

Department of Crop and Soil Sciences

Technical Report 01-3

2000

Eastern Washington

Weed Control Report

**Contributing agencies: Washington State University, U.S. Department of Agriculture and Department of Crop and Soil Sciences.
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Washington State University

Department of Crop and Soil Sciences

2000 Eastern Washington Weed Control Report

Technical Report

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INTRODUCTION

The information that is enclosed in this report is a summary of herbicide weed control trials that were conducted as a part of the Cooperative Extension Weed Management Project in the dryland cropping region of eastern Washington. The results of each individual trial are considered preliminary and are accompanied by a brief discussion. Because these trials include experimental herbicides, herbicides not currently labeled on the crop, and rates differing from the herbicide label, you need to consult the herbicide label for approved uses, labeled rates, and precautions.

Because these are preliminary research results, the results in this report are not to serve as herbicide recommendations. Neither the author, Washington State University, nor WSU Cooperative Extension attest or affirm that this information is presently appropriate for field application. Application or use of any information included herein shall be the sole responsibility of the grower.

These trials were made possible through the efforts, cooperation, and support of many individuals and organizations. I would like to express my appreciation and acknowledge their support. Financial support was provided from the following commodity commissions and private industries.

Washington and Idaho Pea and Lentil Commissions
Washington State Pesticide Registration Commission
Washington Wheat Commission
Washington Barley Commission

Agrevo
Monsanto
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Dupont

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The cooperation of Washington's growers was also critical in the success of these trials, and I especially want to thank the efforts and generosity of the following cooperators:

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Steve Swannack	Jeff Appleford	Lloyd Sunwald
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The successful completion and summation of these trials were also significantly aided by Shana Heaton, Giedre Suffian, Tania Ostrander and Laylah Bewick.

A Comment on Statistics and LSDs

Statistical analysis is performed on each set of data to determine if the differences between control ratings, yields, etc. are likely due to real effects from the herbicide or just chance variation. Variation can result from non-uniform soil conditions, differences in weed densities across the experiment, errors from using a small plot combine, etc. To reduce variation, each herbicide treatment is replicated or repeated so that its performance can be measured a number of times in the trial. The numbers that appear in the data tables for each measurement, such as yield or weed control, are the average of all replications. At the bottom of each table is a row titled LSD (0.05) and includes a number under each column of data. When comparing two herbicide treatments, the control ratings or yields must differ by more than the LSD value to be "significantly different" from each other. The number 0.05 gives the amount of uncertainty that is associated with the analysis. In this case, there is a 5% chance that there would not be a difference if the trial was repeated and 95% confidence that the difference is real. Some experiments include letters to the side of the data. These letters serve the same purpose as the LSD number. Data with the same letter are not significantly different from each other, but data followed by different letters are different with 95% certainty.

RESEARCH RESULTS ARE NOT RECOMMENDATIONS

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Herbicide Reference

Herbicides that were used in these trials are listed below as both common and trade names:

<u>COMMON NAME</u>	<u>TRADE NAME</u>
2,4-D amine	Several
2,4-D ester	Several
2,4-DB	Butyrac 200
BAYMKH6561	Olympus
BAYMKH6562	Everest
bentazon	Basagran
bromoxynil + MCPA	Bronate and others
bromoxynil	Buctril
carfentrazone	Aim
chloransulam	FirstRate
chlorsulfuron	Glean, Telar
clethodim	Select
clodinafop	Discover
Crop Oil Concentrate	COC
dicamba	Banvel, Clarity
diclofop	Hoelon
difenzoquat	Avenge
DPX-M6313	-----
DPX-R6447	-----
fenoxaprop	Puma
flufenacet + metribuzin	Axiom
fluroxypyr	Starane, Vista
glyphosate	Round-up Ultra
imazamethabenz	Assert
imazamox	Raptor
imazapic	Plateau
imazethapyr	Pursuit

Herbicide Reference

Herbicides that were used in these trials are listed below as both common and trade names:

<u>COMMON NAME</u>	<u>TRADE NAME</u>
isoxaflutole	Balance
MCPA - amine	Several
Methylated Seed Oil	MSO
metribuzin	Sencor
metsulfuron	Accent
MON78195	-----
oxyfluorfen	Goal
paraquat	Gramoxone Extra
pendimethalin	Prowl
picloram	Tordon
primisulfuron	Beacon
pronamide	Kerb
prosulfuron	Peak
pyridate	Tough
quizalofop	Assure II
rimsulfuron	Matrix
sethoxydim	Poast
sulfentrazone	Authority
sulfosate	Touchdown
sulfosulfuron	Maverick
thifensulfuron	Harmony GT
thifensulfuron + tribenuron	Harmony Extra
tralkoxydim	Achieve
triallate	Far-Go
tribenuron	Express
trifluralin	Treflan
urea-ammonium nitrate solution 28% or 32%	UAN
V-53482	-----

Weed Reference

Weeds within these trials are listed below both as common and scientific names:

<u>COMMON NAME</u>	<u>BAYER CODE</u>	<u>SCIENTIFIC NAME*</u>
bedstraw, catchweed	GALAP	<i>Galium aparine</i>
bindweed, field	CONAR	<i>Convolvulus arvensis</i>
bluegrass		<i>Poa</i> sp.
brome, downy	BROTE	<i>Bromus tectorum</i>
chamomile, mayweed	ANTCO	<i>Anthemis cotula</i>
goatgrass, jointed	AEGCY	<i>Aegilops cylindrica</i>
kochia	KCHSC	<i>Kochia scoparia</i>
lambsquarters, common	CHEAL	<i>Chenopodium album</i>
lettuce, prickly	LACSE	<i>Lactuca serriola</i>
mustard, wild	SINAR	<i>Brassica kaber</i>
oat, wild	AVEFA	<i>Avena fatua</i>
pigweed, Redroot	AMARE	<i>Amaranthus retroflexus</i>
ryegrass, Italian	LOLMU	<i>Lolium multiflorum</i>
ryegrass		<i>Lolium</i> sp.
starthistle, yellow	CENSO	<i>Centaurea solstitialis</i>
thistle, Russian	SASKR	<i>Salsola iberica</i>
wheat, volunteer		<i>Triticum aestivum</i>

*Scientific name includes genus, species.

00JPY009 - Antagonism of Graminicide Activity in Spring Wheat with Carfentrazone and Sulfonylurea Herbicides-Lamont, WA

This study was conducted to determine wild oat control efficacy of various herbicides and if activity of various graminicides were negatively impacted by broadleaf herbicide partners. Wild oat infestation was very heavy with some suspicion of ACCase, group 1, resistance in the populations.

Although wild oat control was generally poor due to the heavy infestation, control was not compromised by tank mixing any of the graminicides with carfentrazone. Wild oat control with fenoxaprop, imazamethabenz, difenzoquat, tralkoxydim, clodinafop was not lessened when each chemical or the imazamethabenz/difenzoquat combination was tank mixed with carfentrazone compared to each graminicide applied by itself or the combination.

Wild oat control with clodinafop activity was not affected by a tank mix of any of the broadleaf herbicides included in this study. Although yields were generally low, there was a trend for higher yield with clodinafop and its combinations.

