F. Commodity Recommendations

Pesticide Use Disclaimer

THE LABEL IS THE LAW
Before using a pesticide, check the label for up to date rates and restrictions.

Labels can be downloaded from: *http://www.cdms.net/, https://www.greenbook.net/* or *http://www.agrian.com/labelcenter/results.cfm*

For more information on Pesticide Safety and the Pesticide Label see chapter D.

Guide to the Recommended Pesticide Tables in the Following Crop Sections:

1. Pesticides are listed by **group or code number based on chemical structure and mechanism of action**, as classified by the Weed Science Society of America (WSSA) for herbicides, the Insecticide Resistance Action Committee (IRAC) for insecticides, and the Fungicide Resistance Action Committee (FRAC) for fungicides.
   If the number is in bold font, the product may have resistance concerns.

2. For **restricted use pesticides**, the restricted active ingredients are labeled with a *****. (See section D 3.2.1 "Restricted Use Classification Statement" for more information).

3. **In addition to the pesticides listed below, other formulations or brands with the same active ingredient(s) may be available. ALWAYS CHECK THE LABEL:**
   a) to ensure a pesticide is labeled for the same use,
   b) to ensure the pesticide is labeled for the desired crop, and
   c) for additional restrictions.

4. All pesticide recommendations are made for spraying a **broadcast area of 1 acre** (43,560 square feet). **Adjust the rate for banded applications** (for more information, see section E 1.3 Calibrating Granular Applicators).

5. Check the label for the maximum amount of pesticide per application and the maximum number of applications per year.

6. **Bee Toxicity Rating (Bee TR)**: N=nontoxic; L=minimum impact on bees; M=moderately toxic, can be used if dosage, timing and method of application are correct, but should NOT be applied directly to the crop if bees are present; H=highly toxic, severe losses expected, -- = data not available.

Strawberries

Note: "**The Mid-Atlantic Berry Guide for Commercial Growers**", a cooperative publication for PA, MD, NJ, DE, WV and VA, provides additional information.

Annual Production System on Plastic Mulch ("Plasticulture")

This system is recommended for DE, MD, NJ, VA, southeastern PA, and for trial in other areas of PA.

Recommended Varieties[1]

Early	Midseason	Late	Day-Neutral
AC Wendy	Camarosa[3] (shipping only)	AC Valley Sunset	Albion[4]
Galletta	Camino Real (VA only)		San Andreas[4]
Sweet Charlie[2]	Chandler		Seascape
	Flavorfest		
	Rutgers Scarlet		

[1]Listed alphabetically. [2]Matures 7-10 days earlier than Chandler; recommended for trial in southern regions of MD. Plant only in areas with low risk of frost; may require overhead sprinkler for additional frost protection during bloom. [3]Must be fully red-ripe for flavor development. [4]Produces light yields throughout the spring summer and fall resulting in moderate total yields for the season.

Recommended Nutrients Based on Soil Tests

In addition to using the table below, check the suggestions on rate, timing, and placement of nutrients in your soil test report and chapter B Soil and Nutrient Management. Your state's soil test report recommendations and/or your farm's nutrient management plan supersede recommendations found below.

Annual System[1] Strawberry		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
	90-120	100	70	40	0-30[2]	165	115	65	0	Total nutrient recommended
	60-75	100	70	40	0-30[2]	165	115	65	0	Broadcast and disk-in
	15-25[2]	0	0	0	0	0	0	0	0	Inject through drip at 1st first flowering in spring
	15-25[2]	0	0	0	0	0	0	0	0	Inject through drip at fruit enlargement, about 2 weeks after first flowering

[1]For plasticulture, fertility rates are based on 5 ft row spacing. Apply 1-2 lb/A of boron with broadcast fertilizer; see also Table B-7 in chapter B Soil and Nutrient Management. [2]Replacement value of 30 lb/A of P_2O_5 is recommended in MD, DE and VA on Very High P soils.
[2] If day-neutrals are being grown, see information under "Irrigation" instead of making applications at these timings.

Background

The annual plasticulture system has the potential for a higher profit than the conventional matted-row system. Establishment costs are higher, but production is earlier (when crop value is highest) and berries are usually larger. Start with small acreage and increase acreage as knowledge and experience with the system is gained. This is an integrated system and all of the following components are important for maximizing production and efficiency.

Site Selection

Plasticulture's highest yields are achieved at locations with a long growing season. Select fields with good surface and internal drainage, a southern exposure, and protection from westerly winds. If you are planning a Pick-Your-Own-Operation, take into account that customers prefer plasticulture over matted rows.

Plant Bed Preparation, Fumigation and Fertilization

Use soil test results to determine specific nutritional needs. Apply 50-75 lb/A actual N, and P_2O_5 and K_2O as indicated by soil test results. Apply 1-2 lb/A of boron unless soil test results indicate above-normal levels, and work into beds. Base additional P, K and B application rates on soil test results. It is particularly important to adjust the soil pH to the 6-6.5 range, see section B 2 Liming Soils in chapter B Soil and Nutrient Management.

Prepare raised beds: 30-40 inches wide and 6-8 inches high on 5- to 6-ft row centers. Beds should be center-crowned and firm. Depending on soil type, plant vigor, and plant tissue test results, inject an additional 30-40 lb/A of N through the drip system in the spring.

Many fumigants will provide weed control. For additional control of weeds that grow around plant holes, and for banded treatments between the mulched beds, see Weed Control below.

Choose from the following options for bed preparation, fumigation and fertilization:

1. Prepare soil, apply fertilizer, then apply fumigant. See section E 1.5 Soil Fumigation in the Pest Management chapter 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 lb/A of Devrinol DF-XT to the surface of the bed and the area between beds. Lay drip irrigation and plastic mulch.

2. Apply fertilizer, prepare raised beds, and inject metam-sodium (Vapam HL) at 56.0 to 75.0 gal/A or 37.0 gal/mulched A. Immediately reshape beds (if necessary to form a firm, crowned bed) and apply 4.0 to 6.0 lb/A 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.

3. Apply fertilizer and prepare raised beds as described above. Apply 4.0 to 6.0 lb/A 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 gal/mulched A. Wait 20 days between fumigation and planting to allow the fumigant to act and to disperse.

Plants and Planting

Use transplant "plugs" propagated from actively growing runner tips. Plugs can be purchased or produced. To produce plugs from runner tips, use a well-drained artificial mix containing 50% peatmoss and 50% horticultural vermiculite or 50% perlite. A poorly drained growing medium promotes root diseases. Consult your Extension office for a list of nurseries that supply plugs and runner tips and/or directions for propagating from tips.

Plugs can easily be planted mechanically with a waterwheel-type planter. Plant the crown of the transplant at soil level, as deep planting can promote decay and shallow planting can cause desiccation of the plant. Space plants 12 inches apart in each of the double rows in a staggered pattern. If using double rows, space rows 12-18 inches apart; this requires a 36- to 40-inch wide bed. The 18-inch between-row spacing has produced high yields. In southern NJ, DE, MD and northern VA, plant in late August to early September for highest first-year yields. In southern VA, plant in late September. In northern NJ and PA, plant in mid to late August. The latest recommended planting date is mid-September.

Alternatively, dormant plants may be planted directly in the field with a tool that allows the roots to be inserted into the soil without digging a hole. Planting time varies from mid-June to mid-July. The roots of dormant plants may also be trimmed to allow planting in 32-cell trays, followed by growing the plants in the trays until planting at the usual time for plug plants.

Irrigation

At planting, overhead irrigation is essential to cool plants and plastic in warm weather and improve establishment. In the fall, irrigation may promote plant growth before row covers are applied. In the spring, overhead mist irrigation may be required for frost and freeze protection. Maintain adequate soil moisture via frequent drip irrigation in the growing season as this is effective in increasing fruit size without wetting the fruit and increasing rots.

