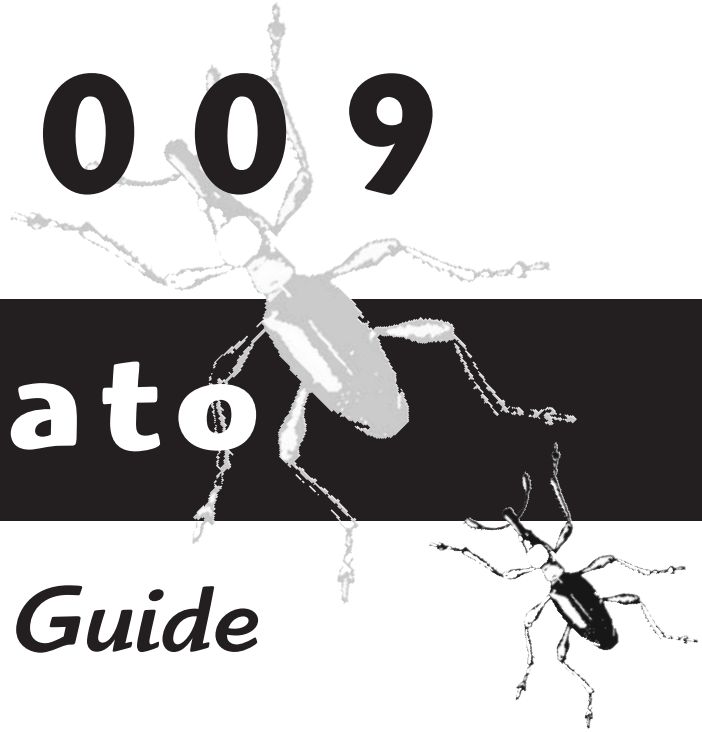
2009

Sweet Potato

Insect Control Guide



General Comments and Guidelines

Objective

To minimize the impact of pests and pest control costs:
a. scout fields regularly and **count** insect pests carefully.
b. use all available, practical, non-insecticidal IPM tools.
c. apply insecticides promptly when needed.
d. use the most cost-efficient insecticide recommended for the target pest, and target applications against the most susceptible stage of development.
e. follow recommended guidelines for practicing insecticide-resistance management.

Before deciding to treat and before choosing the insecticide, consider the potential to intensify secondary pest problems and insecticide resistance.

Warning

Information in this guide is provided for educational and planning purposes only. When using agricultural chemicals, you, the user, are responsible for making sure your use complies with current regulations and the product label. Before applying any insecticide, get current information about usage. Read and follow the product label.

Precautions

Before using a pesticide, read the label carefully. Follow the directions and heed all precautions on the pesticide container label. Observe all regulations on worker protection and pesticide record keeping. Store pesticides in original containers, safely away from livestock, pets, and children. Store pesticides in an area where they will not contaminate food or feed.

Integrated Pest Management

Successful, economical control of insect pests requires a variety of control methods rather than a single method of control, such as scheduled insecticide applications. Integrated pest management (IPM) is the term used to refer to this multifaceted approach to insect control. Current insect control recommendations are based on the IPM concept.

Insecticides are a key part of sweet potato IPM, but insecticides cannot provide sustained economical insect control in Mississippi.

The objective of sweet potato IPM is to use all available, practical, nonchemical methods of suppressing insect populations; to monitor pest populations closely; and when scouting indicates that pest populations have exceeded economic thresholds, to use insecticides in a way that optimizes crop production and minimizes ecosystem disruption.

Management tactics applied against one pest may affect other pests in the system. An overall IPM program must consider these types of long-term effects, which greatly influence the ability of Mississippi growers to maintain economical production.

There are many components of IPM that must be used to manage insect pests effectively. These include managing for early crop maturity, using various cultural practices, managing for insecticide resistance, using economic thresholds, scouting thoroughly, and timing insecticide applications well when needed.

Scouting

Proper scouting is the backbone of an effective insect management program. The goal of any scouting program should be to minimize insecticide use and insect control costs by avoiding unnecessary treatments and timing required treatments properly. Effective scouting requires spending enough time in the field and taking enough samples to decide whether or not treatment is required. Frequent scouting is critical. During most of the growing season, scout fields thoroughly every 3 to 4 days. Allow enough time in the scouting schedule for "spot checks" on a more frequent basis when necessary.

Sampling Equipment

BugVac: A shredder, vacuum, or leaf blower can be used as a bugvac. Find a plastic cup with a bottom diameter of 4.75 inches, and replace its bottom with a 100-mesh nylon screen. Insert the cup into the end of the vacuum tube. Vacuum plants by moving the suction opening back and forth within the plant canopy as you walk along briskly. Count the insects every 25 feet of row, but remember that thresholds are expressed as numbers of insects per 100 feet of row.

