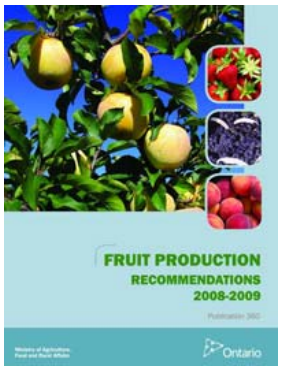
Ontario

Fruit Production Recommendations 2008-2009

Ontario Ministry of Agriculture, Food and Rural Affairs

Chapter 4: Apples



Apple Calendar

Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point. Check Table 4-7. *Products Used on Apples*, on page 66.

Products are listed according to insecticide and fungicide family groups. Use products from different family groups to prevent pest resistance.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Dormant			
San Jose scale European fruit scale Lecanium scale	• Superior 70 Oil	20 L of oil/1,000 L of water	Apply full rate of oil in 2,000–3,000 L of water per ha. 3,000 L gives best results. On large standard trees, use 90 L of oil in 4,500 L of water per ha. Do not use oil within 48 hours of freezing temperatures. Do not use oil within 14 days of Captan or Maestro. Maximum one application per season.
OIL MAY CAUSE BARK INJURY ON RED DELICIOUS, EMPIRE AND CRISPIN (MUTSU).			
Green tip up to half-inch green			
Scab protectants	• Manzate Pro-stick or Dithane DG or Penncozeb 75 DF • Polyram DF • Dikar • Supra Captan 80 WDG or Maestro 80 DF • Vangard 75 WG • Scala SC	6.00 kg 6.00 kg see label 6.00 kg 6.75 kg 3.75 kg 3.75 kg 370 g 1.00 L	Apply fungicide before spore release and keep growing leaves covered. Alternate materials in a spray program. **Dikar**: When used in a full season program, Dikar will suppress mites. Higher water volumes help mite suppression. Consult label. **Vangard or Scala**: Use as protectant fungicides. Vangard and Scala do not control other foliar or fruit diseases. Vangard and Scala are from the same fungicide family and should not be used in rotation. Maximum two applications per season, prebloom only.
Powdery mildew	If powdery mildew was a problem in previous years, then an application of a fungicide is necessary at this time. Use one of the fungicides listed at *Tight cluster to pink,* on page 52.		
Half-inch green to tight cluster			

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
European red mite	• Superior 70 Oil	20 L of oil/1,000 L of water	Apply Superior 70 Oil for the control of European red mite before overwintering eggs hatch. Usually the best timing is between **Half-inch green to tight cluster** when temperatures are getting warmer. Do not apply full rate of oil more than once per season. Apply oil in 2,000–3,000 L of water per ha. 3,000 L gives best results. On large standard trees, use 90 L of oil in 4,500 L of water per ha. Do not use oil within 14 days of Captan or Maestro.
OIL MAY CAUSE BARK INJURY ON RED DELICIOUS, EMPIRE AND CRISPIN (MUTSU).			
Rosy apple aphid	• Assail 70 WP • Actara 25 WG	120 g 160 g	**Assail and Actara**: Both are in the same chemical family and should not be used in rotation. Maximum 4 neonicotinoid applications per season. Repeated use of some neonicotinoids may result in mite outbreaks. **Actara**: Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply during bloom, and wait at least 5 days after treatment before placing beehives in or near treated fields.
Scab	• Manzate Pro-stick or Dithane DG or Penncozeb 75 DF • Polyram DF • Supra Captan 80 WDG or Maestro 80 DF • Dikar • Sovran • Flint 50 WG • Nova 40 W plus Dithane DG • Nova 40 W plus Polyram DF • Nova 40 W plus Maestro 80 DF • Nustar plus Manzate Pro-stick • Vangard 75 WG • Scala SC	6.00 kg 6.00 kg see label 6.00 kg 3.75 kg 3.75 kg 6.75 kg 240 g 140 g 340 g 3.00 kg 340 g 3.00 kg 340 g 1.90 kg 100 g 3.00 kg 370 g 1.00 L	**Sovran, Flint, Nova/Nustar**: Should not be used earlier than **Tight cluster**. After last application tissue is protected from infection for 5–8 days. In conditions of rapid growth, shorten intervals between applications. Check labels for details. Do not use Nova, Nustar, Flint or Sovran once apple scab is present. Use of these products as eradicants may result in the development of fungicide resistance. See Table 2-8. *Fungicide/Bactericide Groupings Based on Sites of Action*, on page 16. The following products are compatible with oil: • Polyram DF • Dithane DG • Manzate DF When mixing fungicides with oil, add fungicide to tank when j to S full of water and mix thoroughly. Add Superior 70 Oil last when tank is at least S full of water. Do not use oil within 14 days of Captan or Maestro.
Powdery mildew	Use one of the products listed at **Tight cluster to pink**.		
Oriental fruit moth	• Isomate M100 • Isomate Rosso	250 dispensers/ha 500 dispensers/ha	Management of OFM is only necessary in orchards where there is a history of damage. Timing is critical for effective control. Mating disruption