00JPY009 - Antagonism of Graminicide Activity in Spring Wheat with Aim and Sulfonylurea Herbicides - Lamont, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/29/00	Type: Silt Loam
Cooperator:	Row Spacing: 7.5 inches	Organic Matter:%
Steve Swannack	Seeding Rate: 80 lbs/A	pH: 6.2
	Variety: Alpowa	

Application Information

	Timing
Date	5/12/00
Air Temperature	65.8 F
Rel. Humidity	25%
Wind Velocity	6.5 mph
Soil Temperature	54.5 F @ 2"
Soil Moisture	Moist
Cloud Cover	40%
Gal/Acre	10 gpa
Pressure	35 psi
Nozzles	Teejet XR8001
Crop Growth Stage	2 leaf
Height	3 inches
Weed Stage	
Wild oat	2 leaf, 2-3 inches

00JPY009 - Antagonism of Graminicide Activity in Spring Wheat with Aim and Sulfonylurea Herbicides-Lamont, WA

Treatment	Rate ^a	Wild Oat Control			Wheat	
		6/6/00	7/7/00	8/16/00	Yield	Test Wt.
		-----%-----			bu/a	lbs/a
Nontreated		0	0	0	10	62
Carfentrazone + UAN*	0.008 + 4%	0	0	0	12	62
Carfentrazone + fenoxaprop	0.008 + 0.078	71	45	43	29	61
Carfentrazone + fenoxaprop + MCPA ester	0.008 + 0.078 + 0.375	75	45	38	25	60
Carfentrazone + imazamethabenz*	0.008 + 0.47	85	83	76	32	61
Carfentrazone + imazamethabenz + difenzoquat*	0.008 + 0.23 + 0.5	81	80	66	22	62
Carfentrazone + tralkoxydim + COC**	0.008 + 0.18 + 0.5%	75	49	36	20	61
Carfentrazone + clodinafop + COC	0.008 + 0.05 + 0.8%	84	78	40	35	62
Fenoxaprop	0.078	70	45	33	26	61
Imazamethabenz *	0.47	81	81	80	35	60
Imazamethabenz + difenzoquat*	0.23 + 0.5	81	78	66	27	61
Tralkoxydim + COC**	0.18 + 0.5%	70	46	30	24	62
Clodinafop + COC	0.05 + 0.8%	90	80	53	49	61
Clodinafop + thifensulfuron + tribenuron + 2,4-D amine + COC	0.05 + 0.0125 + 0.00625 + 0.375 + 0.8%	87	79	55	45	61
Clodinafop + thifensulfuron + tribenuron + MCPA amine + COC	0.05 + 0.0125 + 0.00625 + 0.375 + 0.8%	83	68	48	37	61
Clodinafop + thifensulfuron + tribenuron + bromoxynil + MCPA + COC	0.05 + 0.0125 + 0.00625 + 0.25 + 0.25 + 0.8%	82	70	39	36	61
Clodinafop + thifensulfuron + tribenuron + fluroxypyr + COC	0.05 + 0.0125 + 0.00625 + 0.062 + 0.8%	84	70	44	34	62
Clodinafop + DPX-M6313 + 2,4-D Amine + COC	0.05 + 0.5 + 0.375 + 0.8%	81	66	43	31	62
Clodinafop + DPX-M6313 + MCPA Amine + COC	0.05 + 0.5oz + 0.375 + 0.8%	86	71	64	41	62
Clodinafop + DPX-M6313 + bromoxynil + MCPA + COC	0.05 + 0.5oz + 0.25 + 0.25 + 0.8%	89	77	74	41	61
Clodinafop + DPX-M6313 + fluroxypyr + COC	0.05 + 0.5oz + 0.062 + 0.8%	89	72	40	39	63
Clodinafop + tribenuron + 2,4-D Amine + COC	0.05 + 0.008 + 0.375 + 0.8%	82	51	40	31	62
Clodinafop + tribenuron + MCPA Amine + COC	0.05 + 0.008 + 0.375 + 0.8%	83	67	55	37	61
Clodinafop + tribenuron + bromoxynil + MCPA + COC	0.05 + 0.008 + 0.25 + 0.25 + 0.8%	88	68	45	30	62
Clodinafop + tribenuron + fluroxypyr + COC	0.05 + 0.008 + 0.062 + 0.8%	89	69	46	40	62
LSD (p=0.05)		9	11	22	18	1

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

* NIS applied at 0.25 % .

** Ammonium Sulfate added at 15lbs/100gal.

00JPY011 - Glyphosate Efficacy in Roundup Ready Spring Wheat-Pullman, WA

The study was conducted in Whitman County, WA to determine wild oat control and spring wheat yield response. The study was designed as a randomized complete block with 3 replications. All herbicides were applied using a CO₂ backpack sprayer calibrated to deliver 10 gallons per acre at 35 psi. Timing of herbicide applications included EPOST = early postemergence applied to 3-4 leaf spring wheat on 5/7/00 and LPOST = late postemergence applied to 4-6 leaf spring wheat on 5/18/00. A glyphosate-resistant spring wheat variety was used across the study to ensure crop safety in glyphosate treatments.

Wild oat was effectively controlled by all treatments of glyphosate and glyphosate combinations. Greatest wheat yield was with glyphosate in combination with broadleaf herbicides or with split early plus late applications of glyphosate. Test weights were generally unaffected by herbicide treatment with differences largely due to wild oat or other weed seed contaminating harvested grain samples rather than reduced kernel quality. Harvested grain was not cleaned as samples were weighed and were not saved which precluded further postharvest sample cleaning.

00JPY011 - Glyphosate Efficacy in Roundup Ready Spring Wheat - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/5/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 4.2%
USDA Conservation Farm	Seeding Rate: 80 lbs/A	pH: 5.2
	Variety: Roundup Ready	

Application Information

	Timing	
	EPOST	LPOST
Date	5/7/00	5/18/00
Air Temperature	65 F	72.9 F
Rel. Humidity	29.1%	35.2 %
Wind Velocity	2 mph	5 mph
Soil Temperature	64.3 F @ 2"	68.9 F @ 2"
Soil Moisture	Dry	Dry
Cloud Cover	5%	60%
Gal/Acre	10 gpa	10 gpa
Pressure	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001
Crop Growth Stage	3-4 leaf	4-6 leaf
Height	6 inches	8 inches
Weed Stage		
Broadleaf	3-5 leaf	2-6 leaf
Grasses	3 leaf	4 leaf

00JPY011 - Glyphosate Efficacy in Roundup Ready Spring Wheat-Pullman, WA

Treatment	Rate	Timing	Wild Oat	Spring Wheat	
			Control	Yield	Test wt.
			8/7/00	bu/a	lbs/bu
			----- % -----		
Weedy check			0	84	59
Glyphosate	0.375	EPOST	85	109	61
Glyphosate	0.56	EPOST	92	92	62
Glyphosate	0.75	EPOST	95	106	61
Glyphosate + dicamba	0.375 + 0.06	EPOST	87	114	61
Glyphosate + thifensulfuron + tribenuron ^a	0.375 + 0.01 + 0.005	EPOST	92	115	60
Glyphosate + bromoxynil	0.375 + 0.25	EPOST	94	108	57
Glyphosate	0.75	LPOST	95	102	62
Glyphosate	0.56	LPOST	95	109	59
Glyphosate	0.75	LPOST	97	108	62
Glyphosate + 2,4-D Ester	0.75 + 0.25	LPOST	97	90	59
Glyphosate, glyphosate	0.375, 0.375	EPOST, LPOST	97	113	58
Glyphosate, glyphosate	0.75, 0.75	EPOST, LPOST	97	111	58
Bromoxynil + MCPA + thifensulfuron + tribenuron + fenoxaprop ^a	0.375 + 0.375 + 0.013 + 0.006 + 0.084	EPOST	88	99	60
Bromoxynil + MCPA + thifensulfuron + tribenuron + fenoxaprop ^a	0.375 + 0.375 + 0.013 + 0.006 0.084	LPOST	75	93	55
LSD (p=0.05)			6	17	5

^aapplied with 0.25% nonionic surfactant.

**00JPY012 - Control of Volunteer Roundup Ready Spring Wheat with Graminicides-
Pullman, WA**

This study was conducted to determine the potential to kill glyphosate resistant spring wheat with herbicides. The information is critical to determine the complete cost of potential systems utilizing glyphosate-resistant wheat.

It is possible to effectively kill glyphosate-resistant spring wheats using existing herbicides. Control was nearly complete with early applications that include quizalofop, clethodim, sethoxydim, or other graminicides. The volunteer wheat was killed after the plants had headed, but prior to anthesis. Later applications showed less control on the June 19 rating date, but plants were dying and control would have likely been equal to the earlier applications at a similar post application interval had the plots not been destroyed.

