

GUIDE TO WEED MANAGEMENT IN ORCHARDS

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GROUND COVER MANAGEMENT

Ground cover management is the manipulation of vegetation ground cover within the orchard to maximize its benefits while minimizing its drawbacks. There are many benefits to be gained by managing the ground cover in orchard blocks including more rapid tree growth and earlier bearing, greater response to fertilizer, reduced tree stress during periods of dry weather, increased fruit size and yield, reduced potential for mouse injury, erosion and insulating against deep cold (frost) penetration.

While total ground cover control will eliminate competition for water and nutrients, it does, however, have its drawbacks with regards to erosion, dust, frost penetration, and equipment mobility during periods of wet soil conditions. By today's environmental standards, total vegetation control is not environmentally sustainable under our conditions. Ground cover management in today's orchards should make use of grass alleyways and some form of vegetation control under the tree canopy.

Weed competition in early summer (before mid-July) can decrease shoot growth, tree vigour and fruit bud formation. To get a maximum yield response from managing ground cover, control should start as soon as there is significant new weed growth. A limited amount of weed growth in late summer and fall will have little or no impact on yields, and re-establishment of weeds under the trees at this time has some advantages. Therefore, in bearing orchards a weed control program should aim for enough control to prevent significant weed competition, but enough regrowth during late summer and fall to avoid the detrimental effects of bare ground.

Weed growth in late summer can be controlled, if necessary, by mechanical mowing or chemical mowing with a herbicide such as paraquat or glufosinate ammonium. The use of glufosinate ammonium may also provide some control of two spotted spider mite residing on the ground cover and preventing them from moving up into the tree canopy. In dry years, extending the period of weed control and width of herbicide strip will help to reduce the competition for soil moisture there by helping to offset some of the negative aspects of drought stress on the trees.

Some regrowth of ground cover, starting about mid-July for bearing trees has the following advantages over yearlong bare ground:

1. There is less chance of excessive nitrogen uptake in late summer and fall by the trees. If weather conditions cause an unusually large release of nitrogen from the soil organic matter, the regrowth will compete with the tree for it. Excessive N late in the summer or fall will cause poor fruit colour, shorten fruit storage life and decrease winter hardiness of the tree.

2. Weed cover will decrease the chance of early frost penetration into the root zone before they are hardened off. The likely hood of this occurring is greater on light sandy soils. Weed growth within the row will trap leaves and snow, whereas bare ground is likely to be swept clean. The blanket of leaves and/or snow acting as insulation will decrease frost penetration and reduce the risk of freezing injury to the tree.
3. There is less chance of loosening and leaning of trees in the early spring when the soil is wet. This problem tends to occur more often with dwarf rootstock, especially on soils with poor drainage. The roots of a living ground cover help to bind the soil together and support the trees against wind action.
4. There is less chance of soil erosion. Erosion of bare ground can be extensive, even on soils with a very slight slope, during rapid snowmelt and heavy rain. Vegetation will generally improve soil structure and penetration of water.
5. There is less loss of nutrients by leaching and less soil acidification if vegetation is present during fall, winter and early spring.
6. Decaying organic matter will maintain or increase the soil organic matter and humus (complex mixture of decayed plant tissue). Humus is a major source of nitrogen, phosphorus, and sulphur and can form chelates with micronutrients such as copper, zinc, manganese, etc. These chelated micronutrients are held against leaching from the soil, and under the right conditions, are available to be taken up by the roots. Cation exchange is improved which, in turn, reduces the leaching of nutrients.
7. Humus can increase moisture retaining ability of sandy soils as organic matter can hold up to 20 times its weight in water. It will bind soil mineral particles together to form aggregates. These provide a loose, open granular condition that aids penetration of water, air, and roots and resist erosion. Humus has the ability to absorb many organic pesticides, holding them near the soil surface, where they are more likely to be degraded by biological activity and sunlight, rather than leaching to ground water.

OPTIONS FOR GROUND COVER MANAGEMENT

1. **Permanent sod cover over 100% of the orchard floor.** While this option eliminates the undesirable characteristics of bare ground, trees will still have to compete with ground cover for nutrients and moisture. Mowing the orchard (alleyways and under trees) several times a year is required to keep this option as a viable one. This option should only be considered for mature orchard, once the trees have filled their allotted



spacing. Rootstock and soil type also should be taken into consideration when selecting this option as weed and grass competition has a greater influence dwarf rootstocks than the more vigorous rootstocks. Light soils have less nutrient and soil moisture retention and thereby increasing the negative aspect of weed competition. When utilizing a permanent sod cover growers should consider the use of grasses such as fine-leaf fescue turf grasses and grass mixtures such as Canada and Kentucky Blue grass that are dwarfing and need less frequent mowing. Mowing in the fall is a must to expose mice to predators and reduce possible mouse injury to the trees.

