

Forage Seed Research Update

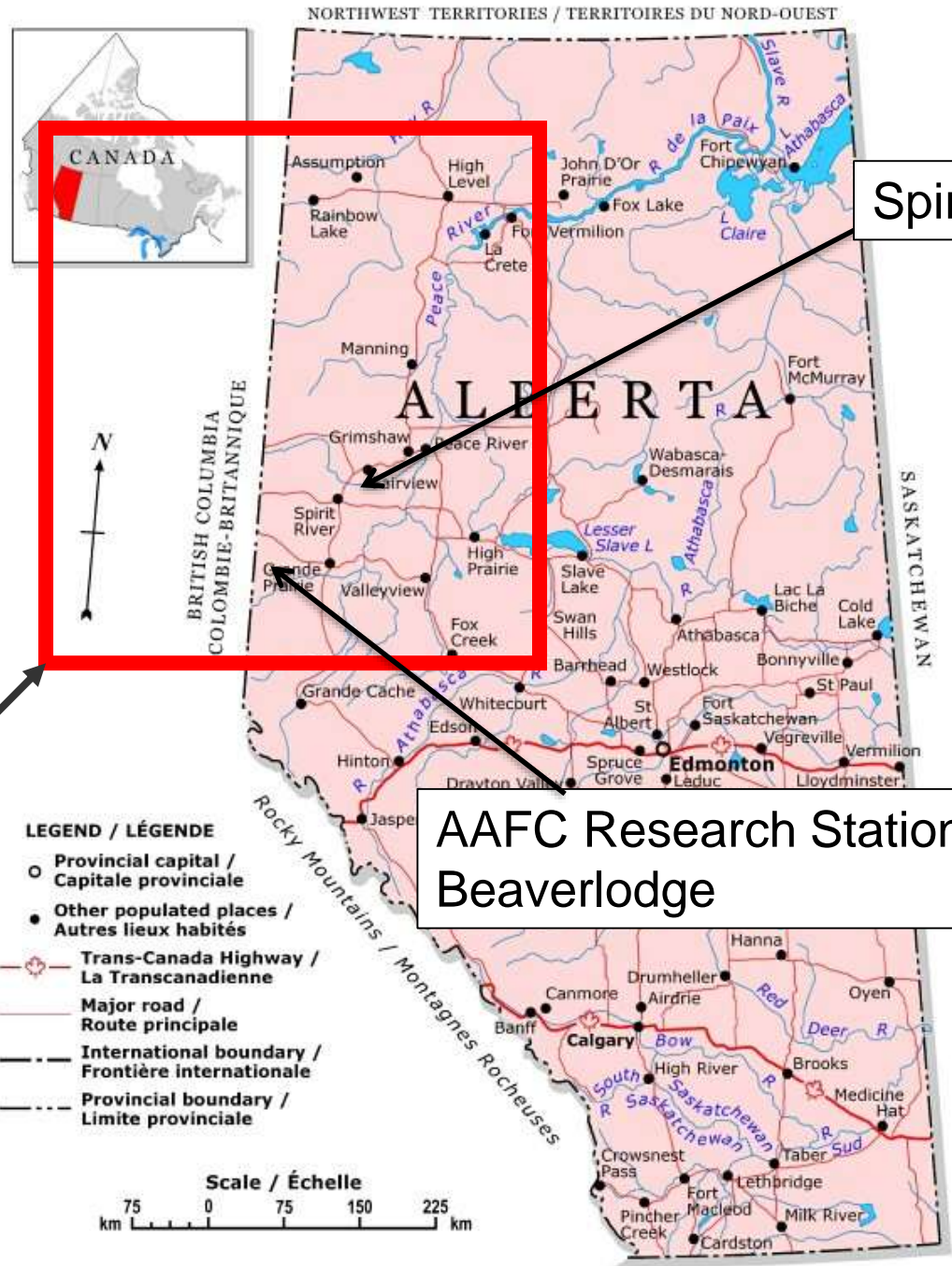
Jan 17th, Saskatoon

Calvin Yoder, Forage Seed Specialist

Alberta Agriculture and Forestry, Spirit River



Peace River Region of Alberta and BC



Spirit River

AAFC Research Station -
Beaverlodge

Peace Region Grass and Legume Seed Research

- Herbicide tolerance trials on grasses and legumes
- Growth regulators on grasses and clover
- Weed control and fungicide studies
- Fertility studies
- Clover desiccation trials
- Insect surveys
- Grass seed testing trial



Research Staff and Resources in the Peace

- Nitya Khanal - Seed Production Program, AAFC
- Jennifer Otani – Entomologist, AAFC
- Calvin Yoder, AAF
- Talon Gauthier, PRFSA
- Peace Region Forage Seed Association
(www.peaceforageseed.ca)

Topics

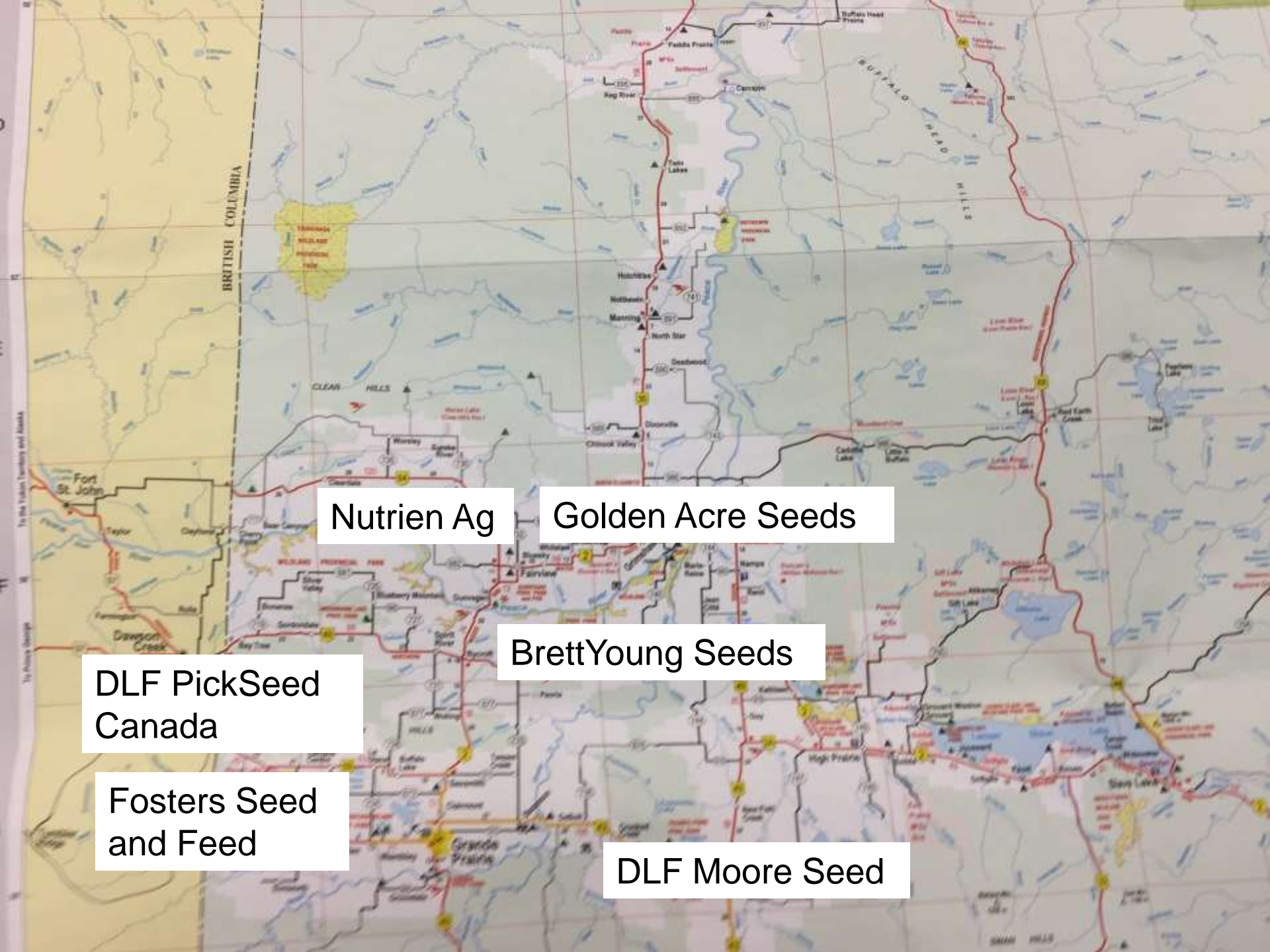
- Peace Region Update
- Herbicide Tolerance Trials and Minor Use Registrations
 - Seedling and established grasses
 - Seedling and established clovers
 - Pre-harvest dessicants for clovers
- Growth Regulators on grasses and clovers



Turf and Forage Seed In The Peace River Region (AB and BC)

YEAR	Seed Sold million lbs	Farm Gate Value million \$
2008	80.6	45.4
2009	51.0	27.1
2010	41.8	20.0
2011	55.1	29.3
2012	50.9	32.5
2013	49.5	37.4
2014	52.7	40.3
2015	54.8	45.5
2016	48.8	43.7
2017	61.6	55.5