Sweep net: A standard 15-inch diameter sweep net of heavy construction is recommended. Sweep nets are available from commercial sources. Count the insects every 25 sweeps, but remember that thresholds are listed as numbers of insects per 100 sweeps.

Thresholds

To reduce insect management costs, base insect management decisions on established treatment thresholds instead of treating on a schedule. Effective use of thresholds requires frequent, intensive scouting to get accurate estimates of pest populations.

The term "treatment threshold" means the pest population level at which treatment must be applied to avoid economic loss that would be greater than the cost of the treatment. Thresholds vary depending on pest species, stage of crop development, yield potential of crop, cost of the treatment, price of crop, populations of other pests present, number of beneficial insects, potential for flaring secondary pests, ability to control secondary pests, and a variety of other factors. While the thresholds recommended in this guide take into account pest species and stage of crop development, fixed thresholds cannot fully consider the many other factors that can influence a treatment decision. The thresholds recommended in this guide are generally somewhat quick to treat,

but factors such as multiple pest species could indicate a need to reduce thresholds. On the other hand, factors such as high beneficial insect populations, risk of flaring difficult-to-control secondary pests, high treatment costs, or low price potential could indicate a need to use higher thresholds.

General Practices

Till or apply herbicide to destroy vegetation at least 4 weeks before planting.

Pre-plant insecticides will not give control for the entire growing season but may provide significant protection from some soil insects during much of the season. Apply pre-plant insecticides as close to the time of planting as the pre-harvest interval (PHI) will allow.

Make lay-by applications before canopy closure, preferably at last cultivation. Rotating foliar products helps manage insecticide resistance.

Adequate coverage can be difficult but is essential with most products. Best results from contact insecticides will be with application volumes of **5 to 10 gallons per acre using hollow cone nozzles**. Do not apply insecticides with herbicide nozzles, low-drift nozzles, or other nozzles that produce large droplets.

Sweet potato fields near pastures or hay fields appear to be more at risk for sugarcane beetle infestations. Planting more productive fields (fields with higher yield potential) first and harvesting them as soon as possible may allow these fields to be harvested before sugarcane beetle infestations get severe.

Biological Control

Mississippi producers are lucky to have many types of naturally occurring biological control agents that help manage pest populations. These agents include predators such as big-eyed bugs, lady beetles, spiders, minute pirate bugs, and parasites. These biological control agents are the main way to control insect pests in Mississippi. It's easy to underestimate the full economic value of biological control agents, but they make profitable production in Mississippi possible. If natural control is maintained, severe outbreaks causing high levels of crop loss or control costs are rare. To maximize the benefit of these natural control agents, you need to know how to identify beneficial insects, which pests they attack, what factors enhance their usefulness, when they are most useful, and when they may not provide effective control.

Predators and parasites can prevent a pest population from reaching treatable levels, and the control they provide is often cheaper, better, and longer lasting than that provided by insecticides. Scouts and producers should be aware of population levels of naturally occurring predators and parasites and recognize that treatment thresholds can often be increased when predator population levels are high. Certain cultural practices may favor populations of specific predators; for example, reduced tillage favors fire ants. When insecticide treatment is necessary, often treatments are available that can control the target pest but have little impact on beneficial insects.

Insecticide Resistance and Resistance Management

"Insecticide resistance" can be defined as increased tolerance to a particular insecticide by a pest population to the point the insecticide no longer provides effective control.

Resistance develops when a pest population is repeatedly or continually exposed to the same insecticide or class of insecticides. After an insecticide application, the death rate of susceptible insects is much greater than the death rate of resistant insects. Those resistant insects survive to pass on their resistance genes, so the next generation has more resistant insects in it than the last one had. If you keep using the same insecticide or class of insecticides, the level of resistance increases even more. At first the number of resistant insects may be really low—say, 1 individual in every 10,000 or more—and the insecticide is effective. But if the insecticide or class of insecticides is applied repeatedly, the percentage of resistant insects increases enough to decrease efficacy and cause field control failures.

High Cost of Resistance: Resistance is costly to producers because it demands higher insecticide rates, shorter treatment intervals, more expensive mixtures of insecticides, or more expensive alternative insecticides to maintain effective control. Reduced control means more yield losses, which can further reduce profits. In the absence of effective treatment alternatives, outbreaks of resistant pests can result in disastrous levels of crop destruction.

