2023 Maine Potato Summit

WEED MANAGEMENT IN POTATOES

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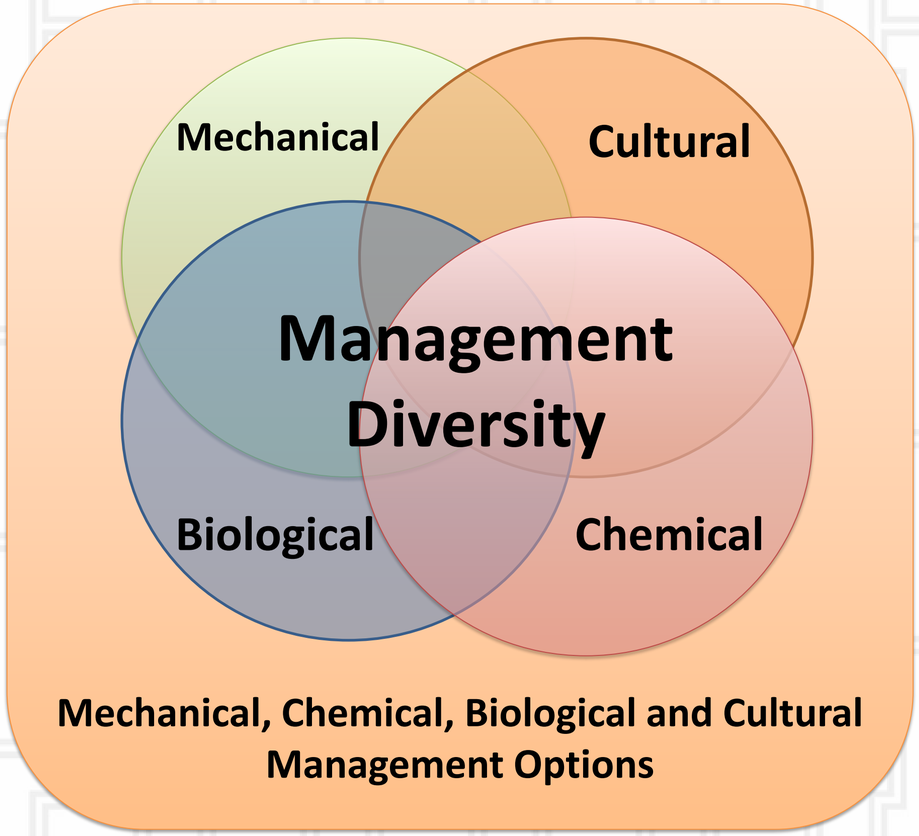
WHAT YOU'LL HEAR FROM ME TODAY

- Integrated Weed Management
- Herbicides labeled for use in potatoes
- cultivation and herbicide application timing
  - Three scenarios
- Nightshades
- Customize your tank mixture

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS

Makes use of all tools available:

- Biological
- Cultural
- Mechanical
- Chemical



INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: MECHANICAL AND CHEMICAL

Current practices in potatoes include:

Cultivation

Herbicides

Combination often more effective than either alone

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: MECHANICAL

Cultivation +'s

- Less expensive than herbicides
- No chemical residues
- Wind not an issue

Cultivation –'s

- Soil compaction, root pruning-crop injury
- Heavy infestations = Multiple cultivations
- Wet soil interferes with timeliness
- In-row weed control difficult
- Disease-spread (important in seed areas)

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: HERBICIDES

Herbicide +'s

- very effective
- faster to spray than cultivate
- often single application vs multiple cultivations

Herbicide –'s

- environmental/safety concerns
- potential for crop injury
- carryover/plant-back restrictions
- cost

HERBICIDE APPLICATION

- **Application methods:**
  - **Aerial or ground *then incorporated via sprinkler (rainfall)* or mechanically**
  - **Chemigation**
- **Timing:**
  - **PPI = pre-plant incorporated**
  - **PRE = preemergence to crop and/or weed**
  - **POST = postemergence to crop and/or weed**

Hilling - cultivation with equipment throwing soil out of the furrow up into the row area to form a hill

- **Last tillage operation in the field**
  because it would break the "herbicide barrier" bringing up nontreated soil and weed seeds

Pre-plant and/or PRE	PRE ONLY	PRE and/or POST**		POST only
Foliar active	**Soil active**	**Soil active only***	**Both Soil and Foliar active**	
Aim and others (carfentrazone-ethyl) **Only as a pre-plant burndown In Canada**	**Chateau** (flumioxazin)*	**Dual Magnum** (s-metolachlor) **Labeled as Dual II Magnum in Canada**	**Matrix** and others (rimsulfuron) *Matrix is not labeled for use in Canada* (see Prism)	**Prism** (rimsulfuron) Only for use in Canada
	Linex or Lorox (linuron)*			**Titus Pro** (co-pack of metribuzin + rimsulfuron) Only for use in Canada
glyphosate (various trade names)	**Outlook** and others (dimethenamid-p)	**Eptam** (EPTC)		**FOLIAR ACTIVE ONLY Will only control grasses**
paraquat (various trade names) **NOT FOR USE IN CANADA**	**Reflex** (fomesafen)	**Prowl H2O** and others (pendimethalin)		
	Sonalan HFP (ethalfluralin)	**Treflan HFP** (trifluralin)	***metribuzin*** (various trade names)	**Select** (Clethodim)
Sequence (pre-mix of glyphosate + s-metolachlor) (s-metolachlor only has soil activity)	***sulfentrazone*** (various trade names)*	**Me-Too-Lachlor** and others (metolachlor)		**Poast Plus, Poast Ultra** and others (sethoxydim)
	Zidua (pyroxasulfone)			
	Sulfentrazone MTZ (pre-mix of sulfentrazone + metribuzin)* **Labeled as Sencor STZ (a co-pack) in Canada**	**Boundary** and others (pre-mix of s-metolachlor + metribuzin)		**Venture** (fluazifop-p-butyl) Only for use in Canada

* Has foliar activity on weeds AND potatoes so must be applied only preemergence (PRE) to potatoes.

** Some of these herbicides may be applied PRE + POST or POST + POST. Follow the label for your area.

*** Although only soil active, potatoes can tolerate these herbicides applied POST. Some growers choose to apply PRE, only.

