

Managing Herbicide Resistant Weeds

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Prairie Weed Survey

- 7.7 million ha (29% of western Canada farm land) is infested with herbicide resistant weeds (Beckie et al 2012)
- Wild Oat
 - Group 1 resistant wild oat was found in 41% of all fields surveyed
 - Group 2 resistant wild oat in 12% of fields
 - Group 1 + 2 in 8% of fields
- Broadleaves – resistant to Group 2
 - kochia (90%)
 - Russian thistle (2%)
 - spiny annual sow thistle (100%)
 - chickweed (40%)
 - cleavers (12%)
- Wild buckwheat, shephard's purse, hempnettle, sinkweed, narrow-leaved hawk's beard, green foxtail, cow cockle
- Herbicide resistant weeds are an irritant for many growers
- Wild oat has limited herbicide options in most crops (with the exception of canola)
- Wild oat and BLW in peas (where Group 2 herbicides used most consistently), Clearfield crops
- Glyphosate resistant kochia in RR sugar beets and RR canola



Management/Prevention

- Resistance is a numbers game
 - 30 years of selection with glyphosate with billions of weeds
- Block the production or distribution of seed
 - Chaff collection
 - Seed destruction
- Use integrated management to reduce weed populations
 - Tillage, delayed planting,
 - Enhance crop competition with high seeding rates, fertilizer placement, variety choices
- Herbicide diversity important to maintain control
 - Sequential herbicides application)
 - Rotation between seasons
 - Mixed *effective* herbicides from different groups
 - (both should control the weed)
- Choose low risk herbicides
- New herbicide groups
 - Few new herbicides in the pipeline
 - No magic bullets should be expected
 - Crops with resistant stacks?



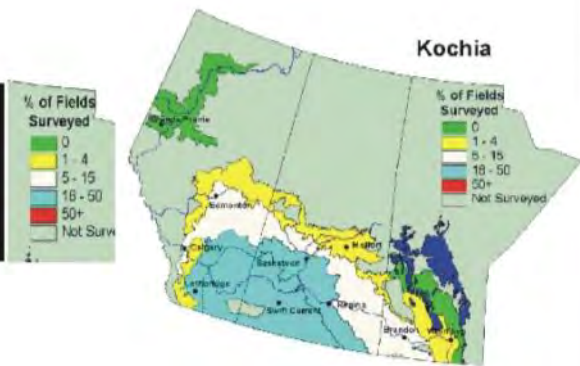
How do we apply to kochia?

- Kochia has short distance (field) and long distance wind distribution
 - Selected in chemical fallow
- Found along roadsides, in industrial areas and in fields
 - Co-ordinate approach