Resistance Management: "Insecticide resistance management" can be defined as a plan of insecticide use that limits exposure of a pest population to a particular class of insecticide chemistry to extend the useful life of that insecticide or class of insecticides. Note that the goal of resistance management is not to prevent resistance from ever occurring, but to slow the development of resistance.

To be most effective, resistance management must be started before resistance is evident (while the frequency of resistance genes is very low) and not after resistance is evident in the field (when frequency of resistance is high). Because many insects can easily move from farm to farm, resistance management efforts work best when all producers in a large geographic area practice them.

With foliar insecticides, selection for resistance may occur whenever an insecticide is used because the pests that survive exposure to the treatment are likely to be resistant. The proportion of the pest population that carries genes for resistance to a particular insecticide is higher after that insecticide has been applied. With foliar insecticides, resistance can be delayed by not exposing successive generations of pests to insecticides from the same class. Rotating different classes of insecticides against different generations of pests is an effective resistance management tool because insects resistant to one class of chemistry are often susceptible to insecticides from a different class. In the short term, rotation gives improved control; in the long term, it reduces selection for resistance.

Responding to Control Failures

Key considerations and responses following suspected insecticide failures:

- Don't panic! Do not assume that the presence of live insects following an insecticide application is the result of an insecticide failure.
- Examine the possible reasons that unsatisfactory control may have occurred. Control decisions should consider many variables that influence insecticide efficacy and damage potential: species complex, insect population density and age, application timing, insecticide dosage rate, application method and carrier, timing of treatment evaluation, need for multiple applications, environmental conditions, and levels of insecticide resistance.
- **Under continuous pressure, multiple insecticide applications are necessary to reduce crop damage. Against high, sustained infestations, recommended, economical treatments applied several times at 3- to 5-day intervals are often more effective than are expensive mixtures applied at high rates and longer intervals.**
- If you suspect an insecticide failed because of insecticide resistance, do not reapply the same insecticide at any rate. Switch to another class of insecticides, or use a mixture of insecticides from different classes.

Caution: Recommendations of specific insecticides are based on information on the manufacturer's label and performance in a limited number of efficacy trials. Because levels of insecticide resistance, environmental conditions, and methods of application may vary widely, insecticide performance will not always conform to the safety and pest-control standards indicated by experimental data.

Insecticides are not listed in order of their effectiveness. Effectiveness of a particular insecticide can vary greatly from field to field, depending on previous insecticide use, pest species, levels of resistance, and many other factors. Insecticides within a group recommended for a specific pest often vary in cost, effectiveness against the primary target pest, and secondary pests controlled. When selecting insecticides, consider each of these factors and the need to rotate among different insecticide classes for resistance management purposes.

Classes of insecticides: Effective resistance management requires rotation among the various classes of available insecticide chemistry. Often when one insecticide in a class fails because of insecticide resistance, other insecticides in the same class will also be ineffective, and selection of an insecticide from a different class will improve the chances of obtaining control. **Be very aware of the type of insecticide chemistry being used.** Classes of insecticides recommended in this guide are identified by the following abbreviations:

Carbamate – (C)	Pyrethroid – (P)	Oxadiazine – (OX)	Biologicals – (B)	Spinosyns – (SPN)	Organophosphate – (OP)
Neonicotinoids – (N)	Avermectins – (AV)	Tetronic Acid – (TA)	Organochlorine – (OC)	Pyridine Carboxamide – (PC)	Insect Growth Regulators – (IGR)

Sweet Potato Weevils – Plant Beds and Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Imidan 70WP (phosmet-OP)	21.33 oz	0.93	0.75	7	Sweet potato weevil is a serious insect pest, but it rarely infests commercial fields in North Mississippi. The Bureau of Plant Industry has a monitoring program to detect sweet potato weevils and a quarantine program to prevent this pest from infesting most of the Mississippi sweet potato production areas.
Penncap-M 2F (methyl parathion-OP)	32 oz	0.5	4	5	
Endosulfan 3EC	21.33 oz	0.5	6	1	Female weevils lay eggs in stems near the soil line, so cut slips at least 2 inches above the soil to help prevent spreading weevils. If you purchase slips, insist on weevil-free slips.
Thionex 3EC	21.33 oz	0.5	6	1	
Thionex 50W (endosulfan-OC)	16 oz	0.5	1	1	
Carbaryl 4L	47.9 oz	1.5	2.67	7	Many sweet potato pests are attracted to beds, so destroy plant beds as soon as they are no longer needed.
Carbaryl 80S	30.1 oz	1.5	0.53	7	Locate plant beds away from sweet potato storage and last season's production areas. Beds are susceptible to sweet potato weevil infestations. Presence of weevils in the sweet potato crop warrants regulatory action. If one or more weevils are captured in pheromone traps (one trap per 10 acres), the Bureau of Plant Industry will notify you of required treatments. The goal is to monitor all sweet potato operations and take action early to eliminate any weevil infestation.
Sevin 4F	47.9 oz	1.5	2.67	7	
Sevin 80 Solupak	30.1 oz	1.5	0.53	7	
Sevin 80S	30.1 oz	1.5	0.53	7	
Sevin 80WSP	30.1 oz	1.5	0.53	7	
Sevin XLR Plus 4SC (carbaryl-C)	47.9 oz	1.5	2.67	7	