HERBICIDE AND CULTIVATION TIMING

Three scenarios:

1) Plant- Hill- Spray same operation
2) Plant
   Hilling and Herbicide Application
   Potato Emergence
3) Plant
   Drag-off
   Potato emergence
   Hilling and Herbicide Application

Potato
emergence

Plant

Row close

3-4 weeks
No competition

~ 5 weeks to row close
Crop starting to compete

Plant, Hill, Spray

Hill at planting (or fall-bed) then apply soil-residual herbicides immediately (*ALL ARE LABELED for this TIMING*)

Potato emergence

Row close

3-4 weeks
No competition

~ 5 weeks
Crop starting to compete

Shooting for SEASON-LONG CONTROL…

- However, herbicides must be effective for *at least* 8 to 9 weeks from application time at planting until row closure (crop shading/ competition)

Scenario 1

A spray w/ foliar active herbicides may be needed If weeds emerge before potatoes emerge (all labeled* AND Roundup or Aim!)

Tillage would be a no-no

Potato emergence

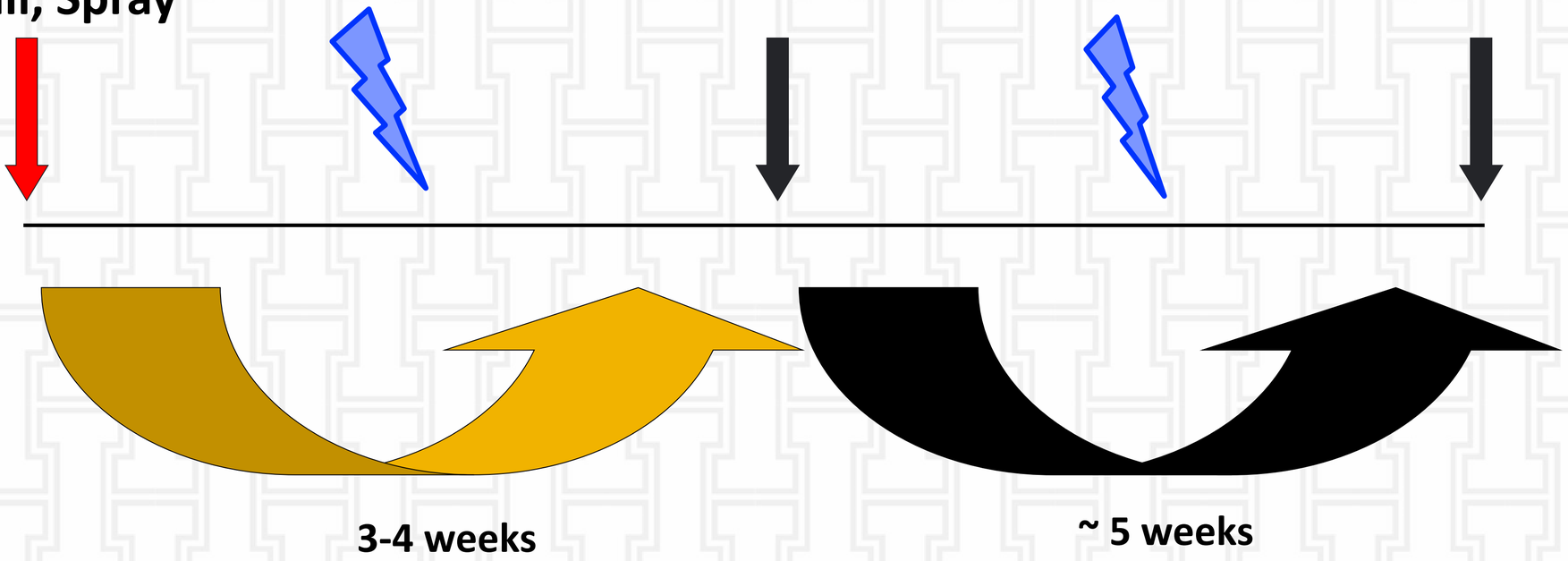
If weeds come up after potato emergence herbicides w/ foliar activity may be necessary (Mat and/or Met*)

Tillage would be a no-no

Row close

Plant, Hill, Spray

Hill at planting (or fall-bed) then apply soil-residual herbicides immediately (*ALL ARE LABELED for this TIMING*)



What if weeds come up after herbicide application???

