

Screening for Herbicide Tolerance in *Taraxacum kok-saghyz*

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ABSTRACT

Practical weed control limits mass production of *Taraxacum kok-saghyz* (TK) as a rubber crop. We are evaluating TK germplasm to identify possible sources of natural herbicide tolerance. Tolerance to the ALS herbicides imazethapyr and imazaquin (applied pre-emergence) was verified up to twice the standard field rate. For well-established plants there was tolerance to S-metachlor, linuron, and metribuzin. Recurrent selection of ALS tolerant types continues.

INTRODUCTION

Taraxacum kok-saghyz (TK) requires excellent weed control to survive as a crop. Unimproved TK establishes slowly, so weeds dominate the canopy and shade out low-lying TK. Closely related weeds grow more quickly and tolerate herbicides, while TK is damaged by most broadleaf herbicides. However, variability within the germplasm, similarity to species that tolerate herbicides, and results of previous screening suggest there might be tolerance to some modes of action. Selecting herbicide-tolerant genotypes is the first step in developing natural herbicide resistance for crop improvement.

OBJECTIVE

To identify traits of resistance to pre-emergence and post-emergence herbicides in *Taraxacum kok-saghyz* at rates sufficient to control important weeds.

MATERIALS AND METHODS

Screening for herbicide tolerance is done by track room spraying the standard field dosage on either seeded or established TK. Seeds are sown in field soil in plastic trays. Herbicides are applied at standard dilutions. The response is evaluated using crop cover and crop injury ratings. Plants that survive with no signs of injury are selected for inter-crossing and tolerant seed line production. Variables evaluated are herbicide type, rate, timing; seed type, density, burial depth; and growth stage at post-emergence application. Herbicides are applied at standard field rates with known efficacy on weeds; therefore, the focus here is on crop injury.

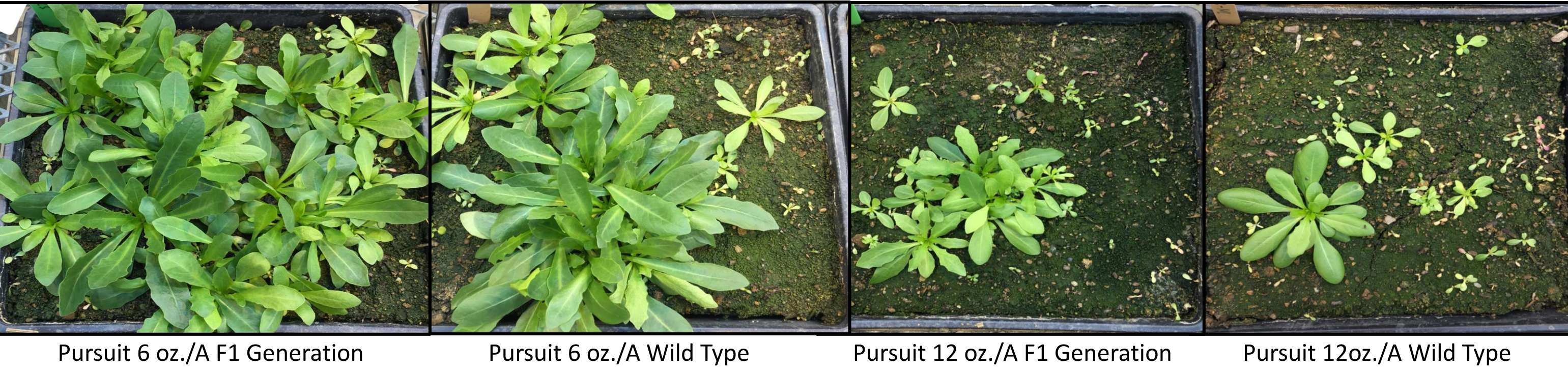
MATERIALS AND METHODS (CONT.)



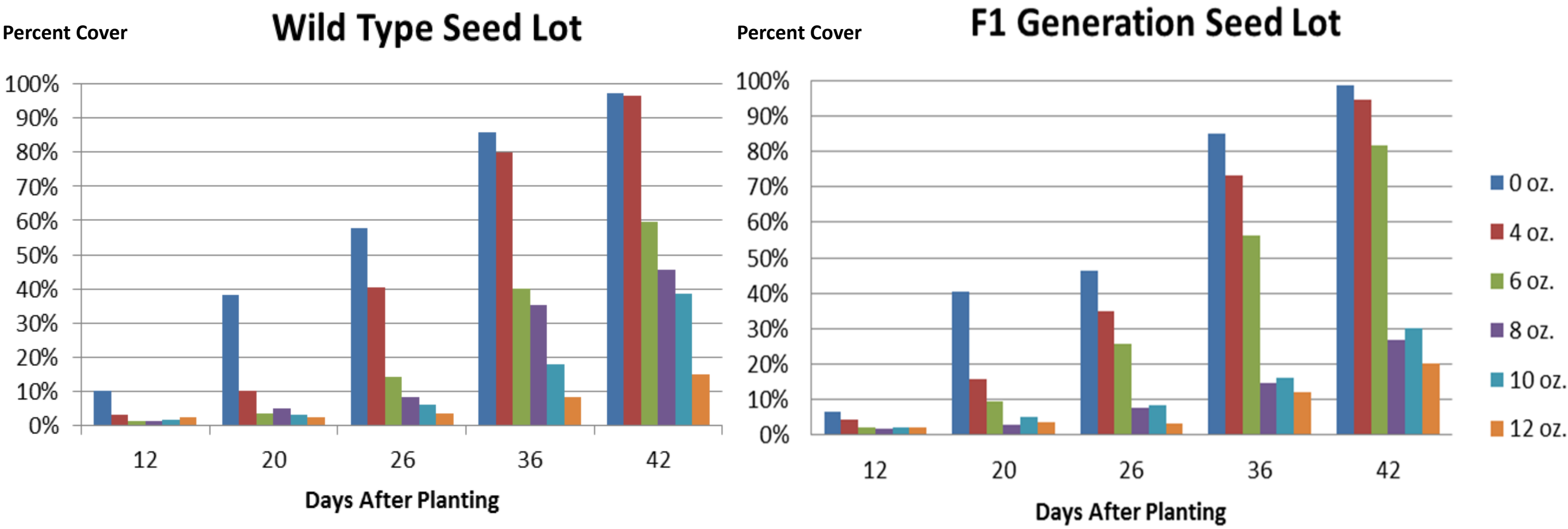
Examples of Crop Cover Rating used to evaluate TK growth over time.

