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THE ARNOLD ARBORETUM SPRAY SCHEDULE

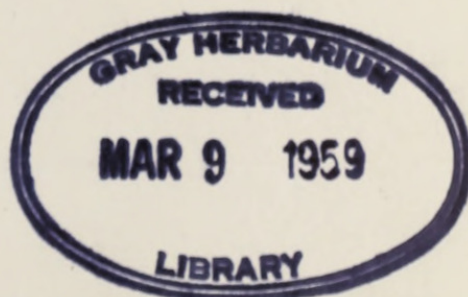
IN THE continuing war against the insect and disease enemies of over 6,000 kinds of woody plants growing in the Arnold Arboretum, the battle lines have flexed and the battle methods and ammunition in the form of spray formulas are continually being modified. These changes have resulted not only from increased knowledge and experience with the spray materials, the introduction of new spray materials, and the timing of spray applications, but also with the desire to control other insects.

Sanitation by removal of dead plants and parts of plants which may serve as a breeding area for insect and disease organisms, is an important adjunct in the control of the pests of plants. The ability of plants in good health and vigor to resist insect and disease attacks in many cases is well known; consequently, we try to keep our plants growing vigorously, thus helping in the battle against insects and diseases.

Information for this spray schedule has been collected from many sources, especially the Cornell University Departments of Entomology and Plant Pathology and the Shade Tree Laboratories of the Waltham Field Station of the University of Massachusetts. We have used most of the sprays in our pest-control program; a few we consider experimental until more results can be noted. Not all sprays are applied each year and those used are not applied to all listed host plants each time; rather, we try to spray to control a specific pest as the need occurs.

This listing is not presented as necessarily the best sprays for control of these pests, but it is a record of what we use to meet our insect and disease problems. The notes given are important. Special attention is called to those cases where a repetition of the spray is required. To succeed in the continuing battle against insect and disease attacks on plants, three things are essential: (1) Apply the right spray. (2) Apply it properly. (3) Apply it at the proper time. Failure to meet any one of these prerequisites materially reduces the effectiveness of the spray.

[1]



ARNOLD ARBORETUM SPRAY SCHEDULE — 1959

Date	Insect or Disease	Host Plants	Hydraulic Spray per 100 Gals. Water		Notes
March 1 to April 20 (Dormant)	Armored Scales: Euonymus Oyster Shell Scurfy San Jose	Celastrus, Crataegus, Dirca, Euonymus, Fraxinus, Popu- lus, Syringa, Chaenomeles, Malus, Prunus, Pyrus, Sorbus	1 gal. D-N slurry (Elgetol or Krenite)		Spray on good drying days when the spray will dry before the temperature goes be- low 40° F. Spray before the buds start to open. This material will discolor paint, stone, etc.
	Cedar-apple Rust	Crataegus, Juniperus, Malus, esp. M. soulardii			"
	Golden oak Scale	Quercus	2-3 gals. dormant superior- type spray oil plus ½ lb. blood albumen		Spray on good drying days when the spray will dry before the temperature goes below 40° F. Spray before the buds have opened.
	Juniper scale Pine Needle Scale	Juniperus Pinus	11 gals. liquid lime sulphur		This material will discolor paint, stone, brick, etc.
	Spruce gall aphid	Picea, esp. P. abies, P. pungens vars.	1½ pts. 50 or 57% malathion emulsifiable concentrate		Warm weather before buds have broken.
April 15 to 30 (Dormant)	Elm bark beetle (Dutch Elm Disease)	Ulmus	8 gals. 25% DDT emulsifi- able concentrate or 6 gals. 34% DDT emulsifi- able concentrate		Mist blower application: 1 part 25% DDT emulsifiable concen- trate plus 1 part water; or 1 part 34% DDT emulsifiable concen- trate plus 1½ parts water. Watch for mite and aphid troubles after any of these sprays.
	White Pine Weevil	Pinus strobus	4 gals. 25% DDT emulsifi- able concentrate		Cover upper part of tree, especially top of main leader and ends of branches, thoroughly.
	European Pine Shoot Moth	Pinus, esp. P. resinosa, P. mugo	4 lbs. 50% DDT wettable powder		

