight stunting may be observed following Sandea use early in the season. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **DO NOT** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed a total of 0.047 pound per acre, equal to 1.0 dry ounce of Sandea, applied pretransplant under plastic mulch.**

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT preemergence in a band under the plastic, immediately before laying the mulch. Condensation that forms on the underside of the mulch will activate the herbicide. Annual grasses and certain annual broadleaf weeds will be suppressed or controlled under the mulch and around the plant hole. Combine with metribuzin to improve the spectrum of broadleaf weeds controlled. Use lower rate on coarse-textured or sandy soil. Devrinol may reduce stand and yield of fall grains. Moldboard plowing will reduce the risk of injury to a small grain follow crop.

### **Soil Strips Between Rows of Plastic Mulch (Directed and Shielded Band Applications)**

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop to treat **Soil Strips Between Rows of Plastic Mulch**, or crop injury and/or poor weed control may result.

1. Complete soil preparation, apply herbicide(s) under the mulch (see above and below), and lay plastic and trickle

irrigation (optional) before herbicide application between the rows.

2. Spray preemergence herbicide(s), registered and recommended for use on the crop in bands onto the soil and the shoulders of the plastic mulch before planting and weeds germinate, **OR** apply after planting as a shielded spray combined with a postemergence herbicide to control emerged weeds. **DO NOT broadcast spray over the plastic mulch at any time!**
3. Incorporate preemergence herbicide into the soil with ½ to 1 inch of rainfall or overhead irrigation within 48 hours of application.
4. Apply Gramoxone in bands to the soil strips between the plastic mulch before the crop emerges or is transplanted, **AND/OR** as a shielded spray postemergence to control emerged weeds. Use in combination with residual herbicides that are registered for use.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### **Pretransplant/ Preemergence to the Weeds**

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted tomatoes in New Jersey and Virginia only. 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 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey as a shielded banded spray directed toward the soil between the rows of plastic mulch pre-transplant.

New Jersey: A maximum of 1.25 pint of Reflex (**or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen**); Virginia: A maximum of 1.5 pint of Reflex (**or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen**) may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24c label for specifics. Do not harvest within 70 days of application.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG as a banded directed shielded spray to the soil strips between rows of plastic mulch to suppress or control broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf

weeds when growing other crops in the rotation. **DO NOT** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed a total of 0.047 pound per acre, equal to 1 dry ounce of Sandea, applied preemergence. DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea, applied preemergence and postemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea, applied preemergence and postemergence to multiple crops in a 1 year (12 month) period.**

S-metolachlor--0.95 to 1.9 lb/A. Apply 1.0 to 2.0 pints per acre Dual Magnum 7.62E as a banded directed shielded spray to control annual grasses, yellow nutsedge, nightshade species, galinsoga, and certain other broadleaf weeds. Use as a surface-applied banded spray, preemergence to the weeds. Posttransplant banded directed shielded sprays should be applied to weed-free soil. Dual Magnum will not control emerged weeds. Control emerged weeds with Gramoxone added to the shielded and directed banded herbicide spray. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Apply only when the soil surface is dry to avoid risk of vapor drift injury to the crop. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Make only one application during the growing season. **DO NOT** apply within 30 days of harvest if 1.33 pints per acre or less is used, or within 90 days of harvest if more than 1.33 pints per acre is used except in VA, where a 60 day PHI must be observed when 1.67 pints or less Dual Magnum is used per year. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.**

Metribuzin--0.25 lb/A. Apply 0.33 pounds per acre metribuzin (or OLF) as a banded directed shielded spray. Primarily controls broadleaf weeds. Tank-mix with Devrinol, or Treflan to control annual grasses at planting, or use a postemergence herbicide. An additional postemergence application of metribuzin may be necessary to control broadleaf weeds.

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. Use the lower rate on coarse-textured or sandy soils. May reduce stand of and yield of fall grains. Moldboard plowing will reduce the risk of injury.

Pendimethalin--0.48 to 1.42 lb/A. Apply 1.0 to 3.0 pints per acre Prowl H<sub>2</sub>O as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds. Use the lower rate on coarse-textured or sandy soils. **DO NOT apply "over the top" of the crop, or severe injury may occur. Observe a 70 day PHI (PreHarvest Interval).**

### Postemergence

DCPA--6.0 to 10.5 lb/A. Apply 8.0 to 14.0 pints per acre Dacthal 6F as a banded directed shielded spray 4 to 6 weeks after transplanting for preemergence weed control. Emerged weeds will not be controlled. Dacthal will not

injure crop foliage. Spray as a band directed between the rows of plastic mulch. Controls late season annual grasses, common purslane, and other broadleaf weeds.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG as a banded directed shielded spray to the soil strips between rows of plastic mulch to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga. Sandea applied postemergence will not control common lambsquarters or eastern black nightshade. Add nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution). **DO NOT** use oil concentrate. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **DO NOT** apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea applied in a 1 year (12 month) period**

Paraquat--0.6 lb/A. Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a **banded directed shielded spray between the rows ONLY**, to control emerged grass and broadleaf weed seedlings. Do not allow spray to contact plants as injury or residues may result. Use shields to prevent spray contact with crop plants. Do not exceed a spray pressure of 30 psi.

Add wetting agent as per label.

Pendimethalin--0.48 to 1.42 lb/A. Apply 1.0 to 3.0 pints per acre Prowl H<sub>2</sub>O as a banded directed shielded spray and activate with one-half inch of rainfall or sprinkler irrigation within 48 hours of application to control most annual grasses and certain broadleaf weeds preemergence. Use the lower rate on coarse-textured or sandy soils. Tank-mix with paraquat to control emerged weeds. **Do NOT apply "over the top" of the crop, or severe injury may occur. Observe a 70 day PHI (PreHarvest Interval).**

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 (1.0 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 20 days.

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 (1.0 gallon per 100 gallons of spray solution) postemergence as a banded directed shielded spray 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 20 days and apply no more than 4.5 pints per acre in one season.

### **For Transplanting Into Soil Without Plastic Mulch (Broadcast Applications)**

Use the following land preparation, treatment, planting sequences, and herbicides labeled for the crop when **planting into Soil Without Plastic Mulch**, or crop injury and/or poor weed control may result.

1. Complete soil tillage, apply preplant incorporated herbicide(s), and incorporate. Use a finishing disk or field cultivator that sweeps at least 100% of the soil surface twice, at right angles, operated at a minimum of 7 miles per hour (mph), OR a PTO driven implement once, operated at less than 2 miles per hour (mph).
2. Seed and apply preemergence herbicide(s) immediately after completing soil tillage, and mechanical incorporation of preplant herbicides. Irrigate if rainfall does not occur, to move the herbicide into the soil and improve availability to germinating weed seeds within 2 days of when the field was last tilled, or plan to control escaped weeds by other methods.

**Note.** All herbicide rate recommendations are made for spraying a broadcast acre (43,560 ft<sup>2</sup>).

### **Preplant Incorporated-Transplants**

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT prior to transplanting. Incorporate thoroughly to a depth of 2 to 3 inches the same day as application. Use lower rate on coarse-textured or sandy soils. Primarily controls annual grasses and certain broadleaf

weeds. Use in combination with metribuzin to improve the spectrum of broadleaf weeds controlled. May reduce stand and yield of fall grains if fields are only disked. Moldboard plowing will reduce the risk of injury.

