UF UNIVERSITY of FLORIDA
IFAS Extension

Chapter 27.
Cucurbit Production in Florida

S.M. Olson, E.H. Simonne, W.M. Stall, P.D. Roberts, S.E. Webb, T.G. Taylor, S.A. Smith

BOTANY

Nomenclature

Family - Cucurbitaceae
Cucumber - *Cucumis sativus*
Cantaloupe- *Cucumis melo*
Summer squash - *Cucurbita pepo*
Pumpkin (jack-o-lantern is *C. pepo*; some processing pumpkins are *C. maxima* and *C. moschata*)
Butternut squash - *Cucurbita moschata*
Tropical pumpkin (Calabaza) - *Cucurbita moschata*
Winter squash - *Cucurbita maxima* e.g. hubbard, buttercup, and Turk's Turban
Watermelon - *Citrullus lanatus*

Origin

Cucurbits originated in several different locations: cucumber (India); cantaloupe (Africa); summer squash (Mexico, Central America); butternut squash (Mexico, Central America); winter squash (South America); and watermelon (Central Africa).

Related Species

Several Oriental and specialty vegetables, including Chinese winter melon, calabash gourd, luffa gourd, bitter melon, and chayote are also included in the Cucurbitaceae family.

VARIETIES

Variety selection, often made several months before planting, is one of the most important management decisions made by the grower. Failure to select the most suitable variety or varieties may lead to loss of yield or market acceptability.

The following characteristics should be considered in selection of vine crop varieties for use in Florida:

Yield: The variety selected should produce crops equivalent to the best varieties available. In recent years, the average harvested yields per acre of vine crops in Florida have been: fresh market cucumber - 525 bu, processing cucumbers - 10 tons, cantaloupe -200 cwt, pumpkins - experimental yields average about 200 cwt, summer squash - 300 bu, Tropical pumpkin (calabaza) 500 cwt, and watermelon - 250 cwt. In most instances, however, harvested yield is usually much less than potential yield because of market constraints.

Disease Resistance: Varieties that combine disease resistance with other desirable horticultural characteristics should be selected when possible. Most modern cucumber varieties are resistant or tolerant to angular leaf spot, anthracnose, downy mildew, powdery mildew, cucumber mosaic virus, and scab. Some cantaloupe varieties have tolerance to downy and powdery mildew, and fruit should be resistant to fruit rots. Unfortunately, disease tolerance is limited in squash and pumpkin varieties at the present time. However, summer squash varieties resistant to a number of diseases, including viruses, are available to growers in limited numbers. Watermelon varieties selected for use in Florida should have resistance to anthracnose-race 1 and fusarium wilt. There is considerable variation among varieties in the degree of fusarium resistance; select varieties with high wilt resistance that have qualities compatible with other requirements.

Horticultural Quality: Slicing cucumber fruit should be smooth and uniformly dark green, have an appropriate length:diameter ratio, have small seeds that are slow to develop, and have a desirable flavor. Pickling cucumber fruit should be firm, medium to dark green in color, have a small seed cavity, an L/D ratio of about 3 at $1\frac{1}{4}$ in. diameter, and good brining qualities if it is to be brined. Gynoecious plants are preferred. Western-type cantaloupes should be sutureless (smooth) or nearly so, round to slightly oval, fully netted, and about 3 lb average weight with a thick deep-salmon interior, and should have a small tight seed cavity, high soluble solids (11% is required for the U.S. Fancy grade), and a pleasant aroma and taste. Eastern-type cantaloupes are sutured and have soft flesh. Desirable traits in pumpkin varieties include a deep orange rind that colors early, smooth fruit, a stem that is proportional to the fruit size and adheres tightly to the fruit, and freedom from fruit rots. Summer squash fruit should have color appropriate to the market requirements, retain their gloss as they mature, and be slow to develop seed. Winter squash fruit should be attractively colored; have a smooth, hard rind; deep orange flesh; be resistant to storage rot; and have an appropriate storage life. Watermelon fruit size and shape; rind color, thickness, and toughness; seed size, number, and color; and flesh color, texture, and soluble solids (10%

This document is HS725, Horticultural Sciences Dept., UF/IFAS, Fla. Coop. Ext. Serv., November 2006

is required for designation as very good internal quality) are all important characteristics to be considered in selection of watermelon varieties. Ability to germinate in cold soils and general plant vigor may be important in certain situations.

Adaptability: Vine crops are well adapted to production in Florida for spring, early summer, and fall markets and to the winter market in the very warmest growing areas. Successful varieties must perform well under the range of environmental conditions encountered in these seasons and in various locations in Florida.

Market Acceptability: For all vine crops, growers must be aware of the needs of the particular market they intend to supply, and grow varieties that produce crops that satisfy that market.

VINE CROP VARIETIES FOR FLORIDA

Cucumber (Fig. 27-1)

Pickling:
- Calypso (H)[1] (GY)[2]
- Excel (H) (GY)
- Eureka (H) (MO)
- FMX 5020 (H)
- Napoleon Classic (H) (MO)
- Royal (H) (GY)
- Transamerica (H)

Slicing:
- Dasher II (H) (GY)
- Daytona (H) (GY)
- General Lee (H) (GY)
- Indy (H) (GY)
- Lightning (H) (GY)
- Panther (H) (GY)
- Prancer (H) (GY)
- Speedway (H) (GY)
- Thunder(H) (GY)

[1](H=hybrid)
[2](Flower Habit - GY=gynoecious,MO=monoecious)

Cantaloupe (Fig. 27-2)

- Athena (H)
- Eclipse (H)
- Odyssey (H)
- Vienna (H)

[1](H=hybrid)

Halloween Pumpkin

Miniature:< 1 lb
- Jack-Be-Little
- Jack-Be-Quick
- Munchkin
- Wee-Be-Little (PVP)[1]

Halloween Pumpkin (continued)

Small: 1-5 lb
- Baby Pam
- Little Lantern
- Trickster (H)[2]

Medium: 5-10 lb
- Autumn Gold (H)
- Jack of All Trades (H)
- Magician (H)
- Magic Lantern (H)
- Merlin (H)
- October (H)
- Wizard (H)

Large: 10-20 lb
- Big Autumn (H)
- Connecticut Field
- Gold Medal (H)
- ProGold 510 (H)

Giant: 25-80 lb
- Prizewinner (H)

[1](PVP=Plant Variety Protection)
[2](H=hybrid)

Squash

Summer (yellow):
- Dixie (H)[1] (CN)[2]
- Enterprise (H) (SN)[2]
- Gentry (H) (CN)
- Goldbar (H) (SN)
- Lemondrop L (H) (SN)
- Medalion (H) (CN)
- Prelude (H) (CN)
- Prelude II (H) (CN)
- Sunbrite (H) (CN)
- Sunglo (H) (CN)
- Suwannee (H) (CN)

Summer (zucchini):
- Cash Flow (H)
- Dividend (H)
- Green Eclipse (H)
- Senator (H)
- Seneca Zucchini (H)
- Spineless Beauty (H)

Acorn (Fig. 27-3):
- Mesa Queen (H)
- Table Ace (H)
- TayBelle PM (H)

Butternut (Fig. 27-4):
- Ultra (H)
- Waltham
- Zenith (H)

[1](H=hybrid)
[2] (Type - CN=crookneck, SN=straightneck)

Tropical Pumpkin (Calabaza)

- Agriset 9001 - vining type
- El Dorado (H) - compact plant
- La Estrella (H) - compact plant

Watermelon

Diploid:
- Celebration (H)[1]
- Gold Strike (H) (orange flesh)
- Jamboree (H)
- Mardi Gras (H)
- Regency (H)
- Royal Star (H)
- Royal Sweet (H)
- Sangria (H)
- Sentinel (H)
- Summer Flavor 790 (H)
- Summer Flavor 800 (H)
- Summer Flavor 900 (H)

Triploid (Seedless, Large):
- Dillion (H) for trial
- Freedom (H)
- Genesis (H)
- Gypsy (H)
- Millionaire (H)
- Olympia (H)
- Revolution (H)
- Ruby Premium (H) for trial
- SugarHeart (H)
- Sugar Shack (H) for trial
- Sugar Time (H) for trial
- Super Crisp (H)
- SummerSweet 5244 (H)
- SummerSweet 5544 (H)
- Super Seedless 7177 (H)
- Sweet Delight (H) for trial
- Tri-X-212 (H) for trial
- Tri-X-313 (H)

Watermelon continued

Triploid (Seedless, Large) continued:
- Tri-X-Carousel (H)
- Tri-X-Palomar (H)
- Triton (H) (yellow flesh)

Triploid (Seedless, Mini):
- Extazy (H)
- Mohican (H)
- Petite Treat (H)
- Solitare (H)
- Valdoria (H)
- Vanessa (H)
- Wonder (H)

[1](H=hybrid)

SEEDING AND PLANTING

Planting dates and seeding information for cucurbits are given in Table 1.

TRIPLOID WATERMELON PRODUCTION

Fruit of diploid watermelon varieties may contain as many as 1,000 seeds in each fruit. The presence of seeds throughout the flesh makes the removal of seeds while eating difficult. The seeds in slices or chunks of watermelon sold in retail stores or salad bars are a nuisance. One reason that seedless grapes are more popular with consumers than seeded varieties is that the consumer does not have to be concerned with and inconvenienced by the seeds while the fruit is being eaten. With proper care, seedless water-

Table 1. Seeding and planting information for cucurbits.

Planting dates	Cucumber	Cantaloupe	Pumpkin[1]	Squash		Watermelon
North Florida	Feb - Apr; Aug - Sept	Feb 15 - Apr 15	Early July	Feb - Apr; Aug - Sept		Feb 15 - Apr 15
Central Florida	Jan - Mar; Sept	Jan 15 - Mar 15	Mid July	Jan - Apr; Aug - Sept		Jan 15 - Mar 15
South Florida	Sept - Feb	Dec 15 - Mar 1	Early August	Aug - Mar		Dec 15 - Mar 1
Seeding information				**Bush**	**Vining**	
Distance between rows[2] (in)	48 - 60	60 - 72	60 - 108	36 - 48	60 - 108	60 - 108
Distance between plants (in)	6 - 12	24 - 36	36 - 60	12 - 24	36 - 60	24 - 72
Seeding depth (in)	0.5 - 0.75	0.5 - 1.0	1.5 - 2.0	1.0 - 1.5	1.5 - 2.0	1.5 - 2.0
Seed per acre (lb)	2 - 4	1 - 2	4 - 5	2 - 3	1 - 1.5	1 - 3
Days to maturity from seed	40 - 65	85 - 110	80 - 100	40 - 50	85 - 120	80 - 100
Days to maturity from transplant	Not recommended	70 - 90	70 - 90	Not recommended	Not recommended	60 - 90
Plant populations[3] (acre)	21,780	4,356	2,904	14,520	2,904	4,356

[1] For Halloween market, for tropical pumpkin follow planting dates for squash.

[2] Cucumber and squash can be grown in two rows per bed (especially mulch culture) with 12 to 18 inches between rows on the bed (Fig. 27-5).

[3] Populations based on closest between and within row spacing.

melons have a longer shelf life than seeded melons. This may be due to the fact that flesh break down occurs in the vicinity of seeds, which are absent, in seedless melons.

Hybrid triploid (seedless) watermelons have been grown for over 40 years in the United States. However, it was not until recently that improved varieties, aggressive marketing, and increased consumer demand created a rapidly expanding market for triploid watermelons. The seedless condition is actually sterility resulting from a cross between two plants of incompatible chromosome complements. The normal chromosome number in most living organisms is referred to as 2N. Triploid watermelons are produced on highly sterile triploid (3N) plants which result from crossing a normal diploid (2N) plant with a tetraploid (4N). The tetraploid is used as the female or seed parent and the diploid is the male or pollen parent (Diagram 1). Since the tetraploid seed parent produces only 5 to 10% as many seeds as a normal diploid plant, seed cost is considerably more than that of diploid, open-pollinated varieties and higher than diploid watermelon varieties. Tetraploid lines are usually developed by treating diploid plants with a chemical called colchicine.

Tetraploid parental lines normally have a light, medium, or dark green rind without stripes. By contrast, the diploid pollen parent almost always has a fruit with a striped rind. The resulting hybrid triploid melon will inherit a striped pattern. Growers may occasionally find a non-striped fruit in fields of striped triploid watermelons. These are the result of accidental self pollinations of the tetraploid seed parent during triploid seed production. Tetraploid fruit are of high quality but will have seeds and must not be sold as seedless. The amount of tetraploid contamination is dependent upon methods and care employed in triploid seed production.

Sterile triploid plants normally do not produce viable seed. However, small, white rudimentary seeds or seedcoats, which are eaten along with the fruit as in cucumber, develop within the fruit. The number and size of these rudimentary seeds vary with variety. An occasional dark, hard, viable seed is found in triploid melons.

Triploid watermelons can be grown successfully in areas where conventional seeded varieties are produced. However, they require some very unique cultural practices for successful production.

Stand Establishment

Containerized production of triploid watermelon transplants is essential because of the special conditions required for seed germination, emergence, and early plant development not found in open-field situations. Furthermore, the extra cost of seedling production is justified because triploid watermelon seeds costs are about six times greater than those of diploid hybrid seeds and 60 times greater than open-pollinated diploid watermelon seeds. One seed per cell should be planted 1 inch deep with the radicle (pointed end) up to reduce seedcoat adherence to the cotyledons. Transplants have been successfully produced with peat pellets or in trays containing sterile media with 1 to 2 inch cell size. The tray is watered lightly to bring the seed and mix in contact. Stacked trays are placed in a germination chamber 85-90˚F for two days or until radicles are visible in the cell drainage holes. The trays are then arranged in a greenhouse with day temperature 70-80˚F and night temperature 65-70˚F where temperature control can be achieved. Plants are fertilized every three days with a solution containing 50 ppm N from $Ca(NO_3)_2$ and KNO_3 from cotyledon expansion until the first true leaf is fully expanded, then with a 200 ppm N solution applied every other day until the second true leaf is fully expanded, finally the fertilizer is reduced for several days before transplanting to the field. Plants are ready for transplanting when the roots are sufficiently developed to permit removal from the cell with the entire growing mix volume intact. This will require three to five weeks depending on cell size and growing conditions.