When day-neutral varieties are being grown, apply 1 to 2 lb/A of N per week - or more - through the drip system if 60-75 lb of N were incorporated pre-plant. Nitrogen requirements differ with the variety and soil type. On heavier soils, ‘Seascape’ performs well with 1 to 2 lb/A of N per week while ‘Albion’ has shown a higher requirement, requiring 2 to 5 lb/A of N per week. Watch plant growth and decrease rates if leaves become larger than normal and foliage is overly dense.

Row Covers

Floating row covers (FRC) are an essential part of plasticulture systems in the Mid-Atlantic to reduce the desiccating effects of winter winds, for frost and freeze protection during winter and early spring. A few studies have also found use of row covers in the late fall enhanced degree-day accumulation and produced an increase in yield. Ultraviolet light resistant covers, 1-1.4 oz/sq yd and 60-70% light transmission have been effective. Apply FRC between October 15 and November 15, depending on location and planting date, if fall FRC deployment is desired. FRC needs be applied in December for frost and freeze protection over the winter. Remove the FRC at the first signs of flower bud emergence. Leaving the covers on too long may interfere with pollination and increase disease risk. Leave the covers at the edge of the field so plants can be quickly covered if there is a frost warning during blooming.

Pest Control

Use an effective disease control program. If there is a known risk for Phytophthora crown rot caused by *Phytophthora cactorum* on the newly set transplants, apply Ridomil Gold SL 1.0 pt/A through the trickle irrigation system 10 days after transplanting. **Do not exceed 3.0 pt/A per year**. During late summer and fall, insecticides and miticides should be applied to prevent aphids and mites from reaching damaging levels in the spring. After plants are established and just before covering plants with the floating row in the fall, apply a fungicide to control leaf spots. After covers are removed in the spring, maintain a good pest control program. Bloom sprays are important for control of both Botrytis gray mold and anthracnose fruit rot (AFR). See the "Disease Control" and "Insect Control" sections below for materials and rates.

Harvesting

The harvest season lasts about 3 to 4 weeks. For local markets, harvest when fruit tips are red. The Chandler variety grown with the annual system ripens about 1 week earlier than standard varieties grown in matted rows.

Renovation

Strawberries grown on plasticulture can be renovated in July and carried over for a second harvest year. For most varieties, mow tops with a rotary mower, leaving several leaves on the plant. For vigorous varieties and plantings that have thick foliage and numerous crowns (*e.g.*, Sonata), mowing, followed by crown thinning using an asparagus knife to cut away part of the plant or "breaking out" half of the plant by hand may be the most effective technique. After renovation, maintain adequate soil moisture, and insect and disease control. In early September, apply 60 lb/mulched A of N, P_2O_5, and K_2O via drip irrigation and follow the same cultural practices as for a new planting.

Berry size is usually smaller than in the first harvest season. With careful management, marketable yields of renovated beds can be equal to or greater than yields in the first harvest season. Renovation is especially useful if the planting will be harvested as a Pick-Your-Own.

Matted Row Culture

Recommended Varieties[1]

Early	Midseason	Late
AC Wendy	Allstar (VR, RSR)[2]	AC Valley Sunset
Earliglow (RSR)[2]	Darselect	Jewel
	Flavorfest	
	Honeoye[2]	

[1]Listed alphabetically; [2]RSR=red stele resistant; VR=verticillium wilt resistant. [2]Becomes dark and soft under hot conditions.

Recommended Nutrients Based on Soil Tests

In addition to using the table below, check the suggestions on rate, timing, and placement of nutrients in your soil test report and chapter B Soil and Nutrient Management. Your state's soil test report recommendations and/or your farm's nutrient management plan supersede recommendations found below.

Matted Row Strawberry		Soil Phosphorus Level				Soil Potassium Level				
		Low	Med	High (Opt)	Very High	Low	Med	High (Opt)	Very High	
	N (lb/A)	P_2O_5 (lb/A)				K_2O (lb/A)				Nutrient Timing and Method
New Plantings[1]	110-150[2]	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[3]	0	0	0		0	0	0	0	Topdress in spring when plants begin to grow
Established Plantings	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 spring when plants begin to grow

[1]For new plantings, apply 1-2 lb/A of boron (B) with broadcast fertilizer; see Table B-7 for more specific recommendations. [2]Rates are appropriate for lighter soils and should be reduced by about 25% for heavier soils in northern locations. [3]On heavier soils in northern locations, omit this application unless rainfall has been excessive.

Plants and Spacing

Use certified dormant plants packed dry in polyliners. Plant virus-free plants as early in the spring as possible. Plant in rows approximately 4 ft apart with plants 18-30 inches apart in the row. Distance will depend on variety and soil type. The approximate number of plants needed at these spacings is between 4,400 and 7,300/A.

Renovation

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

1. Apply 2,4-D herbicide for broadleaf weed control. Wait 7-8 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 ½-1 inch of soil to cover the crown.
4. Apply topdressing with N, P and K (preferably based on soil test results, or as indicated in the Recommended Nutrients table above).
5. Apply preemergent herbicides and irrigate to incorporate fertilizer and herbicide.

Alternative Strawberry Production Systems

Low Tunnel Production

Low tunnels are a relatively low-cost means for providing protection to plants and fruit. Specific keys to success include using a thin plastic (1 to 1.5-mil) designed for low tunnel use so that the plastic can be pulled taut to avoid slippage and water collection on top of the plastic, and attaching plastic securely. In general, yields are increased, and the percentage of marketable fruit increases as long as cover over the crop is maintained. Labor needs are increased per area, but not necessarily per unit of fruit obtained. This system probably has its greatest value for organic or low-spray growers, and may be used with June-bearing or day-neutral cultivars. Additional information can be found in the "Low Tunnel Strawberry Production Guide" published by the University of New Hampshire and available for download online.

High Tunnel Production: In-ground and Containerized

High tunnel production is feasible within the region, particularly in cooler areas. Production is more likely to be profitable when day-neutral varieties are grown, as they can be grown as an annual crop, and harvested for five months or longer during the planting year. June-bearers may be grown in a plasticulture system within a tunnel; however, growers often find that there are more profitable uses for the space. Plants may be grown either in-ground in a plasticulture system similarly to how the plants would be grown in the field, or in containers. In containerized production, growers are experiencing some success with day-neutral varieties, particularly 'Albion'. Keys to success include using containers that are at least 6 inches deep; using a media that has a good combination of water-holding capacity and drainage, such as a 2:1 peat:coarse perlite mix or media with similar proportions of components; planting as early as possible to encourage early fruiting, and fertigating with an appropriate complete fertilizer constant-feed for your water type at 100 ppm N if growing 'Albion' or 'Cabrillo'. Other cultivars, particularly 'San Andreas' and 'Sweet Ann', appear to have a lower nitrogen requirement. Resist the urge to crowd plants, and leave at least 1' between plants within the row, 2' between rows, and space to walk as plants should grow quite large. Powdery mildew and two-spotted spider mites are two main issues to expect, though not everyone experiences difficulties with them. Be prepared to treat and/or release predatory mites.

Greenhouse Production

Recommendations for greenhouse strawberry production in the mid-Atlantic have not yet been developed; it is uncertain whether greenhouse strawberries can be grown profitably in this region at this time.

Vertical Systems

Use of vertical systems for fruit production in this region has been fraught with difficulty, in part because vertical production is better suited to lower latitudes of the country where the sun angle is higher, and more sunlight reaches the lower portions of the canopy. In our region, poor growth in lower levels of the stack often occurs due to excessive shading from nearby rows, which results in a decreased need for water in lower sections of the stack. This unevenness in watering requirements is difficult to manage unless an extremely porous media is used, which then has its own set of challenges due to low water-holding capacity.

