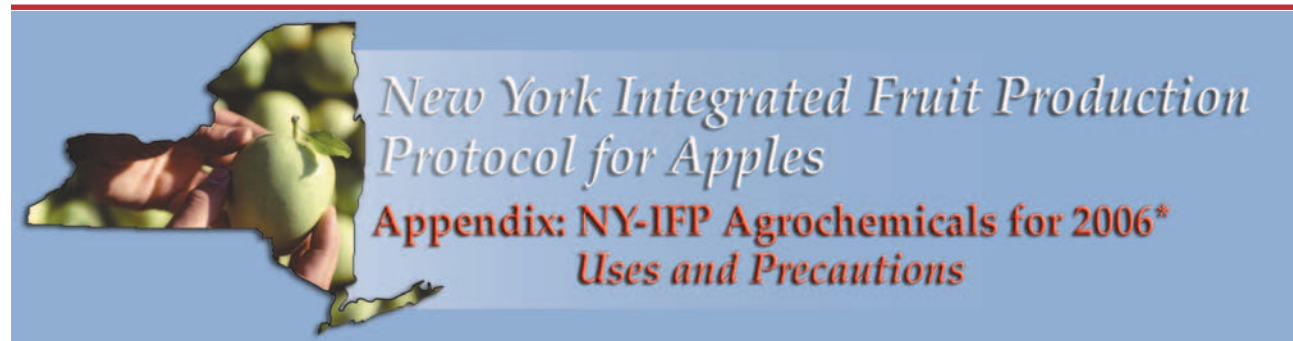


New York's Food and Life Sciences Bulletin

New York State Agricultural Experiment Station, Geneva, a Division of the New York State College of Agriculture and Life Sciences, A Statutory College of the State University, at Cornell University



In Tables 1 – 8, below, are green and yellow color-coded lists of agrochemicals for use under the New York Integrated Fruit Production Protocol for Apples (NY-IFP). The agrochemical materials, colored green, are those that are preferred under NY-IFP and those in yellow materials are one's where restrictions and cautions apply. Materials not listed below that are registered for use on apple in New York are either (1) considered incompatible with IFP goals, (2) were recently registered for use in New York, or (3) may be a Trade Name product with the same active ingredient as found in the list.

1. GROWTH REGULATORS

Green Materials For Crop Management – Preferred under IFP

Material	Uses and Precautions
aminoethoxyvinylglycine (ReTain)	Delay maturity, stop drop.
benzyladenine (Maxcell, Exilis Plus)	Fruit thinning.
benzyladenine + gibberellin (Promalin, etc)	Promote fruit growth and lateral branching.
ethephon (Ethrel, Ethephon 2)	Promote fruit ripening and flower formation.
gibberellin (Pro-Vide)	Fruit russet suppression.
1-naphthaleneacetamide (NAD, Amid-Thin)	Fruit thinning.
naphthaleneacetic acid (various)	Stop drop, sucker suppression, and fruit thinning.
prohexadione-calcium (Apogee)	Growth suppression.

Yellow Materials For Crop Management – Restrictions and Cautions apply

Material	Uses and Precautions
AMADS (Wilthin)	Fruit thinning.
ammonium thiosulfate (ATS)	Fruit thinning.
carbaryl (Sevin)	Only for fruit thinning and no later than 4 weeks after petal fall.
lime sulfur	For blossom and fruit thinning. Can cause phytotoxicity.

*Yearly updates available on the web at www.nysipm.cornell.edu/publications/nyifp_agrochem

oils (Vegetable, Fish or Spray oils) Fruit thinning as a surfactant/penetrant with various chemical thinners. Can cause phytotoxicity if captan is used near oil application.

