



Optimizing Your Pest Control Program with the 2019 Veggie Production Guide

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UNIVERSITY OF MISSOURI
M Extension

Today's Handout

- Article (back page) in free newsletter
- 4 issues per year
- Focused on issues common to produce auctions
- Provide mailing address if you'd like it

Integrated Pest Management
University of Missouri

DECEMBER 2018

What's New in the 2019 Midwest Veggie Guide?

James Quinn

The Midwest Vegetable Production Guide for Commercial Growers is revised annually. There are no major revisions to the 2019 edition; in 2017 there were several, as Michigan State University joined with the seven other Midwestern States. Below are some changes and comments regarding the 2019 edition.

Revisions:

- There were three new tables created last year, one each on fungicides, insecticides and herbicides, which presented selected information, such as the trade name, active ingredient, signal word (caution, danger or warning), the rotational code, usage in greenhouse, and if an organic product. This year's tables use the trade name for sorting the information, making it easier for most to find the desired information.
- A new searchable, mobile-friendly version of this guide is expected sometime in December.

Pest management discussions (in the crop specific sections):

- Cucurbits and cucumber beetles: threshold numbers for this pest are now included, with additional comments on their management. Cantaloupe, cucumber and watermelon thresholds are 1 beetle/plant and for squash and pumpkin is 5 beetles/plant.
- Thrips have been added to fruiting vegetables, reflecting their challenge for tomatoes, both greenhouse and field. I initiated this action, due to comments/complaints from Missouri growers the past several years. An entomologist from Kansas supported this request. There are 21 insecticides listed and many have comments that may be helpful. Two examples, Warrior II comment is 'not for use against Western Flower thrips' and Agri-Mek SC is noted as 1 day PHI for 'commercially-grown greenhouse tomatoes'. (There is a discussion of insecticide rotation options for thrips in the onion pest control section)
- Tomato spotted Wilt Virus/Impatiens Necrotic Spot Virus has a management discussion, which focuses on thrips pest control. With greenhouses, being careful to control thrips on ornamentals (e.g. impatiens) when growing anywhere near tomatoes is noted.

New products:

- Satellite Hydrocap (pendimethalin) is now labeled for Cole Crops and Onions as a preemergent. While this is the same active ingredient as Prowl (3.3 EC and H₂O), Prowl is not labeled at this time. If interested in Satellite Hydrocap, consider looking for it early. It was not listed in this guide in 2018.
- Exirel is a new insecticide class available for use on Onions to control thrips. Minecto is an insecticide mix also with this active ingredient (Cyantraniliprole), now labeled for thrips control on onion.

Product alert:

- Lorsban is listed in the guide as an insecticide for several vegetable crops (e.g. Asparagus, Cole crops, Legumes and Sweet Corn), but there is ongoing discussion about it revoking it. The online version of the production guide will be revised if changes are necessary, but the print copy has been run.

Also In This Issue

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USDA NIFA

The ‘Big’ Picture

- Michigan State University joined with the guide in 2017
- A number of changes were introduced that year.
- A lesser number were incorporated in 2018.
- I'll cover some of the changes that affect spray schedules.
- ***But first- 2019***



Midwest Vegetable Production Guide for Commercial Growers

2019

Illinois
University of Illinois Extension
C1327-18

Indiana
Purdue Extension
ID-56

Iowa
Iowa State University Extension and Outreach
PG04088

Kansas
Kansas State University Research and Extension
MR0229

Michigan
Michigan State University Extension
B0012

Minnesota
University of Minnesota Extension
BB-07094-5

Missouri
University of Missouri Extension
M1004-4
Lincoln University of Missouri
Cooperative Extension and Research
LUCER-B1-2019

Ohio
Ohio State University Extension
Bulletin 945

Midwest Vegetable Guide 2019 vs '18

Tables on fungicides, insecticides and herbicides

- Trade name used to sort

Selected Information About Recommended Fungicides

This table includes selected information about the fungicides recommended in this guide. The products are listed alphabetically by the **Trade Name**. The table also lists the **Common Name** of active ingredient.

The **Signal Word** column indicates the product's possible toxicity. If the signal word is set in bold, the product is a restricted use product (RUP). See page 33.

The **FRAC Code** column indicates the product's mode of action. FRAC stands for Fungicide Resistance Action Committee. Refer to product labels for information about alternating fungicide modes of action.

