



2016 INTERNATIONAL
YEAR OF PULSES

Maximizing Effectiveness of In-crop Herbicide Applications

By Bruce Barker, P. Ag

Maximizing crop safety and obtaining optimum weed control with in-crop herbicides depends on a combination of factors including growth stages, application rates, and environmental conditions.

Pulse crop growth stages are identified as having either a certain number of growth nodes or a certain number of leaves. The [Saskatchewan Guide to Crop Protection](#) includes illustrations of growth stages for lentils, peas, and beans. Follow label directions on pulse crop growth stages when applying herbicides post-emergently to ensure optimum crop safety.

Follow label rates for herbicides. Rates are registered at the lowest effective rate for commercial control of weeds. Reduced rates may also contribute to herbicide resistance by selecting for weed biotypes that have target site resistance.

Herbicides are classified as contact or systemic herbicides based on their mode of action. The mode of action influences how herbicides are applied and weeds are controlled.

Contact Herbicides

Contact herbicides kill only the plant parts contacted by the chemical and therefore good coverage is important. With contact herbicides smaller weeds are much easier to kill than larger weeds. Higher water volumes are also important for better coverage.

When applying contact herbicides like metribuzin and bentazon (Basagran[®], Viper[®] ADV) using higher water volumes, as high as 150 litres per hectare or 15 gallons per acre, is critical not only for weed control but for crop tolerance. Better control comes from better coverage of the susceptible weed. Better tolerance is from a more dilute solution of herbicide reducing the speed of uptake by the tolerant plant, allowing it time to metabolize the herbicide and reduce the risk of injury. Using higher water volumes will not hurt the performance of the Group 2 component of Viper[®] ADV. With contact herbicides, early application is important for the best efficacy and tolerance.



Systemic Herbicides

Systemic herbicides are absorbed by roots or foliage and translocated (moved) to the growing point. Systemic herbicides tend to perform better when the weeds are small and actively growing. Larger weeds require a larger dose of herbicide for adequate control, therefore conditions favoring growth should support good weed control.

Application Tips

1. **Avoid application of Group 2 IMI herbicides (*Odyssey*[®], *Ares*[®], *Solo*[®], *Viper*[®] *ADV*, etc.) in the cold or under stress.** Peas, soybeans, and faba beans may develop temporary yellowing (yellow flash) at the growing point following an application of a Group 2 herbicide that is registered on that crop. This temporary yellowing usually does not impact yield.

Applications made to crops under stress may increase the effects of yellow flash. Stresses can include:

- Flooding or excess water
- Drought
- Frost
- High temps (28°C and above)
- Root rots
- Nutrient deficiency
- Any other factor that hinders growth and development

With field peas, soybeans, and faba beans the crop tolerance is a result of the plant's ability to metabolize the herbicide. When these crops are cold or under stress they are less able to metabolize the herbicide and remove it from their system which means they can suffer from a temporary flash of yellow in the new growing point. With Clearfield[®] lentils the tolerance is not based on metabolism of the herbicide as it is in peas, faba beans, and soybeans and the levels of tolerance to the Group 2 herbicides is much higher. Therefore yellow flash is not usually a concern in Clearfield[®] lentils.

Yellow flash can also be mimicked by a failure of the rhizobium to produce sufficient nitrogen to keep up with a rapidly growing plant so do not assume all yellowing is a result of herbicide application.

2. Apply herbicides at earlier stages rather than later stages of the crop to protect yield potential. Yield response to early weed control is well documented in numerous research studies. For example, research on peas in Alberta found that optimum pea yields required weed removal one to two weeks after emergence. Early weed removal has the greatest impact on yield with crops that are not competitive early on, such as pulses. Controlling weeds early is always the best choice to protect yield potential as the weeds compete for light, moisture, and nutrients, even at small stages. Late applications may also be a contributor to metabolic herbicide resistance.

3. Avoid applying herbicides when rain clouds are approaching. One of the more common questions to weed specialists is “my herbicide has been on for about 30 minutes and I was caught by a light shower that lasted 15 minutes. Is my herbicide going to work or should I re-spray?” The answer is just a guess. The other thing to consider in these cases is that many herbicides are limited to one application per year due to soil residue considerations and possible maximum residue limit violations, whether they get rained on or not. If you feel you need to apply again for insurance, select a different combination of active ingredients. In pulse crops, these alternative options are often limited so it is best to make absolutely sure rain does not wash off the initial application.