BRITISH COLUMBIA

Nutrien Ag

Golden Acre Seeds

BrettYoung Seeds

DLF PickSeed
Canada

Fosters Seed
and Feed

DLF Moore Seed

Herbicide Tolerance Trials and Minor Use Process

Identify Potential Products and Weed Issues

Priorize List With AB, Sask and Manitoba

Residue Data

Conduct Tolerance Trials

Minor Use Priority Setting Meeting in Ottawa

Submit Reports to PPMUC

AAFC Pest Management Centre

Minor Use Submitted

Trials Conducted

Product Approved

Minor Use Submitted

Product Approved

Add Additional Species

Herbicide Tolerance Trials on Forage Seed Crops



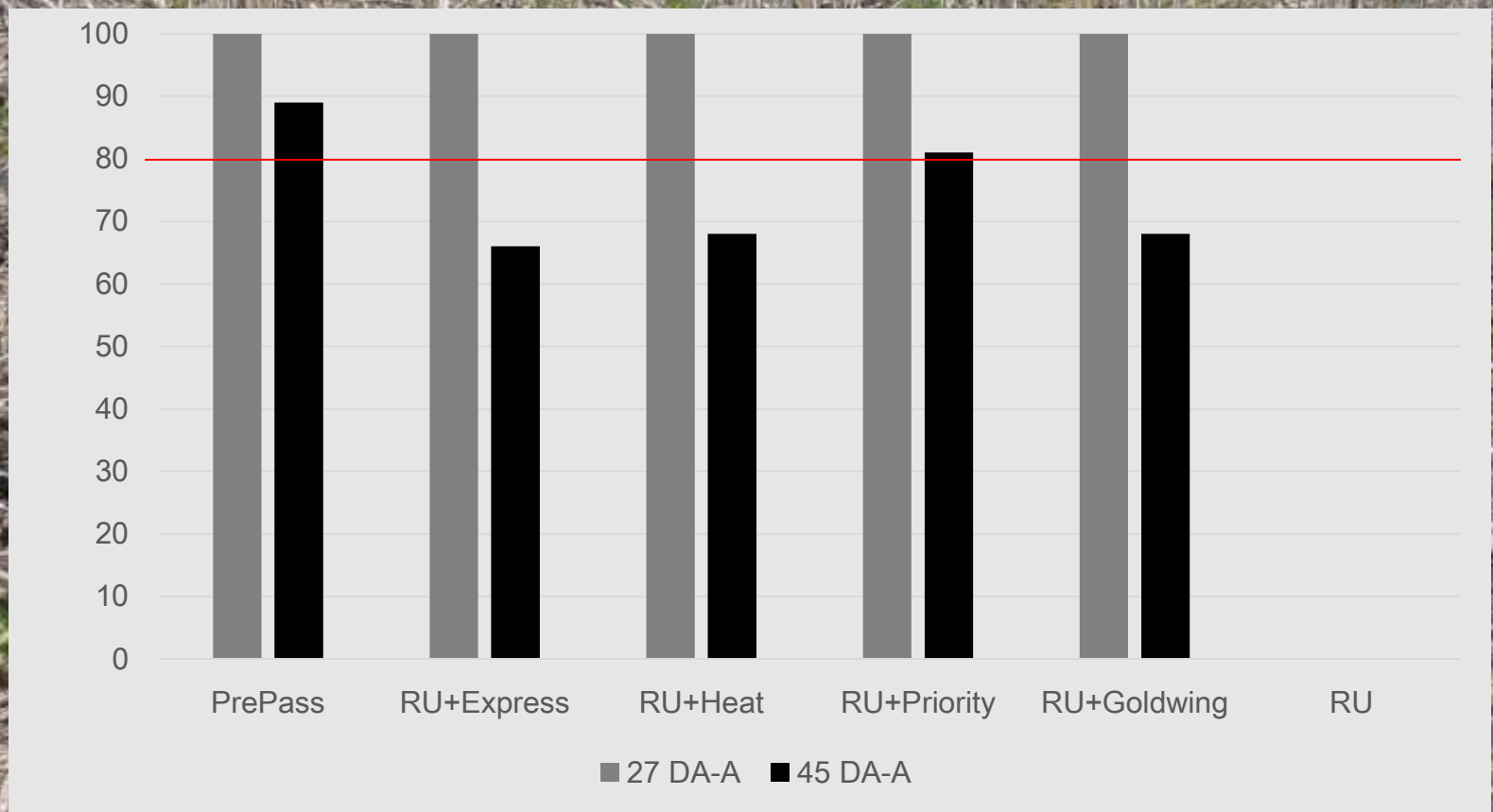
Herbicide Tolerance Trials on Grass and Legume Seed Crops

- Test new herbicides on grass and legume seed crops
- Apply 1 and 2 x recommended rate used in annual crops
- Small plot replicated trials
- Collect seed and dry matter yield
- Collect 1000 kwt and germination on established trials.
- Usually need a minimum of 3-4 trials to submit for a minor use registration
- Co-ordinate trials and data with Sask. and Manitoba

Pre-seed Herbicides When Direct Seeding GRASSES Into Stubble

- **Glyphosate alone**
- **Glyphosate+MCPA or 2,4-D**
- **PrePass XC**
 - Minor Use Registration on creeping red fescue, timothy, smooth brome grass and meadow brome grass. Submission made to add crested wheat grass and meadow fescue.
- **Glyphosate+Express SG**
 - Minor Use Registration on creeping red fescue, timothy, smooth brome grass and meadow brome grass. Submission made to add crested wheat grass, slender wheat grass, meadow fescue, tall fescue and hybrid brome grass.
- **Heat (saflufenacil)+Roundup**
 - Minor Use Registration on Bromegrasses, timothy and creeping red fescue.
- **Initiated tolerance trials in 2016, 2017 and 2018 using HotShot (florasulam+bromoxynil) and Goldwing (pyraflufan+MCPA ester) tank mixed with glyphosate as pre-seed prior to seeding grasses.**
- **Tested ai pyroxasulfone applied prior to seeding grasses. High level of damage.**

% Control of RR Canola Applied Prior to Seeding Smooth Bromegrass, Falher 2018.



Visual % Control of RR CANOLA Following Applications of Herbicides Applied Prior to Seeding Grasses

Treatment	Webster 2014	Grimshaw 2010	Falher 2008	Baldonnel 2008	Blueberry 2004
Glyphosate	0	0	0	0	0
Heat+Glyphosate 1x	78	41	N/A	N/A	N/A
Heat+Glyphosate 2x	88	N/A	N/A	N/A	N/A
Express+Glyphosate	69	65	80	90	63
MCPA ester+ Glyphosate 1x	81	64	85	88	63
Pre-Pass	95	95	93	100	98
2,4-D + Glyphosate	N/A	N/A	82	80	N/A

Broad-leaved Herbicides on SEEDLING Grasses

- MCPA ester*
- Lontrel*
- Buctril M*
- Attain*
- Curtail M
- Prestige XC*
- Refine SG (CRF only)
- Spectrum*
- Infinity*

* Minor Use Registration

Minor Use Applications Submitted

- Stellar (8 grass species)

Selected Minor Use Priority (AAFC)

- Enforcer M on Smooth brome grass
- Pixxaro on Timothy (2016)
- Cirpreme XC on Timothy (2018)

Collecting Data

- Paradigm (halauxifen/florasulam) +MCPA ester on 7 grasses
- Pixxaro (halauxifen/fluroxypyr/MCPA) on 7 grasses
- Enforcer M on 7 grasses
- Infinity FX and Infinity FX+MCPA ester on 7 grasses

Weed Control With Several Herbicides Applied to Seedling Grass Seed Stands 2016 and 2017

Methods

- 2016 on seedling meadow brome grass (Rycroft) and 2017 on seedling creeping red fescue (Hythe)
- Herbicides applied at 2-5 leaf stage
- Visual % weed control ratings taken 10 -14 DA-A and 30 DA-A
- Weeds: Volunteer canola, wild buckwheat, lamb's quarters, cleavers, hemp-nettle, narrow-leaved hawk's beard.
- Treatments
 - Check
 - Refine SG
 - Stellar
 - Enforcer M
 - Infinity + AS
 - Infinity FX
 - Infinity FX+MCPA ester
 - Pixxaro
 - Paradigm+MCPA ester

A photograph of a field with sparse, dry grass and some green weeds. A vertical red line is drawn across the center of the image. To the left of the line is a white box with the word 'Stellar' in black text. To the right of the line is a white box with the word 'Infinity' in black text. The ground is sandy and covered with dry plant matter.

Stellar

Infinity



SUMMARY TO DATE ON WEED CONTROL IN SEEDLING GRASS SEED STANDS

- All products tested to date are generally decent and have good control of annual weeds.
- Infinity FX and Infinity FX+MCPA ester show good activity on a wide range of annual weeds. Works quickly on weeds but some weeds do outgrow some of the initial damage. May also see some leaf burn on seedling grasses but they outgrow it quickly.
- Stellar is a nice option. If PrePass was used prior to seeding may want to consider herbicides without florasulam.
- Infinity FX, Stellar, Paradigm+MCPA ester and Pixxaro quite good on cleavers. Paradigm and Pixxaro also good on big cleavers.
- Long term fescue growers should avoid Refine SG on seedling stands. Consider other herbicides without Group 2 actives eg. Group 2 resistant NLHB
- If horsetail is present consider herbicides containing MCPA ester.

Grassy Weed Herbicides on SEEDLING Grasses

Creeping Red Fescue

- Achieve Liquid*
- Assure II*
- Poast Ultra*
- Horizon
- Axial**
- Puma

Wheatgrasses

- Achieve Liquid*
- Puma*

Perennial Ryegrass

- Puma Advance*

Tall Fescue

- Puma*

Brome-grasses

- Achieve Liquid*
- Puma*
- Axial**

Meadow Fescue

- Puma

Timothy

- Nothing

*Minor Use Registration

** Minor Use Submitted

Herbicide Tolerance Trials on Established Grass and Legume Seed Crops

- Test new herbicides on grass and legume seed crops
- Apply 1 and 2 x recommended rate used in annual crops
- Small plot replicated trials
- Collect seed yield, 1000 kwt and germination.
- Usually need a minimum of 3-4 trials to submit for a minor use registration
- Co-ordinate trials and data with Sask. and Manitoba



Update on Tolerance of Grass And Legume Seed Crops to Herbicides March 2017

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The following is information on tolerance of grass and legume seed crops to herbicides that are applied at the recommended rate used in cereal, oilseed or pulse crops. Please note the information provided is a summary of products registered and products that show potential. The products that show potential are not registered. These products are currently being tested but results are limited at this point in time. The information is to be used as a guide only and is the information available at the time of printing. The authors involved in summarizing this information cannot be held responsible for publication errors or any consequences resulting from the use of this summary. Consult product labels for final detailed instruction before using any product.

Herbicides on Creeping Red Fescue for Seed Production SEEDLING (0-3 months after seeding)

Broadleaved Weed Herbicides		Grassy Weed Herbicides	
Registered	Potential	Registered	Potential
Attain	Curtail M	Achieve L	Axial
Banvel II (alone or with 2,4-D or MCPA)	DyVel DS	Assure II	Horizon
Basagran	Enforcer M	Avenge 200-C	Puma 120 Super
Buctril M	Frontline XL	Poast Ultra	
Embutox 625**	Frontline 2,4-D		
Infinity	Infinity FX		
Lontrel	Paradigm		
MCPA	Pixxaro		
Pardner	Stellar*		
Prestige XC	Target**		
Refine SG	Trophy		
Spectrum			
Target**			
2,4-D			
Tropotox Plus			

Notes:

- Ally should not be recommended for use on seedling creeping red fescue.
- 2,4-D applications in the fall (September) of the seedling year can result in 25-50% yield loss the following year.
- Select, Everest, Simplicity and Velocity can cause extensive damage to seedling creeping red fescue and should not be recommended.
- Enforcer M, Paradigm, Pixxaro and Infinity FX have shown good tolerance on seedling creeping red fescue in trials conducted to date.

ESTABLISHED (spring applications)

Broadleaved Weed Herbicides		Grassy Weed Herbicides	
Registered	Potential	Registered	Potential
Ally	Barricade	Assure II	
Attain	Curtail M	Assure II+Ally	
Banvel II	Enforcer M	Poast Ultra	
Banvel II+2,4-D	Frontline XL		
Infinity	Stellar*		
Lontrel	Trophy		
MCPA			
Prestige XC			
PP 23235			
Spectrum			
2,4-D			
Refine SG			

Notes:

- Spring applications of 2,4-D or Banvel can sometimes cause injury to creeping red fescue.
- Some tank mixes of a broadleaf herbicide and Assure II may result in reduced grassy weed control.
- Select causes extensive damage to established creeping red fescue and should not be recommended.
- Spring applications of quinclorac on established creeping red fescue have resulted in seed yield loss without visual damage.
- Equinox applied to established creeping red fescue reduced seed yields.

