

Chapter 22. Sweetpotato Production in Florida

S.M. Olson, M.L. Lamberts, W.M. Stall, S. Zhang and S.E. Webb

BOTANY

Nomenclature

Family - Convolvulaceae

Sweetpotato - *Ipomoea batatas*

Origin

Originating in tropical America, the sweetpotato was cultivated by pre-Inca farmers.

Related species

Water convolvulus, water spinach, and kangkong (*Ipomoea aquatica*), both upland and aquatic types, are grown as leafy vegetables in the tropics. This crop is illegal in Florida due to the noxious weed potential in fresh waterways. The tops of sweetpotato, especially varieties with short internodes, are sometimes used as a substitute for water convolvulus.

VARIETIES

Sweetpotato varieties grown in Florida include:

- Beauregard
- Covington
- Hernandez
- Jewel
- Picadito (Boniato)

PLANTING AND SEEDING

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

FERTILIZER AND LIME

Broadcast all P₂O₅, micronutrients, and 25 to 50% of N and K₂O before planting. Better fertilizer efficiency might result by banding P₂O₅ and micronutrients when beds are made. Sidedress remaining N and K₂O by banding in side of bed in one or two applications before vines cover sides of beds. Soil test and fertilizer recommendations for sweetpotato on mineral soils are given in Table 2.

PLANT TISSUE ANALYSIS

Plant tissue analysis information for sweetpotato is given in Table 3. The analysis was done before initiation of root enlargement, using the most recently matured leaf.

IRRIGATION

Sweetpotato water requirements (see Chapter 3, *Principles and Practices for Irrigation Management of Vegetables*, Table 4 to 6) increase from 20% of ETo during early growth to 60% of ETo during rapid growth and root enlargement (see Chapter 3, *Principles and Practices for Irrigation Management of Vegetables* Table 3). Proper water management is essential for optimum root sizing.

Water requirements and subsequent irrigation requirements may be reduced to 70% of ETo during the last few weeks of growth.

Table 1. Planting information for sweetpotato.

Planting dates	
North Florida	Mar - June
Central Florida	Feb - June
South Florida	Dec - Sept
	(orange fleshed types)
	Year-round (boniato/batatas types)
Planting information	
Distance between rows (in)	36 - 48
Distance between plants (in)	10 - 12
Planting depth (in)	3 - 4
Transplants needed per acre	9,000 - 15,000
Days to maturity from transplant	85 - 130
Plant populations (acre)	9,000 - 15,000

Table 2. Soil test and fertilizer recommendations for mineral soils for sweetpotato (beds on 36 to 42 inch centers).¹

Target pH	N lb/A ²	P ₂ O ₅ ²					K ₂ O				
		VL	L	M	H	VH	VL	L	M	H	VH
6.5	60	120	100	80	0	0	120	100	80	0	0

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

² 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 P₂O₅, and applied through the plant hole or near the seeds.

Table 3. Plant tissue analysis for sweetpotato just before roots begin to enlarge. Dry wt. basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu
	Percent						Parts per million				
Deficient	<3.0	0.2	2.0	0.5	0.25	0.2	40	40	25	25	5
Adequate range	3.0 -4.0	0.2 -0.3	2.0 -4.0	0.5 -1.8	0.25 -0.5	0.2 -0.4	40 -100	40 -100	25 - 40	25 - 40	5 - 10
High	>4.0	0.3	4.0	1.8	0.5	0.4	100	100	40	40	10