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			products are not insecticides, and will not control other pests. Initial OFM population must be low for good results. Apply to square or rectangular orchard blocks at least 4 ha. in size, before a given generation of OFM flight begins. **Isomate M100**: Make a second application of up to 75–80 days after initial application. **Isomate Rosso**: Provides control for up to 120 days. Take note of field longevity. Do not leave the crop unprotected late in the season.
Tight cluster to pink			
Tentiform leafminer	• Assail 70 WP • Calypso 480 EC • Actara 25 WG • Intrepid 240 F • Confirm 240 F • *Pounce • *Decis 5 EC • *Ripcord 400 EC • *Matador 120 EC	80 g 145 mL 315 g 500 mL 1.00 L 520 mL 250 mL 250 mL 83 mL	See Table 4-10. *Thresholds for Tentiform Leafminer on Apples*, on page 69. **Assail, Calypso, Actara (neonicotinoid insecticides)**: Apply when population is mainly in the sap feeder stage. These products are in the same chemical family and should not be used in rotation. Maximum four neonicotinoid applications per season. Repeated use of some neonicotinoids may result in mite outbreaks. **Actara**: Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply during bloom, and wait at least 5 days after treatment before placing beehives in or near treated fields. **Intrepid or Confirm**: Apply at first egg hatch. Confirm suppresses leafminer populations. Continue monitoring after application. ***Pyrethroids (Pounce, Ripcord, Decis, Matador)**: Pyrethroids are highly toxic to beneficial insects, and may lead to outbreaks of European red mite. Pyrethroids also control spring feeding caterpillars and tarnished plant bugs. Maximum one pyrethroid application per season. Pyrethroids should be applied at first egg hatch.
Scab	Use one of the fungicides listed at **Half-inch green to tight cluster**.		

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Powdery mildew	• Nova 40 W • Nustar • Sovran • Flint 50 WG • Dikar • Microscopic sulphur • Kumulus DF	340 g 200 g 240 g 140 g 6.75 kg See label 22.50 kg	Begin application at **Tight cluster** and continue to **First summer spray**. If powdery mildew was prevalent the previous year, apply fungicides beginning at **Green tip**. Additional sprays beyond **First summer spray** may be needed on susceptible varieties or if disease pressure is severe. **Nova and Nustar**: Should be used with an EBDC fungicide to provide subsequent protection against apple scab**.** **Microscopic Sulphur or Kumulus**: Do not use on Delicious because these products can cause an increase in red mite and scale insect populations.
Cedar apple rust Quince rust	• Ferbam 76 WDG • Dikar • Polyram DF • Dithane DG or Penncozeb 75 DF • Nova 40 W • Flint 50 WG	see label 6.75 kg 6.00 kg 6.00 kg see label 340 g 140 g	Include in each spray up to and including **First summer spray**. **Ferbam**: May cause russeting on Golden Delicious and other sensitive varieties. **Nova**: Should be used with an EBDC fungicide to provide subsequent protection against apple scab.
Plant bugs	• Ripcord 400 EC • Matador 120 EC	250 mL 104 mL	**Pyrethroids (Ripcord, Matador)**: Are highly toxic to beneficial insects, and may lead to outbreaks of European red mite. The application of prebloom or petal fall pyrethroids to manage tentiform leafminer will suppress tarnished plant bugs.
Spring-feeding caterpillars Green fruitworm	• Imidan 50 WP • Guthion 50 WSB or Sniper • Zolone Flo	3.75 kg see label see label 2.00 L	This spray is not necessary if a pyrethroid was applied for tentiform leafminer.
Pink			
Scab	Use one of the fungicides listed at **Half-inch green to tight cluster**.		
Black rot	• Maestro 80 DF • Supra Captan 80 WDG	3.75 kg 3.75 kg	Do not use oil within 14 days of Maestro or Captan.
European red mite	• Carzol SP	1.10 kg	Miticides are most effective when used alone. **Carzol** is harsh on beneficial mite species and bees.
Rosy apple aphid	• Assail 70 WP • Zolone Flo	120 g 2.00 L	Preferred time for control. See Table 9-4, *Relative Toxicity of Pesticides to Honeybees*, on page 193. **Assail**: Maximum 4 neonicotinoid applications per season. Repeated use of some neonicotinoids may result in mite outbreaks.
Bloom			