Field Arrangement

Watermelon fruit set and enlargement is dependent upon growth regulators from the pollen grains and from embryos in developing seeds within the fruit. Inadequate pollination results in triploid watermelon fruit that are triangular in shape and of poor quality. Inadequate pollination may increase the incidence of hollowheart. Triploid watermelon flowers do not produce sufficient viable pollen to induce fruit set and development. Therefore, pollen from a normal or a special diploid pollenizer watermelon variety must be provided. Fields should be interplanted with pollenizer, diploid watermelon plants to provide additional pollen. Planting the pollenizer variety in the outside row and then every third row is one recommendation. As an alternative, the pollenizer variety may be planted every third plant in a row but this may make harvesting difficult. When special pollenizers such as Companion or SP-1 are used they are interplanted so the field can be 100% seedless. Follow suppliers instructions. **Under no circumstances should the pollenizer variety and the seedless variety be planted in separate but adjacent blocks!**

It is important to use a pollenizer variety that is marketable because up to one-third of all melons produced in the field will be of this variety. The rind pattern and/or shape of the seeded pollenizer fruit should be easily distinguished from that of the triploid fruit to reduce confusion at harvest. Selection of a pollenizer variety should also take into account market demand, plant vigor, pollen production, disease resistance, and environmental conditions.

It is important that pollen from the diploid pollenizer variety is available when female blossoms on the triploid plants are open and ready for pollination. As a general

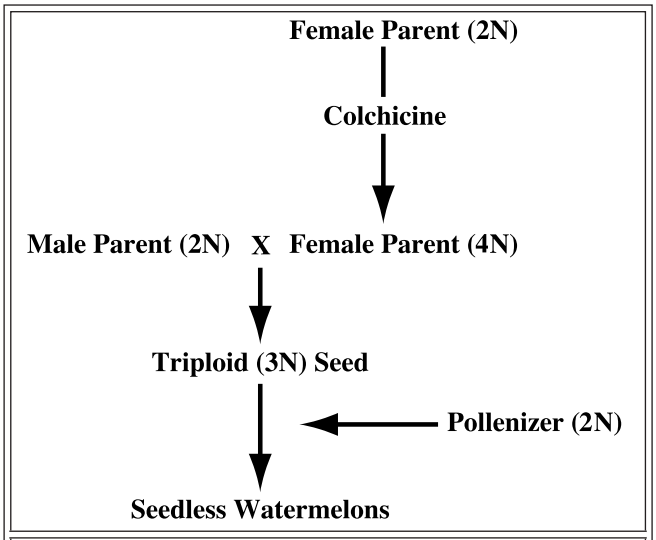

Diagram 1. Steps involved in triploid watermelon seed production. To produce seed, a diploid (2N) female parent plant is treated with colchicine to produce the solid-colored female tetraploid (4N) parent; this is crossed with a striped male parent (2N) which results in triploid (triploid) watermelon seed (3N). To produce a crop of triploid watermelons, the 3N seed is interplanted with a 2N pollenizer variety.

rule, direct field seeding of the pollenizer variety should be done on the same day the triploid seed is planted in the greenhouse. If transplants are used for pollenizers, they can be seeded a few days before triploid transplants are scheduled to be seeded. Small fruited, icebox varieties usually flower earlier than standard watermelon varieties. If icebox varieties are to be used as the pollenizer, then direct seeding should be delayed a week to ten days. The diploid pollenizer variety will frequently set fruit and stop producing male blossoms while the triploid variety is still producing many female blossoms. Growers may make a second planting of a pollenizer two to three weeks after the initial planting to provide pollen for the late-developing female blossoms. We have found no consistent differences among any standard and icebox types in effectiveness of pollination. Icebox varieties used as pollenizers result in high early yields; standard varieties used as pollenizers result in high total yields.

Occasionally, as many as 20 or more hard seeds are found in triploid fruit. These fruit with hard seeds are frequently from the first and second harvests. High numbers of hard seeds in early fruit may be the result of stress conditions such as drought, flood, fertilizer imbalance, or extremes in temperature.

Cultural Practices

Plant spacing requirements vary depending on variety selection, growing area, time of planting, and soil type. In general, early growth of triploid plants is slower than that of diploid plants. However, triploid plant size eventually exceeds that of diploid plants. Seed development in fruit of diploid varieties inhibits further flowering and fruit set. This inhibition does not exist in triploids; therefore, plants continue to produce fruit as long as viral infection does not occur, insects and foliar diseases are controlled and environmental conditions are favorable. Triploid plant population density may be 10 to 20% less than that recommended for production of diploid watermelon varieties. Triploid watermelon production has been successful with 25-30 sq. ft. per plant.

All methods of irrigation including overhead, drip, seepage, and furrow are used successfully in producing triploid watermelons. Maintaining soil moisture at optimum levels is critical for triploid watermelon production. Water stress (drought) can increase the incidence of blossom-end rot and result in poorly shaped, bottle-neck fruit. Excessive field moisture has been associated with hollowheart, a disorder which seems to be more severe in some varieties of triploid melons than in diploid varieties.

FERTILIZER AND LIME

For unmulched crops, incorporate all P_2O_5, micronutrients, and 25 to 50% of N and K_2O in the bed area. Apply no more than 25% N and K_2O broadcast for subsurface irrigated crops. This "modified broadcast" method improves fertilizer efficiency. Apply remaining N and K_2O as a sidedressing when squash has four to six true leaves or when vines begin to run.

For mulched crops under subsurface irrigation, broadcast all P_2O_5, micronutrients, and 20 to 25% of N and K_2O in the bed area. Apply remaining N and K_2O in bands in grooves (2 to 3 inches deep) and 8 to 10 inches from row. Use a single band in bed center for twin-row crops and two shoulder bands for single-row crops.

For mulched crops with sprinkler irrigation, incorporate all fertilizer in bed before mulching. Cover with unfertilized soil so fertilized soil is likely to remain moist. Plastic mulch might need to be perforated to provide irrigation infiltration on deep, droughty sands. Supplemental N and K_2O can be applied by liquid fertilizer injection wheel.

For drip irrigated crops, broadcast all P_2O_5, micronutrients, and up to 20 to 25% of N and K_2O in the bed. Apply remaining N and K_2O through the irrigation tube.

Soil test and fertilizer recommendations for cucurbits on mineral soils are given in Table 2. An injection schedule for N and K for cucurbits grown on soils testing very low in K is given in Table 3a and 3b.

PLANT TISSUE ANALYSIS

Plant tissue analysis information for cucurbits is given in Table 4. The analysis was done at the early bloom stage, using the most recently matured leaf.

PETIOLE SAP TESTING

Fresh sap can be pressed from leaf petioles and analyzed for nitrogen and potassium concentrations. Results can be used to make adjustments in the fertilization program. Sufficiency ranges for sap testing for cucurbit crops are presented in Table 5.

IRRIGATION

Cucurbit water requirements are slightly lower than those of other vegetable crops. Peak water requirements during rapid growth and development may average 90% of reference evapotranspiration levels (ETo), decreasing to 70% of ETo during the final growth period (Tables 3 to 6, Chapter 8, *Principles and Practices of Irrigation Management for Vegetables*). Many of these crops have extensive root systems and can obtain available ground moisture, thus reducing irrigation requirements. It is important to note that excessive irrigation can reduce crop yields by leaching crop nutrients or promoting disease. However, plant stress from limited water availability will also reduce fruit size and quality.

POLLINATION OF CUCURBITS

Cucurbit plants have separate male (staminate) and female (pistillate) flowers (Fig. 27-6). Male flowers generally appear on the plants several days before female flowers. The female flower is easily recognized by the presence of a miniature fruit below the flower petals. Pollen from the male flower must be transferred to the female flower for pollination and subsequent fruit development to occur.

Therefore, it appears that a sufficiently high honeybee population is necessary to insure that each flower is visited at least eight times. How does this translate into hives per acre? Recommendations from various sources range from two hives per acre to one hive per 5 acres (Fig. 27-7). Under most conditions, however, one strong hive per 2 acres should result in sufficient bee activity to effect needed pollination.

Cucurbit flowers open shortly after sunrise and remain open until late afternoon or early evening. Accordingly, each flower is open for only a few hours. The period of maximum honeybee - the most common and effective pollinator of cucurbits - activity closely coincides with the period when the flower is open. Honeybee visitation begins an hour or two after sunrise and continues until mid-afternoon. If temperatures are very warm, bee activity may decline about noon. Research on cantaloupe pollination conducted in California showed that bee visitations increased until 10 a.m. and then declined until 3 p.m. when activity almost ceased.

Research on watermelon at the Central Florida Research and Education Center-Leesburg showed that the number of bee visitations was more important than the length of time that each bee stayed on the flower. Well-shaped, fully expanded fruit occurred following eight bee visitations to a female flower (Fig. 27-8). Fruit set was significantly reduced when only four or two bee visitations were made. Hives should be spaced around the perimeter of large fields to provide distribution of bees over the entire field. To maintain the health and activity of the bee colonies, pesticide applications to the crop should be made when bees are not present in the field, usually at dusk or after dark.

WEED MANAGEMENT

Herbicides labeled for weed control in cucurbit crops are listed in Table 6.

DISEASE MANAGEMENT

Chemicals approved for disease management in cucurbits are listed in the following tables:

Table 7 - Cucumber
Table 8 - Cantaloupe
Table 9 - Pumpkin
Table 10 - Squash
Table 11 - Watermelon

INSECT MANAGEMENT

Insecticides approved for use on cucurbit crops are outlined in the following tables:

Table 12 - Cucumber
Table 13 - Squash
Table 14 - Cantaloupe
Table 15 - Watermelon

PRODUCTION COSTS

Example breakeven production costs for cucurbits grown in Florida are given in the following tables:

Table 2. Soil test and fertilizer recommendations for cucurbits on mineral soils.[1]

Target pH	Bed spacing (ft)	N lb/A[3]	P_2O_5[3] VL	L	M	H	VH	K_2O[3] VL	L	M	H	VH
			(lb/A/crop season)									
Cucumber												
6.5	6	150	120	100	80	0	0	120	100	80	0	0
Muskmelon												
6.5	5	150	150	120	100	0	0	150	120	100	0	0
Pumpkin												
6.5	8	150	120	100	80	0	0	120	100	80	0	0
Squash[2]												
6.5	6	150	120	100	80	0	0	120	100	80	0	0
Watermelon												
6.0	8	150	150	120	100	0	0	150	120	100	0	0

[1] See Chapter 2 section on supplemental fertilizer application and best management practices, pg 11.

[2] Summer and winter

[3] Seeds and transplants may benefit from applications of a starter solution at a rate no greater than 10 to 15 lbs/acre for N and P_2O_5, and applied through the plant hole or near the seeds.

Table 3a . Injection schedule for N and K for cucurbit crops grown on soils testing very low in K.

Crop	Bed spacing (ft)	Total nutrients (lb/A) N	K_2O	Crop development Stage	Weeks[2]	Injection (lb/A/day)[1] N	K_2O
Cucumber	6	150	120	1	1	1.0	1.0
				2	2	2.0	1.5
				3	6	2.5	2.0
				4	1	2.0	1.5
Muskmelon	5	150	150	1	2	1.0	1.0
				2	3	2.0	2.0
				3	3	2.5	2.5
				4	2	2.0	2.0
				5	2	1.0	1.0
Squash	6	150	120	1	2	1.5	1.0
				2	5	2.5	2.0
				3	4	1.5	1.5
Watermelon	8	150	150	1	2	1.0	1.0
				2	2	1.5	1.5
				3	4	2.5	2.5
				4	3	1.5	1.5
				5	2	1.0	1.0

[1] All nutrients injected. Actual amounts may be lower depending on amount of N and K_2O placed in the bed and the K soil test result.

[2] Starting from date of seedling emergence or transplanting. First two weeks worth of injecting can be omitted if 25% of total N and K_2O was applied preplant.

Table 3b. Supplemental fertilization recommendations for cucurbit crops grown in Florida on sandy soils testing very low in Mehlich-1 potassium (K_2O).

		Recommended-Supplemental fertilization[z]		
Production System	**Nutrient**	**Leaching rain[t,u]**	**Measured "low" plant nutrient content [x.w.u]**	**Extended harvest season [x.u]**
Plasticulture	N	n/a	1.5 to 2 lbs/A/day for 7 days[y]	1.5 to 2 lbs/A/day [y, v]
	K_2O	n/a	1.5 to 2 lbs/A/day for 7 days[y]	1.5 to 2 lbs/A/day [y, v]
Bare ground	N	30 lbs/A[s]	30 lbs/A[s]	30 lbs/A [v]
	K_2O	20 lbs/A[s]	20 lbs/A[s]	20 lbs/A [v]

[z] 1 A = 7,260 linear bed feet per acre (6-ft bed spacing); for soils testing "very low" in Mehlich 1 potassium (K_2O)

[y] Fertilizer injections may be done daily or weekly. Inject fertilizer at the end of the irrigation event and allow enough time for proper flushing afterwards.

[x] Plant nutritional status may be determined with tissue analysis or fresh petiole-sap testing, or any other calibrated method. The "low" diagnosis needs to be based on UF/IFAS interpretative thresholds.

[w] Plant nutritional status must be diagnosed every week to repeat supplemental application.

[v] Plant nutritional status must be diagnosed after each harvest before repeating supplemental fertilizer application.

[u] Supplemental fertilizer applications are allowed when irrigation is scheduled following a recommended method (see chapter 8 on irrigation scheduling in Florida). Supplemental fertilization is to be applied in addition to base fertilization when appropriate. Supplemental fertilization is not to be applied "in advance' with the preplant fertilizer.

[t] A leaching rain is defined as a rainfall amount of 3 inches in 3 days or 4 inches in 7 days.

[s] Supplemental amount for each leaching rain.

Table 4. Plant tissue analysis at early bloom stage for cucurbits. Dry weight basis.

	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu	Mo
Status	**Percent**						**Parts per million**					
Cucumber												
Deficient	<2.5	0.25	1.6	1.0	0.3	0.3	40	30	20	20	5	0.2
Adequate range	2.5 -5.0	0.25 -0.6	1.6 -3.0	1.0 -3.5	0.3 -0.6	0.3 -0.8	40 -100	30 -100	20 -50	20 -60	5 -10	0.3 -1.0
High	>5.0	0.6	3.0	3.5	0.6	0.8	100	100	50	60	20	2.0
Toxic (>)								900	950	150		
Cantaloupe												
Deficient	<4.0	0.4	5.0	1.0	0.35	0.2	40	20	20	20	5	0.6
Adequate range	4.0 -5.0	0.4 -0.7	5.0 -7.0	1.0 -2.0	0.35 -0.45	0.2 -0.8	40 -100	20 -100	20 -60	20 -80	5 -10	0.6 -1.0
High	>5.0	0.7	7.0	2.0	0.45	0.8	100	100	60	80	10	1.0
Toxic (>)								900		150		
Pumpkin												
Deficient	<3.0	0.3	2.3	0.9	0.35	0.2	40	40	20	25	5	0.3
Adequate range	3.0 -6.0	0.3 -0.5	2.3 -4.0	0.9 -1.5	0.35 -0.60	0.2 -0.4	40 -100	40 -100	20 -50	25 -40	5 -10	0.3 -0.5
High	>6.0	0.5	4.0	1.5	0.6	0.4	100	100	50	40	10	0.5
Summer Squash												
Deficient	<3.0	0.25	2.0	1.0	0.3	0.2	40	40	20	25	5	0.3
Adequate range	3.0 -5.0	0.25 -0.5	2.0 -3.0	1.0 -2.0	0.3 -0.5	0.2 -0.5	40 -100	40 -100	20 -50	25 -40	5 -20	0.3 -0.5
High	>5.0	0.5	3.0	2.0	0.5	0.5	100	100	50	40	20	0.5
Watermelon												
Deficient	<2.5	0.25	2.7	1.0	0.25	0.2	30	20	20	20	5	0.3
Adequate range	2.5 -3.5	0.25 -0.50	2.7 -3.5	1.0 -2.0	0.25 -0.50	0.2 -0.4	30 -100	20 -100	20 -40	20 -40	5 -10	0.3 -0.5
High	>3.5	0.5	3.5	2.0	0.5	0.4	100	100	40	40	10	0.5

Table 5. Sufficiency ranges for petiole sap testing for cucurbits.

