

Crop Profile for Squash (Summer & Winter) in Ohio

Prepared: January, 1999

General Production Information

Cucurbitaceae (*Curcubita pepo*, *C. moschata* and *C. maxima*)



- Acres in Ohio: 1050(2)
- Percent of US Acreage/Rank: (2)
- Number of Growers: 225(2)
- Per Acre Value: \$
- Value of Production in Ohio: \$

LOCATION OF PRODUCTION(2)

- Huron Co. - 546 acres
- Greene Co. - 94 acres
- Williams Co. - 80 acres
- Sandusky Co. - 59 acres
- Lorain Co. - 35 acres

PRODUCTION METHODS

Squash plants are annuals that thrive in hot weather. Summer squash are bush plants while winter squash are usually vining. Squash prefer light textured soils but usually grow well on most any type. They are usually direct-seeded into soils that have reached a temperature of 60°F, which is required for

germination. Bush types of squash are planted every 18-24 inches in rows that are 4-5 feet apart. Vining squash are planted every 12-24 inches in rows 6-8 feet apart. Soil pH should be maintained at 6.5 for squash production. Broadcast half of the recommended fertilizers before plowing and sidedress remaining fertilizers when the vines begin to run. Some of the early female blossoms boom before there are male flowers available for pollen and therefore will not set fruit. Squash plants require adequate bee activity for good fruit set. It is recommended to have at least one hive per acre. Harvest summer squash when they reach 4-8 inches in length and the rinds are soft. Summer squash are harvested often to ensure the highest number of fruit set. Winter squash are harvested after the rind has hardened but before the fruit is exposed to temperatures below 32°F.

Insect Pests

MAJOR INSECT, MITE AND NEMATODE PESTS

1) Cucumber Beetles (Striped and Spotted)

Cucumber beetles are the most important pests of squash in the Midwest. The striped cucumber beetle has 3 black stripes along the length of its body while the spotted cucumber beetle has 12 black spots on its back. The beetles overwinter as adults in weeds and protected areas. The beetles become active in the spring as temperatures begin to rise. The females deposit eggs in the soil at the base of the plant. The eggs hatch later in the summer and constitute the second generation of beetles. The primary concern regarding cucumber beetles is stand loss during seedling stage. The larvae feed on the root and stem of the young plants and can sometimes do extensive damage. Cucumber beetles can also transmit the bacterium that causes wilt. However, only Hubbard and Butternut squash are susceptible to wilt. Bacterial wilt is usually not a significant problem in squash production.

2) Squash Vine Borer

The squash vine borer larvae tunnel into squash vines causing them to wilt and eventually die. Sawdust-like frass at the base of stems indicates the presence of the borer. Once inside the vine, little can be done to control the borer. Adult moth populations should be monitored to indicate the time when preventive control is needed, usually from mid-June to late July.

MINOR INSECT PESTS

1) Aphids

Aphids live in colonies on the underside of leaves. They feed on the sap from the leaves which can weaken a plant and reduce fruit production. Early signs of aphid feeding are twisted leaves with puckering or cupping in the affected area. Aphids also excrete sticky honeydew onto the leaf surface and fruit. The honeydew can reduce the marketability of the fruit and can serve as the medium for development of sooty fungus. Aphids can also transmit mosaic virus to cucumbers. Aphid populations are usually kept in check by populations of beneficial insects. Chemical use which affects beneficial insects can result in an increase in aphid populations.

2) Squash Bug

Leaves fed upon by squash bug nymphs first develop small specks, which turn yellow and later brown, vines will wilt from the point of attack to the end of the vine, and affected parts become black and crisp. Small plants can be killed by squash bug feeding. Adult squash bugs live on the undersides of leaves but feed mainly on squash stems. Squash bugs are difficult to kill because they are not very susceptible to chemical control and are protected by the plant canopy.

3) Potato Leafhopper

Feeding by this insect is usually accompanied by yellowing, browning or blighting of the foliage known as hopper burn. Leafhoppers can also inject their saliva in to the phloem during their feeding disturbing the plant physiologically and producing disease-like manifestations.

CHEMICAL CONTROLS

Endosulfan (Thiodan)

- Target Pests: cucumber beetles, aphids, squash vine borers and squash bugs
- Percent acres treated: 85%
- Average rate and frequency of application:
 - Thiodan 3EC - 1qt/A, twice
 - Thiodan 50WP - 1.25lb/A, 3-4 times
- PHI: 1 or 4 days depending upon application rate
- Efficacy rating: Good

Carbaryl (Sevin and Adios)

- Target Pests: cucumber beetles, squash bugs, and leafhopper
- Percent acres treated: 49%
- Average rate and frequency of application:

- Sevin XLR - 1 qt/A, once
- Sevin 80S - 1lb/A, 1-2 times
- Adios - 12oz/A, once when vines are 2ft long
- PHI: 3 days
- Efficacy rating: Good to Very good on cucumber beetles, Poor on squash bugs.