Table 4. Chemical weed controls: sweetpotato

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Carfentrazone (Aim)	Sweetpotato	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 spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Clethodim (Select 2 EC) (Arrow) (Intensity) (Select Max)	Sweetpotatoes, Yams (other tuberous and corm vegetables)	Postemergence	0.09-0.25	
Remarks: Postemergence control of actively growing annual grasses. Apply at 6-16 fl oz/acre (Select, Arrow) or 9-16 fl oz/acre (Select Max). Higher rates are listed for perennial grasses. Use a crop oil concentrate for Select and Arrow, but a non-ionic surfactant may be used for Select Max. Do not apply within 30 days of harvest.				
Clomozone (Command 3 ME)	Sweetpotato	Pretransplant Posttransplant	0.48-0.56	---
Remarks: For control of annual grasses and broadleaf weeds, apply broadcast 1.3 pints/acre. Also, may be applied as a single application post transplant to the crop and prior to weed emergence at a maximum rate of 1.5 pints/acre.				
Clomozone (Command 3 ME)	Tuberous and Corm vegetables (arracacha, cassava, tanier, yams)		0.75-1.24	---
Remarks: For control of grasses and broadleaf weeds apply 2 to 3.3 pints/acre broadcast. Try on trial basis only on arracacha, cassava and tanier.				
DCPA (Dacthal)	Sweetpotato	Posttransplanting or layby	8-10.5	---
Remarks: Controls germinating annuals. Apply to moist soil or overhead-irrigate. Apply to weed-free field up to 6 weeks after transplanting.				
Flumioxazin (Valor)	Sweetpotato	Pretransplant	0.095	
Remarks: Valor must be applied prior to transplanting sweet potatoes at no more than 3 oz product/A. Do not apply to any variety other than Beauregard unless user has tested Valor on the other variety and found crop tolerance to be acceptable. Do not apply in a tank mix other than labeled rates of clomozone. Check the supplemental label for complete instructions and precautionary statements.				

Table 4. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Fluazifop (Fusilade)	Sweetpotato, Yams	Postemergence	0.188	0.188
Remarks: Controls actively growing grass weeds. A total of 48 oz. product may be applied per season. Do not harvest within 55 days of application. Apply a crop oil concentrate or non-ionic surfactant in the spray mixture. Consult the label for specific rates and growth stage for best control.				
Glyphosate (Roundup)	Sweetpotato	Preplanting	0.5 - 1.0	---
Remarks: Apply as directed for "Cropping Systems" under conditions described on label. Does not provide residual weed control.				
Napropamide (Devrinol 50 DF)	Sweetpotato	Postransplanting	1-2	---
Remarks: Apply to soil surface immediately after transplanting. Will not control emerged weeds.				
Pelarganic Acid (Scythe)	Root and tuber vegetables, Sweetpotato, yam	Preplant Preemergence Post-Directed	3-10% v/v	3-10% v/v
Remarks: Product is a contact, nonselective, foliar herbicide. It has no residual activity. It may be tank mixed with soil residual herbicides. Consult the label for rates and timings.				
Sethoxydim (Poast)	Sweetpotato	Postemergence	0.188	0.188
Remarks: For control of emerged annual and perennial grass weeds. Always add 1 qt oil concentrate per acre. Do not apply to drought-stressed grass weeds. Minimum time from application to harvest - 30 days.				

CULTURAL PRACTICES

Soil Preparation

Sweetpotatoes grow best when the soil is turned 2 to 3 months before planting. Plowing early helps rot plant debris and reduce some nematode and disease problems. Soils in Miami-Dade County (except for marl soils) should be scarified or "rock plowed" prior to planting to improve drainage and increase available soil depth.

Deep, sandy soils will always produce the best shaped and best looking sweetpotatoes (Fig. 22-1, 22-2). However, long periods of dry weather during the growing season reduce yields if supplemental irrigation cannot be supplied. Wet weather for extended periods can cause leaching of N and K, requiring the addition of more fertilizer than on heavier soils. More frequent applications of lesser amounts of fertilizer are suggested for coarse textured soils.

Soils with more than 2% organic matter are not well suited to sweetpotato production since they usually produce a large percentage of rough or cracked storage roots. Scurf and black rot fungi are more persistent in these soils than in those with less organic matter.

In general, fields that have not been used for sweetpotatoes in the last 2 to 3 years are preferred. Avoid fields that have been idle or have very high nematode populations.