- 2. Permanent sod, cover with herbicide strip.** This method requires mowing in the alleyways and use of herbicides in the tree row. It offers the benefits of sod cover with regards to erosion, orchard equipment operation, etc while reducing weed competition in the tree root zone. The reduction in competition will depend upon the width of the herbicide strip. The strip maybe only wide enough to allow for safe mowing or may be extended to cover the full width of the tree canopy to promote tree growth. The width of the strip can be adjusted from year to year or during the year to compensate for drought conditions. The negative aspect of a weed free-strip is the potential for erosion and frost penetration. The selection of herbicides that allow for late season vegetation growth will help to offset these negative aspects. The use of herbicide strips is presently the most commonly used for ground cover management in Nova Scotia orchards.



- 3. Cultivation.** In the past this was the most common method for weed management in orchards. While clean cultivation has the potential of eliminating weed competition, the negative aspects of this method don't make it a suitable yearly option. Discing of the soil can cause root and bark injury to fruit trees by inattentive tractor operators. Without ground cover, severe soil erosion can occur, and organic matter is broken down more quickly than with other forms of orchard floor management. Operation of orchard equipment can be hindered during periods of wet weather. However clean cultivation the year of planting can be used to reduce the risk of herbicide damage to newly planted trees. In a new planting a sod cover should be established in the fall to reduce soil erosion.



- 4. Mulching.** The use of mulches to control weeds in the orchard is attracting more attention because of environmental issues with regards to the use of herbicides, the negative aspects of maintaining a clean herbicide strip and the benefits to be obtained from mulches. Mulched strips can be used in combination with mowing and herbicides to control ground cover. Prior to the application of mulch, it is beneficial to control weeds by means of a suitable herbicide or cultivation. Spot spraying with an herbicide such as glyphosate may also be required to keep

weed out of the mulch. A number of materials can be used, but hay and straw are presently the most commonly used. Hay and straw mulch will increase soil organic matter and potassium levels in the soil. Mulch can keep soils cooler during the summer months and help conserve soil moisture. Depending upon the extent of soil moisture, mulch may be just as effective as irrigation in reducing drought stress. The negative aspects of mulching are that it is labour intensive to apply; it can provide a shelter for mice and reduce the availability of nitrogen to fruit trees the year of application. When using mulch, potential mice and nutrient problems will need to be addressed.



TYPES OF WEEDS

Annual weeds- weeds that complete their life cycle in one year. These weeds grow from seed, flower, produce seed, and then die. Examples are pigweed, crabgrass and wild radish.

Biennial weeds- weeds such as wild carrot and evening primrose which require two growing seasons to complete their life cycle.

Perennial weeds- weeds that grow and produce seed yearly and survive by producing vegetative underground structures. Quackgrass and vetch are examples of herbaceous perennial while brambles are woody perennials.

TYPES OF HERBICIDES



Herbicides are grouped down into two broad categories: 1) pre-emergence, those that are applied before weeds have emerged and; 2) post-emergence, those applied directly to the weed foliage. A few of the pre-emergence herbicides have some activity against newly emerged seedlings. The two categories can be further divided into residual and non-residual herbicides.

Residual herbicides (generally soil applied to control germinating weeds) are persistent in the soil and have a lasting effect. The length of time a residual herbicide provides weed control depends upon the rate applied, and how quickly it is broken down or lost from the soil by leaching or volatilization. Non-residual herbicides are only effective on those weeds that are emerged at the time of application, provided they are sensitive to the herbicide.

Herbicides also vary with regards to the type of weeds they control. Some are only effective on annual grasses; some on annual broadleaf weeds; some on perennial grasses and broadleaf weeds and others show activity against all types. Table 2 lists herbicides that are approved for use in Canada in 2010 on tree fruits and outlines what they can be used for. Check the PRMA website for the latest list of herbicides registered for use on tree fruits (<http://pr-rp.pmra-arla.gc.ca>).

HERBICIDE DAMAGE TO TREES

Fruit trees can be damaged by herbicides if not used properly. Injury can be local (affecting only the tissue directly hit by the spray), or it may be systemic. Systemic injury can produce symptoms some distance from the site of contact. Damage can also be related to the herbicide rate, tree vigour, and tree age as well as drought stress. Growers should make themselves familiar with label information to determine the potential for herbicide damage.