Trifluralin--0.5 to 1.0 lb/A. Apply 1.0 to 2.0 pints per acre Treflan4EC (or OLF). Incorporate with double-disking into 2 to 3 inches of soil within 8 hours after application. Mount the boom on the front of disk. Primarily controls annual grasses and certain broadleaf weeds. Use in combination with metribuzin to improve the spectrum of broadleaf weeds controlled. Stunting may result if weather is cool and damp. Will not control ragweed, jimsonweed, or morningglory.

Metribuzin--0.25 lb/A. Apply 0.33 pounds per acre metribuzin (or OLF) and incorporate before transplanting tomato plants with a minimum of 5 true leaves. Transplants with less than 5 true leaves are at greater risk of herbicide injury. Primarily controls broadleaf weeds. Tank-mix with Devrinol, or Treflan to control annual grasses at planting, or use Poast 1.5EC to control grasses postemergence. An additional postemergence application of metribuzin may be necessary to control broadleaf weeds.

### **Pretransplant Incorporated or Pretransplant**

S-metolachlor--0.95 to 1.9 lb/A. Apply 1.0 to 2.0 pints per acre Dual Magnum 7.62E as a pretransplant incorporated or pretransplant surface applied spray to control annual grasses, yellow nutsedge, nightshade species, galinsoga, and certain other broadleaf weeds. Apply Dual Magnum before weeds germinate. Dual Magnum will not control emerged weeds. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Make only one application during the growing season. DO NOT apply within 30 days of harvest if 1.33 pints per acre or less is used, or within 90 days of harvest if more than 1.33 pints per acre is used except in VA, where a 60 day PHI must be observed when 1.67 pints or less Dual Magnum is used per year. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.**

### **Pretransplant**

Fomesafen--0.25 to 0.375 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Reflex 2E to control weeds in transplanted tomatoes in New Jersey and Virginia only. 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. Transplanted tomatoes ONLY.** Apply 16 to 24 fl oz/A in Virginia and 16 to 20 fl oz/A in New Jersey up to 7 days prior to transplanting. Effectiveness may be reduced if untreated soil is exposed during transplanting or other field operations. Transplants with fewer than 5 true leaves have increased risk of injury. Overhead irrigation or rainfall prior to transplanting will activate the herbicide and reduce the risk of injury. Avoid field operations that may concentrate Reflex treated soil around the transplant root ball. During transplanting be sure the soil in the transplant hole settles flush or above

surrounding soil surface. Tomato varieties may vary in their response to Reflex; therefore, treat small acreages first to determine crop tolerance, especially when applying to a new variety.

New Jersey: A maximum of 1.25 pint of Reflex (**or a maximum of 0.313 lb ai/A of fomesafen from any product containing fomesafen**); Virginia: A maximum of 1.5 pint of Reflex (**or a maximum of 0.375 lb ai/A of fomesafen from any product containing fomesafen**) may be applied per acre in ALTERNATE years. Be sure to consider rotational crops when deciding to apply fomesafen. If crop is replanted do not re-apply Reflex. Rotational restrictions are dependent on whether fomesafen was applied under the plastic, bare ground, or over plastic mulch, refer to 24c label for specifics. Do not harvest within 70 days of application.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG to suppress or control broadleaf weeds including common cocklebur, redroot, pigweed, smooth pigweed, ragweed species, and galinsoga. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Occasionally, slight stunting may be observed following Sandea use early in the season. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **DO NOT** apply Sandea to crops treated with a soil applied organophosphate insecticide, or use a foliar applied organophosphate insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed a total of 0.047 pound per acre, equal to 1 dry ounce of Sandea, applied pretransplant. DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea, applied preemergence and postemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea, applied preemergence and postemergence to multiple crops in a 1year (12 month) period.**

### Postemergence-Transplanted

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 (1.0 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 20 days.

DCPA--4.5 to 10.5 lb/A. Apply 6.0 to 14.0 pints per acre Dacthal 6F to weed-free soil 4 to 6 weeks after transplanting or after direct-seeded plants are a minimum of 6 inches tall. The crop should be well established and growing under conditions that are favorable for good growth. Dacthal will provide residual control of annual grasses and certain broadleaf weeds, including common purslane, but will not control emerged weeds. Applications can be made over the top of the crop when grown without plastic mulch but must be banded between the rows when plastic mulch is used.

Halosulfuron--0.023 to 0.047 lb/A. Apply 0.5 to 1.0 dry ounce Sandea 75WG to suppress or control yellow nutsedge and broadleaf weeds including common cocklebur, redroot pigweed, smooth pigweed, ragweed species, and galinsoga after the crop has been transplanted at least 14 days. Sandea applied postemergence will not control common lambsquarters or eastern black nightshade. Add nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution). **DO NOT** use oil concentrate. Susceptible broadleaf weeds usually exhibit injury symptoms within 1 to 2 weeks of treatment. Typical symptoms begin as yellowing in the growing point that spreads to the entire plant and is followed by death of the weed. Injury symptoms are similar when yellow nutsedge is treated but may require 2 to 3 weeks to become evident and up to a month for the weed to die. Occasionally, slight yellowing of the crop may be observed within a week of Sandea application. When observed, recovery is rapid with no effect on yield or maturity. Sandea is an ALS inhibitor. Herbicides with this mode of action have a single site of activity in susceptible weeds. The risk of the development of resistant weed populations is high when herbicides with this mode of action are used continuously and exclusively to control a weed species for several years or in consecutive crops in a rotation. Integrate mechanical methods of control and use herbicides with a different mode of action to control the target broadleaf weeds when growing other crops in the rotation. **DO NOT** apply Sandea to crops treated with a soil applied organophosphate (OP) insecticide, or use a foliar applied organophosphate (OP) insecticide within 21 days before or 7 days after a Sandea application. **DO NOT exceed a total of 0.047 pound per acre, equal to 1.0 dry ounces of Sandea, applied postemergence. DO NOT exceed total of 0.094 pounds per acre, equal to 2.0 dry ounces of Sandea, applied preemergence and postemergence, per crop-cycle. DO NOT exceed a total of 0.094 pound per acre, equal to 2.0 dry ounces of Sandea applied preemergence and postemergence to multiple crops in a 1 year (12 month) period.**

Metribuzin--0.25 lb/A. Use 0.33 pound per acre Metribuzin 75DF on tomato plants with a minimum of 5 true leaves. Transplants with less than 5 true leaves are at greater risk of herbicide injury. Primarily controls broadleaf weeds, but does NOT control nightshades. Use Devrinol, or Treflan preplant incorporated or apply Poast 1.5EC postemergence to

control annual grasses. Applications should be delayed until transplants have a minimum of 5 true leaves, have recovered from transplant shock and new growth is evident, or at least 2 weeks. Do not treat tomato plants with less than 5 true leaves. Transplants with less than 5 true leaves are at greater risk of herbicide injury. Do not apply within 3 days after periods of cool, wet, or cloudy weather or crop injury will occur. Do not apply within 24 hours of treatment with other pesticides. Treatment with Sencor may be repeated in 14 days if necessary. Repeat application to suppress or control yellow nutsedge. Do not apply within 7 days of harvest.

