



1988 Missouri Commercial Apple Spray Schedule

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These recommendations are intended to serve as guidelines for commercial apple growers in Missouri. The pesticides and application rates listed for any given pest problem are based on their effectiveness, economy, safety and general integration into control programs for other pests present at or about the same time. The choice of which chemicals to use, when to use them, and how they are applied must be made by individual growers relative to their own experience, equipment and special problems associated with their orchards. The effective and efficient use of all pesticides requires careful selection of the most appropriate material and the rate required, critical timing of the application(s), and uniform, thorough coverage of the trees.

PESTICIDE SAFETY

Responsible use of pesticides also includes their safe storage and handling. Most pesticides are poisonous to people and animals. Handle them with care. Store them only in their original, labeled containers in a dry, locked location out of the reach of children and animals.

READ THE LABEL! Understand it. Know the toxicity of the material you are using and wear the appropriate protective clothing. The greatest hazard with most pesticides occurs during the loading operation before the spray is applied. With highly toxic wettable powder (WP) formulations, empty containers carefully into the tank to avoid undue exposure to the dust; with liquid formulations, avoid splashing and spillage while measuring or making additions to the spray tank.

Avoid contaminating lakes, streams or ponds with any pesticide. Do not clean sprayers or dump excess spray mixtures near any such water supply. Avoid contaminating any crop used for forage or feed by drift of sprays out of the orchard.

RECOMMENDED RATES OF APPLICATION

The correct amount of pesticide required for control in any given orchard is that amount contained in a volume of the recommended dilute mixture which, when applied as a foliar spray, is sufficient to

allow some run-off. Amounts applied in excess of this volume are wasted, and volumes of dilute spray less than that required for run-off commonly result in reduced pest control.

Standard apple trees in full leaf (approx. 20 ft. tall and planted 35-40 trees per acre) require an estimated 400 gallons of dilute spray per acre to achieve run-off. Trees not in full leaf, especially during the period up to petal fall, will require substantially less dilute volume per acre to achieve run-off. Adjustments in delivery volume should be made either by changing the pump discharge rate or the travel speed. Travel speed in most orchards should not exceed 3 mph.

Experience has shown that the same amount of chemical normally applied as a dilute spray can be applied as a low volume (LV) spray using 1/3 or less the normal dilute volume. However, since little or no run-off occurs in LV applications, less total chemical should be applied per acre than in dilute sprays in order to avoid deposits in excess of that needed for control. LV rates are generally calculated (with some exceptions) by multiplying the dilute rate by the gallons per acre of dilute spray required and then subtracting 25% to adjust for the lack of run-off.

Excess run-off in dilute spraying and deposits in excess of that needed for control in low volume spraying are both economically and ecologically unsound.

PESTICIDE CERTIFICATION FOR GROWERS

Missouri's pesticide law went into effect October 21, 1976. This law requires certification for commercial and private applicators to purchase and apply restricted-use pesticides as defined by the Environmental Protection Agency. Since several pesticides used routinely by fruit growers are potential restricted-use materials, it is highly desirable that each grower become certified.

Commercial applicators (all applicators who apply pesticides for hire) must pass an examination administered by the Missouri State Department of Agriculture. Private applicators are required to attend a training program, but are not required to pass an examination. Training sessions are offered to both commercial and private applicators by the University of Missouri Cooperative Extension Service. Contact your local Extension Specialist for further information.