Carbofuran (Furadan)

- Target Pests: cucumber beetles and nematodes
- Percent acres treated: 36%
- Average rate and frequency of application:
 - Furidan 4L- 1qt/A once at planting
- Efficacy rating: Good

Permethrin (Ambush and Pounce)

- Target Pests: cucumber beetles, squash vine borer and squash bug
- Percent acres treated: 34%
- Average rate and frequency of application:
 - Ambush 2EC - 8oz/A, twice
 - Pounce - 5oz/A, twice
- PHI: 0 days
- Efficacy rating: Good

Esfenvalerate (Asana)

- Target Pests: Cucumber beetles, squash vine borers, squash bugs and leafhoppers
- Percent acres treated: 5%
- Average rate and frequency of application:
 - Asana XL - 6oz/A, 3 times
- PHI: 3 days
- Efficacy rating: Good

Malathion

- Target Pests: cucumber beetles, aphids, squash vine borer and leafhoppers
- Percent acres treated: 4%
- Average rate and frequency of application:
 - Malathion 5EC - 2pt/A, once after vining

- PHI: 1 day
- Efficacy rating: Average

CULTURAL CONTROLS

To control cucumber beetles use floating row covers to protect young plants. Row covers should be removed when plants start to flower. Crop remnants should be plowed under after harvest. For aphid management, encourage populations of natural enemies (lacewings, lady beetles & larvae, syrphid fly larvae and parasitic wasps) that eat aphids. On small acreage squash bugs can be controlled using boards as traps. The bugs will hide under the boards and can be killed daily. The adults and nymphs can be hand-picked from the plants and eggs should be destroyed in the spring and early summer. Populations of parasites that attack squash bug eggs should be encouraged. To control squash vine borer in small plantings, slit infected stems, remove and destroy larvae. Stems can also be injected with BTK (*Bacillus thuringiensis* var. *kurstaki*). Watch for and destroy red-orange egg masses in late June or early July at the base of the squash stem.

Diseases

1) Gummy Stem Blight

Gummy stem blight first appears as light brown or gray spots on leaves, petioles and stems. Spots on the stems begin at the nodes and elongate into stem streaks. A gummy exudate usually appears near the streak. The leaves on infected vines turn yellow and die. In severe cases, entire plants can be killed. The causal fungus overwinters in seeds and in plant residue from infected crops.

2) Powdery Mildew

The causal fungus can be introduced through infected greenhouse-grown plants or by wind from areas with relatively warm winters where the fungus can overwinter. A white talcum-like growth appears on the foliage after infection. The areas of powdery growth can expand and grow together, covering most of the surface of the leaf. Affected leaves can wither and eventually become dry and brittle. The loss of foliage often results in secondary fruit effects including sunburning; premature ripening; and poor flavor, handle quality and texture. Periods of high temperature favor disease development.

3) Downy Mildew

Like Powdery Mildew, the causal fungus overwinters in areas with mild winters and is carried by wind to other areas. Periods of moist weather favor disease development. Upon infection, irregular yellow to brown spots appear on the underside of leaves usually at the center of the plant. A purplish mildew

develops on the underside of the spot. As the spots grow in size the leaf dies. The disease progresses rapidly from the crown of the plant to the new growth until the entire plant, except the fruit, is killed.

4) Anthracnose

The causal fungus overwinters in seed and in residues from diseased plants. On the squash leaf an infection first appears as a yellowish or water-soaked area that quickly enlarges, turns brown, and shatters to form a ragged hole. An infection on fruit develops as a depressed dark-bordered canker with creamy pink-colored ooze in the center. Humid conditions, frequent rain and splashing promote disease development.

5) Angular Leaf Spot

Angular leaf spot is caused by a bacterium that overwinters in seeds and infected crop residues. The bacteria can infect leaves, stems and fruit, but the most conspicuous infections occur in the foliage and fruit. On leaves, the disease first appears as small water soaked spots. The spots grow larger and become angular and irregular in shape. Eventually, the site of infection turns tan or gray and drops out, leaving a ragged hole. Fruit infections appear as small sunken water-soaked spots usually followed by fruit rot. The bacterium is spread in the field by splashing rain and passing workers.