Crop development stage	Fresh petiole sap concentration (ppm)	
	NO_3-N	K
Cucumber		
First blossom	800-1000	NR[1]
Fruit three-inches long	600-800	
First harvest	400-600	
Cantaloupe		
First blossom	1000-1200	3000-3200[1]
Fruits two-inches long	800-1000	—
First harvest	700-800	—
Squash		
First blossom	900-1000	NR[1]
First harvest	800-900	
Watermelon		
Vines 6" in length	1200-1500	4000-5000
Fruits 2" in length	1000-1200	4000-5000
Fruits one-half mature	800-1000	3500-4000
At first harvest	600-800	3000-3500

[1]NR-No recommended ranges have been developed.

Table 6. Chemical weed controls: cucurbit crops (muskmelons, cucumbers, squash, watermelon)

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Bensulide (Prefar 4E)	Cucurbit Vegetable group: Cucumbers, Melons, Squash (summer and winter), Pumpkins, edible gourds, bitter melon	Preplant incorporated, Preemergence	5.0-6.0	---
Remarks: Controls germinating grasses. Incorporate 1 to 2 inches. Note precautions of reapplying within 12 months and planting non-registered crops within 18 months. Label states control of crabgrass, foxtail, goosegrass, fall panicum and sprangletop.				
Bensulide + Naptalam (Prefar 4E + Alanap)	Cantaloupes, Muskmelons, Cucumbers, Watermelons	Preplant or Preemergence	5.0 (Bensulide) + 3.0-4.0 (Naptalam)	---
Remarks: Combination (tank mix) will provide wider range of weed control than either material alone. Incorporate into the soil lightly (0.5 to 1.0 inch) with suitable equipment prior to planting or incorporate preemergent treatments with overhead irrigation. Follow all precautions on both labels.				
Carfentrazone (Aim)	Cucurbit Crop Group (All)	Preplant Directed-hooded Row-middles	0.031	0.031
Remarks: Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burndown of emerged broadleaf weeds. May be tank mixed with other registered herbicides. may be applied at up to 2 oz (0.031 lb ai). use a quality spary adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Clethodim (Select)	Cucurbits (cucumber, squash, melons and all commodities in crop group)	Postemergence	0.1-0.125	---
Remarks: Use Select for the control of annual and perennial grasses. Use a crop-oil concentrate at 1% v/v in the finished spray volume. Do not apply more than 8 fl. oz. product/A per application. Do not apply within 14 days of harvest.				
Clomozone (Command 3 ME)	Summer squash Winter squash	Preemergence Preemergence Row Middles	0.15 0.25-0.75 0.75	---
Remarks: Labeled rate for summer squash if 0.25 lb a.i. Bleaching has been seen under adverse conditions at this rate. Suggest use as tank mix to increase efficacy. May be applied to winter squash and processing pumpkins. See label for varieties and cultivars where application is prohibited. Do not use on Jack-O-Lantern type pumpkins. May be used on processing type varieties. Read disclaimer on the label before use.				
DCPA (Dacthal W-75)	Seeded Melons: Cantaloupe, Honeydew, Watermelon; Cucumber, Squash: Summer, Winter	Early postemergence	6-8	---
Remarks: Apply only when plants have 4 to 5 true leaves, well established and growing conditions are favorable for good plant growth. Does not control emerged weeds. If weeds have emerged, cultivate prior to application. Do not incorporate.				
Ethalfluralin + Clomozone (Strategy)	Cucumber, Melons, Watermelons, Squash, Pumpkins	Preemergence and Post-directed	2-3 pts	---
Remarks: Strategy is a premix of ethalfluralin and clomozone at 1.5 + 0.5 lbs/gal. Apply 3 pts. product post-seeding to surface prior to weed and crop emergence. Must be applied no later than 2 days after seeding. Soil incorporate with overhead irrigation at ½ inch, or with a rain(s) at no less that ½ inch within 5 days. Excessive rains or irrigations may cause injury. For furrow irrigation where no rainfall is received, a shallow cultivation may be used to activate the herbicides. Do not apply before transplanting. Do not apply under row covers, hot caps or polyethylene mulches. May be applied as a post-directed spray to row middles after crop emergence or transplanting. Do not apply over plants. The premix controls a large number of grasses and broadleaf weeds.				
Glyphosate (Roundup, Durango) Touchdown, Glyphomax)	Cucurbits	Chemical fallow Preplant, pre mergence, Pre transplant	0.3-1.0	---
Remarks: Roundup, Glyphomax and Touchdown have several formulations. Check the label of each for specific labeling directions.				

Table 6. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Halosulfuron (Sandea)	Cucumber, Cantaloupe, Honeydew and Crenshaw melons.	Preemergence Postemergence	0.024	---
Remarks: Apply uniformly at ½ oz. product with ground equipment in a minimum of 15 gallons of water per acre. For postemergence applications, apply after the crop has reached the 2 true leaf stage, but before flowering. Use a non ionic surfactant for postemergence applications. May be used for row middle treatments at up to 1 oz. product. Controls actively growing nutsedge species best POST. Do not apply within 30 days of harvest for cucumber and 57 days for the melon subgroup.				
Halsulfuron (Sandea)	Cucurbit vegetables including watermelon, squash, pumpkins Cucumbers, and melons	Preplant Pretransplant Row middles	0.024-0.048	
Remarks: May be applied between rows of direct seeded or transplanted crop for the control of nutsedges and listed broadleaf weeds. Apply at 0.5 to 1 oz. product per acre treated. Add a non-ionic surfactant.				
Naptalam (Alanap-L)	Cantaloupes, Muskmelons, Cucumbers, Watermelons	Preemergence Preplant (Irrigated Melons)	3.0-4.0	---
Remarks: Apply within 48 hours of seeding. Apply preemergence to weeds and incorporate with overhead irrigation. Label states control of germinating annuals such as lambsquarter, ragweed, purslane, cocklebur, white mustard, shepherdspurse, redroot pigweed, hairy galingosa and carpetweed.				
Naptalam (Alanap-L)	Cantaloupes, Cucumbers, Watermelons	Postemergence Posttransplant	3.0-4.0	---
Remarks: Apply 1 month after planting when vines are starting to run but before weeds have emerged or immediately after transplanting. Do not use when plants are under stress due to weather conditions. Do not tank mix with crop oil or adjuvants. Phytotoxicity may occur.				
Paraquat (Gramoxone Intron) (Firestorm)	Watermelon, Squash, Pumpkin, Cantaloupe, Muskmelon, Cucumber	Preplant or Preemergence	0.63 - 0.94	---
Remarks: Controls emerged weeds only. Apply prior, during or after planting, but before crop emerges. Use a non-ionic spreader.				
Paraquat (Gramoxone Intron)	Melons	Postemergence directed spray	0.47-0.93	---
Remarks: Controls emerged weeds only. Apply 1.5 to 3.0 pts. per sprayed acre with ground equipment directing spray between the rows and use shields to prevent spray contact with the crop plants. Add a non-ionic surfactant at 8 fl. oz. per 100 gals. of spray mix. Do not apply more than 3 times per season. A Special Local Needs (24c) label for Florida.				
Pelargonic Acid (Scythe)	Cucurbits (melons; cucumber, gourd, pumpkin, squash, muskmelon and watermelon)	Preplant Preemergence Directed-Shielded	3-10% v/v	3-10% v/v
Remarks: Product is a contact, non-selective, foliar applied herbicide. There is no residual activity. May be tank mixed with soil residual compounds. Consult the label for rates and other information.				
Sethoxydim (Poast)	Cucurbits: all	Postemergence	0.188-0.28	---
Remarks: Controls actively growing grass weeds. A total of 3 pts. product per acre may be applied in one season. Do not apply within 14 days of harvest. Apply in 5 to 20 gals. of water adding 2 pts. of crop oil concentrate per acre. Unsatisfactory results may occur if applied to grasses under stress. Use 0.188 lb. ai. (1 pt.) on seedling grasses and up to 0.28 lb. ai. (1.5 pts.) on perennial grasses emerging from rhizomes, etc. Consult label for grass species and growth stage for best control.				

Table 7. Disease management for cucumber.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Acrobat 50WP (Dimethomorph)	40	6.4 oz	32 oz	0	Downy mildew Phytophthora blight	Limit is 5 appl./crop. Tank mix with another fungicide. Harvest after spray is dry.
Aliette 80WDG (Fosetyl-Al) Amistar 80DF (Azoxystrobin)	33 11	5 lb 5 oz	35 lb 1.88 lb	12 hr 1	Downy mildew Downy mildew Powdery mildew Gummy stem blight Anthracnose Alternaria leaf spot Certain leaf spots Belly Rot	Limit is 7 appl./crop. Do not tank mix with copper fungicides. Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Botran 75W (Dicloran) Bravo Ultrex or Equus DF (Chlorothalonil)	14 M5	1.3 lb 2.7 lb	19 lb	1 0	Sclerotinia Anthracnose Scab Downy mildew Gummmy stem blight Powdery mildew	Greenhouse only Maximum application rate is lower for certain diseases including downy mildew
Bravo Weather Stik 6FLs, Equus 720 SST, Echo 720, (Chlorothalonil)	M5	3 pt	21 pt	0	Same as Bravo Ultrex	Same as Bravo Ultrex
Echo 90DF (Chlorothalonil)	M5	2.5 lb	17 lb	0	Same as Bravo Ultrex	Same as Bravo Ultrex
Cabrio 2.09 F (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Same as Amistar	4 appl. Maximum. Same as Amistar.
Curzate 60DF (Cymoxanil)	27	3.2 oz	See Remarks	3	Downy Mildew	Use only with a labeled rate of protectant fungicide. No more than 9 applications per 12 months
Dithane F45 Rainshield (Mancozeb)	M3	2.4 qt	19.6 qt	5	Same as Manzate Pro-Stick	
Dithane-DF Rainshield (Mancozeb)	M3	3 lb	25.6 lb	5	Anthracnose Gummy stem blight Downy mildew	
Maneb 75DF (Maneb)	M3	2 lb	17.1 lb	5	Same as Maneb 80WP	
Manzate Flowable (Mancozeb) Manzate Pro-Stick, Manzate 75DF, Dithane M-45 (Mancozeb)	M3 M3	2.4 qt 3 lb	19.2 qt 24 lb	5 5	Same as Manzate 75DF Anthracnose Downy mildew Gummy stem blight	
Maneb 80WP (Maneb)	M3	2 lb	16 lb	5	Scab Anthracnose Pythium fruit Rot Downy Mildew	

Table 7. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Manex 4F (Maneb) Flint 50WP (Trifloxystrobin)	M3 11	1.6 qt 2 oz	12.8 qt 8 oz	5 0	Same as Maneb 80 WP Powdery mildew Downy Mildew	Limit is 4 appl./crop & alternate chemistry. Maximum rate is higer for downy mildew suppression. Same as Amistar.
Fosphite, Topaz (Potassium phosphite)		3 qt	18 qt (Topaz)	0	Phytophthora, Pythium, Fusarium, Rhizoctonia, Downy Mildew	Check label for required minimum gallons per acre, restrictions for use following copper application, plant and environmental conditions that restrict use, and for compatibility with other materials.
Prophyt (Potassium phosphate) Gavel 75DF (Mancozeb; Zoxamide)	M3 & 22	4 pt 2 lb	16 lb	0 5	Downy Mildew, Phytophthora capsici Alternaria leaf spot Downy mildew	Check label for required minimum gallons per acre, plant and environmental conditions that restrict use, and for compatibility with other materials. Limit is 8 appl./crop.
Heritage (Azoxystrobin)	11	8.0 oz	3.0 lb	1	Same as Amistar	Do not make more than two consecutive applications. Do not make more than 6 applications per crop. Same as Amistar
JMS Stylet Oil ManKocide 61.1DF (Copper hydroxide; Mancozeb)	M1 & M3	3 qt 2.66 lb	128 lb	4 hr 5	Aphid-transmitted viruses, powdery mildew Angular leaf spot Downy mildew	See label for specific appl. Tech. (e.g. use of 400 psi)
Nova 40W (Myclobutanil)	3	5 oz	1.5 lb	0	Powdery mildew	Note that a 30 day plant back restriction exists.
Penncozeb 75DF (Mancozeb) Penncozeb 80WP (Mancozeb)	M3 M3	3 lb 3 lb	25.6 24 lb	5 5	Same as Penncozeb 80 WP Anthracnose Downy mildew Gummy stem blight Pythium fruit rot Scab	
Pristine 38WG (Boscalid;Pyraclostrobin)	7 & 11	18.5 fl oz	74 oz	0	Same as Amistar	Limit is 4 appl.crop & alternate chemistry
Procure 50WS and 480SC (Triflumizole)	3	8 oz	40 oz	0	Powdery Mildew	
Quadris 2.08FL (Azoxystrobin)	11	15.4 fl oz	2.88 qt	1	Same as Amistar	Limit is 4 appl./crop & alternate chemistry. Same as Amistar
Ranman (Cyazofamid)	21	2.75 fl oz	16.5 fl oz	0	Downy Mildew Phytophthora blight	Limit is 6 appl./crop. Follow resistance management guidelines on label.

