Pumpkins and Squash (Summer and Winter)

Culture

Summer squash usually is direct seeded or planted by transplants for early markets. The use of black plastic and transplants also increases early yields in cool springs. Do not plant squash or pumpkin seed until soil temperature reaches 60°F.

Transplants should be grown in large (3-inch) cells or containers. The roots should not be disturbed at transplanting.

Summer squash tends to develop female flowers before male flowers, especially during cool weather. These fruits enlarge for a short time and then abort. This often is a concern of growers, but it remedies itself once growing conditions become favorable.

Pumpkins and squash require bee activity for good fruit set. Fruit set in winter squash and pumpkins takes place largely in a 2- to 3-week period. Poor pollination results in poorly shaped fruit as well as excessive blossom drop. One hive of bees is recommended per acre.

Varieties

Summer: Yellow

Precious II
Lioness
Patriot II
Enterprise
Fortune
Lemon Drop
Seneca Prolific
Multipic
Prelude II
Fredom III

Summer: Green

Cash Flow
Sitos
Spineless Beauty
Cash Flow
Green Eclipse
R8SQ 0190
Zucchini Elite
Dividend (CMV, ZYMV, WMV)
Select
Senator
Seneca Zucchini
Milano
Eldorado (gold zucchini)
Gold Rush (gold zucchini)
Revenue (CMV, ZYMV, WMV)

Winter

Hubbard types
Table Ace (acorn)
Delicious types
Buttercup

Novelty

Vegetable Spaghetti

Scallop

Patty Pan Green Tint
Scallopini
Peter Pan
Sunburst (Gold)

Fall

Waltham Butternut
Puritan (trial)
Table Queen (Ace)
Royal Acorn

Pumpkin

SSX 5078 (30+ lb)
Pro Gold 510
Gold Rush (heat sensitive)
Aladdin
Gladiator (PMT)
Autumn King
Harvest Time (oblong)
Gold Medal
Mr. Wrinkles
Super Herc (HMX 3692) PMT 23 lb+
HMX 6685 PMT
Midas Touch
Gold Challenger
RPX 768
Phat Jack large, big handle
King Midas (trial)

Medium Size Fruit

Gold Standard
Gold Fever
Gold Gem
Gold Bullion
Magic Lantern (PMT)
Hannibal (trial)
HMX 2689 (PMT) (trial)
Octoberfest (trial)
18 or 20 Karat Gold
Aspen (15-16 lbs/fruit)
Jackpot
Spirit (10-15 lbs/fruit)

Small Types

Lil' Ironsides
Cannon Ball (5 lb)
Pic-A-Pie
Mystic Plus (PMT)
Small Sugar
Orange Smoothie (smooth skin)
School Time (5 lb) (trial)
Iron Man PMT (4 lb)
Apprentice HMX 5682 PMT (1 lb) (hard shell)
HMX 5684
HMX 5683
Spookie
Touch of Autumn (PMT)
Oz
Wee Be Little
Gold Speck (mini)
Gold Dust (mini)
Baby Boo (white miniature)
Lil' Pump-ke-mon

Large Types

Big Autumn
Big Max (large, for show)
Big Moon (pink-creme color)

PMT = powdery mildew tolerance
CMV = cucumber mosaic virus resistance
ZYMV = zucchini yellows mosaic virus resistance
WMV = watermelon mosaic virus resistance
Pumpkins suited for pie filling: Autumn Gold, Connecticut Field, Ghostrider, Jackpot, Small Sugar and Spirit.

Lime and Fertilizer

Maintain soil pH at 6.5.

Apply per acre 50-75 lb N, and P_2O_5 and K_2O according to soil test. Broadcast 50% before plowing, and if applicable to the situation, band 50% 2 inches below the seed and 2 inches to the side of the row. Sidedress an additional 30 lb N/A as the vines begin to run. If leaching rains occur, an additional sidedressing may be necessary.

Seeding and Spacing

Rows: bush types, 4-5 ft apart.

In-row: bush types, 18-24 inches between plants.

Vine types should be planted 12-24 inches apart in rows 6-8 ft apart, or 36 inches apart in rows 3-4 ft apart.

Plant seed 0.75-1.25 inch deep, depending on soil texture and moisture.

Seed required: 4-6 lb/A for summer squash, 2-4 lb/A for winter squash and pumpkins.

Harvest

Fruit of summer squash should be harvested on reaching 4-6 inches in length. Care must be taken not to injure the soft skin. Some growers require that harvesters wear gloves to prevent injury from fingernails. Injuries result in brown or discolored areas on the fruit.

Summer squash can be damaged from 3-4 days exposure to temperatures of 32-40°F and 90% or greater relative humidity. This is known as "chilling injury" and causes pitting on the skin surface.

Winter squash and pumpkins normally are not harvested until the rind or skin is completely hardened. Harvest fruits before they are exposed to temperatures of 32°F or frost. Avoid severe wounding of squashes during harvesting and handling.

Some growers knock butternut squash from the vine with a rubber-covered pipe, which results in a fresh scar on the stem end of the fruit. Fruits handled this way should not be handled further until the scar has dried.

A second method of picking butternut squash is to clip the fruits from the vines with pruning shears. Less damage is done to the fruits, but the process is more time consuming.

After harvest, cure butternut squash and pumpkins at temperatures of 80-85°F for 10-12 days to help heal cuts and scars. After curing, butternut squash and pumpkins are ready for storage.