Prevention is going to be difficult

Where resistance is located is not necessarily where it was selected





Kochia biology

Early emergence, short seed bank life



Late Maturity



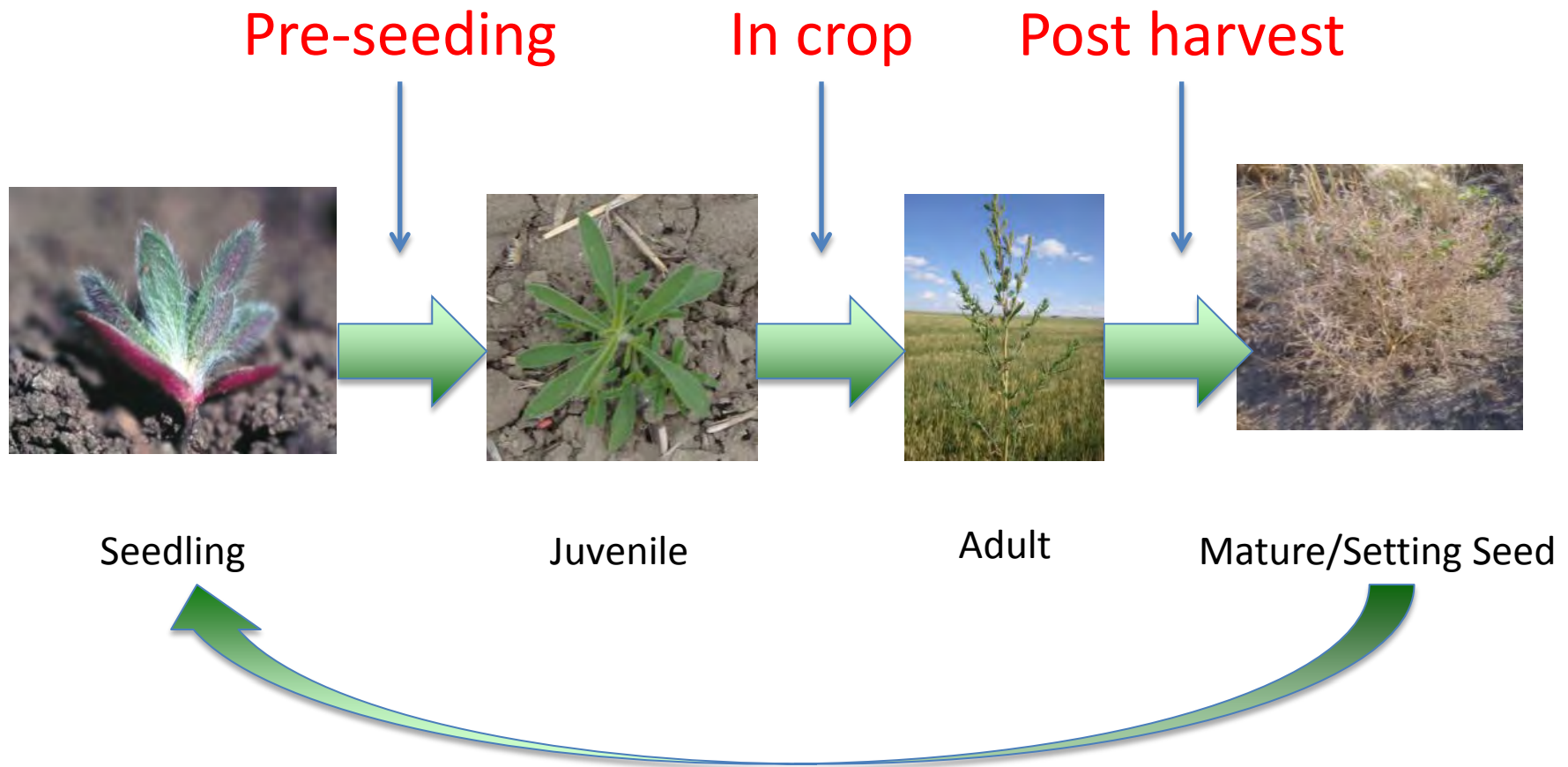
Emergence Timing and Persistence of Kochia (*Kochia scoparia*)

Author(s): Timothy D. Schwinghamer and Rene C. Van Acker

Reviewed work(s):

Source: *Weed Science*, Vol. 56, No. 1 (Jan. - Feb., 2008), pp. 37-41

Herbicide Intervention Points



Screening for herbicides

- Supplement glyphosate pre-seeding to reduce selection and control G–2R kochia
 - Pre-seeding trials in wheat
 - Selective and non-selective herbicides
- Herbicides to reduce seed viability/maturity
 - Post harvest trials following wheat
 - Selective and non-selective herbicides
 - Rate refinement after screening