Table 7. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Reason 500SC (Fenamidone)	11	5.5 fl oz	22 oz	14	Downy Mildew Alternaria leaf spot	Limit is 4 appl./crop & alternate chemistry
Previcur Flex (Promocarb hydrochloride) Ridomil Gold Bravo 76.4W (Chlorothalonil Mefenoxam)	U M5 & 4	1.2 pt 3 lb	6 pt 12 lb	2 7	Downy Mildew Pythium Downy mildew Certain leaf spots Gummy stem blight Scab	Use a tank mix partner. See label for directions using a contact fungicide and Pythium suppression Limit is 4 appl./crop
Ridomil MZ 68WP (Mancozeb; Mefenoxam)	M3 & 4	2.5 lb	10 lb	5	Downy mildew	Limit is 4 appl./crop.
Ridomil Gold/Copper 64.8W (Copper hydroxide; Mefenoxam) Ridomil Gold 4EC (Mefenoxam)	M1 & 4 4	2 lb 2 pt/treated A	8 lb	5	Downy mildew Pythium seedling blight	Limit is 4 appl./crop Apply at seeding in a 7-12" band on soil over seed furrow
Ultra Flourish (Mefenoxam)	4	4 pt/treated A			Same Ridomil Gold 4EC	Same Ridomil Gold 4EC
Serenade ASO (Bacillus subtilis strain QST 713)		6 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Serenade Max (Bacillus subtilis strain QST 713)		3 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Sonata (Bacillus pumilus strain QST 2808) Tanos 50DF (Cymoxanil; Famoxadone)	27 & 11	4 lb 8 oz	32 oz	0 3	Powdery mildew, Downy mildew Downy mildew Anthracnose	Do not use product alone. Apply with registered fungicide Limit is 4 appl./crop. Must tankmix with a contact fungicide. Limit is 72 oz/A maximum per year.
Topsin M 70WP (Thiophanate-methyl)	1	0.5 lb.	3 lb	1	Certain leaf spots, Powdery mildew, Gummy stem blight	Same as Topsin 4.5 FL
Topsin M WSB (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Same as Topsin M 70WP	Same as Topsin 4.5 FL
Topsin 4.5FL (Thiophanate-methyl)	1	10 oz	60 oz	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Thiophanate methyl 85WDG (Thiophanate-methyl)	1	0.4	2.5	1	Powdery Mildew, Gummy stem blight	Same as Topsin
Various copper formulations[1]	M1				Bacterial diseases (See individual label)	See label
Sulfur[2]					Powdery mildew	See label

[1] Badge SC, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2FL, Champion WP, COC DF, COC WP, Copper-Count-N, Cuprofix Disperss, Cuprofix MZ Disperss, Kocide 101, Kocide 2000, Kocide 4.5LF, Kocide DF, Nordox, Nordox 75 WG, Nu-Cop 3L, Nu-Cop 50 WP, Nu-Cop 50 DF, Stretch, Tenn-Cop 5E

[2] Dusting Sulfur, Kumulus DF, Micro Sulf, Micronized Gold, Microthiol Disperss, Sulfur 90W, Thiolux Jet, Thiosperse 80, Wettable Sulfur

Table 8. Disease management for cantaloupe.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Acrobat 50WP (Dimethomorph)	40	6.4 oz	32 oz	0	Downy mildew Phytophthora blight	Limit is 5 appl./crop. Tank mix with another fungicide. Harvest after spray is dry.
Aliette 80WDG (Fosetyl-Al)	33	5 lb	35 lb	12 hr	Downy mildew	Limit is 7 appl./crop. Do not tank mix with copper fungicides.
Amistar 80DF (Azoxystrobin)	11	5 oz	1.88 lb	1	Downy mildew Powdery mildew Gummy stem blight Anthracnose Alternaria leaf spot Certain leaf spots	Limit is 4 applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Bravo Weather Stik 6FL, Echo 720, and Equus 720SST (Chlorothalonil)	M5	3 pt	21 pt	0	Gummy stem blight Anthracnose Downy mildew Alternaria leaf spot Cercospora leaf spot Powdery Mildew[1]	Maximum rate on label is less for downy mildew and certain other diseases..
Echo 90DF (Chlorothalonil)	M5	2.5 lb	17 lb	0	Same as Echo 720	Same as Echo 720
Bravo Ultrex and Equus DF (Chlorothalonil)	M5	2.7 lb	19 lb	0	Same as Echo 720	Same as Echo 720
Cabrio 2.09F (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Same as Amistar	4 appl. Maximum. Same as Amistar.
Curzate 60DF (Cymoxanil)	27	3.2 oz	See Remarks	3	Downy Mildew	Use only with a labeled rate of protectant fungicide. No more than 9 applications per 12 months
Flint 50WP (Trifloxystrobin)	11	2 oz	8 oz	0	Powdery mildew Downy Mildew	Limit is 4 appl./crop & alternate chemistry. Maximum rate is higer for downy mildew suppression. Same as Amistar.
Gavel 75DF (Mancozeb; Zoxamide)	M3 & 22	2 lb	16 lb	5	Alternaria leaf spot Downy mildew	Limit is 8 appl./crop. Some cantaloupe varieties are sensitive, check label.
Heritage (Azoxystrobin)	11	8.0 oz	3.0 lb	1	Same as Amistar	Do not make more than two consecutive applications. Do not make more than 6 applications per crop. Same as Amistar
Quadris 2.08FL (Azoxystrobin)	11	15.4 fl oz	2.88 qt	1	Same as Amistar	Limit is 4 appl./crop & alternate chemistry. Same as Amistar
Fosphite, Topaz (Potassium phosphite)		3 qt	18 qt (Topaz)	0	Phytophthora, Pythium, Fusarium, Rhizoctonia, Downy Mildew	Check label for required minimum gallons per acre, restrictions for use following copper application, plant and environmental conditions that restrict use, and for compatibility with other materials.
Prophyt (Potassium phosphate)		4 pt		0	Downy Mildew, Phytophthora capsici	Check label for required minimum gallons per acre, plant and environmental conditions that restrict use, and for compatibility with other materials.

Table 8. Contiinued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
ManKocide 61.1DF Copper (hydroxide ; Mancozeb)	M1 & M3	2.5 lb	128 lb	5	Angular leaf spot Bacterial fruit blotch Downy mildew	
Maneb 75DF (Maneb)	M3	2 lb	17.1 lb	5	Alternaria leaf spot Anthracnose Cercospora leaf spot Downy mildew Gummy stem blight	Limit is 7 appl./crop. Do not tank mix with copper fungicides. Some cantaloupe varieties may be sensitive to EBCD products, check label or Extension resources for this information.
Manex 4F (Maneb)	M3	1.6 qt	12.8 qt	5	Same as Maneb 75 DF	Same as Maneb 75 DF
Maneb 80WP (Maneb)	M3	2 lb	16 lb	5	Same as Maneb 75 DF	Same as Maneb 75 DF
Penncozeb 80WP, Manate 75DF, Manzate Pro-Stick (Mancozeb)	M3	3 lb	24 lb	5	Same as Maneb 75 DF	Same as Maneb 75 DF
Manzate FL (Mancozeb)	M3	2.4 qt	19.2 qt	5	Same as Maneb 75 DF	Same as Maneb 75 DF
Manzate 75DF, Penncozeb 75DF (Mancozeb)	M3	3 lb	25.6 lb	5	Same as Maneb 75DF	Same as Maneb 75DF
Dithane-DF Rainshield, (Mancozeb)	M3	3 lb	25.6 lb	5	Alternaria leaf spot Anthracnose Downy mildew Gummy stem blight	Same as Maneb 75DF
Dithane M45 (Mancozeb)	M3	3 lb	24 lb	5	Same as Dithane-DF Rainshield	Same as Maneb 75DF
Dithane F45 Rainshield, (Mancozeb)	M3	2.4 qt	19.2 qt	5	Same as Dithane-DF Rainshield	Same as Maneb 75DF
JMS Stylet Oil		3 qt		4 hr	Aphid-transmitted viruses, powdery mildew	See label for specific appl. Tech. (e.g. use of 400 psi)
Nova 40W (Myclobutanil)	3	5 oz	1.5 lb	0	Powdery mildew	Note that a 30 day plant back restriction exists.
Pristine 38WG (Boscalid; Pyraclostrobin)	7 & 11	18.5 oz	74 oz	0	Same as Amsitar	Limit is 4 appl./crop & alternate chemistry
Procure 50WS and 480SC (Triflumizole)	3	8 oz	40 oz	0	Powdery Mildew	
Ranman (Cyazofamid)	21	2.75 fl oz	16.5 fl oz	0	Downy Mildew Phytophthora blight	Limit is 6 appl./crop. Follow resistance management guidelines on label.
Reason 500SC (Fenamidone)	11	5.5 fl oz	22 oz	14	Downy Mildew Alternaria leaf spot	Limit is 4 appl./crop & alternate chemistry
Previcur Flex (Promocarb hydrochloride)	U	1.2 pt	6 pt	2	Downy Mildew Pythium	Use a tank mix partner. See label for directions using a contact fungicide and Pythium suppression

Table 8. Contiinued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Ridomil Gold MZ 68WP (Mancozeb; Mefenoxam)	M3 & 4	2.5 lb	10 lb	5	Downy mildew	Limit is 4 appl./crop
Ridomil Gold/Copper 64.8 W (Copper hydroxide; Mefenoxam)	M1 & 4	2 lb	8 lb	5	Downy mildew	Limit is 4 appl./crop
Ridomil Gold Bravo 76.4W (Mancozeb; Mefenoxam)	M3 & 4	3 lb	12 lb	7	Downy mildew Certain leaf spots Gummy stem blight	Limit is 4 appl./crop
Ridomil Gold 4EC (Mefenoxam)	4	2 pt/treated A			Pythium seedling blight	Apply at seeding in a 7-12" band on soil over seed furrow.
Ultra Flourish (Mefenoxam)	4	4 pt/treated A			Same Ridomil Gold 4EC	Same Ridomil Gold 4EC
Serenade ASO (Bacillus subtilis strain QST 713)		6 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Serenade Max (Bacillus subtilis strain QST 713)		3 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Sonata (Bacillus pumilus strain QST 2808)		4 lb		0	Powdery mildew, Downy mildew	Do not use product alone. Apply with registered fungicide
Sulfur[2]	M2				Powdery mildew	See label. Do not use in warm weather
Tanos 50DF (Cymoxanil; Famoxadone)	27 & 11	8 oz		3	Downy mildew Anthracnose	Limit is 4 appl./crop. Must tankmix with a contact fungicide. Limit is 72 oz/A maximum per year.
Thiophanate methyl 85WDG (Thiophanate-methyl)	1	0.4 lb	2.5 lb	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin 4.5FL (Thiophanate-methyl)	1	10 oz	60 oz	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin M70WP (Thiophanate-methyl)	1	0.5 lb.	3 lb	1	Certain leaf spots, Powdery mildew, Gummy stem blight[4]	Same as Topsin 4.5 FL
Topsin M WSB (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Same as Topsin M 70WP	Same as Topsin 4.5 FL
Various copper formulations[3]					Bacterial diseases (See individual label)	See label

[1]Sphaerotheca only

[2] Kumulus DF, Micro Sulf, Micronized Gold, Microthiol Disperss, Sulfur 90W, Thiolux Jet, Wettable Sulfur

[3] Badge SC, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 FL, Champion WP, COC DF, COC WP, Copper-Count-N, Cuprofix Disperss, Cuprofix MZ Disperss, Kocide 101, Kocide 2000, Kocide 4.5 LF, Kocide DF, Nordox, Nordox 75 WG, Nu-Cop 3L, Nu-Cop 50 WP, Nu-Cop 50 DF, Stretch, Tenn-Cop 5E

Table 9. Disease management for pumpkin.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Acrobat 50WP (Dimethomorph)	40	6.4 oz	32 oz	0	Downy mildew Phytophthora blight	Limit is 5 appl./crop. Tank mix with another fungicide. Harvest after spray is dry.
Aliette 80WDG (Fosetyl-Al) Amistar 80DF (Azoxystrobin)	33 11	5 lb 5 oz	35 lb 1.88 lb	12 hr 1	Downy mildew Downy mildew Powdery mildew Gummy stem blight Anthracnose Alternaria leaf spot Certain leaf spots	Limit is 7 appl./crop. Do not tank mix with copper fungicides. Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Cabrio 2.09F (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Same as Amistar	4 appl. Maximum. Same as Amistar.
Curzate 60DF (Cymoxanil) Equus 720 SST, Echo 720, or Bravo Weather Stik 6FLs (Chlorothalonil)	27 M5	3.2 oz 3 pt	See Remarks 21 pt	3 0	Downy Mildew Alternaria leaf spot Downy mildew Powdery mildew[1] Gummy stem blight	Use only with a lableled rate of protectant fungicide. No more than 9 applications per 12 months [1] For Sphaerotheca only. Rates are lower for certain diseases including downy mildew
Echo 90DF (Chlorothalonil)	M5	2.5 lb	17 lb	0	Same as Equus 720SST	Same as Equus 720SST
Equus DF or Bravo Ultrex (Chlorothalonil)	M5	2.7 lb	19 lb	0	Same as Equus 720	Same as Equus 720SST
Fosphite, Topaz (Potassium phosphite)		3 qt	18 qt (Topaz)	0	Phytophthora, Pythium, Fusarium, Rhizoctonia, Downy Mildew	Check label for required minimum gallons per acre, restrictions for use following copper application, plant and environmental conditions that restrict use, and for compatibility with other materials.
Prophyt (Potassium phosphate)		4 pt		0	Downy Mildew, Phytophthora capsici	Check label for required minimum gallons per acre, plant and environmental conditions that restrict use, and for compatibility with other materials.
Flint 50 WP (Trifloxystrobin)	11	4 oz	8 oz	0	Powdery mildew	Same as Quadris
Heritage (Azoxystrobin)	11	8.0 oz	3.0 lb	1	Same as Amistar	Do not make more than two consecutive applications. Do not make more than 6 applications per crop. Same as Amistar
JMS Stylet Oil		3 qt		4 hr	Aphid-transmitted viruses Powdery mildew	See label for specific appl. techniques required (e.g. 400 psi spray pressure)

Table 9. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Maneb 80WP (Maneb)	M3	2 lb	16 lb	5	Downy mildew	
Manex (Maneb)	M3	1.6 qt	12.8 qt	5	Downy mildew	
Maneb 75DF (Maneb) Nova 40W (Myclobutanil)	M3 3	2 lb 5 oz	17.1 lb 1.5 lb	5 0	Downy mildew Powdery mildew	Note that a 30 day plant back restriction exists.
Pristine Boscalid; Pyraclostrobin)	7 & 11	18.5 oz	74 oz	0	Downy Mildew, Alternaria, Gummy stem blight, Powdery Mildew	Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Procure 50WS and 480SC (Triflumizole)	3	8 oz	40 oz	0	Powdery Mildew	
Quadris 2.08 FL (Azoxystrobin)	11	15.4 fl oz	2.88 qt	1	Same as Equus 720SST	Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Ranman (Cyazofamid)	21	2.75 fl oz	16.5 fl oz	0	Downy Mildew Phytophthora blight	Limit is 6 appl./crop. Follow resistance management guidelines on label.
Reason 500SC (Fenamidone)	11	5.5 fl oz	22 oz	14	Downy Mildew Alternaria leaf spot	Limit is 4 appl./crop & alternate chemistry
Previcur Flex (Promocarb hydrochloride)	U	1.2 pt	6 pt	2	Downy Mildew Pythium	Use a tank mix partner. See label for directions using a contact fungicide and Pythium suppression
Ridomil Gold Copper 64.8 W (Copper hydroxide; Mefenoxam) Ridomil Gold 4EC (Mefenoxam)	M1 & 4 4	2 lb 2 pt/treated A	8 lb	5	Downy mildew Pythium seedling blight	Limit is 4 appl./crop Apply at seeding in a 7-12" band on soil over seed furrow.
Ultra Flourish (Mefenoxam) Ridomil Gold Bravo 76.4W (Chlorothalonil Mefenoxam)	4 M5 & 4	4 pt/treated A 3 lb	12 lb	7	Same Ridomil Gold 4EC Downy mildew Gummy stem blight	Same Ridomil Gold 4EC Limit is 4 appl./crop
Sulfur (numerous brands)[1]	M2			1	Powdery mildew	
Serenade ASO (Bacillus subtilis stain QST 713)		6 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Serenade Max (Bacillus sutilis strain QST 713)		3 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.