At harvest, cure pumpkins and squashes at a temperature of 80°F to 85°F, with a relative humidity of 80 to 85% for 10 days after harvesting. These conditions can often be met in the field, but if cool, wet weather is present, the fruit should be brought under shelter and cured with heat by stoves or other artificial means. At the end of the 10-day period, the humidity should be lowered to about 50 to 70% and the temperature kept between 50°F and 60°F. It is essential to keep the surface dry during the storage period. Temperatures above 60°F tend to keep the respiration too high, and considerable loss in weight results. Excessive loss of moisture or solids impairs the quality (see "Storage," below). Any dry place where the proper temperature can be maintained is suitable for the storage of squashes and pumpkins. They keep best when placed in single layers and not piled on top of each other (if this is practical for your operation). Proper storage greatly reduces the chances of decay.

Storage

Summer squash can be held at temperatures of 45-50°F at 90% relative humidity for up to 2 weeks. However, it is advisable to market summer squash as soon as possible.

Pumpkins can be stored 2-3 months at 50-55°F and 50-75% relative humidity.

Butternut squash stores well if temperatures are maintained at 50-60°F and 50%-60% relative humidity.

Experimental work indicates that a temperature of 55°F, plus or minus 2°, and a relative humidity of 60% is ideal. At temperatures above 60°F, and when relative humidity drops below 50%, moisture loss rapidly increases, causing the interior of the squash to become dehydrated and pulpy. Good storage thus requires the proper combination of heat and humidity.

To maintain uniform temperature and relative humidity throughout the storage period, air movement should be kept constant by fans placed in strategic locations within the storage.

Hubbard squash should keep 6 months or more; acorn, 5-8 weeks. Squash should not be stored with ethylene producers such as ripe apples or pears, because squash will turn color, become stringy and decay. It is important to keep squash dry.

Disease Control

Pumpkin Fungicide Guide for 2008										
Fungicide Trade Name	**Common Name**	**FRAC[1]**	**Powdery mildew**	**Downy mildew**	**Bacterial fruit spot**	**Anthracnose**	**Black Rot/ Gummy stem blight**	**Microdochium (Plectosporium) blight**	**Phytophthora blight**	**Other**
Acrobat**	dimethomorph	15		x					x*	
Agri-Fos Phostrol Prophyte	phosphorous acid/phosphite	33	x						x*	
Aliette	fosetyl-Al	33		x					x*	
Armicarb, Kaligreen	potassium bicarbonate	M	x							
Bravo Ultrex, Bravo Weather Stik, Equus	chlorothalonil	M5	x	x		x	x	x	x*	Target spot, Cercospora, Alternaria, Scab
Cabrio	pyraclostrobin	11	x+	x+		x	x	x		Alternaria, Target spot, Cercospora
Copper, fixed[2]	copper sulfate, copper hydroxide	M1	x*	x*	x*		x*		x*	Angular leaf spot*
Curzate**	cymoxanil	27		x						
Dithane, Manzate, Penncozeb	mancozeb	M3	x	x		x	x			
Flint	trifloxystrobin	11	x+	x*+			x	x		
Maneb, Manex	maneb	M3		x		x	x			No activity without copper
Microthiol Disperss	sulfur	M2	x							
Nova	myclobutanil	3	x+							
Plevicur Flex	propomocarb	28		x						Pythium
Pristine	pyraclostrobin + boscalid	11 +7	x+	x+		x	x			Alternaria
Procure	triflumizole	3	x+							
Quadris	azoxystrobin	11	x+	x+		x	x	x		Belly rot, septoria leaf spot
Quadris Opti	azoxystrobin + chlorothalonil	11 M	x+	x+		x	x	x		Belly rot
Ranman	cyazofamid	12		x					x*	
Ridomil Gold EC/Bravo	mefenoxam + chlorothalonil	4 M5		x+		x	x			Cercospora, Scab, Alternaria
Ridomil Gold EC/Copper	mefenoxam + copper	4 M1		x+						
Tanos**	cymoxanil famoxadone	27 11		x		x			x*	Alternaria
Topsin M	thiophanate-methyl	1	x			x	x			Belly rot, Target spot

*Disease suppression only.
**MUST be tank mixed with other M class fungicides or fungicides with different FRAC number.
+Insensitivity to this fungicide has been observed among agents of this disease, or is likely to occur. Use this product in combination with other fungicides with a different mode of action and with cultural practices and resistant varieties to minimize development of fungicide resistance.
1. FRAC Number. See the Fungicide Resistance management section of this guide, pages 59-60, for information on preventing fungal plant pathogens from developing resistance to fungicides. In this column, fungicides marked with an M are contact fungicides that have multiple modes of action and do not need to be tank mixed or alternated.
2. Fixed coppers include: Champ, Kocide, Tenn-Cop, and Cuprofix Disperss.

Damping Off

Buy seed commercially treated with fungicide. If Pythium has been a problem, apply **Ridomil Gold EC** (46 EC) at 1-2 pt/A preplant. (See label directions.)

Powdery Mildew

When disease appears, apply one of the following:
***Flint** 1.5-2.0 oz/A (0 days-PHI).
***Topsin M 70WP** 0.25-0.5 lb/A (0 days-PHI).
***Quadris** 11-15.4 fl oz/A (1 day-PHI).
***Quadris Opti** 3.2 pt/A (1 day-PHI).
***Bravo Weather Stik** 1.5-2 pt/A (0 days-PHI) or other chlorothalonil formulation.
***Procure** 50WS 4-8 oz/A (0 days-PHI).
Potassium bicarbonate (Armicarb 100, **Kaligreen** or other formulation) 2.5-5 lb/A (0 days-PHI).
Microthiol DF 4 lb/A (0 days-PHI) or other sulfur formulation.
***Nova** (40W) 2.5-5.0 oz/A (1 day-PHI).