Pollination (see also section A 12 Pollination).
Honeybees and wild bees are important for proper pollination and fruit set. Avoid applying insecticides to flowers or weeds in bloom, as pollinators may be adversely affected. If an insecticide must be applied during bloom, observe the precautions for use. Bee toxicity ratings for pesticides are available in the pesticide tables below.

Weed Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F.

Recommended Herbicides

1. Identify the weeds in each field and select recommended herbicides. More information is available in the "Herbicide Effectiveness on Common Weeds in Vegetables" (Table E-2) in chapter E Pest Management.

2. Minimize herbicide resistance development. Identify the herbicide site of action group number and follow recommended good management practices; **bolded group numbers in tables below are herbicides at higher risk for selecting resistant weed populations.** Include non-chemical weed control whenever possible.

1.A. New Planting: Soil-Applied (Preplant Incorporated or Preemergence)

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
3	Dacthal 6F Dacthal W-75	8 to 12 pt/A 6.0 to 14 lb/A	**DCPA**	6 to 9 lb/A	--	12
-Apply preplant incorporated with shallow cultivation before transplanting, or apply any time after transplanting to weed-free soil. -Dacthal will not control emerged weeds; apply to weed-free soils. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. Results have been most consistent when used in fields with coarse-textured soils low in organic matter, and when the application is followed by rainfall or irrigation. Maximum application not addressed on label.						
5	Sinbar 80WDG	2 to 3 oz/A	**terbacil**	0.1 to 0.15 lb/A	110	12
-Apply after transplanting but before new runner plants start to root. If transplants are allowed to develop new foliage prior to application, the spray must be followed immediately by 0.5-1.0" of irrigation or rainfall to rinse the foliage, or unacceptable crop injury may result. -Controls many annual broadleaf weeds, but may be weak on pigweed species. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. **Do not** apply Sinbar to soils with less than 0.5% 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 label. -Data have shown that more consistent weed control and less crop injury occurs when 0.05 lb/A terbacil (1.0 oz/A Sinbar) is applied at 3 week intervals. Begin applications 3-6 weeks after transplanting, when the strawberries have 3 new full size trifoliate leaves, but before weeds exceed 1 inch in height. Maximum Sinbar application per season: 8.0 oz/A, unless otherwise directed on the label.						
15	Devrinol 2-XT 2EC Devrinol DF-XT 50DF	8 qt/A 8 lb/A	**napropamide**	4 lb/A	--	24
-Labeled for preplant incorporated application with plastic mulch production; apply and uniformly incorporate to a depth of 2 inches. -**Bareground** production: apply to weed-free soil immediately after transplanting. Activate with ½ inch sprinkler irrigation within 24hr after application. Irrigation moves the herbicide into the soil and prevents breakdown of Devrinol by the sun. -**Do not** apply from bloom through harvest. Primarily controls annual grasses and suppresses or controls certain annual broadleaf weeds. -Maximum for Devrinol 2-XT 2EC: 8 qt/A per season. Maximum Devrinol DF-XT 50DF: 8 lb/A per season.						

1.B. New Planting: Postemergence

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 12 to 16 fl oz/A	**clethodim**	0.094 to 0.13 lb/A	4	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.188 lb/A	14	12
	Poast 1.5EC	1 to 2 pt/A	**sethoxydim**	0.19 to 0.38 lb/A	7	12
-**Select 2EC**: use crop oil concentrate (COC) at 1% v/v (1 gal/100 gal of spray solution). **Select Max**: use nonionic surfactant (NIS) at 0.25% v/v (1 qt/100 gal of spray solution). **Fusilade DX**: use COC at 1.0% v/v or NIS at 0.25% v/v. **Poast**: use COC at 1.0% v/v. -**The use of COC 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. -Use lower labeled rates for annual grass control and higher labeled rates for perennial grass control. -Yellow nutsedge, wild onion, wild garlic, and broadleaf weeds will not be controlled. Controls many annual and certain perennial grasses, including annual bluegrass, but Poast is preferred for goosegrass control. For best results treat annual grasses when they are actively growing and before tillers are present. Control may be reduced if grasses are large or under hot or dry weather conditions. -Repeated applications may be necessary to control certain perennial grasses. If repeat applications are necessary, allow 14 days between applications. Rainfastness is 1 h.						

1.B. New Planting: Postemergence, Select, Fusilade, Poast - continued on next page

1.B. New Planting: Postemergence, Select, Fusilade, Poast - continued

-**Do not** tank-mix with or apply within 2 to 3 days of any other pesticide, unless labeled, as this may increase the risk of crop injury or reduce the control of grasses. -**Do not** apply more than 8 fl oz of Select 2EC in a single application and **do not** exceed 32 fl oz/A for the season; **do not** apply more than 16 fl oz of Select Max in a single application and **do not** exceed 64 fl oz/A for the season. -**Do not** apply more than 16 fl oz/A of Fusilade DX in a single application and **do not** exceed 1 pt/A per year. -**Do not** apply more than 2.5 pt/A Poast in single application and **do not** exceed 2.5 pt/A for the season.						
5	Sinbar 80WDG	2 to 6 oz/A	**terbacil**	0.1 to 0.3 lb/A	110	12
-Apply in late summer or early fall to control winter annual broadleaf weeds. If the crop is not dormant at the time of application, the spray must be followed immediately by 0.5-1.0 inches of irrigation or rainfall to rinse the strawberry foliage, or unacceptable crop injury may result. Controls many annual broadleaf weeds, but may be weak on pigweed species. -Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. **Do not** apply Sinbar to soils with less than 0.5% 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 label. Maximum Sinbar application per season: 8.0 oz/A, unless otherwise directed on the label.						

1.C. New Planting: Late Fall Dormant

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 12 to 16 fl oz/A	**clethodim**	0.094 to 0.13 lb/A	4	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.188 lb/A	14	12
	Poast 1.5EC	1 to 2 pt/A	**sethoxydim**	0.19 to 0.38 lb/A	7	12
-See Select 2EC / Select Max 0.97EC / Fusilade 1.5EC / Poast 1.5EC in listing under "New Planting-Postemergence"						
3	Dacthal 6F Dacthal W-75	8 to 12 pt/A 6.0 to 14 lb/A	**DCPA**	6 to 9 lb/A	--	12
-Apply to weed-free soil in the fall and repeat in early spring. Dacthal will not control emerged weeds; apply to weed-free soils. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. -Results have been most consistent when used in fields with coarse-textured soils low in organic matter, and when the application is followed by rainfall or irrigation. -Maximum applications per season: not specified						
5	Sinbar 80WDG	2 to 4 oz/A	**terbacil**	0.1 to 0.2 lb/A	110	12
-Apply 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 the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. **Do not** apply Sinbar to soils with less than 0.5% 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 label. Maximum Sinbar application per season: 8.0 oz/A, unless otherwise directed on the label.						
15	Devrinol 2-XT 2EC Devrinol DF-XT 50DF	8 qt/A 8 lb/A	**napropamide**	4 lb/A	--	24
-Apply in late fall through early winter (not on frozen ground) or in early spring. Activate with ½ inch sprinkler irrigation within 24hr after application. Irrigation moves the herbicide into the soil and prevents breakdown of Devrinol by the sun. -Primarily controls annual grasses and suppresses or controls certain annual broadleaf weeds. -Maximum for Devrinol 2-XT 2EC: 8 qt/A per season. Maximum Devrinol DF-XT 50DF: 8 fl oz/A per season.						