00JPY012 - Control of Volunteer Roundup Ready Spring Wheat with Graminicides - Pullman,WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	N/A	Type: Palouse silt loam
Cooperator:		Organic Matter: 4.2%
USDA Conservation Farm		pH: 5.2

Application Information

	Timing	
	EPOST	LPOST
Date	5/7/00	5/30/00
Air Temperature	65 F	47.3 F
Rel. Humidity	29%	49%
Wind Velocity	0 mph	0 mph
Soil Temperature	64.3 F @ 2"	50.4 F @ 2"
Soil Moisture	Dry	Dry
Cloud Cover	5%	10%
Gal/Acre	10 gpa	10 gpa
Pressure	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001
Wheat Growth Stage	3-4 leaf	5-6 leaf
Height	4-8 inches	6-9 inches

00JPY012 - Control of Volunteer Roundup Ready Spring Wheat with Graminicides-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Wheat Injury	
			6/02/00	6/19/00
			----- % -----	
Glyphosate + ammonium sulfate	0.56 + 17	EPOST	0	0
Quizalofop + COC	0.0275 + 1%	EPOST	95	95
Quizalofop + COC	0.04 + 1 %	EPOST	96	95
Quizalofop + COC	0.054 + 1%	EPOST	98	95
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.0275 + 17 + 1%	EPOST	96	92
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.04 + 17 + 1%	EPOST	96	92
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.054 + 17 + 1%	EPOST	96	93
MON78195 + ammonium sulfate	0.525 + 17	EPOST	94	92
MON78195 + ammonium sulfate	0.79 + 17	EPOST	94	92
MON78195 + ammonium sulfate	1.05 + 17	EPOST	90	90
Clethodim + COC	0.11 + 1%	EPOST	98	95
Sethoxydim + COC	0.375 + 1%	EPOST	94	93
Glyphosate + ammonium sulfate	0.56 + 17	LPOST	0	0
Quizalofop + COC	0.0275 + 1%	LPOST	12	70
Quizalofop + COC	0.04 + 1 %	LPOST	17	75
Quizalofop + COC	0.054 + 1%	LPOST	15	77
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.0275 + 17 + 1%	LPOST	17	88
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.04 + 17 + 1%	LPOST	29	85
Glyphosate + quizalofop + ammonium sulfate + COC	0.56 + 0.054 + 17 + 1%	LPOST	35	87
MON78195 + ammonium sulfate	0.525 + 17	LPOST	20	82
MON78195 + ammonium sulfate	0.79 + 17	LPOST	21	83
MON78195 + ammonium sulfate	1.05 + 17	LPOST	17	82
Clethodim + COC	0.11 + 1%	LPOST	28	88
Sethoxydim + COC	0.375 + 1%	LPOST	27	85
LSD (p=0.05)			15	7

^aRate expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix. Fertilizer is expressed in lbs/100gal.

00JPY018 - Wild Oat Control in Conventionally-Tilled Spring Wheat-Pullman, WA

This study was conducted to evaluate current and potential wild oat herbicides in spring wheat. A Clearfield® variety of wheat was used so that imazamox could be included. Unfortunately, imazamox applications were misapplied. Data from imazamox treatments are not shown.

Generally, control was effective with all herbicide treatments. Preemergence triallate and postemergence tralkoxydim provided less control than other treatments, but the tralkoxydim treatment had the greatest yield. Some slight crop injury was noted with some treatments, but yield differences were not significant.

00JPY018 - Wild Oat Control in Conventionally-Tilled Spring Wheat - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/25/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.5%
WSU - Cunningham Farm	Seeding Rate: 80 lbs/A	pH: 5.2
	Variety: Imi	

Application Information

	Timing		
	PPI	POPI	POST
Date	4/25/00	4/29/00	6/5/00
Air Temperature	49 F	38 F	69 F
Rel. Humidity	53%	72%	54%
Wind Velocity	3 mph	6 mph	2.4 mph
Soil Temperature	41 F @ 2"	40 F @ 2"	66.2 F @ 2"
Soil Moisture	Dry	Dry	Dry
Cloud Cover	5%	5%	80%
Gal/Acre	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant Incorporate	Post Plant Preemerge	8 tiller
Height			9-10 inches
Weed Stage	N/A	N/A	
COLQ			1-4 inches
Prickly lettuce			2 inches
Pigweed			1 inch

00JPY018 - Wild Oat Control in Conventionally-Tilled Spring Wheat-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Wild Oat	Wheat	
			Control	Injury	Yield
			8/22/00	6/20/00	
			----- % -----		bu/a
Nontreated			0	0	90
Triallate	1	PPI	76	0	88
Difenzoquat	0.6	SPOST	85	3	93
Imazamethabenz**	0.41	SPOST	96	4	88
Imazamethabenz* + difenzoquat	0.23 + 0.5	SPOST	94	0	89
Fenoxaprop	0.082	SPOST	95	4	87
Diclofop	0.75	SPOST	91	5	90
Tralkoxydim + COC	0.18 + 0.5 %	SPOST	73	5	95
Clodinafop + COC	0.8 oz + 0.8 %	SPOST	95	0	91
MKH6561*	0.027	SPOST	95	1	84
MKH6561*	0.04	SPOST	95	1	92
MKH6562*	0.027	SPOST	92	1	91
MKH6562*	0.04	SPOST	95	2	93
LSD (p=0.05)			3	5	NS

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

* NIS applied at 0.25 %.

** NIS applied at 0.5 %.

00JPY003 - Control of Over-Wintered Wheat in Fallow Situations-Lind, WA

This study was conducted to determine best methods of nonselective control of volunteer cereals and weeds prior to establishment of summer fallow. Herbicide applications were made in late winter or early spring. It was difficult to distinguish grass species on the May 24 evaluation date, so volunteer wheat and downy brome were combined into the category grasses.

Nearly all early treatments provided good to excellent control of annual grass and volunteer with the exception of paraquat where much regrowth of grass vegetation was obvious. Glyphosate, sulfosate, quizalofop, sethoxydim, clethodim, and glyphosate plus quizalofop provided equal control of grasses and volunteer wheat. Downy brome control with glyphosate alone was less than glyphosate plus quizalofop treatments, but not less than sulfosate, quizalofop, clethodim, or sethoxydim alone. Glyphosate, glyphosate and graminicide combinations, sulfosate, and paraquat all provided effective wild mustard control at early applications.

On average, late treatments were not as effective as early applications for grass control. Glyphosate alone or in combination with quizalofop provided grass, volunteer wheat, and downy brome control not less than the best late application. The primary reason for less control with the later applications is more developed plants and drier conditions before, at the time of, and following herbicide applications. Again, glyphosate, glyphosate and graminicide combinations, sulfosate, and paraquat all provided effective wild mustard control at late applications.

