

LAST UPDATED ON Thursday, May 05, 2011

Chemical Weed Control in Potatoes

Successful weed management will: 1) improve potato yield through reduced competition for light, nutrients, and water; 2) reduce availability of alternate hosts for disease and insect pests; 3) improve harvest efficiency. Use of herbicides (chemical control) is an important tool for controlling weeds in potato fields. Herbicides are listed below in alphabetical order according to their active ingredient, with remarks about application and rates provided. Efficacy tables showing how well different herbicides control broadleaf and grass weeds of interest are given at the end of this section, as is a list of web sites that may be useful in identifying weeds.

Other management tools besides herbicides are also important for controlling weeds. Cultivation and hilling play a large role in weed control with potatoes. Weeds between the rows are destroyed, and emerging weeds within the row may be buried during cultivation and hilling. Crop rotation is another important management tool. By shifting crops and control measures, one decreases the possibilities for a weed that is very competitive with any particular crop to dominate the system. Prevention of weeds from seeding in and around fields decreases the weed "seed bank" in the soil and helps prevent new weeds from entering the field. In more intensive systems, use of a stale seedbed and mulching are additional management options for weed control.

Chemical-based weed control requires attention to detail. Label instructions should always be followed. The label instructions are the result of extensive research and provide complete timing and rate information. Timing of application relative to stage of growth of the weeds and the crop, rate of application, coverage, and environmental conditions (e.g. wind speed, temperature) are important variables to consider. Failure to pay attention to each factor when applying herbicides may lead to poor weed control (wasted application), damage to the crop sprayed, and sometimes damage to neighboring fields. Coverage is affected by sprayer calibration, which results primarily from sprayer pressure, ground speed, and nozzle type. Proper sprayer calibration is required to achieve maximum control. In general, low spray pressures improve coverage and reduce drift. Please refer to "Pesticide Drift Management - A Guide for Applicators" for additional information on sprayer equipment and calibration. This publication is available in Maine from your local Extension office.

Note: ALWAYS FOLLOW LABEL INSTRUCTIONS. The information provided here is based on product labels at the time of writing. If there is any discrepancy between the label and the information below, follow label instructions. The current label for any given product is "the law" regarding its application. Also the products listed here are based on what is currently labeled for use in the state of Maine - these products may or may not be approved for use in other jurisdictions.

Pre-Plant Applications**Chemical: Carfentrazone**

Remarks: Herbicide resistance group E; cell membrane disruptor. Apply alone or with other herbicides as a burn-down treatment prior to planting or within 24 hours of planting. This chemical helps to control small broadleaf weeds less than 4 inches tall. Coverage is essential for good control. Use a non-ionic surfactant (NIS) at 0.25% v/v (2 pints per 100 gallons of spray solution). Optimum broad spectrum control requires a tank mix with another burn-down herbicide such as glyphosate. This is a contact herbicide. PHI of 7 days when used as a vine desiccant. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Aim EC	0.5 to 2.0 oz	Preplant burn-down treatment.

Chemical: Metolachlor

Remarks: Herbicide resistance group K3; inhibits cell division. Pre-plant incorporated or pre-emergence. For pre-plant application, incorporate to a depth of 3 inches. WILL NOT CONTROL EMERGED WEEDS. May reduce yield and/or delay maturity of 'Superior' and other early-maturing varieties. Do not use on muck or peat soils. Do not apply more than 3.6 pt per acre in a single season. Use directed spray if applied post-emergence with Sencor. Tank Mixtures (Please see label for tank mix combinations) PHI of 60 days for preemergence application and 40 days for post-emergence application. REI of 24 hours.

Trade Name	Product rate per acre	Comments
Dual Magnum	Pre-emergence: 1.0 to 2.0 pt Post: 1.67 pt	Use lower rate on coarse textured or low organic matter soils.
Me-Too-Lachlor	Pre-emergence: 1.0 to 2.0 pt Post: 1.67 pt	Use lower rate on coarse textured or low organic matter soils.
Cinch	Pre-emergence: 1.0 to 2.0 pt	Use lower rate on coarse textured or low organic matter soils.

Chemical: Paraquat

Remarks: Herbicide resistance group D; disrupts green (photosynthetically active) cells. Pre-plant or pre-emergence. Add either NIS (0.125 to 0.25 % v/v) or COC (1 % v/v). Apply up to ground cracking before potatoes have emerged. This is a nonselective, contact herbicide. REI of 12 hours for pre-plant applications.