Aphids – Plant Beds

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:					**Plant Beds:**
Alias 2F	16 oz	0.25	8	125	Aphids can transmit several viral diseases. Control of aphids infesting plant beds may reduce transfer of diseased plants to the field.
Admire 2F	16 oz	0.25	8	125	
Admire Pro 4.6SC	7.0 oz	0.25	18.3	125	
Advise 2FL	16 oz	0.25	8	125	
Couraze 2F	16 oz	0.25	8	125	
Imida E-AG 2F	16 oz	0.25	8	125	
Macho 2.0FL	16 oz	0.25	8	125	
Nuprid 2F	16 oz	0.25	8	125	
Torrent 2F	16 oz	0.25	8	125	
Widow 2F (imidacloprid-N)	16 oz	0.25	8	125	
Plantinum 2SC (thiamethoxam-N)	5-8 oz	0.078-0.125	25.6-16		
Foliar Application:					
Couraze 1.6F	3.5 oz	0.044	36.4	7	After removing plastic, begin treatments if 2 to 5 aphids per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present.
Impulse 1.6F	3.5 oz	0.044	36.4	7	

Aphids – Plant Beds *(continued)*

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Foliar Application:					
Nuprid 1.6F	3.5 oz	0.044	36.4	7	
Pasada 1.6F	3.5 oz	0.044	36.4	7	
Provado 1.6F	3.5 oz	0.044	36.4	7	
Torrent 1.6F (imidacloprid-N)	3.5 oz	0.044	36.4	7	
Actara 25WG (thiamethoxam-N)	3 oz	0.047	5.33	14	
Fulfill 50W (pymetrozine)	2.75 oz	0.086	5.8	14	

Flea Beetles – Plant Beds

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:					
Alias 2F	16 oz	0.25	8	125	
Admire 2F	16 oz	0.25	8	125	
Admire Pro 4.6SC	7.0 oz	0.25	18.3	125	
Advise 2FL	16 oz	0.25	8	125	
Couraze 2F	16 oz	0.25	8	125	
Imida E-AG 2F	16 oz	0.25	8	125	
Macho 2.0FL	16 oz	0.25	8	125	
Nuprid 2F	16 oz	0.25	8	125	
Torrent 2F	16 oz	0.25	8	125	
Widow 2F (imidacloprid-N)	16 oz	0.25	8	125	
Plantinum 2SC (thiamethoxam-N)	5-8 oz	0.078-0.125	25.6-16		
Foliar Application:					**Plant Beds:** Treat when 10 or more beetles per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present.
Couraze 1.6F	3.5 oz	0.044	36.4	7	
Impulse 1.6F	3.5 oz	0.044	36.4	7	

Flea Beetles – Plant Beds *(continued)*					
Insecticide	**Amount of Formulation Per Acre**	**Pounds Active Ingredient Per Acre**	**Acres 1 Gallon or 1 Pound Dry Will Treat**	**PHI (Days)**	**Threshold and Comments**
Foliar Application:					
Nuprid 1.6F	3.5 oz	0.044	36.4	7	
Pasada 1.6F	3.5 oz	0.044	36.4	7	
Provado 1.6F	3.5 oz	0.044	36.4	7	
Torrent 1.6F (imidacloprid-N)	3.5 oz	0.044	36.4	7	
Endosulfan 3EC	21.33 oz	0.5	6	1	
Thionex 3EC	21.33 oz	0.5	6	1	
Thionex 50W (endosulfan-OC)	16 oz	0.5	1	1	
Carbaryl 4L	47.9 oz	1.5	2.67	7	
Carbaryl 80S	30.1 oz	1.5	0.53	7	
Sevin 4F	47.9 oz	1.5	2.67	7	
Sevin 80 Solupak	30.1 oz	1.5	0.53	7	
Sevin 80S	30.1 oz	1.5	0.53	7	
Sevin 80WSP	30.1 oz	1.5	0.53	7	
Sevin XLR Plus 4SC (carbaryl-C)	47.9 oz	1.5	2.67	7	

