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Table 1: Metric Conversion Factors* (Approximate)

<i>Metric Unit</i>	<i>Metric to Imperial Multiply By</i>	<i>Imperial Unit</i>	<i>Imperial to Metric Multiply By</i>	<i>Metric Unit</i>
LINEAR				LINEAR
centimetre (cm)	x 0.39	inch	x 2.54	centimetre (cm)
AREA				AREA
square metre (m ²)	x 1.2	square yard	x 0.84	square metre (m ²)
hectare (ha)	x 2.5	acres	x 0.4	hectare (ha)
VOLUME				VOLUME
litre (L)	x 0.22	gallon	x 4.55	litre
PRESSURE				PRESSURE
kilopascals (kPa)	x 0.14	psi	x 6.9	kilopascals (kPa)
WEIGHT				WEIGHT
gram (g)	x 0.035	oz	x 28.35	gram (g)
kilogram (kg)	x 2.2	lb	x 0.454	kilogram (kg)
AGRICULTURAL				AGRICULTURAL
litres per hectare (L/ha)	x 0.089	gallons per acre	x 11.23	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.357	quarts per acre	x 2.81	litres per hectare (L/ha)
litres per hectare (L/ha)	x 0.71	pints per acre	x 1.41	litres per hectare (L/ha)
millilitres per hectare (mL/ha)	x 0.014	fl.oz per acre	x 70.22	millilitres per hectare (mL/ha)
kilograms per hectare (kg/ha)	x 0.89	lb per acre	x 1.12	kilograms per hectare (kg/ha)
grams per hectare (g/ha)	x 0.014	oz per acre	x 70	grams per hectare (g/ha)

*EXAMPLE: To convert centimetres to inches, multiply by 0.39; conversely, to convert inches to centimetres, multiply by 2.54. CAUTION: Herbicide labels are in metric units only. Conversion between the Metric and Imperial system may result in confusion. It is recommended to use metric units only.

Guide to Crop Protection 2011

For Reference Until December 31, 2011
This publication is updated annually and replaces
the 2010 and previous issues.

Introduction

How to Use This Book

This publication is only a guide. Always refer to the product label for application details and precautions.

The *Guide to Crop Protection* is divided into four sections: (1) Weed Control; (2) Foliar Fungicides; (3) Seed Treatments; and (4) Insect Control.

To use the information in each of these sections, use the following process:

1. Turn to the charts at the beginning of each section. There is a set of charts for weeds, plant diseases and insect control. Select the chart for the crop you want or plan to grow. Use the chart to match your weed, disease or insect problems with the products available for that crop.
2. Once you have narrowed your product choices down to a few candidates, go to the recommendation section for that product. Products are listed alphabetically. Read the recommendations thoroughly for each product you are considering.
3. Read the product label attached to the container for detailed instructions on application.

This publication is intended to be used as a guide only. Information contained herein is that available at time of printing. While every effort has been made to ensure accuracy, the provincial government does not accept responsibility for label changes. When more than one trade name is listed, not all weeds or tank mixes may appear on all labels. Consult product labels attached to pesticide containers for final detailed instructions.

Certain recommendations in this publication are given in quantity of commercial product per acre (mL, L, g or kg/acre). Product labels are given in quantity of product per hectare (mL, L, g or kg/ha). To avoid application errors be sure to read and understand label recommendations.

The *Guide to Crop Protection* includes the most recent recommendations for weed, plant disease and insect control in field and forage crops. These recommendations

are based on the uses registered under the Pest Management Regulatory Agency's *Pest Control Products Act*. It is an offence under *The Pest Control Products Act* to apply any chemical in a manner not consistent with the product label. If you have any doubts regarding the instructions in this publication, or on the product label, contact the company representative, your local agricultural office or the Pest Management Regulatory Agency for further advice.

Product Labels and PCP Numbers

On each Product Page you will see a PCP number, so named because it is mandated by the *Pest Control Products Act*. Under the Act, every pesticide requires a unique identifier – the product's PCP number. That number must also appear on the product's label.

The pesticide label packaged with the product is the authoritative source of information on use of the product and will contain more detailed information than is included in this Guide. Some products have a number of trade names for the same active ingredient. However, each product will have its own PCP number and these appear next to the registrants' names. Users who are seeking more detailed information than is provided in this guide, prior to purchase, can use the PCP number to access a sample product label online through the Pest Management Regulatory Agency's (PMRA) website or they can contact the PMRA Hotline by phone at 1-800-267-6315.

Use this link – <http://www.hc-sc.gc.ca/cps-spc/pest/index-eng.php> – and select the link that reads 'Label Search' to access Electronic Label Search Tool. The PMRA Product Information database can be searched by a product's trade name, active ingredient, company name or registration (PCP) number. Since several products can contain the same active ingredient and there are often several versions of the same label on this database, using the PCP number is the most direct route to finding the label that links to the

product page in this Guide. *There may be some differences between a label found on the package and the sample labels found on the PMRA-Label Search web site so always refer to the packaged product label when applying the product.*

Once the product is located, you may click on its number to view an Adobe Acrobat (PDF) document containing the label and any supplemental registrations. Some of these documents run to many pages but you can use the 'Find' capabilities of the Acrobat Reader plug-in for your browser to jump to specific areas of interest. If you do not have Adobe Acrobat Reader installed on your computer you can download a free version from www.adobe.com

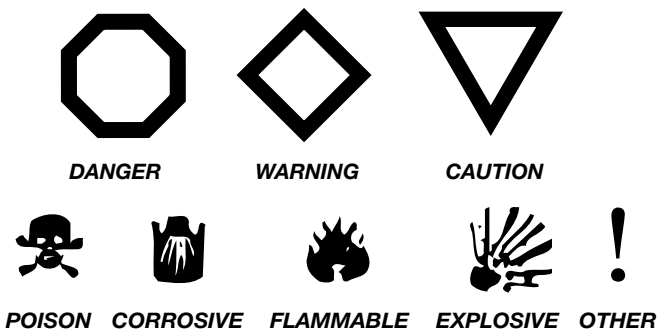
Safe Use of Herbicides, Fungicides and Insecticides

Herbicides, fungicides and insecticides are classified according to the use hazard and risk involved. The categories of hazard are:

- toxicity
- flammability
- explosive potential
- corrosivity
- other




The degree of risk is represented by symbols taken from common traffic sign shapes represented by the stop, caution and yield signs. The signal word for each of the signs is danger (high risk), warning (moderate risk) and caution (low risk). Where the risk is minimal, no designation is required. The label on the container will carry the appropriate signs for the protection of the user. Degree of risk symbols for herbicides, insecticides and fungicides used in field and forage crops are included in the product directory. The symbols are illustrated in Figure 1.

Figure 1. Degree of Risk and Hazard Symbols



LD₅₀ values are used to rate the toxicity of pesticides. The LD₅₀ refers to the dose of pesticide (in mg per kg of the test animal's body weight) that is lethal to 50 percent of the group of test animals. For example, if a pesticide has an LD₅₀ value of 10 mg/kg, and the test animals each weigh 1 kg, then 50 percent of the animals would die if they each ate 10 mg of the pesticide.

Table 2. Oral LD₅₀ Values as they relate to the Risk/Hazard Symbols

	
DANGER POISON LD ₅₀ less than 500 mg/kg indicates high toxicity	WARNING POISON LD ₅₀ 500-1,000 mg/kg indicates moderate toxicity
	SYMBOL ABSENT
CAUTION POISON LD ₅₀ 1,000-2,500 mg/kg indicates low toxicity	LD ₅₀ greater than 2,500 mg/kg indicates very low toxicity

Different types of protective equipment are required for pesticides that differ in toxicity. Special equipment requirements are described on the product label, but in general the following precautions must be taken when using pesticides of different hazard ratings.

Danger Poison - requires goggles, respirator, gloves and skin protection, avoid fumes and spray mist.

Warning Poison - requires goggles, gloves and skin protection, avoid fumes and spray mist.

Caution Poison - requires gloves and skin protection, avoid fumes and spray mist.

The absence of a hazard symbol on a pesticide label indicates low toxicity to mammals. Nevertheless, protective clothing should be worn when using pesticides that do not have a hazard symbol.

Protecting Yourself from Exposure to Herbicides, Fungicides and Insecticides

The use of protective equipment and sound safety procedures will help minimize your exposure to herbicides, fungicides and insecticides. Follow the 10 rules for safe application listed below, and wear the safety equipment recommended.

10 Rules for Safe Application

1. Never smoke or eat while applying pesticides.
2. Avoid inhaling sprays or dusts. Wear protective clothing and a respirator.
3. Sprayer lines carrying chemicals should not enter the operator's cab.
4. Have soap, water and a towel available. Should concentrated product spill on skin, hands, face or eyes, wash immediately.
5. Wash hands and face when leaving the treated area, before break periods, lunch or urination.

6. Bathe or shower and change into clean clothing after working with pesticides. Wash clothing each day before re-use.
7. Call a physician or get the patient to a hospital immediately if symptoms of illness occur during or shortly after pesticide application. Be sure to take along the product label or container.
8. Store pesticides out of reach of children and where there is no chance of contact with human food or live-stock feeds. Do not store herbicides with insecticides and avoid cross-contamination. Storage areas should be locked.
9. Keep chemicals in their original containers, never in unmarked containers or bottles used for food or drink.
10. Follow proper container disposal methods. All containers should be triple rinsed or pressure rinsed, punctured to render the container non-reusable, and delivered to designated disposal sites.