The **Greenhouse Use** column has one of three listings:

yes=the product label explicitly allows greenhouse use

no=the product label explicitly prohibits greenhouse use

silent=the product label does not mention greenhouse use — states vary about whether such products are allowed in greenhouse production

The **OMRI** column, products marked with an X are listed by the Organic Material Review Institute (omri.org) and may be suitable for organic production. Check with your certifier. See page 39 for more information.

Trade Name	Common Name	Signal Word	FRAC Code	Greenhouse Use	OMRI
Actigard®	acibenzolar-s-methyl	Caution	21	silent	
Botanix	<i>Streptomyces lydicus</i> WYE 108	Caution	4+	yes	X
Aframe*	azoxystrobin	Caution	11	no	
Agri-Fos®	phosphorous acid	Caution	33	silent	
Agri-mycin 17*	streptomycin sulfate	Caution	25	yes	
Aliette WDG*	fosetyl-aluminum	Caution	33	silent	
Allegiance-FL*	metalaxyl	Caution	4	certain crops, see label	
Aproach*	picoxystrobin	Caution	11	silent	
Apron XL*	mefenoxam	Warning	4	certain crops, see label	
Aprovia Top*	difenconazole + benzovindiflupyr	Warning	3 + 7	no	
Ariston*	chlorothalonil + cymoxanil	Caution	M5 + 27	no	
Badge SC*	copper hydroxide + copper oxychloride	Danger	M1	yes	
Basic Copper 53*	copper sulfate	Warning	M1	no	X
Blocker 4F*	pentachloronitrobenzene (PCNB)	Caution	14	silent	
Botran 75W*	dichloro-nitroaniline	Caution	14	certain crops, see label	

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Common Name	Trade Name	Signal Word	FRAC Code	Greenhouse Use	OMRI
1,3-dichloropropene + chloropicrin	Telone C-35*	Danger	- + 8B (IRAC)	no	
acibenzolar-s-methyl	Actigard*	Caution	21	silent	
azmetotradin + dimethenamorph	Zampro*	Caution	45 + 40	no	
azoxystrobin	Aframe*	Caution	11	no	
azoxystrobin	Heritage*	Caution	11	silent	
azoxystrobin	Quadris*	Caution	11	no	
azoxystrobin	Satori*	Caution	11	no	
azoxystrobin + benzovindiflupyr	Elatus*	Caution	11 + 7	certain crops, see label	
azoxystrobin + chlorothalonil	Quadris Opti*	Warning	11 + M5	no	
azoxystrobin + difenoconazole	Quadris Top*	Caution	11 + 3	silent	
azoxystrobin + flutriafol	Topguard EQ*	Caution	11 + 3	silent	
azoxystrobin + mefenoxam	Uniform*	Caution	11 + 4	silent	
azoxystrobin + propiconazole	Quilt*	Warning	3 + 11	no	
azoxystrobin + propiconazole	Quilt Xcel*	Caution	3 + 11	no	
azoxystrobin + tebuconazole	Custodia*	Warning	11 + 3	no	
Bacillus subtilis	Serenade Opti*	Caution	44	yes	X
boscalid	Endura*	Warning	7	no	

Herbicides and Insecticides

Selected Information About Recommended Herbicides

This table includes selected information about the herbicides recommended in this guide. The products are listed alphabetically by the **Trade Name**. The table also lists a **Common Name** of active ingredient.

The **Usage** column indicates when the product is applied: preplant incorporated (ppi — applied before weeds emerge and mechanically incorporated into soil), preemergence (pre — applied before weeds emerge), or postemergence (post — applied after weeds emerge).

The **Signal Word** column indicates a product's possible toxicity. If the signal word is set in bold, the product is a restricted use product (RUP). See page 33.

The **WSSA/HRAC Code** column indicates the product's mode of action. WSSA/HRAC stands for Weed Science Society of America/Herbicide Resistance Action Committee Mode of Action Classifications: hracglobal.com/tools/classification-lookup.