May 1 to 10	Lilac Borer	Fraxinus, Syringa	1 gal. 25% DDT emulsifiable concentrate	Spray especially stems and larger branches. Repeat in two weeks.
	Fire-blight	Cotoneaster, Crataegus, esp. <i>C. oxyacantha</i> vars.; <i>Malus</i> , <i>Pyrus</i> , <i>Sorbus</i>	Streptomycin 15% plus Oxytetracycline 1.5% (Agri-mycin 100, $\frac{1}{2}$ of 9.34 oz. bottle)	Do not combine with other sprays. First spray at 20 to 30% bloom. Repeat every 3 to 5 days during blossom time, best when temperature above 70°. Re-apply if heavy rains occur within 18 hours of application. Helps reduce blossom infections, not infections from old cankers.
	Bacterial Blight of Lilac	Syringa	1 pt. Puratized Agricultural Spray	Repeat once a week, especially during wet seasons, during the month of May.
	Anthracnose of Sycamore and Oak	Platanus Quercus, esp. <i>Q. alba</i>	"	One application as buds begin to swell.
	Tent Caterpillar	Prunus, Malus	2 lbs. 50% DDT wettable powder	If not too abundant, prune out and burn nests instead of spraying.
	Juniper Web-worm	Juniperus, esp. <i>J. squamata</i> vars.	2 lbs. 50% DDT wettable powder plus 2 lbs. 50% Ovex (Ovatran) wettable powder	Thorough drenching necessary, as soon as weather warms up and worms start feeding.
May 10 to 15	Hawthorn Leaf Miner	Crataegus	1 lb. 25% lindane wettable powder; or 4 lbs. 25% malathion wettable powder	A few days to a week earlier than birch leaf miner spray. If injury has been severe in the past, repeat in 10 days.
May 15 to 25	Birch Leaf Miner	Betula	1 lb. 25% lindane wettable powder; or 4 lbs. 25% malathion wettable powder	When adult flies are abundant and minute miners can be found; on a warm day. As lilacs start to bloom. Repeat in 10 days; then again July 10-15 for second generation, if needed.
	Elm Leaf Miner	Ulmus	"	Usually a few days later than birch leaf miner.

Date	Insect or Disease	Host Plants	Hydraulic Spray per 100 Gals. Water	Notes
May 15 to 25	Lacebug	Azalea, Pieris, Rhododendron	4 lbs. 25% malathion wet- table powder; or 1 lb. 25% lindane wettable powder	Malathion preferred as it also controls mites and aphids. Spray undersides of leaves. Repeat 10 days later.
	Pine Bark Aphid	Pinus, esp. <i>P. strobus</i> , <i>P. nigra</i> , <i>P. sylvestris</i>	1½ pts. 57% malathion emulsifiable concentrate	Repeat in two-week intervals for heavy infestations.
	Beech Woolly Aphid	<i>Fagus</i>	"	Apply to underside of branches and trunk.
	Juniper Scale	<i>Juniperus</i> , esp. <i>J. chinensis</i> <i>pfitzeriana</i> . Occasionally on <i>Thuja</i>	6 lbs. 25% malathion wet- table powder	Warm weather in mid-May before scales begin to lay eggs. Repeat twice at two-week intervals.
	Cankerworm	<i>Acer</i> , <i>Carya</i> , <i>Catalpa</i> , <i>Fraxinus</i> , <i>Juglans</i> , <i>Prunus</i> , <i>Quercus</i> , <i>Syringa</i> , <i>Tilia</i> , <i>Ulmus</i>	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	Mist blower application: 7 gals. 25% DDT emulsifiable concen- trate plus 14 gals. water, plus 1 qt. 25% aramite emulsifiable concentrate. As lilacs come into full bloom.
	Elm Leaf Beetle	<i>Ulmus</i>	"	"
	Willow-Leaf Beetle	<i>Salix</i>	"	"
	Larch Case-bearer	<i>Larix</i>	"	When young larvae found feeding, usually mid-May.
	Mealybug	<i>Buxus</i> , <i>Ligustrum</i> , <i>Taxus</i>	1½ pts. 57% malathion emulsifiable concentrate	Thorough and heavy. Repeat in 10 to 14 days.
	Kalmia Leaf Spot	<i>Kalmia</i>	10 lbs. wettable sulphur	A sulphur dust may be applied instead. Repeat at 10- to 14-day intervals, especially if season is rainy, until foliage is full-grown.
	Boxwood Leaf Miner, Boxwood Psylla	<i>Buxus</i>	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	When weigela is in full bloom.