4. Best weed control is usually when herbicides are applied to actively growing weeds. Herbicides applied under cooler temperatures or when weeds are not actively growing can take longer to effectively control weeds or be less effective. Knowing the mode of action of the herbicide will help with understanding why most herbicides work better when plants are actively growing. For example, Group 2 ‘imi’ products are the most widely used products in pulse production and they inhibit ALS/AHAS enzymes which halts the synthesis of certain amino acids. The herbicides are more effective when the plant is growing as the plant requires all 21 amino acids for growth and if they are short certain ones, the plant cells cannot grow and divide which halts further development. If the plants are not actively growing when the herbicide is applied then there is less impact of inhibiting the enzyme and control can be much slower and/or less effective.

5. Believe what you see in your field. If your Group 2 herbicide did not work last year, it will not work this year, or the year after that. You likely have herbicide resistance.

Group 2 products are the most widely used products in pulses but are not the only ones registered for use. Table 1 outlines the in-crop options for pulses grown in Saskatchewan.

Table 1. Post-emergent Weed Control in Pulses

	Herbicide Group	Active Ingredient	Activity	Pea	Lentil	Chick-pea	Faba Bean	Soy-bean	Dry bean
Grassy and Broadleaf weeds									
Ares [*]	2	imazamox & imazapyr	Systemic		X ¹				
Flexstar [*] GT	9 + 14	glyphosate & fomesafen	Systemic + Contact					X ^{5,6}	
Glyphosate	9	glyphosate	Systemic					X ⁶	
Liberty [*] 200SN	10	glufosinate	Contact					X ⁷	
Odyssey [*]	2	imazamox & imazethapyr	Systemic	X	X ¹		X	X	
Odyssey [*] Ultra	1 + 2	Sethoxydim, imazamox, & imazethapyr	Systemic	X	X ¹			X	
Solo [*]	2	imazamox	Systemic		X ¹				
Viper [*] ADV	2 + 6	imazamox & bentazon	Systemic + Contact	X				X	X
Grassy weed control									
Clethodim	1	clethodim	Systemic	X	X	X		X	X
Poast [*] Ultra	1	sethoxydim	Systemic	X	X	X	X	X	X
Quizalofop	1	quizalofop	Systemic	X	X	X	X	X	X ²
Broadleaf weed control									
Basagran [*] /Basagran [*] Forte	6	bentazon	Contact	X			X	X	X ²
Blazer [*]	14	acifluorfen	Contact					X	
Imazethapyr	2	imazethapyr	Systemic	X				X	X ³
Linuron	7	linuron	Contact					X	
MCPA Sodium Salt/Amine	4	MCPA	Systemic	X					
MCPB/MCPA	4	MCPA/MCPB	Systemic	X					
Metribuzin	5	metribuzin	Contact	X	X	X			
Permit [*]	2	halosulfuron	Systemic						X ²
Pinnacle [*] SG	2	thifensulfuron	Systemic					X	
Reflex [*]	14	fomesafen	Contact					X	X ⁴

Source: Saskatchewan Guide to Crop Protection 2016



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1. For use in Clearfield[®] lentils only.
2. Not all dry bean types have been tested for tolerance to this herbicide.
3. Pinot pink and red beans only.
4. For use on navy beans in the Red River Valley of Manitoba.
5. For use in the Red River Valley of Manitoba.
6. For use on glyphosate resistant varieties only.
7. For use on Liberty[®] tolerant soybeans only.

Herbicide Tips for Maximizing Effectiveness and Minimizing Injury When Using the Following Herbicides

Ares[®]

Treat crops during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of some weeds may be severely reduced.

Basagran[®]/Basagran[®] Forte

Basagran[®] is a contact only herbicide, and effective coverage using smaller droplet size and increased water volume is key for effective weed control. Poor results will occur if temperatures are cool. Optimum results are achieved when applied at daytime temperatures between 20-28°C. Applications at temperatures greater than 28°C may result in crop injury. If hot, humid conditions prevail (above and 80 per cent relative humidity), use only the low rate of Assist or XA oil concentrate[™].

