
Cornell Cooperative Extension
Cornell Vegetable Program

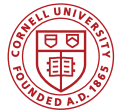


Essais d'herbicides dans l'oignon Onion herbicide trials

Christy Hoepting, CCE Cornell Vegetable Program

Les Journées Horticoles & Grandes Cultures
St. Rémi, Quebec, Canada: December 4, 2018

About Me – I love onions!



- Extension Educator
- Onion Specialist
- 21 onion growing seasons



About Me

- Onion "Research" Scouting Program - 20 fields weekly



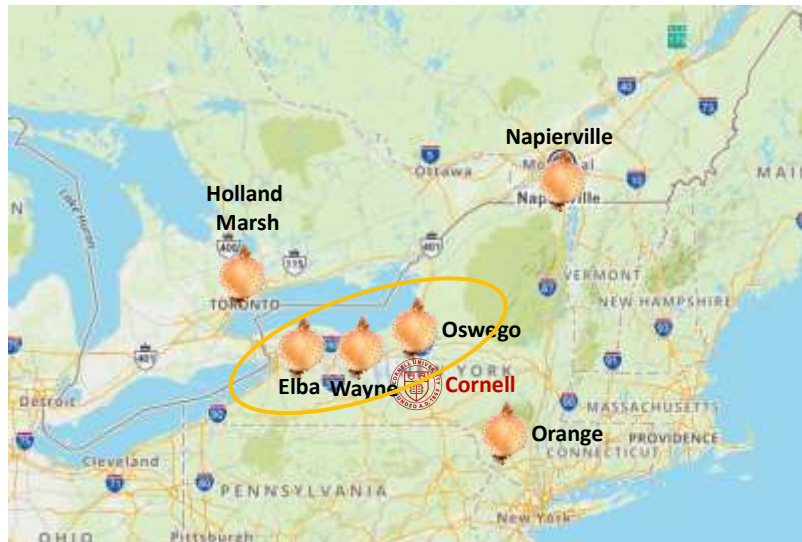
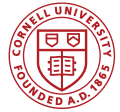
About Me



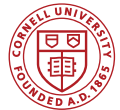
- Onion Researcher – dozens of on-farm trials annually
(mostly herbicide and fungicide trials)



Where I work



Outline



Direct Seeded Onions in Muck:

- Pre-emergent herbicide programs (Outlook, Prowl, Buctril)
- Post-emergent programs (Goal 2XL, Chateau, Buctril, Goaltender)
- Weed Species:
 - Ragweed
 - Pigweed
 - Marsh yellowcress
 - Lamb's quarters
 - Lady's thumb
 - Yellow nutsedge
- Pipeline product
 - bicyclopyrone





Weeds



Ragweed



Lady's thumb
(= smartweed)



Marsh yellowcress
(annual mustard)



Lamb's quarters



Pig weed



Yellow nutsedge



I am interested in what works!

My First Question - What does it take to kill the weeds?

My Second Question – Can the onions take it?

Disclaimer:

- Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties.
- In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action.
- It is your responsibility to check the label before using any product to ensure lawful use, and obtain all necessary permits in advance.
- No endorsement of companies is made or implied.



Pre-Emergent Herbicides

Trade Name	Active Ingredient	WSSA Group	Grass Control	Broadleaf Control	Other
Outlook = Frontier	dimethenamid-P	15	✓	✓	YNS*
Dual Magnum (Not in Quebec)	S-metolachlor	15	✓	✓	YNS*
Prowl EC/H₂O	pendimethalin	3	✓	✓	
Buctril = Pardner	bromoxynil	6	✗	✓	

To kill barley nurse crops (Post-Emergent):

Select EC	clethodim	1
Fusilade	Fluazifop-P-butyl	1
Poast	sethoydim	1



*YNS:
Yellow
nutsedge



Pre-Emergent Herbicides – Weed Control



	Pigweed	Lady's Thumb	Mustards (mostly MYC)	Lamb's quarters	Rag weed	Annual Grasses	YNS
Outlook	VG	G	G-VG	G	Poor-Fail	E	G
Prowl	G-VG	VG-E	VG	E	Poor-Fail	E	None
Buctril	Poor-Fail	Poor-Fail	Poor-Fail	Poor	G	None	none

E: Excellent; **VG**: Very Good; **G**: Good

VG-E control poor or no control

Pre-Emergent Programs



Heavy

Crop Stage	Product	Rate
PRE-onion 1st poke	➡ Outlook	11 fl oz
	Prowl EC	2 pt
	Buctril	1.5 pt
Flag+	➡ Outlook	10 fl oz
	Prowl EC	4.8 pt
	Select EC	1 pt
4-leaf	Prowl EC	4.8 pt

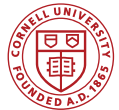
Medium

Crop Stage	Product	Rate
PRE-onion 1st poke	➡ Outlook	12 fl oz
	Buctril	1 pt
loop	➡ Outlook	12 fl oz
	Prowl EC	3 pt
Flag+	Prowl EC	4 pt
	Select EC	1 pt
4-leaf	Prowl EC	4.8 pt

Regarding Crop oil (COC) with Select/Poast/Fusilade for barley kill:

- **Do NOT add COC** when Prowl EC **4 pt** is used.
- Add **0.5% COC** with Prowl EC **3pt**
- Add **1.0% COC** with Prowl EC **2 pt**, **no Prowl EC** or Prowl **H₂O**

Pre-Emergent Programs



Heavy – all Outlook PRE

Crop Stage	Product	Rate
PRE-onion 1st poke	Outlook	21 fl oz
	Buctril	1.5 pt
Flag+	Prowl EC	4.8 pt
	Select EC	1 pt
4-leaf	Prowl EC	4.8 pt
7-leaf	➡ Prowl EC	4.8 pt