*Minor Use Proposal Submitted **Registered For Forage Production

Herbicides on Established Timothy

Broadleaved Herbicides

Registered

Attain
Buctril M
Curtail M
Infinity
Frontline XL
Lontrel
MCPA
Prestige XC
Spectrum
2,4-D

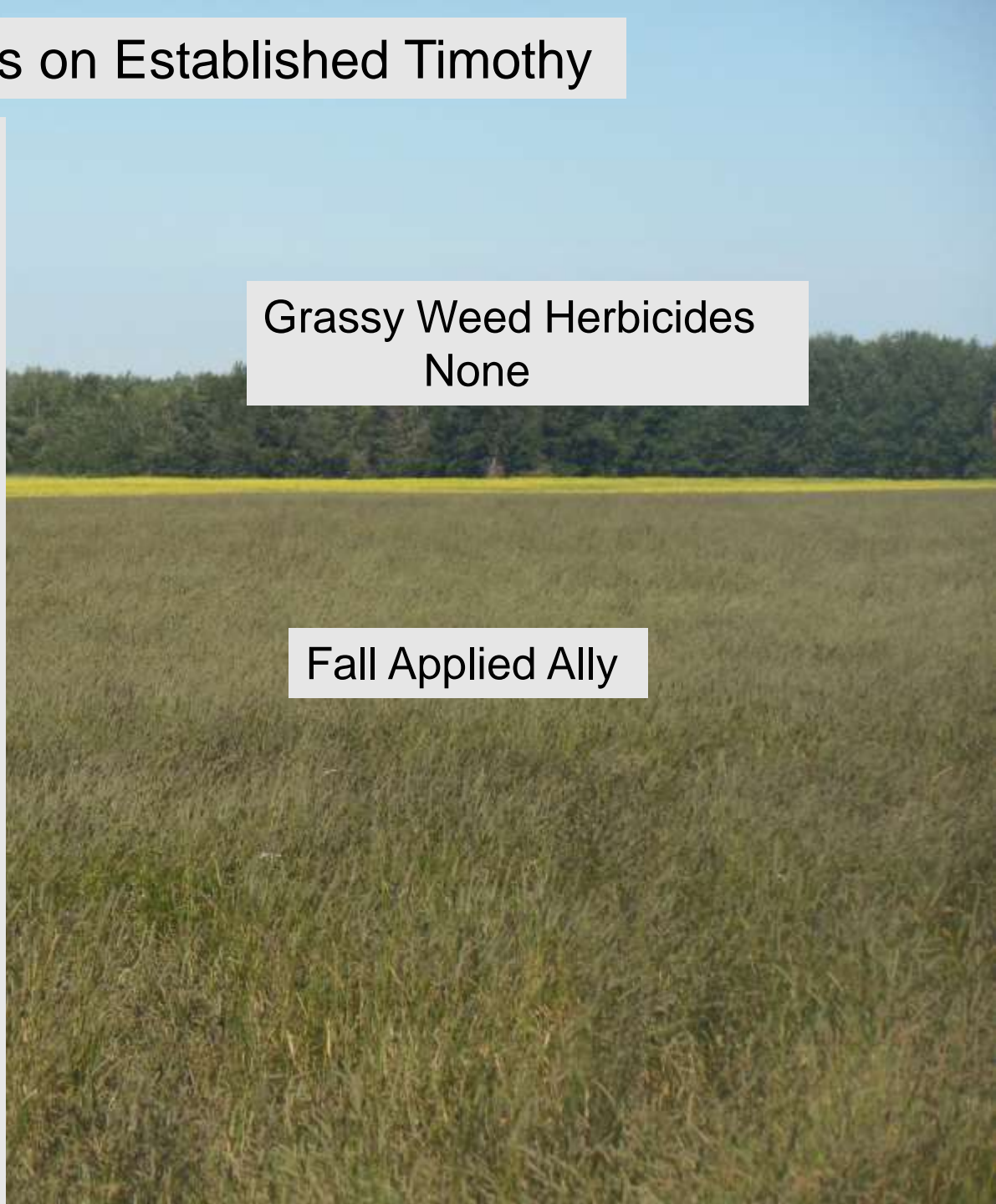
Minor Use Submitted
Stellar

Minor Use Priority (PMC)
Pixxaro
Cirpreme XC

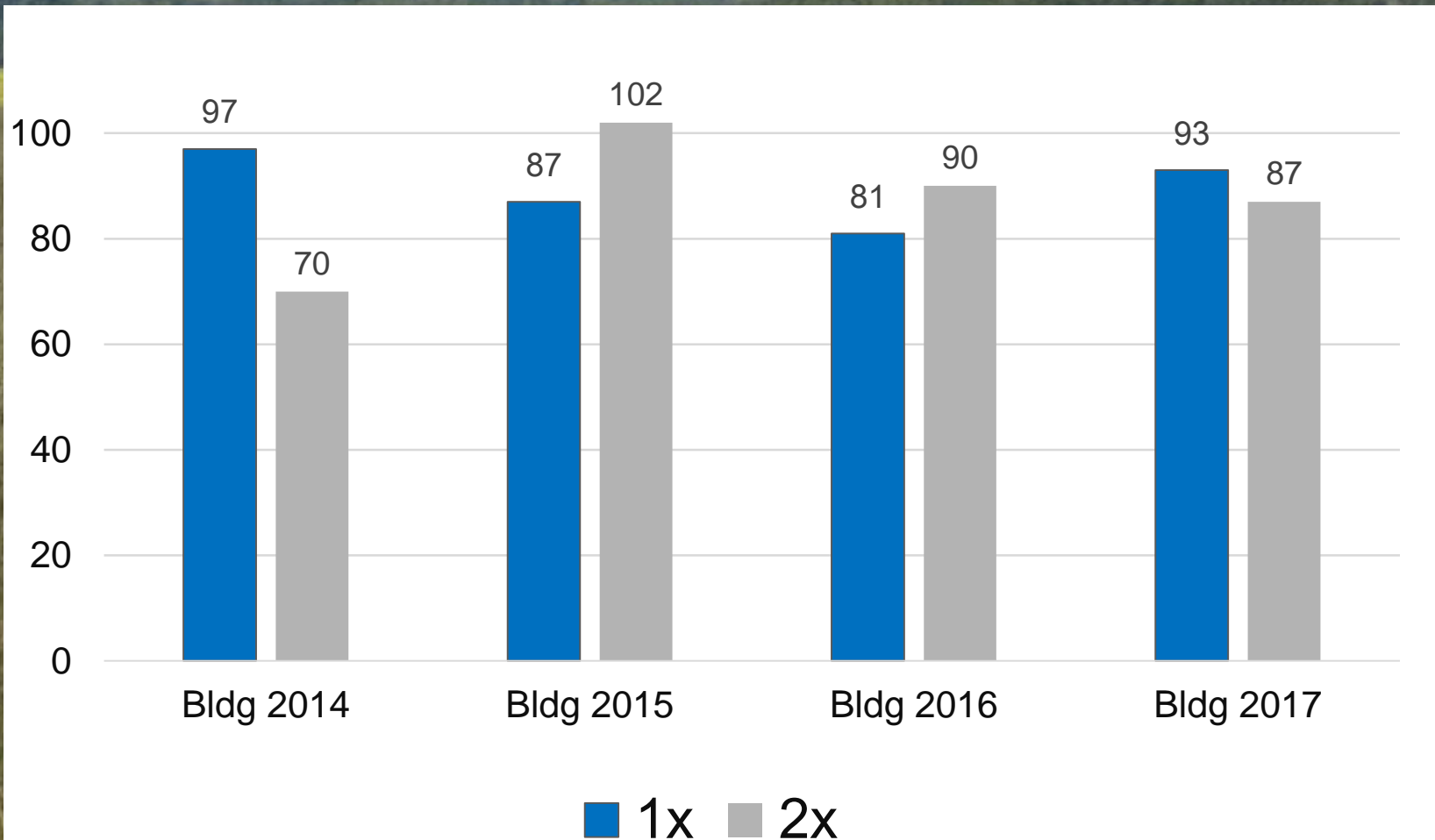
Collecting Data
Paradigm+MCPA ester
Pixxaro
Cirpreme XC

Grassy Weed Herbicides
None

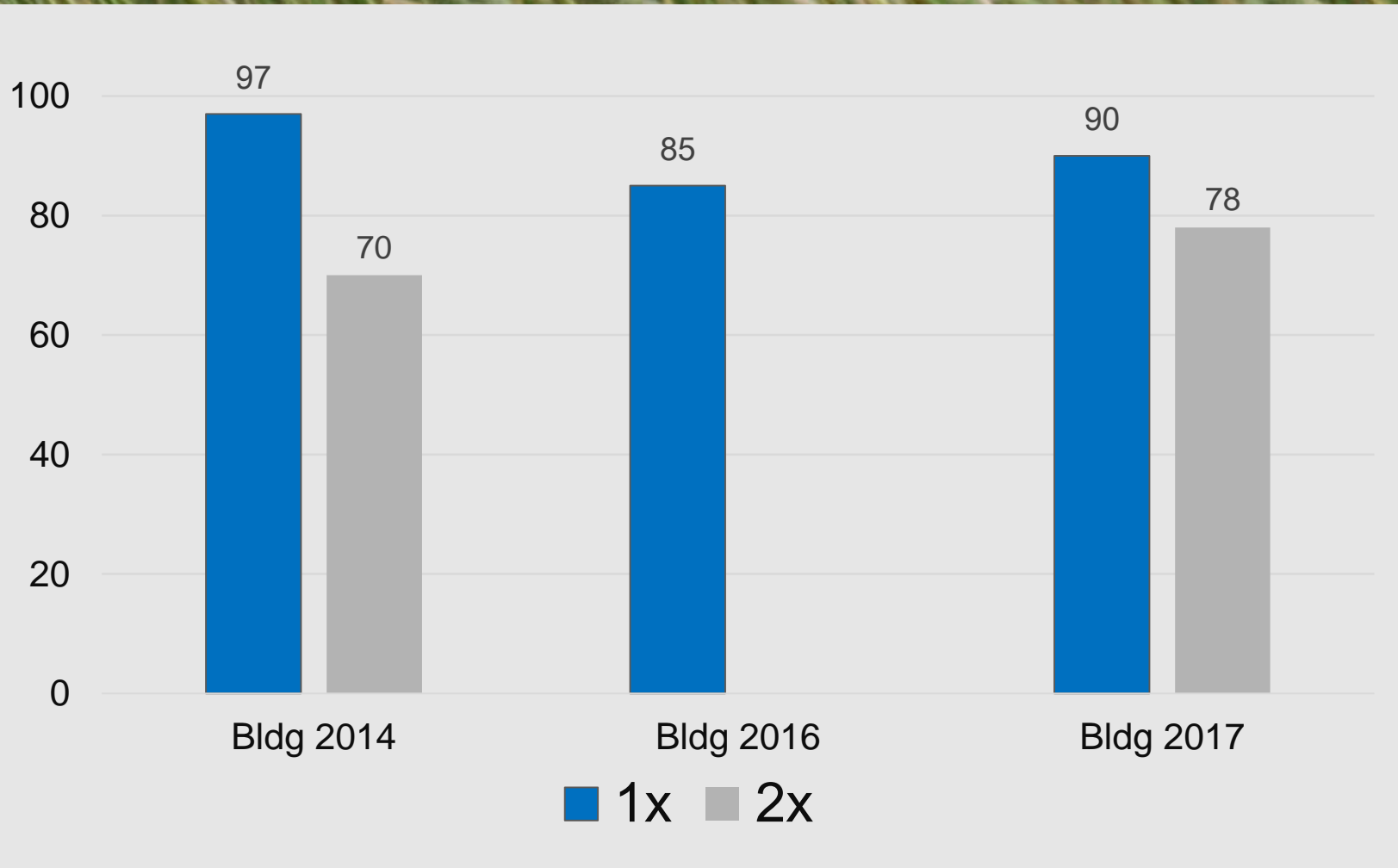
Fall Applied Ally



Tolerance of Established Timothy to Pixxaro (% of Check)



