

# STRAWBERRIES

“The Mid-Atlantic Commercial Berry Guide for Commercial Growers”, a cooperative publication for Pennsylvania, Maryland, New Jersey, Delaware, West Virginia, and Virginia, contains additional information and can be found on the website [pubs.cas.psu.edu/freepubs/MAberryGuide.htm](http://pubs.cas.psu.edu/freepubs/MAberryGuide.htm).

## Annual Production System on Plastic Mulch

This system is recommended for Delaware, Maryland, New Jersey, Virginia, southeastern Pennsylvania, and for trial in other areas of Pennsylvania.

### Varieties

Early	Late
Sweet Charlie <sup>1</sup>	Ovation <sup>3</sup>
Midseason	Everbearer
Chandler	Albion <sup>4</sup>
Camarosa <sup>2</sup> (shipping only)	San Andreas <sup>4</sup>
Allstar	Seascape
Darselect	
Flavorfest	

<sup>1</sup> Matures 7 to 10 days earlier than Chandler; recommended for trial in southern regions of Maryland. Plant only in areas with low risk of frost. May require overhead sprinkler for additional frost protection during bloom.

<sup>2</sup> Must be fully red-ripe for flavor development.

<sup>3</sup> May be better adapted to warmer areas of the region as yields have been low in cooler areas.

<sup>4</sup> Produces light yields throughout the spring summer and fall resulting in moderate total yields for the season.

### Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state's soil test report recommendations and/or your farm's nutrient management plan supercede recommendations found below.

Annual System <sup>1</sup>	Pounds N per Acre	Soil Phosphorus Level				Soil Potassium Level				Nutrient Timing and Method
		Low	Med	High Very		Low	Med	High Very		
				(Opt.)	High			(Opt.)	High	
<b>Strawberries</b>	<b>per Acre</b>	<b>Pounds P<sub>2</sub>O<sub>5</sub> per Acre</b>				<b>Pounds K<sub>2</sub>O per Acre</b>				
	90-120	100	70	40	0-30 <sup>2</sup>	165	115	65	0	Total nutrient recommended.
	60-75	100	70	40	0-30 <sup>2</sup>	165	115	65	0	Broadcast and disk-in.
	15-25	0	0	0	0	0	0	0	0	Inject through drip at first flowering in Spring.
	15-25	0	0	0	0	0	0	0	0	Inject through drip at fruit enlargement, about 2-weeks after first flowering.

<sup>1</sup> For crops grown on plastic mulch, fertility rates are based on a standard row spacing of 5 feet. Apply 1.0 to 2.0 pounds of boron (B) per acre with broadcast fertilizer. See Table B-9 for more specific boron recommendations.

<sup>2</sup> Replacement value of 30 lbs of P<sub>2</sub>O<sub>5</sub> per acre is recommended in Maryland, Delaware, and Virginia on Very High P soils.

### Background

The annual strawberry production system has potential for increased profitability over conventional matted-row plantings. Establishment costs are higher, but production is earlier (when crop value is highest) and of higher quality. Start with small acreage and increase as knowledge and experience is gained with the system. This is an integrated system and all of the components are important for maximum production and efficiency. Omission of one or more of the following components could lead to failure.

### Site Selection

Plan the field location of strawberries grown on plastic and matted rows carefully if you intend to harvest by Pick-Your-Own. Pick-Your-Own customers have a strong preference for berries grown on plastic and may not pick matted row strawberries located in adjacent fields. The annual system has given highest yields at locations with a long growing season.

Select fields with good surface and internal drainage, a southern exposure, and protection from westerly winds.

### Field Preparation

Have the soil tested to determine specific nutritional needs. Apply 50 to 75 pounds actual nitrogen plus P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O at the rates recommended from the soil test, plus 1.0 to 2.0 pounds of boron unless soil test results indicate above-normal levels, and work into beds. Base additional phosphorus, potassium, and boron application rates on soil test results. It is particularly important to adjust the soil pH to the 6.0 to 6.5, according to methods described in Section B. Prepare raised beds (30 to 40 inches wide and 6 to 8 inches high) on 5- to 5½-foot row centers. Beds should be center-crowned and firm. Depending on soil type, plant vigor, and plant tissue test results, inject an additional 30 to 40 pounds of nitrogen per acre through the drip system in the spring.

### Weed Control.

Fumigation is essential to control weeds because labeled residual herbicides cannot be used over the top of the plastic to provide adequate weed control around the plant hole. Several weed control options are listed below to control troublesome winter annuals and other weeds that grow around plant holes.

Prepare soil, apply fertilizer, then apply fumigant. See the Chapter E "Soil Fumigation" and "Nematodes" sections under "Soil Pests--Their Detection and Control" for materials, rates, and precautions. Wait 20 days to allow the fumigant to act and disperse. Then prepare raised beds as described above and apply 4.0 to 6.0 pounds per acre of Devrinol DF-XT to the surface of the bed and the area between beds. Lay drip irrigation and plastic mulch.

OR

Apply fertilizer, prepare raised beds, and inject metam-sodium (Vapam HL) at 56.0 to 75.0 gallons per acre or 37.0 gallons per mulched acre. Immediately reshape beds (if necessary to form a firm, crowned bed) and apply 4.0 to 6.0 pounds per acre of Devrinol DF-XT to the surface of the bed and the area between beds, and lay drip irrigation and plastic mulch. Wait 20 days between fumigation and planting to allow the fumigant to act and to disperse.

OR

Apply fertilizer and prepare raised beds as described above. Apply 4.0 to 6.0 pounds per acre of Devrinol DF-XT to the surface of the bed. Apply drip irrigation and plastic mulch. Inject metam-sodium (Vapam HL) through the drip system at 37 gallons per mulched acre. Wait 20 days between fumigation and planting to allow the fumigant to act and to disperse.

Weeds between the mulched beds can be controlled with standard strawberry weed control herbicides recommended for matted-row culture. Band the treatment between the strips of plastic. Grasses between the rows and around plant holes can be controlled by postemergence applications of Poast 1.5EC. See recommendations for Poast 1.5EC in the "Weed Control" section of Matted Row Culture.

### Plants and Planting

The best current option is the use of transplant "plugs" propagated from actively growing runner tips. Plugs can be purchased directly or one can purchase tips and produce the plugs. To produce plugs, use a well-drained artificial mix containing 50% peatmoss and 50% horticultural vermiculite or 50% perlite. A poorly drained growing medium promotes root diseases. A list of nurseries that supply plugs and runner tips, and/or directions for propagating from tips, is available through your local county Extension office.

Plugs are easy to plant mechanically with a waterwheel-type planter. Be sure to place the crown of the transplant at the soil level when planting. Deep planting can promote decay of the plant and shallow planting allows the plant to desiccate. Space plants 12 inches apart in each of the double rows in a staggered pattern. Space double rows 12 to 18 inches apart on the bed. The 18-inch between-row spacing has produced high yields and requires a 36- to 40-inch wide bed.

