Weed Control in Sugarbeet

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Common Ragweed

- Life cycle, summer annual broadleaf
- Growth habit, shallow, fibrous root system and grows 2 to 4 feet high
- When does it germinate, soil temperature triggers germination, between 50 and 80 F
  - Returns to dormancy when temperatures get hot in June and July
- Reproductive habit, male and female flowers are in separate flower heads on the same plant (monoecious habit)
- Seed production, 30,000 to 60,000 seeds per plant
- Longevity: 25 to 35 years
- Agriculture, more common as soybean and dry bean acres have increased
- Resistant biotypes to multiple classes of herbicides
  - ALS (SOA 2)
  - PPO inhibitor (SOA 14)
  - Glyphosate (9)

Sugarbeet injury and control of common ragweed, Mayville, ND, 2014

Up to one inch common ragweed

Herbicide Treatment[1]	Rate	July 7 sgbt inj	July 7 cora cntl	July 14 cora cntl	July 25 cora cntl
	fl oz/A	----------(%)----------			
PMax / PMax / PMax	28 / 28 /22	1	74	74	76
PMax+Stinger / PMax+Stinger / PMax	28+2 / 28+2 / 22	3	89	88	92
PMax+Stinger / PMax+Stinger / PMax	28+4 / 28+4 / 22	9	95	95	95
LSD (0.05)		10	14	11	10

[1]All treatments were applied with N-Pak AMS at 2.5% v/v and Prefer 90 NIS at 0.25% v/v
[2]PMax is Roundup PowerMax

Sugarbeet injury and control of common ragweed, Mayville, ND, 2014

Greater than two inch common ragweed

Herbicide Treatment[1]	Rate	July 7 sgbt inj	July 7 cora cntl	July 14 cora cntl	July 25 cora cntl
	fl oz/A	----------(%)----------			
PMax / PMax / PMax	28 / 28 / 22	-	64	68	82
PMax+Stinger / PMax+Stinger / PMax	28+2 / 28+2 / 22	-	59	72	84
PMax+Stinger / PMax+Stinger / PMax	28+4 / 28+4 / 22	-	63	76	91
LSD (0.05)		-	14	11	10

[1]All treatments were applied with N-Pak AMS at 2.5% v/v and Prefer 90 NIS at 0.25% v/v
[2]PMax is Roundup PowerMax

Recommendations** for common ragweed control

- For common ragweed control less than <u>one-inch</u> tall
  - Roundup PowerMax + Stinger at 28 + 2 fl oz/A
  - Make a repeat application approximately 14 days following the first application

- For common ragweed control greater than <u>two- to four-inches</u> tall
  - Roundup PowerMax + Stinger at 28 + 4 fl oz/A or
  - Roundup PowerMax + Stinger at 28 + 2 fl oz/A plus either ethofumesate at 4 fl oz/A, UpBeet at 0.5 oz/A or Betamix at 12 fl oz/A
  - Make a repeat application approximately 14 days following the first application

PowerMax plus Stinger, 28 + 2 / PowerMax plus Stinger, 28 + 2 / PowerMax, 22 fl oz/A

PowerMax, 28 / 28 22 fl oz/A

**HSMOC surfactant at 1 pt/A plus AMS at 8.5 lb per 100 gallon

Kochia

- Life cycle, summer annual, goosefoot family
- Growth habit, up to 7 feet tall
- Seed production, 15,000 seeds per plant
- Seed viability, 1 to 2 years
- Biology, very deep rooted, tolerate saline soils
- Biology, extremely competitive; a few plants will reduce yield
- Many document examples of herbicide resistance
  - ALS (SOA 2)
  - 2,4-D and dicamba (SOA 4)
  - Triazines (5)
  - Glyphosate (SOA 9)
  - Multiple resistance, 2+4, 2+9, 2+4+9

Sugarbeet injury and kochia control from soil-applied and postemergence herbicide treatments, Barney, ND, 2015