Heavy – all Outlook at 2-leaf

Crop Stage	Product	Rate
PRE-onion 1st poke	Prowl EC	2 pt
	Buctril	1.5 pt
Flag+	Prowl EC	4.8 pt
	Select EC	1 pt
2-leaf	Outlook	21 fl oz
4-leaf	Prowl EC	4.8 pt

Maximum allowable rates of all products



Pre-Emergent Programs

Heavy – Prowl H₂O

Crop Stage	Product	Rate
PRE-onion 1 st poke	Outlook	11 fl oz
	Prowl H ₂ O	4 pt
	Buctril	1.5 pt
Flag+	Outlook	10 fl oz
	Prowl H ₂ O	4 pt
	Select EC	1 pt
	COC	1% v/v
4-leaf	Prowl H ₂ O	4 pt

Maximum allowable rates of all products

Pre-Emergent Herbicides



• Outlook:

- Full rate provides better control than split application for both broadleaf and YNS
- Applications PRE-emergent to onions improve control compared to apps after onion emergence , especially for yellow nutsedge.
- Very good on pigweed, okay on mustards, Lady's thumb and Lamb's quarters
- Poor control of ragweed
- Applying high rate PRE-onions as part of program can result in too much injury – temporary, but significant stunting & “looping”
- Sometimes see injury with split application stand loss & stunting)



Outlook “looping” injury

Pre-Emergent Herbicides



• Prowl:

- Excellent activity on mustards and Lamb's quarters (better than Outlook), not as good on pigweed
- Poor control of ragweed
- Weed control increases as rate increases and with early timing (e.g. PRE-onions)
- Can cause stunting, especially with high rates PRE-onions
- Still studying the differences between Prowl EC and H2O:
 - Prowl H2O is safer on the crop; weed control often not as good

• Buctril

- Shorter residual than Outlook, Prowl
- Good on ragweed, poor control of other broadleaves compared to Outlook, Prowl
- Safe on crop, even with high rate (1.5 pt)

Pre-Emergent Herbicides – Single Actives



Untreated



Outlook split



Outlook 21 fl oz



Buctril 1.5 pt



Prowl EC 2.4 pt



Prowl EC 3.6 pt



Prowl EC 4.8 pt



Prowl H2O 4 pt = 4.6 pt EC

Marsh Yellowcress & Lady's Thumb

JUN 14 2017 (29 DAT PRE) -OSWEGO

Hoeping 2017

Prowl EC Rates compared to Prowl H2O



Untreated



Prowl EC 2.4 pt



Prowl EC 3.6 pt



Prowl EC 4.8 pt

JUN 23 2017 (30 DAT PRE) - WAYNE

Pigweed, Marsh Yellowcress & Hairy Galingsoga

Hoepting 2017

Prowl EC Rates compared to Prowl H2O



Do not look at onions! Poor emergence not a treatment effect



Untreated

Prowl EC 2.4 pt
71%Prowl EC 3.6 pt
68%Prowl EC 4.8 pt
55%Prowl H2O 2 pt
41%
(=2.3 pt EC)Prowl H2O 4 pt
65%
(=4.6 pt EC)

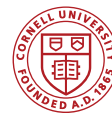
JUN 7 2018 (38 DAT PRE, onions 3-leaf) – ELBA I

Greater differences in efficacy between rates for Prowl H2O
Prowl H2O 4 pt as good as Prowl EC

Pigweed

Hoepting 2018

Prowl EC vs. Prowl H2O in a Program



Standard
Prowl EC
PRE, flag+

EC
formulation
helps to
“nip” tiny
emerged
weeds



Standard
Prowl **H2O**
PRE, flag+

H2O
formulation
Has “no bite”
on tiny
emerged
weeds



Outlook Split vs. Full Rate - Mixed Broadleaves



Untreated



Outlook split



Outlook 21 fl oz




Buctril 12 fl oz

JUN 10 2016 (42 DAT PRE) - ELBA


Mustards, pigweed, Lamb's quarters


Outlook Split vs. Full Rate, Timing - Yellow Nutsedge



WAYNE June 23 2017 6 DAT 2-leaf 30 DAT PRE In programs:	onions 3-leaf			
	Crop Tolerance			
	Visual Onion Injury %	Stand (/3 ft)	Plant Height (inch)	
Untreated		16.6 a		
Outlook Split	15 cde	13.8 b-e	8.4 ghi	60 abc
Outlook High PRE	11 cde	14.5 bcd	9.7 cd	78 a
Outlook High Late (2-leaf)	6 e	16.6 ab	10.1 c	43 bcd

Best!
Safest!

 Statistically same as best treatment

 Statistically same as worst treatment

Outlook Split vs. Full Rate, Timing - Yellow Nutsedge



Treatment (Products and Rate)	Timing
Outlook Split Prowl EC 2 pt + Outlook 11 fl oz + Buctril 2EC 1.5 pt Prowl EC 4.8 pt + Outlook 10 fl oz + barley kill	PRE 1-leaf
Outlook High PRE Outlook 21 fl oz + Buctril 2EC 1.5 pt Prowl H2O 4 pt + barley kill	PRE 1-leaf
Outlook High (2-leaf) Prowl EC 2 pt + Buctril 2EC 1.5 pt Prowl EC 4.8 pt + barley kill Outlook 21 fl oz	PRE 1-leaf 2-leaf