The **Runoff/Leaching Potential** column provides ratings from the USDA-NRCS WIN-PST Pesticide Properties database: go.usa.gov/Kok. There are three ratings for potential runoff/leaching:

1=high

2=intermediate

3=low

Trade Name	Common Name	Usage	Signal Word	WSSA/HRAC Code	Runoff/Leaching Potential
Aatrex 4L*	atrazine	ppi, pre, post	Caution		2/1
Accent*	nicosulfuron	post	Caution	2/B	3/1
Aim EC*	carfentrazone	post	Caution	14/E	3/3
Assure II*	quizalofop	post	Danger	1/A	1/2
Banvel*	dicamba	post	Caution	4/O	3/1
Basagran*	bentazon	post	Danger	6/C3	3/1
Cadet*	fluthiacet-methyl	post	Warning	14/E	3/3
Callisto*	mesotrione	post	Caution	27/F2	3/1
Caparol*	prometryn	pre, post	Caution	5/C1	2/2
Casoron*	dichlobenil	pre	Caution	20/L	
Chateau SW*	flumioxazin	pre	Caution	14/E	2/3
Clarity*	dicamba	post	Caution	4/O	3/1
Clethodim 2E*	clethodim	post	Caution	1/A	3/3
Command 3ME*	clomazone	pre	Caution	13/F4	3/2
Curbit EC*	ethalfluralin	ppi, pre	Danger	3/K1	1/3

Selected Information About Recommended Insecticides

This table includes selected information about the insecticides recommended in this guide. The products are listed alphabetically by the **Trade Name**. The table also lists the **Common Name** of active ingredient.

The **Signal Word** column indicates the product's possible toxicity. If the signal word is set in bold, the product is a restricted use product (RUP). See page 33.

The **IRAC Code** column indicates the product's mode of action. IRAC stands for Insecticide Resistance Action Committee. Refer to product labels for information about alternating fungicide modes of action.

The **Greenhouse Use** column has one of four listings:

yes=the product label explicitly allows greenhouse use

some=the product label explicitly allows greenhouse use for certain crops (see the label for details)

no=the product label explicitly prohibits greenhouse use

silent=the product label does not mention greenhouse use — states vary about whether such products are allowed in greenhouse production

The **OMRI** column, products marked with an X are listed by the Organic Material Review Institute (omri.org) and may be suitable for organic production. Check with your certifier. See page 39 for more information.

Trade Name	Common Name	Signal Word	FRAC Code	Greenhouse Use	OMRI
Acramite 50WS*	bifenazate	Caution		silent	
Actara 25WDG*	thiamethoxam	Caution	4A	no	
Admire Pro 4.6F*	imidacloprid	Caution	4A	some	
Agree WG*	<i>Bacillus thuringiensis aizawai</i>	Caution	11A	yes	x
Agri-Mek 0.15EC*	abamectin	Warning	6	some	
Agri-Mek 0.7SC*	abamectin	Warning	6	some	
Ambush 25W*	permethrin	Warning	3A	silent	
Ammo 2.5EC*	cypermethrin	Caution	3A	silent	
Asana XL 0.66EC*	esfenvalerate	Warning	3	silent	
Assail 30SG*	acetamiprid	Caution	4A	no	
Assail 70WP*	acetamiprid	Caution	4A	no	
Athena*	bifenthrin + abamectin	Caution	3A + 6	silent	
Avaunt 30WDG*	indoxacarb	Caution	22	some	
Azera*	azadirachtin + pyrethrins	Caution	- + 3A	yes	

Weed Management Relative

Ratings Key:
G=Good
F=Fair
P=Poor
N=None/No

Preplant Incorporation Herbicides

Preemerg Surface Applied Herbicide

	Fall Panicle	Foxtails	Grasses
2,4-D	G	G	G
Aim®	G	G	G
Anthem®	G	G	G
atrazine + oil	G	G	G
bentazon	G	G	G
bromoxynil	G	G	G
Cadet®	G	G	G
Callisto®	G	G	G
clethodim	G	G	G
clopyralid	G	G	G
dicamba	G	G	G
Evik® ^{II}	G	G	G
fomesafen	G	G	G
Fusilade®	G	G	G
glyphosate	G	G	G
halosulfuron	G	G	G
Impact®	G	G	G
Laudis®	G	G	G
League®	G	G	G
linuron	G	G	G
Matrix®	G	G	G
metribuzin	G	G	G
nicosulfuron	G	G	G
Option®	G	G	G
oxyfluorfen	G	G	G
paraquat	G	G	G
Poast®	G	G	G
quizalofop	G	G	G
Raptor®	G	G	G
Revelin Q®	G	G	G
Shieldex®	P	P	G
Spin-aid®	N	N	N
Starane®	G	G	G
Thistrol®	F	F	P

