

Crop Profile for Asparagus in Michigan

Prepared: June, 1999

General Production Information

Asparagus is produced in Michigan for fresh market and processing.

	Asparagus
Michigan Ranking	3
Percent of U.S. Production	13.3
Area Planted (5 year average)	18,300
Area Harvested (5 year avg.)	17,800
Value of Production (thousands) (5 year average)	17,871.00
Production (thousands) cwt	277

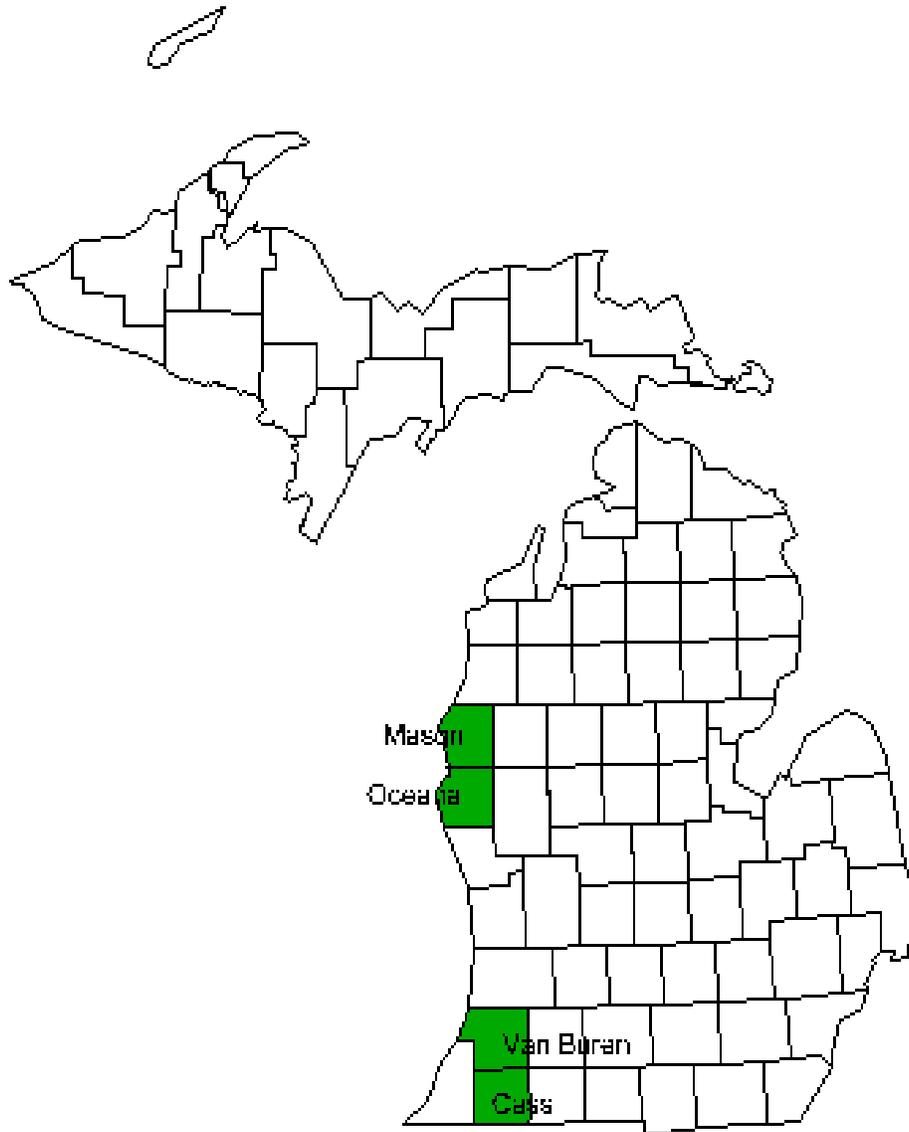
(1)

Production Regions:

Counties in Michigan producing asparagus include: Mason, Cass, Van Buren and Oceana (1)

	Counties	District	Acres Planted
Asparagus	All	Southwest	2404
	All	Northwest	446
	Oceana	West Central	14,282
Asparagus Total			18,000

(1)