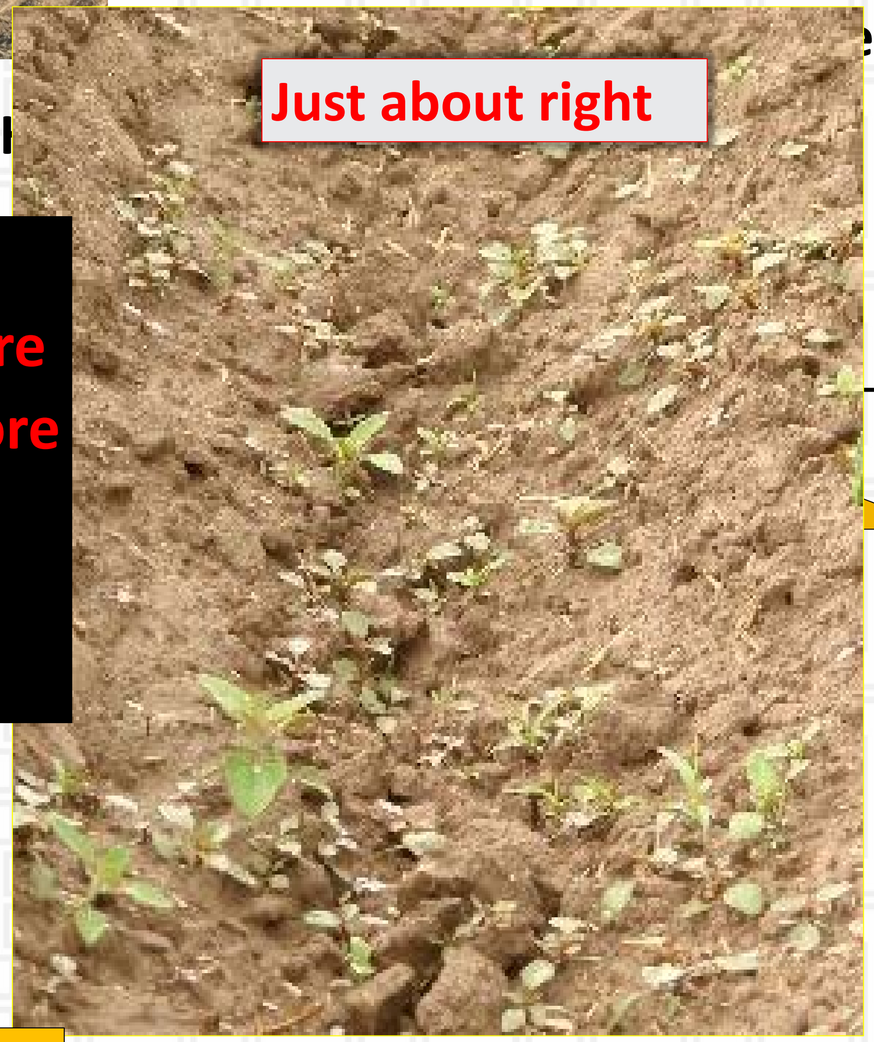
Scenario 1

In order for the foliar-active herbicides to be effective, weeds should not be >2 inch

Plant, I

w close

If foliar herbicides are needed before and/or after potato emergence



Scenario 1

Plant

"Drag off"
after planting but before potato emergence

Potato emergence

Hilling after emergence followed by planned postemergence spray

Row close

3-4 weeks

~ 5 weeks

Scenario 2

Plant

"Drag off"
after planting but before potato emergence

Potato emergence

Hilling after emergence followed by planned postemergence spray

Now only herbicides which do not injure the emerged potatoes can be used

- Only two have foliar activity on broadleaf and grassy weeds (Matrix and metribuzin)
- The others have soil residual but will not control emerged weeds (Prowl H2O, Dual Magnum, Eptam)

Do not wait too long to hill!

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: MECHANICAL

Ideal weed stage for control with cultivator is $\leq$ 2 leaf

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: MECHANICAL

- 3 to 4 inch tall weeds can still be eliminated sometimes, however, when > 4 inch, then cultivation is not effective
- If cultivator is not set up properly, weeds may be left on side of hills
- Even though large weeds are initially covered with soil during a cultivation, they can survive and re-emerge
- Time irrigation before cultivation so that weeds are not stressed because it is too dry; delay after cultivation so that compaction does not occur because its too wet, and weeds can't "re-root

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: MECHANICAL

- Cultivation of potatoes larger than 8 to 10 inches tall may result in root pruning and reduced tuber yields and quality

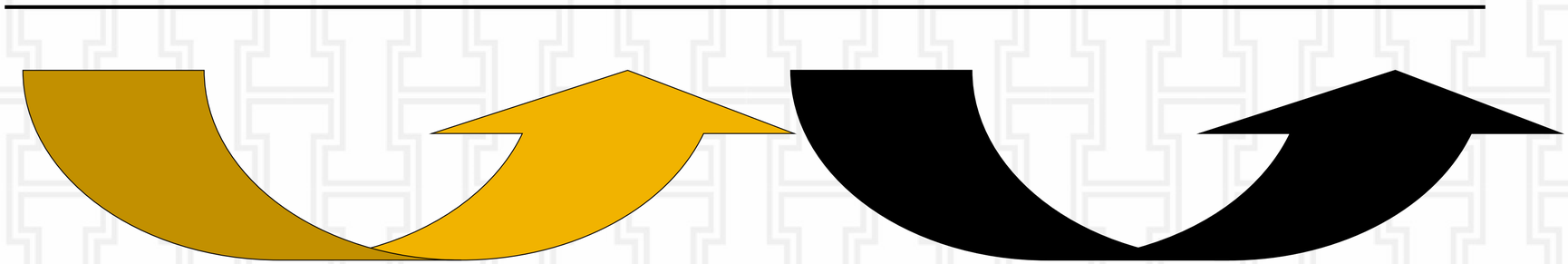
Hill

Then spray

Potato emergence

Plant

Row close



3-4 weeks

~ 5 weeks

Crop starting to compete

Scenario 3

Hilling-reservoir tillage before potato emergence

Hilling operation “takes out” any emerged weeds

Must be <2 inch tall

Apply soil residual herbicides preemergence to the potatoes ASAP after hilling

Coordination between hilling and herbicide application is very important

Don’t want any weeds to emerge before herbicide application, *otherwise a herbicide with foliar activity must be included in the tank mixture*

Scenario 3

Plant

Hill

Then spray

Potato emergence

If weeds come up after potato emergence herbicides w/ foliar activity may be necessary (Matrix or Met)

Add'l tillage is "no no"

Row close

3-4 weeks

~ 5 weeks

Now the interval between application and row close is not as long

Better setup for season-long control

Scenario 3

SOLUBILITY OF HERBICIDES LABELED FOR USE IN POTATO

Herbicide	water solubility ppm (pH 7 25° C)
Matrix	7,300
Metribuzin	1,220
Outlook	1,174
Sulfentrazone	**pH 7.5 160,000**
Dual Magnum	488
Eptam	370
Lorox/Linex	81
Reflex	50
Zidua	3
Chateau	1.78
Sonalan	0.3
Treflan	0.3
Prowl H2O	0.2

The greater the value (ppm) relative to that of the other herbicides, the more soluble.

Solubility high to low

Matrix > metribuzin, Outlook > Sulfentrazone* > Dual Magnum, Eptam > Linex, Reflex > Zidua, Chateau, Sonalan, Treflan, Prowl H2O

***What happens to these herbicides after excess spring rainfall*?**

Depending upon soil characteristics, *the more soluble the herbicide, the more available it is for uptake AND the further it can move down in the soil profile*.