2. HERBICIDES

Green Materials For Weed Management – Preferred under IFP

Material	Uses and Precautions
biomass mulches	Woodchip mulches preferable to minimize vole problems; excellent for soil and water conservation.
carfentrazone (Aim)	Shielded boom or spot applications recommended to minimize tree damage; soil conservation, no leaching or soil residue problems, adequate weed control with minimal risks to soil quality. Do not contaminate or apply to water, surface water or intertidal areas.
durable fabric or geotextile mulches	Fabric mulches are multiyear, but can cause vole problems; good for soil and water conservation. White (reflective) geotextiles can improve fruit color.
glufosinate	Shielded boom or spot applications recommended to minimize tree damage; soil conservation, no leaching or soil residue problems, adequate weed control with minimal risks to soil and water quality.
glyphosate (Roundup)	Shielded boom or spot applications recommended to minimize tree damage; soil conservation, no leaching or soil residue problems, adequate weed control with minimal risks to soil and water quality.

Yellow Materials For Weed Management – Restrictions and Cautions apply

Material	Uses and Precautions
2,4-D	For use in controlling dandelions in the orchard alleyways or for use in combination with glyphosate, to control woody perennial weeds.
flumioxazin (Chateau)	For use in non-bearing orchards only.
napropamide (Devrinol)	For use in newly planted orchards, after soil settles.
oryzalin (Surflan)	For use in bearing orchards.
paraquat (Gramoxone)	For use in newly planted orchards or where glyphosate type herbicides are not labeled; potential harm to applicators.
pendimethalin (Prowl)	For use in non-bearing orchards only.

3. INSECTICIDES

Green Materials For Insect Management – Preferred under IFP

Materials	Uses and Precautions
abamectin (Agri-Mek)	Once per year for WALH, STLM. Reduces phytoseiid predatory mite numbers by 30-50%.

acetamiprid (Assail)	4 sprays per year max; internal leps, AM, RAA, aphids, leafhoppers
azadirachtin (Aza-Direct, Azatin, Neemix)	Soft-bodied insects (RAA, STLM, aphids).
<i>Bacillus thuringiensis</i> (Agree, Biobit, Deliver, Dipel)	Leps only (mainly OBLR-OW generation).
CM granulosis virus (Cyd-X Carpovirusine)	Baculovirus against CM larvae only. Must be ingested in order to be effective.
imidacloprid (Provado)	No more than 1-2 times per year; aphids, STLM.
indoxacarb (Avaunt)	4 sprays per year max; PC, internal leps, AM, STLM, EAS.
kaolin (Surround)	Thorough coverage required, multiple applications PC, CM, AM.
methoxyfenozide (Intrepid)	IGR for OBLR-OW (rotate with SpinTor in summer), internal leps.
pheromone disruption (Isomate, sprayables, etc.)	OFM, CM; use in combination with conventional materials.
pyriproxyfen (Esteem)	IGR for SJS; some activity on STLM, CM.
spinosad (SpinTor, Entrust)	Mainly for summer OBLR, some activity on AM.
thiamethoxam (Actara)	1 spray per year max; PC, TPB, RAA, EAS, STLM.

Yellow Materials For Insect Management – Restrictions and Cautions Apply

Materials	Uses and Precautions
azinphos-methyl (Guthion)	Petal fall: PC, EAS; summer: CM, OFM, AM. Non-target, beneficial species effects; worker hazard.
carbaryl (Sevin)	Mainly for leafhoppers, if needed; thinning activity. Non-target, beneficial species effects.
chlorpyrifos (Lorsban)	Prebloom: OBLR-OW, RAA, SJS; Post-PF: trunk borers. Non-target, beneficial species effects; worker hazard.
dimethoate	Once per season max: aphids, leafhoppers, SJS. Non-target, beneficial species effects; worker hazard.
endosulfan (Thiodan, Thionex)	Once per season max: aphids, leafhoppers, green fruitworm. Non-target, beneficial species effects.
esfenvalerate (Asana)	Once per season max; best at pink: TPB, STLM, RAA. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects.
fenpropathrin (Danitol)	Once per season max; best at pink: TPB, STLM, RAA. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects.
gamma-cyhalothrin (Proaxis)	Once per season max; best at pink: TPB, STLM, RAA. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects.
lambda-cyhalothrin (Warrior)	Once per season max; best at pink: TPB, STLM, RAA. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects.
methidathion (Supracide)	Prebloom: RAA and SJS. Non-target, beneficial species effects; worker hazard.