- **glyphosate:** damage is systemic with absorption taking place through green bark, foliage and fresh pruning wounds. Damage may appear as deformed leaf growth (needle-like growth), limb dieback or even death of young trees. Damaged trees may have poor or stunted growth for several years. Root suckers or low branches that may come in contact with glyphosate should be removed 10 days prior to application. Prior to mid July the removal of root suckers is not as critical because the glyphosate is move to the growing tip and not to the tree root system which occurs after mid July. Injury symptoms can be observed the year following application as well.
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- **terbacil:** can be absorbed by the foliage and roots. Injury appears as foliar yellowing or burning. Similar foliar yellowing and burning may occur with metribuuzin and simazine on young trees.
 - **paraquat, glufosinate-ammonium:** are absorbed by foliage, bark and fruit resulting in local injury that appears as a chemical burn. It is not translocated with in the tree.
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- **2, 4-D:** is absorbed by foliage, bark and roots, resulting in systemic injury of newly forming leaves and growing points that result in a twisting of abnormal growth.
 - **Dichobenil, simizine, trebacil, and 2, 4-D:** can, under some conditions, be taken up by roots, resulting in injury or other symptoms.

TIPS ON USING HERBICIDES

Care should be taken not to apply herbicides to root suckers, foliage, bark or fruit, especially the green bark of young trees. To minimize spray drift injury, apply herbicides on wind free days at pressures not exceeding 200 kilopascals (30 psi). Herbicides may be applied with hydraulic sprayers operating at pressures ranging from 130 to 200 kpa (20 to 30 psi). To reduce spray drift avoid nozzles that produce a fine mist. Flat-fan, flooding, or off-centre nozzles should be used if orchards. Flooding nozzles permit complete coverage with the boom located near the ground to avoid low hanging limbs.

The volume of water used to apply a herbicide may vary with the type of herbicide applied. The recommended volume of water is given on the product label and should be used to obtain the best results.

Recommended rates for pre-emergent herbicide may vary with tree age, weeds present, soil type, organic matter or when used in mixtures. Newly planted trees are more prone susceptible to over application than established trees. The lower registered rates are recommended on light soils. Care must also be exercised to avoid overlapping. Soil texture and organic matter will influence herbicide penetration and uptake by the roots. Sandy or coarse soil textured soils allow easy penetration and quick herbicide uptake. Therefore the lower rate for many pre-emergence herbicides is recommended on these soils. In the case of clay soils or soils high in organic matter, pre-emergence herbicides may be strongly absorbed and the higher rates may be required to obtain satisfactory control. Apply herbicides to soils with less than 2 percent organic matter may result in damage, therefore rates may need to be reduced, or selection of herbicide changed. Non-decomposed organic tissue (surface litter) may tie up some herbicide resulting in poor control. Likewise weed growth may prevent a residual herbicide from contacting the soil surface resulting in poor or variable results. Read herbicides labels prior to use to determine if removal of surface litter or clean cultivation is required prior to use.

Moisture can also influence the effectiveness of herbicides. Drought conditions that slow weed growth may make weeds more tolerant to post-emergence herbicides. Most residual herbicides are most effective when washed into the soil by rain or irrigation. Maximum effect will be obtained if water is applied within a few days of application. Generally, 12 mm of water is sufficient to activate preemergent herbicides.

CALIBRATING THE SPRAYER

Boom sprayer: Calibrating a boom sprayer is relatively simple. First set out two stakes 50 m apart in the orchard or field. Pick a level spot and fill the herbicide sprayer with clean water. Adjust the boom height to provide the amount over lap recommended by the nozzle manufacture. Start the sprayer and while the nozzles are operating, adjust the by-pass pressure relief value to give the desired operating pressures. Ensure that the nozzles are operating properly and each is putting water volumes within 10 percent of each other. Turn the sprayer off, refill, and mark the level of the full tank on a measuring stick.

Next spray in one direction between the two stakes turning on the boom as the first stake is passed and shutting of the boom as the second stake is passed. During the operation, the sprayer should be driven at a constant speed. Mark the throttle setting and gear.

Finally return the sprayer to the same level spot. Carefully measure the amount of water to fill the tank to the same spot on the measuring stick.

Use the following formula to calibrate the volume water applied per unit of ground surface sprayed.

$$\frac{10,000 \text{ m}^2 \times \text{litres used}}{\text{Length} \times \text{width of spray strip}} = \text{L/ha sprayed}$$

Length x width of spray strip

Example A: assume the following conditions: 1.5 litres of water were used to spray 50 m long strip and a strip width of 1.5 m. The litres of water applied to cover a hectare of land is

$$\frac{10,000 \text{ m}^2 \times 1.5 \text{ L}}{50 \text{ m} \times 1.5 \text{ m}} = 200 \text{ L/ha}$$

50 m x 1.5 m

If the recommended herbicide rate is 5 L per hectare then you would apply 5 litres of product for every 400 litres of water in the tank.