Protective Clothing

Wear protective equipment as described in the chart to reduce exposure.

EQUIPMENT	PROTECTION	HOW TO WEAR IT
Coveralls	<p>There are two types of coveralls: disposable and reusable. Disposable coveralls are lightweight and comfortable on warm days. They can be worn for mixing and applying pesticides, then discarded at the day's end. If they become contaminated, they should be discarded at once.</p> <p>The second type of coverall is made of washable fabric and may be reused many times. These fabric coveralls are adequate for use with all but the most highly toxic and concentrated pesticides.</p>	<p>Button (or zip) right up to the neck. Loose coveralls around the neck will suck and blow pesticide in and out of the interior of the coveralls as you bend and move.</p> <p>Wear coveralls over a long-sleeved shirt and pants.</p>
Aprons	<p>When pouring or otherwise handling concentrated pesticides, it makes good sense to wear protection in the form of an apron. The apron protects the front of your body from spills or splashes of the concentrate. The apron should be made of rubber or synthetic liquid-proof material that will resist the solvents used in formulating the pesticide.</p>	<p>Make sure the apron covers your body from your chest to your boots.</p>
Gloves	<p>Protect your hands by wearing chemical-resistant gloves. Neoprene gloves provide the best protection. Natural rubber gloves may be used when handling organo-phosphorus or carbamate pesticides. Be sure that they are designed for use with solvents and pesticides. Never use lined gloves, gloves with wristbands or leather gloves.</p>	<p>Put gloves on and roll up the first inch or two of the cuff. That way when you lift your hands, any liquid on the gloves won't drip down your arms.</p>
Hats	<p>Use a chemical-resistant hat, preferably made of washable plastic. The hat may be a hard hat or made of flexible plastic. In either case, it should have a plastic sweatband. Wash and dry entire hat after each use and before storing. Ordinary baseball caps with cloth sweatbands are dangerous as they absorb the pesticide and recontaminate the forehead each time you wear them. Even small amounts of moderately or slightly toxic pesticides may cause severe skin irritation or other illness if exposure continues for several days.</p>	
Boots	<p>Wear chemical-resistant, unlined boots. These boots are available in a variety of styles and materials. Neoprene boots are the best. Knee-length boots offer greater protection because they extend above the lower end of the apron. Avoid leather or fabric boots and shoes because these will absorb pesticides and cannot be cleaned effectively.</p>	<p>Wear your pant legs outside the top of your boots. This will prevent spills and splashes from running into the boot and onto your leg.</p>

Protecting Your Eyes, Face and Lungs

Wear the following equipment to protect your facial area from exposure:

EQUIPMENT	PROTECTION	HOW TO WEAR IT
Goggles	Chemical-resistant goggles keep your eyes safe from both splashing and, if using dry formulations, dusts or granules. Don't use goggles with cloth or elastic headbands as these will absorb pesticides.	Wear goggles snugly on your face so that the sides of your head are protected from splashes. If you wear glasses, make sure you purchase goggles that fit snugly over them. Never wear contact lenses when working around pesticides.
Respirators	Only NIOSH-approved respirators should be used. Do not exchange parts of different respirators. (For example, do not use a cartridge produced by Company "A" with a respirator produced by Company "B" as the combination may not provide adequate protection to the user). Dust masks are ineffective in protecting against herbicide vapours. Similarly, the filters on tractor cabs are intended to remove dust and are not designed to protect against herbicide vapours or mists. Chemical cartridge respirators are recommended for outdoor use when mixing and applying herbicides.	When carrying out operations, change filters each day. The cartridge should be replaced when chemical odour becomes apparent or when breathing becomes difficult. New cartridges should always be installed at the beginning of the spray season. Prior to commencing work, check the face seal while the respirator is on the wearer's face. Regardless of design, respirators cannot be worn securely by people wearing beards, moustaches or sideburns.
Face Shields	Goggles offer some protection, but frequently full-face protection is advised or required according to the pesticide label. It is especially important to protect your eyes and face when pouring or mixing liquid concentrates. Effective face shields are made of clear plastic.	Since the shield attaches to the hard hat, you can raise or lower it as needed.

Avoiding Spray Drift

To minimize the risk of drift, follow these guidelines:

- Do not spray in winds above 15 km/h (9 mph).
- Do not spray under dead calm conditions in early morning, night, or late evening. These are often associated with temperature inversions and the combination of these factors can result in long-distance spray drift (2 km or more). Fog or dust that seems to hang in the air is a good indicator of an inversion.
- Avoid nozzle pressures above 45 psi (310 kPa) for conventional flat fan tips.
- Use a minimum of 45 L/acre water for all pesticides unless otherwise specified for the product.
- Take note of buffer zones identified in the "Restrictions" section of this guide. Do not spray when the wind is blowing towards a nearby sensitive crop, shelterbelt, garden, or water body.
- Use amine formulations of 2,4-D or MCPA where possible. Use special care when applying volatile herbicides (most herbicides in Group 3 and Group 4, particularly ester formulations). Avoid spraying these products on or immediately before hot days.
- Ensure that air flow from air assisted sprayers is properly set to minimize airblast rebound and drift for different crop canopies.
- Operate nozzles at their minimum recommended height. For 80° tips, this is 18" (45 cm), and for 110° tips, this is 12" (35 cm). Orienting nozzles forward allows further height reductions.
- Special nozzles are now available that create coarse, low-drift sprays. Pre-orifice, Turbo-TeeJet, or venturi-type nozzles are available from a number of manufacturers, and these reduce drift by 50 to 95 percent. (Refer to the section entitled **Herbicide Efficacy with Low-Drift Nozzles**)
- Consider equipping your sprayer with protective shrouds. A number of different designs are available that can reduce drift between 35 and 75 percent.

For more information on reducing drift refer the Factsheet entitled "Spray Drift – Causes and Solutions" available at the Saskatchewan Ministry of Agriculture Website: www.agriculture.gov.sk.ca

Herbicide Efficacy with Low-drift Nozzles

A number of low-drift nozzles are now available from different suppliers. Well established nozzles, such as the Turbo TeeJet, reduce drift by about 50 percent and provide equivalent efficacy to a standard flat fan nozzle. Newer nozzles (“venturi” types) are best known for their dramatic ability to reduce drift (50 to 95 percent), but information on pesticide efficacy is still scarce. Initial data suggest that these nozzles perform well at conventional carrier volumes, travel speeds, and product rates. Some aspects require special attention:

Pressure: Most venturi-type nozzles require higher pressures to operate properly. Below 40 psi (275 kPa), patterns may deteriorate rapidly resulting in poor overlaps and erratic control. Higher pressures are recommended (60 to 80 psi, or 415 to 550 kPa). Drift potential remains low, even at these high pressures. When using automatic rate controllers, make sure your pressures remain high enough for good nozzle performance.

Water Volume: Droplet size become more important at lower water volumes. Little is known about low-drift nozzle performance at or below 5 gal/acre (23 L/acre). Since low-drift nozzles generate fewer droplets than conventional nozzles, ensure that water volumes are high enough for coverage when using coarse sprays.

Weed Type: Difficult-to-wet weeds, such as wild oats, green foxtail, lamb’s-quarters, and cleavers, typically require finer sprays for effective coverage. When using venturi nozzles on these weeds, make sure your pressure is high enough to achieve good coverage. Larger weeds and reduced product rates typically make chemical control more difficult, and these conditions may also reveal some performance differences between nozzles.

Herbicide Type: According to preliminary results, herbicides that belong to herbicide Groups 2, 4, and 9 perform well with venturi nozzles, even at normal pressures (40 psi). Application of herbicides in Groups 1, 6, 8, and 10 may require higher pressures with venturi nozzles to maintain good performance, especially under challenging conditions. Wild oat control may be reduced with the coarsest sprays, even when applied at high pressure.

Check with your chemical representative to see if the manufacturer supports the use of low-drift nozzles with their products.

More information is available in the factsheet “Pesticide Application and Choosing the Right Nozzles,” available from your local extension office or at the Saskatchewan Ministry of Agriculture Website: www.agriculture.gov.sk.ca

Handling a Drift Complaint

When spray drift occurs, it is important to take the right steps to resolve the complaint. If you suspect that your crop or property has been damaged because of spray drift, use the following guidelines for resolving the situation.

1. Are you sure that the symptoms or damage you see has been caused by spray drift? Contact your local agricultural office to help determine if the damage is the result of spray drift.
2. Contact the suspected applicator as soon as possible. View the damage with the suspected applicator and determine if that person did, in fact, cause the damage.
3. If the damage was caused by the applicator, determine the extent of the damage and the level of compensation (if any) with the applicator.
4. If the situation cannot be resolved quickly because of disagreements on the extent of damage or level of compensation, contact your local agricultural office to discuss options on how to proceed. Documentation will be required, particularly if insurance companies are involved.
5. The involvement of a private consultant is recommended if documentation is required. Required documentation often includes samples of the damaged plants, photographs, and yield comparisons to determine losses. Your agricultural office can provide you with a list of private consultants in your area.
6. The best approach is to start an open and honest line of communication with the suspected applicator. The majority of drift complaints are resolved quickly and efficiently by communicating with the applicator, without the involvement of outside parties.