		Sgbt injury		Kochia control	
Treatment[1]	**Rate**	**Jun 8**	**Jun 19**	**Jul 7**	**Aug 4**
	pt/A, fl oz/A or oz/A	--------(%)-------		-------(%)------	
PMax[2] / PMax / PMax	28 / 28 / 22	9	0	78	75
PMax+Etho / PMax+Etho / PMax+Etho	28+4 / 28+4 / 22+4	3	10	75	70
PMax+Etho+Bmix / PMax+Etho+Bmix / PMax+Etho+Bmix	28+4+8 / 28+4+12 / 22+4+16	8	14	78	76
PMax+Etho+Bmix/ PMax+Etho+Bmix/ PMax+Etho+Bmix	28+4+16 / 28+4+24 / 22+4+32	19	18	86	78
PMax+Etho+UpB / PMax+Etho+UpB / PMax+Etho+UpB	28+4+0.5 / 28+4+0.5 / 22+4+0.5	4	11	86	84
Etho / Etho+Bmix+UpB / PMax/ PMax /PMax	7 /12+10+1 / 28 / 28 / 22	11	10	88	85
	LSD (0.10)	11	11	11	10

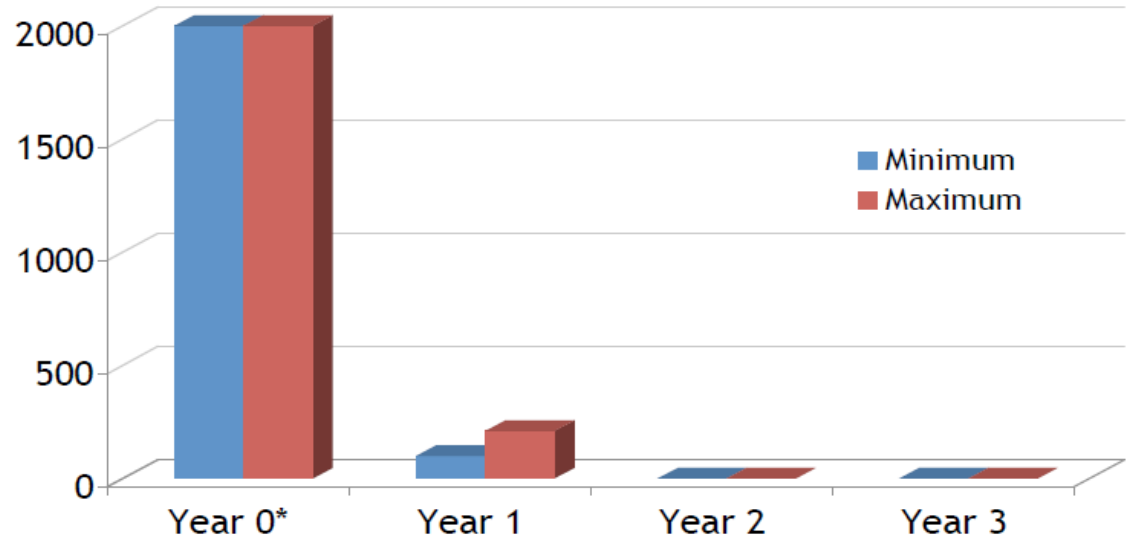
[1]Treatments of Roundup PowerMax contained Prefer 90 NIS at 0.25% v/v plus N-Pak AMS at 2.5% v/v. All other treatments contained Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v.
2PMax = Roundup PowerMax, etho = ethofumesate, Bmix = Betamix, and UpB = UpBeet

The rule of thumb is that Betamix will get kochia the size of a dime but will miss kochia the size of a quarter

Control of volunteer RR canola in sugarbeet

- Canola can survive in soil for up to four years
- Number of canola volunteers is dependent on several factors including weather and time of harvest
- Gulden et al. found that the major of volunteer canola germinate and emerge in the first year following crop
- Volunteers must be managed in crop sequence with herbicides

Figure 1. **Volunteer canola emergence over time.**



*Year 0 is the starting seedbank with 2000 viable seeds/m2

Source: Gulden et al. 2003.