Plant in late August to early September for highest first-year yields in southern New Jersey, Delaware, Maryland, and Virginia. In Pennsylvania and northern New Jersey plant in mid to late August. Mid-September is the latest recommended planting date.

Alternatively, dormant plants may be used, and planted directly in the field with a planting tool that allows the plants' roots to be inserted into the soil without digging a planting hole. Planting time varies from mid-June to mid-July. Alternatively, the plants roots can be trimmed to allow planting in 32-cell trays and then the plants can be grown in the trays until they are planted at the usual time for plug plants.

### Renovation

Strawberries grown on plasticulture can be renovated in July. For varieties (Sweet Charlie) and plantings with moderate vigor, mow tops with a rotary mower, leaving several leaves on the plant. For very vigorous varieties (Chandler) and plantings, cutting away a portion of the crown with an asparagus knife leaving 3 crowns or a combination of mowing followed by crown thinning, may be the most effective renovation technique. After renovation, maintain adequate soil moisture and good insect and disease control. In early September, apply 60 pounds of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O per mulched acre via drip irrigation and manage the renovated planting using the same cultural practices as for a new planting.

Renovation has improved berry size; however, size is usually smaller than in the first harvest season. Marketable yields of renovated strawberries have been equal to yields in the first harvest season with careful management. Renovation is especially useful if the planting will be harvested as a Pick-Your-Own.

### Row Covers

Floating row covers (FRC) are an essential part of the system to reduce the desiccating effects of winter winds, for frost and freeze protection, and early fruiting. Ultraviolet light resistant covers with a weight of 1.0 to 1.4 ounces per square yard and 60 to 70% light transmission have been effective. Apply FRC between October 15 and November 15, depending on location and planting date, for maximum fall growth and yields. FRC can be applied in early December for protection over the winter. Remove the FRC at the first signs of flower bud emergence. Leaving the covers on too long may reduce fruit size. Leave the covers at the edge of the field so plants can be quickly covered if there is a frost warning.

### Irrigation

Overhead irrigation at planting is essential to cool plants and plastic in warm weather and improve establishment. Provide for irrigation in the fall to promote good plant growth before row covers are applied. Large fruit size is important for high crop value, and adequate moisture is critical for maintaining good fruit size. Drip irrigation is effective in increasing fruit size without wetting the fruit and causing increased fruit rots. Be prepared to irrigate frequently to maintain favorable soil moisture in the spring. Overhead mist irrigation may be required in the spring for frost and freeze protection.

### Pest Control.

Use an effective disease control program. To control *Phytophthora* crown rot caused by *Phytophthora cactorum* on newly set transplants apply Ridomil Gold 4SL--1.0 pt/A through the trickle irrigation system 10 days after transplanting if there is a known risk. Apply a fungicide to

control leaf spots after plants are established and just before covering plants with the floating row in the fall. Insecticides and miticides should be applied during late summer and fall to prevent aphids and mites from reaching damaging levels in the spring. Maintain a good pest control program after covers are removed in the spring.

Bloom sprays are important for control of Botrytis gray mold. See "Disease Control" and "Insect Control" sections for materials and rates.

### Harvesting

The Chandler variety grown with the annual system ripens about 1 week earlier than standard varieties grown in matted rows. The duration of harvest is about 3 weeks. For local markets, harvest when tips have red color.

## Matted Row Culture

### Varieties<sup>1</sup>

Early	Late
Earliglow (RSR)	Jewel
Annapolis (RSR)	
Midseason	
Darselect	
Allstar (VR, RSR)	
Honeoye <sup>2</sup>	

<sup>1</sup> Letters in parentheses indicate disease resistance possessed by varieties. RSR = red stele resistant; VR = verticillium wilt resistant.

<sup>2</sup>Becomes dark and soft under hot conditions.

### Recommended Nutrients Based on Soil Tests

Before using the table below, refer to important notes in the Soil and Nutrient Management chapter in Section B and your soil test report. These notes and soil test reports provide additional suggestions to adjust rate, timing, and placement of nutrients. Your state's soil test report recommendations and/or your farm's nutrient management plan supercede recommendations found below.

### New Plantings

Matted Row	Pounds N per Acre	Soil Phosphorus Level			Soil Potassium Level			Nutrient Timing and Method	
		Low	Med (Opt.)	High Very High	Low	Med (Opt.)	High		
Strawberries		Pounds P <sub>2</sub> O <sub>5</sub> per Acre			Pounds K <sub>2</sub> O per Acre				
	110-150 <sup>1</sup>	100	70	40	165	115	65	0	Total amount of nutrients recommended
	30	100	70	40	165	115	65	0	Broadcast and disk-in deep
	20-30	0	0	0	0	0	0	0	Sidedress 2 weeks after planting
	20-30	0	0	0	0	0	0	0	Sidedress when first runners start
	30-40	0	0	0	0	0	0	0	Topdress in mid-August
	10-20 <sup>2</sup>	0	0	0	0	0	0	0	Topdress in February or March

Apply 1.0 to 2.0 pounds of boron (B) per acre with broadcast fertilizer. See Table B-9 for more specific boron recommendations.

<sup>1</sup>Rates are appropriate for lighter soils. Rates should be reduced by about 25% for heavier soils in northern locations.

<sup>2</sup>If on heavier soils in northern locations, omit this application unless rainfall has been excessive

### Established Plantings

Matted Row	Pounds N per Acre	Soil Phosphorus Level			Soil Potassium Level			Nutrient Timing and Method	
		Low	Med (Opt.)	High Very High	Low	Med (Opt.)	High		
Strawberries		Pounds P <sub>2</sub> O <sub>5</sub> per Acre			Pounds K <sub>2</sub> O per Acre				
	30	100	70	40	165	115	65	0	Topdress at renovation
	20-30	100	70	40	165	115	65	0	Topdress in Mid-August
	20-30	0	0	0	0	0	0	0	Topdress in February or March at green up

### Plants

Use certified dormant plants packed dry in polyliners.

### Spacing

Plant virus-free plants as early in the spring as possible. Plant in rows approximately 4 feet apart with plants 18 to 30 inches apart in row. Distance will depend on variety and soil type. The approximate number of plants needed at these spacings per acre is between 4,400 and 7,300.

### Renovation

Strawberry beds must be renovated annually (immediately after harvest) to thin the plants, retain vigor, and maintain berry size in subsequent years. Follow the steps below when renovating strawberry plantings:

1. Apply 2,4-D herbicide for broadleaf weed control. Wait 7 to 8 days for weeds to absorb the herbicide.

2. Mow off the leaves as close to the ground as possible without damaging the crowns.
3. Narrow row widths to 12 inches using a cultivator or rototiller. Allow ½ to 1 inch of soil to cover crown.
4. Apply topdressing with N as indicated in tables above, and P and K preferably as based on soil test results, or as indicated in recommendations above.
5. Apply preemergent herbicides.
6. Irrigate to incorporate fertilizer and herbicide.