Mixing Pesticides

The ability to control a broad range of weeds or other pests in one pass is the advantage that a mix of two or more products allows. If tank mixing is not done in the correct order, the result could be a tank-load of material that may not control the target pests, cause injury to the crop, plug nozzles, or leave an undesirable residue in the tank that will require extensive cleaning. Mistakes like these are costly, could put the user at unnecessary risk of exposure to the products, or create an environmental disposal problem.

To avoid mixing that may result in incompatibilities, **always consult the label of the products that are being used to learn the correct order. Remember to add all like components at the same stage of mixing.** The list below is a general rule-of-thumb for mixing pesticides:

1. Fill the spray tank with 1/4 to 3/4 the amount of water required for the application and turn on the sprayer agitation. Check the products that are being used for the correct amount to add. Once agitation has begun, maintain until the tank is emptied.
2. Add any fertilizer or pH adjuster additives to the tank.
3. Add any wettable powders, water dispersible granules (DF, DG, or WDG), or flowable liquid suspensions to the tank. Add dry products slowly to prevent clogged return lines. Allow sprayer to agitate for a few minutes, allowing the product to become completely suspended in the tank, before adding the next component.

4. Shake any containers of liquid pesticide thoroughly before adding to ensure they are well mixed.
 5. Add any pesticides that are solutions (SN) (i.e. amines and salts)
 6. Add emulsifiable concentrates (EC, SC) (i.e. esters)
 7. Add any surfactants or other adjuvants.
- Remember to always consult the label for compatible mixes and recommended mixing order.

Many pesticides will break down if left in the tank for an extended period. Try not to mix any more than you can spray at one time. If you need to stop spraying for a short time, leave the sprayer agitation running to keep products from settling or separating in the tank.

Container Disposal

Proper disposal of used containers and unused pesticides is important to protect the environment and prevent contamination of soil and water resources. Rinse all containers prior to disposal to reduce environmental contamination caused by open dumping of unwanted containers. Only mix as much pesticide solution as is needed to treat the desired area.

Triple Rinsing

Triple rinsing renders used pesticide containers (metal, plastic, glass) more than 99.9 percent free of residues, in most cases.

Here are the steps that should be followed:

1. Empty contents of the container into the spray tank and drain in a vertical position for 30 seconds.
2. Add a measured amount of rinse water or other diluent until container is about one-fifth full.
3. Rinse the container thoroughly and pour the rinsate into the spray tank.
4. Repeat the procedure twice (it should take only about 5 minutes in total).
5. Puncture or break triple rinsed containers to render them non-reusable. Paper bags should be rinsed once prior to disposal.

Pressure Rinsing

Pressure rinsers can be used to rinse any size of empty pesticide container that can be lifted into position over the spray tank. A 30 second rinse with a pressure rinser is convenient and just as effective as triple rinsing. Pressure rinsers are constructed to be thrust into the bottom of a metal can or plastic jug. Holes, situated laterally in the rinser tip, direct water from a pressurized source against the inner sides of the container and effectively wash the residual pesticide into the spray tank. Some farmers have found it convenient to attach a rinser to the pump on their large water storage tank to minimize container handling. Pressure rinsers have the added advantage of rendering containers useless by automatically puncturing them.

Disposal of Containers

Properly rinsed containers should be delivered to a designated pesticide container disposal site. Contact your ag rep, municipal office or weed supervisor for the locations of pesticide container disposal sites in your municipality.

Sprayer Tank Cleaning

When pesticide application is completed each day it is important to empty and clean the sprayer thoroughly to prevent the breakdown of certain pesticides, prevent adhesion of the pesticide to the sprayer, and to maintain the sprayer parts in good condition. Certain pesticides break down very quickly when left in solution, and several pesticide solutions can be corrosive to sprayer parts. Tank cleaning is especially important when changing from one crop to another or from one pesticide to another. Each year several reports are logged of herbicide damage cause by carryover of product residue in the tank. To avoid the risk of contamination, sprayers should be cleaned as soon as possible after application is completed.

Do not clean sprayers where rinsate can run off into ditches or other water bodies, near sensitive plants or shelterbelts, or where other people or animals are likely to walk, to avoid unnecessary exposure to people, animals and the environment.

There are three basic types of rinse solution for cleaning sprayer tanks. Their recipes and basic procedures are outlined below:

The Ammonia Rinse – Fill spray tank and add 1 L of household ammonia (3%) for every 100 L of clean water needed for the rinse and begin agitation. Allow solution to flush through the booms until the boom is completely filled with ammonia solution and top up the tank with water. Circulate the ammonia solution through the tank and pump system for 15 minutes. Flush hoses and booms with ammonia rinse solution again (minimum 5 minutes) before emptying. Remove nozzles and screens and scrub with 0.1 L household ammonia per 10 L clean water and an old toothbrush. Perform clean water rinse to remove ammonia solution prior to next spray load. Some herbicides recommend leaving the ammonia rinse in the tank over night to improve cleaning potential.

The Fresh Water Rinse – The spray tank cleaning should begin and end with a fresh water rinse to remove the majority of potential contaminants prior to the cleansing process or prior to the next round of spraying. Drain the tank of its previous contents and fill the tank with clean water. Open nozzle valves and pump clean water through the booms and hoses. Top up the tank with more clean water and circulate/agitate for at least 10 minutes and empty the tank of waste water. If this is the first rinse after spraying, a high pressure hose could be used to clean residue from all surfaces in the tank. Do not enter the tank during the cleaning process.

The Detergent Rinse – After rinsing with clean water, fill spray tank and add a heavy-duty detergent at 0.25 L per 100 L of water (some suggest a non-ionic surfactant such as Agral 90 or Agsurf at 0.6 L per 100 L of water). Circulate the mixture for a minimum of 5 minutes and spray out through sprayer nozzles. Nozzles and screens are removed and cleaned individually with the same detergent solution in a small container. Soaking in this solution for several hours also helps to loosen any deposits.

The above solutions are just components of the overall sprayer cleaning process. Typical rinse instructions will repeat a combination of one or two or all of these basic rinses. Below we will give some generic rinse instructions utilizing the basic rinses as components of the larger cleaning procedure. Never enter the tank during the cleaning process as some cleansers may release dangerous gases.

Method A –

Drain contents of tank – 1 to 2 X Water Rinse – 2X Ammonia Rinse – 2X Water Rinse (one just prior to the next spraying event)

Products: 2,4-D, Accent, Ally, Atrazine, Avadex, Dicamba, Dichlorprop/2,4-D, DyVel, Escort, Everest, Express Pack, FlaxMax, Fusion, MCPA, Muster, Pinnacle, Poast Ultra, Prism, Rustler, Tordon 22K, Unity.

Method B –

Drain Contents of tank – 2x Water Rinse – 2X Detergent Rinse – 2X Water Rinse

Products: Achieve, Achieve Liquid Gold*, Basagran, Bromoxynil/MCPA, Clethodim, Gramoxone*, Liberty, Puma¹²⁰ Super, Reglone Desiccant*, Reward*, Sencor, trifluralin products, Venture*

*Manufacturers of these products recommend adding a non-ionic surfactant such as Agral 90 or Agsurf at 0.6 L per 100 L of water.

Method C -

Drain Contents of tank – Several repetitions of the Water Rinse with nozzles and screens removed and checked for debris.

Products: Amitrol 240, Assure II, Attain, Dual II Magnum, Eclipse, glyphosate products, Horizon, Horizon BTM, Prestige.

The above directions are general processes based on the similarities of tank cleaning recommendations between products in each of the herbicide groupings. Always follow the specific instructions on the product label.

Several products in the guide do not have label instructions regarding tank cleaning. In the case of products that have no cleaning recommendations on the label, there are some basic principals that can be applied. Products that are water based formulations can usually be cleaned from spray tanks using Method C above. Products that are formulated as an EC, SC or F (flowable) or use a petroleum based adjuvant should at least use Method B. The detergent breaks down the oil that may be sticking to the side of the tank. Products in Group 2 (most will already have a recommendation) will require the use of Method A. The ammonia in Method A either increases the solubility of the product allowing it to be easily removed from the tank surfaces or neutralizes these products. If the product that is to be cleaned out of the tank is a combination of these elements, use a combination of Methods to clean the tank. In these cases, use a good commercial tank-cleaning product from a recognized source, with both ammonia and detergent as components.

Group 2 compounds can occasionally be trapped on the tank walls by petroleum based formulations or adjuvants when tank mixed with other products, resulting in tank residues. A way to reduce the chance of this occurring is to add detergent at 0.25 L per 100 L to the Ammonia Rinse portion to assist with the breakdown of the petroleum coating so that the ammonia may rid the tank of Group 2 product.

It is very important to clean sprayers immediately after every use. With a more diverse rotation, the likelihood of damage from lack of care increases dramatically.

How to Identify Crop and Weed Leaf Stages

Recognition of plant growth stages is essential for effective weed and disease control. Many herbicides and fungicides are safe on a crop only when applied at a specific growth stage. Similarly, weeds are controlled only when they are at certain growth stages.

For most post-emergent products, growth stages are described by the number of leaves. The following is a description of how to count leaves for staging.

Cereals and Annual Grass Weeds

Manufacturers generally use two different systems of staging for grasses. The minimum stages of application are similar, while the later stages may differ.