methomyl (Lannate)	Once per season max; STLM, leafhoppers, SJS. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects; worker hazard.
oxamyl (Vydate)	Once per season max; STLM, leafhoppers, aphids. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects; worker hazard.
permethrin (Ambush, Pounce)	Not labeled after PF; TPB, STLM, RAA. Will nearly eliminate phytoseiid predatory mites; non-target, beneficial species effects.
phosmet (Imidan)	Petal fall: PC, EAS; summer: CM, OFM, AM. Non-target, beneficial species effects; worker hazard.

Abbreviations

WALH White Apple Leafhopper	EAS European Apple Sawfly
STLM Spotted Tentiform Leafminer	CM Codling Moth
RAA Rosy Apple Aphid	OFM Oriental Fruit Moth
Leps Lepidopterans	IGR Insect Growth Regulator
OBLR Obliquebanded Leafroller	SJS San Jose Scale
OW Overwintering	TPB Tarnished Plant Bug
PC Plum Cucurlio	PF Petal Fall
AM Apple Maggot	

4. MITICIDES

Green Materials for Mite Management – Preferred under IFP

Materials	Uses and Precautions
abamectin (Agri-Mek)	Once per season soon after petal fall.
bifenazate (Acramite)	Rescue treatment if threshold exceeded; recommended for TSSM; once per season maximum.
clofentezine (Apollo) etoxazola (zeal)	Ovicide; pink or post-PF; either don't use in consecutive years or rotate with Savey.
hexythiazox (Savey)	Ovicide; pink or post-PF; either don't use in consecutive years or rotate with Apollo.
horticultural mineral oil , Omni, Stylet, PureSpray, Damoil)	Delayed dormant; summer oils starting post-PF.
pyridaben (Nexter)	Rescue treatment if threshold exceeded; not for TSSM. Preventively or as rescue treatment if thresholds exceeded; once per season maximum.

Yellow Materials For Mite Management – Restrictions and Cautions apply

Materials	Uses and Precautions
dicofol (Kelthane)	Resistant ERM populations common; resistance concerns.
hexakis (Vendex)	Some ERM resistance in NYS; good against TSSM; resistance concerns.

formetanate hydrochloride (Carzol) Not after PF; ERM motiles only; harmful to predatory mites; non-target, beneficial species effects.

Abbreviations

PF Petal Fall

TSSM Two Spotted Spider Mite

ERM European Red Mite

5. FUNGICIDES

Green Materials for Disease Management – Preferred under IFP

Materials	Uses and Precautions
Bacillus subtilis (Serenade)	Biological control agent; apply within three days of streptomycin if blossom blight infection risk remains high as determined by MARYBLYTE or Cougarblight.
captan (field sprays)	Contact fungicide; not compatible with oil sprays; AS, BR, BkR, WR, SB, FS.
carbamate (Ferbam)	Dithiocarbamate contact fungicide; black residue; at high concentrations may cause rapid wear of sprayer pumps; highly toxic to phytoseiid predatory mites; AS, AR.
cyprodinil (Vangard)	Up to 48 hr of postinfection activity against AS; breaks down rapidly at high temps.
dodine (Syllit)	Must be used with caution because dodine-resistant AS is widespread within New York State.
fenarimol (Rubigan)	SI fungicide: always use with contact fungicide (captan, mancozeb, ferbam, thiram) to adequately protect fruit and for resistance management; AS, AR, PM; 72-96 hr postinfection activity against AS.
kresoxim-methyl (Sovran)	Strobilurin fungicide: only 4 applications per season for resistance management; AS, PM, BkR, WR, BR, SB, FS; provides 48-72 hr of postinfection activity against AS.
mefanoxam (Ridomil Gold)	On bearing trees, only apply either before bloom or after harvest; only 1 or 2 applications per season; PRCR.
myclobutanil (Nova)	SI fungicide: always use with contact fungicide (captan, mancozeb, ferbam, thiram) to adequately protect fruit and for resistance management; AS, AR, PM; 72-96 hr postinfection activity against AS.
pyrimethanil (Scala)	Up to 48 hr of postinfection activity against AS; best used during prebloom period because it breaks down rapidly at high temps; after pink combine with captan, mancozeb, or metiram.
streptomycin (Agrimycin Firewall, etc.)	Only 1-4 bloom sprays; apply according to a predictive program such as MARYBLYTE or Cougarblight; 1-2 postbloom applications allowed only if hail occurs in orchards with existing fire blight strikes.
triadimefon (Triadimefon 50)	SI fungicide; AR, PM. No AS control.
trifloxystrobin (Flint)	Strobilurin fungicide: only 4 applications per season for resistance management; AS, PM, BkR, WR, BR, SB, FS; provides 48-72 hr of postinfection activity against AS.