### Pollination

Honeybees and wild bees are important for proper pollination and fruit set. Populations of pollinating insects may be adversely affected by insecticides applied to flowers or weeds in bloom. Do not apply insecticides during bloom. If an insecticide must be applied during bloom, see section on "Pollination" in the General Production Recommendations and/or Table D-6 for relative toxicity of various pesticides for hazards to bees and observe precautions for use.

### Weed Control

Identify the weeds in each field and select recommended herbicides that control those weeds. See Tables E-3 and E-4.

Match preplant incorporated and preemergence herbicide rates to soil type and percent organic matter in each field.

Apply postemergence herbicides when crop and weeds are within the recommended size and/or leaf stage.

Determine the preharvest interval (PHI) for the crop. See Table E-4 and consult the herbicide label.

Find the herbicides you plan to use in the Herbicide Resistance Action Committee's (HRAC) **Herbicide Site of Action Table E-8** and follow the recommended good management practices to minimize the risk of herbicide resistance development by weeds in your fields.

### New Planting-Posttransplant

DCPA--6.0 to 9.0 lb/A. Apply 8.0 to 12.0 pints per acre Dacthal 6F. Apply preplant incorporated with shallow cultivation before transplanting, or apply anytime after transplanting to weed-free soil. Primarily controls annual grasses and certain small-seeded broadleaf weeds.

Napropamide--1.0 to 2.0 lb/A. Apply 2.0 to 4.0 quarts per acre Devrinol 2-XT to weed-free soil immediately after transplanting. Activate with one-half inch sprinkler irrigation within 24 hours after application. Napropamide left on the soil surface is broken down by sunlight. Irrigation moves the herbicide into the soil and prevents breakdown by the sun. Primarily controls annual grasses and suppresses or controls certain annual broadleaf weeds.

Terbacil--0.10 to 0.15 lb/A. Apply 2.0 to 3.0 dry ounces of Sinbar 80WDG per acre after transplanting but before new runner plants start to root. Controls many annual broadleaf weeds, but may be weak on pigweed species. Do NOT add surfactant, oil concentrate, or any other spray additive, or tank-mix with any other pesticide unless the mixture is approved on the Sinbar 80WDG label. If strawberry transplants are allowed to develop new foliage prior to application, the spray must be followed immediately by 0.5 to 1.0 inches of irrigation or rainfall to wash the Sinbar 80WDG off the strawberry foliage, or unacceptable crop injury may result. University data has shown that more consistent weed control and less crop injury occurs when

0.05 lb/A, 1.0 dry ounce, of Sinbar 80WDG is applied at 3 week intervals. Begin applications 3 to 6 weeks after transplanting, when the strawberries have 3 new full size trifoliolate leaves, but before weeds exceed 1 inch in height.

Certain varieties differ in their sensitivity to Sinbar 80WDG. Determine varietal tolerance before spraying field. Do NOT apply Sinbar 80WDG to soils with less than 0.5% organic matter. Do NOT use more than 8.0 ounces of Sinbar 80WDG per acre per year unless otherwise directed on the label.

### New Planting-Postemergence (summer)

Clethodim--0.094 to 0.125 lb/A. Apply 6.0 to 8.0 fluid ounces per acre Select 2EC with oil concentrate to be 1 percent of the spray solution (1 gallon per 100 gallons of spray solution) or 12 to 16 fluid ounces of Select Max 0.97EC with nonionic surfactant to be 0.25% of the spray solution (1.0 quart per 100 gallons of spray solution) postemergence to control many annual and certain perennial grasses, including annual bluegrass. Select will not consistently control goosegrass. The use of oil concentrate with Select 2EC may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 4 days.

Sethoxydim--0.2 to 0.4 lb/A. Apply 1.0 to 2.0 pints per acre Poast 1.5EC with oil concentrate to be 1 percent of the spray solution (1.0 gallon per 100 gallons of spray solution) postemergence to control annual grasses and certain perennial grasses. The use of oil concentrate may increase the risk of crop injury when hot or humid conditions prevail. To reduce the risk of crop injury, omit additives or switch to nonionic surfactant when grasses are small and soil moisture is adequate. Control may be reduced if grasses are large or if hot, dry weather or drought conditions occur. For best results, treat annual grasses when they are actively growing and before tillers are present. Repeated applications may be needed to control certain perennial grasses. Yellow nutsedge, wild onion, or broadleaf weeds will not be controlled. Do not tank-mix with or apply within 2 to 3 days of any other pesticide unless labeled, as the risk of crop injury may be increased, or reduced control of grasses may result. Observe a minimum preharvest interval of 7 days and apply no more than 2.5 pints per acre in one season.

Terbacil--0.1 to 0.3 lb/A. Apply 2.0 to 6.0 dry ounces of Sinbar 80WDG per acre in late summer or early fall to control winter annual broadleaf weeds. Use lower rates on coarse-textured sandy soils low in organic matter, and higher rates on fine-textured silt and clay soils high in organic matter. DO NOT add surfactant, oil concentrate, or any other spray additive, or tank-mix with any other pesticide unless the mixture is approved on the Sinbar 80WDG label. If the crop is not dormant at the time of application, the spray must

be followed immediately by 0.5 to 1.0 inches of irrigation or rainfall to wash the Sinbar 80WDG off the foliage, or unacceptable crop injury may result.

University data has shown that more consistent weed control and less crop injury occurs when 0.05 lb/A, 1.0 dry Ounce, of Sinbar 80WDG is applied at 3 week intervals. Begin applications 3 to 6 weeks after transplanting, when the strawberries have 3 new full size trifoliate leaves, but before weeds exceed 1 inch in height.

Certain varieties differ in their sensitivity to Sinbar 80WDG. Determine varietal tolerance before spraying field. DO NOT apply Sinbar 80WDG to soils with less than 0.5% organic matter. DO NOT use more than 8 ounces of Sinbar 80WDG per acre per year unless otherwise directed on the label.

### **New Planting-Late Fall Dormant**

DCPA--6.0 to 9.0 lb/A. Apply 8.0 to 12.0 pints per acre Dacthal 6F. Apply to weed-free soil in the fall and repeat in early spring, but do not apply after bloom. Primarily controls annual grasses and certain broadleaf weeds.

Napropamide--2.0 to 3.0 lb/A. Apply 4.0 to 6.0 quarts per acre of Devrinol 2-XT (or OLF). Apply in late fall through early winter (not on frozen ground) or in early spring. Do not apply from bloom through harvest. Rainfall or irrigation will increase effectiveness. Primarily controls annual grasses and certain broadleaf weeds, including chickweed spp.