2.A. Bearing Year: Late Winter or Early Spring

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 12 to 16 fl oz/A	**clethodim**	0.094 to 0.125 lb/A	4	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.188 lb/A	14	12
	Poast 1.5EC	1 to 2 pt/A	**sethoxydim**	0.2 to 0.4 lb/A	7	12
-See Select 2EC / Select Max 0.97EC / Fusilade 1.5EC / Poast 1.5EC in listing under "New Planting-Postemergence"						
3	Dacthal 6F Dacthal W-75	8 to 12 pt/A 6.0 to 14 lb/A	**DCPA**	6 to 9 lb/A	--	12
-Apply anytime to weed-free soil in the early spring. -**Do not** apply after first bloom through harvest. Dacthal will not control emerged weeds; apply to weed-free soils. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. -Results have been most consistent when used in fields with coarse-textured soils low in organic matter, and when the application are followed by rainfall or irrigation. Maximum application per season not specified on label.						
4	Weedar 64	1 to 1.5 qt/A	**2,4-D amine**	1 to 1.5 lb/A	--	48
-Apply to established stands in late winter or early spring when the strawberries are dormant. -**Do not** apply 2,4-D between mid-August and winter dormancy, as it may affect flower bud formation, resulting in distorted berries. -**Do not** apply unless possible injury to the crop is acceptable. Controls many broadleaf weeds. -Rainfastness is 6 to 8 h. -Maximum number of applications per year is 1 and **do not** exceed 1.5 qt/A per application.						

2.A. Bearing Year: Late Winter or Early Spring - continued on next page

2.A. Bearing Year: Late Winter or Early Spring - continued

4	Stinger 3A	2 to 10.5 fl oz/A	**clopyralid**	0.047 to 0.25 lb/A	30	12
-**A Special Local Needs Label 24(c) has been approved for the use of Stinger 3A to control broadleaf weeds in strawberries in NJ, MD, PA and VA.** -Apply in 1 or 2 applications. When 2 applications are used to control susceptible hard-to-kill perennial weeds, spray the first application at least 30 days before harvest and the second application at renovation, after harvest -Controls weeds in the Composite and Legume families, including annuals (galinsoga, ragweed species, common cocklebur, groundsel, pineappleweed, clover, and vetch) and perennials (Canada thistle, goldenrod species, aster species, and mugwort). -Use 2 to 4 fl oz/A to control annual weeds less than 2 inches tall. Increase the rate to 4 to 8 fl oz/A to control larger annual weeds. Apply the maximum rate of 10.5 fl oz/A (in 1 or split into 2 applications) to suppress or control perennial weeds. -**Do not** tank-mix Stinger with other herbicides registered for use in strawberries. **Do not** use Stinger with surfactants. -Stinger is a postemergence herbicide with residual soil activity. Observe crop restrictions or injury may occur from carryover. -Rainfastness is 6 h. Maximum Stinger application per year: 10.5 fl oz/A.						
14	Chateau 51WDG	3 oz/A	**flumioxazin**	0.096 lb/A	--	12
-Apply 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. Crop oil concentrate at 1% v/v or nonionic surfactant at 0.25% v/v may be added to improve the control of emerged weeds, but may also increase the risk of crop injury. Maximum for Chateau: 3 oz/A per application, 3 oz/A per season.						
15	Devrinol 2-XT 2EC Devrinol DF-XT 50DF	8 qt/A 8 lb/A	**napropamide**	4 lb/A	--	24
-Apply in late fall through early winter (not on frozen ground) or in early spring. **Do not** apply from bloom through harvest Activate with ½ inch sprinkler irrigation within 24 hr after application. Irrigation moves the herbicide into the soil and prevents breakdown of Devrinol by the sun. Primarily controls annual grasses and suppresses or controls certain annual broadleaf weeds; will not control emerged weeds. Maximum for Devrinol 2-XT 2EC: 8 qt/A per season. Maximum Devrinol DF-XT 50DF: 8 fl oz/A per season.						

2.B. Bearing Year: Renovation-Summer

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 12 to 16 fl oz/A	**clethodim**	0.094 to 0.125 lb/A	4	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.188 lb/A	14	12
	Poast 1.5EC	1 to 2 pt/A	**sethoxydim**	0.2 to 0.4 lb/A	7	12
-See Select 2EC / Select Max 0.97EC / Fusilade 2EC / Poast 1.5EC in listing under "New Planting - Postemergence"						
3	Dacthal 6F Dacthal W-75	8 to 12 pt/A 6.0 to 14 lb/A	**DCPA**	6 to 9 lb/A	--	12
-Apply any time after harvest to weed-free soil. Dacthal will not control emerged weeds; apply to weed-free soils. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. -Results have been most consistent when used in fields with coarse -textured soils low in organic matter, and when the application are followed by rainfall or irrigation. Maximum application not addressed on label						
4	Weedar 64	1 to 1.5 qt/A	**2,4-D amine**	1.0 to 1.5 lb/A	--	48
-**Do not** apply 2,4-D between mid-August and winter dormancy, as it may affect flower bud formation, resulting in distorted berries. -**Do not** apply unless possible injury to the crop is acceptable. Controls many broadleaf weeds. Rainfastness is 6 to 8 h. -Maximum number of applications per year is 1 and **do not** exceed 1.5 qt/A per application.						
4	Stinger 3A	2 to 10.5 fl oz/A	**clopyralid**	0.047 to 0.25 lb/A	30	12
-**A Special Local Needs Label 24(c) has been approved for the use of Stinger 3A to control broadleaf weeds in strawberries in NJ, MD, PA and VA.** Apply in 1 or 2 applications. When 2 applications are used to control susceptible hard-to-kill perennial weeds, spray the first application at least 30 days before harvest and the second application at renovation, after harvest -Controls weeds in the Composite and Legume families, including annuals (galinsoga, ragweed species, common cocklebur, groundsel, pineappleweed, clover, and vetch) and perennials (Canada thistle, goldenrod species, aster species, and mugwort). -Use 2 to 4 fl oz/A to control annual weeds less than 2 inches tall. Increase the rate to 4 to 8 fl oz/A to control larger annual weeds. Apply the maximum rate of 10.5 fl oz/A (in 1 or split into 2 applications) to suppress or control perennial weeds. -**Do not** tank-mix Stinger with other herbicides registered for use in strawberries. **Do not** use Stinger with surfactants. -Stinger is a postemergence herbicide with residual soil activity. Observe crop restrictions or injury may occur from carryover. -Rainfastness is 6 h. Maximum Stinger application per year: 10.5 fl oz/A.						
5	Sinbar 80WDG	4 to 8 oz/A	**terbacil**	0.2 to 0.4 lb/A	110	12
-Apply at postharvest renovation after old leaves have been removed but before new growth begins. -Controls many annual broadleaf weeds, but may be weak on pigweed species. Use the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. **Do not** apply Sinbar to soils with less than 0.5% 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 label. Maximum Sinbar application per season: 8.0 oz/A, unless otherwise directed on the label.						

2.B. Bearing Year: Renovation-Summer - continued on next page

2.B. Bearing Year: Renovation-Summer - continued

22	Gramoxone 2SL	2 pt/A	**paraquat***	0.5 lb/A	21	24
-Apply 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 qt/100 gal of spray solution). **Do not** allow spray or spray drift to contact the crop (use shields) or injury may result. **Do not** exceed a spray pressure of 30 psi. See the label for additional information and warnings. -Rainfastness 30 min. A maximum of 3 application per year are allowed. -***Restricted-use pesticide***. Only certified applicators, who successfully complete the paraquat-specific training, can mix, load or apply paraquat. Application of paraquat "under the direct supervision" of a certified applicator is no longer allowed. Required training link (*http://usparaquattraining.com*); certified applicators must repeat training every three years.						