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
DO NOT APPLY INSECTICIDES WHILE APPLE TREES ARE IN BLOOM. SEE BEE POISONING ON PAGE 192.			
Scab	• Supra Captan 80 WDG or Maestro 80 DF • Polyram DF • Dikar • Manzate Pro-stick or Dithane DG or Penncozeb 75 DF • Nova 40 W plus Dithane DG • Nova 40 W plus Polyram DF • Nova 40 W plus Maestro 80 DF • Nustar plus Manzate Pro-stick • Flint 50 WG • Sovran	3.75 kg 3.75 kg 6.00 kg 6.75 kg 6.00 kg 6.00 kg see label 340 g 3.00 kg 340 g 3.00 kg 340 g 1.90 kg 100 g 3.00 kg 140 g 240 g	**Sovran, Flint, Nova, Nustar**: Do not use earlier than **Tight cluster**. See Table 2-8. *Fungicide/Bactericide Groupings Based on Sites of Action,* on page 16. After last application of Sovran, Flint, Nova or Nustar tissue is protected from infection for 5–8 days. In conditions of rapid growth, shorten intervals between applications. Check label for details. Do not use Nova, Nustar, Flint or Sovran once apple scab is present. Use of these products as eradicants may result in the development of fungicide resistance.
Fire blight	• Streptomycin 17	600 g/1,000 L	Sprays are most effective when applied dilute (high volumes of water) prior to a wetting period. Use alone for best results. Streptomycin 17 is UV light sensitive and is only effective for 2–3 days. Re-application is needed after 2–3 days if warm, wet conditions (above 20ɛC) prevail. 2–3 sprays during bloom may be required for fire blight control. Maximum three applications per season.
Late Bloom/Early Petal Fall			
Fire blight (Suppression of shoot blight stage)	• Apogee	1.35 kg	**Apogee**: A plant growth regulator that reduces vegetative growth in the tree, making the tree less susceptible to fire blight infections of shoots. Apogee has no impact on blossom blight or the fire blight bacteria. Apogee should be applied in late bloom or early petal fall when shoots are 2.5 to 5.5 cm long. Accurate timing of application is critical. Apogee will help suppress fire blight infections from this point on. Re-apply spray 14–21 days later. In plantings with low vigour, a reduction in shoot growth caused by the high rate of Apogee for fire blight suppression may be undesirable. For more information on the use of Apogee refer to *Vegetative growth control in apples*, on page 85.
Petal fall (Calyx) when most petals have fallen			

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Scab	Use one of the fungicides recommended at **Bloom**.		
Black rot	Use one of the fungicides listed at **Pink**.		
Tentiform leafminer	• Agri-Mek 1.9% EC • Admire 240 F or Alias 240 SC • Assail 70 WP • Actara 25 WG • Calypso 480 EC • *Pounce • *Decis 5 EC • *Ripcord 400 EC • *Matador 120 EC	750 mL 380 mL 380 mL 80 g 315 g 145 mL 520 mL 250 mL 250 mL 83 mL	See Table 4-10. *Thresholds for Tentiform Leafminer on Apples*, on page 69. **Agri-Mek and Pyrethroids**: Apply for tentiform leafminer when the first sapfeeders are present. **Agri-Mek**: Do not apply later than 21 days after petal fall. Apply with 10 L of Superior 70 Oil and a minimum of 1,000 L of water per ha. Agri-Mek plus oil may cause russeting to Golden Delicious and other light-skinned cultivars. Do not use Agri-Mek plus oil within 14 days of Captan or Maestro application. Maximum one application Agri-Mek per season. Agri-Mek plus oil is best applied alone. Also controls ERM and TSSM. **Admire/Alias, Assail, Actara, Calypso**: Apply neonicotinoid insecticides when population is mainly in the sap feeder stage. These products are in the same chemical family and should not be used in rotation. These products will also control other insects at this timing. Note that some neonicotinoids are toxic to bees. **Actara**: Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply during bloom, and wait at least 5 days after treatment before placing beehives in or near treated fields. Maximum four neonicotinoid applications per season. ***Pyrethroids (Pounce, Ripcord, Decis, Matador)**: Pyrethroids are highly toxic to beneficial insects, and may lead to outbreaks of European red mite. In years where leafminer egg hatch is delayed, a pyrethroid can be applied at petal fall when first sap-feeding mine is detected. This treatment also controls tarnished plant bug and spring feeding caterpillars. Maximum one pyrethroid application per season.
Rosy apple aphid	• Admire 240 F or Alias 240 SC • Assail 70 WP • Actara 25 WG • Zolone Flo	230 mL 230 mL 120 g 160 g 2.00 L	**Admire /Alias, Assail, Actara**: Applied at this time also control other insects. These products are in the same chemical family and should not be used in rotation. Repeated use of some neonicotinoids may result in mite outbreaks. **Actara**: Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply during bloom, and wait at least 5 days after treatment before placing beehives in or near treated fields. Maximum four neonicotinoid