Cultural Practices

Asparagus is a perennial crop and a planting can be productive for 10 to 15 years. It should be planted in full sun on a well drained soil with a pH of 6.8 to 7.0. Asparagus takes three years to develop from seed into a producing plant. In year one, seeds are planted in nurseries. In the spring of year two, crowns are harvested and planted in a new field. It is then allowed to grow for two years without harvesting, giving the plants time to develop vigor. Some of the newer varieties allowed limited harvest one year after planting.(6)

Prior to spear emergence in the spring, the previous season's vegetation (weeds and ferns) is destroyed

through mowing and tillage and herbicides to prepare a vegetation-free bed for pickers. Generally asparagus is grown in Michigan without tillage.(5)

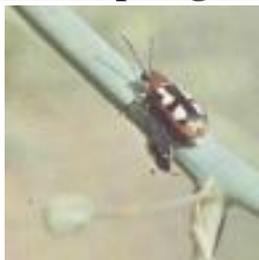
Asparagus spears in established plantings emerge from subterranean crowns early in the spring as soil temperatures approach 50° F. Spears are mostly hand harvested by snapping them at the soil surface or by cutting them with a special knife below the soil surface. They are harvested every one to five days in the early growing season. For the greatest portion of the harvest period, asparagus is harvested every second day in Michigan. Spear harvest ceases in early summer, and the asparagus spears are allowed to grow into fern during the rest of the growing season. This time is called the "layby", following the last harvest and prior to the growth of the fern. At layby, post-emergence herbicides or tillage are used to eliminate weeds. Pre-emergent herbicides are applied at layby to control weeds during the fern season. Fertilizers are applied at layby or during fern stage. Pesticides are sprayed during the fern stage to control insects and diseases that interfere with optimal growth.

Michigan has lower yields than do California and Washington.(2)

Growers establishing new beds will buy one-year old crowns from nurseries, currently **male hybrid varieties having some degree of disease resistance**. Weed, insect and disease control is very important during the nursery stage for the development of vigorous crowns.(5)(2)

Insect Pests

Common Asparagus Beetle



Biology:

The common asparagus beetle can be a serious pest. The common asparagus beetle is a 1/4 inch, black, red and yellow beetle. The adult lays black eggs on the spears. The eggs are nearly impossible to remove. The slug-like larvae are dull gray. Adults and larvae feed on foliage and there are commonly 2 to 3 generations per year. This feeding lowers yields in the following year. Adults overwinter in crop debris and brush around the field. (5)(13)

Cultural Controls:

No information available

Chemical Controls:

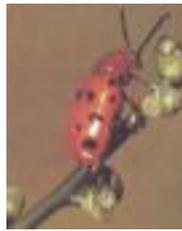
- Rotenone
- Carbaryl (Sevin) is used to control adult beetles during harvest(2)
- Pyrethrin and Sevin are used for larval control during fern season (1)

Carbaryl and pyrethrin can cause aphid outbreaks.(13)

Alternative Controls:

A small wasp, *Tetrastichus asparagi*, attacks eggs of asparagus beetles. Lady beetles also attack common asparagus beetles. Insecticide applications lower the populations of these natural enemies. (13)

Spotted Asparagus Beetle



Biology:

The spotted asparagus beetle is reddish orange with 6 black spots on each wing cover. It overwinters as adults in crop debris and brush around the field and emerge late than the common asparagus beetles. They do not lay eggs until the asparagus produces fern. The larvae feed on asparagus and pupate in the soil. The spotted asparagus beetle has become less of a concern with increased use of male hybrid varieties.(5)(13)

Cultural Controls:

Male varieties reduce spotted asparagus beetles due to the lack of berries.