When boom spraying, it is use full to know how many rows can be sprayed with a full thank. Knowing the approximate area that should be sprayed with a full thank gives the operator an idea of whether or not the sprayer is operating properly. Growers should calibrate their sprayers each growing season prior to use.

Hand gun spraying: Hand held or back pack sprayers may be used for treating young trees, problem areas or areas that were missed with a boom sprayer. The likelihood of over applying a herbicide is much greater when using a hand gun and, therefore, calibration of these sprayers is as important as the calibration of field sprayers. The calibration of hand guns can be fairly accurate by first determining how long it requires to deliver one litre of spray from the hand gun. By choosing a definite plot size and by using the information Table 1, it is possible to calculate the time required to spray a given area under each tree. When using a hand gun, it is advisable to use a nozzle tip that produces a fairly coarse spray and to use relatively low pressures to prevent spray drift.

Example B: The sprayer delivers one litre of spray in 25 seconds. The area to be sprayed is 2 x 2 metre square around each tree (that is, one metre out from the side of the trunk). In Table 1 the number of trees sprayed for the distance of 1 metre from the trunk is 2.5 trees. Therefore it takes 10 seconds to spray under each tree (25 seconds/litre ÷ 2.5trees/litre + 10 seconds/tree).

Table 1: Number of tree sprayed per litre or per 1,000 litres at a given plot size and shape when spraying with a water volume rate of 1,000 litres per hectare when using a hand gun.

Distance sprayed from trunk (metres)	No. Trees sprayed/L		No. Trees sprayed /1,000 L	
	Square plots	Round Plots	Square plots	Round Plots
0.5	10.0	12.6	10,000	12,658
1.0	2.5	3.2	2,500	3,165
1.5	1.1	1.4	1,111	1,406
2.0	0.6	0.8	625	791

Example C: A backpack sprayer holds 15 litres of water when full. The recommended rate of herbicide is 4 litres per hectare. The rate per litre of water is $4 \div 1,000L = 4 \text{ ml/L}$ of water. Therefore in a full tank of water the amount of herbicide required is $15 \times 4 = 60 \text{ ml}$.

DETERMINING THE AMOUNT OF HERBICIDE NEEDED

Before mixing up the spray solution it is important to calculate the actual area of ground surface under the trees to be sprayed. To do this use the following formula:

Area of planting \times row width to be sprayed \div distance between rows = surface area to be sprayed

Example D: In a 3 hectare orchard with a tree spacing of 4 m between trees and 6 m between rows, what is the actual area sprayed when the herbicide strip is 2 m wide.

$$(3 \text{ ha} \times 2 \text{ m}) \div 6 \text{ m} = 1 \text{ ha}$$

In this case only 1 hectare of the land surface was actually sprayed in the 3 hectare orchard.

TANK-MIXING HERBICIDES

Never add concentrated herbicides directly to an empty tank. Fill the tank half full with water, add the herbicide and finish filling the tank. Never allow a sprayer with mixed chemicals to stand without agitation. When applying herbicides combinations place them in the tank in the following order and constantly agitate:

1. Wettable powders
2. Flowables
3. Water soluble
4. Adjuvant
5. Emulsifiable concentrates

Before tank mixing, be sure to check the compatibility of the materials. If you are unsure of the compatibility, use the following test:

1. Add herbicide at the proportional rate in 1 litre of water in a 2 litre jar.
2. Close the jar and mix contents by inverting the jar 10 times
3. Observe immediately
4. Let stand for 30 minutes and check again

If the combination remains uniform for 30 minutes, the mixture can be used. If not, add a surfactant or compatibility agent to the jar and retest. If a mixture separates after 30 minutes but remixes readily with 10 jar inversions, the mixture can be used if good agitation is maintained in the tank. Otherwise do not use the mixture. You cannot add an adjuvant or surfactant unless it is on the label of one of the two products you are tank mixing.