00JPY003 - Control of Over-Wintered Wheat in Fallow Situations - Lind, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Adams County, WA	N/A	Type: Ritzville silt loam
Cooperator:		Organic Matter: 2.1%
WSU - Dryland Experiment Station		pH: 7.4

Application Information

	Timing	
	ESPRING	LSPRING
Date	4/14/00	5/03/00
Air Temperature	63 F	64.3 F
Rel. Humidity	38.5%	65.3%
Wind Velocity	2.5 mph	5.5 mph
Soil Temperature	54.3 F @ 2"	57.4 F @ 2"
Soil Moisture	Dry	Dry
Cloud Cover	30%	25%
Gal/Acre	10 gpa	10 gpa
Pressure	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001
Weed Stage		
Grasses	1-3 tiller	3-4 tiller

00JPY003 - Control of Over-Wintered Wheat in Fallow Situations-Lind, WA

Treatment	Rate ^a	Appl. Timing	Grasses	Vol. Wheat	Downy Brome	Wild Mustard
			Control			
			5/24/00	6/7/00	6/7/00	6/7/00
			----- % -----			
Glyphosate*	0.56	ESPRING	89	89	78	93
Quizalofop + COC	0.04 + 1 %	ESPRING	89	94	94	38
Quizalofop + COC	0.054 + 1%	ESPRING	92	94	91	20
Quizalofop + COC	0.068 + 1%	ESPRING	90	93	82	33
Glyphosate** + quizalofop	0.56 + 0.04	ESPRING	96	97	99	93
Glyphosate** + quizalofop	0.56 + 0.054	ESPRING	97	96	97	96
Glyphosate** + quizalofop	0.56 + 0.068	ESPRING	98	97	97	93
Clethodim + COC	0.11 + 1%	ESPRING	94	91	94	33
Sethoxydim + COC	0.375 + 1%	ESPRING	89	91	94	33
Glyphosate + carfentrazone + NIS + UAN	0.56 + 0.00825 + 0.25% + 1qt	ESPRING	91	93	87	95
Glyphosate + Aim + NIS + UAN	0.56 + 0.0165 + 0.25% + 1qt	ESPRING	93	93	96	96
Paraquat + NIS	0.625 + 0.25%	ESPRING	38	31	65	94
Sulfosate + NIS	1 + 0.25%	ESPRING	95	96	92	94
Glyphosate*	0.56	LSPRING	71	85	68	94
Quizalofop + COC	0.04 + 1 %	LSPRING	38	56	66	54
Quizalofop + COC	0.054 + 1%	LSPRING	36	51	58	40
Quizalofop + COC	0.068 + 1%	LSPRING	31	53	50	36
Glyphosate** + quizalofop	0.56 + 0.04	LSPRING	68	89	73	96
Glyphosate** + quizalofop	0.56 + 0.054	LSPRING	68	90	69	95
Glyphosate** + quizalofop	0.56 + 0.068	LSPRING	69	93	76	96
Clethodim + COC	0.11 + 1%	LSPRING	46	79	78	30
Sethoxydim + COC	0.375 + 1%	LSPRING	63	65	60	31
Glyphosate + carfentrazone + NIS + UAN	0.56 + 0.00825 + 0.25% + 1qt	LSPRING	68	93	74	97
Glyphosate + Aim + NIS + UAN	0.56 + 0.0165 + 0.25% + 1qt	LSPRING	68	88	73	95
Paraquat + NIS	0.625 + 0.25%	LSPRING	53	41	61	92
Sulfosate + NIS	1 + 0.25%	LSPRING	73	90	71	97
LSD (p=0.05)			14	10	18	26

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

* Ammonium sulfate added at 17 lbs/100gal.

** Ammonium sulfate applied at 17 lbs/100gal COC added at 1%.

00JPY007 - Evaluation of Puma with and without Various Broadleaf Herbicides in Winter Wheat-Pullman, WA

This study was conducted to determine wild oat control with fenoxaprop and comparable herbicides and whether broadleaf herbicides tank mixed with fenoxaprop antagonized control of wild oat.

All herbicide treatments provided good to excellent control of wild oats with slightly less control provided by tralkoxydim and BAY MKH6561 tank mixed with bromoxynil, MCPA, and fluroxypyr. It is unlikely that the tank mix partners antagonized the wild oat control provided by tralkoxydim or BAY MKH6561. Fenoxaprop provided the best or equivalent wild oat control regardless of the broadleaf herbicide tank mix partners in this study.

Wheat yields and test weight differences were not significantly different between any of the treatments or the nontreated control.

00JPY007 - Evaluation of Puma with and without Various Broadleaf Herbicides in Winter Wheat - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 9/20/99	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 2.7%
Mark Whitmore	Seeding Rate: 80 lbs/A	pH: 5.5
	Variety: Madsen	

Application Information

	Timing
Date	4/26/00
Air Temperature	68.5 F
Rel. Humidity	28%
Wind Velocity	5.4 mph
Soil Temperature	63 F @ 2"
Soil Moisture	Dry
Cloud Cover	70%
Gal/Acre	10 gpa
Pressure	35 psi
Nozzles	Teejet XR8001
Crop Growth Stage	5 tiller
Height	12 inches
Weed Stage	
Wild oat	5 leaf, 4 inches

00JPY007 - Evaluation of Puma with and without Various Broadleaf Herbicides in Winter Wheat-Pullman, WA

Timing	Rate ^a	Wild oat control		Winter wheat		
		6/28/00	8/2/00	Injury 6/28/00	Yield	Test wt.
		----- % -----			bu/a	lbs/bu
Fenoxaprop	0.084	99	97	0	83	60
Fenoxaprop + thifensulfuron + fluroxypyr*	0.084 + 0.019 + 0.094	99	97	1	81	60
Fenoxaprop + thifensulfuron + fluroxypyr + MCPA ester*	0.084+ 0.019 + 0.094 + 0.375	99	97	1	75	60
Fenoxaprop + thifensulfuron + fluroxypyr + prosulfuron*	0.084+ 0.019 + 0.094 + 0.013	99	97	2	81	61
Fenoxaprop + bromoxynil + MCPA	0.084 + 0.25 + 0.25	99	97	1	82	61
Fenoxaprop + bromoxynil + MCPA + thifensulfuron*	0.084 + 0.375 + 0.375 + 0.019	98	97	2	73	60
Fenoxaprop + bromoxynil + MCPA + thifensulfuron*	0.084 + 0.25 + 0.25 + 0.019	99	96	2	90	60
Fenoxaprop + bromoxynil + MCPA + fluroxypyr	0.084 + 0.25 + 0.25 + 0.094	98	95	1	72	60
Fenoxaprop + bromoxynil + fluroxypyr	0.084 + 0.5 + 0.094	96	94	1	79	60
Fenoxaprop + bromoxynil + fluroxypyr	0.084 + 0.5 + 0.126	99	95	2	77	60
Fenoxaprop+ thifensulfuron*	0.084 + 0.023	99	97	0	76	60
Tralkoxydim + bromoxynil + MCPA + fluroxypyr + COC	0.18 + 0.25 + 0.25 + 0.094 + 0.5%	91	87	2	86	60
BAY MKH6561 + bromoxynil + MCPA + fluroxypyr + COC	0.031+ 0.25 + 0.25 + 0.094 + 1 pt	93	87	10	69	60
Clodinafop + bromoxynil + MCPA + fluroxypyr + COC	0.05 + 0.25 + 0.25 + 0.094 + 0.8%	97	94	1	80	60
Clodinafop + thifensulfuron*	0.05 + 0.023	99	97	0	90	60
LSD (p=0.05)		7	6	3	NS	NS

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.
^{*} NIS applied at 0.25 %.

99JPY021 - Downy Brome Control in Winter Wheat-Lind, WA

The study was conducted at Lind, WA to determine downy brome control and winter wheat response to several herbicides that are currently labeled or expected to be labeled soon in winter wheat. The study was designed as a randomized complete block with 4 replications. Application timings included FPOST = Fall postemergence applications on 12/10/99 and SPOST = Spring postemergence applications on 3/8/00. All herbicides were applied using a CO₂ backpack sprayer calibrated to deliver 10 gallons per acre at 35 psi. An imidazolinone-resistant wheat variety was used to ensure crop safety with imazamox.

Fall applications of sulfosulfuron, imazamox, and combinations of metribuzin plus sulfosulfuron, imazamox, and MKH 6561 controlled downy brome the best. Generally, fall applications provided better control than spring applications with control improving through downy brome maturity. Wheat yield was greatest with fall applications of sulfosulfuron, imazamox, MKH6561, metribuzin, and combinations of metribuzin with imazamox or MKH6561 and a spring sulfosulfuron application. Test weight was not affected by herbicide treatment.