Timing & Major Pests Involved	Materials To Use	Varieties To Treat*	Dilute Rate Per 100 Gals.	Low Volume Rate Per Acre	Comments and Special Precautions
DORMANT					
Fireblight	COPPER SULFATE	JRG	4 lbs.	Not Recommended	Apply COPPER SULFATE at least 10 days before the dormant oil application. COPPER SULFATE may also afford some measure of control of such overwintering apple diseases as black rot (frog eye leaf spot) blotch and certain cankers.
Aphids Mites Scale	SUPERIOR OIL 70 sec	JRG	3 gal.	Not Recommended	Apply OIL at least one week before green tip when the buds are still dormant. Thorough coverage is essential, especially in the tree tops. <i>This spray can be omitted if OIL is applied later at green-tip (see below).</i>
GREEN TIP TO 1/2-INCH GREEN					
Powdery mildew	BENOMYL 50W or TOPSIN M 70W + MANCOZEB 80W	JRG	3 oz. 3 oz. 3/4 lb.	9 oz. 9 oz. 2 1/4 lb.	BENOMYL and TOPSIN are effective antisporegents against both the apple scab and the powdery mildew pathogens. The use of OIL with BENOMYL or TOPSIN increases the effectiveness of these materials. MANCOZEB is effective against scab but not powdery mildew. See note on use of DIFOLATAN for apple scab. BAYLETON is effective against powdery mildew but has little activity against scab.
Scab	or FUNGINEX 1.6EC + MANCOZEB 80W or MANCOZEB 80W or BAYLETON 50W + MANCOZEB 80W	JRG RG J	10 oz. 3/4 lb. 1 1/2 lb. 1/2 to 1 oz. 1 1/2 lb.	36 oz. 2 1/4 lb. 4 1/2 lb. 1 1/2 to 3 oz. 4 1/2 lb.	Oil applications are more effective against aphids and mite eggs when made at 1/2" green.
Aphids	SUPERIOR OIL 70 sec	JRG	2 gal.	6 gal.	Do not use superior oil if FUNGINEX is used in this spray, or if oil was applied dormant. Applications of synthetic pyrethroids for leafminers at this time is not recommended due to potential build-up later of mite populations.
Mites Scale					
TIGHT CLUSTER TO FIRST PINK					
Powdery mildew	BENOMYL 50W or TOPSIN M 70W + MANCOZEB 80W	JRG	3 oz. 3 oz. 3/4 lb.	9 oz. 9 oz. 2 1/4 lb.	Tight cluster is the most critical time for early powdery mildew control. Use FUNGINEX, BAYLETON, BENOMYL or TOPSIN.
Scab Cedar apple rust	or FUNGINEX 1.6EC + MANCOZEB 80W or MANCOZEB 80W or BAYLETON 50W + MANCOZEB 80W	JRG RG J	10 oz. 3/4 lb. 1 1/2 lb. 1/2 to 1 oz. 1 1/2 lb.	36 oz. 2 1/4 lb. 4 1/2 lb. 1 1/2 - 3 oz. 4 1/2 lb.	
FULL PINK					
Fireblight	STREPTOMYCIN 17%	J	1/2 lb.	2 lb.	First application of STREPTOMYCIN under a dormant COPPER SULFATE program will probably be needed at full pink under most Missouri climate conditions.
Powdery mildew	BENOMYL 50W or TOPSIN M 70W + MANCOZEB 80W	JRG	3 oz. 3 oz. 3/4 lb.	9 oz. 9 oz. 2 1/4 lb.	
Scab Cedar apple rust	or FUNGINEX 1.6EC + MANCOZEB 80W or MANCOZEB 80W + BAYLETON 50W	JRG J	10 oz. 3/4 lb. 1 1/2 lb. 1/2 to 1 oz.	36 oz. 2 1/4 lb. 4 1/2 lb. 1 1/2 - 3 oz.	
Aphids Plant bugs	GUTHION 50W or LORSBAN 50W or ZOLONE 3EC	JRG	1/2 lb. 3/4 lb. 1 1/3-2 2/3 pt.	1 1/2 lb. 2 1/4 lb. 5 1/3 to 10 2/3 pt.	This is a critical spray for insects—apple aphids can be troublesome at this time. Effective control of rosy apple aphids with later sprays is doubtful. Control of plant bugs and the early hatch of European red mites at this time reduces the need for additional sprays later.
Leafrollers Mites Leafhoppers	+ PHOSPHAMIDON 8EC or MORESTAN 25WP	JRG	1/4 pt. 1/2 to 1 lb.	3/4 pt. Not Recommended	SEE "1988 MITE CONTROL" on Reverse.
BLOOM					
Fireblight	STREPTOMYCIN 17%	J	1/2 lb.	2 lb.	Repeat application if bloom period extends more than 7 days. Avoid insecticide applications during bloom to protect pollinating insects. MANCOZEB & FUNGINEX are effective against cedar apple rust and quince rust.
Scab	BENOMYL 50W or TOPSIN M 70W + MANCOZEB 80W	JRG	3 oz. 3 oz. 3/4 lb.	9 oz. 9 oz. 2 1/4 lb.	
Powdery mildew Cedar apple rust	or FUNGINEX 1.6EC + MANCOZEB 80W	JRG	10 oz. 3/4 lb.	36 oz. 2 1/4 lb.	
Quince rust	or BAYLETON 50W + MANCOZEB 80W or MANCOZEB 80W	J RG	1/2 to 1 oz. 1 1/2 lb. 1 1/2 lb.	1 1/2 - 3 oz. 4 1/2 lb. 4 1/2 lb.	
PETAL FALL					
Scab	BAYLETON 50W or TOPSIN M 70W + MANCOZEB 80W	J	1/2 to 1 oz. 3 oz. 1 1/2 lb.	1 1/2 to 3 oz. 9 oz. 4 1/2 lb.	Do not use more than five FUNGINEX sprays per year. Do not apply FUNGINEX after petal fall.
Powdery mildew Cedar apple rust	or FUNGINEX 1.6EC + MANCOZEB 80W	JRG	10 oz. 3/4 lb.	36 oz. 2 1/4 lb.	
Quince rust	or MANCOZEB 80W	RG	1 1/2 lb.	4 1/2 lb.	