Flea Beetles - Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:					**Field:** Apply pre-plant. Disk and hip to incorporate. A 4- to 6-inch incorporation is best. Some products are labeled for broadcast and band applications; some are only labeled for broadcast applications. Refer to individual product labels. Most of the first-generation flea beetle larvae are controlled by pre-plant incorporated materials.
Chlorpyrifos 15G	13.3 lb	2.0	-	125	
Lorsban 15G	13.3 lb	2.0	-	125	
Nufos 15G	13.3 lb	2.0	-	125	
Lorsban 75WG	2.67 lb	2.0	-	125	
Chlorpyrifos 4E	64 oz	2.0	2	125	
Govern 4E	64 oz	2.0	2	125	
Lorsban 4E	64 oz	2.0	2	60	
Nufos 4E	64 oz	2.0	2	125	
Warhawk 4E	64 oz	2.0	2	125	
Yuma 4E (chlorpyrifos-OP)	64 oz	2.0	2	125	
Alias 2F	16 oz	0.25	8	125	
Admire 2F	16 oz	0.25	8	125	
Admire Pro 4.6SC	7.0 oz	0.25	18.3	125	
Advise 2FL	16 oz	0.25	8	125	
Couraze 2F	16 oz	0.25	8	125	
Imida E-AG 2F	16 oz	0.25	8	125	

Flea Beetles - Fields *(continued)*

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:					
Macho 2.0FL	16 oz	0.25	8	125	
Nuprid 2F	16 oz	0.25	8	125	
Torrent 2F	16 oz	0.25	8	125	
Widow 2F (imidacloprid-N)	16 oz	0.25	8	125	
Plantinum 2SC (thiamethoxam-N)	5-8 oz	0.078-0.125	25.6-16		
Foliar Application:					
Brigade 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	Immediately after planting, sweet potato slips are very susceptible to injury from flea beetle adults. Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when 2 or more beetles per 100 feet of bed (bug-vac) or per 100 sweeps (sweep net) are present.
Sniper 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Bifenture EC (bifenthrin-P)	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Battalion 0.2EC	7.7-17.9 oz	0.012-0.028	16.6-7.2	3	
Delta Gold 1.5EC (deltamethrin-P)	1.02-1.8 oz	0.012-0.028	125-71.4	3	

Flea Beetles – Fields *(continued)*					
Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Foliar Application:					
Carbaryl 4L	47.9 oz	1.5	2.67	7	
Carbaryl 80S	30.1 oz	1.5	0.53	7	
Sevin 4F	47.9 oz	1.5	2.67	7	
Sevin 80 Solupak	30.1 oz	1.5	0.53	7	
Sevin 80S	30.1 oz	1.5	0.53	7	
Sevin 80WSP	30.1 oz	1.5	0.53	7	
Sevin XLR Plus 4SC (carbaryl-C)	47.9 oz	1.5	2.67	7	
Sweet Potato Flea Beetles – Fields					
Brigade 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	Immediately after planting, sweet potato slips are very susceptible to injury from flea beetle adults. Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when 10 or more beetles per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present.
Sniper 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Bifenture EC (bifenthrin-P)	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Endosulfan 3EC	21.33	0.5	6	1	
Thionex 3EC	21.33	0.5	6	1	
Thionex 50W (endosulfan-OC)	16 oz	0.5	1	1	

Whiteflies – Plant Beds

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:	16 oz	2.0	8	125	**Plant Beds:**
Alias 2F	16 oz	2.0	8	125	Whiteflies can transmit several viral diseases. Control of whiteflies infesting plant beds may reduce transfer of diseased plants to the field.
Admire 2F	7.0 oz	2.0	18.3	125	
Admire Pro 4.6SC	16 oz	2.0	8	125	
Advise 2FL	16 oz	2.0	8	125	
Couraze 2F	16 oz	2.0	8	125	
Imida E-AG 2F	16 oz	2.0	8	125	
Macho 2.0FL	16 oz	2.0	8	125	
Nuprid 2F	16 oz	2.0	8	125	
Torrent 2F	16 oz	2.0	8	125	
Widow 2F (imidacloprid-N)					
Foliar Application:					Treat when colonies are present. Two species of whiteflies infest sweet potatoes. The sweet potato whitefly is more difficult to control than is the banded-winged whitefly.
Endosulfan 3EC	42.7 oz	1.0	3	1	
Thionex 3EC	42.7 oz	1.0	3	1	
Thionex 50W (endosulfan-OC)	1 lb	1.0	1	1	