Tolerance of Established Timothy to Paradigm+MCPA (% of Check)



Herbicides on Established Bromegrasses

Broadleaved Herbicides

Registered

Attain
Infinity
Lontrel
MCPA
Prestige XC
Spectrum
2,4-D

Minor Use Submitted

Stellar

Minor Use Priority (PMC)

Enforcer M

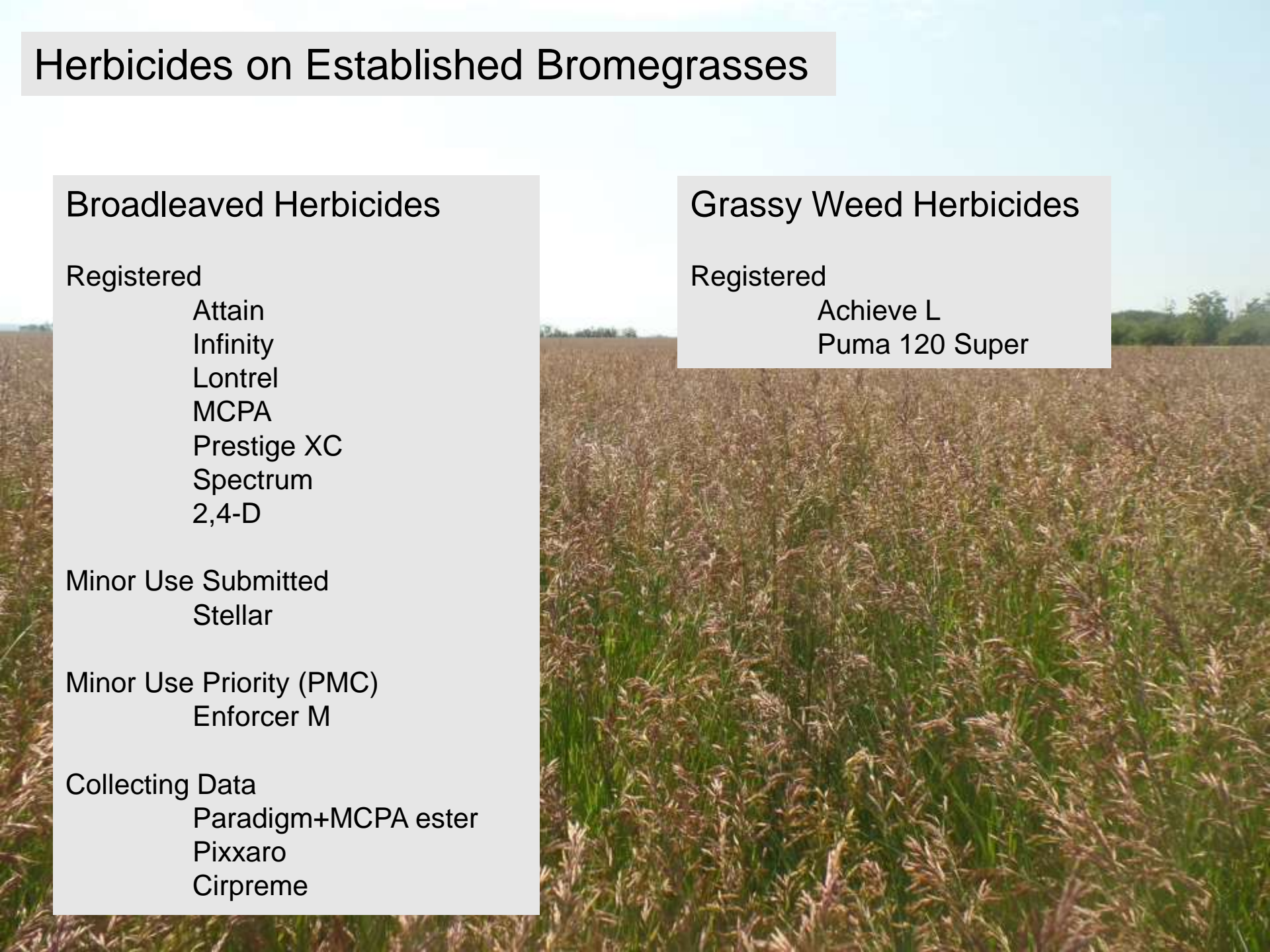
Collecting Data

Paradigm+MCPA ester
Pixxaro
Cirpreme

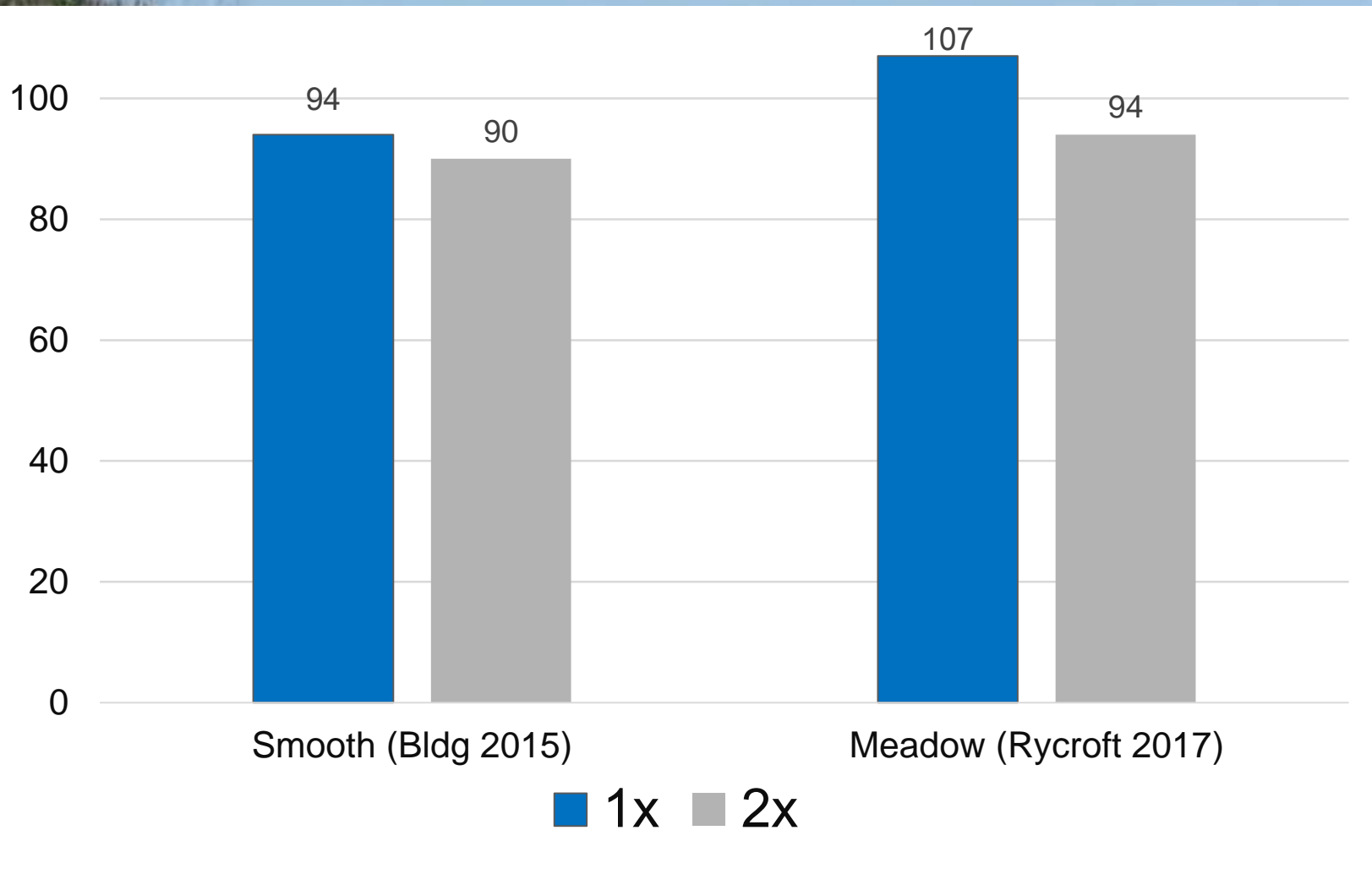
Grassy Weed Herbicides

Registered

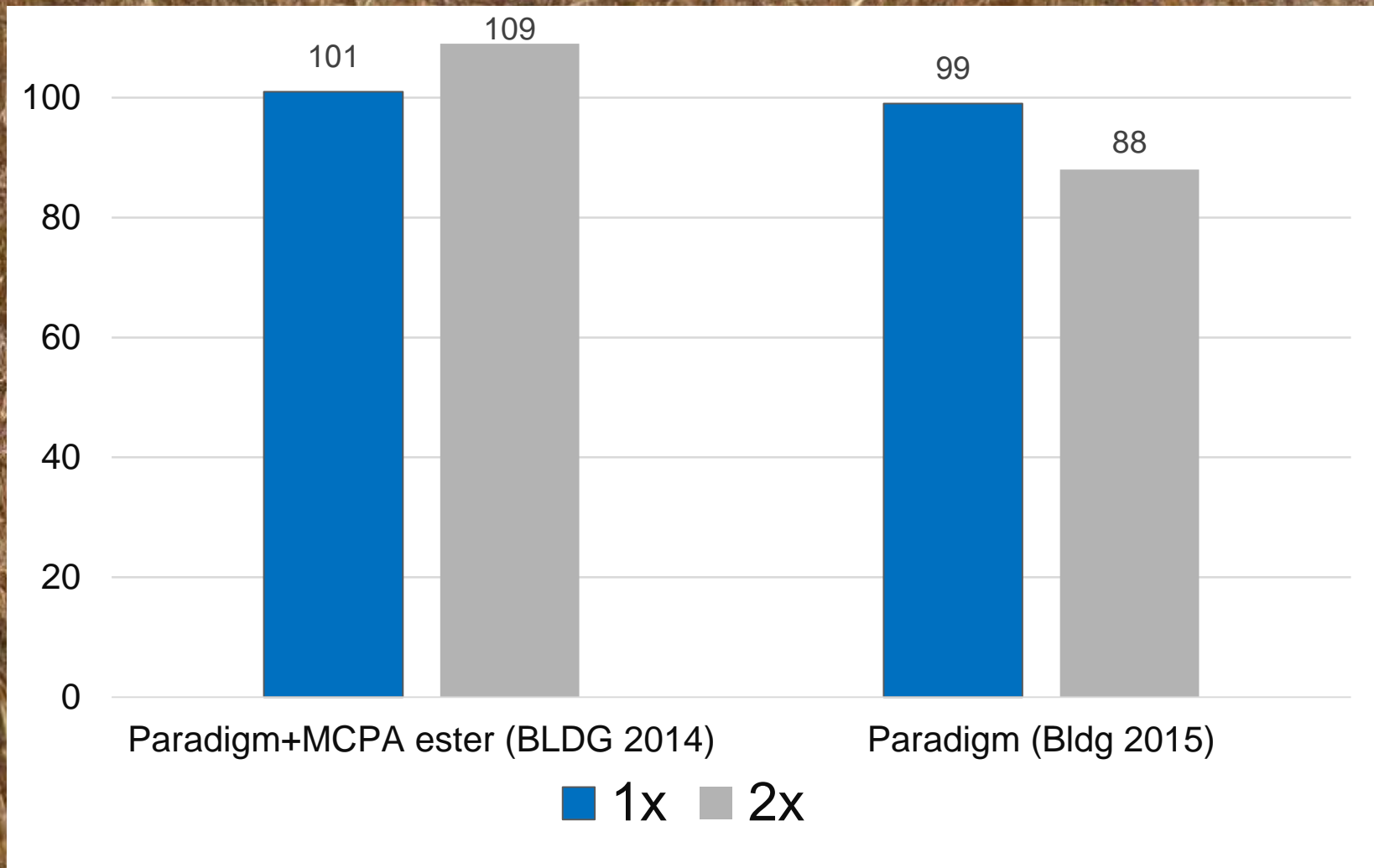
Achieve L
Puma 120 Super



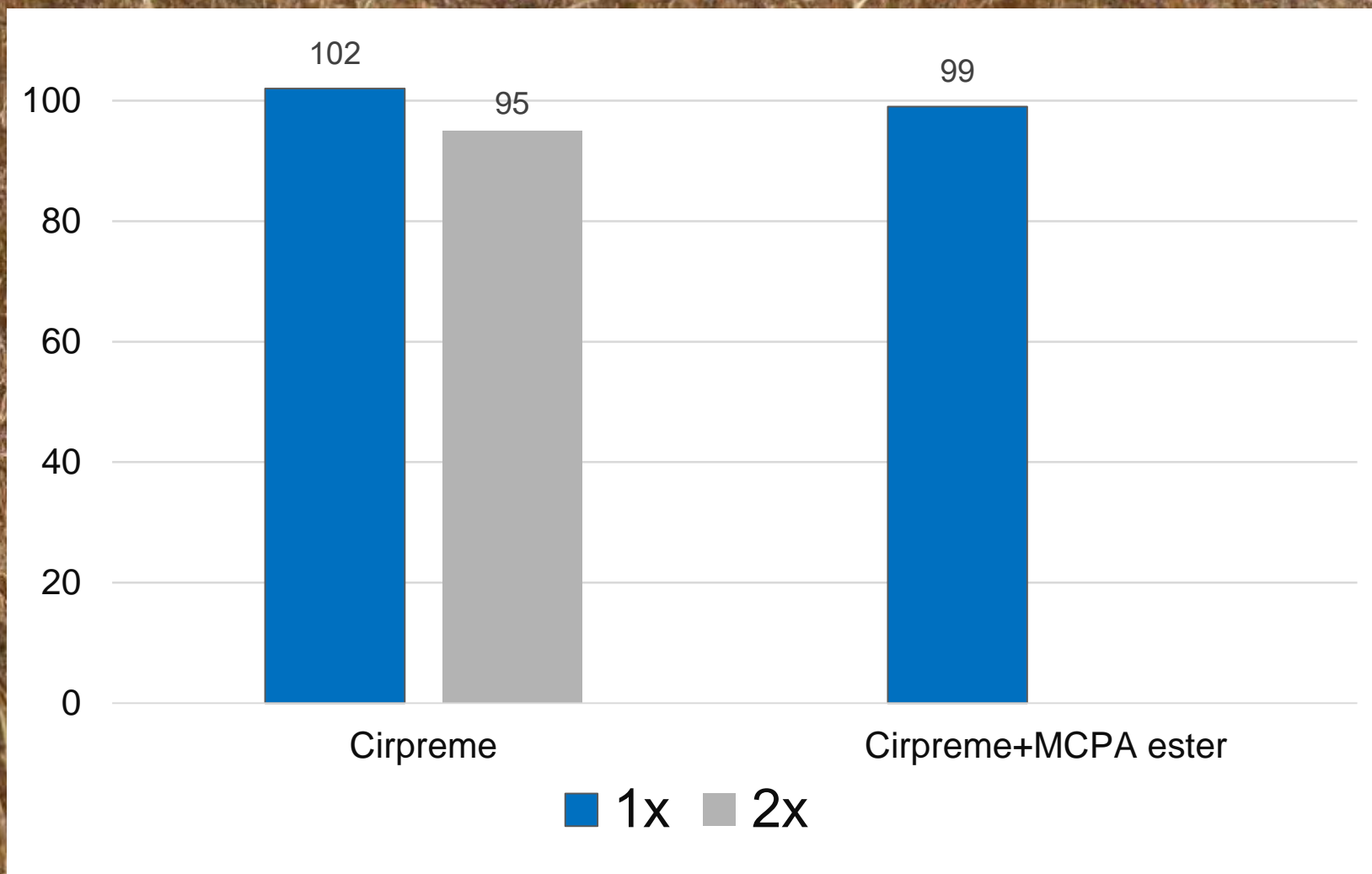
Tolerance of Established Bromegrass to Pixxaro (% of Check)



Tolerance of Established Smooth Bromegrass to Paradigm (% of Check)



Tolerance of Established Meadow Bromegrass to Cirpreme and Cirpreme+MCPA ester (% of Check), 2018



Established Perennial Ryegrass

Broadleaved Herbicides

Registered

Infinity

MCPA

Spectrum

2,4-D

Minor Use Submitted

Collecting Data

Grassy Weed Herbicides

Registered

Puma Advance EC

Assert 300 EC

Established Crested Wheatgrass

Broadleaved Herbicides

Registered

Ally
Attain
Lontrel
MCPA
Prestige XC
Refine SG
Spectrum
2,4-D

Potential Grassy Weed Herbicides

Achieve L

Minor Use Submitted

Collecting Data

Fall Weed Control on Grass Seed Stands

- Dandelions, clovers, narrow-leaved hawks'beard, winter annuals, Canada thistle?.

Fall Applied Herbicides

- Ally – timothy and creeping red fescue.
- Prestige XC
- Curtail M
- Spectrum
- Cirpreme???



Herbicide options and weed control ratings for fall spraying of creeping red fescue seed fields.

Herbicide	NLHB**	NLHB** (group 2 resistant)	Volunteer Clover	Dandelion	Canada Thistle	Rough Cinquefoil
Curtail M	Excellent	Excellent	Excellent	Poor	Poor to Fair	Excellent
Prestige	Excellent	Excellent	Excellent	Fair	Poor to Fair	Excellent
Spectrum	Excellent	Good	Excellent	Very Good	Poor to Fair	Fair
Ally	Excellent	Poor	Very Good	Excellent	Poor	Poor

*E=Excellent G=Good F=Fair P=Poor

**narrow-leaved hawks'beard



Red and Alsike Clover Tolerance to Pre-seed Herbicide Applications

- Express SG+glyphosate on label for pre-seed applications. Currently applying to add sweet clover as well.