Bedding

Plants are often established in rows on flat land (Fig. 22-3). During the cultivation process, ridges are formed down the rows of plants. However, beds can be formed

ahead of time, especially when preplant fertilizers or pest control chemicals need to be applied to the soil before planting. Vines take root at all locations where vines are covered, providing additional sites for storage root formation. In locations where sweetpotato weevils are present, keeping the storage roots covered with soil helps to minimize damage. Ridges also improve drainage and facilitate harvesting.

Cover Crops

Cover crops are not recommended immediately after sweetpotato production. Cultivation is needed after harvest to prevent feral plant establishment.

WEED MANAGEMENT

Herbicides labeled for weed control in sweet potato are listed in Table 4.

DISEASE MANAGEMENT

Virus diseases are the major group of pathogens affecting sweetpotatoes, though many do not cause problems in the United States. Feathery mottle virus is the most common in the U.S. Losses due to infection are as much as 50% with incidences of single and multiple infections approaching 100% in a field. Since sweetpotatoes are vegetatively propagated, virus diseases can be carried from one planting to another in the propagules. Genetic resistance to sweet potato viruses is not well documented.

Common fungal and bacterial diseases of sweetpotatoes in the U. S. include: bacterial wilt and root rot, black rot, internal cork, pox or soil rot, rhizopus soft rot, scurf, surface rot, circular spot, and wilt (stem rot).

Effective disease control for sweetpotatoes is based on prevention. Most of the important diseases are caused by root pathogens or are capable of spreading systemically through the plant. It is generally not possible to restore the health of an affected plant once the disease can be detected. Since sweetpotatoes are vegetatively propagated, pathogens are easily transmitted in the planting stock. A crop rotation of at least 3 years is an important means of controlling diseases. Table 5 outlines the chemicals approved for disease management in sweetpotatoes and yams.

Physiological Disorders

Hardcore and internal breakdown are the main physiological disorders affecting sweetpotatoes.

Harvesting/Packing/Shipping

Unlike most vegetable crops, sweetpotatoes do not have a definite stage where they are classified as mature since plants will continue to grow as long as there are green leaves. The crop should be harvested when it has produced the highest percentage of roots of the desired size. Sweetpotatoes should be harvested before killing frosts. Partial or complete freezing of the foliage is not likely to damage the crop unless soil temperature around the roots is less than 55°F for several hours. Because of the sweet potato weevil, Florida is a quarantine state and potatoes may not be shipped through any of the southeastern states that grow sweetpotatoes.

NEMATODE MANAGEMENT

Sweetpotatoes are frequently damaged by root-knot and reniform nematodes. Either may cause stunting and yield loss; root-knot nematodes in the tubers may cause cracking or internal dark lesions which severely reduce the value of the product. Several steps should be taken together to minimize nematode injury to sweetpotatoes. These include crop rotation; varietal resistance; nematode-free transplants; and nematicides.

Crop Rotation

There are usually not as many root-knot or reniform nematodes where the preceding crop was a grass or small grain. Most vegetable crops are among the worst crops to precede sweetpotatoes, from the standpoint of building up hazardous nematode populations. Field corn may be better than most vegetables. Do not plant sweetpotatoes in the same field in successive years.

NEMATODE-FREE TRANSPLANTS

Do not take nematodes or other soil-borne problems to the field by planting contaminated plants. If plants must be propagated from suspect soil, use un-rooted cuttings to avoid carrying potential problems into the field.

Nematicides

Where damaging levels of nematodes exist, the nematicides listed in Table 6 should reduce losses if applied as directed.

Before application of a nematicide, carefully read and follow the label.

INSECT MANAGEMENT

Weevils are the main pest of sweetpotato. In the United States, the sweetpotato weevil is of major concern. Larvae are reared primarily in storage roots and can be transported from one location to another, unnoticed. Their damage to storage roots makes them unmarketable.