Clethodim--0.094 to 0.125 lb/A. (See the preceding "Clethodim" paragraph.)

Sethoxydim--0.2 to 0.4 lb/A. (See the preceding "Sethoxydim" paragraph.)

Terbacil--0.1 to 0.2 lb/A. Apply 2.0 to 4.0 dry ounces of Sinbar 80WDG per acre just prior to mulching in late fall to extend weed control through harvest the following spring. Controls many annual broadleaf weeds, but may be weak on pigweed species. Use lower rates on coarse textured sandy soils low in organic matter, and higher rates on fine textured silt and clay soils high in organic matter. Do NOT add surfactant, oil concentrate, or any other spray additive. Do NOT apply within 110 days of harvest.

Certain varieties differ in their sensitivity to Sinbar. Determine varietal tolerance before spraying field. DO NOT apply Sinbar 80WDG to soils with less than 0.5% organic matter. DO NOT use more than 8 ounces of Sinbar per acre per year unless otherwise directed on the label.

### **Bearing Year-Late Winter or Early Spring**

Clopyralid--0.047 to 0.250 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Stinger 3A or OLF to control weeds in strawberries in New Jersey, Maryland, Pennsylvania, and Virginia. The legal use of this product may require a waiver of Liability that has been signed by the grower, and returned to Dow AgroSciences.** Apply 2.0 to 10.5 fluid ounces of Stinger 3A or OLF per acre in one or two applications during the spring to control certain annual and perennial broadleaf weeds. Observe a minimum preharvest interval (PHI) of 30 days. When two applications are used to control susceptible hard-to-kill perennial weeds, spray the first application in the spring at least 30 days before harvest and second application at renovation, after harvest. Stinger or OLF controls weeds in the Composite and Legume plant families. Common annuals controlled include galinsoga, ragweed species, common

cocklebur, groundsel, pineappleweed, clover, and vetch. Perennials controlled include Canada thistle, goldenrod species, aster species, and mugwort (wild chrysanthemum). Stinger or OLF is very effective on small seedling annual and emerging perennial weeds less than 2 to 4 inches tall, but is less effective and takes longer to work when weeds are larger. Use 2.0 to 4.0 fluid ounces to control annual weeds less than 2 inches tall. Increase the rate to 4.0 to 8.0 fluid ounces to control larger annual weeds. Apply the maximum rate of 10.5 fluid ounces, in one or split into two applications to suppress or control perennial weeds, but do not exceed 10.5 fluid ounces in one year. Spray additives are not needed or required by the label, and are not recommended. Do NOT tank-mix Stinger or OLF with other herbicides registered for use in strawberries. A generic formulation of clopyralid, called Spur, is labeled in all states, but only allows one application per year after harvest. Observe a minimum preharvest interval (PHI) of 30 days. Stinger or OLF is a postemergence herbicide with residual soil activity. Observe crop restrictions or injury may occur from herbicide carryover.

DCPA--6.0 to 9.0 lb/A. Apply 8.0 to 12.0 pints per acre Dacthal 6F. Apply anytime to weed-free soil in the early spring. Do not apply after bloom. Primarily controls annual grasses and certain broadleaf weeds.

Flumioxazin--0.096 lb/A. Apply 3.0 dry ounces of Chateau 51WDG to established stands of matted row strawberries in late winter or early spring when strawberries are dormant, or as a hooded or shielded spray between the rows of strawberries on plastic mulch before fruit set. Controls many annual broadleaf weeds, and suppresses or controls wild pansy. Tank-mix with 2,4-D to improve the spectrum of weeds controlled when treating dormant matted row strawberries, or tank-mix with Gramoxone when applying a hooded or shielded spray between the rows of strawberries grown on plastic mulch. Oil concentrate at 1% of the spray solution (1.0 gallon per 100 gallons of spray solution) or nonionic surfactant at 0.25% of the spray solution (1.0 quart per 100 gallons of spray solution) may be added to improve the control of emerged weeds, but may also increase the risk of crop injury.

Napropamide--2.0 to 3.0 lb/A. Apply 4.0 to 6.0 quarts per acre Devrinol 2-XT (or OLF). Apply in late fall through early winter (not on frozen ground) OR in early spring. Do not apply from bloom through harvest. Rainfall or irrigation will increase effectiveness. Primarily controls annual grasses and certain broadleaf weeds.

Clethodim--0.094 to 0.125 lb/A. (See the preceding "Clethodim" paragraph.)

Sethoxydim--0.2 to 0.4 lb/A. (See the preceding "Sethoxydim" paragraph.)

2,4-D--1.0 to 1.5 lb/A. Apply 1.0 to 1.5 quarts per acre amine form of 2,4-D (Formula 40) to established stands in late winter or early spring when the strawberries are dormant. Controls many broadleaf weeds. Do not apply unless possible injury to the crop is acceptable. Do not apply 2,4-D between mid-August and winter dormancy, as it may affect flower bud formation, resulting in distorted berries.

### **Bearing Year Renovation-Summer**

Clopyralid--0.047 to 0.250 lb/A. **A Special Local-Needs Label 24(c) has been approved for the use of Stinger 3A**

**or OLF to control weeds in strawberries in New Jersey, Maryland, Pennsylvania, and Virginia. The legal use of this product may require a waiver of Liability that has been signed by the grower, and returned to Dow AgroSciences.** Apply 2.0 to 10.5 fluid ounces of Stinger 3A or OLF per acre in one or two applications to control certain annual and perennial broadleaf weeds. When two applications are used to control susceptible hard-to-kill perennial weeds, spray the first application in the spring at least 30 days before harvest and second application at renovation, after harvest. Stinger or OLF controls weeds in the Composite and Legume plant families. Common annuals controlled include galinsoga, ragweed species, common cocklebur, groundsel, pineappleweed, clover, and vetch. Perennials controlled include Canada thistle, goldenrod species, aster species, and mugwort (wild chrysanthemum). Stinger or OLF is very effective on small seedling annual and emerging perennial weeds less than 2 to 4 inches tall, but is less effective and takes longer to work when weeds are larger. Use 2 to 4 fluid ounces to control annual weeds less than 2 inches tall. Increase the rate to 4 to 8 fluid ounces to control larger annual weeds. Apply the maximum rate of 10.5 fluid ounces, in one or split into two applications to suppress or control perennial weeds, but do not exceed 10.5 fluid ounces in one year. Spray additives are not needed or required by the label, and are not recommended. **DO NOT** tank-mix Stinger or OLF with other herbicides registered for use in strawberries. Observe a minimum preharvest interval (PHI) of 30 days. Stinger or OLF is a postemergence herbicide with residual soil activity. Observe follow crop restrictions or injury may occur from herbicide carryover.