Some manufacturers use "Total Leaf Count" stages based on the number of leaves on the entire plant, including tillers or secondary shoots. Most recommendations however, are based on the number of main stem leaves and tillers. Tillers or stools are the secondary shoots or stems of a grass plant. Similar to the branches of a broadleaf plant, tillers will emerge from the axils between the leaf and main shoot.

Tillers usually begin to appear at the 3 or 4 leaf stage. When staging a plant in this manner, be sure to identify the tillers first, then count only leaves that originate from the main shoot.

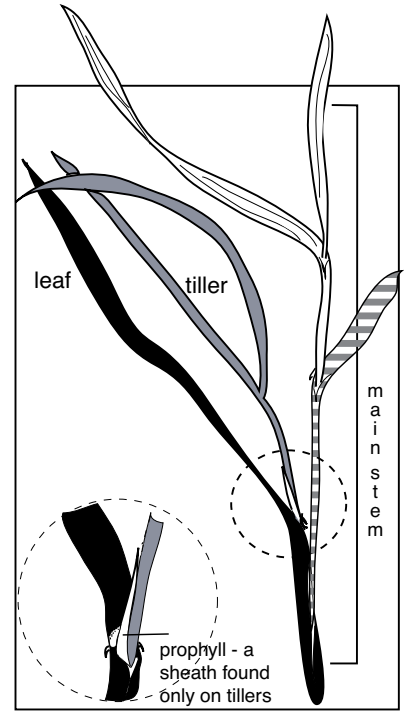


Figure 2. Leaf Stages of Cereals and Annual Grass Weeds

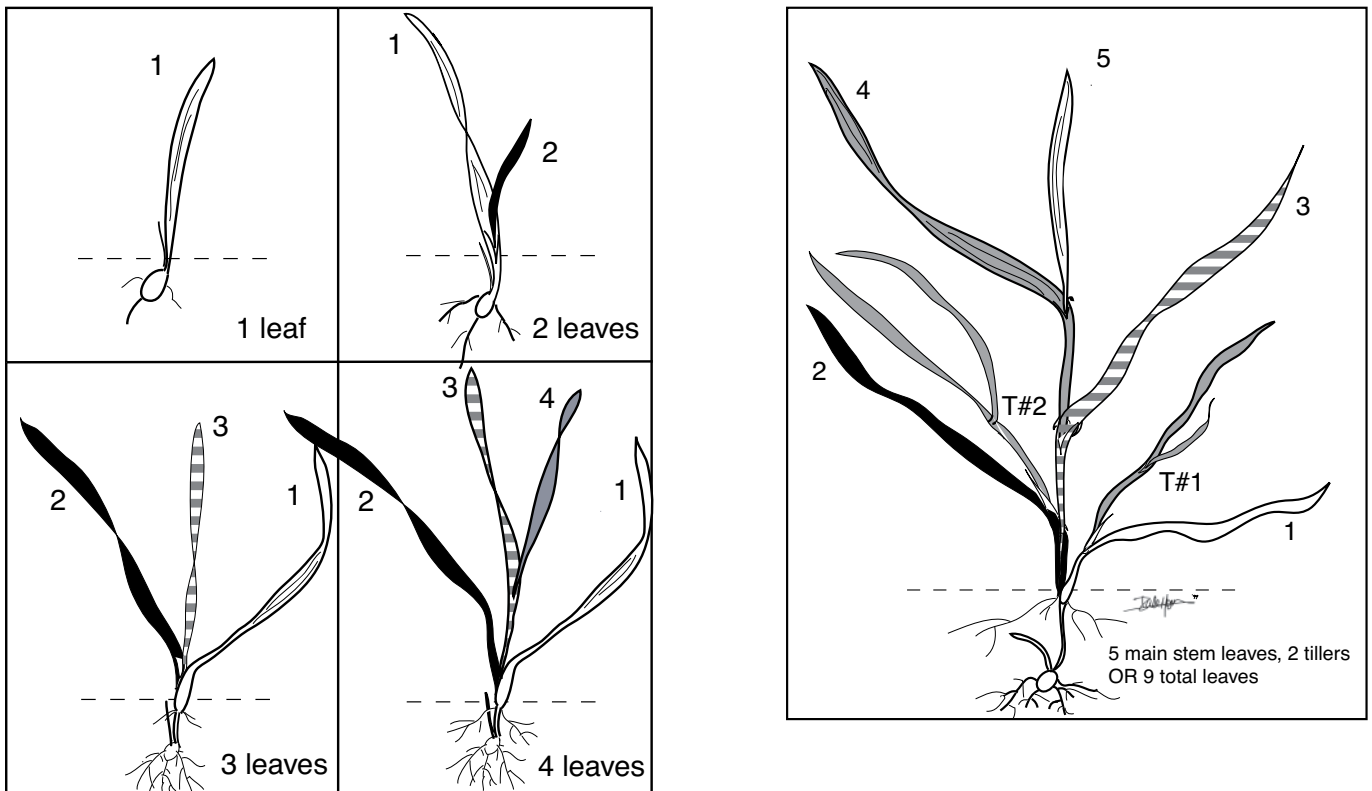
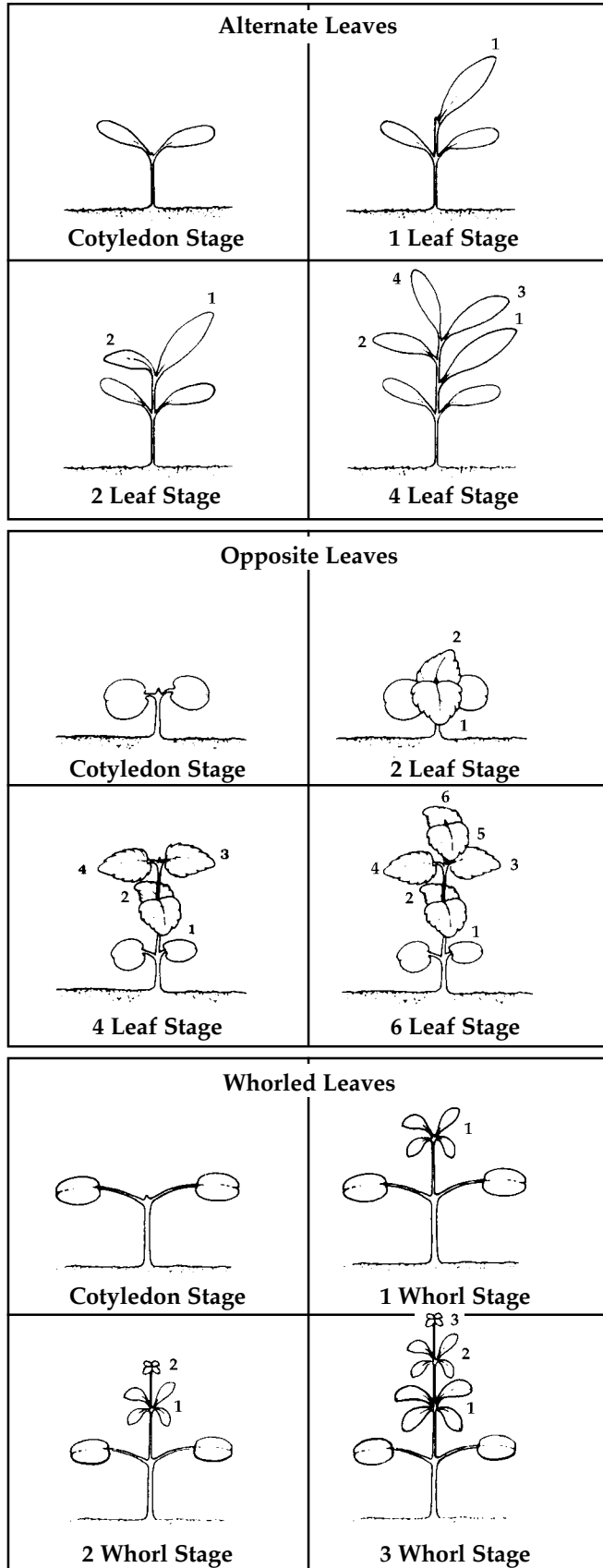


Figure 3. Leaf Stages of Broadleaf Weeds and Crops



Broadleaf Weeds

Cotyledons - These are the seed leaves that usually emerge above ground. On some plants, such as fababeans, lentils and peas, they stay below the soil surface. Cotyledons are not true leaves and are not counted when determining leaf number. They are a different shape than the true leaves and may dry up and disappear at an early stage.

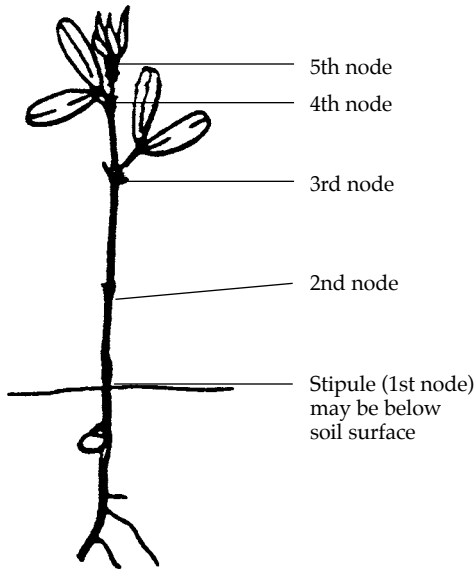
Alternate leaves - Some plants have one leaf at each node on the stem. The next leaf emerges at the next higher node and extends away from the stem in the opposite direction. These plants (lamb's quarters and wild mustard are good examples) are said to have alternate leaves. To determine the leaf stage, simply count the number of leaves present (Figure 3).