Pre-seeding

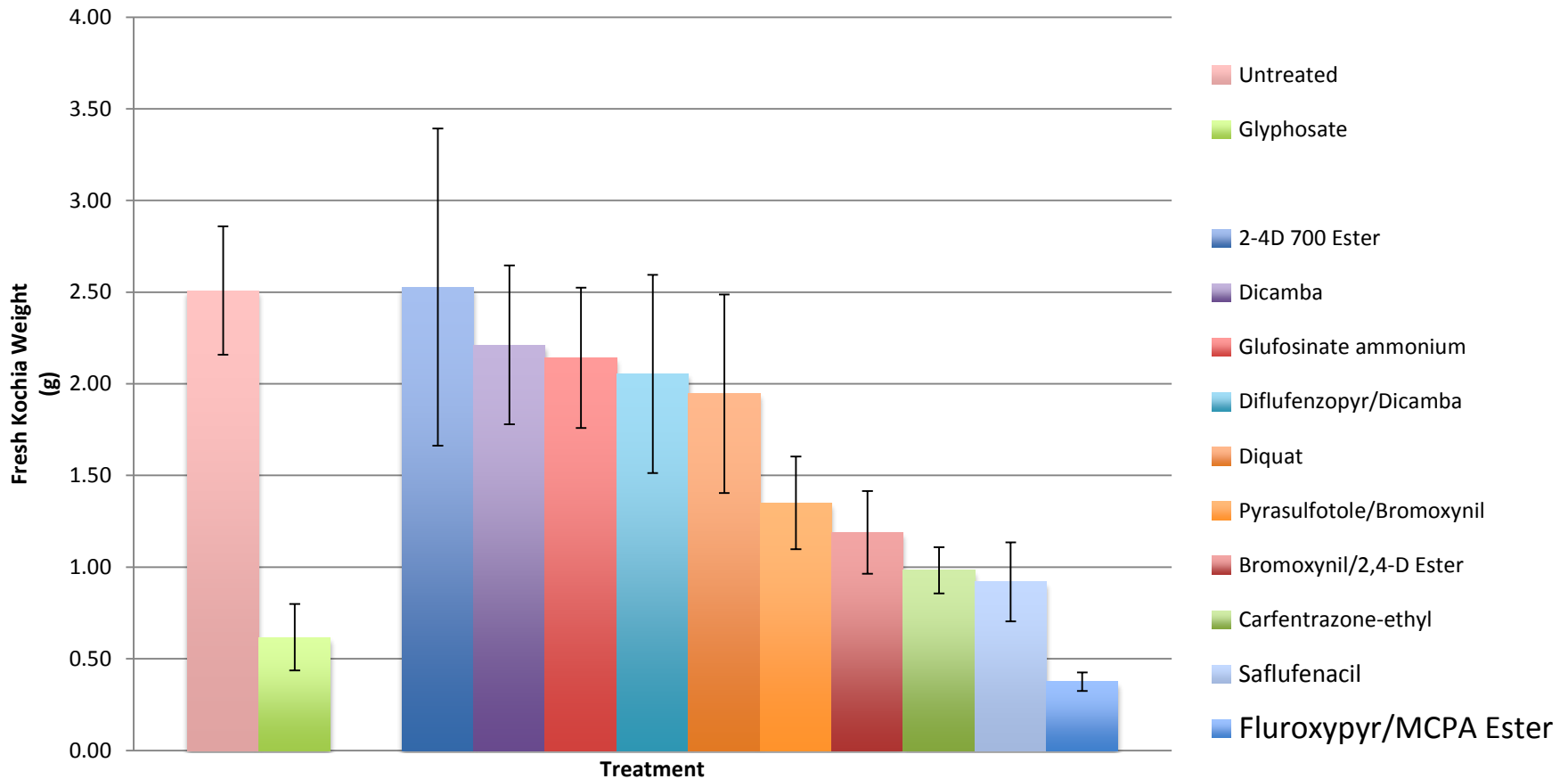


Pre-seeding trials

- Screening trials in 6 locations
 - Ellerslie 2011 and 2012
 - St. Albert 2012
 - Lethbridge 2012
 - Olds 2012
 - Scott 2011

		Treatment Name	Rate (g ai/ha)	Group
1	Untreated		-	
2	Roundup	Glyphosate	900	9
3	Infinity	Pyrasulfotole/ Bromoxynil	31.1 174.3	27/5
4	2,4-D	2,4-D	560	4
5	Heat	Saflufenacil	18	14
6	Cleanstart	Carfentrazone	8.9	14
7	Attain	Fluroxypyr MCPA	107 556	4/4
8	Bromoxynil 2,4-D	Bromoxynil 2,4-D	280 280	5/4
9	Reglone	Diquat	240	22
10	Liberty	Glufosinate	407.7	10
11	Dicamba	Dicamba	130	4
12	Distinct	Diflufenzopyr Dicamba	21.4 55	19/4

Kochia fresh weight (4 weeks after treatment)