*J = Jonathan
R = Red Delicious
G = Golden Delicious

Timing & Major Pests Involved	Materials To Use	Varieties To Treat*	Dilute Rate Per 100 Gals.	Low Volume Rate Per Acre	Comments and Special Precautions
Curculio Codling moth Leafhoppers Aphids Mites	DIAZINON 50W or LORSBAN 50W or GUTHION 50W PENNCAP 2FM or ZOLONE 3EC or IMIDAN 50W CARZOL SP	JRG	1 lb. ¾ lb. ½ lb. 1 to 2 pt. 1½-2½ pt. 1½ lb. ¼ to ½ lb.	3 lb. 2¼ lb. 1½ lb. 4 to 8 pt. 5½ to 10¾ pt. 4½ lb. 1 to 4 lbs.	DIAZINON and ZOLONE may cause russetting of Golden Delicious in some seasons. *WARNING—PENNCAP-M should not be applied if pollinators are working cover crop blooms on orchard floor. CARZOL will kill early hatching mites and lower early season mite numbers. Do not use more than 4 pounds per acre per season.

EARLY COVER SPRAYS (7-10 DAY INTERVALS) (Mid-May to Mid-June)

Scab Powdery mildew Cedar apple rust Quince rust	BAYLETON 50W + MANCOZEB 80W or DIKAR 80W or MANCOZEB 80W	J J RG	½ to 1 oz. 1½ lb. 2 lb. 1½ lb.	1½ to 3 oz. 4½ lb. 6 lb. 4½ lb.	BAYLETON or DIKAR should be used on those varieties susceptible to powdery mildew. Do not use BAYLETON after terminal growth ceases. Do not use more than 24 oz. per acre per season. Scale crawlers become active in June. If a scale problem exists, obtain thorough coverage with either DIAZINON or LORSBAN. DIAZINON is likely to give the best control of leafminers.
Curculio Codling moth Leafrollers Leafminer Scale Crawlers	DIAZINON 50W or LORSBAN 50W or GUTHION 50W or ZOLONE 3EC or IMIDAN 50W	JRG	1 lb. ¾ lb. ½ lb. 1½-2½ pt. 1½ lb.	3 lb. 2¼ lb. 1½ lb. 5½ to 10¾ pt. 4½ lb.	SEE "1988 Mite Control" below.

SUMMER COVER SPRAYS (10-14 DAY INTERVALS) (Mid-June through July)

Scab Powdery mildew Botryosphaeria rot	DIKAR 80W or MANCOZEB 80W	J JRG	2 lb. 1½ lb.	6 lb. 4½ lb.	DIKAR should be used on mildew susceptible varieties, where mildew is a problem. Scale crawlers are most active during June. If a scale problem exists, obtain thorough coverage with either DIAZINON or LORSBAN. Do not use more than 8 applications of LORSBAN per season. Do not apply within 28 days of harvest, or apply last two treatments closer than 21 days apart.
Scale Crawlers Codling moth Leafroller Leafminer	DIAZINON 50W or LORSBAN 50W or GUTHION 50W or ZOLONE 3EC or IMIDAN 50W	JRG	1 lb. ¾ lb. ½ lb. 1½-2½ pt. 1½ lb.	3 lb. 2¼ lb. 1½ lb. 5½ to 10¾ pt. 4½ lb.	SEE "1988 Mite Control" below. European red mite and 2 spotted mite populations frequently increase at this time. With OMITE results may not be evident for 48 hrs. or more. Note use restrictions for miticides (below). DO NOT APPLY more than 3 cover sprays of VENDEX 4L.
E. red mites 2 spotted mites	OMITE 30W VENDEX 4L		1¼ lb. 4 to 8 oz.	3¾ lb. 1 to 3 pts.	

LATE COVER SPRAYS (10-14 DAY INTERVALS) (August and Early September)

Scab Bot. rot Sooty blotch Flyspeck	CAPTAN 50W	JRG	1½ lb.	4½ lb.	CAPTAN affords good control of flyspeck, sooty blotch, bot rot, etc. and with less surface residue than MANCOZEB.
Codling moth Leafroller Leafminer E. red mites 2 spotted mites	USE THE SAME INSECTICIDES AND MITICIDES AS IN SUMMER COVER SPRAYS				

*J = Jonathan
R = Red Delicious
G = Golden Delicious

Apple Pesticides, Days to Harvest, and Other Label Restrictions [1]