Opposite leaves - Plants with two leaves at each node, one on each side of the stem, are said to have opposite leaves. The next pair of leaves on the next node are rotated about 45° so that they are not directly over the previous pair. Plants with opposite leaves have even-leaf numbers only. When counting, the leaf number progresses from cotyledons to 2 leaf, 4 leaf, etc. These plants generally appear shorter than plants with alternate leaves at a similar leaf stage. **Be sure to count each pair as two leaves.** Hemp nettle is a weed that has opposite leaves (Figure 3).

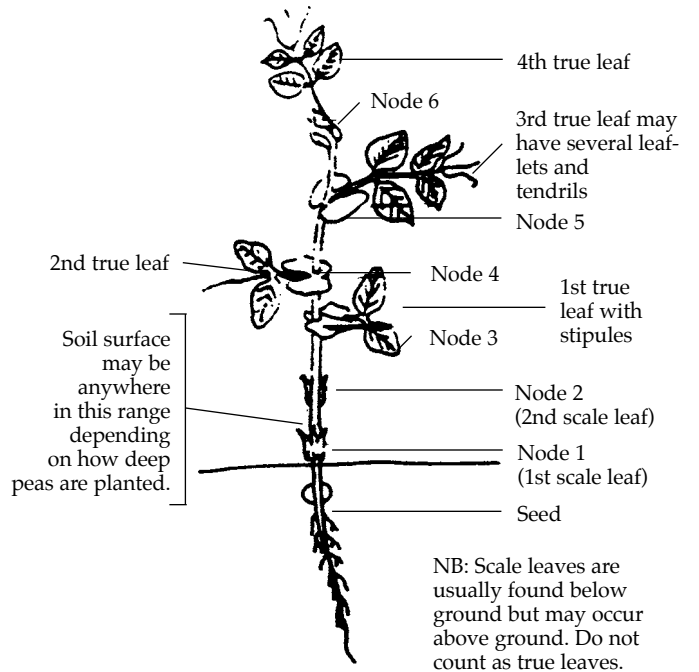
Whorled leaves - More complex plants like cleavers may have whorled leaves. These plants have three or more leaves at each node on the stem. The leaf number in each whorl may vary, so be sure to count each individual leaf unless the Guide or label recommendation refers to the number of leaf whorls (Figure 3).

Figure 4. Leaf Stages of Certain Special Crops and Forages

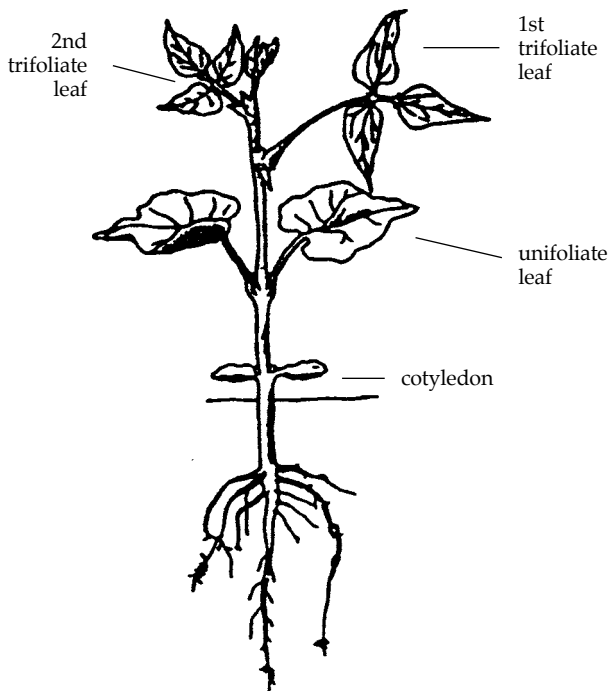
Lentil Seedling



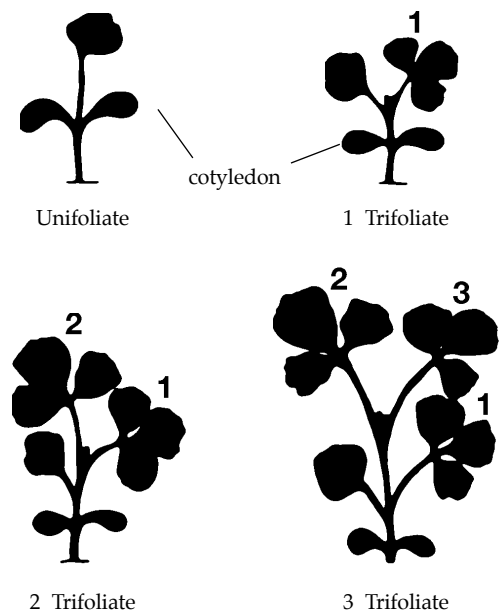
Field Pea Seedling



Dry Bean Seedling



Forage Legume Seedling



Stages of Alfalfa, Red Clover and Alsike Clover Leaf Development

PESTICIDE FORMULATIONS AND COMPANIES

Herbicides

Product	Common Name	Formulation	Company
2,4-D	2,4-D	600, 700 g/L SN, EC	Various
AAtrex Liquid	atrazine	480 g/L SC	Syngenta Crop Protection
Absolute	imazamox:imazethapyr + clopyralid	35% : 35% + 360 g/L DG	BASF Canada
Accent	nicosulfuron	75% DG	E. I. duPont Canada
Accurate	metsulfuron methyl	60% DG	Cheminova Canada
Achieve (Liquid Achieve)	tralkoxydim	400 g/L SC	Dow AgroSciences
Achieve Liquid Gold	tralkoxydim+	400 g/L SC +	Nufarm Agriculture
	bromoxynil : MCPA E	225 : 225 g/L EC	
Adrenalin SC	imazamox : 2,4-D LV ester	20 : 560 g/L SC	BASF Canada
Advance	trifluralin	10% G	Dow AgroSciences
Ally Toss-N-Go	metsulfuron methyl	60% DG	E. I. duPont Canada
Altitude FX	imazimox +	120 g/L SN +	BASF Canada
	fluroxypyr : MCPA 600 ester	180 : 600 g/L EC	
Amitrol 240	amitrole	231 g/L SN	Nufarm Agriculture
Approve	bromoxynil : 2,4-D LV E	225 g/L : 225 g/L EC	Nufarm Agriculture
Arrow	clethodim	240 g/L EC	MANA Canada
Assert 300 SC	imazamethabenz	300 g/L SC	Nufarm Agriculture
Assert FL	imazamethabenz +	300 g/L SC +	Nufarm Agriculture
	florasulam : MCPA ester	4 g : 280 g/L EC	
	quizalofop-p-ethyl	96 g/L EC	
Assure II	fluroxypyr + 2,4-D E	180 g/L + 564 g/L EC	E. I. duPont Canada
Attain	fluroxypyr + 2,4-D E	333 g/L + 660 g/L	Dow AgroSciences
Attain XC	sulfentrazone	480 g/L SC	Dow AgroSciences
Authority	triallate	10% G, 480 g/L EC	Nufarm Agriculture
Avadex MicroActiv/ Extra Strength BW			Gowan Canada
Avenge 200-C	difenzoquat	200 g/L SN	Syngenta Crop Protection
Axial	pinoxaden	100 g/L EC	Syngenta Crop Protection
Axial iPak	pinoxaden +	100 g/L EC +	Syngenta Crop Protection
	pyrasulfotole : bromoxynil	37.5 : 210 g/L EC	
Badge	bromoxynil : MCPA E	225 g/L : 225 g/L EC	
Banvel II	dicamba	480 g/L SN	MANA Canada
Basagran/Basagran Forté	bentazon	480 g/L SN	BASF Canada
Battalion	rimsulfuron + metalachlor + dicamba	25% DF + 915 g/L EC + 480 g/L SN	E. I. duPont Canada
Benchmark	florasulam + bromoxynil	50 g/L SC + 235 g/L EC	Dow AgroSciences
Bengal	fenoxaprop-p-ethyl	120 g/L EC	MANA Canada
Bison	tralkoxydim	400 g/L SC	MANA Canada
Blazer	acifluorfen	240 g/L SN	United Phosphorus Inc.
Bonanza	trifluralin	480 g/L EC, 10% G	UAP
Broadside	thifensulfuron methyl :	33.35% : 16.65% SG + 500 g/L EC	Viterra
	tribenuron methyl + MPCA		
Broadband	pinoxaden : florasulam	92.7 : 7.7 g/L EC	Syngenta Crop Protection
Bromotril	bromoxynil	240 g/L EC	MANA Canada
Brotex	bromoxynil	240 g/L EC	IPCO
Buctril M	bromoxynil : MCPA E	280 g/L : 280 g/L EC	Bayer CropScience
Caliber	2,4-DB	625 g/L EC	UAP
Casoron	dichlobenil	4% G	UAP
Centurion	clethodim	240 g/L EC	Bayer CropScience
Cheminova Glyphosate	glyphosate IPA salt	356 g/L SN	Cheminova Canada
ClearOut 41 Plus	glyphosate IPA salt	360 g/L SN	Farmers of North America
Cleanstart	glyphosate IPA + carfentrazone	356 g/L SN + 240 g/L EC	Nufarm Agriculture
Clovitox Plus	MCPB : MCPA	375 : 25 g/L SN	IPCO
Cobutox	2,4-DB	625 g/L EC	IPCO
Compitox	mecoprop-p	150 g/L SN	Nufarm Agriculture
Credit	glyphosate IPA salt	356 g/L SN	Nufarm Agriculture
Credit 45	glyphosate IPA salt	450 g/L SN	Nufarm Agriculture
Curtail M	clopyralid : MCPA E	50 : 280 g/L EC	Nufarm Agriculture
Cypress	clodinafop-propargyl +	240 g/L EC +	Viterra
	dicamba : mecoprop-p : MCPA	62.5 : 62.5 : 275 g/L SN	
	thifensulfuron methyl :	50% : 25% DG	
Deploy	tribenuron methyl		Arysta LifeScience
Dichlorprop-D	dichlorprop : 2,4-D E	300 : 282 g/L EC	IPCO
Dual II Magnum	metolachlor	915 g/L EC	Syngenta Crop Protection
DyVel	dicamba : MCPA K	84 : 336 g/L SN	BASF Canada
DyVel DSp	dicamba : mecoprop-p : 2,4-D A +	110 : 80 : 295 g/L SN	BASF Canada
Eclipse III	glyphosate DMA + clopyralid	480 g/L + 360 g/L SN	Dow AgroSciences
Edge Granular	ethalfluralin	5% G	Dow AgroSciences
Embutox 625	2,4-DB	625 g/L EC	Nufarm Agriculture
Eptam-8E	EPTC	800 g/L EC	Gowan Comapny
Equinox	tepraloxymid	200 g/L EC	BASF Canada
Escort	metsulfuron methyl	60% DG	E.I. duPont Canada
Estoprop Plus	dichlorprop : 2,4-D E	300 : 282 g/L EC	Nufarm Agriculture