Paraquat--0.6 lb/A. Apply 2.4 pints per acre Gramoxone SL 2.0 or OLF as a directed spray between the rows. Do not allow spray to contact plants, as injury or residues may result. Use shields to prevent spray contact with crop plants. Do not exceed a spray pressure of 30 psi. Add wetting agent as per label.

Rimsulfuron--0.0156 to 0.031 lb/A. Apply 1.0 to 2.0 dry ounces per acre of Matrix 25DF early postemergence to control many annual weeds. Optimum results are obtained when the weeds are very small, less than one inch in height, but not before the crop has at least two full-sized true leaves. Common lambsquarters, common ragweed, jimsonweed, morningglory species, and yellow nutsedge may only be suppressed. Tank-mix with metribuzin to increase the spectrum of weeds controlled. Always check and follow the application instructions on the label for both herbicides related to the size of the crop, size of the weeds, and weather conditions when applying as a tank-mixed combination. Add nonionic surfactant to be 0.25 percent of the spray solution (1.0 quart per 100 gallons of spray solution) to improve weed control. DO NOT exceed a total of 4.0 dry ounces of product per acre per year. **Labeled for use on processing and fresh market tomatoes in all states, except California.**

Rimsulfuron (Matrix 25DF) is an ALS inhibitor. Herbicides in this class of chemistry have a single site of action in susceptible plants. Always use sequentially or in a tank-mixed combination with other herbicides with a different site of action in the plant to prevent the development of resistant weed populations. Read and follow label cautions and resistance management recommendations.

S-metolachlor--0.95 to 1.9 lb/A. Apply 1.0 to 2.0 pints per acre Dual Magnum 7.62E as a shielded directed spray to control annual grasses, yellow nutsedge, nightshade species, galinsoga, and certain other broadleaf weeds. Posttransplant banded directed shielded sprays should be applied to weed-free soil after the first soil settling rainfall or overhead irrigation after transplanting. Dual Magnum will not control emerged weeds. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. Apply only when the soil surface is dry to avoid risk of vapor drift injury to the crop. Rainfall or irrigation after application is necessary before weeds emerge to obtain good control. Make only one application during the growing season. DO NOT apply within 30 days of harvest if 1.33 pints per acre or less is used, or within 90 days of harvest if more than 1.33 pints per acre is used except in VA, where a 60 day PHI must be observed when 1.67 pints or less Dual Magnum is used per year. **Other generic versions of metolachlor and s-metolachlor may be available, and may or may not be labeled for use in the crop.**

Sethoxydim--0.2 to 0.4 lb/A. Apply 1.0 to 2.0 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1.0 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 20 days and apply no more than 4.5 pints per acre in one season.

### Postharvest With or Without Plastic Mulch

Paraquat--0.6 lb/A. 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. Use to prepare plastic mulch for replanting, or to aid in the removal of the mulch. See the label for additional information and warnings.

### Insect Control

#### Field Tomatoes (Fresh Market and Processing Tomatoes)

**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](http://www.CDMS.net) or [www.greenbook.net](http://www.greenbook.net). Also, specific labels can be obtained via web search engines.

#### Aphids (Green Peach and Potato)

Apply one of the following formulations:

**Note:** Thorough spray coverage beneath leaves is important.

acetamiprid--2.0 to 4.0 oz/A Assail 30SG (or OLF)

bifenthrin+imidacloprid--5.10 to 9.85 fl oz/A Brigadier (or OLF)

*Chenopodium* extract--2.0 to 3.0 qts/A Requiem 25EC

clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC

flonicamid--2.00 to 4.28 oz/A Beleaf 50 SG

flupyradifurone--7.0 to 12.0 fl. oz/A Sivanto 200SL

imidacloprid--**soil** 7.0 to 10.5 fl oz/A Admire Pro (or OLF),

**foliar** 1.3 to 2.2 fl oz/A Admire PRO (or OLF)

imidacloprid+beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360

lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC

methomyl--1.5 to 3.0 pts/A Lannate LV

oxamyl--2.0 to 4.0 pt/A Vydate L

pymetrozine--2.75 oz/A Fulfill 50WDG

spirotetramat--4.0 to 5.0 fl oz/A Movento

thiamethoxam--soil 1.66 to 3.67 oz/A Platinum 75SG; **foliar** 2.0 to 3.0 oz/A Actara 25WDG (or other labeled mixtures containing thiamethoxam like Durivo and Voliam flexi)

**Armyworms (True Armyworm (TAW), Fall Armyworm (FAW), Yellow-striped Armyworm (YSAW), Beet Armyworm (BAW))**

bifenthrin--2.1 to 5.2 fl oz/A Bifenture 2EC (Sniper, or OLF) (**except BAW**) (or other labeled mixtures containing bifenthrin like Brigadier)

chlorantraniliprole--soil/drip/foliar 3.5 to 5.0 fl oz/A coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Durivo and Voliam flexi, and Voliam Xpress)

cyantraniliprole--soil 5.0 to 10.0 fl. oz/A (BAW, FAW) Verimark, **foliar** 7.0 to 13.5 fl. oz/A (BAW, FAW) Exirel emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5 SG

flubendiamide--1.5 fl oz/A Belt SC (or other labeled mixtures containing flubendiamide like Vetica)

lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress

methomyl--1.5 to 3.0 pts/A Lannate LV

methoxyfenozide--4.0 to 8.0 fl oz/A (early season), 8.0 to 16.0 fl. oz (late season) Intrepid 2F

novaluron--9.0 to 12.0 fl oz/A Rimon 0.83EC

spinetoram--5.0 to 10.0 fl oz/A Radiant SC

spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**

tebufenozide--6.0 to 8.0 fl. oz /A (early season), 8.0 to 16.0 fl. oz/A (late season) Confirm 2F

zeta-cypermethrin--3.2 to 4.0 fl oz/A Mustang Maxx (or OLF) (**except BAW**)

zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC (**except BAW**)

**Caterpillars Tomato Fruitworm also called Corn Earworm (CEW), Hornworm (HW), European Corn Borer (ECB), Cabbage Looper (CL)**

Apply one of the following formulations:

*Bacillus thuringiensis* (**CL, HW only**)--1.0 to 2.0 lb Dipel (or OLF) **OMRI-listed**

beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL (or other labeled mixtures containing beta cyfluthrin like Leverage 360)

bifenthrin--2.1 to 5.2 fl oz/A Bifenture (Sniper, or OLF)

chlorantraniliprole--soil/drip/foliar 3.5 to 5.0 fl oz/A Coragen 1.67SC (or other labeled mixtures containing chlorantraniliprole like Durivo and Voliam flexi)

cyantraniliprole--soil 5.0 to 10.0 fl. oz/A (CEW, HW), 6.75 to 10.0 fl. oz/A (CL), 10 fl. oz/A (ECB) Verimark; **foliar** 7.0 to 13.5 fl. oz/A (CEW, HW, ECB), 10.0 to 17.0 fl. oz/A (CL) Exirel

cyfluthrin--1.6 to 2.8 fl oz/A Tombstone emamectin benzoate (**except CL and ECB**)--2.4 to 4.8 oz/A Proclaim 5 SG

esfenvalerate (**except ECB**)--5.8 to 9.6 fl oz/A Asana XL 2.9 to 5.8 fl. oz/A Asana XL (HW only)

fenpropathrin (**except ECB**)--10.67 fl oz/A Danitol 2.4EC

flubendiamide--1.5 fl oz/A Belt SC (or other labeled mixtures containing flubendiamide like Vetica)

gamma-cyhalothrin--2.56 to 3.84 fl oz/A Proaxis 1.92 to 3.2 fl. oz/A Proaxis (HW only)

indoxacarb--3.5 oz/A Avaunt 30WDG (or OLF)

lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other

labeled mixtures containing lambda-cyhalothrin like Endigo ZC)

lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress

methomyl--1.5 to 3.0 pts/A Lannate

methoxyfenozide--4.0 to 8.0 fl oz/A (early season) or 8.0 to 16.0 fl. oz/A (late season) (ECB, HW, CL only) Intrepid 2F

novaluron--9.0 to 12.0 fl. oz/A Rimon 0.83EC

spinetoram--5.0 to 10.0 fl oz/A Radiant SC

spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**

tebufenozide--6.0 to 8.0 fl oz/A (early season) or 8.0 to 16.0 fl. oz (late season) Confirm 2F

zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)

zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Colorado Potato Beetle (CPB)**