- In field trials **Seedling Legumes** had exhibited good tolerance to Roundup+Heat pre-seed. Greenhouse studies by BASF showed damage so minor use submission was dropped.
- Pre-emergent applications are not advisable when seeding legumes if tank mixing with some broad-leaved herbicide.
- Conquer (carfentrazone+bromoxynil) + glyphosate???
- Conquer (pyraflufen+bromoxynil) + glyphosate???

Minor Use Registrations for Herbicides on SEEDLING Clover

Alsike Clover

- Basagran Forte
- Embutox
- Odyssey
- Tropotox Plus
- Achieve Liquid
- Assure II
- Poast Ultra
- Viper ADV*
- Axial*
- Puma Advance**
- Horizon**
- Solo

Red Clover

- Basagran Forte
- Embutox
- Odyssey
- MCPA amine
- Tropotox Plus
- Achieve Liquid
- Assure II
- Viper ADV*
- Axial*
- Poast Ultra**
- Puma Advance**
- Horizon**
- Solo

Sweet Clover

- Achieve Liquid
- Poast Ultra
- Assure II
- Odyssey
- Viper ADV*
- Basagran Forte**
- Puma Advance**
- Axial**
- Horizon**
- Solo

*In the process of Minor Use Registration

** Potential to register

Herbicides on ESTABLISHED Clovers

Alsike Clover

- Basagran Forte*
- Viper ADV*
- Assure II*
- Poast Ultra*

Red Clover

- Basagran Forte*
- Viper ADV*
- MCPA amine*
- Assure II*
- Poast Ultra

Sweet Clover

- Basagran Forte*
- Viper ADV
- Assure II*
- Poast Ultra

Viper+AssureII Tank Mix ???

*Registered As A Minor Use

Plant Growth Regulators on Red and Alsike Clover

- Trinexapac-ethyl (TE) applied at stem elongation increased red clover seed yields by up to 34% in Norway (Øverland and Aamalid, 2007) .
- TE has increased red clover seed yield under Oregon, and New Zealand conditions by 9 to 16% (Anderson, et. al. 2015).
- Reduction of canopy height, increase in flowers and earlier maturity.
- Parlay (TE) registered in Canada on perennial ryegrass grown for seed production.

6/28/2010

2013, 2104 and 2015 Trials

- Alsike and red clover seed fields
- Small plot replicated (2m x 40 m and 4 reps)
- Plant heights, flower counts, seed yield, 1000 kwts and germination.



Effects of Trinexapac-ethyl on Red Clover Seed Yields % of Check

Treatment (kg ai/ha)	Beaverlodge 2013	Girouxville 2013	Girouxville 2014	Girouxville 2015
0.140 Stem Elongation	+27	+18	0	+3
0.280 Stem Elongation	+10	+19	-31	+4
0.420 Stem Elongation	+38	+13	-36	+8