Table 2 Herbicide Weed Control Rating For Tree Fruits (Obtained from OMFRA Publication # 75)																							
Table 2. Herbicide Weed Control Ratings for Tree fruits	Active Ingredient	Trade Name	ANNUAL BROADLEAF WEEDS							ANNUAL GRASSES													
			Chickweed Common	Lambsquarter	Mustard	Pigweed	Ragweed	Lady's thumb	Barnyard grass	Cabgrass	Witchgrass	Field Bindweed	Chickweed Mouse eared	Dandelion	Goldenrod	Ground-ivy (Creeping Charlie)	Mallow	Milk weed Common	Nightshade	Plantains	Quackgrass	Thistle Canada	Thistle sow
Soil Applied Grass Herbicides																							
s-metolachor	DUAL II MAGUM	6	7	2	8	4	2	9	9	9	0	?	5	?	?	?	0	?	5	0	0	0	0
Soil Applied Grass and Broadleaf Herbicides																							
dichlobenil	CASRON	8	8	3	8	4	7	7	6	7	7	7	7	?	6	?	?	?	7	7	7	7	?
flumioxazin	CHATEAU	?	9	?	9	9	?	?	?	?	?	?	8	?	?	?	?	9	?	?	?	?	?
napropamide	DEVRIKOL	7	8	5	8	7	6	8	9	8	?	?	5	?	?	?	5	?	5	5	5	5	?
proppyzamide	KERB	9	9	8	9	7	7	8	7	9	?	?	?	?	?	?	6	?	?	6	?	6	?
metribuzin	LEXONE	9	9	9	8	8	9	8	8	9	?	8	6	2	2	2	6	2	8	6	6	2	0
liuron	LOROX,AFOLAN F, LINURON	9	9	7	8	8	7	7	6	9	5	8	?	?	?	?	5	?	?	7	7	8	?
simazine	PRINCE NINE-T	8	9	9	9	8	9	8	8	8	2	?	5	?	?	?	0	?	?	6	5	5	?
metribzin	SENCOR	9	9	9	8	8	9	7	8	9	2	?	?	?	?	?	2	2	?	2	2	2	0
trebacil	SINBAR	9	8	8	7	7	7	8	7	8	6	8	6	?	?	?	6	?	8	6	6	1	?
trifluralin	TREFLAN	7	8	3	8	4	6	9	9	8	2	?	2	1	1	0	2	2	2	2	2	2	0

Active Ingredient	Trade Name	ANNUAL BROADLEAF WEEDS						ANNUAL GRASSES															
		Chickweed Common	Lambsquarter	Mustard	Pigweed	Ragweed	Lady's thumb	Barnyard grass	Cabgrass	Witchgrass	Field Bindweed	Chickweed Mouse eared	Dandelion	Goldenrod	Ground-ivy (Creeping Charlie)	Mallow	Milk weed Common	Nightshade	Plantains	Quackgrass	Thistle Canada	Thistle sow	Vetch
Soil Applied Grass and Broadleaf Tank-Mixes																							
napropamide + simazine	DEVRIKOL + PRINCE NINE-T	7	9	9	9	8	9	8	9	8	2	?	5	2	2	2	5	2	5	6	5	5	1
napropamide + terbiacil	DEVRIKOL + SINBAR	9	8	8	8	7	8	8	9	8	6	?	6	2	2	2	6	2	8	6	6	5	1
Metolachor + metribuzin	DUAL II MAGNUM + LEXONE	9	9	9	8	8	9	9	9	9	2	?	5	?	?	?	2	2	?	2	2	2	2
metolachor + simizane	DUAL II MAGNUM + PRINCEP NINE-T	9	9	9	8	8	9	9	9	9	2	?	5	?	?	?	0	?	?	6	5	5	0
Metribzin + trifluralin	SENCOR + TREFLAN	9	9	9	8	8	9	8	8	9	2	?	2	1	1	0	2	2	2	2	2	2	2
Postemergence Grass Herbicides																							
sethoxydim	POAST	0	0	0	0	0	0	8	8	9	0	0	0	0	0	0	0	0	0	6	0	0	0
fluazifop-p-butyl	VENTURE L	1	1	1	1	1	1	9	9	9	0	0	0	0	0	0	0	0	0	7	0	0	0
Postemergence Broadleaf Herbicides																							
carfentrazone-ethyl	AIM EC (Hooded Sprayer)	?	8	8	8	?	?	?	?	?	?	?	?	?	?	8	?	8	?	?	?	?	?
bentazon	BASAGRAN	8	7	8	8	8	9	0	0	0	7	?	?	?	?	?	5	2	2	2	6	5	5
2,4-D	2,4-D	7	8	9	9	8	4	0	0	?	5	2	8	2	2	2	2	?	8	2	8	6	5