Resistance is not well-documented. Selecting pest-free propagules for planting is one method of control and minimizing adult weevil access to storageroots by keeping them well-covered with soil is another. Keeping fallowed fields free of feral plants and maintaining good sanitation in packing and storage buildings is also recommended.

Other pests identified in the U.S. include: southern potato wireworm, the tobacco wireworm, the banded cucumber beetle, the spotted cucumber beetle, the elongate flea beetle, the pale-striped flea beetle, white grub, and sweetpotato flea beetle. Such findings are similar to those of the other root and tuber crops, once production has become extensive in a particular region and scientific attention is available to investigate pest problems. Fortunately, good levels of genetic resistance are available for these insect groups. To supplement this resistance, various chemical pesticides can be used for insect control in sweetpotatoes. These are listed in Table 7.

Table 5. Disease Management for sweetpotato.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Allegiance FL (metalaxyl)	4	0.75 fl oz/100 lb. seed			Pythium damping-off	Seed treatment
Allude (potassium phosphite)	33	1.25 qt			Pink rot, Pythium leak	
Apron XL (mefenoxam)t	4	0.64 fl oz/100 lb seed			Pythium damping-off	
Armcarb 100 fungicide (potassium bicarbonate)	NC	5 oz/100 gal water		0	Alternaria, Septoria leaf spot and Botrytis gray mold	
Botran 5F (DCNA dichloran)	14	0.6 qt/7.5 gal water			Scurf	Seed drip
		5.73 oz/14 gal water per 1000 sq ft of plant bed			Sclerotinia Blight	Spray
		0.6 qt/100 gal for spray and root dip			Rhizopus Rot	See label
Botran 75-W fungicide (DCNA dichloran)	14	2 lb/15 gal water			Scurf	Dip seed sweet potatoes 10 to 15 seconds
		3.75 lb/15 gal water per 1000 sq ft of plant bed			Sclerotinia Blight	Spray potatoes in bed before covering with soil.
		1 lb/100 gal water for spray, 0.5lb/100 gal for dip			Rhizopus Rot	See label for information on making new suspensions
Cabrio EG (pyraclostrobin)	11	16 oz	48 oz	0	White rust (<i>Albugo</i> spp.)	Alternate with other labeled fungicides after each application
Cease (<i>Bacillus subtilis</i> strain QST 713)	44	6 qt		0	Black root/crown rot	Apply high rates and reduce spray intervals or tank mix with other registered fungicides when disease pressure is high
Endura (boscalid)	7	10 oz	20 oz	10	Sclerotinia white mold	Apply high rates and reduce spray intervals when disease pressure is high
Phosphite fungicide (potassium phosphite)	33	See label		0	Control many diseases See label	Do not apply foliarly to plants treated with copper based compounds at less than 20 day intervals unless instructed to do so
Fungi-Phite (potassium phosphite)	33	Various, See label		0	Pythium, Phytophthora root rot	See label
Headline (pyraclostrobin)	11	12 oz treated acre	1.18 lb/ treated acre	3	Various See label	See label