Outlook Split vs. Full Rate, Timing - Yellow Nutsedge



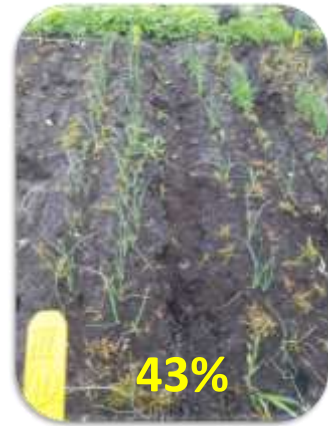
60%

**Outlook
Split**



78%

**Outlook
High PRE**



43%

**Outlook
High Late (2-leaf)**

JUN 27 2017 (9 DAT 3-leaf) - WAYNE

*Chateau applied for POST-Emergent control of YNS

Buctril - POST Activity when used PRE



untreated

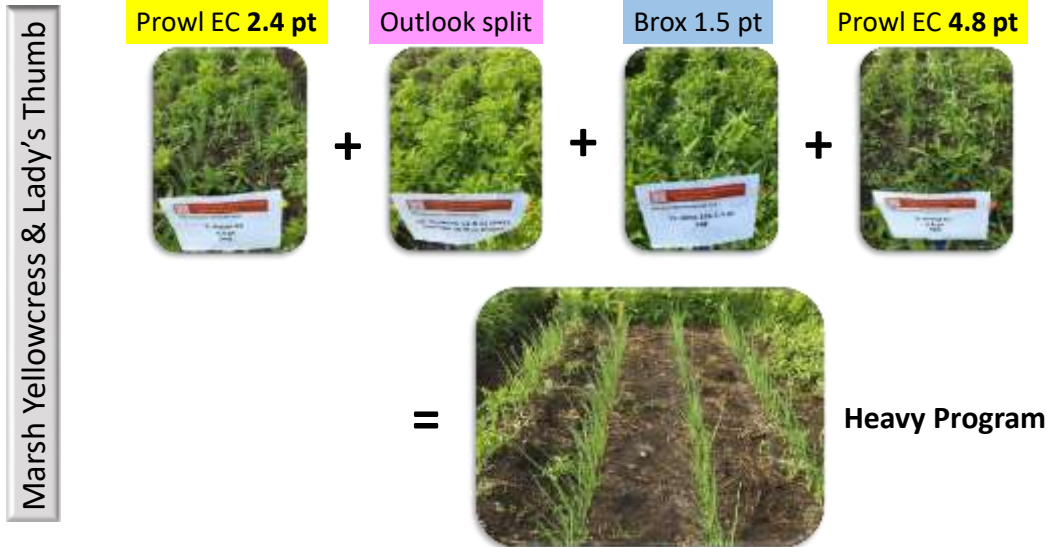


Ragweed

4 DAT:

Buctril 1.5 pt + Prowl EC 2 pt + Outlook 11 fl oz

Synergy of tank mixes



JUN 22 2017 (37 DAT PRE) - OSWEGO

Welcome Chateau

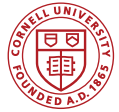


- a.i. flumioxazin
- WSSA Group 14 – same as Goal
- Both PRE- and POST- emergent activity at same rates (1-2 fl oz)
- Long residual control, although rates can be “touchy”
- Excellent control of pigweed, marsh yellowcress, Lady’s thumb, night shade
 - **Weeds MUST be small (<2 inch)**
- Weak on Lamb’s quarters, ragweed
- Labeled:
 - 3-6 leaf onion stage
 - No more than 2 fl oz per app, maximum 3 fl oz per season
 - 14 days between apps
 - **Do NOT tank mix with anything!! (only Prowl H2O allowed)**



generics also available (e.g. Tuscany)

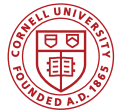
Welcome Chateau



- High – Low is the way to go!
 - **Chateau 2 fl oz followed by 1 fl oz** gave better control than:
 - 1 fl oz fb. 2 fl oz
 - 1.5 fl oz fb. 1.5 fl oz
 - 3 fl oz
- **1 week** between apps worked better than 2 weeks
- To target small weeds (< 2 inch), first application may be made at **1+ leaf**
- **Chateau 2 fl oz @ 1+ leaf f.b. Chateau 1 fl oz 1 week later at 2-3 leaf**

~80% of New York muck onion growers have adopted Chateau into their onion herbicide program

Chateau Timing: Minimum 1+ leaf (= 1st leaf coming)



too early



1 leaf,
flag leaf healthy

Just right!



1+ leaf,
flag leaf dying
2nd leaf starting
(just treated with Chateau 2 oz)



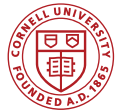
1st leaf nipped by Chateau at soil line
2nd leaf will continue to grow
(= plant lives!)

Chateau – Weed Control



Pigweed and Lady's thumb dead or dying while Lamb's quarters, ragweed and groundsil escape

Chateau – Weed Control Successes



Before

After



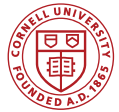
2016: Chateau 2 oz @ 1+ leaf

Chateau – Weed Control Successes



- 2013: Chateau **1.0 oz** at **flag** leaf killed **Lady's thumb** < 1 inch
 - ~10% stand reduction

Chateau Injury: Sometimes more than expected



Chateau 2.0 oz at 2-leaf stage

PRE-Emergent Activity of Chateau



JUN 4 2015 (27 DAT PRE) - ELBA



Untreated



Chateau 2.0 oz PRE

Treatment	% Weed Control Jun-4	% weed control Jun-19
Standard	81 %	74 %
Chateau 6 oz PRE	81 %	75 %
Chateau 2 oz PRE	70%	31 %

Pigweed, Lady's thumb, Lamb's quarters

PRE-Emergent Activity of Chateau

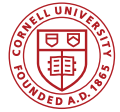


Untreated



Marsh yellowcress

Chateau 1 oz PRE
Chateau 2 oz flag+
90% control



PRE-Emergent Activity of Chateau

Marsh yellowcress, Lady's thumb



Untreated

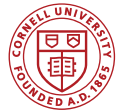


Chateau 1 oz



Chateau 3 oz

JUN 14 2017 (37 DAT PRE) - OSWEGO



PRE-Emergent Activity of Chateau

Pigweed

JUN 7 2018 (38 DAT PRE, onions 3-leaf) – ELBA I



Untreated



Chateau 1 oz
47%



Chateau 2 oz
73%



Chateau 3 oz
91%

Do not look at onions! Poor emergence not a treatment effect



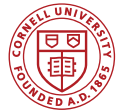
Adding Chateau to Onion Herbicide Program

Heavy

Crop Stage	Product	Rate
1 st poke	Outlook	11 fl oz
	Prowl EC	2 pt
	Buctril	1.5 pt
Flag+	Outlook	10 fl oz
	Prowl EC	4.8 pt
	Select EC	1 pt
➔ 1+ leaf	Chateau	2 oz
➔ 3-4 leaf	Prowl H₂O	4 pt
	Chateau	1 oz

Chateau may be tank mixed with Prowl **H₂O**

Can Chateau be Used PRE-Onion?