Table 3 Guide to chemical weed control in Tree Fruit Orchards

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Year of Planting (Pre-plant Incorporated)					
Grass and Broadleaf	CHATEAU WDG (51WDG) flumioxazin	280 g/ha	Apple Pear	60	Do not apply to apple or pear trees established less than one year, unless protected from spray contact by non-porous wraps, grow tubes or waxed container.
	DEVRIKOL DF (50 DF) napropamide	9 kg/ha	Apple		Apply after planting, prior to weed germination. Use a direct spray at low pressure. Incorporation by rainfall or irrigation is essential within two days of application.
	DEVRIKOL DF (50 DF) napropamide plus PRINCEP NINE-T (90 WG) simazine	7 kg plus 2.25 kg	Apple Cherry Peach Pear Plum		On newly planted trees apply in fall through spring before weeds emerge. Do not apply on frozen ground. Avoid contact with bark and foliage. Incorporation with water is essential. Make only one application per year.
	DEVRIKOL DF (50 DF) napropamide plus SINBAR (80 WP) terbacil	9 kg plus 0.60 kg	Apple Cherry Peach Pear Plum		On newly planted trees apply in fall through spring before weeds emerge. Do not apply on frozen ground. Avoid contact with bark and foliage. Incorporation with water is essential. Make only one application per year.
	DUAL II MAGIKUM (915 G/L) s-etolachlor/benoxacor plus PRINCEP NINE-T (90 WG) simazine	1.25 to 1.75 L/ha 1.1 to 2.2 kg/ha	Apple Cherry Peach Pear Plum		Apply in new orchards following planting and prior to weed emergence and preferably after rain has settled the soil around the trees. One application per year. Do not apply to sandy soil with less than 2% organic matter. Avoid spray contact with the trees

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Year of Planting (Pre-plant Incorporated)					
Grass and Broadleaf	LEXONE DF (75 DF) metribuzin	0.5 to 1 kg/ha	Apple Cherry Peach		Apply as a preplant incorporated within the planting row or over the entire row.
	PRINCEP NINE-T (90 WG) simazine	1.1 to 2.2 kg/ha	Apple Cherry Peach Pear Plum		In year of planting apply prior to weed germination in 150 to 300 L/ha of water. Do not use on sandy soil with less than 2% organic matter. Preferably apply after rain has settled the soil around trees. Avoid contact with bark and foliage.
	SENCOR DF (75 DF) plus TREFLAN EC (480 g/L) or BONAZA 400 (400 g/L) metribuzin plus trifluralin	0.55 to 0.75 g/ha 1.25 to 2.4 L/ha 1.5 to 2.75 L/ha	Apple Cherry Peach Pear Plum		Apply before planting as an orchard floor or in row treatment. Only apply once during the growing season.
	SINBAR (80 WP) terbacil	1.25 kg/ha	Apple Cherry Peach Pear Plum		In year of planting apply prior to weed germination in 150 to 300 L/ha of water. Do not use on sandy soil with less than 3% organic matter. Preferably apply after rain has settled the soil around trees. Avoid contact with bark and foliage
	TREFLAN EC (480 g/ha) or BONANZA trifluralin	1.25 to 2.4 L/ha 1.5 to 2.75 L/ha	Apple Cherry Peach Pear Plum		Apply and incorporate before planting. Use 1.2 L/ha on light, 1.7 L/ha on medium and 2.4 L/ha on heavy textured soil. Apply with at least 100L/ha water. Use 1.5 L/ha on light, 2 L/ha on medium and 2.75 on heavy textured soil. Do not apply more than once per year

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Year of Planting (Postemergent)					
Grass	POAST ULTRA (450 g/ha) plus MERGE sethoxydim plus surfactant/solvent	0.32 to 1.1 L/ha 1 to 2 L/ha	Apple Peach Plum		Apply to emerged annual grasses at the two to six leaf stage of during active growth. Use these rates for specific weeds: annual grasses 0.32 L/ha; volunteer grains 0.47 L/ha; quackgrass (up to 3 rd leaf) 1.1 L/ha. Complete grass control will take 7 to 21 days
	VENTURE L (125 g/L) Fluazifop-p-butyl	0.6 to 2 L/ha	Apple Cherry Peach Pear Plum		Apply at the 2-5 leaf stage of development at the following rates: 0.6 L/ha for volunteer corn; 0.8 L/ha for wheat & barley; 1 L/ha for annual grasses and 2L/ha for quackgrass. Do not apply more than once per season. Grasses emerge after the treatment will not be controlled.
Broadleaf	AIM EC 240 g/L) plus Merge Carfentrazone-ethrel plus surfactant/solvent	37-117 ml/ha 1 to 2 L/ha	Apple Cherry Peach Pear Plum	3	Hooded sprayers must be designed and operated so as to totally enclose the spray nozzles and tips and spray pattern and prevent any spray deposition to the crop being treated. PRECAUTIONS: Crop injury will occur when spray is allowed to come in contact with the green stem tissue, leaves, blooms or fruit of the crop.
	BASAGRAN (480 g/L) ASSIST Bentazon plus oil concentrate	1.75 to 2.25 L/ha 1 to 2 L/ha	Apple Cherry Peach Pear		Direct under the tree to small actively growing weeds. Apply with 100 to 400 L/ha of water. Use lower rate of ASSIT under hot humid conditions. Make only 2 application, 10 days apart at the low rate during the planting year. Avoid contact with tree foliage.