RESULTS

TK tolerance varied depending on the herbicide used, application rate, timing, plant size, and seed source. We identified individual plants that tolerated pre-emergence applications of the ALS herbicides imazethapyr (Pursuit) and imazaquin (Scepter). They were applied up to the 2x field rate, with imazethapyr tolerance being much greater. Post-emergence applications on 8-month-old TK were tolerated for low field rates of S-metachlor (Dual), linuron (Lorox), and metribuzin (Sencor); potential survivors were also observed for lactofen (Cobra).



Pre-emergence herbicide trials with imazethapyr on Wild and F1 plants.



Above Left: Wild type Seed Lot showed natural tolerance in TK seeds. Most plants displayed symptoms of stunting, but overcame them within several weeks.

Above Right: F1 Generation showed varying resistance at higher rates, but stayed consistent at normal field rates.

RESULTS (CONT.)

Pursuit Pre + Post-Emergence Field Control Rating												
		Crop Injury		C. Ragweed		Galinsoga		Purslane		Carpetweed		
		40 DAP	54 DAP	40 DAP	54 DAP	40 DAP	54 DAP	40 DAP	54 DAP	40 DAP	54 DAP	
Control	Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	STD ER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pursuit +	Average	7.5	45.0	81.3	88.8	86.3	66.3	93.8	76.3	77.5	78.8	
	STD ER	1.4	18.3	13.8	1.3	5.5	17.3	1.3	13.0	4.8	5.5	
Pursuit +	Average	8.8	6.3	87.5	86.3	73.8	88.8	95.0	95.0	63.8	70.0	
	STD ER	1.3	2.4	2.5	2.4	11.4	3.8	0.0	0.0	16.3	15.0	
Pursuit +	Average	10.0	8.8	88.8	88.8	81.3	76.3	95.0	92.5	81.3	86.3	
	STD ER	3.5	1.3	3.8	2.4	7.7	12.5	0.0	1.4	6.3	1.3	
Pursuit +	Average	8.8	31.3	90.0	80.0	57.5	86.3	95.0	77.5	65.0	91.3	
	STD ER	3.8	14.6	0.0	0.0	14.5	5.5	0.0	12.7	18.4	2.4	
Pursuit	Average	10.0	17.5	81.3	78.8	73.8	52.5	95.0	57.5	65.0	36.3	
	STD ER	2.0	6.3	10.5	4.7	14.9	18.1	0.0	14.5	11.9	8.0	

*40 DAP: Pursuit Pre-emergence only

*54 DAP: Pursuit Pre-emergence followed by listed Post-emergence
+ Weed control only lists top rated problem weeds for 2016 season

8-Month Old TK Plant Average Herbicide Response

		Control	Sencor	Lorox	Dual	Goal	Cobra
		Average	STD ER	Average	STD ER	Average	STD ER
Plant Fresh Weight (g)	Average	17.2	22.4	22.2	26.7	16.9	20.1
	STD ER	3.9	3.7	2.8	4.0	4.4	3.0
Root Fresh Weight (g)	Average	13.4	15.4	14.0	20.0	12.8	17.2
	STD ER	3.1	2.9	1.6	4.0	3.4	2.4
Top Fresh Weight (g)	Average	3.8	7.0	8.2	6.7	4.1	2.9
	STD ER	1.1	1.5	1.9	1.1	2.5	1.4
Root Dry Weight (g)	Average	3.4	3.3	3.0	4.2	2.4	3.2
	STD ER	0.9	0.6	0.4	0.8	0.7	0.4
Root Near-InfraRed(mg/g)	Average	73.3	70.9	69.0	56.5	66.9	67.4
	STD ER	8.9	4.1	4.8	3.2	2.3	4.1

CONCLUSIONS

Herbicides Showing Promise for Weed Control in TK

Herbicides			Main Weeds Controlled	
Application Timing	Trade Name	Rate (amt./A)	Grasses	Broadleaves
PRE	Pursuit 2S imazethapyr	4-6 fl. oz.	Foxtails	Pigweeds
PRE	Spartan 4F sulfentrazone	4.5 fl. oz.	Annuals	Marestail
PRE/POST	Scepter 70DG imazaquin	2.3-2.8 oz.	Foxtails	Pigweeds
POST	Raptor 1S imazamox	5 fl. oz.	Annuals	Lambsquarters
POST	Harmony SG thifensulfuron	0.25 oz.		Pigweeds
POST	Aim 2EC carfentrazone	0.8 fl. oz.		Velvetleaf
POST	Select Max clethodim	12 fl. oz.	Annuals	Pigweeds
DORMANT*	Sencor 75DF metribuzin	8 oz.	Annuals	Pigweeds
DORMANT*	Lorox 50 DF linuron	8 oz.	Annuals	Pigweeds
DORMANT*	Dual S-metachlor	1.3 fl. oz.	Annuals	Pigweeds

*Only to be used on 3-month or older established TK.

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