Compound	Interval [2]	Compound	Interval [2]
Bayleton	NTL	Karathane	21
Benomyl	NTL	Lorsban	28 [5]
Captan	NTL	Mancozeb	21-30 [5]
Carbaryl	1	Morestan	PB
Carzol [4]	7	Omite [4]	7
Diazinon	14	PennCap-M	14
Dikar	21	Phosphamidon	30
Dodine	7	Pounce	21
Ferbam	7	Pydrin	21
Folpet	NTL	Streptomycin	50
Funginex	PF	Systox	21
Guthion [3,4]	7	Topsin	NTL
Imidan	7	Vendex 4L	14
		Zolone	14

- [1] All references are for use on apples only. Many compounds have different limitations on other crops. READ THE LABEL!
 [2] Time in days between last application and harvest. NTL = no time limitation; PB = pre-bloom sprays only. PF = not after petal fall.
 [3] Do not permit workers to re-enter orchard within 24 hrs. after application of GUTHION unless they wear protective clothing. For all other pesticides, no unprotected farm worker re-entry until the spray dries or the dust settles.
 [4] Not more than 3 applications of OMITE nor 8 of GUTHION nor 4 of VENDEX may be made per season. Do not exceed 4 lbs of CARZOL SP or 8 pts of PENNCAP-M per acre per season.
 [5] Consult product label.

1988 MITE CONTROL

1988 promises to be a difficult year for European Red Mite control. The only miticides registered for cover sprays on apples in 1988 will be OMITE and VENDEX. It is possible that Kelthane may be re-registered by the growing season or that an emergency use label for other miticides will be granted. IT IS IMPORTANT that EARLY season mite control be followed. Apply OIL as recommended, with MORESTAN at pink and CARZOL at petal fall. This should keep early mite populations at a minimum. Applications of OMITE or VENDEX should be applied on an as-needed basis; remember that VENDEX is a slow-acting material. Observe maximum number of applications and post-application harvest intervals.

This information is for educational purposes only. References to commercial products or trade names does not imply endorsement by the Cooperative Extension Service or bias against those not mentioned.

APPLE HERBICIDES

Category	Chemical	Rate per acre sprayed area	Comments
Pre-emergence Newly Planted	napropamide (Devrinol)	8 lbs. 50W	Controls germinating weeds up to 6 weeks.
	oryzalin (Surflan)	5 lbs. 75W	Do not apply until soil has settled and no cracks present. Controls grass weeds.
Established 1 - 3 yrs.	diuron (Karmex)	3 lbs. 80W	For control of germinating weeds. Do not use diuron or simazine for 1 year after harvest.
	simazine (Princep)	3 lbs. 80W	Do not use diuron or simazine for 1 year after planting. Effective up to 6 months. Simazine mainly controls grass weeds. Can be used in combination with paraquat. Apply pronamide in fall after harvest, but before leaves drop & soil is frozen. For winter annuals and perennial grasses. Apply to area free of surface litter.
	terbacil (Sinbar)	2 lbs. 80W	Simazine mainly controls grass weeds. Can be used in combination with paraquat. Apply pronamide in fall after harvest, but before leaves drop & soil is frozen. For winter annuals and perennial grasses. Apply to area free of surface litter.
Other	pronamide (Kerb)	2 - 8 lbs 50W	For control of perennial grasses and weeds. No residual control. Do not apply within 14 days of harvest. Injury will result from contact with foliage & green bark.
	dichlobenil (Norosac) (Casoron)	150 lbs. 4G	Controls germinating weeds. Apply in late November or early December.
Post-emergence Bearing Trees	paraquat (Gramoxone)	3-5 pts.	For control of emerged annual grasses and weeds. Can be used in combination with Princep for residual weed control.
	glyphosate (Round-up)	1-5 qts Read Product Booklet	For control of perennial grasses and weeds. No residual control. Do not apply within 14 days of harvest. Injury will result from contact with foliage & green bark.
Non-bearing Trees	2,4-D amine salt	1½ lbs. ai	For control of most perennial weeds and poison ivy.
	sethoxydim (Poast)	1½ - 2½ pts.	Apply 1½ pts. for grasses up to 6 in. tall, 2½ pts. for grasses up to 12 in. tall. Combine with 2½ pts. of oil concentrate per acre. Do not harvest fruit within 1 year of treatment.
	fluazifop-butyl (Fusilade)	1 pint	Apply to annual grasses less than 8 inches tall and perennial grasses less than 6 inches tall. Use ½ pint non-ionic surfactant per acre mixed with herbicide.

Missouri Poison Control Hotline

1-800-392-9111

All Poison Control Centers are coordinated through Cardinal Glennon Memorial Hospital in St. Louis, MO. This facility has a 24-hour Poison Control Hotline staffed by professionals. The Center will refer you to your closest Poison Control Hospital for treatment.

*In the case of accidental poisoning involving a pesticide, follow the first aid directions printed on the label of the container and consult your physician immediately. Additional information concerning treatment and course of action can be obtained from your nearest poison control center.