2.C. Established Planting: Late Fall Dormant

Group	Product Name	Product Rate	Active Ingredient (*=Restricted Use)	Active Ingredient Rate	PHI (d)	REI (h)
1	Select 2EC Select Max 0.97EC	6 to 8 fl oz/A 12 to 16 fl oz/A	**clethodim**	0.094 to 0.125 lb/A	4	24
	Fusilade DX 2EC	8 to 12 fl oz/A	**fluazifop**	0.125 to 0.188 lb/A	14	12
	Poast 1.5EC	1 to 2 pt/A	**sethoxydim**	0.2 to 0.4 lb/A	7	12
-See Select 2EC / Select Max 0.97EC / Fusilade 1.5EC / Poast 1.5EC in listing under "New Planting - Postemergence"						
3	Dacthal 6F Dacthal W-75	8 to 12 pt/A 6.0 to 14 lb/A	**DCPA**	6 to 9 lb/A	--	12
-Apply to weed-free soil in the fall and repeat in early spring. **Do not** apply after first bloom through harvest. -Dacthal will not control emerged weeds; apply to weed-free soils. Primarily controls annual grasses and a few broadleaf weeds, including common purslane. Results have been most consistent when used in fields with coarse -textured soils low in organic matter, and when the application are followed by rainfall or irrigation. Maximum application not addressed on label.						
5	Sinbar 80WDG	4 to 8 oz/A	**terbacil**	0.2 to 0.4 lb/A	110	12
-Apply 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 the lower rate on coarse-textured soils low in organic matter and higher rates on fine-textured soils and on soils with high organic matter. **Do not** apply Sinbar to soils with less than 0.5% 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 label. Maximum Sinbar application per season: 8.0 oz/A, unless otherwise directed on the label.						
15	Devrinol 2-XT 2EC Devrinol DF-XT 50DF	8 qt/A 8 lb/A	**napropamide**	4 lb/A	--	24
-Apply in late fall through early winter (not on frozen ground) or in early spring. **Do not** apply from bloom through harvest -Activate with ½ inch sprinkler irrigation within 24 hr after application. Irrigation moves the herbicide into the soil and prevents breakdown of Devrinol by the sun. Primarily controls annual grasses and suppresses or controls certain annual broadleaf weeds. -Maximum for Devrinol 2-XT 2EC: 8 qt/A per season. Maximum Devrinol DF-XT 50DF: 8 fl oz/A per season.						

3. Other Labeled Herbicides These products are labeled but limited local data are available; and/or are labeled but not recommended in our region due to potential crop injury concerns.

Group	Product Name	Active Ingredient (*=Restricted Use)
3	Prowl H2O	**pendimethalin**
14	Ultra Blazer	**acifluorfen**
14	Aim	**carfentrazone**
14	Spartan	**sulfentrazone**

Insect Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F.

Recommended Insecticides

Aphids, Spittlebugs Aphids can vector viruses into a planting, thus tolerance for this pest is low. Spittlebugs are primarily a nuisance for harvesters.

Apply one of the following formulations 10 days after new growth begins:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Diazinon AG500 (aphids)	1.0 pt/A	diazinon*	5	36	H
1B	Malathion 57EC	1.5 to 3.0 pt/A	malathion	3	12	H
3A	Brigade WSB	6.4 to 32 oz/A	bifenthrin*	0	12	H
3A	Danitol 2.4EC (spittlebugs)	10.67 fl oz/A	fenpropathrin*	2	24	H
3A + 4A	Brigadier	5.1 to 6.14 fl oz/A	bifenthrin*+imidacloprid - **foliar**	7	12	H
4A	Actara 25WDG (aphids)	1.5 to 3.0 oz/A	thiamethoxam	3	12	H

Aphids, Spittlebugs - continued on next page

Aphids, Spittlebugs - continued

4A	Admire Pro (aphids)	10.5 to 14 fl oz/A	imidacloprid - **soil**	14	12	H
4A	Admire Pro (aphids, spittlebugs)	1.3 fl oz/A	imidacloprid - **foliar**	7	12	H
4A	Assail 30SG	1.9 to 4.0 oz/A	acetamiprid	1	12	M
4A + 15	Cormoran	9.0 to 12.0 fl oz/A	acetamiprid + novaluron	1	12	M
4A + 28	Voliam Flexi (aphids)	2.0 to 4.0 oz/A	thiamethoxam + chlorantraniliprole	3	12	H
4D	Sivanto Prime or 200SL (aphids)	7.0 to 14.0 fl oz/A	flupyradifurone	0	4	M
21A + 39	Apta (aphids)	27 fl oz/A	tolfenpyrad	1	12	H
29	Beleaf 50SG (aphids)	2.8 oz/A	flonicamid	0	12	L
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L
UN	Trilogy (aphids) (OMRI)	1.0 to 2.0% solution	neem extract	0	4	H
n/a	Ecotec Plus (OMRI)	1.0 to 4.0 pt/A	rosemary oil + geraniol + peppermint oil	0	0	L

Leafrollers Leafrollers are a sporadic pest in most of the region. Treatment is usually not required.

The following formulations are available. Apply one spray 10 days after full bloom:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Diazinon AG500	1.0 pt/A	diazinon*	5	36	H
3A	Brigade WSB	6.4 to 32.0 oz/A	bifenthrin*	0	12	H
4A	Assail 30SG	4.0 to 6.9 oz/A	acetamiprid	1	12	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	1	4	M
3A	PyGanic EC 5.0 II (OMRI)	4.5 to 15.6 fl oz/A	pyrethrins	0	12	H
5	Entrust SC (OMRI)	4.0 to 6.0 fl oz/A	spinosad	1	4	M
21A + 39	Apta	27 fl oz/A	tolfenpyrad	1	12	H
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L
UN+3A	Azera (OMRI)	2.0 to 3.0 pt/A	azadirachtin + pyrethrins	0	12	H

Potato Leafhoppers

Potato leafhoppers cause leaf yellowing and distortion. There are no effective cultural controls, though damage may be worse after neighboring fields or weedy patches are mowed as leafhoppers will move to strawberry plants.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Malathion 57EC	1.5 to 3.0 pt/A	malathion	3	12	H
3A	Danitol 2.4 EC	16.0 to 21.3 fl oz/A	fenpropathrin*	2	24	H
3A + 4A	Brigadier	5.1 to 6.14 fl oz/A	bifenthrin*+imidacloprid - **foliar**	7	12	H
4A	Actara 25WDG	1.5 to 3.0 oz/A	thiamethoxam	3	12	H
4A	Assail 30SG	1.9 to 4.0 oz/A	acetamiprid	1	12	M
4A + 15	Cormoran	9.0 to 12.0 fl oz/A	acetamiprid+novaluron	1	12	M
4A + 28	Voliam Flexi	2.0 to 4.0 oz/A	thiamethoxam + chlorantraniliprole	3	12	H
3A	PyGanic EC 5.0 II (OMRI)	4.5 to 15.6 fl oz/A	pyrethrins	0	12	H
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L
UN+3A	Azera (OMRI)	2.0 to 3.0 pt/A	azadirachtin + pyrethrins	0	12	H

Root Weevils

Several species can damage strawberry plants; damage is often worst near wooded field edges. Watch for characteristic leaf notching as a sign of active adults. Larvae should be targeted starting in mid-summer.

Apply one of the following formulations (note: foliar sprays target adults, soil applications target larvae):						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
n/a	Entomopathogenic nematodes[1]	see footnote	see footnote	--	--	--
1B	Malathion 57EC	1.5 to 3.0 pt/A	malathion	3	12	H
3A	Brigade WSB	8.0 to 32.0 oz/A	bifenthrin*	0	12	H
4A	Actara 25WDG	4.0 oz/A	thiamethoxam	3	12	H
4A	Platinum 75SG	1.70 to 4.01 oz/A	thiamethoxam	75	12	H

[1]Entomopathogenic nematodes (use *Heterorhabditis bacteriophora*). Apply 1-2 billion/A during evening or early morning when soil temperatures are at or above 60°F (16°C), then irrigate them into the soil.