Spruce Mite "Red Spiders"	Conifers, esp. Picea, Thuja, Chamaecyparis	2 lbs. 50% Ovex wettable powder	Repeat in late August or September, if needed. (Do not apply Ovex to Ilex, Phil- adelphus, Cornus, Stewartia, Laburnum, or other Rosaceae plants in May or June.)
Mite or "Red Spiders"	Ornamentals and fruits, as: Azalea, Quercus, Ulmus, Gleditsia, Tilia, Buxus, Malus, Prunus, Pyrus, etc.	4 lbs. 25% malathion wet- table powder; or 2 lbs. 15% aramite wettable powder	Malathion preferred as it controls other pests also. Repeat later as needed on various plants. If aramite used, repeat in 10 days.
Powdery mildew	Rosea, esp. R. wichuraiana	$\frac{1}{2}$ lb. Ferbam plus 3 lbs, wettable sulphur	Avoid use of sulphur at temperatures over 90° F. Repeat once a week and especially apply before rainy periods.
May 25 to June 30	Locust Twig Borer	2 lbs. 50% DDT wettable powder plus 2 lbs. 25% malathion wettable powder	Start in late May and repeat weekly through June.
June 1 to 10	Euonymus Scale Crawler	4 lbs. 25% malathion wet- table powder, plus 2 lbs. 50% DDT wettable powder.	Repeat August 15 to 25 for second generation.
Flat-headed Apple Tree Borer	Malus, Rosa, esp. R. rugosa, Sorbus	1 gal. 25% DDT emulsifiable concentrate	On stems and larger branches, especially near the ground. Repeat in two weeks.
Holly Leaf Miner	Ilex opaca	2 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	Repeat in 10 days.
Lacebug	Amelanchier, Cotoneaster	4 lbs. 25% malathion wet- table powder	Will also help control mites. Repeat in 10 days.
June 10 to August 15	Dogwood Twig Borer	1 gal. 25% DDT emulsifiable concentrate	Spray trunks and branches, especially where bark is rough. Repeat at 3- to 4- week intervals for the 2-month period.
June 20 to 30	Black Vine Weevil	2 lbs. 25% dieldron wet- table powder; or 5 lbs. 40% chlordane	Treat whole plant, especially heavy on branches close to ground, plus surface of soil.