Whiteflies – Plant Beds *(continued)*					
Insecticide	**Amount of Formulation Per Acre**	**Pounds Active Ingredient Per Acre**	**Acres 1 Gallon or 1 Pound Dry Will Treat**	**PHI (Days)**	**Threshold and Comments**
Foliar Application:					
Couraze 1.6F	3.5 oz	0.044	36.4	7	
Impulse 1.6F	3.5 oz	0.044	36.4	7	
Nuprid 1.6F	3.5 oz	0.044	36.4	7	
Pasada 1.6F	3.5 oz	0.044	36.4	7	
Provado 1.6F	3.5 oz	0.044	36.4	7	
Torrent 1.6F (imidacloprid-N)	3.5 oz	0.044	36.4	7	
White Grubs/May-June Beetles – Fields					
Soil Application: **White Grubs**					Apply pre-plant. Disk and hip to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast and band applications; some are only labeled for broadcast applications. Refer to individual product labels.
Brigade 2EC	19.2 oz	0.3	6.67	21	
Sniper 2EC	19.2 oz	0.3	6.67	21	
Bifenture EC (bifenthrin-P)	19.2 oz	0.3	6.67	21	
Mocap 15G	40 lb	6	-		
Mocap 6EC (ethoprop-OP)	128 oz	6	1		

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
White Grubs/May-June Beetles – Fields *(continued)*					
Foliar Application: May-June Beetles					Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when 2 beetles per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present. Beetles are more active at night and may not be captured in high numbers. Pheromone traps may help with detection.
Imidan 70WP (phosmet-OP)	21.33 oz	0.93	0.75	7	
Brigade 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Sniper 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Bifenture EC (bifenthrin-P)	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Wireworms/Click Beetles – Fields					
Soil Application: Wireworms					Avoid fields that have been out of production. Bait fields in late winter before disturbing the soil to check for wireworms and grubs. Baits can be made using rolled oats soaked in water. Apply pre-plant. Disk and hip to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast and band applications; some are only labeled for broadcast applications. Refer to individual product labels. Most of the first generation wireworms are controlled by pre-plant incorporated materials.
Chlorpyrifos 15G	13.3 lb	2.0	-	125	
Lorsban 15G	13.3 lb	2.0	-	125	
Nufos 15G	13.3 lb	2.0	-	125	
Lorsban 75WG	2.67 lb	2.0	-	125	
Chlorpyrifos 4E	64 oz	2.0	2	125	
Govern 4E	64 oz	2.0	2	125	

Wireworms/Click Beetles – Fields *(continued)*

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application:					
Lorsban 4E	64 oz	2.0	2	125	
Nufos 4E	64 oz	2.0	2	60	
Warhawk 4E	64 oz	2.0	2	125	
Yuma 4E (chlorpyrifos-OP)	64 oz	2.0	2	125	
Brigade 2EC	19.2 oz	0.3	6.67	21	
Sniper 2EC	19.2 oz	0.3	6.67	21	
Bifenture EC (bifenthrin-P)	19.2 oz	0.3	6.67	21	
Mocap 15G	40 lb	6.0	-		
Mocap 6EC (ethoprop-OP)	128 oz	6.0	1		
Foliar Application: Click Beetles					
Imidan 70WP (Suppression only) (phosmet-OP)	21.33 oz	0.932	0.75	7	Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when four beetles per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present.

Rootworms/Cucumber Beetles – Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Soil Application: Rootworms					Apply pre-plant. Disk and hip to incorporate. A 4- to 6-inch incorporation is preferred. Some products are labeled for broadcast and band applications; some are only labeled for broadcast applications. Refer to individual product labels. Most of the first generation cucumber beetle larvae are controlled by pre-plant incorporated materials.
Brigade 2EC	19.2 oz	0.3	6.67	21	
Sniper 2EC	19.2 oz	0.3	6.67	21	
Bifenture EC (bifenthrin-P)	19.2 oz	0.3	6.67	21	
Mocap 15G	40 lb	6.0	-		
Mocap 6EC (ethoprop-OP)	128 oz	6.0	1		
Foliar Application: Cucumber Beetles					Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when 2 beetles per 100 feet of bed (bugvac) or per 100 sweeps (sweep net) are present.
Imidan 70WP (phosmet-OP)	21.33 oz	0.93	0.75	7	
Brigade 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Sniper 2EC	2.1-6.4 oz	0.033-0.1	60.6-20	21	
Bifenture EC (bifenthrin-P)	2.1-6.4 oz	0.033-0.1	60.6-20	21	