New Products for Vegetable

Preemergent Surface Applied Herbicides	acetochlor		
	acetochlor+atrazine		
	Acuron®		
	alachlor		
	Anthem®		
	Anthem ATZ®		
	atrazine		
	Callisto®		
	Camix®		
	Chateau®		
	Command®		
	Curbit®		
	Dacthal®		
	Define®		
	dimethenamid-P		
	halosulfuron	P	P
	Karmex®	N	P
	Kerb®	P	P
	League®	P	P
	Lexar®	P	P
	linuron	N	N
	Lumax®	P	P
	Matrix®	P	P
	metolachlor	N	P
	oxyfluorfen	P	P
	pendimethalin	P	P
	Pursuit®	G	F
	Sinbar®	G	G
	Sharpen®	P	N
	s-metolachlor	G	F
	Solicam®	G	F
	Spartan®	P	G
	Strategy®	P	G
	Zidua®	G	G

New Products, continued

Insecticide

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– C-
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Minect
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with cya
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billars
- also

Onion chapter- pg 198

Example of Insecticide Rotation for Onion Thrips Management in Dry Bulb Onion

The table below provides an example of an insecticide rotation growers can use to manage onion thrips in dry bulb onion. It provides thresholds for use with each product.

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

IRAC Codes for Onion Thrips Control Products

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

Product	Active Ingredient	IRAC
Radiant SC®	spinetoram	5
Lannate LV®	methomyl	1A
Agri-Mek SC® or 0.15E	abamectin	6
Movento®	spirotetramat	23

Pest management discussions

- Cucurbits & cucumber beetles, threshold numbers now included
 - Cantaloupe, cucumber and watermelon- 1 beetle/plant
 - Squash & pumpkin- 5 b/plnt
- Thrips added for tomato
- Initiated by MO & KS
- 21 insecticides listed
- Noteworthy comments (?)
 - Warrior II not for WF thrips
 - Agri-Mek SC is 1 day PHI for greenhouse tomatoes
 - TSWV/Impatiens necrotic spot virus discussion focuses on thrips control

Optimizing your pest control program

Three crops & different pest classes for examples

We'll use

- Tomatoes & disease
 - Foliar diseases a challenge in a rainy year
- Cantaloupe & weeds
 - Spraying of area between beds is challenging, once vines run
- Cole crops & insects
 - Caterpillars always an issue



Cole Crops and Brassica Leafy Greens

Spacing

Broccoli: Rows 3 feet apart. Plants 12 to 18 inches apart in row.

Brussels sprouts: Rows 3 feet apart. Plants 18 to 24 inches apart in row.

Cabbage for Market: Rows 2 to 3 feet apart. Plants 12 to 15 inches apart in row.

Cabbage for Kraut: Rows 3 feet apart. Plants 18 inches apart in row.

Cauliflower: Rows 3 feet apart. Plants 15 to 18 inches apart in row.

Collards: Rows 3 to 3.5 feet apart. Plants 18 to 24 inches apart in row. Seed 1 to 2 pounds per acre.

Kale: Rows 2 to 3 feet apart. Plants 8 to 16 inches apart in row. Seed 2 to 4 pounds per acre. Use denser plantings if harvesting small leaves for salad or braising mixes.

Mustard: Rows 1 to 1.5 feet apart. Plants 10 to 12 inches apart in row. Seed 3 to 5 pounds per acre. Use denser plantings if harvesting small leaves for salad or braising mixes.

Turnip greens: Rows 6 to 12 inches apart. Plants 1 to 4 inches apart in row.

Greens (collards, kale, and mustard)

N: 60 pounds per acre. P₂O₅: 0 to 150 pounds per acre. K₂O: 0 to 200 pounds per acre.

All crops

Adjust recommendations according to soil type, previous management, and soil test results for your state. For transplants, set each plant with 1 cup (8 ounces) of starter solution. If the transplant flat receives a heavy fertilizer feeding just prior to setting, the starter solution can be eliminated.

Sidedress N

Cole Crops

60 pounds N per acre, two to three weeks after setting the transplants and when rapid growth has begun. Eliminate sidedressing if following soybeans. If leaching is likely on sandy soils, apply an additional 30 pounds N as a sidedress. Avoid excessive N fertilization with broccoli as it can cause too rapid growth and a hollow flower stalk.