Trade Name	Product rate per acre	Comments
Gramoxone Inteon	1.0 to 2.0 pt	

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**Firestorm
Parazone**

0.7 to 1.3 pt

Pre-Emergence Application

Chemical: Dimethenamid

Remarks: Herbicide resistance group K3; inhibits cell division. Pre-emergence application only. Will not control emerged weeds. For effective control, rainfall or sprinkler irrigation is required to move the product into the soil where weed seeds germinate. In wet or cold conditions, this herbicide may cause delayed emergence or stunting of potatoes. Do not apply within 35 feet of endangered plant populations. Maximum application rate of 21 fluid ounces on medium and fine textured soils, and 18 fluid ounces on coarse textured soil. (Please see label for tank mixture combinations) PHI of 40 days. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Outlook Slider	12 to 21 oz	Use lower rates on coarser soils and on low organic matter soils (see label).

Chemical: Glyphosate

Remarks: Herbicide resistance group G; inhibits amino acid/protein synthesis. Apply in spring BEFORE crop emergence. Applications made at emergence will result in injury or death of the emerging crop plants. In coarse sandy soil, apply before seed begins to sprout in order to minimize risk of injury. Application may be made in the fall after harvest on actively growing weeds. Tillage should be delayed at least 3 days, preferably 7, following application to allow translocation of the herbicide within the weed. Check label regarding addition of adjuvants (product may be formulated with an adjuvant). Ammonium sulfate (1% w/w) may enhance activity. REI of 4 hours. PHI not stated.

Trade Name	Product rate per acre	Comments
Roundup OriginalMax (5.5 lb/gal)	16 to 32 oz.	Rate depends on type and size of weeds (see label).
Several formulations are available.	Rate depends on formulation and use	

Chemical: Linuron

Remarks: Herbicide resistance group C2; inhibits photosynthesis. Pre-emergence application after final "dragging" of field, preferably just before or when weeds emerge. Add surfactant (1 pt/25gal) if emerged weeds are present. Seed should be at least 2 inches deep or crop injury may result. Requires rainfall to be activated. Heavy rainfall occurring soon after application may cause crop injury. Do not spray emerged potatoes. Use lower rates on soils with less than 2% organic matter. (Please see label for tank mix combinations) PHI not stated. REI of 24 hours.

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Trade Name	Product rate per acre	Comments
Linex 4L	2.5 to 3 pts. on heavier soil: (>2% organic matter) 1.5 to 2.5 pts. on coarser soil: (<2% organic matter)	

Chemical: Metolachlor

Remarks: Herbicide resistance group K3; inhibits cell division. Pre-plant incorporated or pre-emergence. For pre-plant application, incorporate to a depth of 3 inches. WILL NOT CONTROL EMERGED WEEDS. May reduce yield and/or delay maturity of 'Superior' and other early-maturing varieties. Do not use on muck or peat soils. Do not apply more than 3.6 pt per acre in a single season. Use directed spray if applied post-emergence with Sencor. (Please see label for tank mix combinations. PHI of 60 days for pre-emergence application and 40 days for post-emergence application. REI of 24 hours.

Trade Name	Product rate per acre	Comments
Dual Magnum	Pre-emergence: 1.0 to 2.0 pt Post: 1.67 pt	Use lower rate on coarse textured or low organic matter soils.
Me-Too-Lachlor	Pre-emergence: 1.0 to 2.0 pt Post: 1.67 pt	Use lower rate on coarse textured or low organic matter soils.
Cinch	Pre-emergence: 1.0 to 2.0 pt	Use lower rate on coarse textured or low organic matter soils.