Rootworms/Cucumber Beetles – Fields *(continued)*					
Insecticide	**Amount of Formulation Per Acre**	**Pounds Active Ingredient Per Acre**	**Acres 1 Gallon or 1 Pound Dry Will Treat**	**PHI (Days)**	**Threshold and Comments**
Foliar Application:					
Penncap-M 2F (methyl parathion-OP)	32 oz	0.5	4	5	
Mustang Max (zeta-cypermethrin-P)	1.76-4 oz	0.011-0.025	72.7-32	1	
Whitefringed Beetles – Fields					
Foliar Application:					
Imidan 70WP (phosmet-OP)	21.33 oz	0.93	0.75	7	Use caution when planting into whitefringed beetle infested fields. There are no soil insecticides labeled for whitefringed beetle control in sweet potatoes, but some soil insecticides may provide some control of whitefringed beetle when applied to control other soil insect pests.
Penncap-M 2F (methyl parathion-OP)	32 oz	0.5	4	5	Foliar applications against adults are aimed to minimize oviposition (egg laying). Treat when 1 beetle per 100 feet of bed is present or when 10 plants per 100 show whitefringed beetle feeding injury. Shake plants vigorously and examine soil for dislodged beetles.
Mustang Max (zeta-cypermethrin-P)	1.76-4 oz	0.11-0.025	72.7-32	1	

Cutworms – Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Baythroid XL (beta-cyfluthrin-P)	0.9-1.7 oz	0.007-0.013	142.9-76.9	0	Fields planted to cover crops are susceptible to cutworm injury, especially if the cover crop is destroyed fewer than 4 weeks before planting. Pyrethroids are effective against most cutworm species if adequate coverage is obtained. Kill vegetation with herbicides or tilling at least 4 weeks before planting. Treat if cutworms reduce stand to less than 8 plants per 10 feet of row. If plant density is reduced to fewer than 5 plants per 10 feet of row, consider replanting.
Tombstone 2EC (cyfluthrin-P)	0.8-1.6 oz	0.013-0.025	153.8-80	0	
Battalion 0.2EC	7.7-17.9 oz	0.012-0.028	16.7-7.1	3	
Delta Gold 1.5EC (deltamethrin-P)	1.0-2.4 oz	0.012-0.028	125-53.6	3	
Mustang Max (zeta-cypermethrin-P)	1.28-4 oz	0.008-0.025	100-32	1	

Tortoise Beetles – Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Carbaryl 4L	47.9 oz	1.5	2.67	7	Treat when defoliation exceeds 30 percent and beetles are present.
Carbaryl 80S	30.1 oz	1.5	0.53	7	
Sevin 4F	47.9 oz	1.5	2.67	7	
Sevin 80 Solupak	30.1 oz	1.5	0.53	7	
Sevin 80S	30.1 oz	1.5	0.53	7	
Sevin 80WSP	30.1 oz	1.5	0.53	7	
Sevin XLR Plus 4SC (carbaryl-C)	47.9 oz	1.5	2.67	7	

Caterpillars – Fields (Armyworms, Cutworms, Loopers, and others)					
Insecticide	**Amount of Formulation Per Acre**	**Pounds Active Ingredient Per Acre**	**Acres 1 Gallon or 1 Pound Dry Will Treat**	**PHI (Days)**	**Threshold and Comments**
Armyworms					Treat when 10 or more caterpillars (all species) per 100 feet of row (bugvac) or per 100 sweeps (sweep net) are present. In dry years, caterpillars can invade cracks around the roots and damage roots directly, reducing quality and yield.
Spintor 2SC (spinosad-SPN)	4.5-6.0 oz	0.07-0.094	28.6-21.3	7	
Intrepid 2F (methoxyfenozide-IGR)	6.0-10 oz	0.094-0.156	21.3-12.8	7	
Rimon 0.83EC (novaluron-IGR)	9.0-12.0 oz	0.058-0.078	14.3-10.6	14	
Cutworms					
Baythroid XL (beta-cyfluthrin-P)	0.9-1.7 oz	0.007-0.013	142.9-76.9	0	
Tombstone 2EC (cyfluthrin-P)	0.8-1.6 oz	0.013-0.025	153.8-80	0	
Battalion 0.2EC	7.7-17.9 oz	0.012-0.028	16.7-7.1	3	
Delta Gold 1.5EC (deltamethrin-P)	1.0-2.4 oz	0.012-0.028	125-53.6	3	

Caterpillars – Fields (Armyworms, Cutworms, Loopers, and others) ***(continued)***					
Insecticide	**Amount of Formulation Per Acre**	**Pounds Active Ingredient Per Acre**	**Acres 1 Gallon or 1 Pound Dry Will Treat**	**PHI (Days)**	**Threshold and Comments**
Mustang Max (zeta-cypermethrin-P)	1.28-4 oz	0.008-0.025	100-32	1	
Loopers					
Spintor 2SC (spinosad-SPN)	4.5-6.0 oz	0.07-0.094	28.6-21.3	7	
Intrepid 2F (methoxyfenozide-IGR)	6.0-10 oz	0.094-0.156	21.3-12.8	7	
Rimon 0.83EC (novaluron-IGR)	9.0-12.0 oz	0.058-0.078	14.3-10.6	14	