99JPY021 - Downy Brome Control in Winter Wheat - Lind, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Adams County, WA	Planting Date: 9/9/99	Type: Shano silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 1.2%
WSU - Dryland Experiment Station	Seeding Rate: 30 lbs/A	pH: 5.7
	Variety: IMI FS4 Clearfield	

Application Information

	FPOST	SPOST
Date	12/10/99	3/8/00
Air Temperature	40 F	51.8 F
Rel. Humidity	77%	77%
Wind Velocity	3.6 mph	2 mph
Soil Temperature	33 F @ 2"	39 F @ 2"
Soil Moisture	Moist	Moist
Cloud Cover	90%	95%
Gal/Acre	10 gpa	10 gpa
Pressure	33 psi	35 psi
Nozzles	XR8001	XR8001
Crop Growth Stage	4-6 tiller	2-3 tiller
Height	8 inches	4.5 inches
Weed Stage		
Downy brome	1-2 leaf	2-4 leaf

99JPY021 - Downy Brome Control in Winter Wheat-Lind, WA

Treatment	Rate	Timing	Downy Brome Control		Winter Wheat	
			3/22/00	6/7/00	Yield	Test weight
	lbs/a		----- % -----		bu/a	lbs/bu
Weedy check			0	0	82	62
Flufenacet + metribuzin	0.34 + 0.085	PRE	69	60	86	62
Flufenacet + metribuzin	0.272 + 0.068	FPOST	77	55	85	62
Sulfosulfuron ^a	0.031	FPOST	91	93	95	62
Imazamox ^b	0.04	FPOST	94	95	88	62
MKH6561 ^c	0.04	FPOST	67	70	88	62
MKH6562 ^c	0.04	FPOST	48	44	85	61
Metribuzin	0.28	FPOST	78	74	88	62
Sulfosulfuron + metribuzin ^a	0.023 + 0.14	FPOST	91	89	83	62
Imazamox + metribuzin ^b	0.032 + 0.14	FPOST	94	94	93	62
MKH 6561 + metribuzin ^c	0.032 + 0.14	FPOST	86	88	88	62
MKH 6562 + metribuzin ^c	0.032 + 0.14	FPOST	80	64	82	62
Flufenacet + metribuzin	0.272 + 0.068	SPOST	21	29	84	62
Sulfosulfuron ^a	0.031	SPOST	60	45	89	62
Imazamox ^b	0.04	SPOST	52	76	84	62
MKH6561 ^c	0.04	SPOST	53	58	87	62
MKH6562 ^c	0.04	SPOST	40	10	86	62
Metribuzin	0.375	SPOST	40	63	83	62
LSD (p=0.05)			24	15	7	ns

^aapplied with 0.5% nonionic surfactant.

^bapplied with 0.25% nonionic surfactant and 1 qt/a Solution 32 nitrogen fertilizer.

^capplied with 0.25% nonionic surfactant.

99JPY022 - Grass Weed Control in Winter Wheat-Pullman, WA

This study was conducted to evaluate current and potential grass herbicides in winter wheat. A Clearfield® variety of wheat was used so that imazamox could be included as a treatment.

Generally, all herbicide treatments showed at least an acceptable degree of control with variable results for each treatment. Greatest control of Italian ryegrass was with clodinafop while greatest wild oat control was with MKH6562. However, wild oat control with MKH6562 was significantly greater than the nontreated control, but less than or equal to the other herbicide treatments. Yield differences among the treatments were not significantly different.

99JPY022 - Grass Weed Control in Winter Wheat - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 10/18/99	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.5%
WSU - Cunningham Farm	Seeding Rate: 90 lbs/A	pH: 5.2
	Variety: IMI Resistant	

Application Information

	Timing		
	PREE	SEPOST	SMPOST
Date	10/29/99	4/10/00	4/19/00
Air Temperature	55 F	61 F	45.1 F
Rel. Humidity	64%	17.1%	77.5%
Wind Velocity	2.5 mph	1.4 mph	1 mph
Soil Temperature	46 F @ 2"	61 F @ 2"	45 F @ 2"
Soil Moisture	Wet	Dry	Dry
Cloud Cover	80%	75%	25%
Gal/Acre	10 gpa	10 gpa	10 gpa
Pressure	33 psi	35 psi	35 psi
Nozzles	XR8001	XR8001	XR8001
Crop Growth Stage	Preemergence	1-3 tiller	2-3 tiller
Height		3-5 inches	4-8 inches
Weed Stage	N/A		
Downy Brome		1-4 inches	1-2 tiller

99JPY022 - Grass Weed Control in Winter Wheat-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Italian ryegrass			Wild oat	Winter wheat	
			5/13/00	8/3/00	8/3/00	Yield	Test wt.	
			-----	%	-----	bu/a	lbs/bu	
Nontreated			0	0	0	64	62	
Flufenacet + metribuzin	0.34 + 0.085	PREE	80	53	72	68	62	
Sulfosulfuron + NIS	0.67 + 0.5%	SEPOST	71	70	75	75	63	
Imazamox + NIS + Sol 32	0.04 + 0.25% + 1qt	SEPOST	69	73	64	74	62	
MKH6561 + NIS	0.04 + 0.25%	SEPOST	58	79	70	67	62	
MKH6562 + NIS	0.04 + 0.25%	SEPOST	81	84	85	82	62	
Tralkoxydim + COC + Ammonium Sulfate	0.18 + 0.5% + 1.5	SMPOST	70	84	53	61	61	
Imazamethabenz + NIS	0.47 + 0.25	SMPOST	54	79	50	62	62	
Difenzoquat	1	SMPOST	39	77	57	73	62	
Imazamethabenz + difenzoquat + NIS	0.23 + 0.5 + 0.25%	SMPOST	61	68	76	75	63	
Clodinafop + COC	0.05 + 0.8%	SMPOST	71	97	68	73	62	
Diclofop	1	SMPOST	79	89	68	65	61	
LSD (p=0.05)			36	29	35	NS	NS	

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

99JPY025 - Evaluation of MON37500 Formulations-Winter Wheat-Endicott, WA

This study was conducted to evaluate downy brome control with a liquid (SC) and dry (DF) formulation of sulfosulfuron in combination with liquid fertilizer and surfactant. Both fall and spring applications were evaluated. A heavy infestation of jointed goatgrass at this site prevented harvest of the plots as the grower cooperater wished to prevent jointed goatgrass seed production.

Generally, there were not differences in catchweed bedstraw or downy brome control between the formulations with the exception of the final rating on May 25. At this rating date, the spring applied SC (liquid) formulation provided less downy brome control than the DF (dry) formulation although there were no differences in control on the March 28 evaluation. The opposite was true for the fall application when sulfosulfuron was applied using Solution 32 as a carrier. In the case of the fall application, it was difficult to mix the dry formulation in the Solution 32 and a pure solution was probably not achieved. With the spring applications, the dry formulation was dissolved in a small amount of water to ensure it was at least in a water solution prior to adding the Solution 32. Generally, control declined as the percentage of Solution 32 in the mix increased with results being inconsistent between liquid and dry sulfosulfuron formulations.