Greens

30 pounds N per acre on soils with more than 3 percent organic matter and following soybeans, alfalfa, or a grass-legume hay crop. For greens on soils with less than 3 percent organic matter and following those crops, apply 45 pounds N per acre. For greens following corn, small

Tomatoes- under fruiting vegetables

Disease and weed control is specific, insects for all crops

- #1- how well does a particular fungicide product

Fruiting Vegetables — Tomato - Disease Control													
		Product/Disease Ratings for All Fruiting Vegetables ¹											
		Common Name	MIA or FRAC code: Fungicides with a number in the MIA code should be tank-mixed or alternated with a different MIA code according to the label.	MIA (or FRAC) code	FRAC group	Bacteriostatic	Bacteriocidal	Bifenthrin	Bifenthrin/Pyrethrin	Bifenthrin/Pyrethrin	Bifenthrin/Pyrethrin	Bifenthrin/Pyrethrin	Comments
Product	(FRAC)												
Actigard® (12/04)		aztreonam 5-methyl (P)			P								Not for bell pepper. Do not apply to stressed plants.
Agri-Mycin 17%		aztreonam sulfone (S)			P								For use on tomato/pepper seedlings pre-dosed.

- Will likely need 3 to 4 products for adequate control
- Note comments column!

LIN (2)	monosulfest (S)												mix to use:
Garden Ultra® (4/1)	imidacloprid (U15), monosulfest (S)												Apply as tank-mix of both products in multi-pack.
Provado® (12/12)	imidacloprid (S)												
Provado Flex® (12/15)	imidacloprid/baclofencarb (S)												
Primo® (12/0)	thiophanate (7), propiconazole (11)	G	G		F	VG	G	S			S		
Quinton® (4/8)	aztreonam (S)	G	VG		P	VG	G	P					
Quinton Top® (11/0)	aztreonam (11), difenoctindecano (S)	G	VG			VG	VG				G		
Ramann® (12/0)	cyantraniliprole (2)										VG	G	
Roxyn® (12/14)	isoprothiolane (1)										VG	S	S
Roxyn Top® (12/1)	isoprothiolane (1), imidacloprid (4), difenoctindecano (S)	G				G	G	G			G		Not labeled on paper.
Rokon Gold GR®, Rokon Gold SL® (4/6/7)	monosulfest (S)												*Effective against sensitive isolates only.
Scythe® (12/1)	pyrethroid (S)					G	G						Label includes greenhouse instructions.
Switch® (12/0)	cyantraniliprole (S), difenoctindecano (S)					G	VG						Do not apply to cherry or grape isolation in the greenhouse.
Tonic® (12/7)	cyantraniliprole (7), fenpropimorph (1)	F	G	S	S	S	G	G	G		G		Tank-mix with mancozeb or other FRAC.
Zampro® (12/4)	aztreonam (4), difenoctindecano (S)										VG	S	
Zing® (48/5)	aztreonam (22), chlorothalonil (S)										G	G	VG

Tomatoes- focus on bacterial disease

Bacterial Spot/Speck

Lesions of this disease can be found on leaves, stems, and fruit. Use disease-free seed and/or transplants.

Copper Resistance: Strains of the bacterium that cause bacterial spot on tomato that are resistant to copper products are common in the Midwest. Actigard®, Agri-mycin 17®, mancozeb products, Tanos®, and Serenade Max® used as labeled may help manage copper-resistant strains.

Winter/Off-season: Rotate crops at least 2 years and practice fall tillage. Purchase seed tested for these diseases. Consider seed treatment with hot water or dilute Clorox (see Seed Treatments, page 26).

Greenhouse: Scout and apply fixed copper alternated with streptomycin (Agri-mycin 17®, Firewall 17WP®, Streptrol®).

Planting: Do not plant seedlings with symptoms of bacterial spot/speck. Apply fixed copper product tank-mixed with mancozeb on 7-10 day schedule, depending on disease pressure, beginning within 1 week after transplanting.

Harvest: Inspect fruit. Avoid saving seed.

Only 6 products!