DCPA--6.0 to 9.0 lb/A. Apply 8.0 to 12.0 pints per acre Dacthal 6F. Apply anytime after harvest to weed-free soil. Primarily controls annual grasses and certain broadleaf weeds.

Paraquat--0.5 lb/A. Apply 2.0 pints per acre of Gramoxone SL 2.0 or OLF as a directed shielded spray to control emerged weeds between the rows after crop establishment. Add nonionic surfactant to be 0.25% of the spray solution (1.0 quart per 100 gallons of spray solution). Do not allow spray or spray drift to contact the crop or injury may result. Use shields to prevent spray contact with the crop plants. Do not exceed a spray pressure of 30 psi. Do not apply more than 3 times per season. See the label for additional information and warnings.

Terbacil--0.2 to 0.4 lb/A. Apply 4.0 to 8.0 ounces per acre Sinbar 80WDG at postharvest renovation after old leaves have been removed but before new growth begins. Primarily controls broadleaf weeds but does NOT control pigweed species. Use Devrinol, Dacthal, or Poast 1.5 EC to control annual grasses. Use lower rates on coarse-textured sandy soils low in organic matter, and higher rates on fine-textured silt and clay soils high in organic matter. **DO NOT** add surfactant, oil concentrate, or any other spray additive. Certain varieties differ in their sensitivity to Sinbar 80WDG. Determine varietal tolerance before spraying field. **DO NOT** apply Sinbar 80WDG to soils with less than 0.5% organic matter. **DO NOT** use more than 8.0 ounces of Sinbar 80WDG per acre per year unless otherwise directed on the label.

Clethodim--0.094 to 0.125 lb/A. (See the preceding "Clethodim" paragraph.)

Sethoxydim--0.2 to 0.4 lb/A. (See the preceding "Sethoxydim" paragraph.)

2,4-D--1.0 to 1.5 lb/A. Apply 1.0 to 1.5 quarts per acre amine form of 2,4-D (Formula 40) to established stands immediately after the last picking. Controls many broadleaf weeds. Do not apply 2,4-D between mid-August and winter dormancy, as it may affect flower bud formation, resulting in distorted berries.

### **Established Planting-Late Fall Dormant**

DCPA--6.0 to 9.0 lb/A. Apply 8.0 to 12.0 pints per acre Dacthal 6F. Apply to weed-free soil in the fall and repeat in early spring, but do not apply after bloom. Primarily controls annual grasses and certain broadleaf weeds.

Napropamide--2.0 to 3.0 lb/A. Apply 4.0 to 6.0 quarts per acre Devrinol 2-XT (or OLF). Apply in late fall through early winter (not on frozen ground) **OR** in early spring. Do not apply from bloom through harvest. Rainfall or irrigation will increase effectiveness. Primarily controls annual grasses and certain broadleaf weeds, including chickweed spp.

Clethodim--0.094 to 0.125 lb/A. (See the preceding "Clethodim" paragraph.)

Sethoxydim--0.2 to 0.4 lb/A. (See the preceding "Sethoxydim" paragraph.)

Terbacil--0.2 to 0.4 lb/A. Apply 4.0 to 8.0 dry ounces of Sinbar 80WDG per acre just prior to mulching in late fall to extend weed control through harvest the following spring. Controls many annual broadleaf weeds, but may be weak on pigweed species. Use lower rates on coarse-textured sandy soils low in organic matter, and higher rates on fine-textured silt and clay soils high in organic matter. **DO NOT** add surfactant, oil concentrate, or any other spray additive. **DO NOT** apply within 110 days of harvest.

Certain varieties differ in their sensitivity to Sinbar 80WDG. Determine varietal tolerance before spraying field. **DO NOT** apply Sinbar 80WDG to soils with less than 0.5% organic matter. **DO NOT** use more than 8 ounces of Sinbar 80WDG per acre per year unless otherwise directed on the label.

### **Insect Control**

#### **THE LABEL IS THE LAW. PLEASE REFER TO THE LABEL FOR UP TO DATE RATES AND RESTRICTIONS**

**NOTE:** Copies of specific insecticide product labels can be downloaded by visiting websites [www.CDMS.net](http://www.CDMS.net) or [www.greenbook.net](http://www.greenbook.net). Also, specific labels can be obtained via web search engines.

#### **Aphids, Spittlebug**

Apply one of the following formulations 10 days after new growth begins:

acetamiprid--1.9 to 4.0 oz/A Assail 30SG (or OLF)

azadirachtin--15.0 to 30.0 fl oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**

bifenthrin--6.4 to 32 fl oz/A Brigade WSB (or OLF)

diazinon (**aphids only**)--1.0 pt/A Diazinon AG500 (or OLF)

fenpropathrin (**spittlebugs only**)--10.67 fl oz/A Danitol 2.4EC

imidacloprid--**foliar** - 1.3 fl oz/A Admire Pro (or OLF) (aphids, spittlebug); **soil** - 10.5 to 14 fl oz Admire Pro (or OLF) (aphids only)

neem extract (**aphids only**)--0.5 to 1.0% of Trilogy solution  
**OMRI listed**  
 rosemary oil+peppermint oil--1.0 to 4.0 pt/A Ecotec **OMRI listed**  
 thiamethoxam--**soil** 1.70 to 4.01 oz/A Platinum 75SG; **foliar** 1.5 to 3.0 oz/A Actara 25WDG (**aphids only**)  
 thiamethoxam+chlorantraniliprole--**foliar** 2.0 to 4.0 oz/A Voliam Flexi (**aphids only**)

### Leafroller

Apply one spray 10 days after full bloom:

acetamiprid--4.0 to 6.9 oz/A Assail 30SG (or OLF) **Oblique banded leafroller only**  
 azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 bifenthrin--6.4 to 32.0 oz/A Brigade WSB (or OLF)  
 carbaryl--1.0 to 2.0 qt/A Sevin XLR Plus (or OLF)  
 diazinon--1.0 pt/A Diazinon AG500 (or OLF)  
 flubendiamide--2.0 to 2.4 fl oz/A Belt (or other labeled mixtures containing flubendiamide like Vetica)  
 pyrethrins--4.5 to 18.0 fl oz/A PyGanic EC 5.0 II; 16.0 to 64.0 fl oz Pyganic EC 1.4 II **OMRI listed**  
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC  
 spinosad--4.0 to 6.0 fl oz/A Entrust SC **OMRI listed**

### Potato Leafhopper

Apply one of the following formulations:

acetamiprid--1.9 to 4.0 oz/A Assail 30SG (or OLF)  
 azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 malathion--1.5 to 3.0 pt/A Malathion 57 EC (or OLF)  
 pyrethrins--4.5 to 18.0 fl oz/A PyGanic EC 5.0 II; 16.0 to 64.0 fl oz Pyganic EC 1.4 II  
 thiamethoxam--**soil** 1.70 to 4.01 oz/A Platinum 75SG, **foliar** 1.5 to 3.0 oz/A Actara 25WDG (or other labeled mixtures containing thiamethoxam like Voliam flexi)