Anthracnose, Black Rot and Gummy Stem Blight

(Called "black rot" when disease attacks the fruit, "gummy stem blight" when on the stem. Often serious on Butternut and Hubbard.)

Use western-grown, disease-free seed. Apply one of the following fungicides at weekly intervals as needed:
Bravo Weather Stik (6F) 2-3 pt/A (0 days-PHI).
Bravo Ultrex (82.5 WDG) 1.4-2.7 lb/A (0 days-PHI).
Equus (6F) 2.0-3.0 pt/A (0 days-PHI).
***Quadris** (2.08 F) 11.0-15.4 fl oz/A (1 day-PHI) 2.88 qt/A/season maximum. See label for application directions, resistance management.
***Tanos 50DF** 8 oz/A (3 days-PHI) tank mixed with Maneb or other protectant fungicide. Anthracnose only.
***Cabrio** (20 EG) 12-16 oz/A (0 days-PHI) (Maximum use of 64 oz/A/season.)

Downy Mildew

Scout fields regularly. If cool rainy conditions occur and/or downy mildew has been confirmed in the region, apply a protectant fungicide (Bravo, Equus, maneb, mancozeb). Once downy mildew has been found nearby, apply Previcur Flex + protectant alternated with Tanos 50 DF + protectant. See list below for rates and PHIs.
***Flint** 4 oz/A (0 days-PHI) 16 oz/A/season (See label.)
***Quadris** 11-15.4 fl oz/A (1 day-PHI).
***Quadris Opti** 3.2 pt/A (1 day-PHI).
***Ranman** 2.1-2.75 fl oz/A (0 days-PHI).
***Gavel** 75DF 1.5-2.0 lb/A (5 days-PHI) (See label for use directions.)
***Tanos 50DF** 8 oz/A tank mixed with Maneb or other protectant fungicide (3 days-PHI).
Bravo Weather Stik 1.5-2 pt/A (0 days-PHI).
Equus 720 1.5-2 pt/A (0 days-PHI).
Maneb 75DF 1-2 lb/A (5 days-PHI) or other maneb formulation.
Mancozeb 75DF 2-3 lb/A (5 days-PHI) or other mancozeb formulation.
***Previcur Flex** 1.2 pt/A (2 days-PHI).
***Curzate** 60DF 3.2-5.0 oz/A (3 days-PHI). Apply with a protectant fungicide such as Manex. Maximum 30 oz per 12 months.
***Ridomil Gold EC/Bravo** (76 W) 2 lb/A (0 days-PHI).
***Ridomil Gold EC/Copper** (65 W) 2.0 lb/A (5 days-PHI, see label).
***Ridomil Gold MZ** (70 W) 2.5 lb/A (5 days-PHI, see label for directions).

Microdochium Blight

Rotate out of cucurbit crops at least 2 years. Choose fields with well-drained soil. If disease is found, spray one of the following every 7-14 days.

Maneb (Manex 4F) 2-3 pt/A (5 days-PHI).
Bravo Weather Stik 1.5-2.0 pt/A (0 days-PHI) or other formulation of chlorothalanil.
Cabrio 12-16 oz/A (0 days-PHI).
Flint 1.5-2.0 oz/A (0 days-PHI).
Quadris 11.0-15.4 fl oz/A (1 day-PHI).

Alternate fungicides in the strobilurin group (Quadris, Flint, Cabrio) with protectants (Bravo, Mancozeb).

Viruses: Watermelon Mosaic Virus (WMV), Cucumber Mosaic Virus (CMV), & Zucchini Yellow Mosaic Virus (ZYMV)

For early-season summer squash, pumpkins and winter squash, it may help to kill perennial weeds (virus source plants) within 150 ft of plantings and to control aphids, which are virus vectors. Some growers in eastern states grow late-season summer squash on reflective silver/gray plastic mulch to repel aphids. Resistant cultivars are not available.

Bacterial Diseases

Three bacterial diseases can be serious on pumpkins in Ohio. Although a more well known problem on melons and cucumbers, bacterial wilt has recently become a problem on pumpkins and squash in Ohio. The bacteria that cause this disease are carried by the striped cucumber beetle and the spotted cucumber beetle. It is important to control these beetles with insecticide as soon as they appear in the spring. Once plants are infected with bacterial wilt, no control is possible.

Wet weather and windy conditions can lead to severe Angular Leaf Spot and Bacterial Spot problems. There are no effective chemical controls for these two diseases. Use of clean seeds and crop rotations (2-3 years out of vine crops) can help limit damage.

Phytophthora Blight

This disease, caused by a soil borne pathogen, is severe most years in Ohio when fields flood after heavy, mid-summer rains. The disease develops very rapidly. Once symptoms develop, disease control is impossible. To limit damage from this disease, select fields that have very good internal and surface drainage. Do not select fields that have produced vine crops, tomatoes, peppers, or eggplant within 3 years. If crops can be grown on raised beds, do so.

Use seed treated with Apron XL LS or Allegiance FL to protect plants up to five weeks after sowing. Apply Acrobat 50WP (1 day REI, 0 days-PHI) at 6.4 oz/A tank-mixed with copper sulfate (e.g., Cuprofix Disperss at 2.0 lb/A, 1 day REI). Under conditions favorable for Phytophthora blight, apply fungicides at 5-day to 7-day intervals. Do not make more than two sequential applications before alternating with another effective product with a different mode of action. Five (5) applications/32 oz maximum per season.