INTEGRATED WEED MANAGEMENT IN POTATO CROPPING SYSTEMS: HERBICIDE – SANDY SOILS

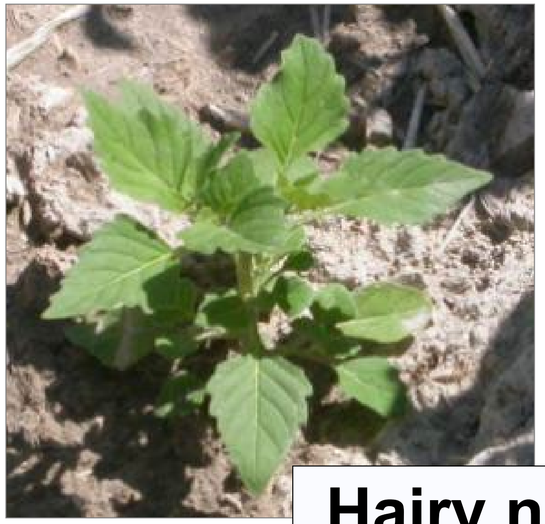
Timing hilling and herbicide application closer to potato emergence
- Herbicides are in the weed germination zone longer into the season

Highly soluble herbicides may be leaching below the weed-seed germination zone which in turn allows weed breaks
- Matrix, metribuzin

Herbicides not as soluble may be more effective in sandy soils
- Zidua, Chateau, Linex, Prowl H2O

Chemigation and sprinkler incorporation
- Follow label instructions
- Coarse- to medium-textured soils use less than 0.5 inches especially if dry

NIGHTSHADE SP



Hairy nightshade

Black nightshade

Cutleaf nightshade

Eastern black nightshade

Hairy nightshade

- ***Solanum physalifolium***
- The weed formerly known as *Solanum sarrachoides*
- *S. Physalifolium* Rusby var. *nitidibaccatum*

SOLANUM PHYSALIFOLIUM RUSBY…

Solanum physalifolium

Rusby

var. *physalifolium*

Solanum Physalifolium
Rusby
var. *nitibaccatum*

dentate leaf margin

Smooth leaf margin

Life Sciences

HAIRY NIGHTSHADE

Annual – 12 to 24 inches

However, hairy nightshade with spreading growth is common

HAIRY NIGHTSHADE

Begins germination in early spring and ***continues germinating throughout the summer***

- **Doesn't need light to germinate**
- **Germinates under wide temperature range**

Produces flowers and fruit until the end of the growing season in PNW: **Can produce viable seed as soon as 4 to 5 weeks after flowering and as late as 6 to 7 weeks before a killing frost**

A light frost does not kill

HAIRY NIGHTSHADE

A large plant can produce 1700+ berries

- 10 to 35 seeds per berry

Innate dormancy for 4+ months after maturity

- Seed buried in the field can develop dormancy when exposed to high temperatures

Longevity in soil:

5 yrs = 90% germination

8 yrs = 2% germination

Reports of germination after 39 years in soil

If seed production is allowed, hairy nightshade control becomes even more difficult next time potatoes are planted in a 3 or 4 year

University of Idaho hairy nightshade competition and critical interference research:

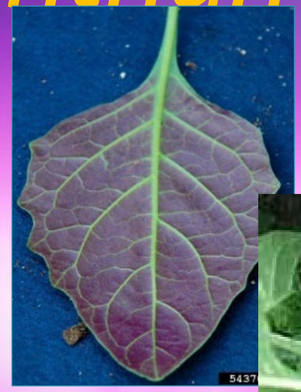
- One hairy nightshade/ m row present from emergence to harvest reduced Russet Norkotah total ylds 16%
- Two per m row in R. Burbank reduced yields 10%
- R. Norkotah must be totally weed-free from 7 to 22 days after emergence or a 5% or greater yield loss will occur

Black nightshade (*Solanum nigrum* L.)

- Introduced from Europe
- Annual - grows up to 3 feet tall and are usually erect
- Shallowly lobed, egg-shaped leaves that may reach 4 inches long
- Stems and leaves are not generally hairy, although the upper surface of the leaves may bear some rough, sparse hairs
- Berries are first green then turn black/purple as they ripen
  - 15 to 60 seeds per berry

Eastern black nightshade (*S. ptycanthum* Dunal)

- **Native to Europe or the Americas?**
- **Annual, highly branched, 1 to 3 ft tall**
- **Germinates from May through July**
- **Eastern black nightshade leaves are dark green, not hairy, and are often reddish-purple on underside**
- **Eastern black nightshade leaves often are covered with holes from flea beetle feeding**



Eastern black nightshade (*S. ptycanthum* Dunal)

- Similar to black nightshade, berries are first green then turn black/purple as they ripen
- Can produce 1,000 or more berries per plant
- 50 to 100 seeds per berry
- Ackley says EBN susceptible but not Black
- ALS resistance in Midwest states
  - Millman et al. 2000
- Rimsulfuron did not control E Black nightshade in a 1997-1999 ND study – they siid naturally tolerant
  - Greenland and Howatt 2005. Hort science

Hairy nightshade

Black nightshade

Nightshade sp

Hairy nightshade
More drought tolerant than EBN

Black nightshade

Cutleaf nightshade

Hairy nightshade emerges earlier than EBN and grows faster first 21 days
HNS ht max mid-July
EBN ht max mid-August

Eastern black nightshade
More shade tolerant than HNS

University of Idaho

REALITY CHECK…
THERE'S MORE THAN ONE WEED SPECIES IN A FIELD!

…AND THE MIX OF SPECIES CHANGES FROM FIELD TO FIELD…

SO

THE SAME TANK MIXTURE WILL NOT WORK FOR ALL FIELDS!

- ✓ CREATE AND USE A HERBICIDE TANK-MIX PARTNER TEMPLATE TO CUSTOMIZE MIXTURES DEPENDING UPON WEED SPECIES IN A FIELD.
- ✓ TARGET THE WEED SPECIES PRESENT IN A FIELD : CHANGE THE HERBICIDES FOR A DIFFERENT FIELD WITH DIFFERENT WEEDS.