Product	Common Name	Formulation	Company
Everest	flucarbazone	66% DG	Arysta LifeScience
Express Pro	tribenuron methyl : metsulfuron	42.9% : 8.6% SG	E.I. duPont Canada
Express SG	tribenuron methyl	50% SG	E. I. duPont Canada
Factor 540	glyphosate K ⁺ salt	540 g/L SN	IPCO
FlaxMax DLX	tepraloxymid + clopyralid : MCPA E	200 g/L EC + 50 : 280 g/L EC	BASF Canada
Foothills	clodinafop-propargyl	240 g/L EC	Viterra
Fortress	triallate : trifluralin	10% : 4% G	Gowan Canada
Frontier	dimethanamid	900 g/L EC	BASF Canada
Frontline XL	florasulam : MCPA ester	4 g : 280 g/L EC	Dow AgroSciences
Frontline 2,4-D	florasulam + 2,4-D E	50 g/L SC + 564 g/L EC	Dow AgroSciences
Guardman Gladiator	imazethapyr	240 g/L SN	Univar Canada
Glyphos	glyphosate IPA salt	360 g/L SN	Cheminova Canada
Gramoxone	paraquat	200 g/L SN	Syngenta Crop Protection
Grazon	picloram : 2,4-D E	65 : 240 g/L SN	Dow AgroSciences
Harmony K	clodinafop propargyl + thifensulfuron methyl :	240 g/L EC + 33.35% : 16.65% SG +	E. I. duPont Canada
Harmony SG	tribenuron methyl + dicamba clodinafop propargyl + thifensulfuron methyl :	480 g/L SN 128 g/L EC + 33.35% : 16.65 SG	E. I. duPont Canada
Horizon 240 EC	tribenuron methyl clodinafop-propargyl	240 g/L EC 240 g/L EC +	Syngenta Crop Protection
Horizon BTM	clodinafop propargyl + bromoxynil : MCPA E	225 g/L : 225 g/L EC 60 g/L EC	Syngenta Crop Protection
Horizon NG	clodinafop-propargyl	60 g/L EC	Syngenta Crop Protection
Infinity	pyrasulfotole : bromoxynil	37.5 : 210 g/L EC	Bayer CropScience
Kerb 50W SP	propyzamide	50% WP	Dow AgroSciences
Koril 235	bromoxynil	235g/L EC	Nufarm Agriculture
Knockout	glyphosate IPA salt	360 g/L SN	Nufarm Agriculture
Ladder	clodinafop-propargyl	240 g/L EC	MANA Canada Inc.
Leader Liquid	bromoxynil : 2, 4-D E	225 : 225 g/L EC	IPCO
Liberty	glufosinate ammonium	150 g/L SN	Bayer CropScience
Liberty 200 SN	glufosinate ammonium	200 g/L SN	Bayer CropScience
Linuron 400	linuron	400 g/L SC	UAP
Logic M	bromoxynil : MCPA E	225 : 225 g/L EC	IPCO
Lontrel 360	clopyralid	360 g/L SN	Dow AgroSciences
Lorox L	linuron	480 g/L SC	E. I. duPont Canada
Marengo	tralkoxydim	400 g/L SC	Dow AgroSciences
Maverick III	glyphosate DMA salt	480 g/L SN	Dow AgroSciences
MCPA	MCPA	300,400,500,564 g/L SN, EC	Various
Mecoprop	mecoprop	150 g/L SN	UAP
Mextrol 450	bromoxynil : MCPA E	225 : 225 g/L EC	Nufarm Agriculture
Muster Toss-N-Go	ethametsulfuron-methyl	75% DG	E. I. duPont Canada
NextStep	clodinafop-propargyl	240 g/L EC	Arysta LifeScience
Nimble	thifensulfuron methyl :	50% : 25% DG	Cheminova Canada
Odyssey	tribenuron methyl	35% : 35% DG	BASF Canada
Odyssey DLX	imazamox : imazethapyr imazamox : imazethapyr + tepraloxymid	35% : 35% DG + 200 g/L EC	BASF Canada
Option 35 DF or Option 2.25 OD	foramsulfuron	35% DG/ or 22.5 g/L OD	Bayer CropScience
Oracle	dicamba	480 g/L SN	Gharda/UAP/Provide Agra
Pardner	bromoxynil	280 g/L EC	Bayer CropScience
Pinnacle	thifensulfuron methyl	75% DG	E. I. duPont Canada
Poast Ultra	sethoxydim	450 g/L EC	BASF Canada
PrePass	glyphosate IPA + florasulam	360 g/L SN + 50 g/L SC	Dow AgroSciences
Prestige	fluroxypyr + clopyralid : MCPA E	180 g/L + 50 : 280 g/L EC	Dow AgroSciences
Prestige XC	fluroxypyr + clopyralid : MCPA E	333 g/L + 50 : 280 g/L EC	Dow AgroSciences
Primextra II Magnum	metolachlor : atrazine	400 : 320 g/L SC	Syngenta Crop Protection
Princep Nine T	simazine	90% DG	True North
Prism	rimsulfuron	25% DG	E.I. DuPont Canada
Pulsar	dicamba + fluroxypyr	480 g/L SN + 180 g/L EC	Syngenta Crop Protection
PulseStar/MultiStar	imazethapyr	240 g/L SN	Viterra
Puma ¹²⁰ Super	fenoxaprop-p-ethyl	120 g/L EC	Bayer CropScience
Pursuit	imazethapyr	240 g/L SN	BASF Canada
Refine M	thifensulfuron methyl :	33.35% : 16.65% SG +	E. I. duPont Canada
Refine SG	tribenuron methyl + MCPA E thifensulfuron methyl :	500g/L EC 33.35% : 16.65% SG	E. I. duPont Canada
Reflex	tribenuron methyl	240 g/L SN	Syngenta Crop Protection
Reglone Desiccant	fomesafen	240 g/L SN	Syngenta Crop Protection
Remedy EC	diquat	240 g/L SN	Syngenta Crop Protection
Restore	triclopyr	480 g/L EC	Dow AgroSciences
Reward	aminopyralid + 2,4-D A diquat	240 g/L + 564 g/L SN 240 g/L SN	Dow AgroSciences True North