Rotation to crops other than potato, tomato, and eggplant is extremely important in reducing CPB problems. Also, transplants placed into no-till fields, mulches or other crop residue will reduce or delay potato beetle infestations.

Look for CPB adults shortly after seedling emergence or transplanting. Early season populations tend to be concentrated in areas where tomatoes or potatoes were previously grown. For direct-seeded tomatoes during emergence, treat when CPB adults are reducing plant densities below recommended levels for maximum yields. Thoroughly scout tomato fields and spray only when necessary. Also spot treatment of "hot spots" only is recommended if infestation is localized. For established direct-seeded or transplant tomatoes, begin treatment if the population level exceeds 15 CPB adults per 10 plants throughout the field. If early treatment is not applied, wait for egg hatch and spray when larvae are young and exceed 20 CPB larvae and/or adults per 10 plants. Reassess after each treatment. Avoid the application of late-season sprays to prevent the buildup of insecticide-resistant beetles. Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7SC (or OLF)

acetamiprid--1.5 to 2.5 oz/A Assail 30SG (or OLF)

bifenthrin+imidacloprid--3.80 to 9.85 fl oz/A Brigadier (or OLF)

chlorantraniliprole--drip/foliar 3.5 to 5.0 fl oz/A Coragen 1.67SC

clothianidin--soil 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC

cyantraniliprole--soil (drip or injection) 5.0 to 10.0 fl. oz/A Verimark; **foliar** 7.0 to 13.5 fl. oz/A Exirel

dinotefuran--soil 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL; or 1.0 to 4.0 oz/A Venom 70SG

flupyradifurone--10.5 to 14.0 fl. oz/A Sivanto 200SL

imidacloprid--soil 7.0 to 10.5 fl oz/A Admire PRO (or OLF), **foliar** 1.3 to 2.2 fl oz/A Admire PRO (or OLF)

imidacloprid+beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360

lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress

lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC

novaluron--9.0 to 12.0 fl. oz/A Rimon 0.83EC

oxamyl--2.0 to 4.0 pts/A Vydate L

spinetoram--5.0 to 10.0 fl oz/A Radiant SC

spinosad--3.0 to 6.0 fl oz/A Entrust SC **OMRI-listed**  
 thiamethoxam--**soil 1.66 to 3.67** oz/A Platinum 75SG; **foliar**  
 2.0 to 3.0 oz/A Actara 25WDG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A  
 Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi

**Cutworms** (Also see Section E in “Soil Pests--Their Detection and Control”.)

Apply one of the following formulations:

*Preplanting Field Treatment*

Just before seeding or transplanting, broadcast on the soil surface the following:

bifenthrin--3.4 to 6.8 fl oz/A Capture LFR (or OLF)  
 diazinon--2.0 to 4.0 qts/A Diazinon AG500 (or OLF)

*Postplanting Treatment*

If control is required after seedling emergence or after transplanting, treat soil thoroughly beneath plants with the following:

beta-cyfluthrin--2.1 to 2.8 fl oz/A Baythroid XL (or other labeled mixtures containing beta cyfluthrin like Leverage 360)  
 bifenthrin--2.1 to 6.4 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 cyfluthrin--2.1 to 2.8 fl oz/A Tombstone (or OLF)  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 gamma-cyhalothrin--1.92 to 3.20 fl oz/A Proaxis lambda-cyhalothrin--0.96 to 1.60 fl oz/A Warrior II or 1.92 to 3.20 fl oz/A Lambda-Cy (LambdaT, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--5.0 to 8.0 fl oz/A Voliam Xpress  
 zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Flea Beetles**

Apply one of the following formulations:

beta-cyfluthrin--2.8 fl oz/A Baythroid XL  
 bifenthrin--2.1 to 5.2 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 bifenthrin+imidacloprid--3.80 to 9.85 fl oz/A Brigadier (or OLF)  
 clothianidin--**soil** 9.0 to 12.0 fl oz/A Belay 2.13SC, **foliar** 3.0 to 4.0 fl oz/A Belay 2.13SC  
 cyantraniliprole--**soil** (at-planting) 6.75 to 13.5 fl oz/A Verimark  
 cyfluthrin--2.8 fl oz/A Tombstone (or OLF)  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 esfenvalerate--5.8 to 9.6 fl oz/A Asana XL  
 gamma-cyhalothrin--2.56 to 3.84 fl oz/A Proaxis  
 imidacloprid--**soil** 7.0 to 10.5 fl oz/A Admire PRO (or OLF)  
 imidacloprid+beta-cyfluthrin--4.1 fl oz/A Leverage 360  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF) (or other labeled mixtures containing lambda cyhalothrin like Voliam Xpress)  
 lambda-cyhalothrin+thiamethoxam--4.0 to 4.5 fl oz/A Endigo ZC  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SC; **foliar** 2.0 to 3.0 oz/A Actara 25WDG  
 thiamethoxam+chlorantraniliprole--**soil/drip** 10.0 to 13.0 fl oz/A Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi

zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang Maxx (or OLF)  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

**Leafminers**

Treat with one of the following formulations when first mines appear and repeat every 7 days or as needed.

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7SC (or OLF)  
 chlorantraniliprole (**larvae only**) **soil/drip/foliar**--5.0 to 7.5 fl oz/A Coragen 1.67SC  
 cyantraniliprole--**soil** 6.75 to 10.0 fl. oz (drip or injection), 6.75 to 13.5 fl. oz (at-planting) Verimark, **foliar** 13.5 to 20.5 fl. oz/A Exirel  
 cyromazine--2.66 oz/A Trigard  
 dimethoate--0.50 to 1.0 pt/A Dimethoate4EC (or OLF)  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 emamectin benzoate--3.2 to 4.8 oz/A Proclaim 5 SG  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A Voliam Xpress  
 novaluron--12 fl. oz/A Rimon 0.83EC  
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC  
 spinosad--6.0 to 10.0 fl oz/A Entrust SC **OMRI-listed**

**Mites**

Mite infestations generally begin around field margins, grassy areas, and windbreaks. CAUTION: DO NOT mow or maintain these areas after midsummer since this forces mites into the crop. Localized infestations can be spot treated.