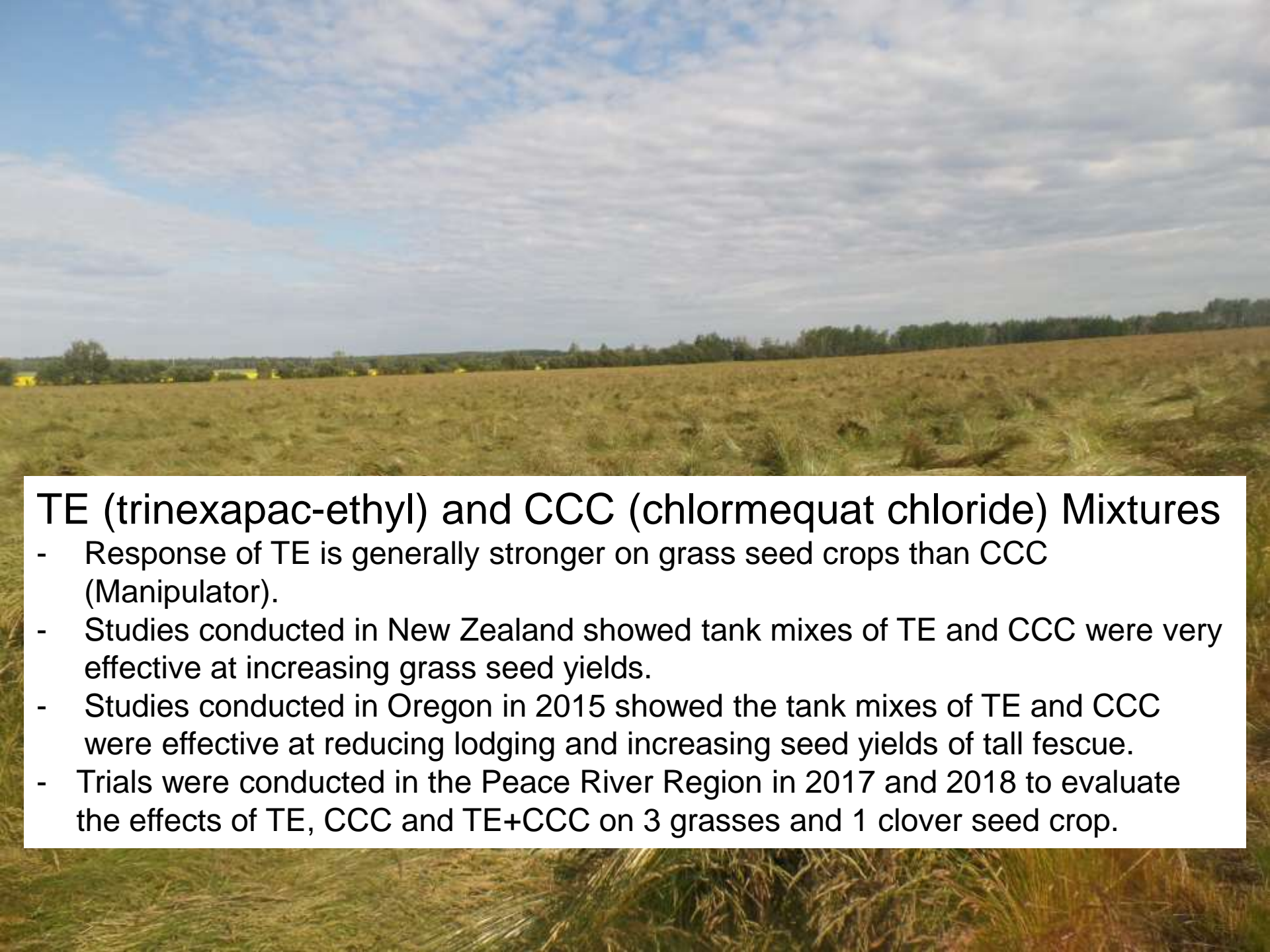
Red Clover – Girouxville 2014



Effects of Trinexapac-ethyl on Alsike Clover Seed Yields % of Check

Treatment kg ai/ha	Guy 2013	Girouxville 2014	Guy 2015
0.140 Stem Elongation	-2	-10	+9
0.280 Stem Elongation	0	-28	+8
0.420 Stem Elongation	-3	-45	+11

06/27/2010



TE (trinexapac-ethyl) and CCC (chlormequat chloride) Mixtures

- Response of TE is generally stronger on grass seed crops than CCC (Manipulator).
- Studies conducted in New Zealand showed tank mixes of TE and CCC were very effective at increasing grass seed yields.
- Studies conducted in Oregon in 2015 showed the tank mixes of TE and CCC were effective at reducing lodging and increasing seed yields of tall fescue.
- Trials were conducted in the Peace River Region in 2017 and 2018 to evaluate the effects of TE, CCC and TE+CCC on 3 grasses and 1 clover seed crop.

2017 TE + CCC on Red Clover (Guy, AB)

- Very strong and uniform stand.
- Underseeded with wheat in May 2016
- Plot size was 2 x 20 m, RCB with 4 reps.
- DATA COLLECTED: Plant height, lodging, flower count, seed yield, 1000 kwt and seed germination.
- TRTs applied on June 3 2017 at 2-3 node stage and 30 cm tall. Staging was a little on the late side.





Dessicated with Reglone on Sept 21 2017
Harvested on Oct 4th. Area harvested was 34 m².



TE on Red Clover 2017

Effect of TE and CCC on Red Clover Seed Crop, Guy 2017

Treatments kg ai/ha	Height cm	Lodging 0-10*	Flower Counts flowers per 1/4m ²	Seed Yield kg/ha	Germ. %	Seed Wt. g/1000
TE 0.140	87.2	10	272	412 a	75.0	1.900
TE 0.280	83.9	10	306	398 a	72.0	1.736
TE 0.140+ CCC 0.588	87.4	10	274	372 ab	71.0	1.768
CCC 1.116	89.2	10	264	304 b	75.8	1.758
Check	90.1	10	244	294 b	68.3	1.758
CV%	3.5	0	12.3	9.7	6.2	3.1
LSD P=.05	NSD	NSD	NSD	65	NSD	NSD

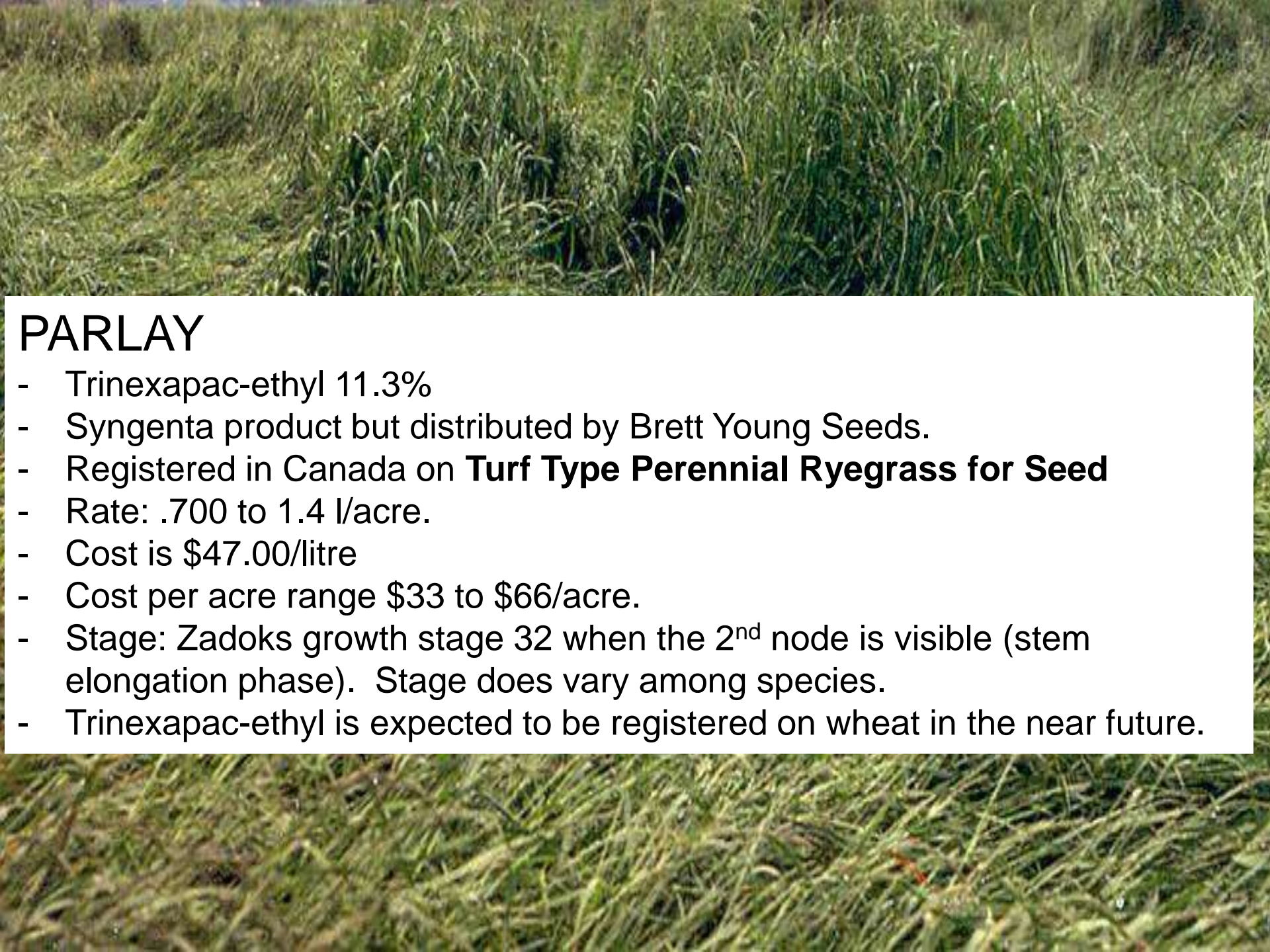
*(10 Is No Lodging)

Means followed by the same letter do not significantly differ (P=.05 Student-Newman-Keuls)

Growth Regulators on Grass Seed Crops

- Trinexapac-ethyl (TE) commonly used on grass seed crops in Oregon, Denmark and New Zealand.
- Shortens internodes which reduces lodging and improves pollination, seed set and harvesting.
- Increases seeds/spikelet and seeds/m².
- Leads to increases in seed yields.
- Parlay (trinexapac-ethyl) Syngenta product distributed by Brett Young Seeds is registered in Canada on perennial ryegrass for seed ONLY.
- TE is expected to be registered on wheat in 2019.



