UF UNIVERSITY of FLORIDA
IFAS Extension

Chapter 40.
Sweetpotato Production in Florida

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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
Georgia Red
Hernandez
Jewel
Picadito (Boniato)
Red Jewel
Vardaman

PLANTING AND SEEDING

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

FERTILIZER AND LIME

Broadcast all P_2O_5, micronutrients, and 25 to 50% of N and K_2O before planting. Better fertilizer efficiency might result by banding P_2O_5 and micronutrients when beds are made. Sidedress remaining N and K_2O 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 8, *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 8, *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

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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_2O_5[2] VL	L	M	H	VH	K_2O VL	L	M	H	VH
		(lb/A/crop season)									
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 P_2O_5, 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: sweet potato, yam.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Carfentrazone (Aim)	Sweet Potato	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 burn-down 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)	Sweet Potatoes, Yams (other tuberous and corm vegetables)	Postemergence	0.1-0.25	0.1-0.25
Remarks: Control of emerged grasses. Always use a crop oil concentrate at 1% v/v in the finished spray volume unless tank mix instructions indicate otherwise. Do not apply within 30 days of harvest. Use 6 oz. to 16 oz. product to control actively growing grasses at recommended heights. For control of annual grasses, use 6 to 16 fl. oz/A, for perennial grasses, use 8 to 16 fl oz/A.				
Clomozone (Command 3 ME)	Sweet Potato	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)	Sweet Potato	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.				
Fluazifop (Fusilade)	Sweet Potato, 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)	Sweet Potato	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)	Sweet Potato	Postransplanting	1-2	---
Remarks: Apply to soil surface immediately after transplanting. Will not control emerged weeds.				

Table 4. Continued.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre) Mineral	Muck
Pelarganic Acid (Scythe)	Root and tuber vegetables, sweet potato, 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)	Sweet Potato	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. 40-1, 40-2). 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. 40-3). 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

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.

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.

Varietal Resistance

Sweetpotato varieties vary in their susceptibility to the southern root-knot nematode. 'Centennial' is very susceptible, 'Red Jewel' is susceptible, 'Georgia Red' is moderately resistant, and 'Jewel' is reported to be resistant. The resistance reported for most varieties is not sufficient to enable the grower to ignore the other steps in nematode management. “Resistance” usually provides only partial protection against the species to which the variety is “resistant” and none at all against other kinds of nematodes.

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 sweet potato.

Chemical (a.i.)	Fungicide Group	Maximum Rate/Acre/ Application	Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks
Mertect 340 F (thiabendazole)	1	8 fl ozs/ 7.5 gal water			Black rot & scurf	Dip seed roots for 1-2 min
Ridomil Gold 4 EC (mefenoxam)	4	2 pts/trtd. acre			Pythium diseases	Apply in water or liquid fertilizer & incorporate into top 2 inches of soil
Botran 75 W (dichloran)	14	1 lb/7 ½ gal. of water for seed dip			Scurf	Dip for 10-15 seconds
		3 3/4 lb./15 gal. of water per 1000 sq. ft. of plant bed			Sclerotium rolfsii	Spray potatoes in bed prior to covering them with soil
		1 lb./100 gal. of water for post harvest use or dip roots for post- harvest use			Rhizopus spp.	See label for information on making new suspensions
Quadris 2.08 FL (azoxystrobin)	11	15.4 fl ozs	3.75 qts	14	Various see label	Limit is 4 appl./crop & alternate chemistry
Amistar 80 DF (azoxystrobin)		5 ozs	2.5 lbs			
Headline 2.09F (pyraclostrobin)	11	12 fl ozs	72 fl oz s	3	Various see label	6 appl. maximum. Alternate with another type of fungicide whenever using strobilurins
Armicarb (potassium bicarbonate)	33	5 lb		0	Alternaria Botrytis Septoria	
Milstop (potassium bicarbonate)	33	5 lb		0	Alternaria Botrytis	
Serenade Max (biofungicide) (QST 713 strain of Bacillus subtilis)		3 lb	Repeat at 7-10 day interval as needed	0	Botrytis	