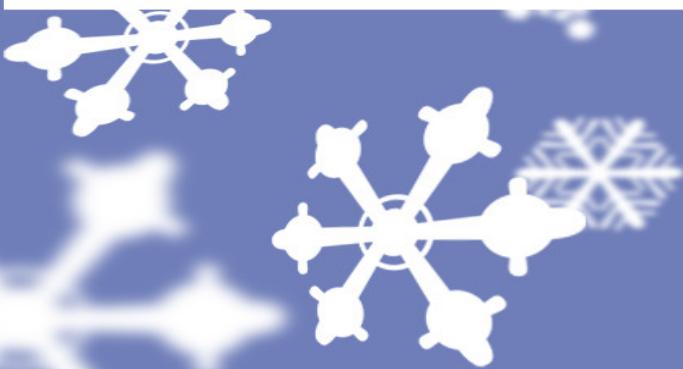
- Actigard
- Agri-mycin
- Copper products
- Regalia
- Serenade
- Tanos
- ? Gavel ?

Tomatoes- resistance may be regional

Bacterial Spot/Speck

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Early Blight and Septoria Leaf Blight

Both of these diseases initially cause lesions on lower leaves of the tomato plant. Plant resistant varieties. Use wilt resistant “VF” cultivars, and avoid fields with a wilt history. Tomato plants weakened by wilt disease may be more prone to leaf blights. Practice 3-4-year rotation with unrelated crops. Rotate out of fields with a history of early blight or Septoria leaf spot.

Group 11 Resistance: Strains of the fungus that causes early blight that are resistant to group 11 fungicides have been observed in Indiana and Ohio. Group 11 products labeled for tomato and early blight include Cabrio® and Quadris®. Tank-mix group 11 fungicides with products that have a different mode of action, or alternate group 11 fungicides with fungicides that have a different group number. See Selected Information About Recommended Fungicides (page 79) for more information.

Tomato Diseases

Leaf Mold

This disease causes yellow lumpy leaf. It is common in tomatoes but is less common in other crops.

Winter/Off-season: Rotate crops and practice fall tillage. Use cover crops.

Greenhouse: Scout for disease symptoms.

Planting: Control relative humidity by venting and pruning. Labeled fungicides may help control leaf mold.

Tomato Spotted Wilt Virus

Necrotic Spot Virus

These viruses are carried by thrips to tomatoes if they infest ornamental plants. They are more common in greenhouses than in fields.

Since ornamental plants can be a source of thrips, avoid growing ornamental plants such as flowers from plugs with tomatoes either as transplants or with mature tomatoes. Controlling thrips may slow the spread of the virus in greenhouse and field.

White Mold (Timber Rot)

This disease may be more common in greenhouses and high tunnels than in open fields. The fungus that causes this disease is soilborne and often results in a woody appearance of the lower stem of the tomato plant. Avoid fields with history of the problem. Pathogen has large host range. Avoid tomato after tomato rotations.

Winter/Off-season: Use long rotations with corn or small grains. Growers should avoid rotations with tomato, pepper, potato, and snap bean.

Greenhouse/Planting: White mold may be common where tomato is grown yearly in the same soil such as under a greenhouse structure.

Fruit Set: Inspect plants for symptoms of white mold.

Southern Blight

This disease is normally observed in southern climates or during seasons with above normal temperatures.

Crop rotations with small grains and deep plowing crop residue should help to reduce inoculum.

Tomato diseases about chemicals!

Late Blight

The fungus that causes late blight does not overwinter in the Midwest. Thus, the fungus must be transported into the Midwest each time the disease occurs.

Winter/Off season: Destroy cull piles and disk under tomato fields at the end of each season.

Tobacco Mosaic Virus

This disease is more of a problem in fresh market tomatoes than processing tomatoes due to extensive handling. The best control is to use a resistant cultivar. There is no chemical control. If only a few plants are showing symptoms, remove them.

Verticillium Wilt

Cultivars have host resistance to Verticillium wilt. Rotate crops where possible. Use of long rotations out of solanaceous crops will prevent rapid increase of pathogen populations. Tomato varieties with resistance are available.