Product	Common Name	Formulation	Company
Rival	trifluralin	500 g/L EC, 10% G	Nufarm Agriculture
Roundup Transorb HC	glyphosate K+ salt	540 g/L SN	Monsanto
R/T 540	glyphosate K+ salt	540 g/L SN	Monsanto
Roundup WeatherMax/Ultra 2	glyphosate K+ salt	540 g/L SN	Monsanto
Rustler	glyphosate IPA + dicamba	194 g/L + 46 g/L SN	Monsanto
Salvo	2,4-D LV Ester	660 g/L EC	UAP
Select	clethodim	240 g/L EC	Arysta LifeScience
Sencor	metribuzin	75% DG	Bayer CropScience
Shadow RTM	clethodim	240 g/L EC	Viterra
Sharpshooter	glyphosate IPA salt	356 g/L SN	UAP
Sharpshooter Plus	glyphosate IPA salt	360 g/L SN	UAP
Signal	clodinafop-propargyl	240 g/L EC	Nufarm Agriculture
Signal D	clodinafop propargyl + bromoxynil : 2,4-D E	240 g/L EC + 225 : 225 g/L EC	Nufarm Agriculture
Signal M	clodinafop propargyl + bromoxynil : MCPA E	240 g/L EC + 225 : 225 g/L EC	Nufarm Agriculture
Simazine 480	simazine	480 g/L SC	UAP
Simplicity	pyroxsulam	30 g/L SC	Dow AgroSciences
Solo	imazamox	70% DG	BASF Canada
Spectrum	florasulam + clopyralid : MCPA E	50 g/L SC + 50 : 280 g/L EC	Dow AgroSciences
Stellar	florasulam + fluroxypyr	2.5 g/L SC + 100 g/L EC	Dow AgroSciences
Sword	dicamba : mecoprop : MCPA A	62.5 : 62.5 : 275 g/L SN	UAP
Target	dicamba : mecoprop : MCPA A	62.5 : 62.5 : 275 g/L SN	Syngenta Crop Protection
Thrasher	bromoxynil : 2, 4-D E	225 : 225 g/L EC	MANA Canada
Thumper	bromoxynil : 2, 4-D E	280 : 280 g/L EC	Bayer CropScience
Titanium	tralkoxydim + bromoxynil : 2, 4-D E	400 g/L SC + 225 : 225 g/L EC	Nufarm Agriculture
Topside	MCPB : MCPA A	375 : 25 g/L SN	UAP
Tordon 22K	picloram	240 g/L SN	Dow AgroSciences
Touchdown Total	glyphosate K+ salt	500 g/L SN	Syngenta Crop Protection
Tracker XP	dicamba : mecoprop : MCPA	62.5 : 62.5 : 275 g/L SN	IPCO
Treflan	trifluralin	480 g/L EC	Dow AgroSciences
Triton C	tribenuron methyl : thifensulfuron methyl : quinclorac	5.15% : 10.3% : 51.55% SG	E. I. duPont Canada
Triton K	tribenuron methyl + dicamba + 2,4-D E or tribenuron methyl : dicamba + 2,4-D E	50% SG + 480 g/L SN + 660 g/L EC or 8.25% : 58.45% DG + 660 g/L EC	E. I. duPont Canada
Trophy	fluroxypyr + MCPA E	180 g/L + 500 g/L EC	Nufarm Agriculture
Tropotox Plus	MCPB : MCPA A	375 : 25 g/L SN	Nufarm Agriculture
Turboprop	dichlorprop : 2,4-D E	300 : 282 g/L EC	UAP
Ultim	nicosulfuron : rimsulfuron	37.5% : 37.5% DG	E.I. duPont Canada
Vantage Plus Max II	glyphosate DMA salt	480 g/L SN	Dow AgroSciences
Velpar DF	hexazinone	75% DG	E.I. duPont Canada
Venture L	fluazifop-p-butyl	125 g/L EC	Syngenta Crop Protection
Viper	imazamox + bentazon	70% DG + 480 g/L SN	BASF Canada
Wildcat	fenoxaprop-p-ethyl	120 g/L EC	Viterra
Wise-Up	glyphosate IPA salt	356 g/L SN	Adjuvants Plus
Yuma	quizalofop-p-ethyl	96 g/L EC	Gowan Canada

Fungicides

Product	Common Name	Formulation	Company
Acrobat 50 WP	dimethomorph	50% WP	BASF Canada
Allegro 500F	fluazinam	40% SC	Syngenta Crop Protection
Bravo 500	chlorothalonil	500 g/L SC	Syngenta Crop Protection
Bumper 418 EC	propiconazole	418 g/L EC	MANA Canada
Copper 53W	tribasic copper sulphate	53% WP	UAP
Copper Spray	copper oxychloride	50% WP	UAP
Curzate 60 DF	cymoxanil	60% DF	E.I. duPont Canada
Dithane DG Rainshield NT	mancozeb	75% DG	Dow AgroSciences
Folicur 423 F	tebuconazole	432 g/L SC	Bayer CropScience
Gavel 75 DF	mancozeb + zoxamide	67% + 8% DF	Gowan Canada
Headline DUO ONE	boscalid : pyraclostrobin	25.2% : 12.8% DG	BASF Canada
Headline DUO TWO	boscalid	70% DG	BASF Canada
Headline EC	pyraclostrobin	250 g/L EC	BASF Canada
Kocide 2000	copper hydroxide	35% DF	E.I. duPont Canada
Kumulus DF	sulphur	80% DG	BASF Canada
Lance	boscalid	70% DG	BASF Canada
Manzate Pro-Stick	mancozeb	75% DG	E.I. duPont CanadaParasol
Parasol Flowable	copper hydroxide	24% F	Nufarm
Parasol WG	copper hydroxide	50% DG	Nufarm
Penncozeb 75 DF	mancozeb	75% DG	UAP
Pivot 418 EC	propiconazole	418 g/L EC	IPCO
Polyram DF	metiram	80% DG	BASF Canada
Proline 480 SC	prothioconazole	480 g/L SC	Bayer CropScience

Product	Common Name	Formulation	Company
Quadris	azoxystrobin	250 g/L SC	Syngenta Crop Protection
Quilt	azoxystrobin : propiconazole	75 : 125 g/L SC	Syngenta Crop Protection
Ranman 400 SC	cyazofamid	400 g/L SC	Syngenta Crop Protection
Reason 500SC	fenamidone	500 g/L SC	Bayer CropScience
Revus	mandipropamid	250 g/L	Syngenta Crop Protection
Ridomil Gold 480EC/480 SL	metalaxyl-M	480 g/L EC, 480 g/L SC	Syngenta Crop Protection
Ridomil Gold/Bravo	metalaxyl-M + chlorothalonil	480 g/L EC + 500 g/L SC	Syngenta Crop Protection
Ridomil Gold SL/Bravo	metalaxyl-M + chlorothalonil	480 g/L SC + 500 g/L SC	Syngenta Crop Protection
Rovral Flo	iprodione	240 g/L SC	Bayer CropScience
Rovral RX	iprodione	240 g/L SC	Monsanto
Scala SC	pyrimethanil	400 g/L SC	Bayer CropScience
Senator 70WP	thiophanate-methyl	70% WP	Engage Agro Corporation
Serenade Max/Serenade ASO	bacillus subtilis	14.6% WP / 13.4% SC	UAP
Shelter	propiconazole + clodinafop-propargyl	250 g/L + 60 g/L EC	Syngenta Crop Protection
Stratego 250EC	propiconazole : trifloxystrobin	125 : 125 g/L EC	Bayer CropScience
Tanos 50 DF	famoxadone : cymoxanil	25% : 25% DG	E.I. duPont Canada
Tattoo C	propamocarb : chlorothalonil	375 g/L : 375g/L SC	Bayer CropScience
Tilt 250E	propiconazole	250 g/L EC	Syngenta Crop Protection

Insecticides

Product	Common Name	Formulation	Company
Actara 240 SC/Actara 25 WG	thiamethoxam	240 g/L SC, 25% DG	Syngenta Crop Protection
Admire 240 / SPT	imidacloprid	240 g/L SC	Bayer CropScience
Alias 240 SC	imidacloprid	240 g/L SC	UAP
Assail	acetamiprid	70% WP	E.I. duPont Canada
Citadel 480EC	chlorpyrifos	480 g/L EC	IPCO
Clutch	clothianidin	50% DG	Valent Canada Inc.
Coragen	chlorantraniliprole	200 g/L SC	E.I. duPont Canada
Cygon 480EC / Cygon 480-Ag	dimethoate	480 g/L EC	IPCO, Cheminova Canada
Decis	deltamethrin	50 g/L EC; 50 g/L SC	Bayer CropScience
Diazinon	diazinon	50% L; 50% EC, 50% WP	UAP, IPCO
Dibrom	naled	864 g/L EC	UAP
Dipel 2X DF	<i>Bacillus thuringiensis</i>	32 BIU/kg DG	Valent BioSciences
Eco Bran	carbaryl	2% spreadable bran bait	Peacock Industries
Entrust	spinosad	80% WP	Dow AgroSciences
Fulfill	pymetrozine	50% DG	Syngenta Crop Protection
Furadan	carbofuran	480 g/L SC	Bayer CropScience
Grapple	imidacloprid	240 g/L SC	Cheminova Canada
Imidan	phosmet	50% WP	UAP
Insecto	diatomaceous earth	90%	Natural Insecto Products Inc.
Lagon 480E	dimethoate	480 g/L EC	UAP
Lanmate	methomyl	90% WSP	E.I. duPont Canada
Lorsban 4E	chlorpyrifos	480 g/L EC	Dow AgroSciences
Malathion 500E / 500	malathion	500 g/L EC	UAP, IPCO
Matador	lambda-cyhalothrin	120 g/L EC	Syngenta Crop Protection
Monitor	methamidophos	480 g/L L	Bayer CropScience, UAP
Movento 240 SC	spirotetramat	240 g/L SC	Bayer CropScience
Nolo Bait	spores of <i>Nosema (Paranosema) locustae</i> Canning	Minimum of 2.2x106 on coated wheat bran	M&R Durango, Inc.
Nufos 4E	chlorpyrifos	480 g/L EC	Cheminova Canada
Orthene	acephate	75% WSP	UAP
Perm-UP	permethrin	384 g/L EC	United Phosphorous Inc
Phostoxin	aluminum phosphide	55%	Degesch America Inc
Pounce	permethrin	384 g/L EC	UAP
Protect-It	diatomaceous earth	90%	Hedley Technologies Ltd
Pyrifos 15G	chlorpyrifos	15% G	UAP
Pyrinex 480EC	chlorpyrifos	480 g/L EC	UAP
Rimon 10 EC	novaluron	10% EC	Chemtura Canada
Ripcord	cypermethrin	407 g/L EC	BASF Canada
Sevin XLR	carbaryl	480 g/L SC	Bayer CropScience
Silencer 120 EC	lambda-cyhalothrin	120 g/L EC	MANA Canada
Success 480 SC	spinosad	480 g/L SC	Dow AgroSciences
Tempo	cyfluthrin	20% WP	Bayer CropScience
Thimet 15G	phorate	15% G	Amvac Chemical Corporation
Thiodan 4EC	endosulfan	400 g/L EC	Bayer CropScience
Thionex EC / 50 WP	endosulfan	400 g/L EC, 50% WP	UAP
UP-Cyde	cypermethrin	250 g/L EC	United Phosphorous Inc
Vydate L	oxamyl	240 g/L SN	E.I. duPont Canada

Abbreviations

WP	wettable powder	EC	emulsifiable concentrate	WSP	water soluble powder	SN	solution	A	amine
DG	water dispersible granule	G	granule	DF	dry flowable	F	flowable	E	ester
WSG	water soluble granule	SC	suspension concentrate	SG	soluble granule	OD	oil dispersion		

KEY TO PRODUCT PAGES

Pesticide Product Name

This field lists the pesticide product name. Where there is only one product the commercial "trade" name is given. Where more than one company sells pesticides with the same combination of active ingredients the "generic" (active ingredient) name is given.