Chemical Controls:

Most growers do not treat for the spotted asparagus beetle.(1)

- Rotenone
- Pyrethrin

Alternative Controls:

Generally control is not necessary.(13)

Asparagus Miner**Biology:**

The asparagus miner is a small and shiny black 2 winged fly as an adult. Eggs are laid toward the end of May and produce white, legless larvae that mines the stem above ground level. The second generation larvae mine below the soil level on the stem.(5) The asparagus miner does not directly damage the plant, although it may provide entry sites for disease organisms including Fusarium.(4)

Cultural Controls:

Control has not been shown to be beneficial.(13)

Chemical Controls:

There are no chemical controls listed, generally control is not beneficial.(13)

Alternative Controls:

No information available

Cutworms

Biology:

White cutworms feed on the growing tips, causing cullage. They overwinter as $\frac{3}{4}$ grown larvae. They feed from late May to early June and then pupate in the soil. The one-inch gray moths that emerge lay eggs from late June to mid-August. Eggs hatch in August and the larvae feed on weeds and volunteer asparagus plants during the fall. Up to 80%-90% of the larvae may die during winter, depending on snow and tillage practices.(2)

Dark-sided cutworms overwinter in the egg stage and eggs hatch in early spring and damage asparagus plants during the entire harvest. They feed on spears just above or below the soil surface. Potentially all asparagus producing regions in the U.S. are subject to cutworm infestations, however, in any given year infestations are limited and sporadic.(2)(5)

Cultural Controls:

Cutworms may be partially controlled by removing weeds. Mechanical control involves incorporating field trash and crop residues from previous years. Damage is more severe in no-till soils and is worst in the spring because spear growth is slow and there are few asparagus spears on which to feed.(2)

Chemical Controls:

- Diazinon
- Carbaryl
- Methomyl
- Permethrin
- Chlorpyrifos
- Fonofos (Dyfonate)

Alternative Controls:

No information available

Plant Bug

Biology:

In Michigan there are two plant bugs, the tarnished plant bug and the alfalfa plant bug. Both of these pests cause "tip dieback" injury to the asparagus fern. Adults and nymphs feed by inserting sucking mouth parts into the plant tissue, injecting salivary enzymes and sucking plant juices. The salivary enzymes are toxic to asparagus and cause a collapse of the conductive tissue and death of the plant above the point of injury. Symptoms occur several days after feeding. There is no long-term impact. These pests overwinter as adults and emerge in April or May. The first generation feeds on alfalfa, but when these are cut migrate to alternate hosts like asparagus. Tarnished plant bugs can cause up to 10% yield loss due to lower quality and quantity.(3)(2)(5)

Cultural Controls:

Do not plant asparagus near alfalfa, when alfalfa is cut alfalfa plant bugs move to asparagus as an alternative host. (13)

Chemical Controls:

- Permethrin

Outbreaks occur at times during growth flushes of fern and then migrate, so timing is critical.(2)

Alternative Controls:

Plant bugs migrate in and out of the field, scouting and control can be difficult.(13)

Pesticide Profiles

Carbaryl (carbamate)

Formulations: Sevin 50 WP, Sevin 80 S, Sexin XLR+

Pests Controlled: adult asparagus beetle.(2)

Acres of Crop Treated: 37,723 (2)

Application Rate: (lb ai/A) 1.0 (2)

Recommended Rate: 1 1/4 to 2 1/2 ai/ac (3)

Types of Applications:Duster(3); ground spray /boom (95%); aerial spray(5%) (3)

Timing: during and after harvest, during fern growth(3)

Pre-Harvest interval: 1 day suggested (14)

REI: 12 hrs (14)

IPM Concerns: Synthetics are a concern because they are hard on aphid predators. Removal of Sevin would result in massive aphid outbreaks.(3)

Use in Resistance Management Programs: If OP's and carbamates taken away, resistance could increase quickly.(3)

Efficacy Issues: most effective and inexpensive

Advantages: Registered on many crops, low mammalian toxicity.(8) Most effective and inexpensive material available.(3)

Disadvantages: Non-specific. Carbaryl drifts and is toxic to bees.(3)

RUP (14)

Permethrin(synthetic pyrethoid)

Formulations: Ambush 2 EC, Pouncee 3.2 EC

Pests Controlled: Asparagus beetle larvae, cutworms, plant bugs(2)

Acres of Crop Treated: 14,620(2); 20%

Application Rate (lb ai/A): 0.1(2)(3)

Recommended Rate: 2 lb ai/A(2)

Types of Applications: banded over the row

Timing: fall treatment for cutworms

Pre-Harvest interval: 1 day suggested (14)