Canola control from UpBeet plus PowerMax; early or late planting, canola stage at application, Prosper, ND

		Early, April planting					Late, May planting			
		Cotyl canola		2-leaf canola			Cotyl canola		2-leaf canola	
Herbicide[1]	Rate (oz/A)	29 Ju1	2 Aug	29 Jul	2 Aug		2 Aug	24 Aug	2 Aug	24 Aug
		----------(%)----------					----------(%)----------			
UpBeet	0.25	56	58	60	60		-	-	-	-
UpBeet	0.5	68	65	78	75		80	60	78	66
UpBeet	0.75	79	66	81	74		86	65	80	65
UpBeet	1.0	-	-	-	-		93	66	91	76
LSD (0.1)		3					11			

[1]UpBeet plus Roundup PowerMax with Destiny HC at 1.5 pt/A plus N-Pak AMS at 2.5% v/v

Roundup PowerMax control

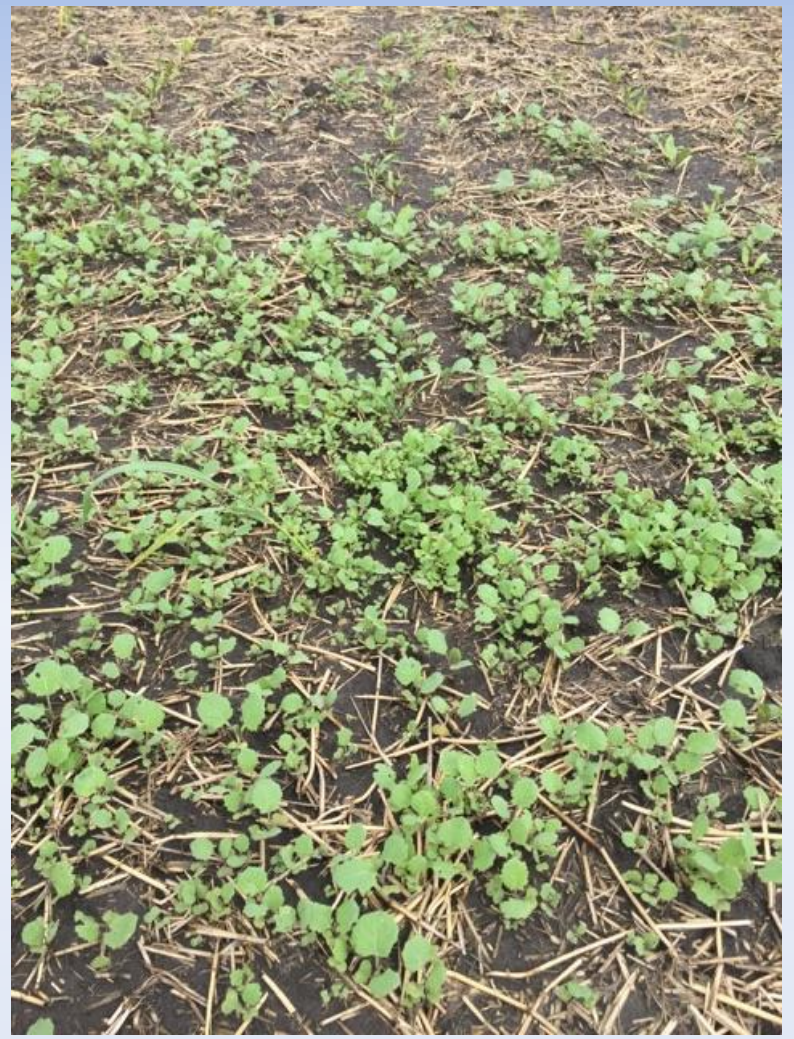
UpBeet, 0.5 oz/A, cotyledon timing

UpBeet, 0.75 oz/A, cotyl timing

UpBeet, 0.75 oz/A, 2-leaf timing

Control of volunteer RR canola in sugarbeet

- Sugarbeet injury from UpBeet was inconsistent; tended to be less when initial application at 2-leaf canola
- Canola control from UpBeet tended to be better when applied beginning at the 2-leaf canola compared to cotyledon canola
- Duration of canola germination complicates UpBeet rate decision; 4 x 0.5 oz, 3 x 0.75 oz or 2 x 1 oz/A
- ethofumesate soil applied followed by Roundup PowerMax gave inadequate canola control



Wheat cover crop in Wilkin County, 2014

Repeat applications of glyphosate, Traverse County

Percent visual waterhemp control from sequential applications of glyphosate[1]

	Herman, MN 2014	Herman MN 2015	Moorhead, MN 2015	Lake Lillian, MN 2015
	----------(% Preharvest Control[2])----------			
Experiment 1	33	48	60	48
Experiment 2	35	56	34	-
Experiment 3	36	58	66	60
Experiment 4	-	48	39	-