Table 9. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Sonata (Bacillus pumilus strain QST 2808) Tanos 50DF (Cymoxanil; Famoxadone)	27 & 11	4 lb 8 oz		0 3	Powdery mildew, Downy mildew Downy mildew Anthracnose	Do not use product alone. Apply with registered fungicide Limit is 4 appl./crop. Must tankmix with a contact fungicide. Limit is 72 oz/A maximum per year.
Topsin 4.5FL (Thiophanate-methyl)	1	10 oz	60 oz	1	Anthracnose, Gummy Stem , Powdery Mildew	Follow resistance management guidelines on label
Topsin M 70W, Topsin M WSB (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Same as Topsin 4.5 FL	Same as Topsin 4.5 FL
Thiophanate methyl 85WDG (Thiophanate-methyl)	1	0.4	2.5	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Various copper formulations[2]	M1				Bacterial diseases (See individual label)	See label

[1] Dusting Sulfur, Micronized Gold, Microthiol Disperss, Sulfur 90W, Thiolux Jet.

[2] Badge, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 FL, Champion WP, COC DF, COC WP, Copper-Count-N, Cuprofix Disperss, Kocide 101, Kocide 2000, Kocide 4.5 LF, Kocide DF, Nordox, Nordox 75 WG, Nu-Cop 3L, Nu-Cop 50DF, Nu-Cop 50WP, Stretch, Tenn-Cop 5E

Table 10. Disease management for squash.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Acrobat 50 WP (Dimethomorph)	40	**Application** 6.4 oz	**Season** 32 oz	0	Downy mildew Phytophthora blight	Limit is 5 appl./crop. Tank mix with another fungicide. Harvest after spray is dry.
Aliette 80WDG (Fosetyl-Al) Amistar 80DF (Azoxystrobin)	33 11	5 lb 5 oz	35 lb 1.88 lb	12 hr 1	Downy mildew Downy mildew Powdery mildew Gummy stem blight Anthracnose Alternaria leaf spot Certain leaf spots	Limit is 7 appl./crop. Do not tank mix with copper fungicides. Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Cabrio 2.09F (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Same as Amistar	4 appl. Maximum. Same as Amistar.
Curzate 60DF (Cymoxanil)	27	3.2 oz	See Remarks	3	Downy Mildew	Use only with a lableled rate of protectant fungicide. No more than 9 applications per 12 months
Dithane F45 Rainshield,Manzate FL (Mancozeb)	M3	2.4 qt	19.2 qt	5	Downy mildew	Summer squash only
Dithane M45WP, Manzate 75DF, Manzate Pro-Stick, Penncozeb 80WP (Mancozeb)	M3	3 lb	24 lb	5	Downy mildew	Summer squash only
Dithane DF Rainshield Penncozeb 75DF (Mancozeb)	M3	3 lb	25.6 lb	5	Downy mildew	Summer squash only
Maneb 75DF (Maneb)	M3	2 lb	17.1 lb	5	Downy mildew	
Maneb 80WP (Maneb)	M3	2 lb	16 lb	5	Downy mildew	
Manex 4F Echo 720 or Equus 720 6 FLs, Bravo Weather Stik 6F (Chlorothalonil)	M3 M5	1.6 qt 3 pt	12.8 qt 21 pt	5 0	Downy mildew Alternaria leaf spot Downy mildew Gummy stem blight Powdery mildew[1]	Recommended maximum rate is lower for downy mildew
Bravo Ultrex or Equus DF (Chlorothalonil)	M5	2.7 lb	19.0 lb	0	Same as Echo 720	Same as Echo 720
Echo 90DF (Chlorothalonil)	M5	2.5 lb	17 lb	0	Same as Echo 720	Same as Echo 720

Table 10. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Fosphite, Topaz (Potassium phosphite)		3 qt	18 qt (Topaz)	0	Phytophthora, Pythium, Fusarium, Rhizoctonia, Downy Mildew	Check label for required minimum gallons per acre, restrictions for use following copper application, plant and environmental conditions that restrict use, and for compatibility with other materials.
Prophyt (Potassium phosphate) Flint 50WP (Tfifloxystrobin)	11	4 pt 2 oz	8 oz	0 0	Downy Mildew, Phytophthora capsici Powdery mildew Downy Mildew	Check label for required minimum gallons per acre, plant and environmental conditions that restrict use, and for compatibility with other materials. Limit is 4 appl./crop & alternate chemistry. Maximum rate is higer for downy mildew suppression. Same as Amistar.
Gavel 75DF (Mancozeb; Zoxamide)	M3 & 22	2 lb	16 lb	5	Alternaria Leaf spot, Downy Mildew	Limit is 8 applications per crop
Heritage (Azoxystrobin)	11	8.0 oz	3.0 lb	1	Same as Amistar	Do not make more than two consecutive applications. Do not make more than 6 applications per crop. Same as Amistar
JMS Stylet Oil ManKocide 61.1 DF (Copper hydroxide; Mancozeb)	 M1 &M3	3 qt 4 lb	128 lb	4 hr 5	Aphid-transmitted viruses Powdery mildew Downy mildew Powdery mildew	See label for specific appl. techniques required (e.g. 400 psi spray pressure) Summer Squash only
Nova 40W (Myclobutanil)	3	5 oz	1.5 lb	0	Powdery mildew	Note that a 30 day plant back restriction exists.
Pristine 38WG (Boscalid; Pyraclostrobin)	7 & 11	18.5 oz	74 oz	0	Same as Amistar	Same as Amistar
Quadris 2.08FL (Azoxystrobin)	11	15.4 fl oz	2.88 qt	1	Same as Amistar	Limit is 4 appl./crop & alternate chemistry. Same as Amistar
Procure 50WS and 480SC (Triflumizole)	3	8 oz	40 oz	0	Powdery Mildew	
Ranman (Cyazofamid)	21	2.75 fl oz	16.5 fl oz	0	Downy Mildew Phytophthora blight	Limit is 6 appl./crop. Follow resistance management guidelines on label.
Reason 500SC (Fenamidone)	11	5.5 fl oz	22 oz	14	Downy Mildew Alternaria leaf spot	Limit is 4 appl./crop & alternate chemistry
Previcur Flex (Promocarb hydrochloride) Ridomil Gold Bravo 76.4 W (Chlorothalonil; Mefenoxam)	U M5 & 4	1.2 pt 3 lb	6 pt 12 lb	2 7	Downy Mildew Pythium Downy mildew Certain leaf spots Gummy stem blight	Use a tank mix partner. See label for directions using a contact fungicide and Pythium suppression Limit is 4 appl./crop

Table 10. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Ridomil Gold MZ 68WP (Mancozeb; Mefenoxam) Ridomil Gold 4EC (Mefenoxam)	M3 & 4 4	2.5 lb 2 pt/treated A	10 lb	5	Downy mildew Pythium seedling blight	Limit is 4 appl./crop (Summer Squash) Apply at seeding in a 7-12" band on the soil over seed furrow.
Ultra Flourish (Mefenoxam)	4	4 pt/treated A			Same Ridomil Gold 4EC	Same Ridomil Gold 4EC
Ridomil Gold/Copper 64.8 W (Copper hydroxide; Mefenoxam)	M1 & 4	2 lb	8 lb	5	Downy mildew	Limit is 4 appl./crop
Serenade ASO (Bacillus subtilis stain QST 713)		6 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Serenade Max (Bacillus subtilis strain QST 713)		3 lb		0	Powdery mildew, Gummy Stem blight, Downy mildew	Do not use product alone. Apply with registered fungicide.
Sonata (Bacillus pumilus strain QST 2808)		4 lb		0	Powdery mildew, Downy mildew	Do not use product alone. Apply with registered fungicide
Sulfur[3] (Sulfur)	M2 27 & 11	8 oz		3	Powdery mildew	See label. Do not use in warm weather.
Tanos 50DF (Cymoxanil; Famoxadone)					Downy mildew Anthracnose	Limit is 4 appl./crop. Must tankmix with a contact fungicide. Limit is 72 oz/A maximum per year.
Thiophanate methyl 85WDG (Thiophanate-methyl)	1	0.4	2.5	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin 4.5FL (Thiophanate-methyl)	1	10 oz	60 oz	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin M WSB (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Same as Topsin M 70WP	Same as Topsin 4.5 FL
Topsin M 70WP (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Certain leaf spots, Powdery mildew, Gummy stem blight	Same as Topsin 4.5 FL
Various copper formulations[2]	M1				Bacterial diseases (See individual label)	See label .Various copper fungicides are labeled and could be useful if angular leaf spot (a bacterial disease) became a problem

[1]Sphaerotheca only

[2] Badge SC, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2 FL, Champion WP, COC DF, COC WP, Copper-Count-N, Cuprofix Disperss, Cuprofix MZ Disperss, Kocide 101, Kocide 2000, Kocide 4.5LF, Kocide DF, Nordox, Nordox 75WG, Nu-Cop 3L, Nu-Cop 50WP, Nu-Cop 50DF, Stretch, Tenn-Cop 5E

[3] Dusting Sulfur, Kumulus DF, Micro Sulf, Micronized Gold, Microthiol Disperss, Sulfur 90W, Thiolux Jet, Thiosperse 80, Wettable Sulfur

Table 11. Disease management for watermelon.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Acrobat 50WP (Dimethomorph)	40	6.4 oz	Season 32 oz	0	Downy mildew Phytophthora blight	Limit is 5 appl./crop. Tank mix with another fungicide. Harvest after spray is dry.
Aliette 80WDG (Fosetyl-Al) Amistar 80 DF (Azoxystrobin)	33 11	5 lb 5 oz	35 lb 1.88 lb	12 hr 1	Downy mildew Downy mildew Powdery mildew Gummy stem blight Anthracnose Alternaria leaf spot Certain leaf spots	Limit is 7 appl./crop. Do not tank mix with copper fungicides. Limit is four applications/crop for all QoI fungicides. Do not make more than two consecutive applications.
Cabrio 2.09 F (Pyraclostrobin)	11	16 fl oz	64 fl oz	0	Same as Amistar	4 appl. Maximum. Same as Amistar.
Curzate 60DF (Cymoxanil) Bravo Weather Stik, Echo 720, Equus 720 SST FLs (Chlorothalonil)	27 M5	3.2 oz 3 pt	See remarks 21 pt	3 0	Downy Mildew Alternaria leaf spot, Anthracnose Cercospora leaf spot Downy mildew Gummy stem blight, Powdery mildew	Use only with a labeled rate of protectant fungicide. No more than 9 applications per 12 months Recommended maximum rate is less for certain diseases including downy mildew. Follow label recommendations on watermelon after fruit set.
Bravo Ultrex or Equus DF (Chlorothalonil)	M5	2.7 lb	19.1 lb	0	Same as Echo 720	Same as Echo 720
Echo 90DF (Chlorothalonil)	M5	2.5 lb	17 lb	0	Same as Echo 720	Same as Echo 720
Dithane Rainshield F45 (Mancozeb)	M3	2.4 qt	19.2 qt	5	Alternaria leaf spot Anthracnose Cercospora leaf spot, Downy mildew Gummy stem blight	
Dithane M45, Penncozeb 80WP, Manzate Pro-Stick, Manzate 75DF (Mancozeb)	M3	3 lb	24 lb	5	Same as Dithane F45	
Dithane-DF Rainshield (Mancozeb)	M3	3 lb	25.6 lb	5	Same as Dtihane F45	
Manex 4F (Maneb)	M3	1.6 qt	12.8 qt	5	Same as Dithane F45	
Maneb 80WP (Maneb)	M3	2 lb	16 lb	5	Same as Dithane F45	
Maneb 75DF (Maneb)	M3	2 lb	17.1 lb	5	Same as Dithane F45	

Table 11. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Maximum Rate/Acre/ Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Manzate Flowable 4F (Mancozeb)	M3	2.4 qt	19.2 qt	5	Same as Dithane F45	
Penncozeb 75DF (Mancozeb) Flint 50WP (Trifloxystrobin)	M3 11	3 lb 2 oz	24 lb 8 oz	5 0	Same as Dithane F45 Powdery mildew Downy Mildew	Limit is 4 appl./crop & alternate chemistry. Maximum rate is higer for downy mildew suppression. Same as Amistar.
Gavel 75DF (Mancozeb; Zoxamide)	M3 & 22	2 lb	16 lb	5	Alternaria Leaf spot, Downy Mildew	Limit is 8 applications per crop
Heritage (Azoxystrobin)	11	8.0 oz	3.0 lb	1	Same as Amistar	Do not make more than two consecutive applications. Do not make more than 6 applications per crop. Same as Amistar
JMS Stylet Oil		3 qt		4 hr	Aphid-transmitted viruses, powdery mildew	See label for specific appl. techniques required (e.g. use of 400 psi.)
Fosphite, Topaz (Potassium phosphite)		3 qt	18 qt (Topaz)	0	Phytophthora, Pythium, Fusarium, Rhizoctonia, Downy Mildew	Check label for required minimum gallons per acre, restrictions for use following copper application, plant and environmental conditions that restrict use, and for compatibility with other materials.
Prophyt (Potassium phosphate) ManKocide 61DF (Copper hydroxide ; Mancozeb)	M1 & M3	4 pt 2.66 lb	128 lb	0 5	Downy Mildew, Phytophthora capsici Angular leaf spot Downy mildew Bacterial fruit blotch	Check label for required minimum gallons per acre, plant and environmental conditions that restrict use, and for compatibility with other materials.
Nova 40W (Myclobutanil)	3	5 oz	1.5 lb	0	Powdery mildew	Note that a 30 day plant back restriction exists.
Procure 50WS and 480SC (Triflumizole)	3	8 oz	40 oz	0	Powdery Mildew	
Pristine 38WG (Boscalid; Pyraclostrobin)	7 & 11	18.5 oz	74 oz	0	Same as Amistar	Limit is 4 appl./crop & alternate chemistry. Same as Amistar
Quadris 2.08FL (Azoxystrobin)	11	15.4 fl oz	2.88 qt	1	Same as Amistar	Limit is 4 appl./crop & alternate chemistry. Same as Amistar
Ranman (Cyazofamid)	21	2.75 fl oz	16.5 fl oz	0	Downy Mildew Phytophthora blight	Limit is 6 appl./crop. Follow resistance management guidelines on label.
Reason 500SC (Fenamidone)	11	5.5 fl oz	22 oz	14	Downy Mildew Alternaria leaf spot	Limit is 4 appl./crop & alternate chemistry

Table 11. Continued.