99JPY025 - Evaluation of MON 37500 Formulations -Winter Wheat- Endicott, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 10/1/99	Type: Palouse Silt Loam
Cooperator:	Row Spacing: 7 inches	Organic Matter:3.7%
Dale Stover	Seeding Rate: 90 lbs/A	pH:5.2
	Variety: Kashup	

Application Information

	Timing	
	FPOST	SPOST
Date	11/29/99	2/10/00
Air Temperature	54 F	49 F
Rel. Humidity	75%	86%
Wind Velocity	3.7 mph	0 mph
Soil Temperature	45 F @ 2"	45 F @ 2"
Soil Moisture	Moist	Wet
Cloud Cover	75%	30%
Gal/Acre	10 gpa	10 gpa
Pressure	35 psi	30 psi
Nozzles	XR8001	XR8001
Crop Growth Stage	3-5 leaf, 1-3 tiller	3-4 tiller
Height	4 inches	4.5 inches
Weed Stage		
Downy Brome	3 leaf	2 tiller

99JPY025 - Evaluation of MON37500 Formulations-Winter Wheat-Endicott, WA

Treatment	Rate ^a	Appl. Timing	Catchweed	Downy brome	
			bedstraw	Control	
			2/24/00	3/28/00	5/25/00
			----- % -----		
Sulfosulfuron DF + NIS	0.031 + 0.5%	FPOST	90 ab	69 ab	79 ab
Sulfosulfuron SC + NIS	0.031 + 0.5%	FPOST	94 a	75 ab	90 a
Sulfosulfuron DF + NIS + 28-0-0	0.031+ 0.25% + 50%	FPOST	97 a	73 ab	74 abc
Sulfosulfuron SC + NIS + 28-0-0	0.031 + 0.25% + 50%	FPOST	97 a	64 b	56 cde
Sulfosulfuron DF + NIS + 28-0-0	0.031+ 0.25% + 100%	FPOST	89 ab	36 c	19 gh
Sulfosulfuron SC + NIS + 28-0-0	0.031+ 0.25% + 100%	FPOST	97 a	48 c	42 def
Sulfosulfuron DF + 28-0-0	0.031+ 100%	FPOST	95 a	44 c	29 fg
Sulfosulfuron SC + NIS	0.031+ 0.5%	FPOST	91 a	42 c	28 fg
Sulfosulfuron DF + NIS	0.031 + 0.5%	SPOST	92 a	74 ab	64 bc
Sulfosulfuron SC + NIS	0.031 + 0.5%	SPOST	81 bc	79 a	39 efg
Sulfosulfuron DF + NIS + 28-0-0	0.031 + 0.25% + 75%	SPOST	77 c	74 ab	62 bcd
Sulfosulfuron SC + NIS + 28-0-0	0.031 + 0.25% + 75%	SPOST	71 c	79 ab	80 ab
LSD (p=0.05)			10	15	21

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

99JPY030 - Russian Thistle Control in Winter Wheat- Benton County, WA

This study was conducted to determine selective control of Russian thistle using applications which were applied postemergence to crops and weeds and post-emergence to crop, but preemergence to weeds (layby). Russian thistle was present at the time of February applications, but subsequent freezing temperatures killed weeds that were present including those in the control plots. However, information was collected on the safety of the various chemicals to the winter wheat.

Sulfentrazone, which has shown excellent Russian thistle control in other studies at the rates tested, showed slight injury to the wheat. Injury symptoms were yellowing and bleaching of leaves present at the time of application with growth following the application showing no injury. Injury did not affect yield relative to the nontreated wheat.

We expect to conduct this experiment a second time in the presence of a heavier Russian thistle infestation. Also, given the crop safety exhibited by sulfentrazone in this study and the control shown in other studies, we intend to further evaluate these materials over locations and years.

99JPY030 - Russian Thistle Control in Winter Wheat - Benton County, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Benton County, WA	Planting Date: 11/10/99	Type: Silt Loam
Cooperator:	Row Spacing: 10 inches	Organic Matter 1%
Doug Raul	Seeding Rate: 60 lbs/A	pH: 7.8
	Variety: Malcolm	

Application Information

	Timing
Date	2/24/00
Air Temperature	58 F
Rel. Humidity	58%
Wind Velocity	1 mph
Soil Temperature	39 F @ 2"
Soil Moisture	Moist
Cloud Cover	10%
Gal/Acre	10 gpa
Pressure	53 psi
Nozzles	Teejet XR8001
Crop Growth Stage	2-3 tiller
Height	3-5 inches
Weed Stage	
Russian thistle	1 seedleaf, 1 inch
Downy brome	3-4 tiller, 1-2 inches
Jointed goatgrass	2 tiller, 1-3 inches
Brassicaceae	1 st true leaf, <1 inch

99JPY030 - Russian Thistle Control in Winter Wheat- Benton County, WA

Treatment	Rate ^a	Wheat Injury	Wheat Yield
		3/22/00 ----- % -----	7/11/00 bu/a
Control			19
Sulfentrazone	0.125	3	19
Sulfentrazone	0.175	4	19
Sulfentrazone	0.25	11	18
Trifluralin	0.75	0	19
Trifluralin	1	0	20
Pendimethalin	0.75	0	19
Pendimethalin	1	0	21
DPX-R6447	0.03	1	18
DPX-R6447	0.06	0	22
DPX-R6447	0.09	2	20
DPX-R6447	0.125	1	17
Sulfentrazone + chlorsulfuron + metsulfuron	0.125 + 0.017 + 0.003	1	18
Sulfentrazone + chlorsulfuron + metsulfuron	0.175 + 0.017 + 0.003	2	16
DPX-R6447 + chlorsulfuron + metsulfuron	0.06 + 0.017 + 0.003	0	21
DPX-R6447 + chlorsulfuron + metsulfuron	0.09 + 0.017 + 0.003	0	22
chlorsulfuron + metsulfuron	0.017 + 0.003	0	20
LSD (p=0.05)		2	3

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

00JPY006 - Broadleaf Weed Control in Barley with Carfentrazone - Endicott, WA

This study was conducted to determine weed control efficacy and crop injury with carfentrazone and combinations containing carfentrazone in spring barley. All applications were made postemergence to crop and weeds. Predominate weed populations were Russian thistle and kochia.

Crop safety was excellent with all treatments although some injury was seen when liquid nitrogen or dry ammonium sulfate and surfactant were added to carfentrazone alone or tank mix combinations including carfentrazone. Excellent crop safety was also seen with applications of sulfentrazone.

Russian thistle control exceeded 90% for all treatments except carfentrazone plus 2,4-D amine applied with nonionic surfactant only. Control with carfentrazone plus 2,4-D amine increased when liquid nitrogen fertilizer was added in addition to the nonionic surfactant. Control with sulfentrazone was excellent.

Control of kochia was also excellent for carfentrazone treatments, but slightly less control was seen with sulfentrazone at the later planting date. Yields were not significantly different and no trends were apparent.

00JPY006 - Broadleaf Weed Control in Spring Wheat or Barley with Aim Herbicide - Endicott, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/1/00	Type: Silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.7%
Cleter Hughes	Seeding Rate: 100 lbs/A	pH: 5.2
	Variety: Two-row barley	

Application Information

	Timing
Date	5/15/00
Air Temperature	82.6 F
Rel. Humidity	25.5%
Wind Velocity	3.5 mph
Soil Temperature	70.7 F @ 2"
Soil Moisture	Dry
Cloud Cover	10%
Gal/Acre	10 gpa
Pressure	35 psi
Nozzles	Teejet XR8001
Crop Growth Stage	2-3 tiller
Height	3-5 inches
Weed Stage	
Volunteer barley	4-6 inches
Grasses	2-3 inches

00JPY006 - Broadleaf Weed Control in Barley with Aim Herbicide - Endicott, WA

Treatment	Rate ^a	Russian thistle		Kochia		Barley	
		Control		Injury		Yield	
		7/7/00	7/31/00	7/7/00	7/31/00	5/25/00	8/14/00
		-----%-----					lbs/a
Nontreated		0	0	0	0	0	2674
Carfentrazone + 2,4-D amine*	0.008 + 0.25	91	88	91	90	1	2516
Carfentrazone + 2,4-D amine**	0.008 + 0.25	95	94	95	95	2	2637
Carfentrazone + 2,4-D amine + ammonium sulfate*	0.008 + 0.25 + 17lbs/100gal	95	95	95	95	4	2753
Carfentrazone + 2,4-D ester**	0.008 + 0.25	93	94	95	95	2	2772
Carfentrazone + MCPA amine**	0.008 + 0.375	95	91	95	95	5	2414
Bromoxynil + MCPA + thifensulfuron + tribenuron*	0.25 + 0.25 + 0.0156 + 0.0078	91	94	91	91	1	2906
Bromoxynil + MCPA	0.375 + 0.375	95	95	95	94	1	2630
Carfentrazone + fluroxypyr**	0.008 + 0.125	95	95	95	93	3	2585
Carfentrazone + fluroxypyr + 2,4-D **	0.008 + 0.063 + 0.25	95	95	95	95	6	2429
Carfentrazone + fluroxypyr**	0.008 + 0.074 + 0.3	95	94	95	95	6	2397
Carfentrazone + thifensulfuron + tribenuron**	0.008 + 0.0156 + 0.0078	95	93	95	95	1	2731
Fluroxypyr + thifensulfuron + tribenuron**	0.19 + 0.0156 + 0.0078	95	91	95	90	2	2719
Sulfentrazone	0.09	91	94	90	78	0	2829
Sulfentrazone	0.14	91	95	91	80	0	2657
LSD (p=0.05)		5	5	5	10	2	NS

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

* NIS applied at 0.25 %.