<i>Date</i>	<i>Insect or Disease</i>	<i>Host Plants</i>	<i>Hydraulic Spray per 100 Gals. Water</i>	<i>Notes</i>
June 25 to July 5	European Pine Shoot Moth	Pinus, esp. <i>P. mugo</i> , <i>P. nigra</i> , <i>P. resinosa</i> , <i>P. sylvestris</i>	2 lbs. 50% DDT wetable powder	Thoroughly wet bases of new needles— when larvae are boring into buds.
	Elm Bark Beetle (Dutch Elm Disease)	Ulmus	4 lbs. 50% DDT wettable powder plus 2 lbs. 15% aramite wettable powder	Thorough application. Mist application: 5 gals. 25% DDT emulsifiable concen- trate, 15 gals. water plus 1 qt. 25% aramite emulsifiable concentrate.
July 10 to 15	Azalea Bark Scale	Rhododendron, Azalea	4 lbs. 50% DDT wettable powder plus 3 lbs. 25% malathion wettable powder	Thorough wetting of stems. Repeat in 10 days.
	Peach Tree Borer	Prunus, esp. <i>P. persica</i>	1 gal. 25% DDT emulsifiable concentrate	Repeat in 2 weeks. Apply to stems and larger branches, especially near ground.
	Japanese Beetle	Ampelopsis, Aesculus, Hydrangea, Metasequoia, Rosa, Sassafras, Tilia, Vitis,	2 lbs. 50% DDT wettable powder plus 4 lbs. 25% malathion wettable powder	Spray on bright warm day to hit the beetle. Repeat every two weeks through mid-Aug.
July 15 to 25	Golden Oak Scale	Quercus	1 qt. 25% DDT emulsifiable concentrate plus 1½ pts. 50% malathion emulsifiable con- centrate	To kill young when they start to crawl.
Aug. 10 to Sept. 30	Locust Borer	Robinia	4 lbs. 50% DDT wettable powder. After Sept. 15, add 3 lbs. 25% malathion wettable powder	Repeat the spray at 10-day intervals. Thorough wetting, especially on rough bark.

PESTS FREQUENTLY DESTRUCTIVE IN THE ARNOLD ARBORETUM

Host	Pest	Spray Date
Acer	Cankerworm	May 15-25
Aesculus	Japanese beetle	July 10-15 (with repeat)
Amelanchier	Lacebug	June 1-10 (with repeat)
Ampelopsis	Japanese beetle	July 10-15 (with repeat)
Azalea (Rhododendron)	Lacebug	May 15-25 (with repeat)
	Mite or "Red Spider"	May 15-25
	Azalea bark scale	July 10-15 (with repeat)
Betula	Birch leaf miner	May 15-25 (with repeat)
Buxus	Boxwood leaf miner	)
	Boxwood psylla	) May 15-25
	Mite or "Red Spider"	)
	Mealybugs	May 15-25 (with repeat)
Carya	Cankerworm	May 15-25
Catalpa	Cankerworm	May 15-25
Celastrus	Euonymus scale	March 1-April 20; June 1-10
Chaenomeles	Oystershell scale	) March 1-April 20
	San Jose scale	)
Chamaecyparis	Spruce mite or "Red Spider"	May 15-25
Cornus	Dogwood twig borer	June 10-Aug. 15 (with repeat)
Cotoneaster	Fire-blight	May 1-10 (with repeat)
	Lacebug	June 1-10 " "
Crataegus	Oystershell scale	)
	San Jose scale	) March 1-April 20
	Cedar apple rust	)
	Fire-blight	May 1-10 (with repeat)
	Leaf miner	May 10-15
Dirca	Euonymus scale	March 1-April 20; June 1-10
Euonymus	Euonymus scale	March 1-April 20; June 1-10
Fagus	Beech wooly aphid	May 15-25 (with repeat)
Fraxinus	Oystershell scale	March 1-April 20
	Lilac borer	May 1-10 (with repeat)
	Cankerworm	May 15-25
Gleditsia	Mite or "Red Spider"	May 15-25
Hydrangea	Japanese beetle	July 10-15 (with repeat)