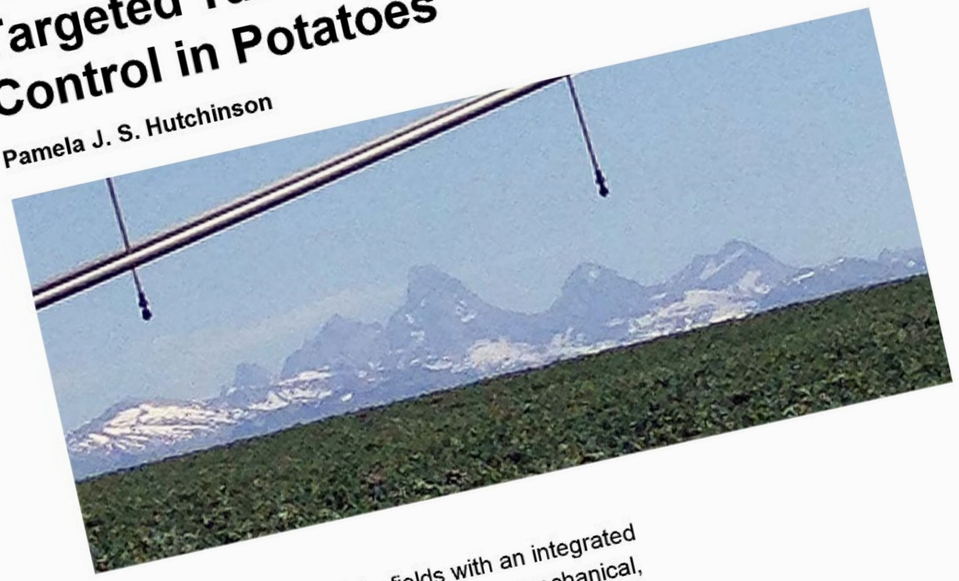
University of Idaho Extension Bulletin 950

University of Idaho Extension

BUL 950

Targeted Tank Mixtures for Weed Control in Potatoes

Pamela J. S. Hutchinson



Managing weeds in potato fields with an integrated approach—using all available cultural, mechanical, chemical, and biological tools—is critical. In fact, University of Idaho (UI) research shows that cultural and mechanical practices in potatoes combined with applications of the appropriate herbicides is much

Table 1. Herbicides labeled for use in potatoes: group number/classification, site/mechanism of action, and chemical family.

Group #	Trade Names[1]	Active Ingredient	Chemical family[2]	Site of Action (SOA)
1	Poast Plus or Ultra	sethoxydim	Cyclohexanedione (DIMs)	Acetyl CoA carboxylase (ACCase) inhibitor
	Select	clethodim		
	Venture (*sold only in Canada*)	fluazifop-butyl	Aryloxyphenoxy-propionate (FOPs)	
2	Matrix (Prism in Canada)	rimsulfuron	sulfonylurea (S.U.s)	Inhibits Acetolactate synthase (ALS) (aka Acetohydroxyacid synthase (AHAS))
3	Prowl H2O	pendimethalin	dinitroanilines (DNA's)	Microtubule assembly inhibitor
	Sonalan HFP	ethalfluralin		
	Treflan HFP	trifluralin		
5	TriCor 4F and others	metribuzin	triazinone	Inhibits photosynthesis at Photosystem II (PS II) Site A
7	Linex Lorox	linuron	urea	Inhibits photosynthesis at Photosystem II (PS II) site A; different behavior from Group 5
8	Eptam	EPTC	ghiocarbamate	Lipid synthesis inhibitor (not ACCase)
9	Roundup PowerMax, Touchdown, and others	glyphosate	glycine	EPSP synthase inhibitor
10	Rely	glufosinate (for vine kill only	phosphinic acid	Glutamine synthetase inhibitor
14	Chateau	flumioxazin	N-phenylphthalimide	Protoporphyrinogen oxidase (PPO) inhibitor
	Sulfentrazone	sulfentrazone	triazolinone	
	Rely	fomesafen	diphenylether	
	Aim EC	carfentrazone-ethyl	triazolinone	
	Vida	pyraflufen ethyl (for vine kill only)	phenylpyrazole	
15	Dual Magnum/ Dual II Magnum	s-metolachlor	chloroacetamides	Mitosis inhibitor
	metolachlor (various trade names)	metolachlor		
	Outlook	dimethenamid-p		
	Zidua	pyroxasulfone	isooxazoline	
22	Gramoxone and others	Paraquat	bipyri	Photosystem I (PSI)
	Reglone	diquat (for vine kill only)		

Formulated pre-mixes/

15	Boundary (pre-mix)	s-metolachlor	Mitosis inhibitor
+ 5		+ metribuzin	+ Photosystem II inhibitor
14	Titus Pro (co-pack 2 containers (*sold only in Canada*))	rimsulfuron	ALS inhibitor
+ 5		+ metribuzin	+ Photosystem II inhibitor
2	Sencor STZ (co-pak 2 containers (*sold only in Canada*)) or Sulfentrazone MTZ (pre-mix)	sulfentrazone	PPO inhibitor
+ 5		+ metribuzin	+ Photosystem II inhibitor
15	Sequence (pre-mix)	s-metolachlor	Mitosis inhibitor
+ 9		+ glyphosate	+ EPSP synthase inhibitor

[1] Not all trade names are listed. Mention of a trade name in no way endorses that product.

[2] Only the chemical families for the potato herbicides are listed. Visit www.weedscience.com for information on more chemical families that may be included in each Group.

Adapted from information in the 2021 PNW Weed Management Handbook, Potato chapter; PNW No. 437, Herbicide-Resistant Weeds and Their Management, and other sources such as The International Survey of Herbicide Resistant Weeds available at www.weedscience.com.

Create a Herbicide Tank Mix Partner Choice Chart

SOA Group #	Herbicides	WEED SPECIES PRESENT IN THE AREA						
		Weed 1	Weed 2	Weed 3	Weed 4	Weed 5	Weed 6	Weed 7
14	**Chateau** (flumioxazin)							
14	**Sulfentrazone** (various names)							
14	**Reflex** (formesafen)							
15	**Outlook** (dimethenamid-p)							
15	**Dual Magnum** (s-metolachlor)							
15	**Metolachlor** (various names)							
15	**Zidua** (pyroxasulfone)							
2	**Matrix (**and others) (PRE or POST)							
8	**Eptam** (EPTC)							
3	**Sonalan HFP** (ethafluralin)							
3	**Treflan HFP** (trifluralin)							
3	**Prowl H2O** (and others) (pendimethalin)							
5	**Metribuzin** (various names)							
7	**Linex/Lorox** (linuron)							
15 + 5	**Boundary** (and others)							
14 + 5	**Sulfentrazone MTZ**							
1	**Poast Plus** (sethoxydim)/**Select** (clethodim)							