REI: 12 hours (14)

IPM Concerns: None reported in grower interviews.(3)

Resistance Management Concerns: None reported in grower interviews.(3)

Efficacy Issues: High (3)

Advantages: no information available

Disadvantages: Reflects an increase in chemical costs.(2) Very hard on bees.(3)

Methomyl(carbamate)(alternative for permethrin and malathion)

Formulations: Lannate

Pests Controlled: Asparagus beetle, thrips(3)

Percent of Crop Treated: 1%(3)

Application Rate (lb ai/A):.1-1.4 pt (3)

Recommended Rate: 2.4 lb ai/G(2) , AI 29(3)

Types of Applications: Ground Spray/Boom (3)

Timing: At Fern (3)

Pre-Harvest interval: 1 day suggested (14)

REI: 48 hours (14)

Use in IPM programs: Concern is its toxicity to beneficials(3)

Resistance Management Concerns: None reported in grower interviews.

Efficacy Issues: no information available

Advantages: no information available

Disadvantages: Reflects an increase in chemical costs.(2), increased oral and dermal toxicity.(3)

Malathion(Organophosphate) (alternative for permethrin and methomyl)

Formulations: Cythion

Pests Controlled: Asparagus beetle, Tarnished plant bug.(3)

Percent of Crop Treated: 10%

Application Rate (lb ai/A): 1.35

Recommended Rate: 5.0 lb ai/G

Types of Applications: Ground/Boom spray by 95% of growers, aerial by 5% of growers(3)

Timing: used on ferns after spears are harvested (3)

Pre-Harvest interval: 180 days(3)

REI: 12 hours (14)

IPM Concerns: use of synthetic alternatives leads to aphid problems.(3)

Resistance ManagementConcerns: None reported in grower interviews.(3)

Efficacy Issues: high efficacy

Advantages: Excellent aphid control. Safer for bees and non-toxic to humans.(3)

Disadvantages: Reflects an increase in chemical costs.

Chlorpyrifos(Organophosphate)

Formulations: Lorsban 4E

Pests Controlled: Asparagus beetle, cutworms(2)

Acres of Crop Treated: 7,911(2)

Application Rate (lb ai/A): 0.1(2)

Recommended Rate: 4 lb ai/A (2)

Types of Applications: banded or broadcast

Timing: before harvest

Pre-Harvest interval: Not applicable

REI: 24 hours (14)

Use in IPM programs: no information available

Use in Resistance Management Programs: loss of this could cause cutworm resistance to permethrin (profile above), the alternative chemical.(3)(2)

Efficacy Issues: no information available

Advantages: no information available

Disadvantages: Permethrin is more cost effective to the grower.

RUP: Restricted Use Pesticide

See Critical Use

Diseases

Asparagus Rust (*Puccinia asparagi*)

Biology:

The asparagus rust overwinters as a teliospore, a sexual, thick-walled resting spore produced from telium, a type of fungal spore bearing structure. The teliospores remain attached to crop debris until the next spring and germinate to produce basidiospores from basidia. The basidiospores are produced about the time the new, young asparagus shoots are emerging from the soil. They are then dispersed through the air by wind and penetrate asparagus plant tissue and cause infection that forms aecial lesions. The spores produced can penetrate shoot tissue and cause an infection that forms uredial lesions (the most apparent lesions) in mid to late summer.(2)

Puccinia asparagi attacks all above ground plant parts with symptoms including reduced plant vigor, increased water loss from the plant and premature death. The disease can cause a decrease in carbohydrate reserves, leading to reduced yield the following seasons. Yield loss increases greatly if the rust is allowed to continue for successive years.(2)

Cultural Controls:

Can be controlled with moderately resistant asparagus varieties that are planted in well drained areas in rows that allow free air movement being oriented with the prevailing wind. Eliminating asparagus seedlings and volunteers and planting nursery beds an adequate distance from commercial fields. (9)

Chemical Controls:

Fungicides should be applied before the disease reaches the telial stage.