Marsh Yellowcress & Lady's Thumb

Standard Prowl EC:
Prowl EC 2 pt
+ Outlook 11 fl oz
+ Buctril 1.5 pt **PRE**
Prowl EC 4.8 pt **flag+**



Prowl H₂O with Chateau PRE:
Prowl **H₂O** 4 pt
+ Outlook 11 fl oz
+ Buctril 1.5 pt
+ **Chateau 1 oz PRE**
Outlook 10 fl oz
Prowl **H₂O** 4 pt **flag+**

NO!

When Chateau 1 oz PRE was added to Prowl H₂O program, **stand** was significantly **reduced by 52%**, onions were significantly **stunted by 2.3"** (=32%) and **yield was reduced by 34%**.

JUN 22 2017 (37 DAT PRE) - OSWEGO

Can Chateau be Used PRE-Emergent?



Standard:

Prowl EC 2pt
+ Outlook 11 fl oz
+ Buctril 12 fl oz **PRE**
Prowl EC 4.8 pt
+ Outlook 10 fl oz **flag+**
Prowl EC 4.8 pt **4-leaf**



Michigan with Chateau PRE:

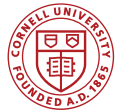
Prowl **H2O** 4 pt
+ Buctril 4E 12 fl oz
+ **Chateau 1 oz PRE**

Prowl **H2O** 4 pt
+ Goaltender 2 fl oz **1-2 leaf**
Goaltender 2 fl oz
+ **Chateau 2.0 oz 4-leaf**

YES!

When no Outlook or
Prowl EC are used.

Can Chateau be Used PRE-Emergent?



Chateau controls pigweed
that slips through Prowl **H2O**)



Standard



Michigan with **Chateau 1 oz PRE**
(Nothing for YNS!)



Michigan:
Prowl **H2O** 4 pt + Buctril 4E 12 pt **PRE**
Prowl **H2O** 4 pt + Dual Magnum 1.3 pt **3-leaf**

Safe Timing Between Prowl/Select EC and Chateau



Heavy

Crop Stage	Product	Rate
1st poke	Outlook	11 fl oz
	Prowl EC	2 pt
	Buctril	1.5 pt
Flag+ → →	Outlook	10 fl oz
	Prowl EC	4.8 pt
	Select EC	1 pt
1+ leaf →	Chateau	2 oz
3-4 leaf	Prowl H_2O	4 pt
	Chateau	1 oz

EC and other “oily” formulations may cause injury when used in too close proximity to Chateau:

- Select EC
- Crop oil
- Outlook

Safe Timing Between Prowl/Select EC and Chateau

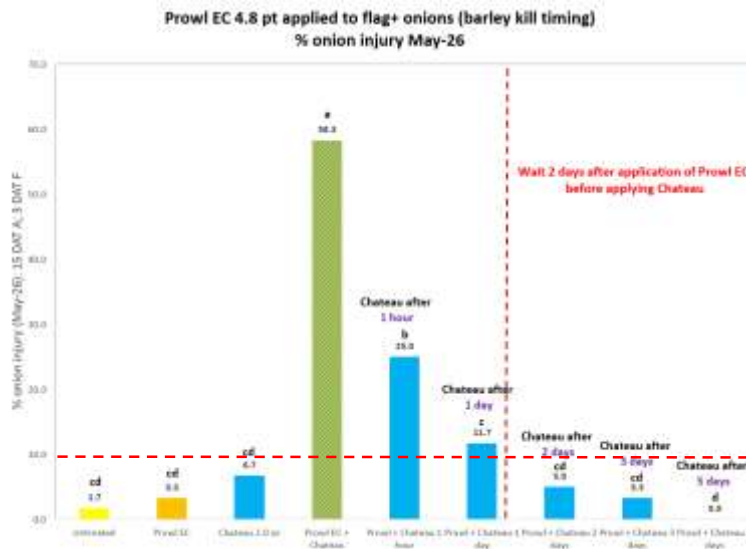


Treatments	Onion Stage	Date
1 Untreated		
2 Prowl EC 4.8 pt (with barley kill)*	Flag + 1 st leaf (same size as flag)	May-18
3 Chateau 2.0 oz	“	“
4 Prowl EC 4.8 pt + Chateau 2.0 oz	“	“
5 Prowl EC 4.8 pt Chateau 2.0 1 hour later**	“	“
6 Prowl EC 4.8 pt Chateau 2.0 1 day later	“	May-18 May-19
7 Prowl EC 4.8 pt Chateau 2.0 2 days later		May-18 May-20
8 Prowl EC 4.8 pt Chateau 2.0 3 days later	1-leaf	May-18 May-21
9 Prowl EC 4.8 pt Chateau 2.0 5 days later	1-leaf (flag starting to die)	May-18 May-23