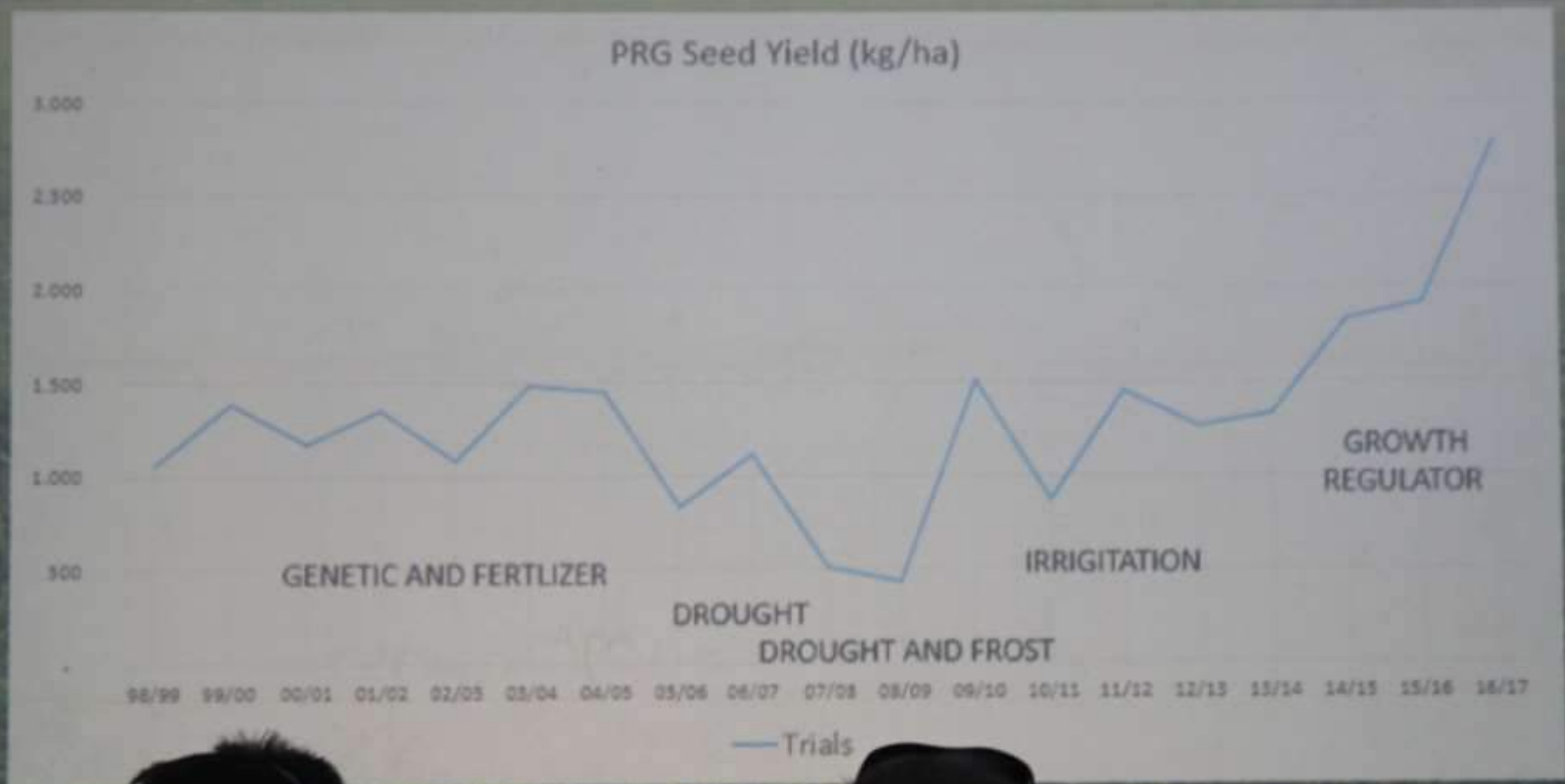


PARLAY

- Trinexapac-ethyl 11.3%
- Syngenta product but distributed by Brett Young Seeds.
- Registered in Canada on **Turf Type Perennial Ryegrass for Seed**
- Rate: .700 to 1.4 l/acre.
- Cost is \$47.00/litre
- Cost per acre range \$33 to \$66/acre.
- Stage: Zadoks growth stage 32 when the 2nd node is visible (stem elongation phase). Stage does vary among species.
- Trinexapac-ethyl is expected to be registered on wheat in the near future.

Grass Seed Production

Perennial Rye Grass



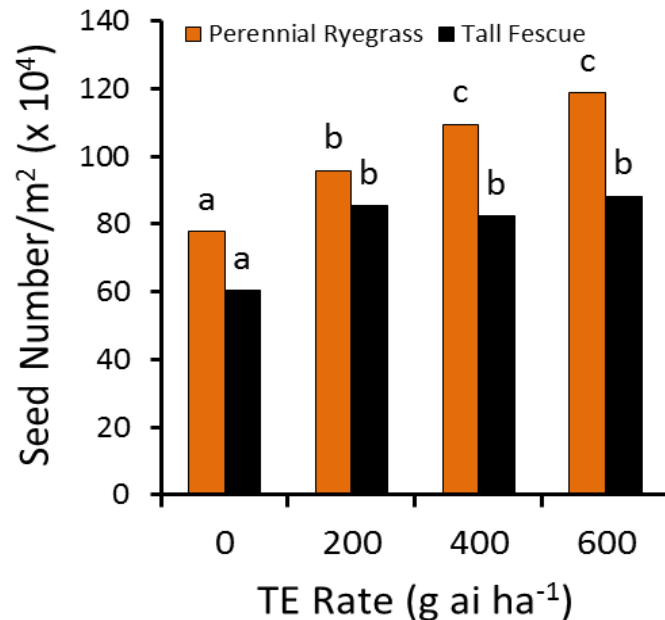
Plant Growth Regulators

Trinexapac-ethyl treated

- Spike Length = 18.8 cm
- Spikelets/Spike = 22.3
- Seeds/Spike = 48.3

Untreated

- Spike Length = 21.6 cm
- Spikelets/Spike = 23.0
- Seeds/Spike = 40.8



Effect of trinexapac-ethyl (TE) on perennial ryegrass spike morphology (Chastain et al, 2003)



Effect of Trinexapac-ethyl (TE) on Peace Region Grass Seed Crops

- 2015, 2016, 2017 trials conducted at AAFC Beaverlodge.
- Small plot (2 x 10 m) RCB with 4 replicates
- 3 rates x 2 stages of application
- Grasses received fall nitrogen application.
- Also included early spring applied UAN with and without TE.
- Conducted on 1st and 2nd years stands of creeping red fescue, timothy and meadow brome grass.

TE on Grasses Treatment List

Treatment	Rate kg ai/ha	Stage	UAN (spring applied)	Cost \$/acre**
1	0.200	2 Nodes		33
2	0.300	2 Nodes		50
3	0.400	2 Nodes		67
4	0.200	Heading		33
5	0.300	Heading		50
6	0.400	Heading		67
7	0.300 + UAN	2 Nodes	40 lbs of N/acre*	82
8	0.300 + UAN	Heading	40 lbs of N/acre*	82
9	UAN		40 lbs of N/acre*	32
10	Check			

*50 l/acre of UAN

**2016 prices

TE on Grass Seed Crops- SUMMARY (2015-2017)

- TE reduced plant height and lodging in timothy and meadow bromegrass.
- Largest seed yield response in timothy. TE increased seed yields by 50% in 2015 and 30% in 2016 and 0% in 2017.
- Additional Spring UAN generally resulted in lodging of the crop and sometimes a seed yield reduction particularly in creeping red fescue.
- No significant response to additional Spring UAN applications with or without TE but a slight trend for Spring UAN+TE to be one of the higher yielding treatments in timothy and meadow bromegrass.
- Little impact using TE on creeping red fescue seed crops in trials to date.
- TE appears to have more potential for use on first year stands.
- TE had no affect on germination or seed weight.
- Concern on possible damage to the crops if conditions are dry.



TE on Timothy

TE on Meadow Bromegrass



TE + CCC on Meadow Bromegrass, Rycroft, 2017+2018



TE + CCC on Meadow Bromegrass (Rycroft 2017 and 2018)

- Seeded in 2016.
- Very uniform stand with high nitrogen fertility.
- Plot size was 2 x 10 m, RCB with 4 reps.
- DATA COLLECTED: Plant height, lodging, head length, seed yield, dockage, 1000 kwt and seed germination. Harvest area 17 m².

2017

- STAGE 1: Applied on May 28th at 2 node to boot stage. Staging was on the late side.
- STAGE 2: Applied on June 7th at early heading.

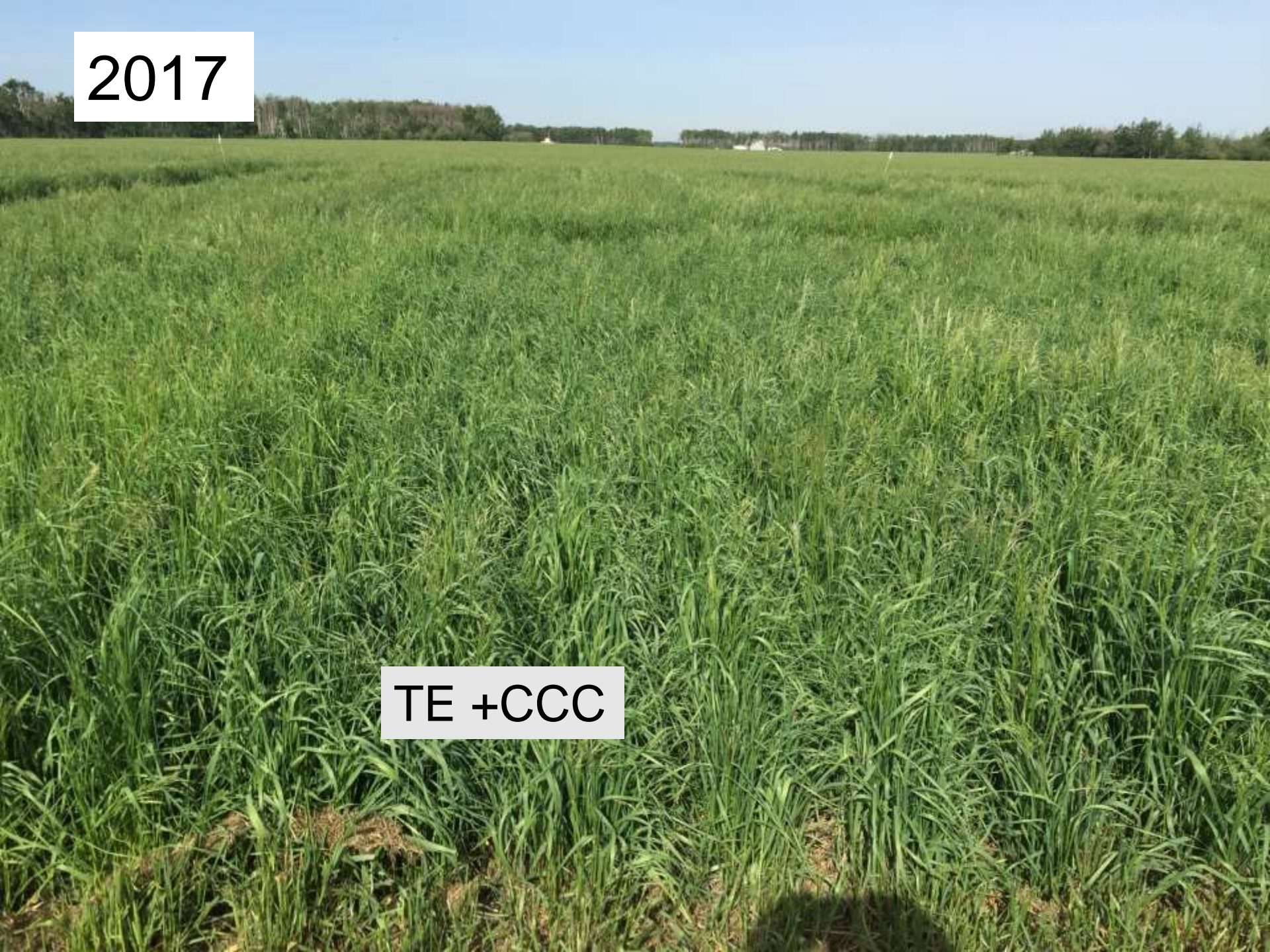
2018

- STAGE 1: Applied on May 24th at 2 node.
- STAGE 2: Applied on June 3rd at early heading.