Cantaloupes

- Plastic mulch vs bare ground affects greatly
- Determine what works for your weed profile
- Adjust and change yearly
- Watch out for glyphosate resistant weeds!
- About 20 products
- There are several state specific crop restrictions
 - Chateau
 - Dual Magnum
 - Reflex
- Carefully review and understand table on page 132

Herbicides for All Cucurbits¹

Product (REL/PHD)	Common Name	Timing and Application Location Relative to Crop ²						Incorporated	Timing Relative to Weeds		Weed Groups Controlled		Crops ³				
		Before setting	After seedling emergence	Before transplanting	Postemergence-between rows only	Postemergence	Premature		Postemergence	Annual grasses	Small-seeded broadleaves	Broadleaves	Cucumber	Carrot	Waxbean	Squash, summer	Squash, winter
Aim EC* (12h/-)	carfentrazone			X	X				X	X	X	X	X	X	X	X	X
Command 3ME* (12h/45d)	clomazone	X	X	X					X	X	X	X	X	X	X	X	*
Curbit 3EC* (24h/-)	ethalfluralin		X		X			no	X	X	X	X	X	X	X	X	X
Dacthal W-75*, Dacthal Flowable* (12h/-)	DCPA					X			X	X				X	X		
Dual Magnum* (24h/30d)	s-metolachlor	X between rows	X between rows	X between rows	X				X	X	X						X
Gramoxone* (12h to 24h ⁴)	paraquat	X	X	X	X				X	X	X	X	X	X	X	X	X
League* (12h/48d)	imazosulfuron				X				X	X	X	X	X	X	X		
Poast* (12h/14d)	sethoxydim					X				X	X			X	X	X	X
Prefar 4E* (12h/-)	bensulide	X	X	X			yes		X	X			X	X	X	X	X
Prowl H2O (24h/35d)	pendimethalin		X between rows	X between rows	X				X	X	X			X	X		
Roundup*, others (12h/14d)	glyphosate	X	X	X	X				X	X	X	X	X	X	X	X	X
Sandea* (12h/14d)	halosulfuron		X	X	X	X			X	X	X	X	X	X	X	X	X
Select Max*, others (12h/14d)	clotrimazole					X				X	X			X	X	X	X
Sinbar* (12h/70d)	terbacil		X	X	X				X		X				X		
Strategy* (24h/45d)	clomazone and ethalfluralin		X		X			no	X	X	X	X	X	X	X	X	X
Treflan*, others (12h/30d to 60d)	trifluralin					X		yes	X	X	X	X	X	X	X	X	X

*For effectiveness against specific weeds, see Relative Effectiveness of Herbicides for Vegetable Crops (page 68), and read label. This table does not include all label information. Be sure to read and follow all instructions and precautions on the herbicide label. Herbicides can cause serious crop injury and yield loss if not used properly.

X=permitted for at least one crop.

*X=may be used for that crop. State-specific labels not indicated.

⁴=Processing crops only.

Cantaloupes- noteworthy (pg 129)

For cucurbits that are no-till direct-seeded into a killed crop (such as pumpkins after soybeans, rye cover crop, or wheat) growers often use a burndown herbicide with a preemergence herbicide. If residue and cucumber vines are not sufficient to suppress later-emerging weeds, growers may use postemergence herbicides, or shielded applications of nonselective herbicides.

For cucurbits direct-seeded into tilled soil, growers often combine one or more preemergence herbicides at planting with one or more cultivations. Sometimes, growers also apply a preemergence herbicide at the last cultivation to improve control of late-emerging weeds. If needed, growers may use postemergence herbicides or shielded applications of nonselective herbicides.

When cucurbits are transplanted into plastic mulch, some growers apply a preemergence herbicide under the mulch as well as between the rows. Other growers only apply between the rows. Growers may also use one or more cultivations, and if needed, postemergence herbicides or a shielded application of a nonselective herbicide.

Weed pressure may be substantially reduced when growers prepare seedbeds several weeks in advance of planting and kill the first one or two flushes of weeds before planting without stirring up new weed seeds. Cucurbits lend themselves to this stale seedbed practice because they are often planted after common weeds have emerged in tilled soil.

The more quickly cucurbit vines cover the soil surface, the better they will suppress late-emerging weeds. Closer row spacing promotes rapid vine cover, and growers can increase in-row spacing to maintain a constant plant population.

Uniform spacing in the row will also promote uniform vine cover. Seeding equipment that allows large gaps in direct-seeded crops usually leads to weed patches where the crop population is lower.