****barley kill:**
Select EC 1 pt + LI700 0.25% v/v;
applied between Prowl and Chateau

Safe Timing Between Prowl/Select EC and Chateau – Visual Injury 8 DAT Prowl EC



Hoepting 2016

Safe Timing Between Prowl/Select EC and Chateau – Visual Injury 8 DAT Prowl EC



Untreated



Prowl EC 4.8 pt



Chateau 2 oz

Safe Timing Between Prowl/Select EC and Chateau – Visual Injury 8 DAT Prowl EC



Prowl + Chateau



Prowl + Chateau
1 hour later

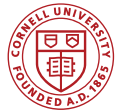


Prowl + Chateau
1 day later



Prowl + Chateau
2 days later

Safe Timing Between Prowl/Select EC and Chateau



- Wait at least 1 day after spraying Prowl EC or any other EC formulation to spray Chateau
 - Especially when onions are small (<1-leaf)
- Should be very safe after 2 days
 - When conditions are favorable for injury

Question:

- How long to wait after Chateau to apply Prowl EC (or other EC)?
- Or, Chateau and Movento + surfactant?
 - Less than 24 hours may cause severe injury

Caution: Clean sprayers thoroughly after using Chateau

Post-Emergent Herbicides – Weed Control



Trade Name	Active Ingredient	WSSA Group	Pig-weed	Lady's Thumb	Mustards (mostly MYC)	Lamb's quarters	Rag weed	YNS
Goal 2XL* Goaltender	oxyflufen	14	VG	VG	G	G	G-VG	G
Chateau	flumioxazin	14	E	VG	E	F-Poor	G	VG
Buctril	bromoxynil	6	Poor-Fail	VG	E	Poor	VG	none

*Goal 2XL better than Goaltender
Goaltender is safer than Goal 2XL

VG-E control poor or no control

POST-Emergent Herbicides



The Onion Weed Race:

Getting onions big enough to safely apply POST-emergent herbicides before weeds get to big for herbicides to control

- Start with Chateau 2 oz @ minimum **1+ leaf**
 - Use **1 oz** if conditions are cool and wet (onions and weeds soft)
- 1 week later @ 2-3 leaf – if weeds not dead & <10% injury:
 - **Chateau 1 oz** (may be tank mixed with Prowl H2O) for **pigweed, mustards (especially marsh yellowcress), nightshade**
 - Or, **Goal 2XL 4 fl oz** (not with Prowl) IF: Lady's thumb, Lamb's quarters are 1-2 inch
 - Or, **Buctril 2E 8 fl oz** IF: **ragweed** and "other" mustard are 1-2 inch
 - Or, **Buctril 2E 8 fl oz + Goal 2XL 4 fl oz** IF: **ragweed and/or "other mustard" AND pigweed, nightshade, Lamb's quarters, and/or purslane**

"other mustard": wild mustard, wormseed mustard, pennycress, Shepherd's purse



POST-Emergent Herbicides

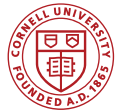
1 week after 2-3 leaf app:

- IF **crop injury** is less **than 10%** AND **weeds** still **not dead** – hit it again!
- **Until:** 1) Maximum use rate per season
2) PHI is reached
e.g. Goal 2XL max 32 fl oz (= 8 x 4 fl oz apps); 45 day PHI (= mid-July)
- Many growers include Goal 2XL 0.5 to 1 fl oz in every tank mix

Temptation to start early (= 1+ leaf):

- Generally NOT necessary, EXCEPT for Chateau 2 oz @ 1+ leaf
- Goal 2XL 2 fl oz @ 1+ leaf = Goal 2XL 4 fl oz @ 2-leaf
- Goaltender 1 fl oz @ 1+ leaf = Goaltender 2 fl oz @ 2-leaf
- Buctril 4 fl oz @ 1+ leaf = Buctril 8 fl oz @ 2-leaf

POST-Emergent Herbicides: Goal 2XL vs. Goaltender/1-leaf vs. 2-leaf



Hoepting 2018

7 DAT 1-leaf; 9 DAT 2-leaf - ELBA

Treatment	Leaf Stage	Visual Onion Injury (%)	Weed Control Rating*						
			Lamb's quarters	Pig-weed	Rag-weed	Worm-seed mustard	Field penny-cress	Lady's thumb	Wild buck-wheat
3 Goal 2XL 4 fl oz	2-leaf	7.8	G	E	G	G	P-F	VG	VG
4 Goaltender 2 fl oz	2-leaf	8.3	Poor-fail	E	Poor-Fail	Fail >4"	Fail	--	F
5 Goal 2XL 2 fl oz	1-leaf	6.0	Poor-F cot dead	F	F	--	Poor-Fail	F	F
6 Goaltender 1 fl oz	1-leaf	3.0	fail-P cot dead	Poor	Poor-Fail	--	Poor	Poor-F	Poor