Other fungicide choices include:
Prophyte 3-6 pt/A (0 days-PHI).
***Gavel 75 DF** 1.5-2 pt/A (5 days-PHI).
***Ranman** 2.1-2.75 fl oz/A (0 days-PHI).
***Tanos** 8-10 oz/A (3 days-PHI), tank mixed with Manzate 75DF or other protectant fungicide and a copper-containing fungicide such as Kocide 3000. Disease suppression only.

*Follow guidelines for fungicide resistance management on the product label (see pages 59-60).

Insect Control

See the table on the next page for overview of insecticides used to control pumpkin and squash pests.

• At-planting treatment

Bifenthrin (3 days-PHI)
For maggot, wireworm, grubs.
Brigade 10WSB: 8-16 oz/A. Apply in-furrow with seed.

Insecticides for Use on Pumpkins and Squash in Ohio

(E = excellent; G = good; F = fair; P = poor; ✓ = pest listed on label but efficacy uncertain; - = pest not on label; rating in parentheses = pest not on label but product known to provide some control)

Pest >>	**Pre-harvest interval (days)**	**Seed-corn maggot**	**Cucumber beetles**	**Aphids**	**Squash vine borer**	**Squash bug**	**Spider mites**	**Caterpillars**	***Impact on beneficial insects***
How often an insecticide has been needed on Ohio farmsfor this pest in the past >>		occasional especially in cool wet springs	every year especially early season	occasional	occasional	occasional	occasional especially in dry years	rare	
ORGANOPHOSPHATES									
Dibrom (naled)	1	-	✓	✓	-	-	✓	✓	moderate/ disruptive
malathion (Cythion)	1, 3	-	G	F	✓	-	F	F	low/moderate
MSR (oxydemetonmethyl)	3, 14	-	-	G	-	-	(F)	-	moderate
CARBAMATES									
Furadan (carbofuran)	-	-	E	-	-	-	-	-	moderate
Lannate (methomyl)	1, 3	-	G	G	-	-	-	G	disruptive
Sevin (carbaryl)	3	-	G	-	-	P	-	F	disruptive
Vydate (oxamyl)	1	-	-	G	-	-	(G)	-	disruptive
PYRETHROIDS									
Asana (esfenvalerate)	3	-	G	-	✓	G	-	G	disruptive
Baythroid (cyfluthrin)	0	-	✓	-	-	-	-	✓	disruptive
Capture (bifenthrin)	3	-	G	F	✓	G	F	G	disruptive
Danitol (fenpropathrin)	7	-	G	-	-	(G)	F	-	disruptive
Decis (deltamethrin)	3	-	✓	-	-	-	-	✓	disruptive
Mustang (zeta-cyper.)	1	-	✓	-	✓	✓	-	-	disruptive
Pounce (permethrin)	0	-	G	F	✓	G	-	G	disruptive
NEONICOTINOIDS (CHLORONICOTINYLS)									
Actara (thiamethoxam)	0	-	✓	✓	-	-	-	-	low/moderate
Admire (imidacloprid)	21	-	✓	G	-	-	-	-	low/moderate
Platinum (thiamethoxam)	30	-	(G)	G	-	-	-	-	low/moderate
Venom (dinotefuran)	1, 21	-	✓	✓	-	✓	-	-	low/moderate
OTHER INSECT NERVE POISONS									
Agri-Mek (abamectin)	7	-	-	-	-	-	G	-	low/moderate
Avaunt (indoxacarb)	3	-	-	-	-	-	-	✓	low/moderate
Beleaf (flonicamid)	0	-	-	✓	-	-	-	-	-
Fulfill (pymetrozine)	0	-	-	G	-	-	-	-	low
Pyronyl, PyGanic (pyrethrins)	0	-	✓	✓	✓	G	-	✓	moderate
Radiant (spinetoram)	3	-	-	-	-	-	-	✓	-
SpinTor (spinosad)	3	-	-	-	-	-	-	G	low
Thionex (endosulfan)	1, 2	-	G	G	✓	F	-	F	moderate
INSECT GROWTH REGULATORS									
Courier (buprofezin)	7	-	-	-	-	-	-	-	low/moderate
Neemix, Aza-Direct (azadirachtin)	0	-	-	( )	✓	✓	-	✓	low/moderate
Trigard (cyromazine)	0	-	-	-	-	-	-	-	low/moderate
MISCELLANEOUS									
Acramite (bifenazate)	3	-	-	-	-	-	✓	-	low
Bacillus thuringiensis (B.t.)	0	-	-	-	-	-	-	G	very low
cryolite (Kryocide)	7	-	✓	-	-	-	-	✓	low
Kelthane (dicofol)	2	-	-	-	-	-	G	-	low/moderate
Oberon (spiromesifen)	7	-	-	-	-	-	✓	-	-
soap (M-Pede)	0	-	-	F	-	-	F	-	low

Carbofuran
For cucumber beetles, nematodes.
Furadan 4F: 2.4 fl oz/1,000 feet; apply in seed furrow or as 7-inch band over row. (Ohio 24c label)

Dinotefuran (21 days-PHI)
For aphids (suppression), thrips, whiteflies, leafhoppers, cucumber beetles, squash bug.
Venom 70SG: 5-6 oz/A as in-furrow spray, post-seeding drench, or transplant drench. Limit 12 oz/A per season.

Imidacloprid (21 days-PHI)
For aphids, cucumber beetles, thrips, whiteflies.
Admire 2F, Alias 2F: 16-24 fl oz/A. Limit 24 oz/A per year.
Admire Pro (4.6F): 7-10.5 fl oz/A.