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14	**Reflex** (formesafen)							
15	**Outlook** (dimethenamid-p)							
15	**Dual Magnum** (s-metolachlor)							
15	**Metolachlor** (various name							
15	**Zidua** (pyroxasulfone)							
2	**Matrix (**and others) (PRE o							
8	**Eptam** (EPTC)							
3	**Sonalan HFP** (ethafluralin)							
3	**Treflan HFP** (trifluralin)							
3	**Prowl H2O** (and others) (p							
5	**Metribuzin** (various names							
7	**Linex/Lorox** (linuron)							
15 + 5	**Boundary** (and others)							
14 + 5	**Sulfentrazone MTZ**							
1	**Poast Plus** (sethoxydim)/**Select** (clethodim)							

This chart has space for up to seven weed species of interest across the top.

- ***Enter weeds common to the potato production area.***

Potato herbicides on the left grouped by herbicide Site of Action (SOA).

- The specific protein or biochemical site in the plant to which the herbicide binds (sometimes referred to as Mechanism of Action).
- ***The SOA Group #'s are included in this chart for explanation, only, and are not needed in the actual Tank Mix Partner Choice Chart. Color grouping by SOA would be helpful.***

Burndown and vine kill products are not included in this chart but could be entered in other charts.

Create a Herbicide Tank Mix Partner Choice Chart

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14	**Sulfentrazone** (v							
14	**Reflex** (formesaf							
15	**Outlook** (dimeth							
15	**Dual Magnum** (s							
15	**Metolachlor** (var							
15	**Zidua** (pyroxasul							
2	**Matrix (**and othe							
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3	**Sonalan HFP** (eth							
3	**Treflan HFP** (trifl							
3	**Prowl H2O** (and							
5	**Metribuzin** (vari							
7	**Linex/Lorox** (linu							
15 + 5	**Boundary** (and o							
14 + 5	**Sulfentrazone MTZ**							
1	**Poast Plus** (sethoxydim)/**Select** (clethodim)							

- ✓ Appropriate tank mixtures and sequential application of herbicides with different SOA can provide control of the multiple weed species present in a given field.
- ✓ Just as important as using more than one herbicide to control multiple weed species in a field is the use of different SOA herbicide combinations that can control the *same* weed species in order to prevent or delay the development of a herbicide-resistant population of that species.

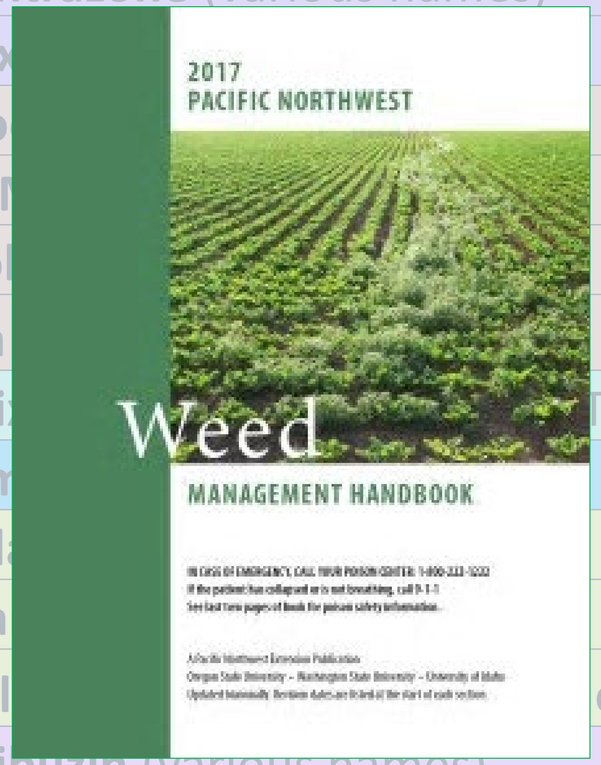
Creat… …art

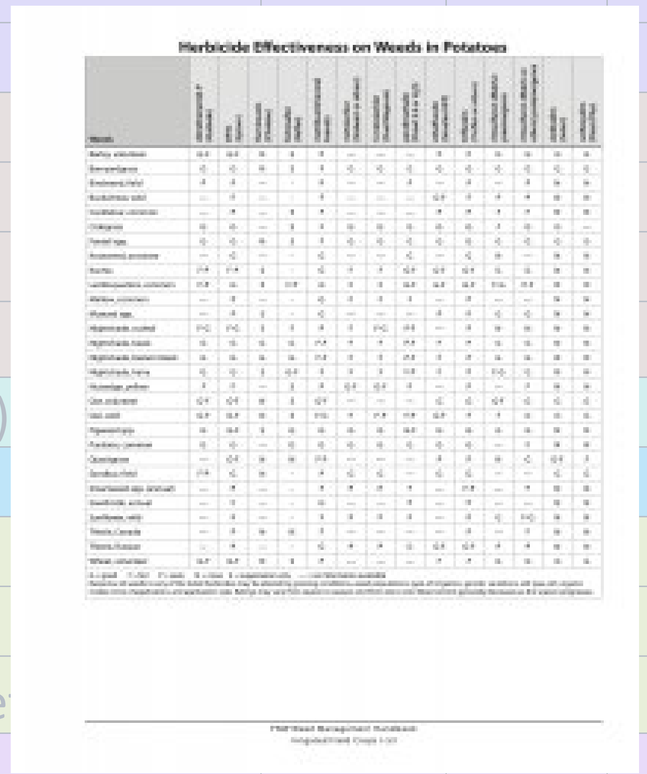
Weed control ratings in these charts are based on