- Mancozeb-not allowed by some processors.(9)
- myclobutonil-Section 18.(9)

Fusarium Crown Rot and Wilt

Biology:

Fusarium crown rot is caused by the fungal pathogen *Fusarium*. It is a major cause of stand decline in asparagus in Michigan. Symptoms of infected plants include wilting, dwarfing, chlorosis, browning of vascular tissue and death to the growing point. Infection usually occurs in patches throughout the field and one to many shoots or the entire crown may be infected. It can also cause damping off in seedlings.

Plant stress, viral infection and high soil temperature increase incidence of crown rot infection. After an

asparagus stand is removed, Fusarium spores persist in the soil for many years.(2)

Cultural Controls:

Not planting on previous asparagus fields for four years. Avoid rotations to corn. Using Fusarium resistant varieties and managing stands to minimize overcutting, drought, overwatering, insect injury, inadequate weed control, disease control and soil compaction.(2)

Mechanical controls include destroying crop debris from the previous year by burning or burying in late fall or winter. Tillage practices that could damage fleshy roots and crowns should be avoided.(2)

Chemical Controls:

No information available

Alternative Controls:

No information available

Stemphylium Purple Spot

Biology:

Stemphylium vesicarium is a fungal pathogen that is a serious problem in Michigan because of rainfall. During severe infestations in Michigan, up to 90% of spears can be rejected. There can be up to 52% yield loss on a subsequent crop, due to lesions that defoliate the fern. Disease symptoms include small, slightly sunken purple spots that occur just before harvest, causing cullage. Asparagus fern infected with this pathogen have tan to brown lesions with dark purple margins.(2)

Stemphylium overwinters in debris from the previous crop. Moisture from dew and rain is required for the development of purple spot. Stemphylium will enter the plant through wounds and stomata. In late fall and winter, the fungus will produce sexual fruiting bodies called pseudothecia.(2)

Cultural Controls:

These include planting cover crops and other measures to reduce injury from windblown sand.

Chemical Controls:

- Chlorothalonil-Section 18(9)

Alternative Controls:

No information available

Fungicide Profile

Mancozeb(dithiocarbamate)

Formulations: Dithane M-45

Pests Controlled: Rust and Purple Spot (partial control)(2)

Acres of Crop Treated: 38,634(2)

Application Rate (lb ai/A): 1.5 every 10-14 days (2) 1.5-2 lbs, within 8lbs/acree/season (3)

Recommended Rate: 80% ai (2) 75%ai (3)

Types of Applications: fern applied(2) 95% ground spray/boom spray, 5% aerial (3)

Timing: at fern (3)

Pre-Harvest interval: 180 days suggested

REI: 48 hours

Use in IPM programs: Only alternative is B2 carcinogen, if lost there is no control on asparagus of these pests (3)

Use in Resistance Management Programs:

Efficacy Issues: Not an effective control on Purple Spot.(3)

Advantages: Inexpensive and very effective on rust. (3)

Disadvantages: Not allowed by a major processor.(9)

Weeds

Annual and perennial weeds rob asparagus of light, water and nutrients, causing reduction in yield. They also harbor or provide alternate hosts or food for disease and insect pests, block thorough application of pesticides and hide asparagus spears, making them difficult to see and harvest. Annual weeds include both winter and summer annuals. Winter annuals germinate in the fall and overwinter in a vegetative state, flower in the spring form seeds and die. Summer annuals germinate in the spring, flower and fruit during the summer or fall and die in the fall. Perennial weeds include both simple and creeping weeds. Simple perennials regenerate each year from a root or crown structure and produce sexually only. Creeping perennials regenerate from roots, shoots and other structures and reproduce both sexually and asexually. Breaking under ground plant structures can increase the spread of these weeds. There is a different set of procedures to control weeds in nonbearing asparagus than exists to control weeds in bearing asparagus. In non-bearing asparagus, mechanical controls include tillage and hand weeding.(2)

Cultural Controls:

These include not planting beds in fields known to be infested with perennial weeds.