Thiamethoxam (30 days-PHI)
For aphids, flea beetles, leafhoppers, thrips, suppression of cucumber beetles.
Platinum 2SC: 5-11 fl oz/A.

• Bait treatment

Carbaryl (0-3 days-PHI)
Sevin 5B: 20 lb/A or 7.3 oz/1,000 sq ft. For cutworms, grasshoppers. 1 day-PHI.
Prozap Sevin 10% Bait Granules: 10 lb/A. For cutworms, grasshoppers.

• Foliar treatment

Cucumber beetles: Cucumber beetles are often a problem during stand establishment. If Furadan or Admire was *not* used at planting, then a foliar insecticide application might be needed as soon as the young plants start to break through the soil surface, and repeated at 5-7 day intervals if there is 0.5 or more beetles per plant until the 4-leaf stage. If Furadan or Admire *was* used at planting, a foliar spray might be needed about 4 weeks after planting if there are more than 5 beetles per plant. Cucumber beetles may require control if they attack rinds of fruit during the last few weeks before harvest.

Aphids: Aphids transmit watermelon mosaic virus (WMV) and other viruses. WMV in Ohio pumpkins usually appears in late July or early August. Insecticide treatment for aphids will not prevent or eliminate virus infection. Experience in Ohio suggests that if the initial infestation of infective aphids is light, then spread of virus can be delayed or suppressed by applying insecticide after detection of increasing numbers of winged aphids in mid to late July. Metasystox-R, Endosulfan (Thiodan), or Fulfill usually work best.

Squash bug: This pest does not usually warrant control on commercial farms in Ohio in most years; eggs can be parasitized by tiny wasps. Control may be needed if there is an average of more than one egg mass per plant at the time of early flowering. Adult squash bugs are more difficult to kill than nymphs. Squash bugs live on the underside of leaves, so sprays must penetrate the canopy. Control is usually best with pyrethroids (Ambush, Pounce, or Asana), but these will kill natural enemies as well.

Squash vine borer: If frass is found at the base of stems, or on farms with a history of this pest, apply insecticide at 7-day intervals once squash vine borer moths become active. Moths can be monitored with pheromone (sex attractant) traps. In average years, moths become active in late June and 5 sprays may be needed. Direct the spray to the base of plants.

Abamectin (7 days-PHI)
For spider mites, leafminers.
Agri-Mek 0.15EC, Abba 0.15EC: 8-16 fl oz/A.

Bifenazate (3 days-PHI)
For spider mites.
Acramite 50WS: 0.75-1.0 lb/A. Limit one spray per season.

Bifenthrin (3 days-PHI)
Brigade 2EC, Capture 2EC, Discipline 2EC, Fanfare 2EC, Sniper 2EC, Tundra 2EC: 2.6-6.4 fl oz/A for cucumber beetles, squash bug, vine borer, aphids; 5.12-6.4 fl oz/A for mites.
Brigade 10WSB: 8-16 oz/A.

Buprofezin (7 days-PHI)
For whiteflies.
Courier 0.7EC: 6-9 oz/A.

Carbaryl (3 days-PHI)
For cucumber beetles, flea beetles, squash bug, pickleworm, loopers, leafhoppers.
Note: The repeated use of carbaryl may cause a buildup of aphids. Carbaryl may cause injury to young cucurbit plants if applied during periods of high humidity.
Carbaryl 90DF: 1.1 lb/A for beetles; 0.6-1.1 lb/A for worms.
Carbaryl 4L; Sevin XLR Plus (4EC); Sevin 4F: 1 qt/A for cucumber beetles, flea beetles, squash bug, leafhoppers; 0.5-1 qt/A for pickleworm.
Sevin 80S: 1.25 lb/A for cucumber beetles, flea beetles, squash bug, leafhoppers; 0.67-1.25 lb/A for pickleworm.
Sevin 50WP: 2 lb/A for cucumber beetles, flea beetles, squash bug, leafhoppers; 1-2 lb/A for pickleworm.

Cryolite (7 days-PHI, summer squash; 14 days-PHI, pumpkins and winter squash)
For flea beetles, pickleworm, loopers and cucumber beetles.
Kryocide (96% a.i.): 8-16 lb/A.
Prokil Cryolite 96 (96% a.i.): 10-16 lb/A.

Cyfluthrin (0 days-PHI)
For cucumber beetles.
Baythroid 2EC: 2.4-2.8 fl oz/A. Limit 4 applications per year.

Cyromazine (0 days-PHI)
For leafminer.
Trigard 75WP WSP: 1/6 lb (1 packet)/A.

Deltamethrin (3 days-PHI)
Decis 1.5EC, Delta Gold 1.5EC: 1.0-2.4 fl oz/A for cutworms, leafhoppers. 1.5-2.4 fl oz/A for cucumber beetles, flea beetles, grasshoppers, pickleworm, stink bugs. Limit 14.4 fl oz/A per season. Allow 3 days between applications.

Dicofol (2 days-PHI)
For mites.
Limit 2 applications.
Dicofol 4EC: 0.75 pt/A.
Kelthane 50WP: 1-1.25 lb/A.

Dinotefuran (1 day-PHI)
For aphids (suppression), thrips, whiteflies, leafhoppers, cucumber beetles, squash bug.
Venom 70SG: 1-4 oz/A. Limit 6 oz/A per season.