** NIS applied at 0.25 % and UAN at 4% .

00JPY001 - Weed Control in No-Tillage Peas-Pullman, WA

This study was conducted to determine best timing of application of preemergence herbicides for no-tillage dry pea production. Greatest control of redroot pigweed, common lambsquarters, and prickly lettuce, and greatest crop yield was with early preemergence applications of imazethapyr and sulfentrazone. Weed control with late preemergence imazethapyr was about equal to the earlier application of the same material, but control and yield declined somewhat with late sulfentrazone applications relative to an earlier application of the same herbicide. None of the preemergence applications injured peas with the exception of chloransulam applied early. Later applications with this herbicide did not seem to be carried into the soil zone as rapidly as early applications and injury was much less with later applications.

Generally, postemergence applications provided less weed control and had lower dry pea yields than preemergence treatments. Injury was a concern with imazamox, but tank mixing imazamox with bentazon reduced crop injury. This combination treatment had the greatest yield of all postemergence treatments.

00JPY001 - Weed Control in No-Tillage Peas - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/20/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 10 inches	Organic Matter: 4.3%
USDA Conservation Farm	Seeding Rate: 180 lbs/A	pH: 5.2
	Variety: Karita	

Application Information

	Timing			
	EPREE	LPREE	EPOST	LPOST
Date	3/30/00	4/26/00	6/5/00	6/16/00
Air Temperature	56.2 F	48.7 F	79.5 F	67.2 F
Rel. Humidity	34.6%	63.5%	42%	51%
Wind Velocity	4.5 mph	7.9 mph	2.2 mph	2 mph
Soil Temperature	45.3 F @ 2"	45.5 F @ 2"	59.4 F @ 2"	55.6 F @ 2"
Soil Moisture	Moist	Dry	Moist	Dry
Cloud Cover	45%	20%	90%	2%
Gal/Acre	10 gpa	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant	Preemergence	4-6 nodes	8-10 nodes
Height			5-8 nodes	10-12 inches
Weed Stage	N/A	N/A		
COLQ				
Pigweed				

00JPY001 - Weed Control in No-Tillage Peas-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Redroot pigweed	Common lambsquarters	Prickly lettuce	Pea		
			6/19/00	6/19/00	8/8/00	8/8/00	Injury 6/19/00	Yield 9/1/00
			-----%-----				lbs/a	
Nontreated			0	0	0	0	0	1584
Imazethapyr	0.047	EPREE	95	94	97	89	0	1917
Sulfentrazone	0.25	EPREE	91	93	97	79	0	1939
Sulfentrazone	0.19	EPREE	80	83	89	77	1	1702
Flufenacet + metribuzin	0.4 + 0.1	EPREE	63	54	76	68	0	1522
Metribuzin	0.25	EPREE	71	74	72	87	0	1478
Chloransulam	0.032	EPREE	93	93	82	94	21	1395
Imazethapyr	0.047	LPREE	95	94	95	90	3	1884
Sulfentrazone	0.25	LPREE	90	91	95	83	0	1465
Flufenacet + metribuzin	0.4 + 0.1	LPREE	80	75	74	81	0	1537
Metribuzin	0.25	LPREE	61	71	82	95	3	1608
Chloransulam	0.032	LPREE	83	83	82	88	6	1508
Imazamox + UAN + NIS	0.031 + 1qt + 0.25%	EPOST	88	90	95	92	48	1133
Metribuzin	0.25	EPOST	93	95	97	89	9	1539
Imazamox + bentazon + UAN + NIS	0.031 + 0.375 + 1qt + 0.25%	EPOST	86	85	97	84	5	1577
Bentazon + COC	0.5 + 1qt	LPOST	50	54	74	85	0	1201
Bentazon + quizalofop + NIS	0.5 + 0.05 + 0.25%	LPOST	53	53	83	91	1	1317
MCPA-amine	0.25	LPOST	81	85	97	82	9	1487
LSD (p=0.05)			16	16	17	14	9	341

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

00JPY013 - Weed Control in Conventionally-Tilled Peas-Pullman, WA

This study was conducted to evaluate weed control and crop safety in conventionally tilled dry peas. Excessive shattering of the Karita peas in this study resulted in relatively low yield in some instances. Yield increased with increased crop injury largely due to delayed maturity and less shattering of peas.

Preplant incorporated or preemergence treatments of pendimethalin, pendimethalin + imazethapyr, sulfentrazone, V-53482, and chloransulam resulted in significantly greater yields than the nontreated control without crop injury. On average, control of mayweed chamomile, prickly lettuce, and common lambsquarter was greatest with preplant incorporated pendimethalin + imazethapyr and sulfentrazone. Chloransulam applied preemergence did not result in the high degree of crop injury observed in the no-tillage study.

Bentazon treatments had the greatest yields of both the postemergence treatments and the overall study. Greater yields with bentazon were largely due to better weed or equivalent weed control as other treatments plus a delay in maturity caused by a slight degree of injury which effectively reduced pod shattering. Imazamox alone caused greater than 50% crop injury resulting in the lowest yielding treatment of the study. Tank mixing imazamox with 0.375 lbs bentazon/a lessened crop injury while providing the best overall weed control of the postemergence treatments.

00JPY013 - Weed Control in Conventionally-Tilled Peas- Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/11/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.5%
WSU - Cunningham Farm	Seeding Rate: 180 lbs/A	pH: 5.2
	Variety: Karita	

Application Information

	Timing			
	PPI	PREE	EPOST	LPOST
Date	4/10/00	4/12/00	5/24/00	6/2/00
Air Temperature	64.5 F	65 F	55.5 F	70.9 F
Rel. Humidity	35%	35%	55.8%	41%
Wind Velocity	8 mph	5 mph	2 mph	4.2 mph
Soil Temp.	56.6 F @ 2"	56.6 F @ 2"	58.3 F @ 2"	67.4 F @ 2"
Soil Moisture	Dry	Dry	Dry	Dry
Cloud Cover	5%	5%	5%	10%
Gal/Acre	10 gpa	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant Incorporate	Preemergence	2 tiller	3-4 tiller
Height			3-4 inches	8 inches
Weed Stage	N/A	N/A		
COLQ			1-3 inches	2-4 inches
M. chamomile			0.5 inch	1 inch