Chemical Controls in non-bearing asparagus:(2)

- metam-sodium
- paraquat
- linuron
- diuron
- Sethoxydim (Poast 1.5E) (PHI 30 days)
- Glyphosate (Roundup)
- Terbacil on charcoal protected seed rows
- Fluazifop

Chemical Controls in bearing asparagus: (2)

- Glyphosphate
- Paraquat
- Metribuzin
- Diuron
- Norflurazon
- Napropamide
- Trifluralin
- Linuron
- 2,4-D amine

Frequently preemergence chemicals are tank mixed to increase the spectrum of weed control.

Herbicide Profiles

Sethoxydim (Cyclohexenone) (15)

Formulations: Poast 1.5E

Weeds Controlled: emerged grasses (15)

Acres of Crop Treated: no information available

Application Rate (lb ai/A): Suggested up to two applications per year with a total maximum of 5 pints per acre per year

Recommended Rate: 0.19-0.38 lb ai/ac (17)

Types of Applications: foliar spray to actively growing grasses

Timing: anytime during the season (15)

Pre-Harvest interval: 1 day (15)

REI: 12 hours (17)

Use in IPM programs: no information available

Use in Resistance Management Programs: no information available

Efficacy Issues: not effective at temperatures below 60° F(19)

Advantages: selective for emerged grasses (17)

Disadvantages: established grasses may require two applications (15)

Clopyralid (Picolinic-acid derivative)(15)(18)

Formulations: Stinger 3L

Weeds Controlled: emerged broadleaf weeds (15)

Acres of Crop Treated: No information available

Application Rate (lb ai/A): No information available

Recommended Rate: 0.188-0.25 lb ai/ac (17)

Types of Applications: spray

Timing: post emergence, suggested for used after harvest (15)

Pre-Harvest interval: 12 hour (15)

REI: 12 hours (17)

Use in IPM programs: No information available

Use in Resistance Management Programs: No information available

Efficacy Issues: soil temperatures below 70° results in poor control(19)

Advantages: postemergence, selective herbicide(18)

Disadvantages: may cause some asparagus spears to curl(15)

2,4-D (Phenoxy Acid) (8)

Formulations: Weedbar 64, Hi Dep

Weeds Controlled: annual broadleaf weeds, some perennial weeds(2)

Acres of Crop Treated: 6,615(2)
Application Rate (lb ai/A): 1.7(2)
Recommended Rate: 3.8lb ae/G(2)
Types of Applications:
Timing: during harvest season, post-harvest(2)
Pre-Harvest interval:
Use in IPM programs:
Use in Resistance Management Programs:
Efficacy Issues:
Advantages:
Disadvantages:

Linuron(phenylureas)(8)

alternative for 2,4-D(2)
Formulations: Lorox
Weeds Controlled: Annual weeds(2)
Acres of Crop Treated: 3,518 bearing & 1900 nonbearing(2)
Application Rate (lb ai/A): 1.0(2)
Recommended Rate: 50% ai(2)
Types of Applications:
Timing: Immediately before and during harvest Pre-Harvest interval:(2)
Use in IPM programs:
Use in Resistance Management Programs:
Efficacy Issues:
Advantages:
Disadvantages:

Metribuzin(triazine) (8)

Formulations: Lexone; Sencor
Weeds Controlled: Annual weeds (2)
Acres of Crop Treated: 7,482(2)
Application Rate (lb ai/A): 0.9(2)
Recommended Rate: 75% ai(2)
Types of Applications:
Timing: Immediately before and after harvest Pre-Harvest interval:
Use in IPM programs:
Use in Resistance Management Programs:
Efficacy Issues:
Advantages:

Disadvantages:

Diuron(phenylureas)(8)

alternative for metribuzin

Formulations: Karmex 80 WP; 80 DF

Weeds Controlled: Annual weeds(2)

Acres of Crop Treated: 20,934(2)

Application Rate (lb ai/A): 2.0(2)

Recommended Rate:80% ai(2)

Types of Applications:

Timing: Immediately before and after harvest Pre-Harvest interval:

Use in IPM programs:

Use in Resistance Management Programs:

Efficacy Issues:

Advantages:

Disadvantages:

Norflurazon(pyridazinones)(8)

Formulations: Solicam 80Df

Weeds Controlled: Annual weeds and yellow nutsedge.(2)

Acres of Crop Treated: 912(2)