2017

TE +CCC





Harvested on August 16th , 2017 and August 15th in 2018 from an area of 17 m²

TE + CCC on Meadow Bromegrass (Rycroft 2017)

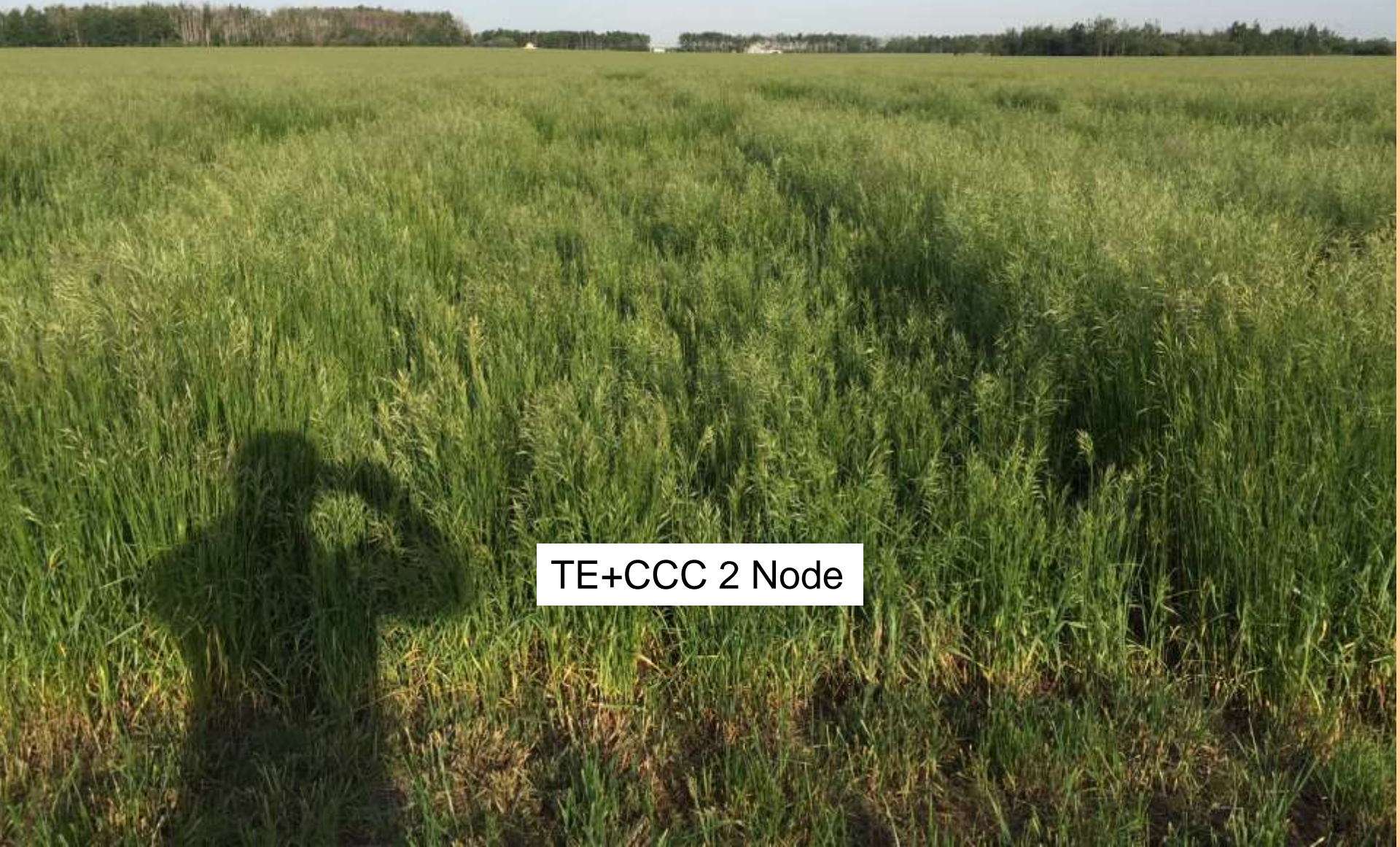
Treatments kg ai/ha	Stage	Plant Height cm	Lodging 0 – 10 (10 Is No Lodging)			Seed Yield kg/ha	Dockage %
			July 10	July 20	August 14		
TE 0.200	2 Node	126	9.8 a	6.8 a	8.9 a	1537 a	14.2 bc
TE 0.100+ CCC 0.560	2 Node	125	10.0 a	8.0 a	9.8 a	1572 a	13.5 c
CCC 1.116	2 Node	127	7.6 a	4.3 b	5.8 a	1282 ab	15.5 b
TE 0.200	Heading	128	9.0 a	8.0 a	6.3 a	1320 ab	15.7 b
CCC 1.116	Heading	131	8.4 a	4.5 b	7.3 ab	1290 ab	14.8 bc
Check		130	4.1 b	3.0 c	3.6 c	1092 b	17.7 a
CV%		3.2	17.9	13.2	18.9	11.3	5.1
LSD P=.05			2.1	1.2	2.1	232	1.2

Means followed by the same letter do not significantly differ (P=.05 Student-Newman-Keuls)

TE and CCC on Meadow Brome – Rycroft 2018



Meadow Brome 2018 - Rycroft



TE+CCC 2 Node

Meadow Brome 2018 - Rycroft

TE Early Head



Meadow Brome 2018 - Rycroft

CCC Early Head

Check



TE + CCC on Meadow Bromegrass (Rycroft 2018)

Treatments kg ai/ha	Stage	Plant Height cm	Lodging 0 – 10 (10 Is No Lodging)			Seed Yield kg/ha	Dockage %	Seed Moisture %
			July 12	August 1	August 15			
TE 0.200	2 Node	33.5 bc	10.0 a	9.8 a	10.0 a	1016	3.7 bc	11.4 b
TE 0.100+ CCC 0.560	2 Node	30.6 c	10.0 a	10.0 a	10.0 a	966	3.5 bc	11.9 b
CCC 1.116	2 Node	37.2 b	9.6 a	8.8 a	9.8 a	1095	4.4 bc	12.0 b
TE 0.200	Heading	35.7 b	10.0 a	9.6 a	10.0 a	1065	3.3 c	11.7 b
CCC 1.116	Heading	39.4 a	9.0 a	8.5 a	9.4 a	1176	5.2 b	12.3 b
Check		42.6 a	6.4 b	5.5 a	7.0 b	910	7.2 a	14.1 a
CV%		6.7	10.3	10.2	9.9	13.6	9.7	8.6
LSD P=.05		3.7	1.4	1.3	1.4	NSD	1.7	1.6

Means followed by the same letter do not significantly differ (P=.05 Student-Newman-Keuls)

Meadow Brome, Valhalla 2018



TE at .300 ai kg/ha 2 node

Meadow Brome, Valhalla 2018

CCC at 2 node

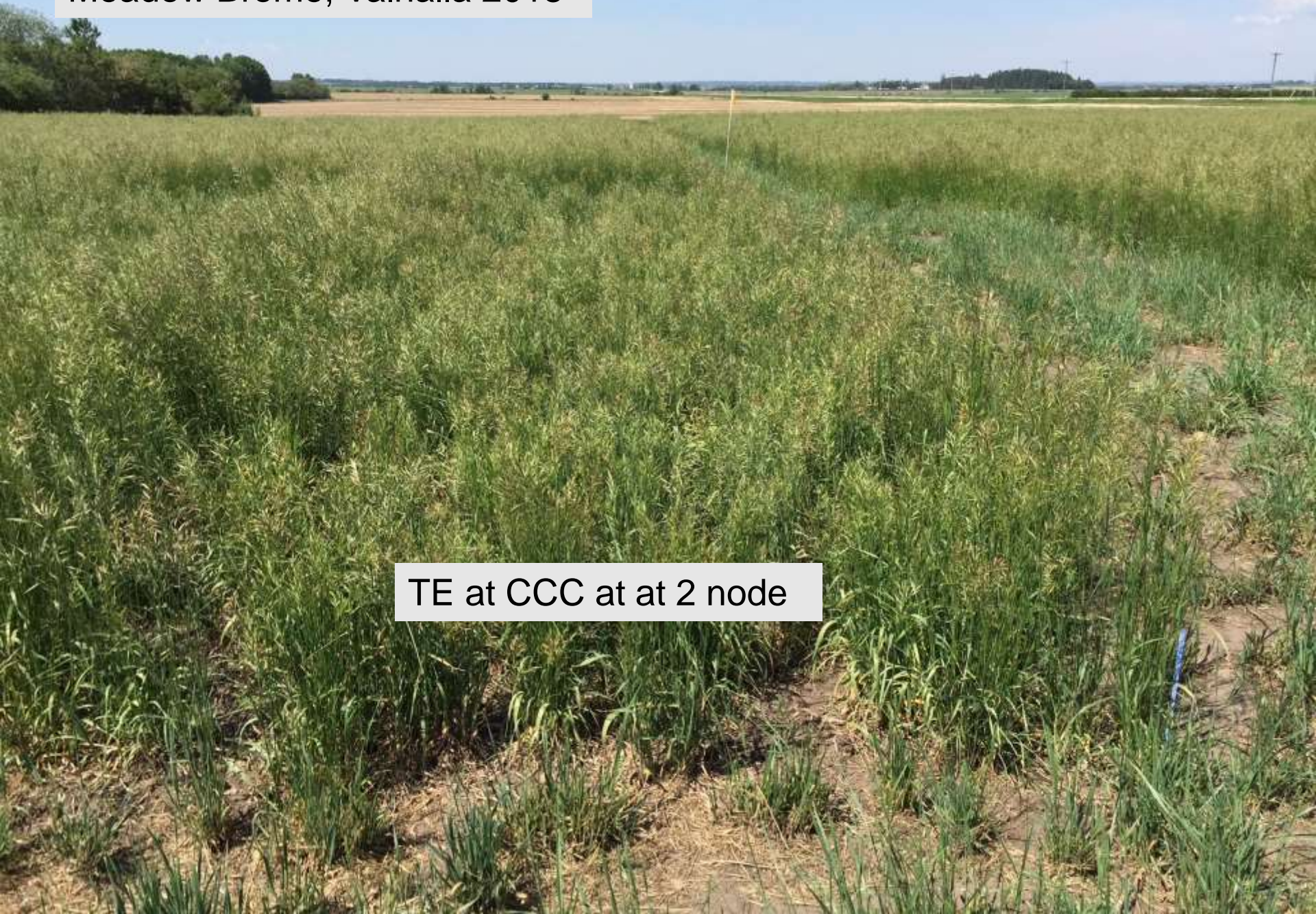


Meadow Brome, Valhalla 2018



TE at CCC at at 2 node

Meadow Brome, Valhalla 2018



TE at CCC at at 2 node

TE + CCC on Meadow Bromegrass (Valhalla 2017)

Treatments kg ai/ha	Stage	Plant Height cm	Lodging 0 – 10 (10 Is No Lodging)		Seed Yield kg/ha	Seed Moisture %
			July 6	July 27		
TE 0.200	2 Node	81 c	10.0	9.8 a	867 b	16.3 bc
TE 0.100+ CCC 0.560	2 Node	86 c	10.0	10.0 a	921 b	18.0 b
CCC 1.116	2 Node	103 b	10.0	8.8 a	1064 a	14.0 d
TE 0.300	2 Node	64 d	10.0	9.6 a	627 c	20.2 a
Check		114 a	10.0	5.5 a	878 b	15.3 cd
CV%		3.5		10.2	7.3	6.7
LSD P=.05		.53		1.3	98.4	1.7



NEXT STEPS

- TE alone or in tank mix with CCC may have potential on grasses but will depend on yield potential of the stand and moisture conditions.
- TE shows good potential for use on red clover seed crops. CCC does not appear to be effective on red clover.
- Require more data over a number of years and environmental conditions.
- Timing of GR is similar to herbicide applications so should investigate the interaction.
- Field demonstrations should be conducted.

Future Work

- 5 yrs of funding through PRFSA and Agri-Science and Innovation program.
- Herbicide tolerance trials and weed control studies
- Growth regulators
- Integrated practices GRxFungicideXFertilizer
- Funding secured to purchase small plot swather and pickup header for combine.

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