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Heritage (azoxystrobin)	11	10.5 oz/treated acre	2 lb/treated acre	0	Control many diseases including Alternaria leaf spot See label	Do not apply directly to water except as specified on the label
Maxim 4FS (fludioxonil)	12	0.16 fl oz/100 lb seed			Seed decay, damping-off, seedling blight caused by soil pathogens	Not effective against <i>Pythium</i> spp.; Apply Maxim 4FS tanked mix with others for <i>Pythium</i> control
Mertect 340-F (thiabendazole)	1	107 fl oz/100 gal water		0	Black rot Scurf Root rot	Dip seed roots for 1-2 min
Micro Sulf (sulfur)	M2	5 lb/treated acre		0	Septoria leaf spot	Do not use within 2 weeks of an oil spray treatment
Microthiol Disperss (sulfur)	M2	10 lb			Leaf spot, powdery mildew	Do not use within 2 weeks of an oil spray treatment
Milstop (potassium bicarbonate)	NC	5 lb		0	Botrytis gray mold, <i>Penicillium</i> spp., Powdery mildew, Septoria leaf spot	See label
Phorcephite (potassium phosphite)	33	4 qt		0	<i>Pythium</i> , <i>Phytophthora</i> spp. and others See label	Limit to 6 applications
Presidio Fungicide (fluopicolide)	43	4 fl oz		7	Pink rot, Late blight	For resistance management, tank mix with a labeled fungicide having a different mode of action
Quadris (azoxystrobin)	11	Various, See label	Various, See label	See label	Control many soil-borne diseases, See label	See label
Quadris TOP (azoxystrobin; difenoconazole)	11 & 3	14 fl oz	55.3 fl oz	14	Alternaria blight, Powdery mildew, Septoria leaf spot, Rust	Make no more than 2 consecutive applications; Adding adjuvant may enhance the efficacy
Rampart (potassium phosphite)	33	See label		0	Pink rot, Late blight <i>Pythium</i> , <i>Phytophthora</i> spp. and others	See label
Reason 500SC (fenamidone)	11	8.2 fl oz	16.4 fl oz	14	Alternaria blight, White rust	Do not make more than 1 application before alternating with a registered fungicide having a different mode of action
Regalia (extract of <i>Reynoutria sachalinensis</i>)	P	4 pt		0	Powdery mildew, Gray mold, Early blight, Black root/crown rot	Tank mix with other registered fungicides when disease pressure is high
Rhapsody (<i>Bacillus subtilis</i> strain QST 713)	44	6 qt		0	Black root/crown rot, Early blight	Refer to label

Table 5. Continued.

Chemical	Fungicide Group	Max Rate / Acre		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
		Application	Season			
Ridomil Gold EC Ridomil Gold SL (mefenoxam)	4	2 pt/treated acre		0	Pythium, Phytophthora root rot	Apply in water or liquid fertilizer & incorporate into top 2 inches of soil
Scala SC (pyrimethanil)	9	7 fl oz	35 fl oz	7	Early blight, Botrytis leaf spot	See label
Scholar SC (fludioxonil)	12	In-line dip/drench, 32 fl oz/100 gal of water In-line aqueous or fruit coating spray application, 16 fl oz/200,000 lb of sweet potatoes			Rhizopus rot	Post-harvest treatment; Do not make more than 1 post-harvest application
Serenade ASO, Serenade MAX, Serenade SOIL (<i>Bacillus subtilis</i> strain QST 713)	44	ASO 6 lb MAX 3 lb SOIL 6 qt		0	Black root/crown rot, Early blight, Gray mold, Powdery mildew, White mold	Apply high rates and reduce spray intervals or tank mix with other registered fungicides when disease pressure is high. See label
SoilGard 12G (<i>Gliocladium virens</i> GI-21)	Biological material	10 lb		0	Soil pathogens such as <i>Pythium</i> , <i>Rhizoctonia</i> , spp.	Apply preventatively; Do not use other fungicides with SoilGard 12G
Sonata (<i>Bacillus pumilus</i> strain QST 2808)	Biological material	4 qt		0	Early blight, Powdery mildew, White mold	Can be used alone or in alternating spray programs or tank mixes
Sporatec (rosemary oil, clove oil, thyme oil)	NC	2.0 pt		0	Black root rot, Early blight, Powdery mildew	Use of a spreader and/or penetrating adjuvant improves product performance
Switch 62.5WG (cyprodinil; fludioxonil)	9 & 12	14 oz	56 oz	7	Alternaria leaf blight, Powdery mildew	Alternate with another labeled fungicide for 2 applications after 2 applications of Switch WG
Trilogy Neem oil (clarified hydrophobic extract)	NC	2 lb/100 gal water per treated acre		0	Various, see label	Do not apply this product through any type of irrigation system
Topaz (potassium phosphite)	33	See label		0	Control many diseases, See label	Do not apply foliarly to plants treated with copper based compounds at less than 20 day intervals unless instructed to do so
Ultra Flourish (mefenoxam)	4	4 pt		0	Pythium, Phytophthora root rot	Apply as a broadcast soil application at preplant or as a surface application at planting

Table 6. Approved nematicides for sweetpotato.