**Note:** Thorough spray coverage beneath leaves is important. The use of dimethoate for aphids and leafminers will reduce spider mite populations. Apply one of the following formulations:

abamectin--1.75 to 3.5 fl oz/A Agri-Mek 0.7SC (or OLF)  
 bifenazate--0.75 to 1.00 lb/A Acramite 50WS  
 fenpyroximate--2.0 pt/A Portal; 2.0 pts/A Portal XLO  
 spiromesifen--7.0 to 8.5 fl oz/A Oberon 2SC

**Pinworms**

- This pest is introduced on southern transplants. Begin sprays if leaf damage is observed. Late evening sprays may be most effective when moths are active. Apply one of the following formulations:

abamectin--3.5 fl oz/A Agri-Mek 0.7SC (or OLF)  
 beta-cyfluthrin--2.1 to 2.8 fl oz/A Baythroid XL  
 chlorantraniliprole (**larvae**) **soil/drip/foliar**--3.5 to 5.0 fl oz/A Coragen 1.67SC  
 cyantraniliprole--**soil** 5.0 to 10.0 fl. oz/A Verimark, **foliar** 7.0 to 13.5 fl. oz/A Exirel  
 cyfluthrin--2.1 to 2.8 fl oz/A Tombstone (or OLF)  
 emamectin benzoate--2.4 to 4.8 oz/A Proclaim 5 SG  
 esfenvalerate--5.8 to 9.6 fl. oz/A Asana XL  
 flubendiamide--1.5 fl oz/A Belt SC (or other labeled mixtures containing flubendiamide like Vetica)  
 gamma-cyhalothrin--2.56 to 3.84 fl oz/A Proaxis  
 imidacloprid+beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage 360

indoxacarb--3.5 oz/A Avaunt 30WDG (or OLF)  
 lambda-cyhalothrin--1.28 to 1.92 fl oz/A Warrior II or 2.56  
 to 3.84 fl oz/A Lambda-Cy (LambdaT, or OLF)  
 lambda-cyhalothrin+chlorantraniliprole--6.0 to 9.0 fl oz/A  
 Voliam Xpress  
 methomyl--1.5 to 3.0 pts/A Lannate LV  
 novaluron--9.0 to 12.0 fl oz/A Rimon 0.83EC  
 NoMate TPW--200 to 400 spirals/A

**Note.** NoMate is a technique using a mating disruption pheromone useful for preventing mating of emerging adults from young transplants. The pheromone is applied to a hard plastic matrix formed into a hanging "spiral" for dispersal into the air. Apply at first sign of pinworm larvae in leaves.

spinetoram--5.0 to 10.0 fl oz/A Radiant SC  
 spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl. oz/A  
 Durivo, **foliar**--4.0 to 7.0 oz/A Voliam Flexi  
 zeta-cypermethrin--2.24 to 4.00 fl oz/A Mustang MAX (or  
 OLF)  
 zeta-cypermethrin+bifenthrin--4.0 to 10.3 fl oz/A Hero EC

### Stink bug

Apply one of the following formulations:  
 beta-cyfluthrin--2.8 fl oz/A Baythroid XL  
 bifenthrin--5.2 fl oz/A Bifenture 2EC (Sniper, or OLF)  
 bifenthrin+imidacloprid--9.85 fl oz/A Brigadier (Swagger or  
 OLF)  
 clothianidin--**foliar** 4.0 fl oz/A Belay 2.13SC  
 cyfluthrin--2.8 fl oz/A Tombstone (or OLF)  
 dinotefuran--**soil** 10.5 fl oz/A Scorpion 35SL; or 6.0 oz/A  
 Venom 70SG; **foliar** 7.0 fl oz/A; Scorpion 35SL or 4.0  
 oz/A Venom 70SG  
 fenpropathrin--10.67 fl oz/A Danitol 2.4 EC  
 gamma-cyhalothrin--3.84 fl oz/A Proaxis  
 imidacloprid+beta-cyfluthrin--4.1 fl oz/A Leverage 360  
 lambda-cyhalothrin--1.92 fl oz/A Warrior II or 3.84 fl oz/A  
 Lambda-Cy (LambdaT, or OLF) (or other labeled  
 mixtures containing lambda-cyhalothrin like Voliam  
 Xpress)  
 lambda-cyhalothrin+thiamethoxam--4.5 fl oz/A Endigo ZC  
 methomyl--3.0 pts/A Lannate LV (Brown Marmorated Stink  
 Bug only)  
 thiamethoxam--5.5 oz/A Actara 25WDG (or other labeled  
 mixtures containing thiamethoxam like Durivo and  
 Voliam flexi)  
 zeta-cypermethrin--4.0 fl oz/A Mustang Maxx (or OLF)  
 zeta-cypermethrin+bifenthrin--10.3 fl oz/A Hero EC

### Thrips

Several species of thrips spread Tomato Spotted Wilt Virus. Scout for thrips and begin treatments when thrips are observed. Do not produce vegetable transplants with bedding plants in the same greenhouse. Apply one of the following formulations:

acetamiprid--4.0 oz/A Assail 30SG (or OLF)  
 beta-cyfluthrin--1.6 to 2.8 fl oz/A Baythroid XL (**except Western flower thrips**)  
 cyfluthrin--2.1 to 2.8 fl oz/A Tombstone (or OLF)  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0  
 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A  
 Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 gamma-cyhalothrin (**except Western flower thrips**)--2.56 to  
 3.84 fl oz/A Proaxis

imidacloprid--**soil** 7.0 to 10.5 fl oz/A Admire PRO (or OLF)  
 (foliage feeding thrips only)  
 imidacloprid+beta-cyfluthrin--3.8 to 4.1 fl oz/A Leverage  
 360 (foliage feeding thrips only)  
 lambda-cyhalothrin (**except Western flower thrips**)--1.28 to  
 1.92 fl oz/A Warrior II or 2.56 to 3.84 fl oz/A Lambda-Cy  
 (LambdaT, or OLF)  
 lambda-cyhalothrin+thiamethoxam (**except Western flower  
 thrips**)--4.5 fl oz/A Endigo ZC  
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC  
 spinosad--4.0 to 8.0 fl oz/A Entrust SC **OMRI-listed**  
 thiamethoxam--**soil** 1.66 to 2.67 oz/A Platinum 75SG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A  
 Durivo

### Whiteflies

Apply one of the following formulations:  
 acetamiprid--2.5 to 4.0 oz/A Assail 30SG (or OLF)  
 buprofezin--9.0 to 13.6 fl oz/A Courier SC or OLF  
*Chenopodium* extract--2.0 to 3.0 qt/A Requiem 25EC  
 dinotefuran--**soil** 9.0 to 10.5 fl oz/A Scorpion 35SL; or 5.0  
 to 6.0 oz/A Venom 70SG; **foliar** 2.0 to 7.0 fl oz/A  
 Scorpion 35SL or 1.0 to 4.0 oz/A Venom 70SG  
 fenpyroximate--2.0 pt/A Porta; 2.0 pts/A Portal XLO 1  
 flupyradifurone--10.5 to 14.0 fl. oz/A Sivanto 200SL  
 imidacloprid--**soil** 7.0 to 10.5 fl oz/A Admire PRO (or OLF)  
 pymetrozine--2.75 oz/A Fulfill 50WDG  
 pyriproxyfen--8.0 to 10.0 fl oz/A Knack  
 spiromesifen--7.0 to 8.5 fl oz/A Oberon 2SC  
 spirotetramat--4.0 to 5.0 fl oz/A Movento  
 thiamethoxam--**soil** 1.66 to 3.67 oz/A Platinum 75SG; **foliar**  
 3.0 to 5.5 oz /A Actara 25WDG  
 thiamethoxam+chlorantraniliprole--**soil** 10.0 to 13.0 fl oz/A  
 Durivo; **foliar** 4.0 to 7.0 oz/A Voliam Flexi