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			applications per season.
Mullein leaf bug	• Calypso 480 EC • Actara 25 WG • Admire 240 F or Alias 240 SC • Diazinon 50 W	290 mL 315 g 380 mL 380 mL 3.25 kg	Timing of sprays is important. **Neonicotinoids (Actara/Calypso/Admire/Alias)**: Applied at this time also control green apple aphid, rosy apple aphid, white apple leafhopper, and tentiform leafminer. Repeated use of neonicotinoids may result in mite outbreaks. Maximum four neonicotinoid applications per season.
Oystershell scale San Jose scale	• Guthion 50 WSB or Sniper	see label see label	Apply when the crawlers are active.
Plum curculio	• Actara 25 WG • Calypso 480 EC • Imidan 50 WP • Zolone Flo • Guthion 50 WSB or Sniper • Surround WP	385 g 440 mL 3.75 kg 3.00 L see label see label 50.0 kg	**Actara/Calypso**: These products are in the same chemical family and should not be used in rotation. Repeated use of some neonicotinoids may result in mite outbreaks. Do not use Calypso/Actara in border sprays. Actara and Calypso also have activity against mullein bug and tentiform leafminer. Maximum four neonicotinoid applications per season. Research indicates that application of Calypso/Actara at petal fall plus 3 days is the optimal timing for plum curculio. However if monitoring indicates plum curculio is in the orchard prior to this timing, then insecticides should be applied at petal fall. **Actara**: Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply during bloom, and wait at least 5 days after treatment before placing beehives in or near treated fields. **Guthion, Sniper, Imidan, and Zolone**: Will provide subsequent control of some caterpillars. These products should be applied immediately at petal fall, or when monitoring indicates plum curculio is in the orchard. **Surround**: Must be applied before plum curculio are present in orchard. Make two applications, 7 days apart, at 50 kg/ha, to establish a base layer. Continue at 7–14 day intervals, using a reduced rate of 25 kg/ha, to maintain even coverage of developing fruits. Do not use Surround in border sprays. See *Particle film technology* on page 10.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
European apple sawfly	• Guthion 50 WSB or Sniper	see label see label	Apply as a special spray to orchards where there has been a history of damage.
European red mite	• Agri-Mek 1.9% EC • Acramite 50 WS • Envidor 240 SC • Kanemite 15 SC • Apollo SC • Carzol SP	750 mL 851 g or 3.75 pouches 750 mL 2.1 L 300 mL 1.10 kg	See Table 4-8. *Thresholds for European Red Mite and Two-spotted Spider Mite on Apples*, on page 68. Do not apply any miticide more than once per season. Thorough coverage is essential for good control with miticides. To prevent development of pesticide resistance, miticides should be rotated with products from different families. See Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action,* on page 15. **Agri-Mek**: Apply when mites are in the nymph stage, no later than 21 days after petal fall. Apply with 10 L Superior 70 Oil and a minimum of 1,000 L of water per ha. Agri-Mek plus oil may cause russeting to Golden Delicious and other light-skinned varieties. Do not use Agri-Mek plus oil within 14 days of a Captan or Maestro application. Ideally, alternate yearly with other early season miticides (e.g., Superior 70 Oil, Apollo). Agri-Mek also controls tentiform leafminer. **Envidor**: Has slow activity and results may not be apparent for up to 1 week. Envidor is effective in managing rust mites. **Acramite and Envidor**: Should be applied when there are 5 or more active mites per leaf. **Apollo**: Kills mite eggs. Apply when mites are mostly in the egg stage and before there are more than 3 active mites per leaf. Thorough coverage is essential for good control. Apply Apollo alone in a minimum of 1,100 L of water per ha. **Carzol**: Harsh on beneficial insects, mites and bees.
Blister spot	• Aliette WDG	2.00 kg	Begin applications at petal fall with 1–2 subsequent sprays at 7 day intervals. Do not mix with copper compounds. Maximum three applications per season.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Obliquebanded leafroller	• Success 480 SC • Entrust 80 W • *Dipel 2X DF or *Foray 48BA or *Bioprotect CAF • Intrepid 240 F • Confirm 240 F	182 mL 109 g 1.12 kg 2.80 L 4.00 L 750 mL 1.00 L	When applied for leafroller control, these products also control other caterpillars. OBLR are resistant to OP insecticides in most commercial apple orchards. Cross-resistance to pyrethroids and Confirm has been documented in some Ontario OBLR populations. Cross-resistance with OP insecticides and Intrepid has been observed in other apple growing regions, but this has not been demonstrated in Ontario. Avoid treating sequential generations with the products from the same chemical family. See Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action*, on page 15. **Success/Entrust**: Monitor populations and re-apply as necessary on a 7–10 day schedule. Spray solution should be above pH 6.0. ***B.t. products (Dipel, Foray, Bioprotec)**: Make two applications at 5–7 day intervals if activity of the larvae is extended. For best results when using B.t. products, acidify spray mix to below pH 7.0 and apply at dusk or on overcast days. **Intrepid or Confirm**: Accurate timing these products is important. See label for specific timing. Intrepid will also manage leafminers and oriental fruit moth when applied at this time.
Oriental fruit moth	• Intrepid 240 F • Assail 70 WP • Calypso 480 EC • Rimon 10 EC • *Decis 5 EC	1.00 L 240 g 440 mL 1.4 L/1,000 L 250 mL	Apply as a special spray to orchards where there is a history of damage. Timing is critical for effective control; use monitoring results to adjust spray timing. Begin applications at peak egg hatch based on pheromone trap counts and degree-days. **Intrepid**: Application at this time will provide subsequent control of OBLR . **Rimon**: Use for first generation only. Rimon applied at this time will also control codling moth (CM), however a repeat application 10–14 days later will be necessary for CM control. See label for additional information on rates and volumes. Do not allow Rimon to drift onto grapes as leaf spotting may occur. **Neonicotinoids (Assail, Calypso)**: When applied at this time will also control mullein bug and tentiform leafminer. Assail and Calypso are in the same chemical family and should not be used in rotation. Repeated use of some neonicotinoids may result in mite outbreaks. Maximum four neonicotinoid applications per season. ***Pyrethroids (Decis)**: Pyrethroids are highly toxic to beneficial insects and may lead to outbreaks of European red mite. Use only as a last resort. Maximum 1 pyrethroid per season.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Codling moth	• Rimon 10 EC	1.4 L/1,000L	**Rimon**: Has a unique mode of action and should be applied earlier then other products for codling moth. Apply Rimon at petal fall and re-apply 10–14 days later. Use for first generation only. See label for additional information on rates and volumes**.** Do not allow Rimon to drift onto grapes as leaf spotting may occur**.** The application of Rimon at this time will provide subsequent control of OBLR and OFM.
Powdery mildew	Use one of the fungicides listed at **Tight cluster to pink.**		
First summer spray (7–14 days after Petal fall (Calyx))			
Scab	Use one of the fungicides recommended at **Bloom.** An extra scab spray may be required between **Petal fall (Calyx)** and **First summer spray**. See *Control of apple scab under adverse weather conditions* on page 70.		
Plum curculio	Use one of the insecticides listed under **Petal fall (Calyx)**.		
Fire blight	• Streptomycin 17	600 g/1,000 L	Apply to control shoot blight especially if blossom blight has occurred.
European red mite	• Agri-Mek 1.9% EC • Acramite 50 WS • Envidor 240 SC • Kanemite 15 SC • Apollo SC	750 mL 851 g or 3.75 pouches 0.75 L 2.1 L 300 mL	See Table 4-8. *Thresholds for European Red Mite and Two-spotted Spider Mite on Apples*, on page 68. Do not apply any miticide more than once per season. Thorough coverage is essential for good control with miticides. To prevent development of pesticide resistance, miticides should be rotated with products from different families see Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action,* on page 15. **Agri-Mek**: Apply when mites are in the nymph stage, no later than 21 days after petal fall. Apply with 10 L of Superior 70 Oil and a minimum of 1,000 L of water per ha. Agri-Mek plus oil may cause russeting to Golden Delicious and other light-skinned cultivars. Do not use Agri-Mek plus oil within 14 days of Captan or Maestro application. Ideally, alternate yearly with other early season miticides (e.g., Superior 70 Oil, Apollo). Agri-Mek also controls tentiform leafminer. **Envidor**: Effective in managing rust mites. Activity is slow; control may not be apparent for up to 1 week. **Acramite and Envidor**: Should be applied when there are 5 or more active mites per leaf. **Apollo**: Apply no later than 14 days after petal fall. Apollo kills mite eggs. Apply when mites are mostly in the egg stage and before there are more than 3 active mites per leaf. Apply Apollo alone in a minimum of 1,100 L of water per ha. See *Pest Resistance to Insecticides, Fungicides,*