Product	When to apply	Application pattern	Incorporation depth	Rate
Mocap 10G	2 to 3 weeks preplant	Row, 12 to 15 inch band	4 to 8 inches with rotary hoe, tiller, etc., or by bedding over the band	30 to 40 lbs/A or 2.4 to 3.2 lbs/1000 ft of row (min. row spacing 42 ins)
Mocap 10 G	2 to 3 weeks preplant	Broadcast	4 to 8 inches deep	60 to 80 lbs/A
Mocap EC	2 to 3 weeks preplant	Broadcast	4 to 8 inches deep	1 to 1.33 gals/A
Vydate L ¹	Within 1 week before or at planting	Broadcast or in furrow. Transplant drench	4 to 8 inches deep	2 to 3 gals/A broadcast or 1 to 2 gals/A in furrow

¹ Vydate L has registration for nematode control on potatoes only as a broadcast or in-furrow treatment. Foliar applications are registered for insect control only. For broadcast or in-furrow treatments, Vydate L should be applied in a minimum of 20 gallons of water. As a broadcast treatment thoroughly incorporate to a soil depth of 4 to 6 inches.

Table 7. Selected insecticides approved for use on insects attacking sweet potatoes.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Actara (thiamethoxam)	1.5-3.0 oz	12	14	aphids, flea beetles, potato leafhopper	4A	Toxic to bees. Do not use after Platinum.
Admire Pro (imidacloprid)	4.4-10.5 fl oz	12	125	aphids, flea beetles, leafhoppers, whiteflies	4A	One application per season.
Agri-Mek 0.15EC* (abamectin)	8-16 fl oz	12	14	<i>Liriomyza</i> leafminers, spider mites	6	See label for maximum amount per season.
Assail 70WP Assail 30SG (acetamiprid)	0.6-1.7 oz 1.5-4.0 oz	12	7	aphids, cucumber beetles, flea beetles, leafhoppers, whiteflies	4A	Whiteflies not on label for sweet potatoes but are for other crops on label. No more than 4 applications per season.
Avaunt (indoxacarb)	2.5-6.0 oz	12	7	cabbage looper	22	Do not apply more than 24 oz/acre per crop.
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	un	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	un	Antifeedant, repellent, insect growth regulator.
*Baythroid XL (beta-cyfluthrin)	0.8-2.8 fl oz	12	0	cutworms, cabbage looper, flea beetles, potato leafhopper, sweetpotato weevil adults	3	No more than 16.8 oz/acre per season.
Biobit HP (<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i>)	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed ² .
BotaniGard 22 WP, ES (<i>Beauveria bassiana</i>)	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 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
*Brigade 2 EC (bifenthrin)	9.6-19.2 oz at-plant (soil); 3.2-9.6 oz at lay-by (soil); 2.1-6.4 oz (foliar)	12	21	cucumber beetles, flea beetles, sweetpotato weevil adults (foliar), whitefringed beetle adults, white grub adults, white grubs (lay- by), wireworm adults, wire- worms (at-plant and lay-by)	3	No more than 2 foliar applica- tions, at least 21 days apart. Do not apply more than 0.5 lb active ingredient per acre per season, including soil applica- tions.
*Capture LFR	See label for rates for LFR.					
Coragen (rynaxypyr)	3.5-5.0 fl oz	4	14	beet armyworm	28	Foliar only. No more than 4 applications per crop. Do not make more than 2 successive applications in a 30-day peri- od. Do not apply more than 15.4 fl oz per acre per crop.
Crymax WDG <i>(Bacillus thuringiensis</i> <i>subspecies kurstaki)</i>	0.5-2.0 lb	4	0	caterpillars	11	Use high rate for armyworms. Treat when larvae are young.
Deliver <i>(Bacillus thuringiensis</i> <i>subspecies kurstaki)</i>	0.25-1.5 lb	4	0	caterpillars	11	Use higher rates for army- worms. OMRI-listed ² .
Diatect V; Diatect Multipurpose Insecticide II (dia- tomaceous earth + pyrethrins + piperonyl butoxide)	1-6 lb	12	0	aphids, armyworms, cab- bage looper	3, --	Diatect V is OMRI-listed ² (no piperonyl butoxide)
DiPel DF <i>(Bacillus thuringiensis</i> <i>subspecies kurstaki)</i>	0.5-2.0 lb	4	0	caterpillars	11	Treat when larvae are young. Good coverage is essential.
Entrust (spinosad)	1-3 oz	4	7	armyworms, leafminers, <i>Liriomyza</i> , loopers, thrips	5	Do not make applications less than 7 days apart or apply more than 4 times per crop. Do not apply more than 6.5 oz/acre per crop.
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)	2.75-5.5 oz	12	14	buckthorn aphid, green peach aphid, melon aphid, potato aphid	9B	Allow a minimum of 7 days between applications. Do not exceed 11 oz/acre/season.
Imidan 70 W (phosmet)	1.3 lb	4 days for seedbed treat- ment, 5 days for foliar	7	banded cucumber beetle, sweetpotato weevil, white- fringed beetle, suppression of white grub and wire- worm	1B	No more than 5 applications per season. Do not apply through irrigation system. Crop must be mechanically harvested.
Javelin WG <i>(Bacillus thuringiensis</i> <i>subspecies kurstaki)</i>	0.12-1.5 lb	4	0	most caterpillars, but not <i>Spodoptera</i> species (army- worms)	11	Treat when larvae are young. Thorough coverage is essen- tial. OMRI-listed ² .