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest
<b>INSECTICIDE</b>			
abamectin	R	12	7
acetamiprid	G	12	7
<i>bacillus thuringiensis</i>	G	4	0
beta-cyfluthrin	R	12	0
bifenthrin	R	12	1
bifenthrin + imidacloprid	R	12	1
bifenazate	G	12	3
buprofezin	G	12	1
<i>Chenopodium</i> extract	G	4	0
chlorantraniliprole (soil/drip/foliar)	G	4	1
clothianidin (soil/foliar)	G	12	21/7
cyantraniliprole (soil/foliar)	G	4/12	1
cyfluthrin	R	12	0
cyromazine	G	12	0
dimethoate	R	48	7
dinotefuran (soil/foliar)	G	12	21/1
emamectin benzoate	R	12	7
esfenvalerate	R	12	1
fenpropathrin	R	24	3
fenpyroximate	G	12	1
flonicamid	G	12	0
flubendiamide	G	12	1
flubendiamide + buprofezin	G	12	1
flupyradifurone	G	4	1
gamma-cyhalothrin	R	24	5
imidacloprid (soil/drip/foliar)	G	12	21/0
imidacloprid + beta-cyfluthrin	R	12	0
imidacloprid + cyfluthrin	R	12	0
indoxacarb	G	12	3

(table continued in next page)

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest <sup>3</sup>
<b>INSECTICIDE (cont'd)</b>			
lambda-cyhalothrin	R	24	5
lambda-cyhalothrin + chlorantraniliprole	R	24	5
lambda-cyhalothrin + thiamethoxam	R	24	5
methomyl	R	48	1
methoxyfenozide	G	4	1
novaluron	R	12	1
oxamyl	R	48	3
pymetrozine	G	12	0
pyriproxyfen	G	12	14
spinetoram	G	4	1
spinosad	G	4	1
spiromesifen	G	12	1
spirotetramat	G	24	1
tebufenozide	G	4	7
thiamethoxam (soil/drip/foiar)	G	12	30/0
thiamethoxam + chlorantraniliprole (soil/drip/foiar)	G	12	30/1
zeta-cypermethrin	R	12	1
zeta-cypermethrin + bifenthrin	R	12	1
<b>FUNGICIDE (FRAC code)</b>			
Actigard (Group P1)	G	12	14
Aliette (Group 33)	G	12	14
Aprovia Top (Groups 3 + 7)	G	12	0
azoxystrobin (Group 11)	G	4	0
Cabrio (Group 11)	G	12	0
Catamaran (Groups M5+33)	G	12	0
chlorothalonil (Group M5)	G	12	0
Contans WG (biological)	G	4	0
copper, fixed (Group M1)	G	see label	0
Curzate (Group 27)	G	12	3
Endura (Group 7)	G	12	0
Flint (Group 11)	G	12	3
Flouronil (Groups 4 + M5)	G	48	14
Fontelis (Group 7)	G	12	0
Forum (Group 40)	G	12	4
Gavel (Groups 22 + M3)	G	48	5
Inspire Super (Groups 3 + 9)	G	12	0
mancozeb (Group M3)	G	12, 24	5
ManKocide (Groups M3 + M1)	G	48	5
Micora (Group 40)	G	4	0
Previcur Flex (Group 28)	G	12	5
Presidio (Group 43)	G	12	2
Priaxor (Groups 7 + 11)	G	12	7
Quadris Top (Groups 3 + 11)	G	12	0
Quintec (Group 13)	G	12	3
Rally (Group 3)	G	12	0
Ranman (Group 21)	G	12	0
Revus Top (Groups 3 + 40)	G	12	1
Ridomil Gold (Group 4)	G	48	0
Ridomil Gold Bravo (Groups 4 + M5)	G	48	14
Ridomil Gold Copper (Groups 4 + M1)	G	48	14
Scala (Group 9)	G	12	1
Switch (Groups 9 + 12)	G	12	0
Tanos (Groups 11 + 27)	G	12	3
Terraclor (Group 14)	G	12	AP
thiophanate-methyl (Group 1)	G	12	14
Ultra Flourish (Group 4)	G	48	0
Zing! (Groups 22 + M5)	G	12	7

See Table D-6.

<sup>1</sup> G = general, R = restricted.<sup>2</sup> Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL.<sup>3</sup> AP=At Plant

## Nematode Control

See Chapter E "Nematodes" section of Soil Pests--Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section.

## Disease Control

### Seed Treatment

Check with your seed company to determine if seed is hot water treated. Purchase hot water treated seed if possible or request hot water seed treatment. Heat treatment of seeds is a non-chemical alternative to conventional chlorine treatments that only kill pathogens on the surface of the seed coat. Heat treatment has the additional benefit of killing pathogens that may be found within the seed coat. Heat treatment is particularly useful for crops, such as tomato and pepper, that are prone to seed-borne bacterial infections. Seed heat-treatment follows a strict time and temperature protocol, and is best done with thermostatically controlled water baths. Two baths are required; one for pre-heating, and a second for the effective (pathogen killing) temperature. The initial pre-heat cycle is for 10 minutes at 100°F (38°C) followed by the effective temperature. Soak tomato seed at 122°F (50°) for 25 minutes. Immediately after removal from the second bath, seeds should be rinsed with cool water to stop the heating process. Afterward, seeds should be dried on screen or paper. Do not use pelleted seeds because moisture results in the loss of coating material. Heat treat only seed that will be used during the current production season.

An alternative to hot water seed treatment is to use 1 part Alcide (sodium chlorite), 1 part lactic acid, and 18 parts water as a seed soak. Treat seed for 1 to 2 minutes under constant agitation and rinse for 5 minutes in cool running water. Following either treatment above, dry the seed, then dust with captan 50WP or thiram 480DP at 1 level tsp/lb seed (3.0 oz/100 lbs).

### Damping-Off

*Greenhouse:* Use seed treatment and plant in a disease-free mix.

*Field:* At planting apply one of the following:

Aliette--2.5 to 5.0 lb 80WDG/A,  
mefenoxam (Ridomil Gold--1.0-2.0 pt 4SL/A or 2.0 to 4.0 pt Ultra Flourish 2E/A). Apply in a 7-inch band at transplanting. Use formula given in the "Calibration for Changing from Broadcast to Band Application" section to determine amount of Ridomil Gold or Ultra Flourish needed per acre.

metalaxyl (MetaStar--2.0 to 4.0 pt 2E AG/A)

Additional field applications may be made as needed, see label for specific instructions.

Fumigants will also offer some suppression of in-field damping-off.

### Bacterial Wilt

Use certified transplants. Avoid growing tomatoes in fields where bacterial wilt has occurred. Crop rotation to non-host crops is the best measure to reduce levels of bacterial wilt. In particular, avoid planting where tomatoes or peppers were grown in the preceding year. Some resistant cultivars, such as BHN669, are also available. Soil fumigation with a fumigant that contains either methyl bromide/iodide or chloropicrin may reduce disease

occurrence. Ponds that are adjacent to previously diseased fields may be contaminated with the causal agent. Avoid irrigating with pond water when possible, especially avoiding those ponds that may be contaminated.