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			Miticides on page 13.
Two-spotted spider mite	• Agri-Mek 1.9% EC • Acramite 50 WS • Envidor 240 SC • Kanemite 15 SC • Apollo SC	750 mL 567 g or 2.5 pouches 0.75 L 2.1 L 300 mL	See Table 4-8. *Thresholds for European Red Mite and Two-spotted Spider Mite on Apples*, on page 68. Do not apply any miticide more than once per season. Thorough coverage is essential for good control with miticides. To prevent development of pesticide resistance, miticides should be rotated with products from different families. See Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action,* on page 15. **Agri-Mek**: Apply when mites are in the nymph stage, no later than 21 days after petal fall. Apply with 10 L of Superior 70 Oil and a minimum of 1,000 L of water per ha. Agri-Mek plus oil may cause russeting to Golden Delicious and other light-skinned cultivars. Do not apply within 14 days of Captan or Maestro application. Ideally, alternate yearly with other early season miticides (e.g. Superior 70 Oil, Apollo). Agri-Mek also controls tentiform leafminer. **Envidor**: Effective in managing rust mites. Activity is slow; control may not be apparent for up to 1 week. **Acramite and Envidor**: Should be applied when there are 5 or more active mites per leaf. **Apollo**: Apply no later than 14 days after petal fall. Apollo kills mite eggs. Apply when mites are mostly in the egg stage and before there are more than 3 active mites per leaf. Thorough coverage is essential for good control. Apply Apollo alone in a minimum of 1,100 L of water per ha. See *Pest Resistance to Insecticides, Fungicides, Miticides* on page 13.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Rosy apple aphid	• Admire 240 F or Alias 240 SC • Assail 70 WP • Actara 25 WG • Zolone Flo	230 mL 230 mL 120 g 160 g 2.00 L	**Admire/Alias, Assail, or Actara**: When applied at this time also control green apple aphid and white apple leafhopper. Maximum four neonicotinoid applications per season. Repeated use of neonicotinoids may result in mite outbreaks.
Powdery mildew	Use one of the fungicides listed under **Tight cluster to pink**.		
Blister spot	• Copper 53 W • Aliette WDG	3.00 kg 2.00 kg	**Copper 53 W**: To reduce the incidence of blister spot lesions on Crispin and other sensitive varieties, apply up to three applications beginning 10 days after petal fall. Use hydrated lime as a safener (to reduce the risk of phytotoxicity) at a rate of 6 kg per 1 kg of Copper 53 W per 1,000 L of water. Apply 3,000 L of water per ha. **Aliette**: Begin applications at petal fall with 1–2 subsequent sprays at 7 day intervals. Do not mix with copper compounds. Maximum three applications per season.
Oriental fruit moth	• Isomate M 100 • Isomate Rosso	250 dispensers/ha 500 dispensers/ha	Refer to mating disruption comments listed under **Half-inch green to tight cluster.** Make a second application of Isomate M 100 75–80 days following the first application. **Isomate Rosso**: Will provide control for up to 120 days.
Codling moth (1st generation)	• Intrepid 240 F • Confirm 240 F • Assail 70 WP • Calypso 480 EC • Imidan 50 WP • Guthion 50 WSB or Sniper • Zolone Flo	1.00 L 1.00 L 170 g 440 mL 3.75 kg see label see label 2.00 L	Timing is critical; use pheromone traps to time sprays. Place traps in orchards at bloom. **OP insecticides (Imidan, Guthion, Sniper, Zolone)**: Apply for 1st generation codling moth at 100 DDC (base 11єC). **Intrepid and Confirm**: Apply Intrepid/Confirm 2–3 days earlier than OP insecticides. These products also suppress leaf-feeding caterpillars, but do not control apple maggot. Border sprays are not recommended with these products. Intrepid residuals last 14+ days. **Assail and Calypso**: Apply 1–2 days earlier than OP insecticides. Calypso provides subsequent control of plum curculio and apple maggot. Border sprays are not recommended with Calypso and Assail. Repeated use of neonicotinoids may result in mite outbreaks. Calypso/Assail residues last 10–14 days. Maximum four neonicotinoid applications per season. **Guthion and Sniper**: Also control scale crawlers. **Zolone**: Also controls aphids. Not all of the products registered for codling moth provide subsequent control of plum curculio and apple maggot.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Subsequent summer sprays			
Scab	Until the end of the primary scab season use one of the fungicides recommended at **Bloom.** For summer (secondary) scab control, use one of the following:		
	• Supra Captan 80 WDG or Maestro 80 DF • Dikar WP • Polyram DF • Manzate Pro-stick or Dithane DG or Penncozeb 75 DF	3.75 kg (1.9) 3.75 kg (1.9) 6.75 kg 6.00 kg (4.5) 6.00 kg (5.0) 6.00 kg (4.5) see label	If scab is controlled in your orchard use the lower rate given in brackets. Do not apply Polyram, Dikar, Manzate, Dithane or Penncozeb within 45 days of harvest.
Sooty blotch Fly speck	• Supra Captan 80 WDG or Maestro 80 DF • Flint 50 WG	3.75 kg 3.75 kg 140 g	**Captan or Maestro**: Repeat application in 2 weeks. At full rates these products protect against black rot.
Codling moth	• Intrepid 240 F • Confirm 240 F • Assail 70 WP • Calypso 480 EC • Imidan 50 WP • Guthion 50 WSB or Sniper • Zolone Flo	1.00 L 1.00 L 170 g 440 mL 3.75 kg see label see label 2.00 L	Timing is critical for effective control. Use pheromone traps to time sprays. Not all of the products registered for codling moth provide subsequent control of apple maggot. **OP insecticides (Imidan, Guthion, Sniper, Zolone)**: Apply for 2nd generation codling moth at 700 DDC (base 11єC). **Intrepid and Confirm**: Accurate timing of Confirm/Intrepid is important. Apply 2–3 days earlier than OP insecticides. Border sprays are not recommended. These products also suppress leaf-feeding caterpillars, but do not control apple maggot. Intrepid residues last 14+ days. **Assail and Calypso**: Apply 1–2 days earlier than OP insecticides. Calypso provides subsequent control of apple maggot. Border sprays are not recommended. Repeated use of neonicotinoids may result in mite outbreaks. Assail and Calyspo residues last 10–14 days. Maximum four neonicotinoid applications per season. **Guthion and Sniper**: Also control scale crawlers. **Zolone**: Also controls aphids.
Oriental fruit moth	• Isomate M 100 • Isomate Rosso	250 dispensers/ha 500 dispensers/ha	Refer to mating disruption comments listed under **Half-inch green to tight cluster**. Make a second application of Isomate M 100, 75–80 days following first application. Isomate Rosso provides control for up to 120 days.