### Root Weevils

Note: Foliar sprays target adults. Soil applications target larvae. Apply one of the following formulations:

bifenthrin--8.0 to 32.0 oz/A Brigade WSB (or OLF)  
 Entomopathogenic nematodes (use *Heterorhabditis bacteriophora*). Apply 1-2 billion per acre during evening or early morning when soil temperatures are 60°F (15.6°C) or greater, then irrigate them into the soil.  
 malathion--1.5 to 3.0 pt/A Malathion 57EC (or OLF)  
 thiamethoxam--**soil** 1.70 to 4.01 oz/A Platinum 75SG; **foliar** 4.0 oz/A Actara 25WDG

### Sap Beetles

Sap beetles are attracted to ripe, decaying fruit and bore into berries. They are a nuisance, especially in Pick-Your-Own fields where rotting, over-ripe berries abound. Preventing the accumulation of decaying fruit on or between beds is one way of avoiding beetle buildup. Apply one of the following formulations:

acetamiprid--4.0 to 6.9 oz/A Assail 30SG (or OLF)  
 azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 bifenthrin--6.4 to 32.0 oz/A Brigade WSB (or OLF)  
 fenpropathrin--16.0 to 21.3 fl oz/A Danitol 2.4 EC  
 novaluron--12.0 fl oz/A Rimon 0.83EC

### Slugs

Slugs prefer a cool, wet, dark environment. Mulch, weeds, and other plant trash in beds during a wet spring provide the perfect setting for their development. Mulch removal and adequate weed control are two ways to reduce the slug population. Apply one of the following formulations: metaldehyde--see labels for rates.

iron phosphate--20.0 to 44.0 lb/A Sluggo (or OLF) **OMRI listed**

### Strawberry Rootworm

Use of broad-spectrum insecticides for other pests will aid in controlling strawberry rootworm.

### Spotted Wing Drosophila

Spotted wing drosophila has been problematic on day-neutral strawberries during late summer and fall, but not on strawberries earlier in the season. Apply one of the following formulations:

novaluron--12.0 fl oz/A Rimon 0.83EC  
 azadirachtin + pyrethrins--2.0 to 3.0 pt/A Azera **OMRI listed**  
 bifenthrin--16.0 oz/A Brigade WSB (or OLF)  
 malathion--1.0 pt/A Malathion 8F (or OLF)  
 pyrethrins--4.5 to 18.0 fl oz/A PyGanic EC 5.0 II; 16.0 to 64.0 fl oz Pyganic EC 1.4 II **OMRI listed**  
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC (NY only)  
 spinosad--4.0 to 6.0 fl oz/A Entrust SC **OMRI listed**

### Strawberry Weevil (Strawberry Clipper)

Apply one of the following formulations after new growth starts and before fruit buds are visible. Repeat 10 days later:

azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 bifenthrin--6.4 to 32.0 oz/A Brigade WSB (or OLF)  
 carbaryl--1.0 to 2.0 qt/A Sevin XLR  
 chlorpyrifos--1.0 qt/A Lorsban Advanced (or OLF). Apply when buds first appear and again 10-14 days later. DO NOT apply after blossoms are open.  
 fenpropathrin--16.0 to 21.3 fl oz/A Danitol 2.4 EC

### Tarnished Plant Bug

Apply one of the following formulations:

acetamiprid--4.0 to 6.9 oz/A Assail 30SG (or OLF)  
 azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 bifenthrin--6.4 to 32.0 oz/A Brigade WSB (or OLF)  
 fenpropathrin--10.67 fl oz/A Danitol 2.4EC  
 pyrethrins--4.5 to 18.0 fl oz/A PyGanic EC 5.0 II; 16.0 to 64.0 fl oz Pyganic EC 1.4 II **OMRI listed**  
 rosemary oil+peppermint oil--1.0 to 4.0 pt/A Ecotec **OMRI listed**

### Thrips

Apply one of the following formulations:

acetamiprid--4.0 to 6.9 oz/A Assail 30SG (or OLF)  
 azadirachtin--15.0 to 30.0 oz/A Ecozin Plus 1.2% ME (or OLF) **OMRI listed**  
 neem extract--0.5 to 1.0% of Trilogy solution **OMRI listed**  
 pyrethrins--4.5 to 18.0 fl oz/A PyGanic EC 5.0 II; 16.0 to 64.0 fl oz Pyganic EC 1.4 II **OMRI listed**  
 rosemary oil+peppermint oil--1.0 to 4.0 pt/A Ecotec **OMRI listed**  
 spinetoram--6.0 to 10.0 fl oz/A Radiant SC  
 spinosad--4.0 to 6.0 fl oz/A Entrust SC **OMRI listed**

**Two-Spotted Spider Mite (TSSM)**

For best results, control TSSM early in the spring before eggs are laid. Thorough underleaf spray coverage is necessary. For resistance management, alternate materials with different modes of action. Apply one of the following formulations:

- abamectin--16.0 fl oz/A Epi-mek 0.15 EC (Temprano, or OLF)
- acequinocyl--21.0 to 31.0 fl oz/A Kanemite 15SC
- bifenazate--0.75 to 1.00 lb/A Acramite 50WS
- etoxazole--2.0 to 3.0 oz/A Zeal Miticide<sup>1</sup>
- fenbutatin-oxide--1.5 to 2.0 lb/A Vendex 50WP (or OLF)
- fenpyroximate--2.0 pt/A Portal
- hexythiazox--6.0 oz/A Savey 50DF (or OLF)
- neem extract--0.5 to 2.0% of Trilogy solution **OMRI listed**
- rosemary oil+peppermint oil--1.0 to 4.0 pt/A Ecotec **OMRI listed**
- spiromesifen--12.0 to 16.0 fl oz/A Oberon 2SC