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Year of Planting (Postemergent)					
Broadleaf	LONTREL 360 (360 g/L) clopyralid	0.56 L/ha	Apple	30	For control of vetch at early flower stage. Apply as spot treatment. Avoid contact with tree limbs
Established Planting (Pre-emergence)					
Grass	DUAL II MAGNUM (915 g/L) s-metolachor	1.75 L/ha	Apple Cherry Peach Pear Plum		Apply once per year prior to grass emergence. Avoid drift on to the tree, Do not use on sandy soil with less than 2% organic matter.
	KERB (50 WP) propyzamide	4.5 kg/ha	Apple Pear		Apply from late September to early November to trees established for one year or more. Best results obtained when soil temperatures are low but above freezing and soil moisture is high.
Broadleaf	Lexone DF (75 DF) metribuzin	1 kg/ha	Apple Cherry Peach Pear Plum		Apply once per year as a band treatment prior to weed emergence. Apply in 150 to 300 L/ha water. Avoid contact with bark and foliage.
Grass and Boradleaf	Casron 4G (4G) dichlobenil	110 to 175 kg/ha	Apple Pear		Do not use on light sandy soil. A rate of 70 grams applied to an area of 2x2 m is equivalent to 175 kg/ha. Apply late fall or early spring. Do not apply if temperatures are above 10-15 C to avoid injury from volatilization.

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Grass and Broadleaf	CHATEAU WDG (51 WDG) flumioxazin	280 g/ha	Apple Pear	60	Do not apply to apple or pear trees established less than one year, unless protected from spray contact by non-porous wraps, grow tubes or waxed container.
	DEVRIKOL DF (50 DF) napropamide	9 kg/ha	Apple Peach Pear		Apply in the fall through early spring before weeds emerge. Avoid contact with fruit and foliage incorporation by rainfall or irrigation is essential within two days of application.
	DUAL II MAGINUM (915 G/L) s-etolachlor/benoxacor plus Lexone DF (75 DF) metribuzin	1.75 L/ha 1 kg/ha	Apple Cherry Peach Pear Plum		One application per year to establish trees. Do not use on sandy soil with less than 2% organic matter. Avoid drift on to trees.
	DUAL II MAGINUM (915 G/L) s-etolachlor/benoxacor plus PRINCEP NINE-T (90 WG) simazine	1.75 L/ha 1.1 to 2.2 kg/ha	Apple Cherry Peach Pear Plum		One application per year. Do apply to sandy with less than 2% organic matter. Avoid spray contact with the trees. Late season crabgrass and fall witch grass may escape this treatment.
	LOROX DF (50DF) LOROX L (480 g/L) AFOLAN (450g/L) LINURON (400g/L) linuron	8.6 kg/ha 9.0 L/ha 10.0 L/ha 10.8 L/ha	Apple Cherry Peach Pear Plum		Apply before weeds are 10cm high. Apply in 400-600 L/ha water with a surfactant. Avoid spray drift contact with fruit, foliage or bark. Use only on trees which have been established 10 or more years (1 year in the case for peach).
	PRINCEP NINE-T (90 WG) SIMADEX (500g/L) simazine	2.5 to 5 kg/ha 4.5 to 9 L/ha	Apple Pear		Apply to trees planted one year or longer in 300-1000 L of water. User higher rate for perennial weeds such as quackgrass. Avoid contact with the bark and foliage.

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Grass and Broadleaf	SINBAR (80 WP) terbacil	2.25 to 4.5 kg/ha	Apple Peach		Apply once per year to trees that have been established for at least three years.
	SINBAR (80 WP) Plus LEXONE DF (75DF) terbacil plus metribuzin	630 g/ha 1 kg/ha	Apple Cherry Peach Pear		Apply once per year in 150 to 300 L/ha water a band treatment. Do not use on soils coarser than sandy loam and less than 3% organic matter
Established Plantings (Post emergence Grass Treatments)					
Grasses	POAST ULTRA (450 g/ha) plus MERGE sethoxydim plus surfactant/solvent	0.32 to 1.1 L/ha 1 to 2 L/ha	Apple Peach Plum	30	Apply to emerged annual grasses at the two to six leaf stage of during active growth. Use these rates for specific weeds: annual grasses 0.32 L/ha; volunteer grains 0.47 L/ha; quackgrass (up to 3 rd leaf) 1.1 L/ha. Complete grass control will take 7 to 21 days.
	VENTURE L (125 g/L) Fluazifop-p-butyl	0.6 to 2 L/ha	Apple Cherry Peach Pear Plum		Apply at the 2-5 leaf stage of development at the following rates: 0.6 L/ha for volunteer corn; 0.8 L/ha for wheat & barley; 1 L/ha for annual grasses and 2L/ha for quackgrass. Do not apply more than once per season. Grasses emerge after the treatment will not be controlled.
Established Planting (Postemergence Broadleaf Treatments)					
Broadleaf	2,4-D Admine (470 g/L) 2,4-D Adime (564 g/L) 2,4-D	2 L/ha 1.7 L/ha	Apple Cherry Peach Pear Plum	80	Apply in early spring after weed emergence or in the fall once harvest is complete.