Endosulfan (2 days-PHI, squash; 1 day-PHI, pumpkins)
For cucumber beetles, flea beetles, aphids, squash vine borer, squash bug, pickleworm, loopers.
Thionex 3EC; Endosulfan 3EC: 0.7-1.3 qt/A for cucumber beetles, flea beetles, aphids, squash vine borer, squash bug, pickleworm; 1.3 qt/A for loopers. Limit 6 applications per year or 4 qt/A per year.
Thionex 50WP: 1-2 lb/A for cucumber beetles, flea beetles, aphids, squash vine borer, squash bug, pickleworm; 2 lb/A for loopers. Limit 6 applications or 6 lb/A per year.

Esfenvalerate (3 days-PHI)
For cucumber beetles, squash vine borer, squash bug, pickleworm, loopers, leafhoppers.
Asana XL 0.66EC, Adjourn 0.66EC: 5.8-9.6 fl oz/A. Limit 48 fl oz/A per season.

Fenpropathrin (7 days-PHI)
For striped cucumber beetle, spider mites.
Danitol 2.4EC: 10.7-16 fl oz/A.

Flonicamid (0 days-PHI)
For aphids.
Beleaf 50SG: 1.2-2.8 oz/A. Limit 3 applications per year.

Indoxacarb (3 days-PHI)
For pickleworm, melonworm.
Avaunt 30WG: 2.5-6 oz/A. Limit 24 oz/A per crop.

Malathion (1 day-PHI, squash; 3 days-PHI, pumpkins)
For cucumber beetles, aphids, squash vine borer, mites, pickleworm, leafhoppers.
Note: May cause injury if applied before plants start to vine. Do not apply unless plants are dry.

Malathion 5EC; Malathion 57EC: 3 pt/A for cucumber beetles, squash vine borer; 1.5-2 pt/A for aphids; 2 pt/A for mites, pickleworm, leafhoppers.
Malathion 8EC; Malathion 8 Aquamul: 1.5-1.75 pt/A for cucumber beetles; 1-1.75 pt/A for aphids, mites, pickleworm, leafhoppers.

Methomyl (1 or 3 days-PHI, depending on rate; summer squash only)
For cucumber beetles, flea beetles, aphids, pickleworm, loopers.
Limit 12 applications/crop.
Lannate 90SP: 0.5-1 lb/A.
Lannate LV (2.4WSL): 1.5-3 pt/A.

Methoxyfenozide (3 days-PHI)
For caterpillars: pickleworm, melonworm.
Intrepid 2F: 4-10 fl oz/A. Limit 4 applications or 64 fl oz/A per season.

Naled (1 day-PHI, summer squash only)
For cucumber beetles, aphids, mites, pickleworm.
Dibrom 8EC: 1-2 pt/A.

Oxamyl (1 day-PHI)
For aphids, leafminers.
Vydate L (2WSL): 2-4 pt/A.

Oxydemetonmethyl (3 days-PHI, summer squash; 14 days-PHI, winter squash and pumpkin)
For aphids.
MSR (Metasystox-R 2SC): 1.5-2 pt/A. Not more than one application per season.

Permethrin (0 days-PHI)
For cucumber beetles, squash vine borer, squash bug, pickleworm, loopers.
Pounce 3.2EC, Arctic 3.2EC, Permethrin 3.2EC: 4-8 fl oz/A for cucumber beetles, squash vine borer, pickleworm, loopers; 8 fl oz/A for squash bug. Limit 64 fl oz/A per season.
Ambush 25WP; Pounce 25WP: 6.4-12.8 oz/A for cucumber beetles, squash vine borer, pickleworm, loopers; 12.8 oz/A for squash bug. Limit 102 oz/A per season.

Pyriproxyfen (7 days-PHI)
For whiteflies.
Esteem 35WP: 2.5-3 oz/A. Limit 2 applications or 6 oz/A per season.

Pymetrozine (0 days-PHI)
For aphids.
Fulfill 50WDG: 2.75 oz/A. Limit 5.5 oz/A per season.

Spinetoram (3 days-PHI)
For caterpillars, thrips.
Radiant 1SC: 5-10 fl oz/A. Limit 6 applications per crop.

Spinosad (3 days-PHI)
SpinTor 2SC: 4-8 fl oz/A for caterpillars; 6-8 fl oz/A for leafminers, thrips. Limit 29 fl oz/A per year.
Entrust (80WP): 1.25-2.5 oz/A.

Spiromesifen (7 days-PHI)
For two-spotted spider mite, whiteflies.
Oberon 2SC: 7.0-8.5 fl oz/A. Limit 3 applications per crop season.

Thiamethoxam (0 days-PHI)
For aphids, flea beetles, cucumber beetles.
Actara 25WDG: 1.5-3 oz/A for aphids, flea beetles; 3-3.5 oz/A for suppression of cucumber beetles.

Zeta-cypermethrin (1 day-PHI)
For cucumber beetles, squash bug, squash vine borer, pickleworm, melonworm.
Mustang Max 0.8EC: 2.8-4 fl oz/A.
Mustang 1.5EW: 3-4.3 fl oz/A.

Weed Control

Preplant Incorporated

Squash and Pumpkins

Prefar 4EC: Controls germinating annual grasses and certain broadleaf weeds. Apply 1.0-1.5 gal/A Prefar 4EC preplant and incorporate into the soil.

Command 4EC: Pumpkins—apply 1.5-2 pt/A Command 4EC. Incorporate the herbicide to a depth of 1 inch or less and place the seed or transplant below the chemical barrier when planting. Consult the label.