E: Excellent; VG: Very Good; G: Good; F: Fair VG-E control poor or no control

POST-Emergent Herbicides: Goal 2XL vs. Goaltender/1-leaf vs. 2-leaf



JUN 13, 2018; 9 DAT 2-leaf - ELBA

Do not look at onions! Poor emergence not a treatment effect



Lamb's quarters

Note: Lamb's quarters already too big at first app

Hoepting, 2018

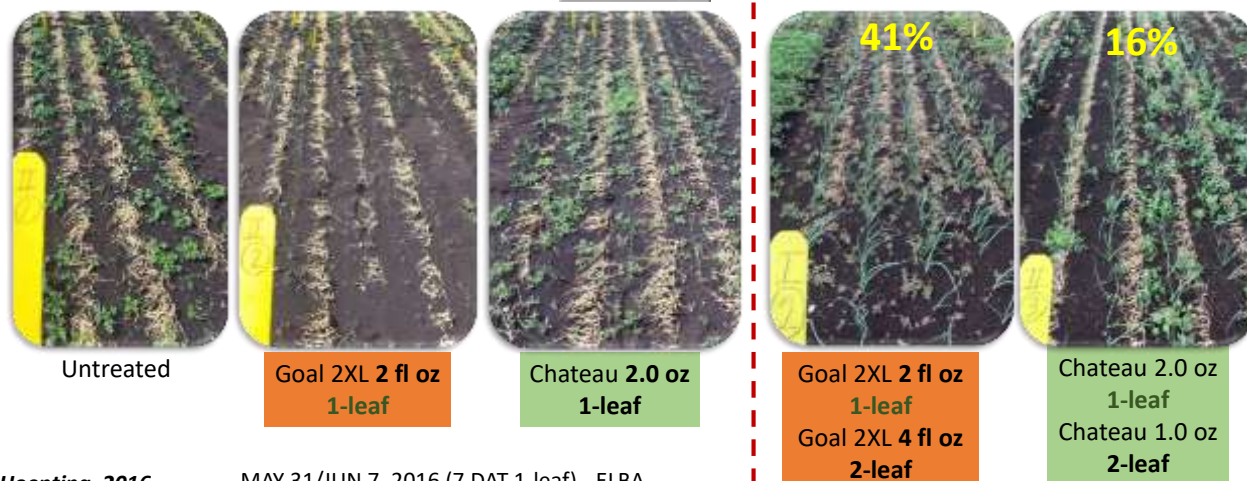
POST-Emergent Herbicides: Chateau vs. Goal 2XL



7 DAT 1st app

Ragweed

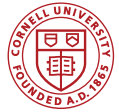
12 DAT 2nd app



Hoepting, 2016

MAY 31/JUN 7, 2016 (7 DAT 1-leaf) - ELBA

POST-Emergent Herbicides: Chateau vs. Goal 2XL/1-leaf vs. 2-leaf



Untreated

Goal 2XL 4 fl oz
2.5 & 4-leafChateau 2 oz
2.5-leaf
Chateau 1 oz
4-leafChateau 2 oz
1-leaf
Chateau 1 oz
2.5-leafChateau 2 oz
+ Goaltender 2 fl oz
2.5 leaf
Chateau 1 oz
+ Goaltender 2 fl oz
4 leaf

Lady's Thumb

Hoepting, 2017

Jul 12 2017 (14 DAT 4 leaf) - OSWEGO

POST-Emergent Herbicides: Chateau 2 oz + Goaltender 2 fl oz



Killed 6-8 inch pigweed; Lamb's quarters untouched

POST-Emergent Herbicides: Chateau Timing for Yellow nutsedge



Nutsedge 1-2" tall

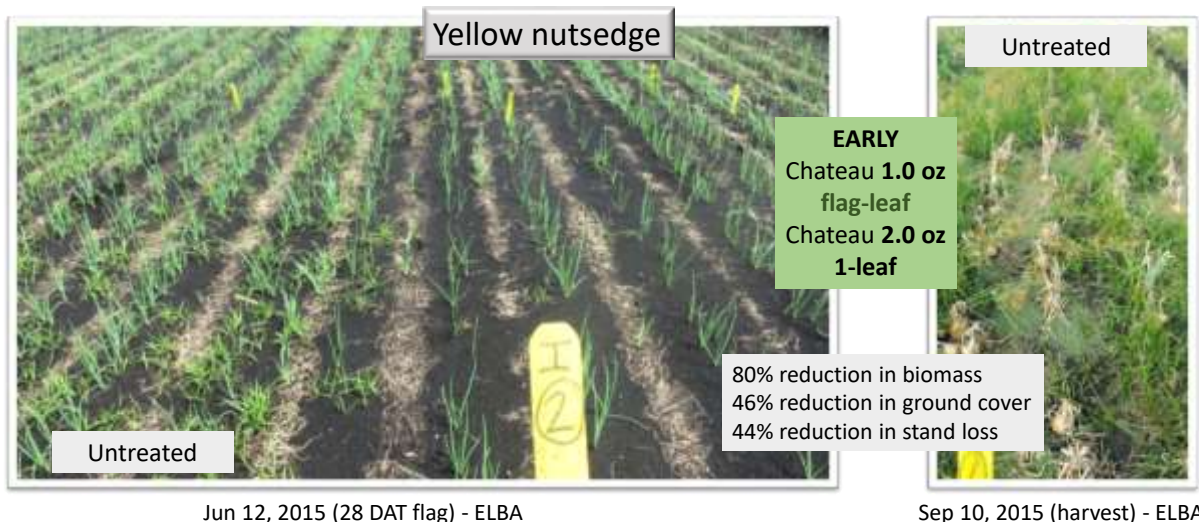
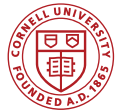


No rhizomes or
new shoots



Once YNS produces side-shoots and rhizomes, it more readily grows back

POST-Emergent Herbicides: Chateau Timing for Yellow nutsedge



POST-Emergent Herbicides: Chateau vs. Goal 2XL for Yellow nutsedge



Yellow nutsedge



Untreated

BEST!

Chateau is better than Goal 2XL



4. Chateau 1.0 oz @ flag+
Chateau 2.0 oz @ 1, 2, 3, 4, 6 leaf
Goal 2XL 4 fl oz @ 7-8 leaf

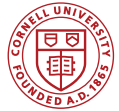
*Transplant
timings*



5. Goal 2XL 1 fl oz @ flag+
Goal 2XL 2 fl oz @ 1-leaf
Goal 2XL 4 fl oz @ 2, 3, 4, 6, 7-8 leaf

Jul 22, 2015 (14 DAT last app) - ELBA

POST-Emergent Herbicides: Chateau Timing for Yellow nutsedge

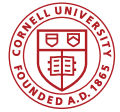


No.	Product and rate (per acre)	Timing to onions	Visual Onion Injury (%) Jun-17	Overall Weed Control (%) Jun-17
3	Almost Legal: Chateau 2 oz Chateau 1 oz Goal 2XL 4 fl oz as needed until 45 d PHI	➡ 2-leaf 3-leaf 4, 6 & 7-8 leaf	6 bcd	33 b
9	Chateau Early: Chateau 2 oz Chateau 1 oz Goal 2XL 4 fl oz as needed until 45 d PHI	➡ 1-leaf 2-leaf 3, 4, 6 & 7-8 leaf	7 bcd	63 a
4	As much Chateau as onions can take Chateau 1 oz Chateau 2 oz as needed until 6-leaf Goal 2XL 4 fl oz as needed until 45 d PHI	flag 1, 2, 3, 4 & 6 leaf 7-8 leaf	9 bcd	63 a