If the active ingredients are all in a common formulation (liquid, granule, etc.) the generic name will appear as '*Ingredient A/Ingredient B*' and if the active ingredients are in separate containers to be mixed in the sprayer the names are given as '*Ingredient A + Ingredient B*'.

Company:

This section identifies the company (or companies) that manufacture or market this crop protection product (or generic equivalents) in Canada as well as the PCP# for that (those) product(s). See page 9 for more information on PCP numbers. PCP#s are given as '*(PCP#XXXXXX)*' where XXXXX is a four or five digit number unique to that product. In some cases, where there are multiple components with separate PCP numbers, the PCP number will be provided below under 'Formulation:'

Formulation:

This section gives information on the active ingredient and its concentration in the product as well as information on formulation type and packaging types and configurations. Formulation strength (or concentrations) are given in % by weight for dry formulations and g/L for liquid formulations. PCP numbers may also be give for some products (see above).

Crops and Staging:*

This section indicates on which crops the product may be used and what stage of crop development it should be applied at. Rates may also be included in this section if they vary between crop types or crop stage.

**This section will also indicate which crops are registered under the User Requested Minor Use Label Expansion (URMULE) program. Some companies, as a condition of placing these minor crops on their labels request, that users of their product on these crops do so at their own risk because the registration was approved with information the company did not produce.*

These crops will be flagged separately from the main crops.

Pesticide Resistance Group –

This area will indicate what mode of action the pesticide uses and refer to a page number where more information can be found.

Pest (Diseases, Insects, Weeds) and Staging:

This section indicates the pests (Diseases, Insects, or Weeds) that are indicated on the product label as controlled or suppressed, as well as any specifics on the timing of application relative to the pest stage if required. Rates may also be included in this section if they differ for different pests or stage of pest.

Rates:

The rates provided in this section are given in the amount of product required per acre and the number of acres treated per package unit where possible. This section will also indicate any adjuvants that are to be used in conjunction with the product and the rate of that adjuvant.

This section will not be present if rates have been integrated into either of the previous **Crops** or **Pest** sections.

Application Information:

Water Volume: This section indicates the minimum carrier water volume to be used to apply the product. Using less than the recommended minimum carrier application volume can negatively affect pesticide performance, particularly with contact pesticides and when using low drift nozzles.

Nozzles and Pressure: This section indicates if there are any particular nozzles that should or should not be used to apply the product. Pressures indicated reflect those for conventional nozzles. Low drift nozzles may require higher pressures for proper performance. A general statement of "Use nozzles and pressures designed to deliver proper coverage with ASAE ___ droplets" indicating the ideal droplet sizes to allow for the combination of lowest drift potential and best performance from the pesticide. ASAE

refers to the American Society of Agricultural Engineers who have set standards a series of droplet measurements (in microns or micrometres) that classify droplet sizes from 'fine' to 'very coarse'.

How it Works:

This section typically refers to the page where a general description of the various modes of action of either herbicide, fungicides or insecticides.

Effects of Growing Conditions:

This section summarizes any adverse conditions that will affect the biological function of the crop or the target pest and therefore possibly impact the product's performance. In most cases both crop and target pest must be growing or functioning normally for pesticides to provide expected performance and/or crop tolerance. Adverse weather conditions such as extreme heat, cold, drought or flooding can slow or stop the biological processes in the crop or pest. These biological processes in the crop allow the pesticide to be degraded quickly. If biological processes that are attacked by the pesticide, and under normal conditions would kill the pest, are not functioning normally the pest may be able to rid itself of the pesticide before dying and recover from the application.

Tank Mixes:

This section indicates which other pesticides the pesticide label indicates are registered for use as tank mix combinations with this pesticide.

Common mixes may include:

Herbicides:

(Subtitles may indicate specific crops or condition restrictions.)

Insecticides:

Fungicides:

Fertilizers:

There may be additional pesticides that are registered but not listed on this product's label. Other pesticides may have this product listed as a mix option on their labels. The note below (**in bold**) directs users to a chart inside the back cover that show all available mixes for this pesticide. The product listed on the left column of the chart is the product that supports the mix. Mixes supported by both

products are marked with an 'X'. Mixes supported by only one of the products is indicated by an arrow pointing to the left column.

Included in the tank mix section in non-bolded italics may be any precautions against the mixing of pesticides which will have adverse reactions such as crop injury, reduced pest control or unusual increased danger in the use of the product.

Note: The above mixes are those listed on the pesticide label only. To check for other possible mixes see the blue fold out chart inside the back cover.

Restrictions:

Since most pesticides have a capacity to injure neighboring plants, wildlife or people, they will come with restrictions on their use in order to prevent this unintentional damage. Misuse of pesticides may result in as little as temporary or superficial damage to plants or a slight irritation to the eyes or nose, or could also result in poor performance of the pesticide, severe injury and/or yield loss to very sensitive plants and/or unacceptable residues in agricultural commodities, and/or serious illness or death of non-target organism or people. It is important to comply with product restrictions in order to minimize the impact of the pesticide used on non-target organisms and people. A selection of common restrictions and precautions found on product labels are provided in this section, *but it is important to read the label carefully in order to understand how to use the product properly.*

Rainfall: This section indicates the required delay between application and rainfall to avoid reductions in the performance of the product or the unintentional movement of the product.

Re-entry: This section indicates when it is safe for a person to re-enter treated field following an application of a particular pesticide without the same personal protection used to apply the product.

Resistance Management: This section highlights products where an increased risk of the target pests developing resistance to the group of products (typically fungicides) has been identified. If no specific risk has been identified the reader is referred to a general resistance section. All pesticides have some risk of the target pest developing resistance. Rotating pesticide groups using as many different resistance groups as possible in the rotation is one way to avoid or delay resistance development.

Grazing: This section indicates whether and how soon

treated crops may be grazed by livestock or otherwise fed to livestock. This restriction is in place to avoid residues of the pesticide from being detected in milk or meat from animals consuming forage, greenfeed or straw from treated crops or forage.

Pre-harvest interval: Is the time that must be left between application of a pesticide and the harvest of a crop in order to prevent greater than allowable residues of the product in harvested grain. Maximum Residue Limits (MRLs) are set for commodities based on registered rates and staging of pesticides used in the production of those commodities. Disregarding these intervals can result in residues over the MRLs, which can lead to market disruptions.

Re-cropping: This section indicates how soon specific crops may be seeded into treated fields. Failure to adhere to these delays could result in injury to the following crop.

Aerial Application: This section indicates whether the product may be applied by aircraft and any special conditions that may be necessary.

Labelling: In addition to other precautions and warnings, seed treatment products will also have statements about how seed treated with the product should be labeled.

Storage: This section indicates how the product must be stored. As a general rule, unused pesticides should always be stored in their original containers in a secure, dry area, away from other pesticides, food or feed.

Environment: This section will indicate any setback distances that are required from sensitive aquatic or upland habitats. Newer labels may indicate that these distances are from the downwind edge of the boom but older labels may not. Examples of aquatic habitats are lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands. Examples of terrestrial habitats are grasslands, forested areas, shelter belts, woodlots, hedgerows, riparian areas and shrublands.

In addition to the set back or 'buffer' distances indicated on product labels, provincial environment departments may also have additional restrictions or requirements for permits to apply pesticides to or near water. Check with the provincial environment department/ministry for more information.

Tank Cleaning:

This section describes the measures that are required to properly clean out spray tanks. A general overview of sprayer cleaning is given on page 14, but products where there is a high risk of crop damage as a result of very low level contamination of the spray solution, will have specific measures indicated.

Hazard Rating:

This section indicates the relative toxicity of the pesticide, formulations or components. For an explanation of the symbols used here see page 10. An additional symbol that is used that is not a standard symbol is the (!) exclamation mark which indicates an otherwise undefined risk factor (i.e. irritation).

Example:



Caution – Eye Irritant

Some older products have not had hazard ratings developed while others products have very low toxicity and do not have hazard warnings. Even in the absence of a hazard rating users should wear a minimum of nitrile gloves and an apron as well as long sleeved apparel during mixing and avoid unnecessary exposure.