Cole crops- focus on caterpillars

- Many products labeled
- Consider rotating products
- Several reduced risk products, e.g.
 - BT, Coragen, Confirm, Entrust & Radiant.
- Diamondback moth has developed resistance to a number of insecticide
 - Varies regionally

Cole Crops - Insect Control

Caterpillar Threshold

Crop	Stage	% Infested	
		Diamondback Moth Larvae	Imported Cabbageworm and Cabbage Looper
Cabbage — Fresh	seed bed	not applicable	not applicable
	transplant to cupping	50% with ≥ 5 larvae/plant	30%
	cupping to early head	50% with ≥ 5 larvae/plant	20%
	early head to harvest	10% with ≥ 1 larva/plant	10%
Broccoli, Cauliflower	seedbed	10%	10%
	transplant to first curd	40%	20%
	first curd to harvest	10%	10%

Cole crops- neonics & more

- Neonics aren't effective against flea beetles except thiamethoxam (Platinum and Farmore 1400) & Belay
- Good for aphids
- Not effective on caterpillars
- Consider Belay, only neonic for stink bugs
- There is NO table on relative effectiveness regarding insecticides and specific insect pests
- If it is listed in the guide, it is considered at least GOOD on that pest
- I don't want to say don't trust the label, but be wary

Summary & Parting Comments

- Mobile friendly version of this guide, now available
- Chapters download (as a PDF) and are searchable
- Finding and acquiring novel or new pesticides during the growing season can be difficult (do this now)
- New products keep coming available, guide keeps you current
- Remember to rotate between MOA codes
- Review management comments

Lorsban may get revoked



It takes

Midwest Vegetable

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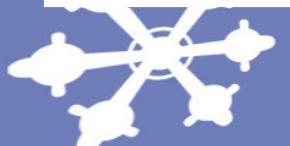
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Michigan State University: M

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Vegetable	Storage Conditions		
	Temperature (°F)	Relative Humidity (%)	Relative Storage Life
Asparagus	36	95-100	2-3 weeks
Beans, snap	40-45	95	7-10 days
Beets & carrots, bunched	32	98-100	10-14 days
Broccoli	32	95-100	10-14 days
Cabbage, late	32	98-100	5-6 months
Cantaloupe	36-41	95	2-3 weeks
Cauliflower	32	95-98	3-4 weeks
Cucumber	50-54	85-90	10-14 days
Eggplant	50-54	90-95	1-2 weeks
Greens — collards, kale, & spinach	32	95-100	10-14 days
Lettuce	32	98-100	2-3 weeks
Okra	45-50	90-95	7-10 days
Onions, dry	32	65-70	1-8 months
Onions, green	32	95-100	3 weeks
Peas, in pods	32	90-98	1-2 weeks
Peas, southern	40-41	95	6-8 days
Pepper, green	45-55	90-95	2-3 weeks
Pepper, ripe	42-45	90-95	1 week
Potato, early	*	90-95	*
Potato, late	b	90-95	b

Vegetable	Storage Conditions		
	Temperature (°F)	Relative Humidity (%)	Relative Storage Life
Pumpkin	54-59	50-70	2-3 months
Radish	32	95-100	1-2 months
Rhubarb	32	95-100	2-4 weeks
Squash, summer	40-45	95	1-2 weeks
Squash, winter	54-59	50-70	*
Sweet corn	32	95-98	2-5 days, up to 21 days for supersweet cultivars
Sweet potato	55-59	85-95	4-7 months
Tomato, light red	50-55	90-95	1 week
Tomato, mature-green	50-60	90-95	1-2 weeks
Tomato, firm-ripe	46-50	85-90	3-5 weeks
Turnip root	32	95	4-5 months
Watermelon	50-60	90	2-3 weeks

*Most summer-harvested potatoes are not stored. However, they can be held 4-5 months at 40°F if cured 4-5 days at 60-70°F before storage. They can be stored 2-3 months at 50°F without curing. Potatoes for chips should be held at 70°F or conditioned for best chip quality.

^bFall-harvested potatoes should be cured at 50-60°F and high relative humidity for 10-14 days. Storage temperatures for seed or table stock should be lowered gradually to 38-40°F. Potatoes intended for processing should be stored at 50-55°F. Those stored at lower temperatures or with a high reducing sugar content should be conditioned at 70°F for 1-4 weeks or until trial cooking tests are satisfactory.

^aWinter-squash varieties differ in storage life. Acorn squash can be stored for 35-55 days, butternut squash for 60-90 days, and Hubbard squash for 180 days.

culture; Amanda Deering,

horticulture; Laura Jesse Iles,

ogy.

ndrei, Entomology;

Fritz, Horticulture; ation.

Farming;

Pathology; Eric C. Burkness, MN

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Questions and Thank You!

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