Host	Pest	Spray Date
Ilex	Holly leaf miner	June 1-10 (with repeat)
Juglans	Cankerworm	May 15-25
Juniperus	Cedar apple rust	March 1-April 20
	Juniper scale	March 1-April 20; May 15-25 (with repeat)
	Juniper web-worm	May 1-10
Kalmia	Kalmia leaf spot	May 15-25 (with repeat)
Larix	Larch case-bearer	May 15-25
Ligustrum	Mealybugs	May 15-25 (with repeat)
Malus	Oystershell scale	) March 1-April 20
	Cedar apple rust	)
	Fire-blight	May 1-10 (with repeat)
	Tent caterpillar	May 1-10
	Mite or "Red Spider"	May 15-25
	Flat-headed apple tree borer	June 1-10 (with repeat)
Metasequoia	Japanese beetle	July 10-15 (with repeat)
Pachistima	Euonymus scale	June 1-10 (with repeat)
Pachysandra	Euonymus scale	June 1-10 (with repeat)
Picea	Spruce gall aphid	March 1-April 20
	Spruce mite or "Red Spider"	May 15-25
Pieris	Lacebug	May 15-25 (with repeat)
Pinus	Pine needle scale	March 1-April 20
	White pine weevil	April 15-30
	European pine shoot moth	April 15-30; June 25-July 5
	Pine bark aphid	May 15-25 (with repeat)
Platanus	Anthracnose	May 1-10
Populus	Oystershell scale	March 1-April 20
Prunus	Oystershell scale	March 1-April 20
	Tent caterpillar	May 1-10
	Mite or "Red Spider"	) May 15-25
	Cankerworm	)
	Peach tree borer	July 10-15 (with repeat)
Pyrus	Oystershell scale	March 1-April 20
	Fire-blight	May 1-10 (with repeat)
	Mite or "Red Spider"	May 15-25
Quercus	Golden oak scale	March 1-April 20; July 15-25
	Anthracnose	May 1-10

Host	Pest	Spray Date
Quercus	Mite or "Red Spider") Cankerworm)	May 15-25
Robinia	Locust twig borer Locust borer	May 25-June 30 (with repeat) Aug. 10-Sept. 30 (with repeat)
Rosa	Powdery mildew Japanese beetle	May 15-25 (with repeat) July 10-15 (with repeat)
Rosa rugosa	Flat-headed apple tree borer	June 1-10 (with repeat)
Rhododendron	Lacebug Azalea bark scale	May 15-25 (with repeat) July 10-15 (with repeat)
Salix	Willow-leaf beetle	May 15-25
Sorbus	Oystershell scale Fire-blight Flat-headed apple tree borer	March 1-April 20 May 1-10 (with repeat) June 1-10 (with repeat)
Sassafras	Japanese beetle	July 10-15 (with repeat)
Syringa	Euonymus scale) Oystershell scale) Lilac borer) Bacterial blight) Cankerworm)	March 1-April 20 May 1-10 (with repeat) May 15-25
Taxus	Mealybugs Black vine weevil	May 15-25 (with repeat) June 20-30
Thuja	Spruce mite or "Red Spider" Juniper scale	May 15-25 May 15-25 (with repeat)
Tilia	Cankerworm) Mite or "Red Spider") Japanese beetle)	May 15-25 July 10-15 (with repeat)
Tsuga	Black vine weevil	June 20-30
Ulmus	Elm bark beetle Elm leaf miner) Elm leaf beetle) Mite or "Red Spider") Cankerworm)	April 15-30; June 25-July 5 May 15-25
Viburnum	Dogwood twig borer	June 10-Aug. 15 (with repeat)
Vitis	Japanese beetle	July 10-15 (with repeat)

Small Amounts of Spray Materials

Estimating small amounts of spray materials from the amounts suggested in this schedule can be done in the following way: Use one level tablespoonful of a wettable powder to a gallon of water where the formula calls for one pound of the wettable powder to a hundred gallons of water; or use one level teaspoonful of liquid material per gallon where the formula calls for a pint of the liquid to a hundred gallons of water; or a level tablespoonful of liquid material per gallon where the formula calls for three pints per 100 gallons.

ROBERT G. WILLIAMS

REMINDER

Arnoldia Subscriptions are now due and all notices were mailed in January. Those who have not yet sent in their 1959 subscriptions, please do so at once (price \$2.00), mailing it to "Arnoldia," Arnold Arboretum, Jamaica Plain 30, Mass. **Please make checks payable to Harvard University.**

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