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Apple maggot	• Imidan 50 WP • Guthion 50 WSB or Sniper • Zolone Flo • Diazinon 50 W • Calypso 480 EC • Surround WP	3.75 kg see label see label 3.00 L see label 440 mL 50.00 kg	Use trap catches to time the first spray. Make subsequent applications at 14–21 day intervals or as required based on monitoring. **OP's (Imidan, Guthion/Sniper, Zolone, Diazinon) and Calypso**: Apply 7 days after the first adult maggot is caught on a sticky board. OP insecticide residues last approximately 18–21 days. Calypso residue lasts 14 days. Maximum four neonicotinoid applications per season. Repeated use of neonicotinoids may result in mite outbreaks. **Surround**: Begin applications well before first maggot flies are trapped in commercial orchards, and continue at 7–14 day intervals to maintain even coverage of fruit as long as flies continue to be captured. Use 50 kg/ha for the first two applications of the season, continue at 25 kg/ha. See *Particle film technology* on page 10**.** **Calypso or Surround**: Not recommended for use as border sprays.
Special summer sprays			
Blister spot	• Copper 53 W • Aliette WDG	3.00 kg 2.00 kg	See comments on blister spot control under **First summer spray.**
Green apple aphid Rosy apple aphid	• Admire 240 F or Alias 240 SC • Assail 70 WP • Zolone Flo • Diazinon 50 W • Thiodan 50 WP or Thionex 50 W	230 mL 230 mL 120 g 2.00 L see label 4.50 kg 4.50 kg	**Zolone and Diazinon**: Also control woolly apple aphid, codling moth and apple maggot. **Admire/Alias and Assail**: Also control white apple leafhopper. Maximum four neonicotinoid applications per season. Repeated use of neonicotinoids may result in mite outbreaks. **Thiodan and Thionex**: Also control white apple leafhopper.
Woolly apple aphid	• Diazinon 500 E • Malathion 25 W • Zolone Flo	see label see label 2.00 L	Use high volumes of water and ensure spray contacts trunk and scaffold limbs. Repeat application in 14 days if woolly apple aphid is still present. **Zolone**: Effective only if used on a regular basis.
White apple leafhopper	• Admire 240 F or Alias 240 SC • Calypso 480 EC • Sevin XLR • Carzol SP • Thionex 50 W	200 mL 200 mL 145 mL 3.10 L 1.10 kg 2.60 kg	Spray when nymphs are present (2–5 per leaf). There are 2 generations of nymphs per season, in mid-June and early August. Control of adults is very difficult. **Admire/Alias**: When applied for first generation, also controls green apple aphid and rosy apple aphid. **Assail**: Applied at a rate of 120 g/ha for aphids will control leafhoppers. Repeated use of neonicotinoids may result in mite outbreaks. Maximum four neonicotinoid