Double
YNS control

- Applying first Chateau 2 oz at 1-leaf while YNS < 2 inch doubled overall control compares to waiting until 2-leaf
- Onions survived 5 applications of Chateau from flag to 6-leaf without significant injury

POST-Emergent Herbicides: Chateau Timing for Yellow nutsedge



2-leaf onions



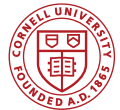
Chateau 2.0 @ 1-leaf



Nutsedge too big at 2-leaf

Nutsedge gets too big if you wait until 2-leaf to apply Chateau.

POST-Emergent Herbicides: Buctril 2EC – High vs. Split



Ragweed



1st: Buctril 12 fl oz



1st: Buctril 8 fl oz
2nd: Buctril 4 fl oz

High-Low is the way to go!

JUN 7, 2016 (7 DAT 1-leaf) - ELBA

POST-Emergent Herbicides: Buctril 2EC + Goal 2XL



Ragweed

JUN 15, 2018; 6 DAT 2-leaf (onions 3-leaf) - LINWOOD

JUN 7, 2016 (7 DAT 1-leaf) - ELBA



Buctril 8 fl oz + Goal 2XL 4 fl oz (3-leaf)
Buctril 4 fl oz + Goal 2XL 4 fl oz (4-leaf)

Treatment	Crop Stage	Visual Onion Injury (%)	Overall Ragweed Control (%)	Ragweed Mortality (%)
Buctril 2E 8 fl oz	2-leaf	3.7	47	12
Buctril 2EC 8 fl oz	2-leaf	8.0	69	34
+ Goal 2XL 4 fl oz	2-leaf			
Buctril 2EC 8 fl oz	2-leaf	3.3	72	25
+ Goaltender 2 fl oz	2-leaf			
Buctril 2EC 4 fl oz	2-leaf	5.3	65	18
+ Goal 2XL 4 fl oz	2-leaf			

Buctril 2E 8 fl oz at 2-leaf was safe

POST-Emergent Herbicides: Buctril 2EC + Goal 2XL



Ragweed



Untreated



Hand weeded



Buctril 8 fl oz
2- & 3-leaf



Buctril 8 fl oz
+ Goal 2XL 4 fl oz
2- & 3-leaf



Buctril 8 fl oz
+ Goaltender 2 fl oz
2- & 3-leaf



Buctril 4 fl oz
+ Goal 2XL 4 fl oz (2-leaf)
Buctril 8 fl oz
+ Goal 2XL 4 fl oz (3-leaf)

JUL 5, 2018; 18 DAT 3-leaf - LINWOOD

Hoepting, 2018

POST-Emergent Herbicides: Buctril 2EC + Goal 2XL



Do not look at onions! Poor emergence not a treatment effect



Untreated



Goal 2XL 4 fl oz
2-leaf



Buctril 8 fl oz
2-leaf



Buctril 8 fl oz
+ Goal 2XL 4 fl oz
2-leaf

JUN 13, 2018; 9 DAT 2-leaf - ELBA

Hoepting, 2018

Lamb's quarters

Note: Lamb's quarters already too big at first app

Future Weed Control in Muck Onion Bicyclopyrone Revolutionary



- New active ingredient
- WSSA MOA group 27 (no other 27 in onions)
 - Recently registered by Syngenta in two pre-mixes for corn, Acuron and Acuron Flexi
 - Under development as a single active for use in vegetables.
- Efficacy
 - PRE control of grasses and selected broadleaf weeds.
 - Activity on ragweed and mustards
 - POST control of selected broadleaf weeds
 - activity on pigweed, ragweed, marsh yellowcress, Lady's thumb
 - Weak on Lamb's quarters, wild buckwheat and field pennycress
- Very good crop safety
- Excellent tank mix partner with Buctril 2EC and Chateau
- Will have maximum 3.4 fl oz per app and per season; 45 day PHI



Welcome bicyclopyrone

- To Revolutionize Weed Control in Muck Onion



Ragweed

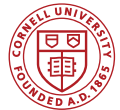
11. Bic 6.8 fl oz + Buctril 4E 8 fl oz (3-leaf)
Bic 6.8 fl oz + Buctril 4E 4 fl oz (4-leaf)

23. Bic 6.8 fl oz
+ Chateau 2.0 oz (2-leaf)

Welcome bicyclopyrone

- Tank mix partner

Lady's thumb



Oswego 2017	Visual Onion Injury %		% Weed Control Jul 12	Yield (lb /plot)
	7 DAT 1st	Jul 14		
Buctril 2EC 8 fl oz @ 2.5-leaf Buctril 2EC 4 fl oz @ 5-leaf (2 week)	0.0 d	0.0	77.6 ab	19.3
Buctril 2EC 8 fl oz + Goaltender 2 fl oz @ 2.5-leaf Buctril 2EC 4 fl oz + Goaltender 2 fl oz @ 5-leaf (2 wk)	5.0 cd	5.0	88.3 ab	24.6
Buctril 2EC 8 fl oz + Bic 3.4 fl oz @ 2.5-leaf Buctril 2EC 4 fl oz + Bic 3.4 fl oz @ 5-leaf (2 week)	9.3 bc	3.3	98.7 ab	21.0
Bic 3.4 fl oz @ 1-leaf Bic 6.8 fl oz @ 2.5 leaf (1 week)	9	0	100	17.1
Chateau 2 oz + Bic 3.4 fl oz @ 2.5 leaf Chateau 1 oz + Bic 3.4 fl oz @ 5 leaf (2 weeks)	10	5	100	22.0
Chateau 2 oz @ 2.5 leaf Chateau 1 oz @ 4-leaf (1 week)	11	1	20	17.4