Chemical: Metribuzin

Remarks: Herbicide resistance group C1; inhibits photosynthesis. Pre-emergence, post-emergence, or split-shot. Do not exceed 1.3 lb/ac/season. On sandy soils or with sensitive varieties, do not exceed 0.67 lb/ac pre-emergence application rates. Avoid post-emergence applications on sensitive varieties. Early maturing smooth skinned white and all red-skinned varieties may be injured by post-emergence applications. Crop injury is more likely to occur under high soil pH, and on coarse textured soils. The varieties Atlantic, Bellchip, Centennial, Chipbelle, and Shepody are sensitive to Sencor. For optimum control, apply before weeds are one inch tall. Do not make post-emergence applications within 3 days after cool, wet weather or crop injury may occur. Also post-emergence application followed by rain or irrigation on recently cultivated potatoes may result in crop injury. Low preemergence application rates (< 0.67 lb/ac) may only control wild mustard species. (Please see label for tank mix combinations) PHI of 60 days. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Metribuzin 75	Pre-emergence: 1/3 to 1 1/3 lb Post: 1/3 to 2/3 lb	

Other formulations available

Chemicals: premix of Metolachlor and Metribuzin

Remarks: Herbicide resistance group C1 and K3; inhibits cell division and photosynthesis. Pre-emergence only unless applied through a center pivot. To avoid crop injury, post-emergence applications should be made only on russeted or white skinned varieties that are not early maturing. Do not make post-emergence applications within 3 days after cool, wet weather or crop injury may occur. Do not apply post-emergence except through a center pivot (see label for rates). Rotation limitations and other considerations that apply for use of metribuzin will also be relevant for the use of this product. Do not pre-plant incorporate. PHI of 60 days. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Boundary - preemergence	coarse soil (< 3% OM): 1.5 to 2.0 pt medium or fine soil (< 3 % OM): 2.4 to 2.75 pt coarse soil (> 3% OM): 2.0 to 2.4 pt. medium or fine soil (> 3 % OM): 2.75 to 2.9 pt Sands: do not exceed 1.5 pt per acre.	

Chemical: Paraquat

Remarks: Herbicide resistance group D; disrupts green (photosynthetically active) cells. Pre-plant or pre-emergence. Add either NIS (0.125 to 0.25 % v/v) or COC (1 % v/v). Apply up to ground cracking before potatoes have emerged. This is a nonselective, contact herbicide. REI of 12 hours for pre-plant applications.

Trade Name	Product rate per acre	Comments
Gramoxone Inteon	1.0 to 2.0 pt	
Firestorm Parazone 3SL	0.7 to 1.3 pt	

Chemical: Pendimethalin

Remarks: Herbicide resistance group K1; inhibits cell division. Pre-emergence or early post-emergence (up to 6 inches of growth). Will not control emerged weeds. Needs rainfall within 7 days of application, or it may be thoroughly incorporated into the surface one to two inches of soil for activation. If incorporated, take care not to damage seed pieces or sprouts. Do not apply post-emergence if crop is under stress (cold/wet or hot/dry). Make only one application per season. The variety 'White Rose' is sensitive to pendimethalin. (Please see label for tank mix combinations) PHI not stated. REI of 24 hours.

Trade Name	Product rate per acre	Comments
Prowl H2O	1.5 to 3.0 pt	Use lower rates on coarser soils and on low organic matter soils (see label).

Other formulations available

Chemical: Rimsulfuron

Remarks: Herbicide resistance group B; an ALS inhibitor – blocks protein synthesis. Pre-emergence and post-emergence. Requires rainfall or irrigation within 5 days of application for pre-emergence weed control. In the absence of rainfall or irrigation, post-emergence application would result in better weed control. Include a surfactant (0.125 to 0.25 % v/v NIS, or 1 % v/v COC or MSO) for control of emerged weeds when Matrix is applied by itself. When Matrix is tank-mixed with Sencor post-emergence, use a NIS at 0.125 % v/v; do not use COC or MSO in this case; note use of an adjuvant with Sencor increases the possibility of crop damage occurring. Avoid using COC or MSO adjuvants at temp. > 85 F or crop injury may result. Addition of fungicides may increase risk of crop injury under high temperatures. May be split applied with 14 to 28 days between applications (1 to 1.5 oz pre-emergence followed by 1 oz post-emergence; or sequential post-emergence applications). For seed potatoes, if sequential post-emergence applications are made use a 1.0 oz rate for both applications. Do not exceed 2.5 oz/ac/year. For a single pre-emergence application, use the 1.5 oz. rate. Provides poor control of lambsquarter. Do not apply to potatoes grown from microtubers, minitubers, or transplants, or to plants under stress. (Please see label for tank mix combinations) PHI of 60 days. REI of 4 hours.