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			applications per season.
Potato leafhopper	• Thionex 50 W • Calypso 480 EC	2.60 kg 145 mL	**Assail**: Applied at a rate of 120 g/ha for aphids will also control leafhoppers.
Tentiform leafminer	• Admire 240 F or Alias 240 SC • Assail 70 WP • Calypso 480 EC • *Pounce • *Decis 5 EC • *Ripcord 400 EC • *Matador 120 EC	380 mL 380 mL 80 g 290 mL 520 mL 250 mL 250 mL 83 mL	See Table 4-10. *Thresholds for Tentiform Leafminer on Apples*, on page 69. **Admire/Alias, Assail and Calypso**: Apply when populations are mainly in the sap-feeder stage. **Calypso**: Note rate change from 1st to 2nd generation. Maximum four neonicotinoid applications per season. Repeated use of neonicotinoids may result in mite outbreaks. ***Pyrethroids**: Use is discouraged for summer generations of tentiform leafminer. Pyrethroids are highly toxic to beneficial insects and may lead to outbreaks of European red mite. These products do not control larvae within the mines.
Dogwood borer Apple bark borer	• Pounce plus Superior Oil	22 mL/100 L water with 2 L oil	Soak the trunk. Make two applications at 2–3 week intervals when adults are flying (late June–early August).
Obliquebanded leafroller	• Success 480 SC • Entrust 80 W • *Dipel 2X DF or *Foray 48BA or *Bioprotec CAF • Intrepid 240 F • Confirm 240 F	182 mL 109 g 1.12 kg 2.80 L 4.00 L 750 mL 1.00 L	Place pheromone traps in orchards by June to monitor adult populations. Insecticide populations for summer generation larvae should be applied at 240-280 DDC after first sustained moth catch (base 6.1єC). When applied for leafroller control, these products also control other leaf-feeding caterpillars. OBLR are resistant to OP insecticides in most commercial apple orchards. Cross-resistance to pyrethroids and Confirm has been documented in some Ontario OBLR populations. Cross-resistance with OP insecticides and Intrepid has been observed in other apple growing regions, but has not been demonstrated in Ontario. Avoid treating sequential generations with the products from the same chemical family. See Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action*, on page 15. **Success/Entrust**: Monitor populations and re-apply as necessary on a 7–10 day schedule. Maximum three applications per season. Spray