Preplant

Squash and Processing Pumpkin

Command 3ME: Controls annual grasses and suppresses some broadleaf weeds. For winter squash apply 0.67-2 pt/A prior to transplanting or seeding. For summer squash the maximum rate is 1.33 pt/A. Do not use under plastic mulch. Some cultivars and varieties are sensitive and unacceptable whitening of the fruit may occur. Do not use on Jack-o-lantern Pumpkins.

Preemergence

Curbit: Controls germinating annual grasses and broadleaf weeds. Apply 3-4 pt/A Curbit within 2 days of seeding prior to crop and weed emergence. Do not apply later than 2 days after seeding. Do not incorporate. Use the lower rate on coarse soils (sandy) and the higher rate on fine soils (clay, clay loams). Not for use on soils containing more than 10% organic matter.

Strategy: Apply 2.0-6.0 pt/A, depending upon soil type. Controls annual broadleaf weeds and grasses. Strategy must be applied after seeding but before weed emergence. A banded application between the rows can be applied after crop emergence or transplanting. Rainfall or irrigation is required to activate the herbicide.

Pumpkins and Winter Squash (direct seeded)

Sandea: Apply 0.5-0.66 oz/A after seeding but before ground crack. (Up to 1 oz/A may be applied in a single application for direct-seeded processing pumpkin and squash only.) Use lower rates on lighter textured soil, low in organic matter. Heavy rainfall and/or cool weather following an application during the germination and early growth period may result in severe crop injury and/or reduced stands. Two applications may be made per season. Do not apply a total of more than 1 oz/A/season. PHI is 30 days.

Premergence or Postemergence

Pumpkins and Winter Squash (transplanted) and Summer Squash

Sandea: For control of labeled broadleaf weeds and yellow nutsedge in row-middles of pumpkins and winter squash in plastic mulch, apply 0.5-1.0 oz/A. Do not apply the herbicide to the plastic mulch. For postemergence applications add nonionic surfactant at 1-2 quarts/ 100 g spray mixture. Two applications may be made per season. Do not apply a total of more than 1 oz/A/season. PHI is 30 days.

Postemergence

Poast: For postemergent control of annual and perennial grasses. Apply 1-1.5 pt/A Poast (15 days-PHI). Do not exceed 3 pt/A/season. Add 1 qt/A nonphytotoxic oil concentrate. Rate is dependent on grass species and stage of development.

Select: Controls emerged annual and perennial grasses. Apply 8 fl oz/A (14 days-PHI). Do not exceed 32 fl oz/A/season. Add a crop oil concentrate at 1% on a volume basis (v/v).

Pumpkins and Winter Squash (direct seeded)

Sandea: Apply 0.5-0.66 oz/A plus a nonionic surfactant (1-2 qts/100 g spray) after seeding but before ground crack. Crop oil concentrate and silicone-based adjuvants are not recommended. (Up to 1 oz/A of Sandea may be applied in a single application for direct-seeded processing pumpkin and squash only.) Apply after the crop has reached the 2-5 leaf stage, but before first female flowers appear. Use lower rates on lighter textured soil, low in organic matter. Two applications may be made per season. Do not apply a total of more than 1 oz/A/season. PHI is 30 days.

Premergence or Postemergence

Pumpkins and Winter Squash (transplanted) and Summer Squash

Row-Middle Applications Between Plastic Mulch

Sandea: For control of labeled weeds in row-middles of pumpkins and winter squash in plastic mulch, apply 0.5-1.0 oz/A. Do not apply the herbicide to the plastic mulch. For postemergence applications add nonionic surfactant at 1-2 quarts/100 g spray mixture. Crop oil concentrate and silicone-based adjuvants are not recommended. Two applications may be made per season. Do not apply a total of more than 1 oz/A/season. PHI is 30 days.

Directed/shielded application

Gramoxone Extra: Controls emerged annual weeds and top growth of perennial weeds. Apply 1.5 pt/A Gramoxone Extra. For control or suppression of emerged weeds between rows after crop establishment. Prevent contact with crop otherwise crop injury will result. See the label for specific precautions.