Blazer[®]

Soybeans may exhibit speckling, bronzing, and/or leaf burn. The trifoliolate leaf emerging at the time of application may be distorted. Soybeans usually outgrow these conditions and continue to grow at a normal rate with no adverse effect on vigour, maturity, or crop yield. It is important to have good spray coverage on the weeds as Blazer[®] works mainly by contact action.

Clethodim (Select[®], Centurion[®], Arrow[®], Shadow[™] RTM)

Clethodim will be less effective when plants are stressed by lack of moisture, excessive moisture, low temperature, and/or very low relative humidity. Re-growth of tillers may occur if application is made under any of the above stress conditions.



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Flexstar® GT

Moisture is necessary to activate the herbicide for residual weed control. Dry weather following application of the herbicide may reduce effectiveness.

Glyphosate

Best results are achieved under relatively warm, sunny conditions when weeds are actively growing. Control will be reduced if foliage is heavily covered with dust.

Imazethapyr (Pursuit®, MPower®, Kamikaze®, Phantom®, Gladiator®, MultiStar®)

Do not use in the Brown or Dark Brown soil zones (except for use in dry bean). Treat crops during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of some weeds may be severely reduced.

Liberty® 200SN

Cool temperatures (less than 10°C), drought, and low humidity conditions slow weed growth. Applications made under these stressed conditions may result in reduced weed control. Weed control may also be reduced when heavy dew, fog, or mist are present at the time of application.

Linuron

In post-emergent applications the best weed control occurs when temperatures are moderate, when relative humidity is high, and when soil moisture is adequate.

MCPA Sodium Salt/Amine

Best weed control occurs when temperatures are above 21°C (daytime) or 10°C (night time) and humidity is above 70 per cent. Do not apply if temperature exceeds 27°C.

MCPB/MCPA

Damage to peas may occur if the crop is sprayed when under drought or disease stress. Under extremely hot or humid conditions, crop injury may be severe. Do not apply when temperatures are over 27°C. Best activity on weeds occurs in warm weather.

Metribuzin (Sencor[®], TriCor[®])

Crop height reductions or yellowing may occur if high temperatures occur within 48 hours of application. Cold, cloudy weather or frost within three days of application will also aggravate injury. If frost occurs, allow four to five days for crop to recover prior to applying metribuzin. Heavy rainfall soon after application to peas, lentils, and chickpeas can result in stand reduction on soils with less than four per cent organic matter.

Odyssey[®]

Treat crops during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of some weeds may be severely reduced.

Permit[®]

Optimum activity is experienced between 12 to 24°C when weeds are actively growing. Weeds may not be actively growing and as a result reduced activity will occur when temperatures are below 8°C or above 27°C.

Pinnacle[®] SG

Pinnacle applied to crops that have been under stress before application may result in crop injury. Stress conditions within three days after application may also result in crop injury. Injury symptoms can be crop discoloration (yellowing, purpling, or reddening of leaf veins), or stunting. Weeds under stress conditions at the time of application may not be adequately controlled.

Poast[®] Ultra

Most effective control is achieved when grasses are actively growing. Control may be reduced if temperatures are below 15°C. Subsequent tillering may occur under stress conditions or if fertility is low.

Quizalofop (Assure[®] II; Yuma[®] GL)

Crop injury may occur if crops are stressed because of drought or flooding. Less than acceptable weed control may be expected if weeds are under stress because of drought, flooding, or cool weather.

Reflex[®]

Weed control and crop tolerance may be reduced under certain stress conditions such as cold temperatures, excess moisture, drought, and injury from hail or previous herbicide applications.



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Solo[®]

Treat crops during warm weather when weeds are actively growing and soil moisture is adequate for rapid growth. Under cool or dry conditions, control of some weeds may be severely reduced.

Viper[®] ADV

Do not spray if temperatures of 5°C or less are forecast within three days of application. Under cool or dry conditions, control of some weeds may be severely reduced. Do not apply to crops stressed from hail damage, flooding, drought, hot, humid weather, widely fluctuating temperatures, prolonged cold, or injury from previous herbicides, as crop injury may result.