Sugarcane Beetle

Sugarcane beetle adults may enter fields from root enlargement until harvest. The beetles burrow down to the roots and feed. Currently no effective insecticides have been identified for controlling sugarcane beetle in sweet potatoes. In fields that historically have had sugarcane beetle problems, crop rotation may be beneficial. Sweet potato fields near pastures or hay fields appear to be more at risk for sugarcane beetle infestations. Planting more productive fields (fields with higher yield potential) first and harvesting them as soon as possible may allow these fields to be harvested before sugarcane beetle infestations get severe. Sugarcane beetles may also be brought into storage facilities on or in infested potatoes. Sugarcane beetles are strongly attracted to lights. In storage areas kept in darkness for periods of time, such as overnight, light traps may help capture beetles and reduce damage to stored sweet potatoes.

Other Insects – Fields

Insecticide	Amount of Formulation Per Acre	Pounds Active Ingredient Per Acre	Acres 1 Gallon or 1 Pound Dry Will Treat	PHI (Days)	Threshold and Comments
Thrips Spintor 2SC (spinosad-SPN)	4.5 oz	0.07	28.6	7	Thrips can stunt and reduce growth in young transplants. They can quickly infest freshly planted fields, especially when alternate hosts like weeds and border plants mature and dry down or are destroyed. Scout for thrips by beating plants onto a white surface and counting them as they move about. Sample at least 50 plants. Treat when plants are stunted and thrips are present.
Crickets					In dry years, crickets can invade cracks around the roots and damage roots directly, reducing quality and yield. There are no insecticides labeled to control crickets in sweet potatoes.

Storage		
Insecticide	**Application Rate**	**Threshold and Comments**
Sweet Potato Weevil Imidan 5D (phosmet-OP)	4 oz product / bu	Apply to stored sweet potatoes in areas of suspected sweet potato weevil infestation as a preventive treatment.
Fruit Flies Pyrethrins	Apply 1 gal of solution / 100,000 cu ft. Refer to label for proper dilution.	Space spray for stored sweet potatoes.
Sugarcane Beetle		Sugarcane beetles may also be brought into storage facilities on or in infested potatoes. There are no insecticides currently recommended for controlling sugarcane beetles in sweet potatoes. Sugarcane beetles are strongly attracted to light. In storage areas kept in darkness for periods of time, such as overnight, light traps may help capture beetles and reduce damage to stored sweet potatoes.

Supplemental Information

Insect pests to expect at different stages of plant development:
Based on historical data, the following pests could be expected at different stages of plant development. This is a generalized statement, and conditions may be different on specific farms or in specific seasons.

Stages of Plant Development	Common Insect Pests
Plant beds	Sweet potato weevil, flea beetles, aphids, whiteflies
Planting to runner development	Wireworms, white grubs, root worms, flea beetle adults and larvae, whitefringed beetle larvae, cutworms, thrips
Canopy closure to full root development	Wireworms, root worms, white grubs, flea beetle larvae, caterpillars
Root maturity to harvest	Wireworms, root worms, white grubs, flea beetle larvae, sugarcane beetle, caterpillars
Postharvest storage	Sweet potato weevil, sugarcane beetle, fruit flies

Spray Drift Precautions

- Keep all aerial and ground application equipment maintained and calibrated using appropriate carriers.
- Do not make aerial or ground applications during temperature inversions.
- Make aerial or ground applications when wind velocity is about 3 to 10 miles per hour, which favors on-target product deposition. Do not apply when wind velocity is greater than 15 miles per hour.
- For aerial applications, mount the spray boom on the aircraft to reduce drift caused by wing tip or rotor vortices. Boom length must not exceed 75 percent of wing span or rotor diameter.
- When using pyrethroid insecticides, do not apply by ground within 25 feet or by air within 150 feet of lakes, reservoirs, rivers, permanent streams, marshes, natural ponds, estuaries, commercial fish ponds, or other bodies of water. Increase the buffer zone to 450 feet when ultralow volume (ULV) applications are made. Be sure to observe all other label restrictions regarding drift pre cautions for pyrethroids and all other insecticides.

Foliar Insecticide Application Recommendations

Adequate coverage can be difficult but is essential with most products. Best results from contact insecticides will be with application volumes of 5 to 10 gallons per acre. Apply foliar insecticides with hollow cone nozzles. Do not exceed an application volume of 12 gallons per acre.

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