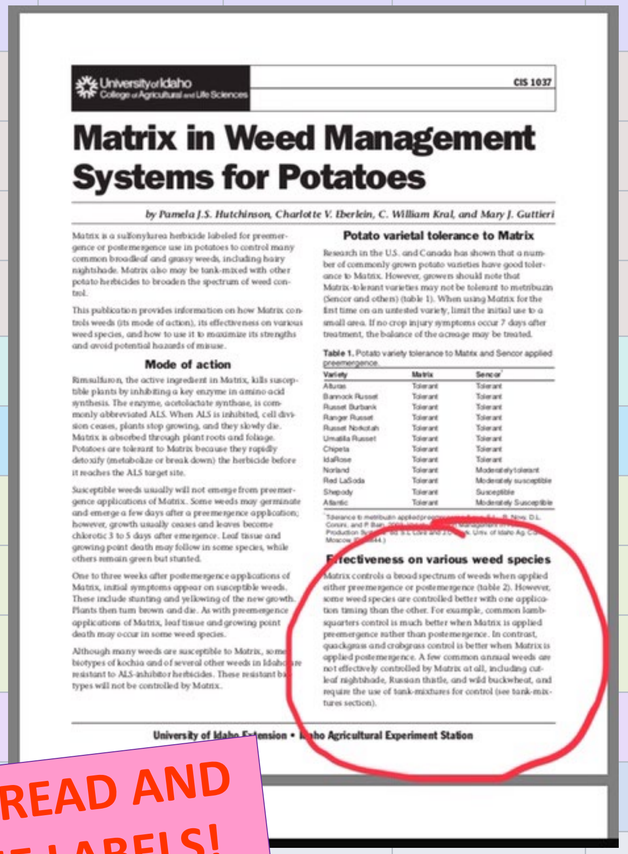
Season-long control research results

and information on herbicide labels

SOA Group #	Herbicides	…HE AREA Weed 5	Weed 6	Weed 7
14	**Chateau** (flumiox…			
14	**Sulfentrazone** (various names)			
14	**Reflex**			
15	**Outlo**			
15	**Dual M**			
15	**Metol**			
15	**Zidua**			
2	**Matri**…T)			
8	**Eptam**			
3	**Sonal**			
3	**Trefla**			
3	**Prowl**…e			
5	**Metribuzin** (various names)			
7	**Linex/Lorox** (linuron)			
15 + 5	**Boundary** (and others)			
14 + 5	**Sulfentrazone MTZ**			
1	**Poast Plus** (sethoxydim)/**Select** (clethodim)			



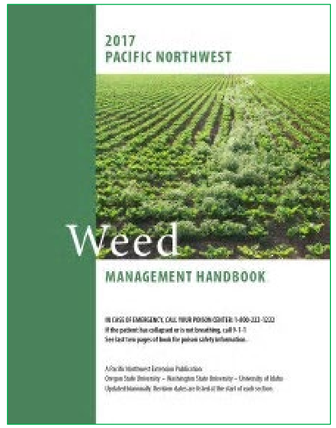




CAREFULLY READ AND FOLLOW THE LABELS!

POTATO HERBICIDE WEED CONTROL

Table 2A from the PNW Weed Mgt Handbook Potato chapter (2022)



https://pnwhandbooks.org/weed/agronomic/potato

Broadleaves

	Broadleaf Annuals									Perennials	
Herbicides	Kochia	Common lambsquarters	Mustard spp.	Cutleaf nightshade	Black nightshade	Eastern black nightshade	Hairy nightshade	Redroot pigweed	Russian thistle	Canada thistle	Field bind-weed
Chateau (flumioxazin)	S	S	S	S	G	G	G	S	–	N	–
Dual Magnum (S-metolachlor)	F	F	P	F-G	F	F	F	G	P	N	–
Eptam (EPTC)	P-F	G	P	F-G	G	G	G	F-G	P	P	P
Linex 4L (linuron)	F	G	G	–	–	S	F	G	–	P	–
Matrix or others (rimsulfuron) PRE/POST	G	P/F	G	N	G	G	G	G	P	–/F	P
Prism[1] (rimsulfuron) POST only, Canada only	F-G	S	–	N	–	–	F-G	–	–	–	P
Metribuzin (various trade names) PRE/POST	G	G	G	P	F	P-F	P/F	G	G	F	P
Outlook (dimethenamid-p)	P-F	P	P	F-G	G	G	G	G	–	–	P
Prowl 3.3 or H2O (pendimethalin)	G-F	F-G	–	P-F	P-F	P-F	F-P	F-G	G	–	P
Reflex (fomesafen)	–	P	G	F	G	G	F	G	–	N	–
Sonalan HFP (ethalfluralin)	F-G	F-G	P	–	F	F	F	G	F-G	–	–
Metolachlor (various trade names)	F	F	P	F	F	F	F	G	P	N	–
Sulfentrazone (various trade names)	G	G	G	G	G	G	G	F-G	G	-	P
Treflan HFP or others (trifluralin)	F-G	F-G	P	P	P	P	P	G	F-G	P	P
Zidua (pyroxasulfone)	P-F	–	–	–	F-G	F-G	F-G	F-G	–	–	–
Boundary[2] (S-metolachlor + metribuzin)	F	F-G	F	F-G	F	F	F	G	F-G	P-F	P
Sencor STZ (Canada), Sulfentrazone MTZ, and other trade names (metribuzin + sulfentrazone)	G	G	G	G	G	G	G	G	G	F	P

SEASON-LONG CONTROL: G, good = 90%–100%; F, fair = 80%–89%; P, poor = 0%–30%; N, none = 0%; S, suppression only = approx. 50% control; – = no information available.

Herbicide effectiveness chart and control ratings are derived from herbicide labels and potato field research trial results.

Response of weeds to any of the listed herbicides may be altered by growing conditions, weed populations, type of irrigation, genetic variations, soil type, pH, organic matter (OM), time of application, and application rate. Ratings may vary from season to season and from site to site. Weed control generally decreases as the season progresses.

[1]Product used only in Canada. The Prism rate in Canada is 60 g/ha (0.86 oz/A) POST only. Matrix rate range in the United States is 1–1.5 oz/A PRE or POST.