### Bacterial Canker

Use certified transplants. Rotate to allow 3 years between tomato plantings. When producing transplants, be sure to chlorox or heat-treat seed as described under the "Seed Treatment" section in Chapter E to help prevent bacterial canker. When producing transplants, in addition to using seed treatment, be sure to treat used transplant growing flats with sodium hypochlorite (bleach). See the "Treatment of Flats and Trays" section of Plant Growing in Chapter A. For staked tomatoes, stakes from bacterial canker infested fields should be power washed to remove excess debris and soil, soaked into in a 20% (one part bleach plus four parts water) commercial bleach solution for at least 30 minutes, and powerwashed a second time prior to use. Pruning and stringing particularly when foliage is wet, will promote spread of disease in infested fields. Avoid working plants when foliage is wet to reduce spread within the field. Applications of Actigard 50WG (0.33 oz/A increasing to 0.75 oz/A when plants are full size, see label for details) plus fixed copper (1.5 lb active/A) have been shown to reduce bacterial canker symptoms on fruit.

### Bacterial Speck and Bacterial Spot

When producing transplants, be sure to chlorox- or heat-treat seed as described under the "Seed Treatment" section to help reduce seed infestation and carryover into transplant production. Apply streptomycin (Agri-Mycin 17, Agri-Strep) sprays (1.0 pound per 100 gallons, 1.25 teaspoon per gallon) when the first true leaves appear and continue every 4 to 5 days until transplanting. Streptomycin cannot be used after transplanting. Be sure to reduce moisture on foliage and injurious handling in the greenhouse. Rotate to allow 2 to 3 years between tomato plantings. There can be a high risk of developing bacterial leaf spot and/or speck when using southern-produced transplants. Use only certified transplants. Strains of copper resistant bacterial spot are common in some areas of the mid-Atlantic particularly on the Eastern Shore of Virginia. To ensure successful disease control, utilize Actigard either alone or in conjunction with copper-containing materials. Where disease is present or anticipated, do not work in fields when plant surfaces are wet. Apply one of the following beginning shortly after transplanting and repeat every 7 days.

Actigard--0.33 to 0.75 oz 50WG/A (follow label instructions)  
copper, fixed--1.0 lb ai/A *plus* mancozeb--1.5 lb 75DF/A or OLF

Quintec--6.0 fl oz 2.08SC/A

ManKocide--2.5 to 5.0 lb 61WP/A

Cuprofix MZ--1.75 to 7.25 lb 52.5DF/A

### Postharvest Rots

To prevent rots in mature green tomatoes, avoid washing freshly harvested fruit in cold water. Avoid harvesting fruit when the foliage is wet. Maintain water temperature in flumes and tanks by not allowing temperature to get 10 degrees F above fruit temperature to prevent movement of bacteria into the stem end of the fruit. Use a minimum 100 ppm free chlorine and keep pH between 6.5 and 7.0 in the flume. Store at 55 degree F with relative humidity of 80%. For more information on methods for reducing postharvest

losses see the website: <http://edis.ifas.ufl.edu/HS131>.

### Powdery Mildew

For more control options on selected tomato diseases in greenhouses and high tunnels see Table E-13. "Selected Fungicides and Bactericides Labeled for Greenhouse Use".

The disease has been observed in unsprayed fields, and has resulted in defoliation. When the disease first appears, apply one of the following and repeat every 14 days:

Cabrio--8.0 to 12.0 20EG/A

Quintec--6.0 fl oz 2.08SC/A

Rally--2.5 to 4.0 oz 40WSP/A

Revus Top--5.5 to 7.0 fl oz 4.16SC/A

Inspire Super--16.0 to 20.0 fl oz 2.82SC/A

Aprovia Top--10.5 to 13.5 fl oz 1.62SC/A

In greenhouse settings, apply one of the following with thorough coverage of the upper and lower leaf surface and repeat at 7-day intervals:

JMS Stylet Oil--1.0 to 2.0 gal/100 gal,

Scala--7.0 fl oz 5SC/A

### Timber Rot (*Sclerotinia*)

Rotate away from fields where snap or lima beans, peas, peanuts, lettuce or cucurbits have been grown. Apply 3 to 4 months prior to the onset of disease to allow the active agent to reduce inoculum levels of sclerotia in the soil. Following application, incorporate to a depth of 1 to 2 inches. However, to avoid the chance of infesting the upper soil layer with untreated sclerotia from the lower soil layer **do not plow** between treatment and transplanting times.

Timber rot occurs during prolonged periods of moisture and cooler temperatures (<80°F). Timing fungicide applications to be either just prior to or to coincide with favorable conditions for disease is essential for optimal disease control.

Control of white mold in the field:

Applying Contans in all areas within 300 ft of structure because the fungus produces spores which can travel via air currents into structures. Do not discard plant material within 300 ft of greenhouse or high tunnel.

### Southern Blight (*Sclerotium rolfsii*)

Southern blight is more commonly seen in the southern portion of the Mid-Atlantic region. High soil moisture and temperature favor disease development. Long crop rotations with corn and small grains help reduce disease incidence. Weed control is also important since *Sclerotium rolfsii* can also infect a number of commonly encountered weeds in the Mid-Atlantic. Soil fumigation and staking tomatoes will greatly reduce disease incidence. Applications of Blocker 4F in either the transplant water or as an in-furrow treatment may suppress levels of disease (see label for specific rates/instructions).

### Fusarium and Verticillium Wilts

Be certain that you select a variety with resistance to Fusarium wilt. Soil fumigation and crop rotation are essential components of a successful management program for these wilts. For Fusarium wilt, select cultivars that are resistant to Races 1, 2, and 3 as all are prevalent on in the Mid-Atlantic region.

### Leaf Spots (Early Blight, Septoria leaf spot) and Fruit Rots (Early blight, Anthracnose)

Follow a crop rotation that provides at least 2 years without tomatoes or potatoes. Use disease-free transplants and disease-resistant varieties when possible. For fields in mountainous areas, fields not rotated away from tomatoes, and in late planted fields, begin sprays shortly after transplanting. In all other areas, either follow a regular (7-day) spray schedule starting when crown fruit are one-third their final size, or time sprays based on a locally-verified forecaster such as Tomcast® or TomFAST®.

Rotate one of the following fungicides to help delay the development of resistant pathogen strains:

#### Alternate:

chlorothalonil--2.0 to 3.0 pt 6F/A or OLF (also for gray leaf spot, black mold and soil rot)

mancozeb--3.0 lb 75DF/A or OLF (also for gray leaf spot and leaf mold)

Gavel--1.5 to 2.0 lb 75DF/A (product contains mancozeb)

Zing!--36.0 fl oz 4.90SC/A (product contains mancozeb)

#### With one of the following:

Aprovia Top--10.5 to 13.5 fl oz 1.62SC/A

azoxystrobin--5.0 to 6.2 fl oz 2.08SC/A or OLF (Also for buckeye rot and black mold. Do not apply near apples: see label for details)

Cabrio--8.0 to 12.0 oz 20EG/A

Endura--2.5 to 3.5 oz 70W/A (also for Botrytis at 9.0 to 12.5 oz/A)

Flint--4.0 oz 50WDG/A, (Do not apply near Concord grapes)

Fontelis--16.0 to 24.0 fl oz 1.67SC/A

Inspire Super--16.0 to 20.0 fl oz 2.82SC/A

Priaxor--4.0 to 8.0 fl oz 4.17SC/A

Quadris Top--8.0 fl oz 2.72SC/A

Revus Top--5.5 to 7.0 fl oz 4.16SC/A

Tanos--8.0 oz 50W/A *plus* protectant fungicide (also for buckeye rot suppression and gray leaf spot).