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Broadleaf	AIM EC (240 g/L) plus Merge Carfentrazone-ethrel plus surfactant/solvent	37-117 ml/ha 1 to 2 L/ha	Apple Cherry Peach Pear Plum	3	Hooded sprayers must be designed and operated so as to totally enclose the spray nozzles and tips and spray pattern and prevent any spray deposition to the crop being treated. PRECAUTIONS: Crop injury will occur when spray is allowed to come in contact with the green stem tissue, leaves, blooms or fruit of the crop.
	LONTREL 360 (360 g/L) clopyralid	0.56 L/ha	Apple	30	For control of vetch at early flower stage. Apply as spot treatment. Avoid contact with tree limbs
Established Plantings (Post emergence Grass and Broadleaf Treatments)					
Grasses & Broadleaf	Amitrol 240 (231 g/L)	9.4 to 13.5L/ha	Apple	30	Apply after weeds have fully developed. For all emerged weeds including poison ivy. Keep spray of trees and trunks as much as possible.
	glyphosate (360 g/L) glyphosate (480 g/L) glyphosate (540 g/L)	2.25 to 12 L/ha 1.69 to 9 L/ha 1.5 to 8 L/ha	Apple Cherry Peach Pear Plum	30	Apply with 200-300 L/ha of water. Do not apply to tree with green bark. Use low rate for emerged annual and perennial weeds, mid rates for quackgrass and Canada thistle, high rates for woody perennials such as nightshade and brambles. Remove all root suckers before application. Do not apply when weeds are under drought stress.
	GRAMOXONE (200g/L) paraquat	5.5 L/ha	Apple Cherry Peach Pear Plum		Apply to trees that have been established for at least one year. Apply with 1100 L/ha of water to wet weed foliage.

Weeds	TRADE NAME Active ingredient	Product Rate per Hectare Covered	Crops	Days to Harvest	Notes
Grass and Broadleaf	GRAMOXONE (220 g/ha) plus DEVERINOL DF (50DF) or PRINCEP NINE-T (90 WG) paraquat plus napropamide or simazine	5.5L/ha plus 9 kg/ha or 2.5 to 5 kg/ha	Apple Cherry Peach Pear Plum		Add DEVIRONEL to the tank first then agitate and add GRAMOXONE. Apply with 1100 L/ha of water. Use on trees that have been established for more than an year. Avoid contact with green bard and leaves.
	IGNITE (150g/L) glufosinate ammonium	2.7 to 5 L/ha	Apple Peach Pear Plum	40	Apply before weed growth reaches 30 cm in height. Apply with 110 to 330 L/ha of water. Use higher rate and water volume when weed growth is heavy. Apply to trees that have been established for at least one year.
	IGNITE (150g/L) Plus PRINCEP NINE-T (90 WG) Or SIMADEX (500 g/L) glufosinate ammonium plus simazine	2.7 to 5 L/ha plus 2.5 to 5 kg/ha or 4.5 to 9 L/ha	Apple Peach Pear Plum	40	Apply before weed growth reaches 30 cm in height. Apply with 110 to 330 L/ha of water. Use higher rate and water volume when weed growth is heavy. Apply to trees that have been established for at least one year. To control emerged weed and provide residual weed control.
	LOROX DF (50DF) LOROX L (480 g/L) AFOLAN (450g/L) LINURON (400g/L) linuron	8.6 kg/ha 9.0 L/ha 10.0 L/ha 10.8 L/ha	Apple Cherry Peach Pear Plum		Apply before weeds are 10cm high. Apply in 400-600 L/ha water with a surfactant. Avoid spray drift contact with fruit, foliage or bark. Use only on trees which have been established 10 or more years (1 year in the case for peach).
	PRINCEP NINE-T (90 WG) plus glyphosate (360 g/L) glyphosate (480 g/L) glyphosate (540 g/L) simazine plus glyphosate	1.1 to 2.2 kg/ha plus 2.25 to 12 L/ha or 1.69 to 9 L/ha or 1.5 to 8 L/ha	Apple Cherry Peach Pear Plum	30	Apply with 200-300 L/ha of water. Do not apply to tree with green bark. Use low rate for emerged annual and perennial weeds, mid rates for quackgrass and Canada thistle, high rates for woody perennials such as nightshade and brambles. Remove all root suckers before application. Do not apply when weeds are under drought stress