Chemical	Fungicide Group	Maximum Rate/Acre/ Application	Crop	Min. Days to Harvest	Pertinent Diseases	Remarks
Previcur Flex (Promocarb hydrochloride) Ridomil Gold Bravo 76.4W (Chlorothalonil; Mefenoxam)	U M5 & 4	1.2 pt 3 lb	6 pt 12 lb	2 7	Downy Mildew Pythium Downy mildew Certain leaf spots Gummy stem blight	Use a tank mix partner. See label for directions using a contact fungicide and Pythium suppression Limit is 4 appl./crop
Ridomil MZ 68WP (Mancozeb; Mefenoxam)	M3 & 4	2.5 lb	10 lb	5	Downy mildew	Limit is 4 appl./crop
Ridomil/Copper 70W (Copper hydroxide; Mefenoxam) Ridomil Gold 4EC (Mefenoxam)	M1 & 4 4	2 lb 2 pt/treated A	8 lb	5	Downy mildew Pythium Seedling blight	Limit is 4 appl./crop Apply at seeding in a 7-12" band on soil over seed furrow
Ultra Flourish (Menfenoxam)	4	4 pt/treated A			Same Ridomil Gold 4EC	Same Ridomil Gold 4EC
Serenade ASO (Bacillus subtilis strain QST 713)		6 qt		0	Downy mildew, Gummy Stem	Do not use product alone. Mix with a registered fungicide
Serenade Max (Bacillus subtilis strain QST 713)		3 lb		0	Downy mildew, Gummy Stem	Do not use product alone. Mix with a registered fungicide
Sonata (Bacillus pumilus strain QST 2808) Tanos 50DF (Cymoxanil; Famoxadone)	 27 & 11	4 qt 8 oz		0 3	Downy mildew, Gummy Stem Downy mildew Anthracnose	Do not use product alone. Mix with a registered fungicide Limit is 4 appl./crop. Must tankmix with a contact fungicide. Limit is 72 oz/A maximum per year.
Thiophanate methyl 85WDG (Thiophanate-methyl)	1	0.4	2.5	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin M WSB (Thiophanate-methyl)	1	0.5 lb	3 lb	1	Same as Topsin M 70WP	Same as Topsin 4.5 FL
Topsin 4.5FL (Thiophanate-methyl)	1	10 oz	60 oz	1	Anthracnose, Powdery Mildew, Gummy stem blight	Follow resistance management guidelines on label
Topsin M70WP (Thiophanate-methyl)	1	05 lb	3 lb	1	Certain leaf spots, Powdery mildew, Gummy stem blight	Same as Topsin 4.5 FL
Various copper formulations[1]	M1				Bacterial diseases (See individual label)	See label

[1] Badge SC, Basic Copper 53, Champ DP Dry Prill, Champ Formula 2FL, Champion WP, COC DF, COC WP, Copper-Count-N, Cuprofix Disperss, Cuprofix MZ Disperss, Kocide 101, Kocide 2000, Kocide 4.5LF, Kocide DF, Nordox, Nordox 75 WG, Nu-Cop 3L, Nu-Cop 50 WP, Nu-Cop 50 DF, Stretch, Tenn-Cop 5E

[2] Kumulus DF, Micro Sulf, Micronized Gold, Microthiol Disperss, Sulfur 90W, Thiolux Jet, Wettable Sulfur

Table 12. Selected insecticides approved for use on insects attacking cucumbers.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Acramite-50WS (bifenazate)	0.75-1.0 lb	12	3	twospotted spider mite	25	One application per season.
Admire 2F (imidacloprid)	0.1 fl oz/1000 plants	12	21	aphids, whiteflies	4A	**Planthouse:** 1 application to transplants. See label.
Admire Pro	0.44 fl oz/10,000 plants					
Admire 2F (imidacloprid)	1.4 fl oz/1000 plants	12	0 (soil)	aphids, whiteflies	4A	Mature plants in greenhouse, one application. Do not apply to immature plants.
Admire Pro	0.6 oz/1000					
Admire 2F (imidacloprid)	16-24 oz	12	21	aphids, cucumber beetles, leafhoppers, thrips, whiteflies	4A	Will not control thrips in flowers.
Admire Pro	7-10.5 fl oz					
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	leafminers, spider mites	6	Minimum 7-day intervals. No more than 2 sequential applications.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	0	cabbage looper, cucumber beetles (adults), cutworms, leafminers, lygus bug, melonworm, pickleworm, rindworms, squash bug, squash vine borer, stink bugs	3	Do not apply more than 1.6 lb active ingredient per acre, per season. (102.4 oz)
***Asana XL (0.66 EC)** (esfenvalerate)	5.8-9.6 fl oz	12	3	cabbage looper, corn earworm, cucumber beetles (adults), cutworms (seedling spray), grasshoppers, leafhoppers, lygus bug, pickleworm, rindworms, squash bug, squash vine borer, stink bugs	3	Do not apply more than 0.25 lb a.i. per acre per season or 5 applications at high rate.
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator.
Baythroid 2 (cyfluthrin)	0.8-2.8 fl oz	12	0	armyworm, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, melonworm, pickleworm, rindworms, tobacco budworm	3	Apply no more than 4 times per season.

Table 12. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (Beauveria bassiana)	WP: 0.5-2 lb/100 gal ES: 0.5-2 qt/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
***Capture 2 EC** (bifenthrin)	2.6-6.4 fl oz	12	3	aphids, armyworms, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, leafhoppers, melonworm, mites, pickleworm, plant bugs, rindworms, squash bug, squash vine borer, stink bugs, tobacco budworm	3	Do not apply more than 19.2 ounces of product per acre per season. Do not make more than 2 applications after bloom.
Courier 70WP, 40SC (buprofezin)	**70WP:** 6-9 oz **40SC:** 9-13.6 fl oz	12	7	whitefly nymphs	16	Insect growth regulator. Do not make more than 2 applications per season per crop. Do not plant food crops except those on the label within 120 days following application.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
***Danitol** (fenpropathrin)	10.67 fl oz	24	7	banded cucumber beetle, cabbage looper, fall armyworm, green stinkbugs, plant bugs, spider mites, striped cucumber beetle. Tank-mix with endosulfan to control aphids, thrips, and whiteflies.	3	Do not apply more often than every 7 days. Do not exceed 0.8 lb active ingredient per acre per season.
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
Dicofol 4E (dicofol)	0.75 pt	12	2	twospotted mites	20	Do not apply more than twice a season.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed[2].
Endosulfan 3 EC (endosulfan)	0.66-1.33 qt	24	2	aphids, cabbage looper, cucumber beetles, fall armyworm, flea beetles, melonworm, pickleworm, squash beetle, squash bug, squash vine borer, whiteflies	2	Do not make more than 6 applications per year or exceed 3.0 lb active ingredient per acre per year.

Table 12. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Entrust (spinosad)	1.25-2.5 oz	4	1	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	Do not apply more then 6 times (or 9 oz per acre per crop). OMRI-listed[2].
Esteem Ant Bait (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7D	Apply when ants are actively foraging.
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	0	green peach aphid, melon aphid, suppression of whiteflies	9B	Minimum of 7 days between applications. Maximum 5.5 oz/acre/season.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	3	beet armyworm, cabbage looper, melonworm, pickleworm, rindworm, southern armyworm, true armyworm, yellowstriped armyworm	18	Do not make more than 4 applications per seaon.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms).	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
Kelthane 50 WSP (Bacillus thuringiensis subspecies kurstaki)	1.25 lb	48	2	mites	20	Do not apply more than twice per season.
Knack IGR (pyriproxyfen)	8-10 fl oz	12	7	whiteflies (immatures)	7D	Do not apply more than twice per season.
Kryocide (cryolite)	8-12 lb	12	14	cabbage looper, cucumber beetles, flea beetles, melonworm, pickleworm	9A	Do not exceed 48 lb/acre per season. Minimum of 10 days between applications.
***Lannate LV; *SP** (methomyl)	**LV:** 1.5-3.0 pt **SP:** 0.5-1.0 lb	48	1 - 1.5 pt (LV) or 0.5 lb (SP) 3 - > 1.5 pt or 0.5 lb	aphids, beet armyworm, cucumber beetles, cutworms, fall armyworm, flea beetles, loopers, melonworm, pickleworm, tobacco budworm, variegated cutworm, yellowstriped armyworm	1A	
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
Malathion 8 F (malathion)	1.75 pt	12	1	aphids, cucumber beetles, leafminers, mites, pickleworm, squash vine borer	1B	Do not apply unless plants are dry. Can be used in greenhouse.
***MSR Spray Concentrate** (oxydemeton-methyl)	1.5-2 pt	48	3	aphids, mites	1B	Do not apply more than 2 times per season.

Table 12. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	aphids, leafhoppers, mites, thrips, whiteflies	--	OMRI-listed[2].
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	fall armyworm, leafminers, melonworm, pickleworm, rindworms, squash bug, squash vine borer, tobacco budworm, whiteflies	26	IGR and feeding repellant. Greenhouse and field use. OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	twospotted spidermite, whiteflies	23	Maximum amount per crop: 25.5 fl oz/acre. No more than 3 applications.
Oils, Insecticidal **SunSpray 98.8% Ultra-Fine** **JMS Stylet Oil** **Others**	3-6 qts/ 100 gal (JMS)	4	0	aphids, leafhoppers, leafminers, mites, thrips, whiteflies, aphid transmitted viruses (JMS)	--	Organic Stylet-Oil is OMRI-listed[2].
Platinum (thiamethoxam)	5-8 fl oz	12	30	aphids, flea beetles, whiteflies	4A	For most crops that are not on the label, a 120-day plant-back interval must be observed.
***Pounce 3.2 EC** (permethrin)	4-8 oz	12	0	aphids, cabbage looper, cucumber beetles (adults), cutworms, leafhoppers, leafminers, lygus bug, melonworm, pickleworm, rindworms, squash bug, squash vine borer, stink bugs	3	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, cucumber beetles, flea beetles, leafhoppers, leafminers, loopers, lygus bug, mites, squash bug, squash vine borer, stink bugs, thrips, whiteflies	3	
Sevin 80S, 4F, XLR Plus (carbaryl)	**80S:** 0.63-1.25 lb **4F, XLR:** 0.5-1 qt	12	3	cucumber beetles, flea beetles, leafhoppers, melonworm, pickleworm, squash bug	1A	Do not apply more than 6 qt or 7.5 lb per acre per crop.
SpinTor 2 SC (spinosad)	4-8 fl oz	4	1	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	Do not apply more than 29 oz per acre per season.
***Telone C-35** (dichloropropene + chloropicrin) ***Telone II** (dichloropropene)	See label	5 days (see label)	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
Trigard (cyromazine)	2.66 oz	12	0	leafminers	17	Do not make more than 6 applications.
Trilogy (extract of neem oil)	0.5-2.0 % V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].

Table 12. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Venom (dinotefuran)	**foliar:** 1-4 oz **soil:** 5-6 oz	12	1 - foliar 21 - soil	green peach aphid, leafhoppers, leafminers, melon aphid, thrips, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz per acre per season (soil). Do not use both application methods.
***Vydate L** (oxamyl)	2-4 pt	48	1	aphids, leafminers, thrips	1A	
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates
- 2A. GABA-gated chloride channel antagonists
- 3. Sodium channel modulators
- 4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
- 5. Nicotinic Acetylcholine receptor agonists (not group 4)
- 6. Chloride channel activators
- 7A. Juvenile hormone mimics, Juvenile hormone analogues
- 7D. Juvenile hormone mimics, Pyriproxifen
- 9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
- 9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
- 11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
- 11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
- 12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
- 15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
- 16. Inhibitors of chitin biosynthesis, type 1, Homopteran
- 17. Inhibitors of chitin biosynthesis, type 2, Dipteran
- 18. Ecdysone agonist/disruptor
- 20. Site II electron transport inhibitors
- 21. Site I electron transport inhibitors
- 22. Voltage-dependent sodium channel blocker
- 23. Inhibitors of lipid biosynthesis
- 25. Neuroactive (unknown mode of action)
- 26. Unknown mode of action, Azadirachtin

[2] OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.

* Restricted Use Pesticide

Table 13. Selected insecticides approved for use on insects attacking squash.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Acramite 50WS (bifenazate)	0.75-1.0 lb	12	3	twospotted spider mite	25	One application per season.
Admire 2F (imidacloprid)	16-24 oz	12	21	aphids, cucumber beetles, leafhoppers, thrips, whiteflies	4A	Will not control thrips in flowers.
Admire Pro	7.0-10.5 oz					
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	leafminers, spider mites	6	Minimum 7-day intervals. No more than 2 sequential applications.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	0	cabbage loopers, cucumber beetles, cutworms, leafminers, Lygus bug, melonworms, pickleworms, plant bugs, rindworm complex, squash bug, squash vine borer, stink bugs	3	Do not apply more than 1.6 lb ai/acre per season. (102.4 oz)
***Asana XL (0.66 EC)** (esfenvalerate)	5.8-9.6 fl oz	12	3	cabbage looper, corn earworm, cucumber beetles (adults), cutworms (seedling spray), grasshoppers, leafhoppers, Lygus bug, pickleworms, rindworm complex, squash bug, squash vine borer, stink bugs	3	Do not apply more than 0.25 lb ai/acre per season (5 applications at high rate).
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator.
Baythroid 2 (cyfluthrin)	0.8-2.8 fl oz	12	0	armyworm, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, melonworm, pickleworm, rindworms, tobacco budworm	3	Apply no more than 4 times per season.
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (Beauveria bassiana)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qt/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.