Sap Beetles

Sap beetles are attracted to ripe, decaying fruit and bore into berries. They are a nuisance, especially in Pick-Your-Own fields with rotting, over-ripe berries abound. Preventing the accumulation of decaying fruit on or between beds is one way of avoiding beetle buildup. Sprays may not reach adults which are protected under the berries. Sprays that target larvae should be applied when adults are first noticed.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Brigade WSB	6.4 to 32.0 oz/A	bifenthrin*	0	12	H
3A	Danitol 2.4 EC	16.0 to 21.3 fl oz/A	fenpropathrin*	2	24	H
4A	Assail 30SG	4.0 to 6.9 oz/A	acetamiprid	1	12	M
4A + 15	Cormoran	12.0 fl oz/A	acetamiprid+novaluron	1	12	M
15	Rimon 0.83EC (only affects larvae)	6 to 12.0 fl oz/A	novaluron	1	12	M
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L

Slugs

Slugs prefer a cool, wet, dark environment, and mulch, weeds, and other plant trash in beds during a wet spring provide the perfect setting. Mulch removal and adequate weed control help reduce the slug population.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
n/a	Sluggo (OMRI)	20.0 to 44.0 lb/A	iron phosphate	0	0	N
n/a	Deadline Bullets	up to 25 lb/A	metaldehyde	0	12	N

Spittlebugs See Aphids, Spittlebugs above.

Spotted Wing Drosophila

Sporadically problematic on day-neutral strawberries during late summer and fall, but not earlier in the season.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
3A	Danitol 2.4 EC	16.0 to 21.3 fl oz/A	fenpropathrin*	2	24	H
5	Radiant SC	6 to 10 fl oz/A	spinetoram	1	4	M
28	Exirel	13.5 to 20.5 fl oz/A	cyantraniliprole	1	12	H
3A	PyGanic EC 5.0 II (OMRI)	4.5 to 15.6 fl oz/A	pyrethrins	0	12	H
UN + 3A	Azera (OMRI)	2.0 to 3.0 pt/A	azadirachtin + pyrethrins	0	12	H

Strawberry Rootworms Use of broad-spectrum insecticides for other pests will aid in controlling rootworms.

Strawberry Weevils (Strawberry Clippers)

Apply one of the following formulations after new growth starts and before fruit buds are visible. Repeat 10 days later:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1A	Sevin XLR Plus	1.0 to 2.0 qt/A	carbaryl	7	12	H
1B	Lorsban Advanced	1.0 qt/A	chlorpyrifos* - **prebloom only**	21	24	H
3A	Brigade WSB	6.4 to 32 oz/A	bifenthrin*	0	12	H
3A	Danitol 2.4 EC	16.0 to 21.3 fl oz/A	fenpropathrin	2	24	H
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L

Tarnished Plant Bugs

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
1B	Malathion 57EC	1.5 to 3.0 pt/A	malathion	3	12	H
3A	Brigade WSB	6.4 to 32.0 oz/A	bifenthrin*	0	12	H
3A	Danitol 2.4EC	10.67 fl oz/A	fenpropathrin	2	24	H

Tarnished Plant Bugs - continued on next page

Tarnished Plant Bugs - continued

3A + 4A	Brigadier	5.1 to 6.14 fl oz/A	bifenthrin*+imidacloprid - **foliar**	7	12	H
4A	Assail 30SG	4.0 to 6.9 oz/A	acetamiprid	1	12	M
4A+15	Cormoran	12.0 fl oz/A	acetamiprid+novaluron	1	12	M
4C	Transform WG	1.5 to 2.25 oz/A	sulfoxaflor	7	24	H
4C	Closer SC	2.75 to 4.5 oz/A	sulfoxaflor	7	24	H
21A + 39	Apta	27 fl oz/A	tolfenpyrad	1	12	H
29	Beleaf 50SG	2.8 oz/A	flonicamid	0	12	L
3A	PyGanic EC 5.0 II (OMRI)	4.5 to 15.6 fl oz/A	pyrethrins	0	12	H
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L
UN+3A	Azera (OMRI)	2.0 to 3.0 pt/A	azadirachtin + pyrethrins	0	12	H
n/a	Ecotec Plus (OMRI)	1.0 to 4.0 pt/A	rosemary oil + geraniol + peppermint oil	0	0	L

Thrips

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
4A	Assail 30SG	4.0 to 6.9 oz/A	acetamiprid	1	12	M
4A + 15	Cormoran	12.0 fl oz/A	acetamiprid+novaluron	1	12	M
5	Radiant SC	6.0 to 10.0 fl oz/A	spinetoram	1	4	M
21A + 39	Apta	27 fl oz/A	tolfenpyrad	1	12	H
5	Entrust SC (OMRI)	4.0 to 6.0 fl oz/A	spinosad	1	4	M
3A	PyGanic EC 5.0 II (OMRI)	4.5 to 15.6 fl oz/A	pyrethrins	0	12	H
UN	Azatin O, Aza-Direct, Ecozin, Neemix (OMRI)	Refer to individual labels for rates	azadirachtin	0	4	L
UN + 3A	Azera (OMRI)	2.0 to 3.0 pt/A	azadirachtin + pyrethrins	0	12	H
n/a	Trilogy (OMRI)	1.0 to 2.0% solution	neem extract	0	4	H
n/a	Ecotec Plus (OMRI)	1.0 to 4.0 pt/A	rosemary oil+geraniol+peppermint oil	0	0	L

Cyclamen Mites

Thorough coverage in the crown area is necessary. Sprays are best applied when foliage is minimal (early spring or renovation), and in high volumes of water. Predatory mites are effective if released when cyclamen mite populations are still low and confined to "hot spots", and before cool temperatures occur in Fall.

Apply one of the following formulations:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
6	Agri-Mek SC	3.5 fl oz/A	abamectin*	3	12	H
21A	Portal XLO	2.0 pt/A	fenpyroximate	1	12	L

Two-Spotted Spider Mites (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:						
Group	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
6	Agri-Mek SC	3.5 fl oz/A	abamectin*	3	12	H
6 + 28	Minecto Pro	10.0 fl oz/A	abamectin* + cyantraniliprole	3	12	H
10A	Savey 50DF	6.0 oz/A	hexythiazox	3	12	L
10B	Zeal Miticide[1]	2.0 to 3.0 oz/A	etoxazole	1	12	L
12B	Vendex 50WP	1.5 to 2.0 lb/A	fenbutatin-oxide*	1	48	L
20B	Kanemite 15SC	21.0 to 31.0 fl oz/A	acequinocyl	1	12	L
20D	Acramite 50WS	0.75 to 1.0 lb/A	bifenazate	1	12	M
21	Nexter	4.4 to 10.67 oz/A	pyridaben	1	12	H
21A	Portal XLO	2.0 pt/A	fenpyroximate	1	12	L
23	Oberon 2SC	12.0 to 16.0 fl oz/A	spiromesifen	3	12	M
25	Nealta	13.7 fl oz/A	cyflumetofen	1	12	L
UN	Trilogy (OMRI)	1.0 to 2.0% solution	neem extract	0	4	H
n/a	Ecotec Plus (OMRI)	1.0 to 4.0 pt/A	rosemary oil + geraniol + peppermint oil	0	0	L

Disease Control

THE LABEL IS THE LAW-see the Pesticide Use Disclaimer on the first page of chapter F. Recommended Fungicides

Nematode Control

See sections E 1.5 Soil Fumigation and E 1.6 Nematode Control in chapter E Pest Management.