Application Rate (lb ai/A): 1.2(2)

Recommended Rate:80% ai (2)

Types of Applications:

Timing: after fern chop in fall or early spring(2)

Pre-Harvest interval:

Use in IPM programs:

Use in Resistance Management Programs:

Efficacy Issues:

Advantages:

Disadvantages:

Glyphosate(phosphono amino acid)(8)

Formulations:Roundup Ultra

Weeds Controlled: annual and perennial weeds and for killing a cereal rye cover crop. (2)

Acres of Crop Treated: 15,507(2)

Application Rate (lb ai/A): 2.0(2)

Recommended Rate: 4 lb ai/G(2)

Types of Applications:

Timing: Immediately before, during and after harvest Pre-Harvest interval:

Use in IPM programs:

Use in Resistance Management Programs:

Efficacy Issues: Excellent

Advantages: non-residual

Disadvantages:

Paraquat(Bipyridylum)

Formulations: Gramoxone

Weeds Controlled: All weeds and kill cover crop(2)

Acres of Crop Treated: 9,306(2)

Application Rate (lb ai/A): 1.0(2)

Recommended Rate: 2.5 ai/G(2)

Types of Applications:

Timing: Immediately before and after harvest.(2)

Pre-Harvest interval:

Use in IPM programs:

Use in Resistance Management Programs:

Efficacy Issues:

Advantages:

Disadvantages:

Terbacil (urea compound)

Formulations: Sinbar 80W

Weeds Controlled: preemergence annuals(2)

Acres of Crop Treated: No information available

Application Rate (lb ai/A): No information available

Recommended Rate: 1.2 - 2 ai/A for producing plants, 0.8 - 1.6 for crows(17)

Types of Applications: spray

Timing: seeds beds for crown production and before spears appear (17)

Pre-Harvest interval: 5 days (17)

REI: 12 hours (17)

Use in IPM programs: No information available

Use in Resistance Management Programs: No information available

Efficacy Issues: No information available

Advantages: controls for 2-4 months (17)

Disadvantages: cannot use on soils with less than 1% organic matter (17)

Napropamide (propionamide compound)

Formulations: Devrinol 50DF

Weeds Controlled: germinating grasses (2)

Acres of Crop Treated: No information available

Application Rate (lb ai/A): No information available

Recommended Rate: 4 ai/A (17)

Types of Applications: spray

Timing: before emergence in spring (17)

Pre-Harvest interval: 5 days (17)

REI: 12 hours (17)

Use in IPM programs: No information available

Use in Resistance Management Programs: No information available

Efficacy Issues: good grass control

Advantages: 4-6 week residual activity, long lasting compound (19)

Disadvantages: toxic to fish (19)

Trifluralin (Nitroanilines)

Formulations: Treflan 4E, Trilin 4E

Weeds Controlled: to control broadleaves and annual grasses

Percent of Crop Treated: No information available

Types of Applications: incorporated into soils for pre-planting weed control

Application Rates: No information available

Number of Applications: No information available

Timing: apply early in spring when spears are at least 4 inches beneath the soil

Pre-Harvest Interval: not applicable

REI: 12 hours (17)

Use in IPM Programs: No information available

Use in Resistance Management Programs: No information available

Efficacy Issues: soil incorporation within 24 hours gives greatest effectiveness, good grass control (19)

Advantages: inexpensive, kills weed seeds as they germinate, rainfall is not required (19)

Disadvantages: No information available

Fluazifop-P-butyl (Oxyphenoxy Acid Esters)

Formulations: Fusilade DX 2E

Weeds Controlled: for control of emerged grass

Percent of Crop Treated: No information available
Types of Applications: No information available
Application Rates: 0.25 - 0.38 ai/A
Number of Applications: No information available
Timing: Apply to actively growing grasses
Pre-Harvest Interval: not applicable
REI: 12 hours (17)
Use in IPM Programs: No information available
Use in Resistance Management Programs: No information available
Efficacy Issues: use a high rate on quackgrass (17)
Advantages: broadleaf crops are tolerant (19)
Disadvantages: for non-bearing asparagus only, toxic to fish (17)(19)

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