Table 13. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Capture 2 EC** (bifenthrin)	2.6-6.4 fl oz	12	3	aphids, armyworms, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, leafhoppers, melonworm, pickleworm, plant bugs, rindworms, squash bug, squash vine borer, stink bugs, tobacco budworm	3	Do not apply more than 19.2 ounces of product per acre per season. Do not make more than 2 applications after bloom.
Courier 70WP, 40SC (buprofezin)	**70WP:** 6-9 oz **40SC:** 9-13.6 fl oz	12	7	whitefly nymphs	16	Insect growth regulator. Do not make more than 2 applications per season per crop. Do not plant food crops except those on the label within 120 days following application.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
***Danitol** (fenpropathrin)	10.67 fl oz	24	7	banded cucumber beetle, cabbage looper, fall armyworm, southern green stink bug, spider mites, striped cucumber beetle, yellowstriped armyworm. Tank-mix with endosulfan to control aphids, thrips, and whiteflies.	3	Do not apply more often than every 7 days. Do not exceed 0.8 lb ai. per acre per season. (42.67 fl oz)
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
Dibrom 8 EC (naled) **summer squash only**	1 pt	48	1	aphids, armyworms, cucumber beetles, loopers, mites, thrips	1B	Apply no more than 1 pt per acre in Florida. Do not apply when temperature is over 90°F.
Dicofol 4E (dicofol)	0.75 pt	12	2	twospotted mites	20	No more than 2 applications per season.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed[2].
Endosulfan 3 EC (endosulfan)	0.66-1.33 qt	24	2	aphids, cabbage looper, cucumber beetles, flea beetles, melonworm, pickleworm, squash beetle, squash bug, squash vine borer, whiteflies	2	Do not make more than 6 applications per year or exceed 3.0 lb active ingredient per acre per year.
Entrust (spinosad)	1.25-2.5 oz	4	3	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	Do not apply more than 6 times or 9 oz per acre/crop. OMRI-listed[2].
Esteem Ant Bait (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7D	Apply when ants are actively foraging.

Table 13. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Extinguish ((S)-methprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	0	green peach aphid, melon aphid, suppression of whiteflies	9B	Minimum of 7 days between applications. Two applications only.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	3	beet armyworm, cabbage looper, melonworm, pickleworm, rindworm, southern armyworm, true armyworm, yellowstriped armyworm	18	Do not apply more than 4 applications per season.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.5 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
Kelthane 50WSP (dicofol)	1.25 lb	48	2	mites	20	Do not apply more than twice per season.
Knack IGR (pyriproxyfen)	8-10 fl oz	12	7	whiteflies (immatures)	7D	Do not apply more than twice per season.
Kryocide (cryolite)	8-16 lb	12	7	cabbage looper, Diabrotica beetles, flea beetles, melonworm, pickleworm	9A	Do not exceed 64 lb/acre per season.
***Lannate LV; *SP** (methomyl) **summer squash only**	**LV:** 1.5-3.0 pt **SP:** 0.5-1.0 lb	48	1 or 3, depending on rate used	aphids, beet armyworm, cucumber beetles, fall armyworm, flea beetles, granulate cutworms, loopers, melonworm, pickleworm, tobacco budworm, yellowstriped armyworm	1A	
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
Malathion 8 F (malathion)	1.75 pt	12	1	aphids, cucumber beetles, leafminers, mites, pickleworm, squash vine borer	1B	Do not apply unless plants are dry.
***MSR Spray Concentrate** (oxydemeton-methyl)	1.5-2.0 pt	48	3 - summer 14 - winter	aphids	1B	Apply only once per season.
M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	--	OMRI-listed[2].
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	fall armyworm, leafminers, melonworm, pickleworm, rindworm complex, squash bug, squash vine borer, tobacco budworm, whiteflies	26	IGR and feeding repellent. Greenhouse and field use. OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	twospotted spider mite, whiteflies	23	Maximum amount per season: 25.5 fl oz. No more than 3 applications.

Table 13. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Oils, Insecticidal SunSpray 98.8% Ultra-Fine JMS Stylet Oil Others	3-6 qts/100 gal (JMS)	4	0	aphids, leafhoppers, leafminers, mites, thrips, whiteflies (pest controlled vary by specific product).	--	See label for cautions on tank mixes. Organic Stylet-Oil is OMRI-listed[2].
Platinum (thiamethoxam)	5-8 fl oz	12	30	aphids, flea beetles, whiteflies	4A	For most crops that are not on the label, a 120-day plant-back interval must be observed.
***Pounce 3.2 EC** (permethrin)	4-8 oz	12	0	aphids, cabbage looper, cucumber beetles, cutworms, leafhoppers, leafminers, lygus bug, melonworm, pickleworm, plant bugs, rindworm complex, squash bug, squash vine borer, stink bugs	3	
Prokil Cryolite 96 (cryolite)	8-16 lb	12	14 - winter 7 - summer	cabbage looper, Diabrotica beetles, flea beetles, melonworm, pickleworm	9A	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, cabbage looper, cucumber beetles, flea beetles, leafhoppers, leafminers, loopers, lygus bug, mites, plant bugs, squash bug, squash vine borer, stink bugs, thrips, whiteflies	3, 21	
Sevin 80S, **4F, XLR Plus** (carbaryl)	**80S:** 0.63-1.25 lb **4F, XLR Plus:** 0.5-1.0 qt	12	3	cucumber beetles, flea beetles, leafhoppers, melonworm, pickleworm, squash bug	1A	Do not apply more than 7.5 lb or 6 qt per acre per crop.
SpinTor 2 SC (spinosad)	4-8 fl oz	4	3	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	Do not use more than 3 times in a 21-day period. Rotate to a different class of product for 21 days.
***Telone C-35** (dichloropropene + chloropicrin)	See label	5 days (see label)	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
***Telone II** (dichloropropene)						
Trigard (cyromazine)	2.66 oz	12	0	leafminers	17	Do not make more than 6 applications.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom (dinotefuran)	**foliar:** 1-4 oz **soil:** 5-6 oz	12	1 - foliar 21 - soil	green peach aphid, leafhopper, leafminers, melon aphid, thrips, whiteflies	4A	Do not apply more than 6 oz/acre per season (foliar) or 12 oz/acre (soil). Use only one application method (soil or foliar, not both).

Table 13. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Vydate L** (oxamyl)	2-4 pt	48	1	aphids, leafminers, thrips	1A	Do not apply more than 24 pt per acre per season.
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates
- 2A. GABA-gated chloride channel antagonists
- 3. Sodium channel modulators
- 4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
- 5. Nicotinic Acetylcholine receptor agonists (not group 4)
- 6. Chloride channel activators
- 7A. Juvenile hormone mimics, Juvenile hormone analogues
- 7D. Juvenile hormone mimics, Pyriproxifen
- 9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
- 9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
- 11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
- 11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
- 12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
- 15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
- 16. Inhibitors of chitin biosynthesis, type 1, Homopteran
- 17. Inhibitors of chitin biosynthesis, type 2, Dipteran
- 18. Ecdysone agonist/disruptor
- 20. Site II electron transport inhibitors
- 21. Site I electron transport inhibitors
- 22. Voltage-dependent sodium channel blocker
- 23. Inhibitors of lipid biosynthesis
- 25. Neuroactive (unknown mode of action)
- 26. Unknown mode of action, Azadirachtin

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

* Restricted Use Pesticide

Table 14. Selected insecticides approved for use on insects attacking cantaloupes.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Acramite-50WS (bifenazate)	0.75-1.0 lb	12	3	twospotted spider mite	25	One application per season.
Admire 2F (imidacloprid)	16-24 fl oz	12	21 (soil)	aphids, cucumber beetles, leafhoppers, thrips, whiteflies	4A	Will not control thrips in flowers.
Admire Pro	7.0-10.5 fl oz					
Admire 2F (imidacloprid)	0.1 fl oz/1000 plants	12	21	aphids, whiteflies	4A	**Planthouse -** See label, 1 application.
Admire Pro	0.44 fl oz/10,000 plants					
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	leafminers, spider mites	6	Minimum 7-day intervals, no more than 2 sequential applications.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	0	cabbage looper, cucumber beetles, cutworms, leafminers, Lygus bug, melonworm, pickleworm, plant bugs, rindworms, squash vine borer, stink bugs	3	Do not apply more than 102.4 oz acre per season.
***Asana XL (0.66 EC)** (esfenvalerate)	5.8-9.6 fl oz	12	3	cabbage looper, corn earworm, cucumber beetles (adults), cutworms (seedling spray), grasshoppers, leafhoppers, Lygus bug, pickleworm, rindworms, squash bug, squash vine borer, stink bugs	3	Do not apply more than 0.25 lb ai/acre per season. (5 applications at high rate).
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator.
Baythroid 2 (cyfluthrin)	0.8-2.8 fl oz	12	0	armyworm, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, melonworm, pickleworm, rindworms, tobacco budworm	3	Apply no more than 4 times per season.
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].

Table 14. Cotninued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
BotaniGard 22 WP, ES (Beauveria bassiana)	**WP:** 0.5-2.0 lb/100 gal **ES:** 0.5-2 qt 100/gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
***Capture 2 EC** (bifenthrin)	2.6-6.4 fl oz	12	3	aphids, armyworms, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, leafhoppers, melonworm, mites, pickleworm, plant bugs, rindworms, squash bug, squash vine borer, stink bugs, tobacco budworm	3	Do not apply more than 19.2 ounces of product per acre per season. Do not make more than 2 applications after bloom.
Courier 70WP, 40SC (buprofezin)	**70WP:** 6-9 oz **40SC**: 9-13.6 fl oz	12	7	whitefly nymphs	16	Insect growth regulator. Do not make more than 2 applications per season per crop. Do not plant food crops except those on the label within 120 days following application.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
***Danitol 2.4 EC** (fenpropathrin)	10.67 fl oz	24	7	banded cucumber beetle, cabbage looper, fall armyworm, green stink bug, plant bugs, spider mites, striped cucumber beetle, yellow striped armyworm	3	Mix with endosulfan for aphid, thrips, and whitefly control.
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
Dibrom 8 EC (naled)	1 pt	48	1	aphids, armyworms, leafhoppers, leafminers, loopers	1B	Netted varieties only. Apply no more than 2 pt per acre per season. Do not apply when temperature is over 90°F.
***Diazinon 4 E, *50 W** (diazinon)	**AG500, 4E:** 0.5-1.5 pts **50W:** 0.5-1.5 lb	24	3 (foliar)	aphids, cucumber beetles, leafhoppers, leafminers, melonworm, mites, thrips	1B	Will not control organophosphate- resistant leafminers. Limited to 5 applications.
	AG500, 4E: 2-4 qts **50W:** 4-8 lb		preplant	cutworms, wireworms		
Dimethoate 4 EC, 2.67 EC (dimethoate)	**4EC:** 1 pt **2.67:** 1.5 pts	48	3	aphids, leafhoppers, leafminers, thrips	1B	Highly toxic to bees.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed[2].

Table 14. Cotninued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Endosulfan 3 EC (endosulfan)	0.66-1.33 qts	24	2	aphids, armyworms, cabbage looper, cucumber beetles, flea beetles, loopers, melonworm, pickleworm, squash beetle, squash bug, squash vine borer, whiteflies	2	Do not make more than six applications per year or apply more than 3 lb active ingredient per acre per year.
Entrust (spinosad)	1.25-2.5 oz	4	3	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	No more than 6 applications per crop or 9 oz per acre per crop. OMRI-listed[2].
Esteem Ant Bait (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7D	Apply when ants are actively foraging.
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	0	green peach aphid, melon aphid, suppression of whiteflies	9B	Minimum of 7 days between applications.
Intrepid 2F (methoxyfenozide)	4-10 fl oz	4	3	beet armyworms, cabbage looper, melonworm, pickleworm, rindworm, wouthern armyworm, true armyworm, yellow-striped armyworm	18	Do not make more than 4 applications per season.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.50 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
Kelthane 50WSP (dicofol)	1.25 lb	48	2	mites	20	Do not apply more than twice per season.
Knack IGR (pyriproxyfen)	8-10 fl oz	12	7	whiteflies (immatures)	7D	Do not apply more than twice per season.
Kryocide (cryolite)	8-16 lb	12	14	cabbage looper, cucumber beetles, flea beetles, melonworm, pickleworm	9A	Do not exceed 64 lb/acre per season.
***Lannate LV, *SP** (methomyl)	1.5-3.0 pt 0.5-1.0 lb	48	1=1 1/2 pts 3=1 1/2+ pts	aphids, beet armyworm, cucumber beetles, fall armyworm, flea beetles, granulate cutworms, loopers, melonworm, pickleworm, tobacco budworm, variegated cutworm, yellowstriped armyworm	1A	

Table 14. Cotninued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1-2 lb	12	0	most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
***MSR Spray Concentrate** (oxydemeton-methyl)	1.5-2 pt	48	14	aphids, mites	1B	Do not apply more than 3 times per season.
M-Pede 49% EC (Soap, insecticidal)	1-2% V/V	12	0	aphids, leafhoppers, mites, thrips, whiteflies	--	OMRI-listed[2].
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	fall armyworm, leafminers, pickleworm, rindworms, squash bug, squash vine borer, tobacco budworm, whiteflies	26	IGR and feeding repellant. Greenhouse and field use. OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	twospotted spider mite, whiteflies	23	Maximum amount per crop: 25.5 fl oz acre. No more than 3 applications.
Platinum (thiamethoxam)	5-8 fl oz	12	30	aphids, flea beetles, whiteflies	4A	For most crops that are not on the label, a 120-day plant-back interval must be observed.
***Pounce 3.2 EC** (permethrin)	4-8 oz	12	0	aphids, cabbage looper, cucumber beetles, cutworms, leafhoppers, leafminers, lygus bug, melonworm, pickleworm, plant bugs, rindworms, squash vine borer, stink bugs	3	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12	aphids, leafhoppers, leafminers, loopers, lygus bug, mites, plant bugs, thrips, whiteflies	3, 21	
Sevin 80S, 4F, XLR (carbaryl)	**80S:** 0.63-1.25 lb **4F, XLR:** 0.5-1.0 qt	12	3	ants, cucumber beetles, flea beetles, grasshoppers, leafhoppers, melonworm, pickleworm, squash bug	1A	
SpinTor 2 SC (spinosad)	4-8 fl oz	4	3	armyworms, cabbage looper, leafminers, melonworm, pickleworm, rindworms, thrips	5	Do not apply more than 3 times in a 21-day period. Rotate to a different class of product for 21 days.
Sulfur, others	See label	24	1	mites	--	
Sun Spray 98.8%, JMS Stylet-Oil, others (Oil, insecticidal)	3-6 qts/100 gal (JMS)	4	0	aphid-transmitted viruses (JMS), leafhoppers, leafminers, mites, thrips, whiteflies	--	See label for cautions on tank mixes. Organic Stylet-oil is OMRI-listed[2].
***Telone C-35** (dichloropropene + chloropicrin)	See label	5 days (See label)	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
***Telone II** (dichloropropene)						