Dip Treatments for Freshly Dug (Bare Root) Transplants

Only use products registered for plant dips to control diseases just prior to planting. Use Switch for transplants with a known anthracnose infection. Dip entire plants for 2 to 5 minutes, then plant as quickly as possible. Topsin M (thiophanate-methyl) has some efficacy against Anthracnose crown rot (ACR) caused by *Colletotrichum gloeosporioides* but resistance has been found in the same pathogen in other crops. Abound is effective against Anthracnose Fruit Rot (AFR) and ACR, but resistance is common (about 30%). Use of Captan or Thiram as dip materials for AFR or ACR is not effective and may suppress transplant growth. In addition, phosphite fungicides can be used to suppress Pythium or Phytophthora (check labels). Dip plants in 2.5 lb/100 gal (Aliette), 2 pt/100 gal (ProPhyt), or 2.5 pt/100 gal (Phostrol) for 15 to 30 minutes, then plant as quickly as possible (within 24 hours). Root dip waste needs to be disposed of properly.

Code	Product Name	Rate (preplant dip)	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
9 + 12	Switch 62.5WG	5.0 to 8.0 oz/100 gal water	cyprodinil + fludioxonil	0	12	L
11	Abound 2.08F	5.0 to 8.0 oz/100 gal water	azoxystrobin	0	4	N
P07	Aliette 80WDG	2.5 lb/100 gal water	fosetyl-Al	0.5	4	N
P07	ProPhyt	2.0 pt/100 gal water	potassium phosphite	0	4	N
P07	Phostrol	2.5 pt/100 gal water	phosphite salts	n/a	4	N

Bacterial and Fungal Diseases

Angular Leaf Spot

Angular (bacterial) leaf spot, caused by bacterium *Xanthomonas fragariae*, may cause caps to turn brown or black resulting in unmarketable fruit. Planting disease-free plants is critical. If symptoms appear on established plants, applying fixed copper products can help, but not if weather conditions are highly favorable to the disease. Repeat applications at 7- to 10-day intervals. Discontinue fixed copper applications if plant injury occurs, usually after 4-5 sprays. Overhead irrigation for frost protection will make angular leaf spot worse. Applying Actigard (FRAC P01) early in the season may also help (see supplemental label for details), but there is no solid data.

Anthracnose Crown Rot

This disease is primarily caused by *C. gloeosporioides* as opposed to *C. acutatum* that causes mostly fruit rot. The response to fungicides differs between these species and a product may not be effective against both diseases. For example: *C. gloeosporioides* is sensitive to Topsin M (thiophanate methyl, FRAC 1), whereas *C. acutatum* is naturally insensitive to Topsin M. Do not apply the same FRAC code, except for captan and thiram, more than 2 times in a season for resistance management purposes.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Maintain continuous coverage of Captan.						
M04	Captan 50W	6.0 lb/A	captan	0	24	N
M04	Captan 80WDG	3.7 lb/A	captan	0	24	N
M04	Captan 4L	3.0 qt/A	captan	0	24	N
M04+17	Captevate 68WDG[1]	3.5 to 5.25 lb/A	captan + fenhexamid	0	24	N
Use the following fungicides ONLY when disease pressure is high. NEVER apply them solely during critical periods (*i.e.*, bloom and fruit maturation) due to high resistance risk. Do not apply the same FRAC code more than twice in a row or in a season (Cabrio and Pristine are considered the same FRAC code).						
1	Topsin M[2]	1.0 lb/A	thiophanate-methyl	1	24	N
3 + 11	Quadris Top 1.67SC	12 to 14 fl oz/A	difenoconazole + azoxystrobin	0	12	--
3 + 11	Quilt Xcel 2.2SE	14 fl oz/A	propiconazole + azoxystrobin	0	12	N
7 + 11	Luna Sensation 4.25SC	4.0 to 7.6 fl oz/A	fluopyram + trifloxystrobin	0	12	--

Anthracnose Crown Rot - continued on next page

Anthracnose Crown Rot - continued

7 + 11	Merivon 2.09SC	5.5 to 8 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 11	Pristine 38WG	18.5 to 23.0 oz/A	boscalid + pyraclostrobin	0	12	--
9 + 12	Switch 62.5WG	11 to 14 oz/A	cyprodinil + fludioxonil	0	12	L
11	Abound 2.08F	6.0 to 15.5 fl oz/A	azoxystrobin	0	4	N
11	Cabrio 20EG	12 to 14 oz/A	pyraclostrobin	0	12	N

[1]Do not tank mix Captevate with Elevate. [2]For *Colletotrichum gloeosporioides* only (accurate species identification is needed to ensure effective control).

Anthracnose Fruit Rot (*Colletotrichum acutatum*)

Anthracnose fruit rot, caused by *C. acutatum* mostly, has become a major disease in strawberries. Nursery transplants latently infected with *C. acutatum* are thought to be the primary source of inoculum. If young plants are diagnosed with anthracnose, fungicides need to be applied immediately. Removal of infected and dying plants in the field can also help. Keep in mind that FRAC 11 fungicides (**especially pyraclostrobin**) offer better efficacy for anthracnose control in general, however, resistance is a concern (frequency of resistance is about 30 to 50%). Captan and Switch have moderate efficacy, and resistance has not been found to either one. Except for Captan, do not apply the same fungicides more than 2 times in a row or in a season. Maintain continuous coverage of Captan, and tank mix with FRAC code 11 or 12 fungicide when disease pressure is high. The pathogen is mainly dispersed by rain or water-splash. Any production systems such as tunnels that can keep the rain off the plants will certainly reduce disease incidence. **Refer to the table above (under Anthracnose Crown Rot) for fungicide choices**.

High risk is estimated with weather-based models recommended by the Strawberry Advisory System: *http://agroclimate.org/tools/strawberry/*. Note that any disease forecasting systems require on-site weather data to be most accurate and effective.

Black Root Rot Complex

This is a disease complex caused by cultural stresses (*e.g.*, compaction of soil) coupled with many different fungi and by nematode feeding injury, and is the main reason for preplant fumigation of strawberry. Winter injury is also a factor that facilitates the black root rot complex (BRRC). The most prevalent fungi associated with the disease are *Rhizoctonia* and *Pythium*. Crop rotation of 4-5 years will reduce the incidence of BRRC. In fields with a high water table, the use of raised beds and/or pre-plant fumigation will provide some control. If rotation is not an option, preplant fumigation may be helpful. Fumigants are listed in section E 1.5 Soil Fumigation in chapter E Pest Management. Applying azoxystrobin may help suppress Rhizoctonia root rot. Also see Red stele and Phytophthora crown rot.

Fungal Leaf Blight, Leaf Scorch and/or Leaf Spot

In the fall or early spring, leaf diseases are not usually problematic in strawberries, but prolonged warm, wet weather favors the disease in the late spring and summer. Incidence may be associated with plant source.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
M04	Captan 50W	6.0 lb/A	captan	0	24	N
M04	Captan 80WDG	3.7 lb/A	captan	0	24	N
M04	Captan 4L	3.0 qt/A	captan	0	24	N
M04+17	Captevate 68WDG[1]	3.5 to 5.25 lb/A	captan + fenhexamid	0	24	N
Do not apply the same FRAC code more than twice in a row or in a season.						
1	Topsin M	1.0 lb/A	thiophanate-methyl	1	24	N
2	Meteor[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Nevado 4F[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Rovral 4F[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
11	Cabrio 20EG	12 to 14 oz/A	pyraclostrobin	0	12	N
3 + 11	Quadris Top 1.67SC	12 to 14 fl oz/A	difenoconazole + azoxystrobin	0	12	--
3 + 11	Quilt Xcel 2.2SE	14 fl oz/A	propiconazole + azoxystrobin	0	12	N
7 + 11	Merivon 2.09SC	4 to 7 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 11	Pristine 38WG	18.5 to 23.0 oz/A	boscalid + pyraclostrobin	0	12	--

[1]Do not tank mix Captevate with Elevate. [2]Do not make more than 1 application/season. Do not apply these products after first fruiting flower.