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest
<b>INSECTICIDE</b>			
abamectin	R	12	3
acequinocyl	G	12	1
acetamiprid	G	12	1
azadirachtin	G	4	see label
azadirachtin + pyrethrins	G	12	see label
bifenazate	G	12	1
bifenthrin	R	12	0
buprofezin	G	12	3
carbaryl (foliar)	G	12	7
chlorpyrifos	R	24	21
diazinon	R	72	5
etoxazole	G	12	1
fenbutatin-oxide	R	48	1
fenpropathrin	R	24	2
fenpyroximate	G	12	1
flubendiamide	G	12	1
flubendiamide + buprofezin	G	12	1
hexythiazox	G	12	3
imidacloprid (soil/foliar)	G	12	14/7
iron phosphate	G	0	0
malathion	G	12	3
metaldehyde <sup>3</sup>	G	12	see labels
neem extract	G	4	0
novaluron	G	12	1
pyrethrins	G	12	0
rosemary + peppermint oil	G	4	0
spinetoram	G	4	1
spinosad	G	4	1
spiromesifen	G	12	3
thiamethoxam(soil/foliar)	G	12	75/3
thiamethoxam+ chlorantraniliprole	G	12	3
<b>FUNGICIDE (FRAC code)</b>			
Abound (Group 11)	G	4	0
Aliette (Group 33)	G	12	0.5
Cabrio (Group 11)	G	12	0
Captan (Group M4)	G	24	0
Captex (Group M4)	G	24	0
Captivate (Groups 17 + M4)	G	24	0
copper, fixed (Group M1)	G	see label	0
Elevate (Group 17)	G	12	0
Fontelis (Group 7)	G	12	0
Inspire Super (Groups 3 + 9)	G	12	0
Mettle (Group 3)	G	12	0

(table continued next column)

Pesticide	Use Category <sup>1</sup>	Hours to Reentry <sup>2</sup>	Days to Harvest
<b>FUNGICIDE (FRAC code)</b>			
Phosphite salts (Group 33)	G	4	0
Pristine (Groups 11 + 7)	G	12	0
Procure (Group 3)	G	12	1
Quadris Top (Groups 11+3)	G	12	0
Quintec (Group 13)	G	12	1
Rally (Group 3)	G	24	0
Rampart (Group 33)	G	4	0
Ridomil Gold (Group 4)	G	48	0
Rovral (Group 2)	G	24	prebloom
Switch (Groups 9 + 12)	G	12	0
Thiram (Group M3)	G	24	3
Topsin M (Group 1)	G	24	1
Torino (Group U6)	G	4	0
Ultra Flourish (Group 4)	G	48	0

See Table D-6.

<sup>1</sup> G = general, R = restricted

<sup>2</sup> Chemicals with multiple designations are based on product and/or formulation differences. CONSULT LABEL

<sup>3</sup> Depends on product formulations. CONSULT LABEL

**Nematode Control**

See Chapter E - "Nematodes" section of Soil Pests--Their Detection and Control. Use fumigants listed in the "Soil Fumigation" section.

**Disease Control**

**Dip Treatments for Freshly Dug (Bare Root) Transplants**

Use 5.0 to 8.0 fl oz/ of Abound or Switch per 100 gal. of water for plants with a known anthracnose problem. Dip entire plant for 2 to 5 minutes, then plant as quickly as possible. Phosphite fungicide can be used to suppress *Pythium* or *Phytophthora*. See labels for specific details.

**Angular Leaf Spot**

This disease may cause caps to turn brown or black resulting in unmarketable fruit. Planting disease-free plants is critical. If symptoms appear after plants are established, applying fixed copper products can help, but not if weather is highly favorable to the disease. Overhead irrigation/frost protection will make this disease worse. Discontinue fixed copper applications if plant injury occurs, usually after 4 to 5 sprays.

**Anthracnose Fruit Rot**

Begin sprays no later than 10% bloom or prior to disease development and continue on a 7 to 10 day interval. Use the higher rate and shorter intervals when disease pressure is high. Do not make more than two (2) consecutive applications of fungicides other than captan or thiram before switching to a fungicide in a different chemical class. Maintain continuous coverage of captan and/or a FRAC Group 11 (strobilurin) fungicide, by applying the following combinations:

**Application #1:**

Captan--3.7 lb 80WDG/A or Thiram 4.4 lb 75WDG/A tank-mixed with

Pristine--18.5 to 23.0 oz 38 WG/A or Cabrio--12.0 to 14.0 oz 20EG/A

**Application #2, apply one of the following:**

Captivate--3.5 to 5.25 lb 68WDG/A

Captan--3.7 lb 80WDG/A or OLF

**Application #3:**

Captan--3.7 lb 80WDG/A or OLF or Thiram 4.4 lb/A 480DP/A

*tank-mixed with*

Pristine--18.5 to 23.0 oz 38WG/A or Cabrio--12.0 to 14.0 oz 20EG/A

For subsequent applications, rotate among the following fungicides or fungicide combinations:

Captan--1.9 to 3.7 lb 80WDG/A or OLF

Elevate--1.1 to 1.5 lb 50WDG/A *plus* Cabrio--12.0 to 14.0 oz 20EG/A

Pristine--18.5 to 23.0 oz 38WG/A

Switch--11.0 to 14.0 oz. 62.5WG/A *plus* Cabrio--12.0 to 14.0 oz 20EG/A

When wet weather persists or during bloom, include Elevate or Switch to improve Botrytis control.

**Anthracnose Crown Rot**

This disease is caused by *Colletotrichum gloeosporioides* as opposed to *C. acutatum* that causes mostly fruit rot. These two species respond to fungicides very differently and same product may not be effective against both diseases. Do not apply Quadris Top more than twice before rotating with Captan or Switch on a 10-14 day schedule.

Captan--3.7 lb 80WDG/A or OLF or Thiram 4.4 lb/A 480DP/A

Quadris Top--12 to 14 fl oz/A

Switch--11.0 to 14.0 oz. 62.5WG/A

**Gray Mold (Botrytis Fruit Rot)**

Start sprays when plants begin to bloom, because 90% of fruit infections occur through the flower, and repeat every 7-10 days. Increase spray intervals during persistent dry periods, but decrease intervals to 5-7 days during very wet periods. Four weekly sprays starting at 5-10% bloom are usually sufficient for season-long control. Tank-mix and rotate fungicides from different FRAC codes to reduce the chances for fungicide resistance development.

**Application #1, apply one of the following:**

Captan--3.7 lb 80WDG/A or OLF

Thiram--4.4 lb 480DP/A

Switch--11.0 to 14.0 oz. 62.5WG/A

**Application #2, apply one of the following:**

If resistance is unlikely on your farm:

Elevate--1.1 to 1.5 lb 50WDG/A

Fontelis--16.0 to 24.0 fl oz 1.67SC/A (except Jewel, L'Amour, and Clancy varieties)

If testing, observation or frequent prior use of the above materials indicates high resistance risk:

Captevat--3.5 to 5.25 lb 68WDG/A

Captan--3.7 lb 80WDG/A or OLF

Thiram--4.4 lb 480DP/A

**Application #3:**

same as Application #1

For subsequent applications, rotate between two or more of the following fungicides:

Captan--3.7 lb 80WDG/A

Captevat--3.5 to 5.25 lb 68WDG/A

Elevate 1.1 to 1.5 lb 50WDG/A

Switch--11.0 to 14.0 oz. 62.5WG/A

Fontelis--16.0 to 24.0 fl oz 1.67SC/A (except Jewel, L'Amour, and Clancy varieties)