triflumizole (Procure)	SI fungicide: always use with contact fungicide (captan, mancozeb, ferbam, thiram) to adequately protect fruit and for resistance management; AS, AR, PM; 72-96 hr postinfection activity against AS.
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Yellow Materials For Disease Management – Restrictions and Cautions apply

Materials	Uses and Precautions
copper fungicides (Champ, Kocide, COCS, Basicop, Bordeaux Mix, etc.)	Only 1-2 prebloom applications; suppress FB inoculum; additional uses prohibited because of adverse cumulative effects on soils and earthworms.
lime sulfur	Only one application per year; adverse effects on phytoseiid predator mites; worker hazard; antispore activity on AS; fruit thinning with oil if applied near petal fall.
mancozeb (Dithane, Manzate, Penncozeb)	EBDC fungicide: 1-4 prebloom applications; AS, AR, SB, FS, BR. If high phytoseiid predatory mite densities, up to 7 applications (including postbloom) may be used without compromising mite biocontrol.
metiram (Polyram)	EBDC fungicide; 1-4 prebloom applications; AS, AR, SB, FS, BR. If high phytoseiid predatory mite densities, up to 7 applications (including postbloom) may be used without compromising mite biocontrol.
sulfur	Not compatible with oil sprays; 1-4 applications; rates no greater than 1.5 lb/100 gal dilute spray equivalent; use is limited due to adverse effects on phytoseiid predatory mites and effects on soil pH.
thiophanate-methyl (Topsin-M)	1-2 prebloom and/or 1-4 summer applications; between petal fall and harvest for SB, FS, BkR, WR; not for fungicide resistant PM. Adverse effects on earthworms and some predatory mites.
thiram & ziram	Dithiocarbamate fungicides; AS, AR, SB, FS; ziram weak on AS; 1-4 prebloom applications in lieu of EBDC's; 1-2 applications post-bloom in lieu of captan when oil used; if high phytoseiid predatory mite densities postbloom applications will not compromise mite biocontrol.

Abbreviations		
AS - Apple Scab	FS - Flyspeck	SI - Sterol Inhibitor
BR - Bitter Rot	PM - Powdery Mildew	EBDC - Ethylenebisdithiocarbamate
BkR - Black Rot	AR - Apple Rusts	
WR - White Rot	FB - Fire Blight	
SB - Sooty Blotch	PRCR - Phytophthora Root and Crown Rot	

6. SOIL FUMIGANTS

Green Materials For Soil Fumigation – Preferred under IFP

Materials	Uses and Precautions
Sudan Grass cover crop	For use prior to planting where nematodes are a problem. Establish midsummer and plow down prior to planting. Excellent biomass accumulation and weed suppression.

Yellow Materials For Soil Fumigation* – Restrictions and Cautions apply

Materials	Uses and Precautions
sodium methyldithiocarbamate (Vapam)	For soil fumigation where replant disease is a problem on light textured soils.
1,3-dichloropropene (Telone C-17)	For soil fumigation where replant disease is a problem; not for use in Nassau or Suffolk counties.
1,3-dichloropropene (Telone C-35)	For soil fumigation where replant disease is a problem; not for use in Nassau or Suffolk counties.