5 weeds and level of control by each herbicide

Herbicides	Hairy nightshade	Redroot pigweed	C. lambs-quarters	Kochia	Wild oat
Chateau (flumiox	G	G	PN	S	N
Sulfentrazone (various names)	G	G	PN	G	N
Reflex (formesafen)	F	G	PN	F	S
Outlook (dimethenamid-p)	G	G	PN	F	G
Dual Magnum (s-metolachlor)	F	G	PN	F	G
Metolachlor (various names)	F	G	PN	F	G
Zidua (pyroxasulfone)	F	G	PN	S	F
Matrix (and others) (PRE or POST)	G	G	PN	F	F
Eptam (EPTC)	G	G	S	F	G
Sonalan HFP (ethalfluralin)	PN	G	F	F	G
Treflan HFP (trifluralin)	PN	G	F	F	G
Prowl H2O (and others) (pendimethalin)	S	G	G	F	F
Metribuzin (various names)	N	G	G	G	G
Linex/Lorox (linuron)	F	G	G	F	G
Boundary (s-metolachlor + metribuzin)	F	G	G	F	G
Sulfentrazone MTZ (sulfentrazone + metribuzin)	G	G	G	G	G
Poast Plus or Ultra (sethoxydim)/**Select** (clethodim)	N	N	N	N	G

G, good = 90 to 100%; **F**, fair = 80 to 89%; **PN**, poor to none = 0 to 30% control;

N, None = 0% control; **S** = suppression only, approx. 50% control

Example Field with 3 weeds: Herbicides providing "Good" control circled

Herbicides:	Hairy nightshade	C. lambs-quarters	Redroot pigweed	Kochia	Green foxtail
Chateau (flumioxa	G	PN	G	S	N
Sulfentrazone (var	G	PN	G	G	N
Reflex (formesafen)	F	PN	G	F	S
Outlook (dimethenamid-p)	G	PN	G	F	G
Dual Magnum (s-metolachlor)	F	PN	G	F	G
Metolachlor (various names)	F	PN	G	F	G
Zidua (pyroxasulfone)	G	PN	G	S	F
Matrix (and others) (PRE or POST)	G	PN	G	F	F
Eptam (EPTC)	G	S	G	F	G
Sonalan HFP (ethalfluralin)	PN	F	G	F	G
Treflan HFP (trifluralin)	PN	F	G	F	G
Prowl H2O (and others) (pendimethalin)	S	G	G	F	F
Metribuzin (various names)	N	G	G	G	G
Linex/Lorox (linuron)	F	G	G	F	G
Boundary (s-metolachlor + metribuzin)	F	G	G	F	G
Sulfentrazone MTZ (sulfentrazone + metribuzin**)**	G	G	G	G	G
Poast Plus or Ultra (sethoxydim)/**Select** (clethodim)	N	N	N	N	G

G, good = 90 to 100%; **F**, fair = 80 to 89%; **PN**, poor to none = 0 to 30% control;

N, None = 0% control; **S** = suppression only, approx. 50% control.

Example of a 3-way tank mixture: Chateau + metribuzin + Linex

Herbicides:	Hairy nightshade	C. lambs-quarters	Redroot p…	…	Green foxtail
Chateau (flumioxazin)	G	PN			N
Sulfentrazone (various names)	G	PN			N
Reflex (formesafen)	F	PN			S
Outlook (dimethenamid-p)	G	PN	G	F	G
Dual Magnum (s-metolachlor)	F	PN			G
Metolachlor (various names)	F	PN			G
Zidua (pyroxasulfone)	G	PN			F
Matrix (and others) (PRE or POST)	G	PN			F
Eptam (EPTC)	G	S			G
Sonalan HFP (ethalfluralin)	PN	F			G
Treflan HFP (trifluralin)	PN	F			G
Prowl H2O (and others) (pendimethalin)	S	G			F
Metribuzin (various names)	N	G	G	G	G
Linex/Lorox (linuron)	F	G			G
Boundary (s-metolachlor + metribuzin)	F	G			G
Sulfentrazone MTZ (sulfentrazone + metribuzin**)**	G	G			G
Poast Plus or Ultra (sethoxydim)/**Select** (clethodim)	N	N			G

G, good = 90 to 100%; **F**, fair = 80 to 89%; **PN**, poor to none = 0 to 30% control;

N, None = 0% control; **S** = suppression only, approx. 50% control

Hairy nightshade and Common lambsquarters Control: Metribuzin alone or tank-mixed with Outlook

Metribuzin controls c. lambsquarters
Does not control hairy nightshade

Metribuzin + Outlook provided 100% Season-long control of all weeds in the plot.

Outlook controls h. nightshade
Does not control common lambsquarters

CAUTION:
This 2-way mix does not have overlapping control.

Trial was conducted at the Aberdeen R&E Center. Herbicides were applied PRE and sprinkler-incorporated w/in 24 hr by 0.5 inches irrigation water

Hairy nightshade and Common lambsquarters Control: Outlook tank-mixed with metribuzin

metribuzin: SOA Group 5

Metribuzin controls c. lambsquarters
Does not control hairy nightshade

Outlook: SOA Group 15

Outlook controls h. nightshade
Does not control common lambsquarters

Metribuzin + Outlook provided 100% season-long control of c. Lambsquarters and h. nightshade

Overlapping control/activity with different SOA's ???

No!

OUTLOOK + METRIBUZIN + LINEX

Nontreated:
Hairy nightshade and common lambsquarters

WE HAVE OVERLAP!!!

Outlook: SOA Group 15
hairy nightshade (90-100%)

Linex: SOA Group 7
common lambsquarters (90-100%)
AND hairy nightshade (80-89%)

metribuzin: SOA Group 5
common lambsquarters (90-100%)

3-way tank mix Outlook + metribuzin + Linex
100% season-long control of hairy nightshade and common lambsquarters

WHAT YOU HEARD TODAY

- INTEGRATED WEED MANAGEMENT
- HERBICIDES LABELED FOR USE IN POTATOES
- CULTIVATION AND HERBICIDE APPLICATION TIMING
  - THREE SCENARIOS
- NIGHTSHADES
- CUSTOMIZE YOUR TANK MIXTURE

WEED MANAGEMENT IN POTATOES RESOURCES

www.weedscience.org

WSSA.net/resistance

Potato Production Systems Handbook: Weed chapter

CIS 1037 Matrix in Weed Management Systems for Potatoes

CIS 1126 Outlook Herbicide for Weed Control in Potatoes

CIS 1136 Chateau Herbicide for Use in Potatoes

CIS 1185 Weed Control and Potato Crop Safety with Metribuzin

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Thank you for your time, attention, and interest in my Research and Extension Program!

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