Trade Name	Product rate per acre	Comments
Matrix	Pre-emergence: 1 to 1.5 oz Post: 1 to 1.5 oz	

Post-Emergence Application**Chemical: Clethodium**

Remarks: Herbicide resistance group A; inhibits lipid synthesis. Post-emergence when grasses are 2 to 6 inches tall (4 to 8 inches for perennial grasses e.g. quackgrass). Use a crop oil concentrate (1qt/ac or 1 % v/v); addition of liquid fertilizer (i.e. ammonium sulfate) at 1-2 qt/ac will enhance control of grasses. Apply to actively growing grasses. For perennial grasses, repeat application if regrowth occurs. PHI of 30 days. REI of 24 hours.

Trade Name	Product rate per acre	Comments
Arrow 2EC	6 to 16 fl oz	

Chemical: Metribuzin

Remarks: Herbicide resistance group C1; inhibits photosynthesis. Pre-emergence, post-emergence, or split-shot. Do not exceed 1.3 lb/ac/season. On sandy soils or with sensitive varieties, do not exceed 0.67 lb/ac pre-emergence application rates. Avoid post-emergence applications on sensitive varieties. Early maturing smooth skinned white and all red-skinned varieties may be injured by post-emergence applications. Crop injury is more likely to occur under high soil pH, and on coarse textured soils. The varieties Atlantic, Bellchip, Centennial, Chipbelle, and Shepody are sensitive to Sencor. For optimum control, apply before weeds are one inch tall. Do not make post-emergence applications within 3 days after cool, wet weather or crop injury may occur. Also post-emergence application followed by rain or irrigation on recently cultivated potatoes may result in crop injury. Low pre-emergence application rates (< 0.67 lb/ac) may only control wild mustard species. (Please see label for tank mix combinations) PHI of 60 days. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Metribuzin 75DF	Pre-emergence: 0.33 to 1.3 lb Post: 0.33 to 0.67 lb	

Chemical: Pendimethalin

Remarks: Herbicide resistance group K1; inhibits cell division. Pre-emergence or early post-emergence (up to 6 inches of growth). Will not control emerged weeds. Needs rainfall within 7 days of application, or it may be thoroughly incorporated into the surface one to two inches of soil for activation. If incorporated, take care not to damage seed pieces or sprouts. Do not apply post-emergence if crop is under stress (cold/wet or hot/dry). Make only one application per season. The variety 'White Rose' is sensitive to pendimethalin. (Please see label for tank mix combinations) PHI not stated. REI of 24 hours.

Trade Name	Product rate per acre	Comments
Prowl H2O	1.5 to 3.0 pt	Use lower rates on coarser soils and on low organic matter soils (see label).
Prowl 3.3EC	1.8 to 3.6 pt	Use lower rates on coarser soils and on low organic matter soils (see label).
Pendimax 3.3	1.2 to 3.6 pt	Use lower rates on coarser soils and on low organic matter soils (see label).
Stealth	1.8 to 3.6 pt	Use lower rates on coarser soils and on low

organic matter soils (see label).

Chemical: Rimsulfuron

Remarks: Herbicide resistance group B; an ALS inhibitor – blocks protein synthesis. Pre-emergence and post-emergence. Requires rainfall or irrigation within 5 days of application for pre-emergence weed control. In the absence of rainfall or irrigation, post-emergence application would result in better weed control. Include a surfactant (0.125 to 0.25 % v/v NIS, or 1 % v/v COC or MSO) for control of emerged weeds when Matrix is applied by itself. When Matrix is tank-mixed with Sencor post-emergence, use a NIS at 0.125 % v/v; do not use COC or MSO in this case; note use of an adjuvant with Sencor increases the possibility of crop damage occurring. Avoid using COC or MSO adjuvants at temp. > 85 F or crop injury may result. Addition of fungicides may increase risk of crop injury under high temperatures. May be split applied with 14 to 28 days between applications (1 to 1.5 oz pre-emergence followed by 1 oz post-emergence; or sequential post-emergence applications). For seed potatoes, if sequential post-emergence applications are made use a 1.0 oz rate for both applications. Do not exceed 2.5 oz/ac/year. For a single pre-emergence application, use the 1.5 oz. rate. Provides poor control of lambsquarter. Do not apply to potatoes grown from microtubers, minitubers, or transplants, or to plants under stress. (Please see label for tank mix combinations) PHI of 60 days. REI of 4 hours.