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Lorsban 15G, 75WG, *Advanced (chlorpyrifos)	See labels for rates	24	preplant broad- cast treat- ment, 125 days before harvest	flea beetles, sweet potato flea beetle, wireworms (<i>Conoderus</i>)	1B	See label. Must be incorpo- rated into soil.
Malathion 8 F (mala- thion)	1-1.75 pt	12	3	leafhoppers, morning glory leafminer	1B	
*Mocap 15 G, *EC (ethoprop)	See labels	48	preplant see label	cucumber beetles, flea beetles, white grubs, wire- worms	1B	Two to three weeks before planting.
Movento (spirotetramat)	4.0-5.0 fl oz	24	7	aphids, psyllids, whiteflies	23	Maximum of 10 fl oz/acre per season.
M-Pede 49% EC Soap, insecticidal	1-2 % V/V	12	0	aphids	–	OMRI-listed ² .
*Mustang (zeta-cypermethrin)	1.4-4.3 oz	12	1	cabbage looper, cucumber beetles, cutworms, flea beetles, grasshoppers, leafhoppers, tarnished plant bug, vegetable weevil, whitefringed beetle (adult), yellowstriped armyworm; aids in control of aphids and beet armyworm	3	A maximum of 0.3 lb ai/acre per season may be applied. Leaves cannot be used for food or feed.
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, beetles, caterpillars, grasshoppers, leafhoppers, leafminers, thrips, weevils, whiteflies	un	Does not kill adult insects. IGR and feeding repellent. OMRI-listed ² .
Oberon 2SC (spiromesifen)	8-16 fl oz	12	7	twospotted spider mite, whiteflies	23	Maximum amount per crop: 32 oz/acre. No more than 2 applications.
Oil, insecticidal	1-2 gal/100 gal	12	Up to day of harvest	leafminers, mites, whiteflies	--	
Platinum	5-8 fl oz	12	Applied at plant- ing	aphids, Colorado potato beetles, flea beetles, potato leafhoppers	4A	For most crops that are not on the label, a 120-day plant-back interval must be observed. To manage resistance, avoid using Actara or Provado in conjunction with Platinum.
Platinum 75SG (thiamethoxam)	1.66-2.67 oz					
Provado 1.6F (imidacloprid)	3.5 oz	12	7	aphids, flea beetles, leaf- hoppers, whiteflies	4A	Limited to 3 applications.
Pyrellin EC (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, cabbage looper, leafhoppers, mites, plant bugs, thrips	3, 21	
Radiant (spinetoram)	6-8 fl oz	4	7	armyworm, Colorado potato beetle, dipterous leafminer, loopers, thrips	5	Do not make more than 4 applications per year.