Welcome bicyclopyrone

- Tank mix partner



Lady's thumb



Buctril 2EC 8 fl oz (2.5leaf)
Buctril 2EC 4 fl oz (5 leaf)



Buctril 2EC 8 fl oz
+ Goaltender 2 fl oz (2.5leaf)
Buctril 2EC 4 fl oz +
Goaltender 2 fl oz (5 leaf)

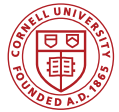


Buctril 2EC 8 fl oz
+ Bic 3.4 fl oz (2.5 leaf)
Buctril 2EC 4 fl oz
+ Bic 3.4 fl oz (5 -leaf)

Jul 12 2017 (14 DAT 4-leaf) - OSWEGO

Welcome bicyclopyrone

- Tank mix partner



Lady's thumb



Chateau 2 oz 2.5-leaf
Chateau 1 oz 5-leaf



Bic 3.4 fl oz (1-leaf)
Bic 6.8 fl oz (2.5 leaf)



Chateau 2 oz + Bic 3.4 fl oz (2.5-leaf)
Chateau 1 oz + Bic 3.4 fl oz (5-leaf)

Jul 12 2017 (14 DAT 4-leaf) - OSWEGO

yield reduction

Welcome bicyclopyrone

- Tank mix partner



Ragweed

JUN 15, 2018; 6 DAT 2-leaf (onions 3-leaf) - LINWOOD

Treatment	Crop Stage	Visual Onion Injury (%)	Overall Ragweed Control (%)	Ragweed Mortality (%)
Buctril 2E 8 fl oz	2-leaf	3.7	47	12
Buctril 2EC 8 fl oz	2-leaf	8.0	69	34
+ Goal 2XL 4 fl oz	2-leaf			
Buctril 2EC 8 fl oz	2-leaf	6.0	97	89
+ Bic 3.4 fl oz	2-leaf			
Buctril 2EC 4 fl oz	2-leaf	6.0	94	45
+ Bic 3.4 fl oz	2-leaf			

BEST!

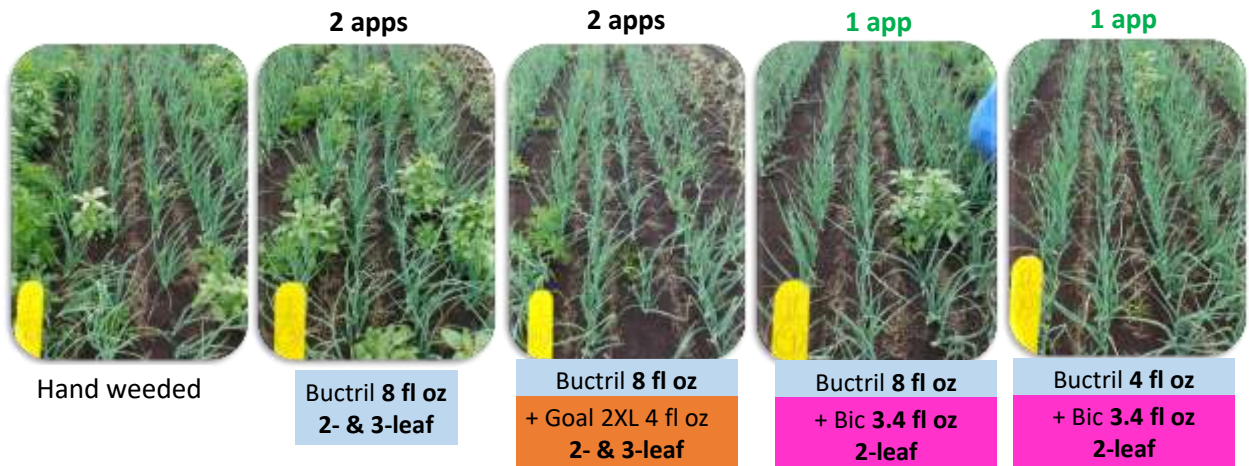
Buctril 2E 8 fl oz at 2-leaf was safe

Welcome bicyclopyrone

- Tank mix partner



Ragweed



JUL 5, 2018; 18 DAT 3-leaf - LINWOOD

Hoeping, 2018

Weed Control in Onions Comes Down to:



Would you rather?

- A) Prevent weed escapes with a heavy PRE-emergent program?
 - May cause stunting, reduced stand
 - Minimize Post-emergent weed control efforts (herbicides & hand weeding)
- B) Let onions come up healthy and strong at risk of having more weed escapes that will need to be controlled?
 - Potentially cause more injury with POST-herbicides
 - And/or more money with hand weeding
- Know your weed pressure, strengths & weaknesses of your herbicides and build a program accordingly
 - Make adjustments according to weather conditions

Other Onion Weed Control Research



- Stinger (a.i. imidacloprid) – WSSA Group 4 growth regulator
 - Perennial sow thistle
 - Ragweed
 - Tank mixes and programs with other POST herbicides
- Nortron (a.i. ethofumesate) – WSSA Group 8
 - Mostly as a tank mix partner for improved POST weed control
- Zidua (a.i. pyroxasulfone) – WSSA Group 15
 - PRE-emergent weed control
- Reflex (a.i. fomesafen) – WSSA Group 14
 - PRE- and POST-emergent control, mostly ragweed
- Dual Magnum (a.i. metalochlor) – WSSA Group 15
 - Fall application for control of yellow nutsedge



Questions? What Caught Your Attention?

Christy Hoepting

585-721-6953

cah58@cornell.edu

Website: <http://cvp.cce.cornell.edu/>