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 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, potato leafhopper	4A	Toxic to bees. Do not use after Platinum.
Admire 2F (imidacloprid)	10-24 fl oz	12	125	aphids, leafhoppers, whiteflies	4A	One application per season.
Admire Pro	4.4-10.5 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].
Assail 70WP (acetamiprid)	0.6-1.7 oz	12	7	aphids, leafhoppers, flea beetles, whiteflies	4A	Whiteflies not on label for sweet potatoes but are for other crops on label! No more than 4 applications per season.
Assail 30SG	1.5-4.0 oz					
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	cutworms, cabbage looper, potato leafhopper	3	No more than 6 applications.
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 qts/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.
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.
Deliver (Bacillus thuringiensis subspecies kurstaki)	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed[2].
Diatect V; Diatect Multipurpose Insecticide II (diatomaceous earth + pyrethrins + piperonyl butoxide)	1-6 lb	12	0	aphids, armyworms, cabbage looper	3, --	Diatect V is OMRI-listed[2] (no piperonyl butoxide)
DiPel DF (Bacillus thuringiensis subspecies kurstaki)	0.5-2.0 lb	4	0	caterpillars	11B2	Treat when larvae are young. Good coverage is essential.
Endosulfan 3 EC (endosulfan)	0.66-1.33 qt	24	1	sweetpotato flea beetle, sweetpotato weevil, whiteflies	2	Do not make more than 3 applications per year or exceed 3.0 lb active ingredient per acre per year.

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Entrust (spinosad)	1-3 oz	4	7	armyworms, leafminers, Liriomyza, loopers, thrips	5	Do not make applications less than 7 days apart or apply more than 4 times per crop.
Extinguish ((S)-methoprene)	1.0-1.5 lb	4	0	fireants	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	14	buckthorn aphid, green peach aphid, melon aphid, potato aphid	9B	Allow a minimum of 7 days between applications.
Imidan 70W (phosmet)	1.3 lb	24	7	banded cucumber beetle, sweetpotato weevil, white-fringed beetle, suppression of white grub and wireworm	1B	No more than 5 applications per season. Do not apply through irrigation system. SLN# FL-200005
Intrepid 2F (methoxyfenozide)	4-8 fl oz	4	1	armyworms, cabbage looper, garden webworm	18	Early season applications only to young crops and small plants.
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].
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.
Lorsban 15G, 75WG (chlorpyrifos)	See labels for rates	48	preplant broadcast treatment, 125 days before harvest	flea beetles, sweet potato flea beetle, wireworms (Conoderus)	1B	See label.
Malathion 8 F (malathion)	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, wireworms	1B	
M-Pede 49% EC Soap, insecticidal	1-2 % V/V	12	0	aphids	–	OMRI-listed[2].
Neemix 4.5 (azadirachtin)	4-16 fl oz	12	0	aphids, beetles, caterpillars, grasshoppers, leafhoppers, leafminers, thrips, weevils, whiteflies	26	Does not kill adult insects. IGR and feeding repellant. 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	--	

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code[1]	Notes
Platinum (thiamethoxam)	5-8 fl oz	12	Applied at planting	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.
Provado 1.6F (imidacloprid)	3.5 oz	12	7	aphids, flea beetles, leafhoppers, 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	
Rimon 0.83 EC (novaluron)	9-12 fl oz	12	14	armyworms, loopers, other foliage feeding caterpillars, whiteflies	15	Do not apply more than 24 oz per acre per season. Limited to two applications.
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, sweepotato weevil (preplant dip), tortoise beetle, whitefringed beetle, yellowstriped armyworm	1A	Do not apply more than 10 lb per acre per crop or 8 qt. See label for preplant dip treatment.
SpinTor 2 SC (spinosad)	3-6 fl oz	4	7	armyworms, leafminers (Liriomyza 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	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed[2].
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.

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.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 Only.