Trade Name	Product rate per acre	Comments
Matrix	Preemergence: 1 to 1.5 oz Post: 1 to 1.5 oz	

Chemical: Sethoxydim

Remarks: Herbicide resistance group A; inhibits lipid synthesis. Post-emergence. Add MSO (1.5 pt/ac) or COC (2 pt/ac). Addition of a nitrogen source (UAN at 4 to 8 pt/ac or AMS at 2.5 lb/ac) will enhance control. There is a potential for crop injury at temperatures > 90 F. Use a rate of 1.5 pt/acre to control volunteer oats or barley, and apply before they are 4 inches tall. Repeat applications may be needed to control perennial grasses or large annual grasses. Do not apply more than 5 pints per acre in one season. PHI of 30 days. REI of 12 hours.

Trade Name	Product rate per acre	Comments
Poast	1.0 to 1.5 pt	Max. rate of 2.5 pt for rescue treatment of large annual grasses or heavy quackgrass infestation (see label).

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Herbicide Comparison Table for Control of Common Broadleaf Weeds

<i>Broadleaf Weeds</i>												
<u>Herbicides</u>	Galinsoga	Lambsquarter	Mustard	Nightshade	Pigweed	Purslane	Ragweed	Shepherd's Purse	Smartweed		REI (Hours)	PHI (Days)
Dimethenamid (Outlook,Slider)	G	P	F-P	F	G	F	P		P		12h	40d
Glyphosate (Roundup and others)	G	G	G	G	G	G	G	G	G		4h	
Linuron (Linex)	G	G	G	P	G	G	G	F	G		24h	
Metolachlor (Dual Magnum, Me-Too-Lachlor, Cinch)	G	P	P	F	F	F	P	P	F-P		24h	40d
Metribuzin	G	F	F	P	F	F	G	F	F		12h	60d
Paraquat (Gramaxone, Firestorm, Parazone)	G	F	F	F	F	F	F	F	F		12h	
Pendimethalin (Prowl)	P	F	P	P	F	G			F		24h	
Rimsulfuron (Matrix)	G	P	F	F	G	F**	P		F-P		4h	60d

G = Good, F = Fair, P = Poor, Blank = no information or no control

*** = post-emergence use only**

**** = pre-emergence use only**

Herbicide Comparison Table for Control of Common Grass Weeds

<i>Grass Weeds</i>										
Herbicides	Barnyardgrass	Crabgrass	Foxtail species	Quackgrass	Vol. Cereals	Yellow Nutsedge	Wild Oat		REI	PHI
Clethodim (Select / Arrow)	F		F	F	F		F		24h	30d
Dimethenamid (Outlook)	F	G	G		F	G	P		12h	40d
EPTC (Eptam)	G	G	G	F	F	F	F		12h	45d
Glyphosate (Roundup and others)	G	G	G	F	G	F	G		4h	
Linuron (Lorox)	F	F	F	P		P			24h	
Metolachlor (Dual Magnum)	G	G	G			F			24h	40d
Metribuzin (Sencor)	F-P	F	F	P	F-P	P	F-P		12h	60d
Paraquat (Gramaxone)	F	F	F	P	F	P	F-P		12h	3d
Pendimethalin (Prowl / Pendimax)	G	G	G	P		P	P		24h	
Rimsulfuron (Matrix)	G	F-P	G	F*	G	P	F-P		4h	60d
Sethoxydim (Poast)	F		G	F	G		G		12h	30d

G = Good, F = Fair, P = Poor, Blank = no information or no control

*** = post-emergence use only**

**** = pre-emergence use only**

Data in these tables on weed control are a synthesis of extension publications from the University of Maine, Cornell University, North Dakota State University, Manitoba Dept. of Agriculture and Food, Oregon State University, and UC-Davis.

Some Internet Sites for Weed Identification:

New Jersey – Rutgers University

<http://www.rce.rutgers.edu/weeds/>

Michigan State University

<http://www.msue.msu.edu/msue/iac/e1363/e1363.htm#broadleaf>

Illinois Council on Food and Ag. Research

<http://web.aces.uiuc.edu/weedid/>

Virginia Tech.

<http://www.ppws.vt.edu/weedindex.htm>

Iowa State Univeristy

<http://www.weeds.iastate.edu/weed-id/weedid.htm>