[1]Roundup Power Max at 28/28/22 fl oz/A plus Prefer 90 NIS at 0.25% v/v and N-Pak AMS at 2.5% v/v

[2]Visual percent waterhemp control at preharvest evaluation

Waterhemp control from postemergence herbicides, across locations and years

Herbicides[1]	Herman 2014	Moorhead 2015	Herman 2015	Lake Lillian 2015	Average
	----------% visual control[2]----------				
glyphosate	36	66	20	61	46
glyphosate + ethofumesate	58	81	40	66	61
glyphosate + Betamix	65	86	40	68	65
glyphoste + UpBeet	51	90	48	69	65
gly + Betamix + UpBeet	64	96	64	83	76
gly + etho + Betamix	69	88	73	78	78
gly + etho + UpBeet	64	93	68	64	72

[1]Roundup alone with Prefer 90 NIS at 0.25% v/v and N-Pak AMS at 2.5% v/v. Roundup tank-mixes with Destiny HC at 1.5 pt/A and N-Pak AMS at 2.5% v/v.
[2]Visual percent waterhemp control at preharvest evaluation

Sugarbeet injury and weed control from soil-applied herbicides followed by glyphosate, across locations and years

		Sugarbeet Injury		Waterhemp Control			
Herbicide[1]	Rate pt/A	Herman 2014	Moorhead 2015	Herman 2014	Moorhead 2015	Herman 2015	L Lillian 2015
		----------%----------					
Ro-Neet SB	5.3	8	19	91	65	76	91
ethofumesate	6 / 7	3	4	74	79	74	96
S-metolachlor	0.5	6	5	89	61	63	90
S-metolachlor	0.75	9	13	94	74	61	91
S-metolachlor	1	9	18	100	70	69	92
S-metolachlor	2	10	28	99	85	74	97
No soil-applied		-	14	33	60	48	48

[1]Treatments all included Roundup PowerMax at 28 /28 22 fl oz/A plus Prefer 90 NIS at 0.25% v/v + N-Pak AMS at 2.5 % v/v

Sugarbeet injury and weed control from soil-applied herbicides followed by glyphosate, across locations and years

		Sugarbeet Injury		Waterhemp Control			
Herbicide[1]	Rate pt/A	Herman 2014	Moorhead 2015	Herman 2014	Moorhead 2015	Herman 2015	L Lillian 2015
		----------	----------	----------	% ----------	----------	----------
Ro-Neet SB	5.3	8	19	91	65	76	91
ethofumesate	6 / 7	3	4	74	79	74	96
S-metolachlor	0.5	6	5	89	61	63	90
S-metolachlor	0.75	9	13	94	74	61	91
S-metolachlor	1	9	18	100	70	69	92
S-metolachlor	2	10	28	99	85	74	97
No soil-applied		-	14	33	60	48	48

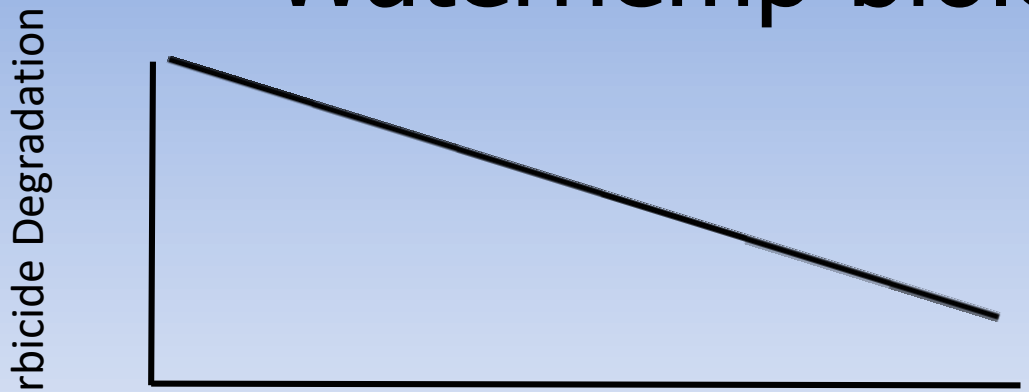
[1]Treatments all included Roundup PowerMax at 28 /28 22 fl oz/A plus Prefer 90 NIS at 0.25% v/v + N-Pak AMS at 2.5 % v/v