Basic Guide to Pumpkin Production			
Stage >>	**Pre-plant**	**Planting (late May to mid-June)**	**Seedling & stand establishment (June)**
Culture	• **select site:** select a well drained fertile soil that is free of serious perennial weeds such as quackgrass, johnsongrass or Canadian thistle. See also disease factors below. • **test soil:** take samples in the fall before planting. Apply lime in the fall if necessary. Minimum desired soil pH is 6.0. • **select variety:** Select varieties known to perform well in your area. Many different sizes are now available and varieties can be matched to your customer needs. Some new varieties have good levels of powdery mildew tolerance and resistance to certain virus diseases. • **apply fertilizer:** Apply 100% of the recommended phosphorus and potassium fertilizer preplant. Usual nitrogen rates are 60 to 100 pounds of actual nitrogen per acre. Apply 60 to 80% of the recommended nitrogen fertilizer preplant. (The remaining nitrogen can be sidedressed before vine tip or applied through the trickle irrigation system.) • In retail markets for improved yield and quality, lay **drip tape** and **plastic mulch** for weed control, irrigation and fertigation.	• **plant seed** when soil temperatures reach 58 to 60 degrees F. Use seed treated with fungicide and insecticide. • Lay **drip tape** to provide supplemental water to improve germination, plant stand vine growth, and fruit set later in the season.	• **Irrigation** may be required to germinate seed and insure good plant stand; irrigate to provide 1 inch water per week • Apply remaining nitrogen **fertilizer** in a band along the side of the row before vines begin to tip.
Weed management	• Apply preplant incorporated (PPI) herbicides, Command or Prefar: - Command: Be aware of replanting and application restrictions. Good control of **lambsquarter, jimsonweed, purslane, ragweed and velvetleaf.** - Prefar: excellent control of **barnyardgrass, crabgrass, fall panicum and foxtails.** Fair to good control of **pigweed.**	• Curbit: Apply before crop and weeds emerge but no later than 2 days after planting. Do not incorporate and do not use with plastic. Good control of **annual grasses, purslane, lambsquarter and smartweed.** Poor to fair control of **pigweed, mustards, ragweed and galinsoga.** • Strategy: Premix of Command plus Curbit. See preemergence in weed control. • Sandea: After seeding but before ground crack.	• Apply Poast or Select plus crop oil concentrate to **emerged grass weeds.** Safe after crop is established but avoid application during periods of hot (>90°F), humid weather. • Sandea + nonionic surfactant at 0.25%. Wait until crop has reached 2-5 true leaf stage. • For **emerged weeds between rows:** apply Gramoxone Extra in shielded application. Do not let herbicide come in contact with the crop.
Disease management	• select site based on crop rotation: - crop rotation for control of **black rot:** at least 1 year without vine crops. - crop rotation for control of **Phytophthora blight:** 2 to 3 years without vine crops, tomato, pepper, or eggplant. • select field with good surface drainage, for **Phytophthora blight** control • select variety with resistance to **powdery mildew** or **watermelon mosaic virus,** if available. • treat seed with bleach to control **bacterial diseases** (see page 24).	• Use seed treated with captan and thiram, to control Pythium, Phytophthora, and Fusarium. Also consider Apron XL or Allegiance treatment for Phytophthora control.	• If **Phytophthora** has been a problem in this field in past 2 years, treat with fungicide (Ridomil Gold).
Insect management		• Use seed treated with insecticide to control **seedcorn maggot,** especially in fields with much organic matter, and when weather at planting is wet and cool. • Apply systemic insecticide (Furadan or Admire or Platinum) to soil at planting for 4 weeks control of **cucumber beetles.**	• If systemic insecticide not used at planting, then scout twice per week for **cucumber beetles;** especially check plants at field edges. Spray insecticide (Sevin, Asana, Mustang, Pounce, Baythroid, Capture, Decis, or Danitol) if >3 beetles per plant. This threshold should prevent beetles from vectoring bacterial wilt to crop.

Basic Guide to Pumpkin Production			
Vine tip (late June to mid-July)	**Fruit set (July to August)**	**Fruit maturity (late August to October)**	**Post-harvest**
• Move **bee hives** near field when crop starts to flower; use 1 to 3 hives per acre (and note insecticide cautions in insect management section below). • **Irrigate** to provide 1 inch water per week.	• **Irrigate** to provide 1 inch water per week	• **Harvest** can begin when fruit are fully colored, avoiding cuts and bruises. • Do not leave fruit in field if wet weather expected or fruit are consistently wet.	• **Cure** after harvest at 80-85 degrees F and 75-80% humidity for about 10-20 days. This can be done in the field if weather cooperates. • After curing, store at 50-60 degrees and 70% humidity. • Keep fruit dry and provide good air circulation. • Temperatures below 40 degrees for long periods cause chilling injury and lead to fruit rots. • Pumpkins will keep for 2-3 months if properly handled.
• **Cultivate** before vines close, or use Poast for **emerged grasses,** or shielded applications of Gramoxone Extra for **emerged broadleaf weeds.**			• **Plow** down weed residue.
• If field has history of **Fusarium belly rot, anthracnose,** or **gummy stem blight,** then treat with fungicide (Bravo, Cabrio, or Quadris) at vine-tip and every 7-10 days until harvest. • If **Phytophthora** symptoms appear, use fungicide (Ridomil Gold, Amistar, Flint, Tanos, Acrobat, or Quadris).	• Treat with fungicide (Flint, Cabrio, Quadris, or Nova) for **powdery mildew** every 7-14 days starting on August 1st or when lesions first seen. This is a key disease in Ohio.	• If **downy mildew** is detected and fruit not yet orange (usually occurs in August or later), use fungicide (Quadris, Ridomil Gold, Flint, Cabrio, or Tanos) every 7-10 days.	• Plow down crop residue to reduce fungal inoculum (**anthracnose, alternaria leaf spot,** etc.)
• Scout once per week for eggs of **squash bug** on leaves and stems. Use insecticide (Asana, Pounce, Baythroid, Mustang, or Capture) if there is more than one squash bug egg mass per plant; apply when eggs have hatched and bugs are in small nymph stage. • If pheromone trap detects large populations of **squash vine borer** adults (usually in early July), then spray base of stems twice, one week apart, when eggs are hatching (usually mid-July), with pyrethroid (Pounce, Asana, Baythroid, Mustang, or Capture) or endosulfan (Thionex). • Protect **honey bees** from insecticide by choice of timing and product (see pp. 29-30).	• Scout leaves once per week for **spider mites;** if abundant, treat with Agri-Mek, Oberon, Acramite, or Kelthane. • Protect **honey bees** from insecticide by choice of timing and product (see pp. 29-30).	• Scout once per week for **cucumber beetles** and **squash bug;** treat only if feeding damage occurring on fruit surface. • Scout for **aphids;** treat (with Actara, Venom, Fulfill, Beleaf, Thionex, or Metasystox-R) only if honeydew dripping on fruit is unacceptable.	• Plow down crop residue to reduce overwintering sites for **cucumber beetle, squash bug,** and **squash vine borer.**