**Note: If Pristine is included in the schedule for anthracnose control, in most cases that provides satisfactory gray mold control and separate application of specific products may not be necessary.**

**Fungal Leaf Blight, Leaf Scorch and Leaf Spot**

Leaf diseases are not usually problematic in strawberries, particularly in the fall or early spring. Incidence may be associated with plant source, but prolonged warm, wet weather favors increased disease. In such cases, don't make more than 2 consecutive applications of FRAC Group 11 fungicides (Cabrio & Pristine) before switching to another product to reduce chances of fungicide resistance development. **Apply one of the following:**

Captan--3.8 lb 80WDG/A or OLF

Captec--3.0 qt/A 4L/A

Captan--2.5 lb 80WDG/A or OLF *plus* Topsin-M--1.0 lb 70WP/A

Cabrio--12.0 to 14.0 oz. 20EG/A

Pristine--18.5 to 23.0 oz 38WG/A

Rally--2.5 to 5.0 oz 40WSP/A

Rovral--1.5 to 2.0 pt 4FL/A (prebloom only)

**Powdery Mildew**

Unless symptoms are severe, crop losses are rare in the fall and the disease may not reappear in the spring. Check both sides of leaves in the spring for disease pressure. Severe disease during spring may justify fungicide application on a 14 to 21 day interval. To reduce chances of fungicide resistance developing, don't make more than 2 consecutive applications of FRAC Group 11 fungicides (Cabrio and Pristine). Apply one of the following:

Cabrio--12.0 to 14.0 oz 20EG/A

Rally--2.5 to 5.0 oz 40WSP/A

Pristine--18.5 to 23.0 oz 38WG/A

Procure--4.0 to 8.0 oz 50WSP/A

Quintec--4.0 to 6.0 fl oz 2.08SC/A

Torino--3.4 oz 0.85SC/A

Mettle--3.0 to 5.0 fl oz 125ME/A

Inspire Super--16.0 to 20.0 fl oz 2.8F/A

**Virus Diseases**

Use certified, virus-free plants.

**Red Stele and Phytophthora Crown Rot**

Where possible, prevent spread of the red stele pathogen via cultivation equipment and/or surface runoff water. Selecting fields with well-drained soils and planting on high, raised beds will help reduce disease. Crop rotation may be of little value, as the red stele pathogen persists in soil for many years, and persistence of the crown rot pathogen is unknown. However, disease is very unlikely when clean plants are introduced to soil with no history of strawberry production. If red stele is present, use resistant varieties such as 'Allstar', 'Earliglow', 'Guardian' and 'LATESTAR', which have resistance to several races. No resistant cultivars are available for crown rot. The following fungicides can be applied as preplant dips (for "freshly dug" or "bare root" transplants), foliar sprays, or by drip irrigation for additional control. See section on preplant dips for further information on this method. For other application methods:

**New Plantings**

Foliar sprays of phosphite products should begin 14 to 21 days after planting and continue on a 30 to 60 day interval as long as favorable disease conditions occur. These products include:

- Aliette--2.5 to 5.0 lb 80WDG/A
- Phosphite salts--1.0 to 3.0 qt/A or OLF
- Rampart--1.0 to 3.0 qt/A

Fungicides containing mefenoxam or metalaxyl can be applied as sprays or through drip irrigation. These fungicides include:

- Ridomil Gold--1.0 pt 4SL/*treated A*
- Ultra Flourish--2.0 pt 2F/*treated A*
- Metastar 2E--2.0 qt 2F/*treated A*

Calculate the correct rate for drip applications as for a banded spray:

$$\frac{\text{Width of Bed (in inches)}}{\text{Bed Spacing (in inches)}} \times \text{Broadcast rate of fungicide} = \text{Fungicide rate for Drip Application}$$

Bed Spacing (in inches)

For example, for strawberries planted in beds on 5 ft (60 inch) centers:

$$\frac{30 \text{ inch-wide bed}/60 \text{ inches between beds}}{60 \text{ inches}} \times 1 \text{ pt/A} = 0.5 \text{ pt 4SL/A of strawberry.}$$

**Established Plantings**

Spring applications should begin when plants start active growth and before 1<sup>st</sup> bloom. Foliar sprays of phosphite products should be repeated every 30 to 60 days as long as weather conditions favor disease development. These products include:

- Aliette--2.5 to 5.0 lb 80WDG/A
- Phosphite salts--1.0 to 3.0qt/A
- Rampart--1.0 to 3.0 qt/A

Fungicides containing mefenoxam or metalaxyl can be applied as sprays or through drip irrigation. The first spring application should be made when plants start active growth before 1<sup>st</sup> bloom. A second spring application may be made at fruit set when Ridomil Gold is used, but not Meta Star or Ultra Flourish. All 3 products may be applied to perennial plantings in the fall after harvest has been completed. These fungicides include (apply one of the following):

- Ridomil Gold--1.0 pt 4SL/*treated A*
- Ultra Flourish--2.0 pt 2E/*treated A*

Calculate the correct rate for drip applications as for a banded spray:

$$\frac{\text{Width of Bed (in inches)}}{\text{Fungicide rate for Drip Application Bed Spacing (in inches)}} \times \text{Broadcast rate of fungicide} =$$

For example, for strawberries planted in beds on 5 ft (60 inch) centers:

$$\frac{30 \text{ inch-wide bed}/60 \text{ inches between beds}}{60 \text{ inches}} \times 1 \text{ pt/A} = 0.5 \text{ pt 4SL/A of strawberry}$$

**Black Root Rot**

This is a disease complex caused by cultural stresses coupled with many different fungi and by nematode feeding injury, and is the main reason for preplant fumigation of strawberry. The most prevalent fungi associated with the disease are *Rhizoctonia* and *Pythium*. Crop rotation of 4 to 5 years will reduce the incidence of black root rot. In fields with a high water table, the use of raised beds will provide some control. If rotation is not an option, preplant fumigation may be helpful. Fumigants listed in the "Section E-Soil Fumigation" can be used.

## SUMMER SQUASH

### Varieties<sup>1</sup> Summer Squash Variety Selection Guide

Variety	Reported Disease Resistance <sup>2</sup>					Comments
	CMV	WMV2	ZYMV	PRSV	PM <sup>4</sup>	
<b>Scallop Types</b>						
Flying Saucer						Yellow and Green Fruit
Garden Sun						Yellow Fruit
Peter Pan						Light Green Fruit
Starship						Dark Green Fruit
Sunburst						Golden Yellow Fruit
Sunny Delight						Yellow Fruit
<b>Specialty Types</b>						
Comela						Middle Eastern Type, Light Green Fruit
Eight Ball						Round Green fruit
Magda						Middle Eastern Type, Light Green Fruit
One Ball						Golden Yellow Round Zucchini Type Fruit

*(Table continued next page)*