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
Rimon 0.83 EC (novaluron)	6-12 fl oz	12	14	armyworms, loopers, other foliage feeding caterpillars, sweet potato leafminer, whiteflies	15	Do not apply more than 24 oz per acre per season. Limited to two applications for whiteflies.
Sevin 80S; XLR; 4F (carbaryl)	80S: 1.25-2.5 lb XLR, 4F: 1-2 qt	12	7	corn earworm, cucumber beetles, flea beetles, sweetpotato hornworm, sweetpotato weevil (preplant dip), tortoise beetle, whitefringed beetle, yellowstriped armyworm	1A	Do not apply more than 10 lb (80S) per acre per crop or 8 qt (4F, XLR). See label for preplant dip treatment.
SpinTor 2 SC (spinosad)	3.2-9.6 fl oz	4	7	armyworms, leafminers (<i>Liriomyza</i> spp.), loopers, thrips	5	Do not apply more than a total of 21 fl oz per acre per crop.
*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)						
Trilogy (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	un	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed ² .
Voliam Flexi (thiamethoxam and chlorantraniliprole)	4.0 oz	12	14	aphids, beet armyworm, cabbage looper, flea beetles, potato leafhopper	4A, 28	Do not exceed a total of 8 oz of product per acre per season.
Voliam Xpress* (lambda-cyhalothrin, chlorantraniliprole)	5-9 oz	24	14	aphids, armyworms, crickets, cutworms, flea beetle adults, grasshoppers, leafhoppers, loopers, saltmarsh caterpillar, stink bugs, sweet potato vine borer, webworms, others	3, 28	Do not apply more than 27.0 fl. oz of product per acre per season.
Xentari DF (<i>Bacillus thuringiensis</i> subspecies <i>aizawai</i>)	0.5-2.0 lb	4	0	caterpillars	11	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.

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code ¹	Notes
¹ Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v. 6.1 August 2008.						
1A. Acetyl cholinesterase inhibitors, Carbamates (nerve action)						
1B. Acetyl cholinesterase inhibitors, Organophosphates (nerve action)						
2A. GABA-gated chloride channel antagonists (nerve action)						
3. Sodium channel modulators (nerve action)						
4A. Nicotinic acetylcholine receptor agonists (nerve action)						
5. Nicotinic acetylcholine receptor allosteric activators (nerve action)						
6. Chloride channel activators (nerve and muscle action)						
7A. Juvenile hormone mimics (growth regulation)						
7C. Juvenile hormone mimics (growth regulation)						
9B and 9C. Selective homopteran feeding blockers						
10. Mite growth inhibitors (growth regulation)						
11. Microbial disruptors of insect midgut membranes						
12B. Inhibitors of mitochondrial ATP synthase (energy metabolism)						
15. Inhibitors of chitin biosynthesis, type 0, lepidopteran (growth regulation)						
16. Inhibitors of chitin biosynthesis, type 1, homopteran (growth regulation)						
17. Molting disruptor, dipteran (growth regulation)						
18. Ecdysone receptor agonists (growth regulation)						
22. Voltage-dependent sodium channel blockers (nerve action)						
23. Inhibitors of acetyl Co-A carboxylase (lipid synthesis, growth regulation)						
28. Ryanodine receptor modulators (nerve and muscle action)						
un. Compounds of unknown or uncertain mode of action						
² OMRI-listed: Listed by the Organic Materials Review Institute for use in organic production.						
* Restricted Use Only.						