6) Phytophthora Blight

Symptoms include root rot, stem canker, leaf blight and fruit rot. Affected areas become water-soaked, dark and may be bordered by a white mold growth. The disease is promoted by warm wet weather.

7) Cucumber Mosaic Virus

The new leaves on cucumbers infected with the CMV may wilt and die, whereas old crown growth may turn yellow and dry up as the entire plant slowly declines. Infected young fruits show symptoms ranging from a mild mottle to extensive warty malformations.

CHEMICAL CONTROLS

Chlorothalonil (Bravo and Terranil)

- Target diseases: Anthracnose, Gummy Stem Blight, Downey Mildew
- Percent acres treated: 86%
- Average rate and frequency of application:
 - Bravo 720 - 2pts/A, 5 times
 - Bravo - 2.5lbs/A, 3 times

- Terranil 6L - 3pts/A, 3 times
- PHI: 0 days
- Efficacy rating: Good to Very Good

Benomyl (Benlate)

- Target diseases: Powdery Mildew
- Percent acres treated: 52%
- Average rate and frequency of application:
 - 0.5lb/A, twice
- PHI: 1 day
- Efficacy rating: Average to Good

Metalaxyl/Chlorothalonil (Ridomil/Bravo)

- Target diseases: Anthracnose, Gummy Stem Blight, Downey Mildew
- Percent acres treated: 52%
- Average rate and frequency of application:
 - Ridomil/Bravo - 2lbs/A, twice
- PHI: 0 days
- Efficacy rating: Average

Mefenoxam (Ridomil Gold)

- Target diseases: Gummy Stem Blight, Downey Mildew, Anthracnose, and Phytophthora Blight
- Percent acres treated: 35%
- Average rate and frequency of application:
 - Ridomil Gold - 0.4 pt/A, once
- Efficacy rating: Very good

CULTURAL PRACTICES

Crop rotation on a 3-4 year basis, plant resistant varieties, destroy infected vines, limit movement in fields (especially when the field is wet), keep crop separated from other cucurbits to limit spread of disease spores. Keep winter squash off of the ground by using mulch or boards to limit fruit rot.

Weeds

Broadleaf and Grasses

CHEMICAL CONTROLS

Ethalfluralin (Curbit)

- Target weeds: Broadleaf and grass
- Percent acres treated: 87%
- Average rate and frequency of application:
 - Curbit - 2qts/A, once post-plant but pre-emergence
- Efficacy rating: Good

Clomazone (Command)

- Target weeds: Broadleaf and grass
- Percent acres treated: 36%
- Average rate and frequency of application:
 - Command 4EC - 0.5lb a.i./A (1pt/A), once pre-plant
- Efficacy rating: Good

Sethoxydim (Poast)

- Target weeds: annual and some perennial grasses
- Percent acres treated: 1%
- Average rate and frequency of application:
 - Poast - 0.3 lb a.i./A (1.5 pts/A), once postemergent
- PHI: 14 days
- Efficacy rating: Good to Very Good (depending upon the weather)

CULTURAL CONTROLS

Cultivations until vining, mulch and hoeing.

CRITICAL PEST CONTROL ISSUES

Important pesticides used for which there are few or no other alternatives or the only alternatives are organophosphates, carbamates or B2 carcinogens include:

- Chlorothalonil (Bravo)
- Carbofuran (Furidan)
- Benomyl (Benlate)

Contacts

Celeste Welty
Extension Entomology
The Ohio State University
1991 Kenny Road, Columbus, Ohio 43210
(614) 292-2803.

R.M. Riedel
Plant Pathology
The Ohio State University
2021 Coffey Road, Columbus, Ohio 43210
(614) 292-1293.

Bob Precheur
Horticulture and Crop Science
The Ohio State University
2001 Fyffe Court, Columbus, Ohio 43210
(614) 292-3857.

References

1. Ohio State University Extension. 1998. *Ohio Vegetable Production Guide*. Ohio State University.
2. *The 1992 Census of Agriculture*. U.S. Department of Commerce, Bureau of the Census. February 1994. Part 35.

3. Foster, R., Brust G. and Barrett B. 1995. Watermelons, Muskmelons, and Cucumbers. In *Vegetable Insect Management* (eds.) R. Foster and B. Flood. Meister Publishing Company, Willoughby, Ohio. Pp.157-168.
4. MacNab, A.A., Sherf, A.F. and Springer, J.K.1983. *Identifying Vegetable Diseases*. The Pennsylvania State University College of Agriculture, University Park, Pennsylvania.

Compiled by: M.F. Huelsman

Database and web development by the [NSF Center for Integrated Pest Management](#) located at North Carolina State University. All materials may be used freely with credit to the USDA.