Gray Mold (Botrytis Fruit Rot)

Start spraying at 5-10% bloom, because most fruit infections occur through the flower. Repeat every 7-10 days. Spray less frequently during prolonged dry periods, but spray every 5-7 days during very wet periods. For season-long control it is usually sufficient to spray once a week for 4 weeks. Base resistance management on protectants captan and thiram and add in rotation FRAC 7 (*e.g.*, Kenja, Fontelis, Merivon, or Luna series), or FRAC 12 (Switch) to the protectants when weather conditions turn favorable for disease. **Do not** use the same FRAC code more than twice per season. FRAC 2 products (*e.g.*, Rovral) needs to be applied before first fruiting flower and can only be applied once per season. Risk of resistance to FRAC 17 (Elevate) and 2 (*e.g.*, Rovral) is high. High risk of Botrytis infection is estimated with weather-based models recommended by the Strawberry Advisory System (*http://agroclimate.org/tools/strawberry/*).

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Apply Captan or Thiram solely when disease pressure is low to moderate. Captan is a better choice if anthracnose is a concern or present.						
M03	Thiram Granuflo	4.4 lb/A	thiram	3	24	N
M03	Thiram 24/7	2.6 qt/A	thiram	1	24	N
M03	Thiram SC	2.6 qt/A	thiram	1	24	N
M04	Captan 50W	6.0 lb/A	captan	0	24	N
M04	Captan 80WDG	3.7 lb/A	captan	0	24	N
M04	Captan 4L	3.0 qt/A	captan	0	24	N
M04+17	Captevate 68WDG[1]	3.5 to 5.25 lb/A	captan + fenhexamid	0	24	N
Tank mix Captan or Thiram with one of the following fungicides ONLY when disease pressure is high. NEVER apply the following fungicides solely during critical periods (*i.e.*, blooming and maturing) due to high resistance risk. Do not apply the same FRAC code more than twice in a row or in a season.						
2	Meteor[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Nevado 4F[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
2	Rovral 4F[2]	1.5 to 2.0 pt/A	iprodione	n/a	24	N
7	Fontelis 1.67SC	16 to 24 fl oz/A	penthiopyrad	0	12	L
7	Kenja 400SC	13.5 to 15.5 fl oz/A	isofetamid	0	12	--
7 + 9	Luna Tranquility 4.16SC	16 to 27 fl oz/A	fluopyram + pyrimethanil	1	12	--
7 + 11	Luna Sensation 4.25SC	6 to 7.6 fl oz/A	fluopyram + trifloxystrobin	0	12	--
7 + 11	Merivon 2.09SC	8 to 11 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
9 + 12	Switch 62.5WG	11 to 14 oz/A	cyprodinil + fludioxonil	0	12	L
17	Elevate 50 WDG	1.5 lb/A	fenhexamid	0	12	N

[1]Do not tank mix Captevate with Elevate. [2]Do not make more than 1 application/season. Do not apply these products after first fruiting flower.

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 14-21 day interval. Do not apply FRAC code 11 fungicides (*i.e.*, Cabrio or Pristine) more than twice in a row. Switch to another product to reduce the chance of fungicide resistance development.

Code	Product Name	Product Rate	Active Ingredient(s) (*=Restricted Use)	PHI (d)	REI (h)	Bee TR
Rotate between the following fungicides with different modes of action (FRAC code):						
U06	Torino 0.85SC	3.4 oz/A	cyflufenamid	0	4	--
3	Mettle 125ME	3.0 to 5.0 fl oz/A	tetraconazole	0	12	--
3	Procure 480SC	4.0 to 8.0 oz/A	triflumizole	1	12	N
3	Rally 40WSP	2.5 to 5.0 oz/A	myclobutanil	0	24	N
3 + 9	Inspire Super 2.82EW	16.0 to 20.0 fl oz/A	difenoconazole + cyprodinil	0	12	--
7	Fontelis 1.67SC	16 to 24 fl oz/A	penthiopyrad	0	12	L
7	Kenja 400SC	13.5 to 15.5 fl oz/A	isofetamid	0	12	--
7 + 9	Luna Tranquility 4.16SC	16 to 27 fl oz/A	fluopyram + pyrimethanil	1	12	--
7 + 11	Luna Sensation 4.25SC	4 to 7.6 fl oz/A	fluopyram + trifloxystrobin	0	12	--
7 + 11	Merivon 2.09SC	4 to 7 fl oz/A	fluxapyroxad + pyraclostrobin	0	12	N
7 + 11	Pristine 38WG	18.5 to 23.0 oz/A	boscalid + pyraclostrobin	0	12	--
11	Cabrio 20EG	12.0 to 14.0 oz/A	pyraclostrobin	0	12	N
11	Flint Extra 500SC	2.5 to 3.0 fl oz/A	trifloxystrobin (**Do not apply near Concord grapes**, see label)	0	12	--
13	Quintec 2.08SC	4.0 to 6.0 fl oz/A	quinoxyfen	1	12	--

Red Stele and Phytophthora Crown Rot

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 in the soil, consider using varieties that are resistant to several races such as 'Allstar' or 'Earliglow'. For crown rot, resistant cultivars are not available.

The following fungicides can be applied as preplant dips (See note for: "Dip Treatments for Freshly Dug (Bare Root) Transplants" above), foliar sprays, or by drip irrigation for additional control.

NEW PLANTINGS						
Code	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
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:						
P07	Aliette 80WDG	2.5 to 5.0 lb/A	fosetyl-Al	0.5	12	N
P07	ProPhyt	2 to 4 pt/A	phosphites	0	4	N
P07	Phostrol	2.5 to 5.0 pt/A	phosphites	0	4	N
Fungicides containing mefenoxam or metalaxyl can be applied as sprays or through drip irrigation.						
4	MetaStar 2E AG	2.0 qt/*treated* A	metalaxyl	0	48	N
4	Ridomil Gold 4SL	1.0 pt/*treated* A	mefenoxam	0	48	N
4	Ultra Flourish 2E	2.0 pt/*treated* A	mefenoxam	0	48	N
ESTABLISHED PLANTINGS						
Code	**Product Name**	**Product Rate**	**Active Ingredient(s) (*=Restricted Use)**	**PHI (d)**	**REI (h)**	**Bee TR**
Spring applications should begin when plants start active growth and before 1st 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:						
P07	Aliette 80WDG	2.5 to 5.0 lb/A	fosetyl-Al	0.5	12	N
P07	ProPhyt	2 to 4 pt/A	phosphites	0	4	N
P07	Phostrol	2.5 to 2.0 pt/A	phosphites	0	4	N
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 1st 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):						
4	Ridomil Gold 4SL	1.0 pt /*treated* A	mefenoxam	0	48	N
4	Ultra Flourish 2E	2.0 pt /*treated* A	mefenoxam	0	48	N
Calculate the correct fungicide rate for drip applications as for a banded spray, see explanation under NEW PLANTINGS above.						

Virus Diseases

Use certified, virus-free plants.

For Immediate Medical Attention

Call 911

For a Pesticide Exposure Poisoning

Emergency Call

For All States

This number will automatically connect you to the poison center nearest to you.
Anyone with a poisoning emergency can call the toll-free telephone number for help. Personnel at the Center will give you first-aid information and direct you to local treatment centers if necessary.

For Pesticide Spills

Small Spills: See the product label for cleanup advice.
Large spills: Call the National Response Center at 1-800-424-8802 or CHEMTREC at 800-424-9300 (24 hours) - Industry assistance with emergency response cleanup procedures for large, dangerous spills.
Be aware of your responsibility to report spills to the proper state agency.