Soil-applied herbicide longevity is dependent on herbicide family

- Soil-applied herbicides work well against weeds
- They provide effective weed control from 30 to 70 days*
  - Chloroacetamide herbicides (SOA 15) provide 30 to 45 days control
  - Ro-Neet (SOA 8) provides 40 to 55 days control
  - Ethofumesate (SOA 8) provides up to 70 days control

*from personal communication, the WSSA herbicide handbook, and from the ethofumesate label

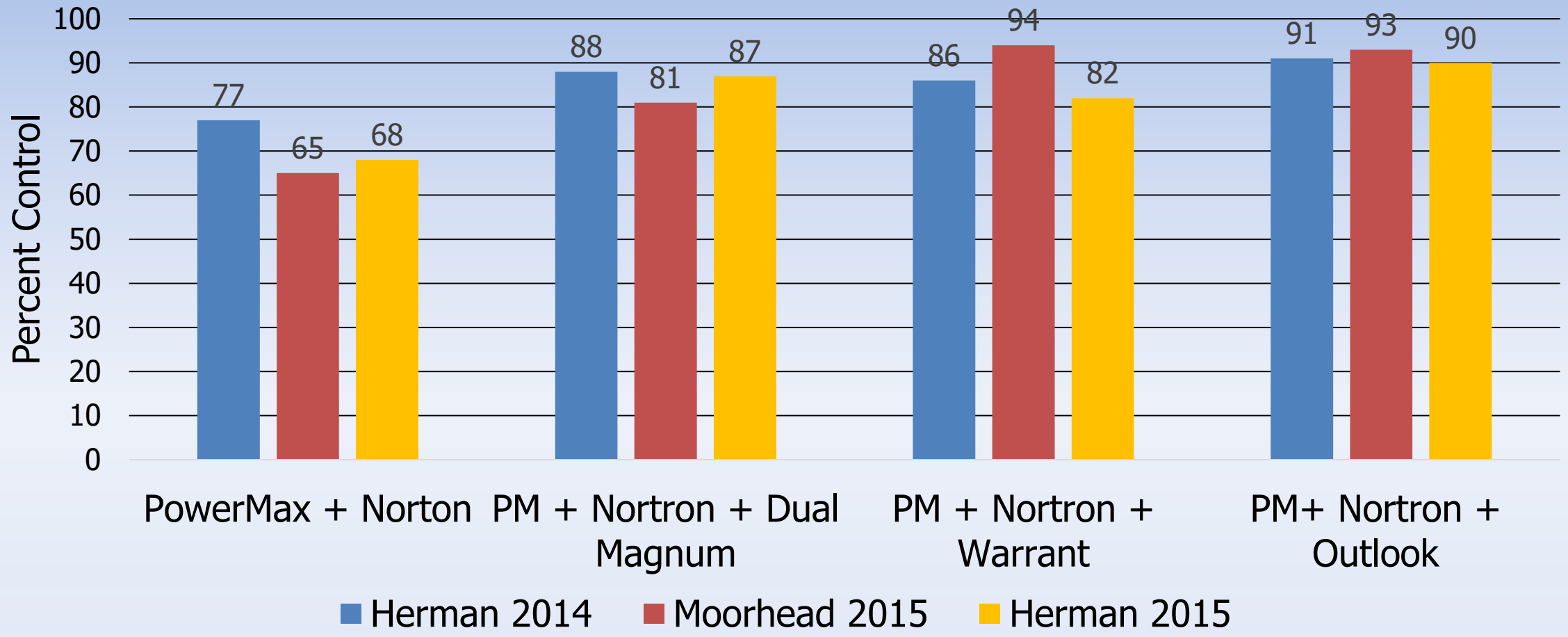
Waterhemp biology



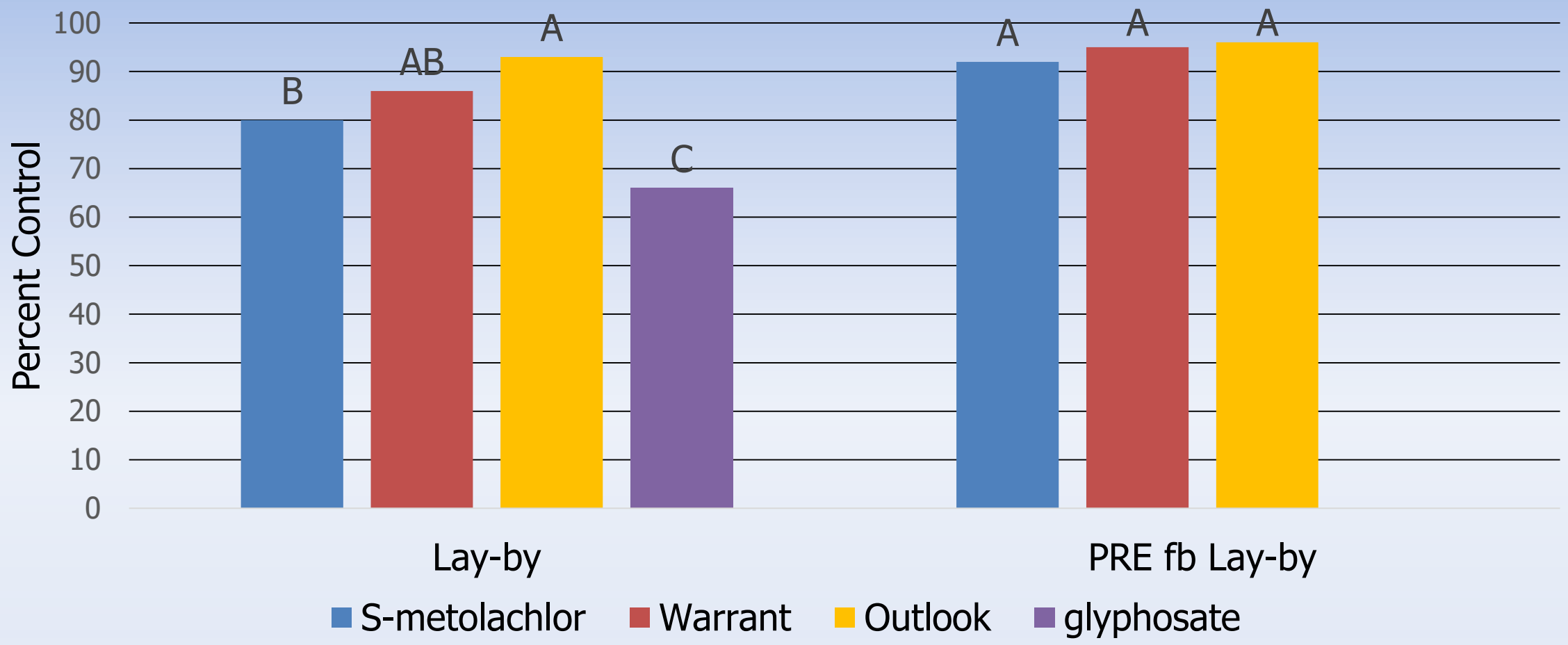
Dual Magnum give 'good' waterhemp control when applied lay-by

1-Apr	10-Apr	20-Apr	30-Apr	1-May	10-May	20-May	30-May	1-Jun	10-Jun	20-Jun	30-Jun

Waterhemp control from postemergence herbicides, across locations and years



Waterhemp control from soil-applied herbicides lay-by or S-metolachlor at 0.5 pt/A fb lay-by, across locations, 2015



Early Planting (Moorhead) and late planting (Herman)

Herbicides applied lay-by wash from cover crop residue and into the soil

Herbicide[1]	Timing	Rate (pt or fl oz/A)	amata control Jun 16, 2015	Amata control Jun 30, 2015
S-metolachlor	PRE	0.5	88 cd	0 c
S-metolachlor	Lay-by	1	95 abc	69 b
Outlook	Lay-by	18	97 a	86 ab
S-metolachlor / S-metolachlor	PRE / lay-by	0.5 / 1.25	96 ab	89 ab
S-metolachlor / Outlook	PRE / lay-by	0.5 / 18	98 a	90 a

[1]+ Roundup PowerMax at 28 fl oz/A + Prefer 90 NIS at 0.25% v/v + N-Pak AMS at 2.5% v/v

Terminate cover crops

PRE

PRE fb Lay-by