Post Harvest

Plasticity in *Kochia scoparia*

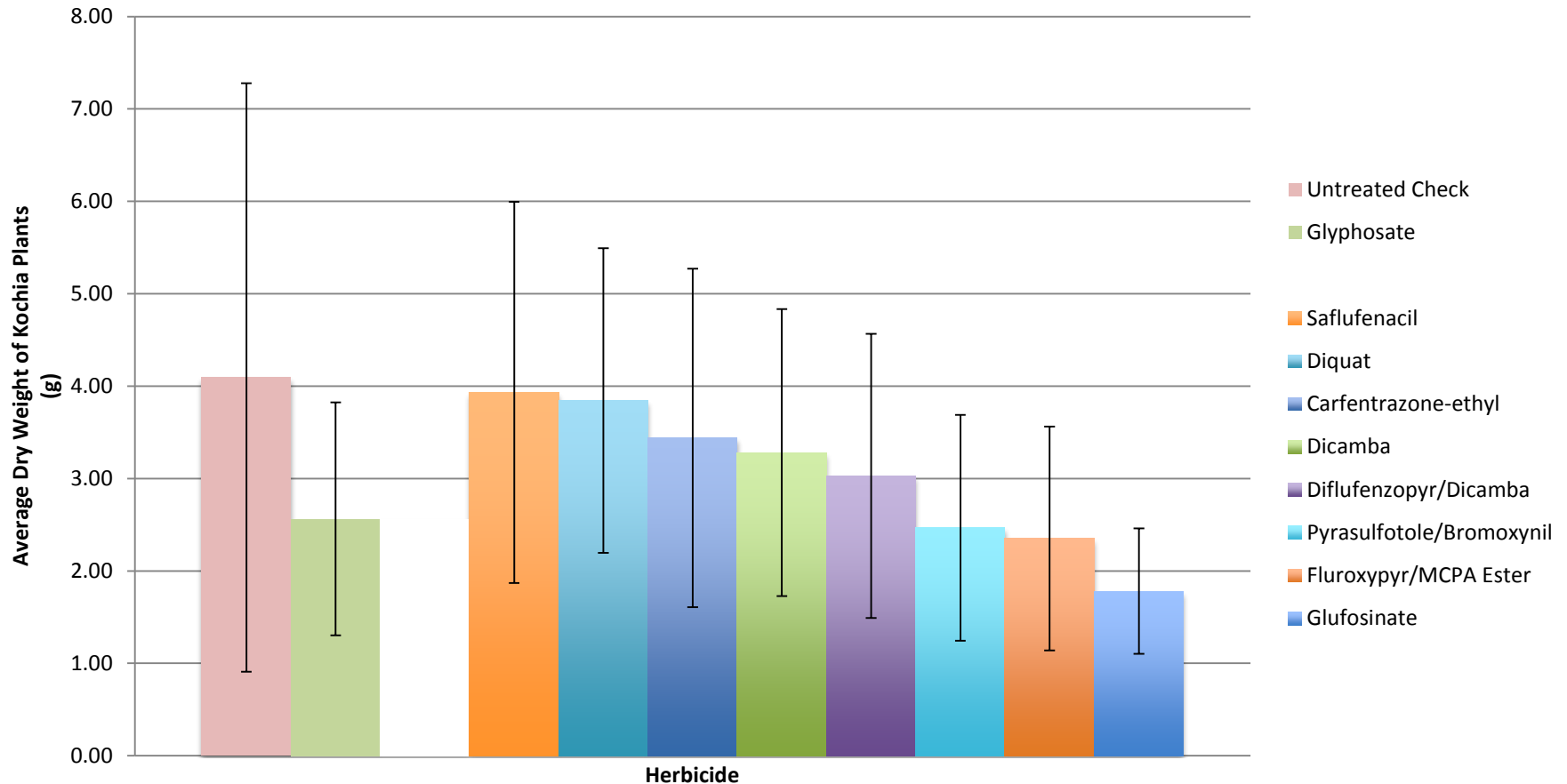


Post harvest trials (application immediately after harvest)

- 2011
 - Lethbridge
 - Twin Creek
- 2012
 - Ellerslie
 - Olds
 - St. Albert

	Treatment		Rate (g ai/ha)
1	Untreated	Untreated	-
2	Glyphosate	Glyphosate	900
3	Pyrasulfotole Bromoxynil	Infinity	31.1 174.3
4	Dicamba	Dicamba	139
5	Saflufenacil	Heat	18
6	Carfentrazone-ethyl	Cleanstart	8.9
7	Fluroxypyr MCPA	Attain	107 556
8	Gluphosinate ammonium	Liberty	407.7
9	Diquat	Reglone	240
10	Diflufenzopyr Dicamba	Distinct	21.4 55

Kochia dry weight treated immediately after harvest (7 weeks after application)



Can we reduce seed set and viability?

Viable seeds produced



Vigor of seedlings after herbicide application



Solving a problem created by herbicide use by using herbicides?

- Integrated weed management are very critical for wild oat in competitive crops
- In less competitive crops such as peas, sugar beets and in chemical fallow herbicides are required
- Kochia is both an agricultural weed and a weed of roadsides and disturbed areas
- Kochia requires cooperation of municipalities, vegetation management of industrial sites
- Mixing of herbicides with other MOA
 - Pre-seeding
 - Reducing seed set and seed viability
- Take advantage of the short seed bank life
- Proactive approach – have solutions available