To provide effective late-season control, one additional may be necessary after the application of a fruit-ripening agent.

Materials in different FRAC codes should be alternated to reduce the chances for fungicide resistance development.

### Late Blight

Transplants that are disease free should be used for plantings. If possible, produce your own transplants under sanitary conditions, since the use of transplants produced in other regions may increase the risk of a late blight infestation. When plants are 6 inches tall, apply one of the following *protectant* fungicides and repeat every 7 days, or follow a locally-verified disease forecasting system such as BLITECAST® to schedule the fungicide applications:

chlorothalonil--1.0 to 3.0 pt 6F/A or OLF

Gavel--1.5 to 2.0 lb 75DF/A (product contains mancozeb)

mancozeb--3.0 lb 75DF/A or OLF

Zing!--36.0 fl oz 4.90SC/A (product contains mancozeb)

Protectant fungicides should only be applied preventatively. Monitor for movement of the disease by contacting your local extension professional or visiting the

following website to receive updates on where the disease is currently located ([www.usablight.org](http://www.usablight.org)). Once late blight is detected in your area, tank mix one of the following translaminar fungicides which can move into and through leaves with a protectant fungicide. Products containing mefenoxam (Ridomil Gold brand names) should not be used unless your extension professional or the aforementioned website are certain that current strains are sensitive. To achieve the best control initially rotate between one of the following options:

Curzate--3.2 to 5.0 oz 60DF/A *plus* a protectant fungicide

Forum--6.0 fl oz 4.18SC/A *plus* a protectant fungicide

Presidio--3.0 to 4.0 fl oz 4SC/A *plus* a protectant fungicide

Previcur Flex--1.5 pt 6F/A *plus* a protectant fungicide

Ranman--2.10 to 2.75 fl oz 400SC/A *plus* a protectant fungicide

Reason--5.5 to 8.2 fl oz 500SC/A *plus* a protectant fungicide

The below products will also offer protection from leaf spots in addition to late blight:

Revus Top--5.5 to 7.0 fl oz 4.16SC/A *plus* a protectant fungicide (Not for use on small fruited varieties)

Tanos--8.0 oz 50WG/A *plus* a protectant fungicide

In greenhouse settings late blight can be particularly damaging. A strong scouting and preventative fungicide program is essential to reduce potential impacts. Microclimate management to reduce levels of free moisture on foliage is essential to reduce disease spread. The following materials permit greenhouse applications. You should consult fungicide labels to ensure greenhouse applications are permitted. The following materials can offer suppression and are labeled for greenhouse applications, apply one of the following:

Heritage--1.6 to 2.0 oz 50WG/A

Catamaran--5.5 to 7.0 pt 5.3F/A

### Fruit Rot caused by Pythium and Buckeye Rot caused by Phytophthora

Apply mefenoxam (Ridomil Gold at 1.0 pint 4SL per acre or Ultra Flourish at 1.0 quart 2E per acre) as a soil surface application under the vines 4 to 8 weeks before harvest. Apply broadcast or banded (see Chapter E the section on "Calibrating Granular Application Equipment" for the amount needed per acre). Irrigate after application. An alternative to soil application of mefenoxam is to apply one of the following as a foliar spray beginning when crown fruit are one-third their final size and repeat every 14 days up to a total of 3 times:

mefenoxam + chlorothalonil (Flouronil, Ridomil Gold Bravo)--2.0 lb 76WP/A,

Ridomil Gold Copper--2.0 lb 65WP/A

If weather and soil conditions continue to favor disease development apply one of the following between applications of the above listed fungicides:

Gavel--1.5 to 2.0 lb 75DF/A,

Tanos--8.0 oz 50WG/A

### Botrytis Fruit Rot (Gray Mold)

Gray mold is a problem during the fall in fields with dense foliage and poor drainage. For fall production, select fields

with good drainage. Shortly before harvest when conditions are wet and cool, apply one of the following:

chlorothalonil--2.0 to 2.75 pt 6F/A or OLF (also very good for late blight),

Endura--9.0 to 12.5 oz 70WG/A (also very good for early blight; not for use in greenhouses),

Switch--11.0 to 14.0 oz 62.5WG/A

#### Leaf Mold (*Passalora/Fulvia/Cladosporium fulva*)

Leaf mold may occur during periods of high moisture particularly within the canopy. The disease is primarily damaging in greenhouse and high tunnel tomato settings. In both settings, if the disease is present, precautions should be taken to minimize canopy moisture. For field outbreaks, the following fungicide can be used:

Revus Top--5.5 to 7.0 fl oz 4.16SC/A

Catamaran--4.5 to 7.0 pt 5.3F/A

#### Tomato Spotted Wilt Virus (TSWV)

TSWV can be serious and result in severely stunted plants. The virus is spread by thrips from ornamental plants (flowers), field crops, and weeds to tomatoes. TSWV can be particularly devastating in southern and eastern parts of Virginia. Use resistant varieties when available. Do not grow any ornamental bedding plants in the same greenhouse as tomato transplants. Control weeds in and around greenhouses. Monitor greenhouses and tomato fields for thrips and begin an insecticide control program once thrips are observed. Use of reflective mulch can help repel thrips and can reduce the incidence of spotted wilt. If tomato crops are near wheat/barley fields be aware of increased thrips pressure (potentially increasing the likelihood of TSWV transmission) once the crop starts to turn brown in the spring.

## WATERMELONS

### Recommended Watermelon Varieties

Seeded	Reported Disease Resistance <sup>1</sup>						Size (lbs)	Shape	Flesh Color	Rind Description
	Fon Gen	Fon 0	Fon 1	Fon 2	Co	Px				
Crimson Sweet	R				R		16-20	globe	red	medium green with dark green stripes
Jamboree			I		I		24-28	oblong	red	dark green with broken light green stripes
Mardi Gras	I				I		20-24	oblong	red	dark green with broken light green stripes
Sangria	I				I		20-24	oblong	red	dark green with broken light green stripes
Starbrite					R		22-31	oblong	red	medium green with dark green stripes
Top Gun			I		I		21-24	globe	red	medium green with dark green stripes
<b>Seedless, Early</b>										
Melody							14-16	globe	red	medium green with dark green stripes
Sweet Gem							13-16	globe	red	dark green
Sweet Eat'n	I				I		15-20	oval	red	light green with broad, medium green stripes
Secretariat							16-20	oval	red	light green with broad, medium green stripes
Amarillo							13-15	globe	yellow	light green with narrow dark green stripes
Vagabond							14-17	oval	red	medium green with dark green stripes
<b>Seedless, Mid Season</b>										
Charismatic							13-16	globe	red	medium green with dark green stripes
SS 7167							16-20	oval	red	medium green with dark green stripes

(Table continued next page)