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			solution should be above pH 6.0. **Intrepid/Confirm**: Note these products provide suppression of OBLR at this timing. Apply a second spray 10–14 days after the first application. Accurate timing is important. See label for specific timing. Maximum two applications per season. ***B.t. products**: Make two applications of B.t. products at 5–7 day intervals if activity of the larvae is extended. For best results acidify spray mix to below pH 7.0 and apply at dusk or on overcast days.
Oriental fruit moth	• Assail 70 WP • Calypso 480 SC • *Decis 5 EC • Intrepid 240 F	240 g 440 mL 250 mL 1.00 L	Apply as a special spray to orchards where there has been a history of damage. Timing is critical for effective control; use monitoring results to adjust spray timing. Begin applications at peak egg hatch based on pheromone trap counts and degree-days. Apply sprays 6–10 days after upswing in the moth flight for the first generation and 3–6 days after the upswing in moth flight for subsequent generations Rotate between products in different chemical families to deter the development of pesticide resistance. See Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action,* on page 15. ***Pyrethroids**: Highly toxic to beneficial insects and may lead to outbreaks of European red mite. Use only as a last resort.
European red mite	• Pyramite or Nexter • Acramite 50 WS • Envidor 240 SC • Kanemite 15 SC • Kelthane 50 W • Carzol SP	300 g 300 g 851 g or 3.75 pouches 0.75 L 2.10 L 3.25 kg 1.10 kg	Thorough coverage is essential for good control with miticides. To prevent development of pesticide resistance, miticides should be rotated with products from different families see Table 2-7. *Insecticide and Miticide Groups Based on Sites of Action,* on page 15. Use established spray thresholds to time miticide applications. See Table 4-9. *Activity of Miticides Registered on Apple and/or Pear in Ontario*, on page 68. Miticides are best used alone. Use a minimum of 1,000 L/ha of water when applying summer miticides. Use each miticide only once per season to delay development of resistance. See *Pest Resistance to Insecticides, Fungicides, Miticides* on page 13. **Envidor, Pyramite/Nexter or Kelthane**: Will also control rust mite. **Pyramite/Nexter**: Most effective against immature stages (but not eggs).

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
			Envidor: Has slow activity; control may not be apparent for up to 1 week. **Carzol**: Harsh on beneficial mite species.
Two-spotted spider mite	• Pyramite or Nexter • Kelthane 50 W • Carzol SP • Acramite 50 WS • Envidor 240 SC • Kanemite 15 SC	600 g 600 g 3.25 kg 1.10 kg 567 g or 2.5 pouches 0.75 L 2.10 L	Use established spray thresholds to time miticide applications. See Table 4-9. *Activity of Miticides Registered on Apple and/or Pear in Ontario*, on page 68. Miticides are best used alone. Use a minimum of 1,000 L/ha of water when applying summer miticides. Apply each miticide only once per season to delay development of resistance. See *Pest Resistance to Insecticides, Fungicides, Miticides* on page 13. **Envidor, Pyramite/Nexter or Kelthane**: Will also control rust mite. **Pyramite/Nexter**: Most effective against immature stages (but not eggs). **Envidor**: Has slow activity; control may not be apparent for up to 1 week. **Carzol**: Harsh on beneficial mite species.
Japanese beetle	• Imidan 50 WP	3.75 kg	Japanese beetles have recently become a problem in some Ontario orchards, especially in young plantings of Honeycrisp. If Japanese beetles cause economic damage, insecticide sprays may be necessary. For information on managing this pest contact your local crop consultant.
Pinpoint and storage scab	Use one of the fungicides recommended for secondary scab in **Subsequent summer sprays**. Do not use fungicides closer than the stated interval to harvest. See Table 4-7. *Products Used on Apples,* on page 66.		
Preharvest sprays			
Botrytis grey mould *Penicillium* storage diseases (suppression)	• Scala SC	2.00 L	**Scala**: Apply 2 weeks before harvest. **Captan and Maestro**: Summer applications provide some protection against storage rots.
Postharvest treatment			

Diseases and Insects	Materials	Amount/ha trees 4.5–5.5 m high	Comments
Blue mould Grey mould	• Mertect SC • Scholar 50 WP	0.50 L/500 L 227 g of product in 378 L of water.	**Mertect**: Continuous agitation is required. Follow label instructions. Does not control blue mould (*Penicillium*) or grey mould (*Botrytis*), that are resistant to benzimidazole fungicides. **Scholar**: For use in dip tank or drencher. Treats up to 90,000 kg of fruit. For dip treatments, dip fruit for approximately 30 seconds and allow fruit to drain.