Table 14. Cotninued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Trigard (cyromazine)	2.66 oz	12	0	leafminers	17	Do not make more than 6 applications.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom (dinotefuran)	**foliar:** 1-4 oz **soil:** 5-6 oz	12	**foliar** - 1 **soil** - 21	green peach aphid, leafhoppers, leafminers, melon aphid, thrips, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz per acre per season (soil). Do not use both application methods.
***Vydate L** (oxamyl)	2-4 pt	48	1	aphids, leafminers, thrips	1A	
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates
- 2A. GABA-gated chloride channel antagonists
- 3. Sodium channel modulators
- 4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
- 5. Nicotinic Acetylcholine receptor agonists (not group 4)
- 6. Chloride channel activators
- 7A. Juvenile hormone mimics, Juvenile hormone analogues
- 7D. Juvenile hormone mimics, Pyriproxifen
- 9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
- 9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
- 11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
- 11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
- 12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
- 15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
- 16. Inhibitors of chitin biosynthesis, type 1, Homopteran
- 17. Inhibitors of chitin biosynthesis, type 2, Dipteran
- 18. Ecdysone agonist/disruptor
- 20. Site II electron transport inhibitors
- 21. Site I electron transport inhibitors
- 22. Voltage-dependent sodium channel blocker
- 23. Inhibitors of lipid biosynthesis
- 25. Neuroactive (unknown mode of action)
- 26. Unknown mode of action, Azadirachtin

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Pesticide**

Table 15. Selected insecticides approved for use on insects attacking watermelon.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Acramite-50WS (bifenazate)	0.75-1.0 lb	12	3	twospotted spider mite	25	One application per season.
Admire 2F (imidacloprid) Admire Pro	16-24 oz 7-10.5 oz	12	21 (soil)	aphids, cucumber beetles, leafhoppers, thrips, whiteflies	4A	Will not control thrips in flowers.
Admire 2F (imidacloprid) Admire Pro	0.1 fl oz/1000 plants 0.44 fl oz/ 10,000 plants	12	21	aphids, whiteflies	4A	**Planthouse:** One application to transplants.
Agree WG (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	lepidopteran larvae (caterpillar pests)	11B1	Apply when larvae are small for best control. OMRI-listed[2].
***Agri-Mek 0.15 EC** (abamectin)	8-16 fl oz	12	7	leafminers, spider mites	6	Minimum 7-day int. No more than 2 sequential applications.
***Ambush 25W** (permethrin)	6.4-12.8 oz	12	0	cabbage looper, cucumber beetles, cutworms, leafminers, lygus bug, melonworm, pickleworm, plant bugs, rindworms, squash vine borer, stink bugs	3	Do not apply more than 102.4 oz of product per acre per season.
***Asana XL (0.66 EC)** (esfenvalerate)	5.8-9.6 fl oz	12	3	cabbage looper, corn earworm, cucumber beetles (adults), cutworms (seedling spray), grasshoppers, leafhoppers, lygus bug, rindworms, squash bug, squash vine borer, stink bugs	3	Do not apply more than 0.25 lb ai/acre per season, (or 5 applications at high rate).
Aza-Direct (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator. OMRI-listed[2].
Azatin XL (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Antifeedant, repellant, insect growth regulator.
Baythroid 2 (cyfluthrin)	0.8-2.8 fl oz	12	0	armyworm, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, melonworm, pickleworm, rindworms, tobacco budworm	3	Apply no more than 4 times per season.
Biobit HP (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed[2].
BotaniGard 22 WP, ES (Beauveria bassiana)	**WP:** 0.5-2 lb/100 gal **ES:** 0.5-2 qt/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Capture 2 EC** (bifenthrin)	2.6-6.4 fl oz	12	3	aphids, armyworms, cabbage looper, corn earworm, cucumber beetles, cutworms, grasshoppers, leafhoppers, melonworm, mites, pickleworm, plant bugs, rindworms, squash bug, squash vine borer, stink bugs, tobacco budworm	3	Do not apply more than 19.2 ounces of product per acre per season. Do not make more than 2 applications after bloom.
Courier 70WP, 40SC (buprofezin)	**70WP:** 6-9 oz **40SC:** 9-13.6 fl oz	12	7	whitefly nymphs	16	Insect growth regulator. Do not make more than 2 applications per season per crop. Do not plant food crops except those on the label within 120 days following application.
Crymax WDG (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
***Danitol 2.4 EC** (fenpropathrin)	10.67 fl oz	24	7	banded cucumber beetle, cabbage looper, fall armyworm, green stink bug, plant bug, striped cucumber beetle, twospotted spider mite, yellowstriped armyworm **NOTE:** mix with endosulfan for aphid, thrips, and whitefly control.	3	Do not exceed 42.67 fl oz per acre per season.
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
***Diazinon 4 E, *50 W** (diazinon)	**foliar - AG500, 4E:** 0.5-1.5 pt **50W:** 0.5-1.5 lb	24	3	aphids, cucumber beetles, leafhoppers, leafminers, mites, thrips	1B	Will not control organophosphate- resistant leafminers. Do not apply more than 5 times. (foliar)
	preplant - AG500, 4E: 2-4 qts **50W:** 4-8 lb		preplant	cutworms, wireworms		
Dimethoate 4 EC, 2.67 EC (dimethoate)	**4EC:** 0.5-2 pt **2.67:** 0.75-1.5 pt	48	3	aphids, leafhoppers, leafminers, maggots	1B	Highly toxic to bees.
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential. OMRI-listed[2].
Endosulfan 3 EC (endosulfan)	0.66-1.33 qt	24	2	aphids, cabbage looper, cucumber beetles, flea beetles, loopers, melonworm, omnivorous leafroller, pickleworm, rindworms, squash beetle, squash bug, squash vine borer, whiteflies	2	Do not make more than 6 applications per year or exceed 3.0 lb active ingredient per acre per year.

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Entrust (spinosad)	1.25-2.5 oz	4	3	armyworms, cabbage looper, leafminers, loopers, melonworm, pickleworm, rindworms, thrips	5	Do not apply more than 6 times or 9 oz per acre per crop. OMRI-listed[2].
Esteem Ant Bait (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7D	Apply when ants are actively foraging.
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.
Fulfill (pymetrozine)	2.75 oz	12	0	green peach aphid, melon aphid, suppression of whiteflies	9B	Minimum of 7 days between applications. Maximum 5.5 oz/acre/season.
Intrepid 2F (methoxyfenopzide)	4-10 oz	4	3	beet armyworm, cabbage looper, melonworm, pickleworm, rindworm, southern armyworm, true armyworm, yellowstriped armyworm	18	Do not make more than 4 applications per season.
Javelin WG (Bacillus thuringiensis subspecies kurstaki)	0.12-1.50 lb	4	0	most caterpillars, but not Spodoptera species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential. OMRI-listed[2].
Kelthane 50WSP (dicofol)	1.25 lb	48	2	mites	20	Do not apply more than twice per season.
Knack IGR (pyriproxyfen)	8-10 fl oz	12	7	whiteflies (immatures)	7D	Do not apply more than twice per season.
Kryocide (cyrolite)	8-16 lb	12	14	cabbage looper, Diabrotica beetles (cucumber beetles), flea beetles, melonworm, pickleworm	9A	Do not exceed 64 lb/acre per season.
***Lannate LV** (methomyl)	LV: 1.5-3.0 pt	48	1=1 1/2 pts 3=1 1/2+ pts	aphids, beet armyworm, cucumber beetles, fall armyworm, flea beetles, granulate cutworms, loopers, melonworm, pickleworm, tobacco budworm, variegated cutworm, yellowstriped armyworm	1A	
***Lannate SP** (methomyl)	SP: 0.5-1.0 lb	48	1=1/2 lb 3=1/2+ lb	See above		
Lepinox WDG (Bacillus thuringiensis subspecies kurstaki)	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
M-Pede 49% EC (Soap, Insecticidal)	1-2%V/V	12	0	aphids, leafhoppers, mites, plant bugs, thrips, whiteflies	–	OMRI-listed[2].

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***MSR Spray Concentrate** (oxydemeton-methyl)	1.5-2.0 pt	48	7	aphids, mites	1B	Do not apply more than 2 times per season.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	fall armyworm, leafminers, melonworm, pickleworm, rindworms, squash bug, squash vine borer, tobacco budworm, whiteflies	26	IGR and feeding repellant. Greenhouse and field use. OMRI-listed[2].
Oberon 2SC (spiromesifen)	7.0-8.5 fl oz	12	7	twospotted spider mite, whiteflies	23	Maximum amount per crop: 25.5 fl oz/acre. No more than 3 applications.
Oil, Insecticidal **SunSpray 98.8% Ulta-Fine** **JMS Stylet Oil** Others	3-6 qts/100 gal (JMS)	4	0	aphids, leafhoppers, leafminers, mites, thrips, whiteflies, aphid-transmitted viruses (JMS)	--	Organic Stylet-Oil is OMRI-listed[2].
Platinum (thiamethoxam)	5-8 fl oz	12	30	aphids, flea beetles, whiteflies	4A	For most crops that are not on the label, a 120-day plant-back interval must be observed.
***Pounce 3.2 EC** (permethrin)	4-8 oz	12	0	aphids, cabbage looper, cucumber beetles, cutworms, leafhoppers, leafminers, Lygus bug, melonworm, pickleworm, plant bugs, rindworms, squash vine borer, stink bugs	3	
Prokil Cryolite 96 (cyrolite)	8-16 lb	12	14	cabbage looper, Diabrotica beetles (cucumber beetles), flea beetles, melonworm, pickleworm	9A	
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, leafhoppers, leafminers, loopers, lygus bug, mites, plant bugs, thrips, whiteflies	3, 21	Can be used on greenhouse vegetables.
Pyronyl Crop Spray (pyrethrin + piperonyl butoxide)	1-12 fl oz	12	12 hours	ants, aphids, armyworms, cabbage looper, corn earworm, cucumber beetles, flea beetles, leafhoppers, thrips, whiteflies	3	Can be used on greenhouse vegetables.
Sevin 80S, 4F, XLR (carbaryl)	**80S:** 0.63-1.25 lb **4F, XLR:** 0.5-1.0 qt	12	3	cucumber beetles, flea beetles, leafhoppers, melonworm, pickleworm, squash bug	1A	Do not apply more than 7.5 lb or 6 qt per acre per year.
SpinTor 2 SC (spinosad)	4-8 fl oz	4	3	armyworms, cabbage looper, leafminers, melonworm, pickleworm, thrips	5	Do not apply more than 3 times in a 21-day period. Rotate to a different class of product for 21 days.
Sulfur	See label	24	1	mites	--	

Table 15. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
***Telone C-35** (dichloropropene + chloropicrin) ***Telone II** (dichloropropene)	See label	5 days	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
Trigard (cyromazine)	2.66 oz	12	0	leafminers	17	Do not make more than six applications.
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
Venom (dinotefuran)	**foliar:** 1-4 oz **soil:** 5-6 oz	12	**foliar:** 1 **soil:** 21	green peach aphid, leafhoppers, leafminers, melon aphids, thrips, whiteflies	4A	Do not apply more than 6 oz per acre per season (foliar) or 12 oz (soil) per acre per season. Use only one application method (soil or foliar).
***Vydate L** (oxamyl)	2-4 pt	48	1	aphids, leafminers, thrips	1A	Do not apply more than 24 pt per acre per season.
Xentari DF (Bacillus thuringiensis subspecies aizawai)	0.5-2.0 lb	4	0	caterpillars	11B1	Treat when larvae are young. Thorough coverage is essential. May be used in the greenhouse. Can be used in organic production.

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

[1] Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates
- 2A. GABA-gated chloride channel antagonists
- 3. Sodium channel modulators
- 4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids
- 5. Nicotinic Acetylcholine receptor agonists (not group 4)
- 6. Chloride channel activators
- 7A. Juvenile hormone mimics, Juvenile hormone analogues
- 7D. Juvenile hormone mimics, Pyriproxifen
- 9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite
- 9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine
- 11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai
- 11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki
- 12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide
- 15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran
- 16. Inhibitors of chitin biosynthesis, type 1, Homopteran
- 17. Inhibitors of chitin biosynthesis, type 2, Dipteran
- 18. Ecdysone agonist/disruptor
- 20. Site II electron transport inhibitors
- 21. Site I electron transport inhibitors
- 22. Voltage-dependent sodium channel blocker
- 23. Inhibitors of lipid biosynthesis
- 25. Neuroactive (unknown mode of action)
- 26. Unknown mode of action, Azadirachtin

[2] OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.

*** Restricted Use Pesticide**

Table 16. Breakeven production costs of cucumber at various yield levels in southwest Florida, 2004-2005.

		Yield (bushels/acre)				
	Cost per acre	**400**	**500**	**600**	**700**	**800**
Variable Costs	$1,521.22	$3.80	$3.04	$2.54	$2.17	$1.90
Fixed Costs	$731.24	$1.83	$1.46	$1.22	$1.04	$0.91
Harvest Cost/unit		$4.66	$4.66	$4.66	$4.66	$4.66
Total Cost/unit		$10.29	$9.16	$8.41	$7.88	$7.48

Table 17. Breakeven production costs of summer squash at various yield levels in the Miami-Dade County area, 2004-2005.

		Yield (bushels/acre)				
	Cost per acre	**300**	**338**	**375**	**413**	**450**
Variable Costs	$1,421.03	$4.74	$4.20	$3.79	$3.44	$3.16
Fixed Costs	$1,148.26	$3.83	$3.40	$3.06	$2.78	$2.55
Harvest Cost/unit		$5.30	$5.30	$5.30	$5.30	$5.30
Total Cost/unit		$13.86	$12.90	$12.15	$11.52	$11.01

Table 18. Breakeven production costs of watermelon at various yield levels in the Manatee/Hillsborough areas, 2004-2005.

		Yield (cwt/acre)				
	Cost per acre	**280**	**300**	**320**	**340**	**360**
Variable Costs	$1,400.50	$5.00	$4.67	$4.38	$4.12	$3.89
Fixed Costs	$697.30	$2.49	$2.32	$2.18	$2.05	$1.94
Harvest Cost/unit		$2.60	$2.60	$2.60	$2.60	$2.60
Total Cost/unit		$10.09	$9.59	$9.16	$8.77	$8.43

Table 19. Breakeven production costs of watermelon at various yield levels in the southwest Florida area, 2004-2005.

		Yield (cwt/acre)				
	Cost per acre	**300**	**320**	**340**	**360**	**380**
Variable Costs	$1,966.13	$6.55	$6.14	$5.78	$5.46	$5.17
Fixed Costs	$1,019.67	$3.40	$3.19	$3.00	$2.83	$2.68
Harvest Cost/unit		$2.95	$2.95	$2.95	$2.95	$2.95
Total Cost/unit		$12.90	$12.28	$11.73	$11.24	$10.81