Extensive on-farm studies throughout New York have shown that tree responses to preplant orchard soil fumigation with available chemical fumigants rarely compensate for the costs of these treatments.

7. VERTEBRATE CONTROL CHEMICALS

Green Materials For Vertebrate Management – Preferred under IFP

Materials	Uses and Precautions
ammonium soaps (Hinder)	Deer/rabbit repellent; direct plant application or on flags on exclusion fencing; not during bloom; potential fruit finish problems after petal fall under hot, humid conditions.
egg solids (Deer Away Big Game Repellent)	Deer repellent; direct plant application or on flags on exclusion fencing; on dormant bearing and non-bearing trees.
capsaicin (Hot Sauce Animal Repellent)	Deer/rabbit/rodent repellent; not within 60-90 days of harvest.
egg solids+capsaicin+Allium sativum (Deer-Off, Bonide Shot Gun Deer & Rabbit Repellent)	Deer/rabbit/rodent repellent; direct plant application or on flags on exclusion fencing; not within 2 weeks of harvest.

Yellow Materials For Vertebrate Management – Restrictions and Cautions apply

Materials	Uses and Precautions
thiram (Chew-Not)	Deer/rabbit/rodent repellent; for dormant applications; worker hazard.

thiram (DeerPro, Gustofson 42S, Optima 4F)	Deer / rabbit / rodent repellent; on non bearing trees that will not bear within one year of application; worker hazard.
zinc phosphide pelletized bait (Bonide Orchard Mouse Bait, Hopkins Zinc phosphide Bait, ZP Rodent Bait AG)	Rodenticide; post harvest; hand bait method preferred; non-target/beneficial species effects; worker hazard; bait-shyness concerns.
zinc phosphide grain-based bait (Zinc phosphide oat bait, Zinc phosphide corn bait)	Rodenticide; post harvest; hand bait method preferred; increased non-target/beneficial species effects; worker hazard; bait-shyness concerns.
chlorophacinone (Rozol Paraffinized Pellets)	Rodenticide; post harvest; hand bait only; non-target/beneficial species effects; worker hazard; must have SLN permit on person during application.
gas cartridges	Woodchuck control in burrows; non-target/beneficial species effects; worker hazard.

8. POST-HARVEST CHEMICALS

Green Materials For Post Harvest – Preferred under IFP

Materials	Uses and Precautions
1-MCP (1-methylcyclopropene)	Be aware of supplier guidelines because of different varietal responses.
fludioxonil (Scholar)	SD; 1 post-harvest application allowed either as a drench or in a line spray. If fludioxonil is used for post-harvest treatments in one year, then pyrimethanil should be used the following year to avoid selecting resistant strains of <i>Penicillium expansum</i> . Some export destinations may not yet accept apples treated with this fungicide.
sodium hypochlorite, calcium hypochlorite	Antimicrobial; concentrations of 50 ppm free chlorine should be maintained in water flumes on apple packing lines to eliminate bacteria and fungal spores that otherwise accumulate in the recycling water.
pyrimethanil (Penbotec)	SD; 1 post-harvest application allowed either as a drench or in a line spray. If pyrimethanil is used for post-harvest treatments in one year, then fludioxonil should be used the following year to avoid selecting strains of <i>P. expansum</i> . Some export destinations may not yet accept apples treated with this fungicide.

Yellow Materials For Post Harvest – Restrictions and Cautions apply

Materials	Uses and Precautions
DPA (diphenylamine)	Use is restricted to storage scald sensitive varieties.
captan (postharvest drench treatment)	SD; 1 post-harvest application allowed only if fruit drenched with diphenylamine (DPA) for storage scald; use where SD is resistant to Mertect fungicide.
thiabendazole (Mertect 340-F)	SD; 1 post-harvest application allowed only if fruit drenched with diphenylamine (DPA) for storage scald.

Abbreviations

SD - Storage Decays caused by *Penicillium expansum* and *Botrytis cinerea*