00JPY013 - Weed Control in Conventionally-Tilled Peas-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Prickly lettuce	Mayweed chamomile	Common lambsquarters		Dry pea	
			8/2/00	8/2/00	6/20/00	8/2/00	Injury	Yield
			----- % -----					lbs/a
Nontreated			0	0	0	0	0	260
Imazethapyr	0.047	PPI	61	59	91	70	0	329
Pendimethalin	0.75	PPI	63	60	86	68	1	391
Imazethapyr + pendimethalin	0.047 + 0.75	PPI	89	69	89	88	1	409
Sulfentrazone	0.25	PPI	66	91	86	74	0	398
Sulfentrazone	0.19	PREE	69	88	90	78	0	429
Flufenacet + metribuzin	0.4 + 0.1	PREE	76	61	61	45	0	322
Metribuzin	0.25	PREE	73	76	79	58	0	304
Chloransulam	0.032	PREE	61	85	74	43	0	404
V-53482	0.078	PREE	80	80	74	68	0	409
Imazamox + UAN + NIS	0.031 + 1qt + 0.25%	EPOST	89	73	95	95	58	161
Metribuzin	0.25	EPOST	91	81	88	72	3	187
Imazamox + bentazon + UAN + NIS	0.031 + 0.375 + 1qt + 0.25%	EPOST	93	95	94	95	15	353
Bentazon + COC	0.5 + 1qt	LPOST	86	95	94	89	6	553
Bentazon + quizalofop + NIS	0.5 + 0.05 + 0.25%	LPOST	88	93	94	88	19	562
MCPA amine	0.25	LPOST	84	58	94	95	15	355
LSD (p=0.05)			22	23	17	17	11	126

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

99JPY023 - Weed Control in Fall-Seeded Peas- Pullman, WA

This study was conducted to evaluate herbicide efficacy in fall-seeded peas. Several of the herbicides tested provided good control of prickly lettuce and mayweed chamomile. The pea stand was thin and inconsistent for this study and yields were not taken. Grass weeds were killed across the entire plot in the late spring with quizalofop (Assure II) to eliminate confusion due to differential grass control.

Although control of broadleaf weeds were evaluated exclusively in this study, FPOST applied imazamox and pronamide provided excellent control of volunteer grains and winter annual grass weeds. Based on field observations, the overwintering grass weeds provided suppression of the broadleaf weeds evaluated. This observation was based on the fact that the heaviest broadleaf weed infestations were in the pronamide treated plots in which grass control was near 100%. Broadleaf weed density was actually greater in these plots than the nontreated control. Thus, there seems to be potential to provide at least suppression of broadleaf weeds through proper management and timeliness of grass weed removal.

Future plans are to more completely study method and timeliness of winter annual grass removal from fall-seed peas to determine potential suppression of difficult to control broadleaf weeds.

99JPY023 - Weed Control in Fall-Seeded Peas -Pullman , WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date:10/29/99	Type: Palouse silt loam
Cooperator:	Row Spacing: 10 inches	Organic Matter: 3.5%
USDA Conservation Farm	Seeding Rate:180 lbs/A	pH: 5.2
	Variety:Granger	

Application Information

	Timing		
	PREE	FPOST	SPOST
Date	11/4/99	11/30/99	4/5/00
Air Temperature	51 F	47 F	49.3 F
Rel. Humidity	50 %	71%	46%
Wind Velocity	4 mph	2.8 mph	6.4 mph
Soil Temperature	49 F @ 2"	44 F @ 2"	41.7 F @ 2"
Soil Moisture	Moist	Moist	Moist
Cloud Cover	50%	80%	80%
Gal/Acre	10	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi
Nozzles	XR8001	XR8001	XR8001
Crop Growth Stage	N/A	1-2 cotyledon	2 tiller
Height	N/A	3 inches	9-12 inches
Weed Stage			
Volunteer wheat		1 tiller, 2 leaf	3-5 leaf

99JPY023 Weed Control in Fall-Seeded Peas- Pullman, WA

Treatment	Rate ^a	Appl. Timing	Weed Control	
			Prickly Lettuce	Mayweed Chamomile
			5/5/00	5/5/00
			----- % -----	
Imazethapyr	0.047	PREE	62	75
Imazethapyr + triallate	0.047 + 1.25	PREE	53	45
Pendimethalin, bentazon + quizalofop*	0.75, 0.5 + 0.055	PREE, SPOST	65	88
Imazethapyr, metribuzin	0.047, 0.25	PREE, SPOST	78	73
Imazethapyr, bentazon + quizalofop	0.047, 0.5 + 0.055	PREE, SPOST	68	85
Sulfentrazone	0.375	PREE	80	90
Sulfentrazone	0.025	PREE	85	88
Sulfentrazone, quizalofop*	0.375, 0.055	PREE, SPOST	90	90
Imazamox* + Sol 32	0.03 + 1 qt	FPOST	30	28
Pronamide	0.75	FPOST	0	0
Imazamox* + Sol 32	0.03 + 1 qt	SPOST	85	65
Imazamox* + bentazon	0.03 + 0.5	SPOST	76	90
Imazethapyr + pendimethalin, quizalofop*	0.047 + 0.75, 0.055	PREE, SPOST	63	75
Bentazon + quizalofop*	0.5 + 0.055	SPOST	75	75
Imazethapyr + triallate, bentazon + COC	0.047 + 1.25, 0.5 + 1 qt	PREE, SPOST	83	90
LSD (p=0.05)			30	31

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

* NIS applied at 0.25 %.

00JPY010 - Weed Control in No-Tillage Lentil-Pullman, WA

This study was conducted to determine the best timing of application of preemergence herbicides for no-tillage lentil production and continued evaluation of herbicides for use in lentils. Greatest crop yield was with postemergence applications of 2,4-DB. Control of redroot pigweed, common lambsquarters, and mayweed chamomile was greatest with early preemergence applications of imazethapyr. Generally, weed control effectiveness did not relate to yield.

Weed control with preemergence applications of imazethapyr, sulfentrazone, and flufenacet plus metribuzin was about equal for both the early and late applications. However, chloransulam and V-53482 weed control tended to be slightly reduced with the later applications while control with metribuzin increased slightly with the later application. Injury was a concern with the early application of chloransulam and remained significant with the later preemergence application, although injury was much less with the later application. Lentil yields with the early application were severely reduced due to injury and were less than the nontreated control. Reduced activity with later applications of chloransulam and V-53482 activity was probably due to the increased moisture conditions of the earlier application date. Metribuzin activity likely increased with the later preemergence application due to postemergence activity on the extremely small weeds present at the later application.

Metribuzin applied postemergence did cause some injury to lentils and had slightly lower lentil yield than the highest yielding treatments. Crop safety with 2,4-DB was again exceptional and the early postemergence application of this chemical had the greatest yield in the study.

00JPY010 - Weed Control in No-Tillage Lentil - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
<u>Whitman County, WA</u>	<u>Planting Date: 4/20/00</u>	<u>Type: Palouse silt loam</u>
<u>Cooperator:</u>	<u>Row Spacing: 10 inches</u>	<u>Organic Matter: 3.5%</u>
<u>WSU - Cunningham Farm</u>	<u>Seeding Rate: 80lbs/A</u>	<u>pH: 5.2</u>
	<u>Variety: Brewers</u>	

Application Information

	Timing			
	EPREE	LPREE	EPOST	LPOST
Date	3/30/00	4/26/00	6/5/00	5/16/00
Air Temperature	56.2 F	48.7 F	79.5 F	67.2 F
Rel. Humidity	34.6%	63.5%	42%	51%
Wind Velocity	4.5 mph	7.9 mph	2.2 mph	2 mph
Soil Temperature	45.3 F @ 2"	45.5 F @ 2"	59.4 F @ 2"	55.6 F @ 2"
Soil Moisture	Moist	Dry	Moist	Dry
Cloud Cover	45%	20%	90%	2%
Gal/Acre	10 gpa	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant	Preemergence	2-4 heads	6-8 nodes
Height			2-5 inches	6-8 inches
Weed Stage	N/A	N/A		
Pigweed			2 inches	
COLQ			8-10 leaves	
M. Chamomile				

00JPY010 - Weed Control in No-Tillage Lentil-Pullman, WA

Treatment	Rate ^a	Appl. timing	Redroot pigweed	Mayweed chamomile	Common lambsquarters		Lentil	Yield lb/a	
			Control				Injury		
			6/19/00	8/8/00	6/19/00	8/8/00	6/19/00		
			----- % -----						
Nontreated			0	0	0	0	0	1235	
Imazethapyr	0.047	EPREE	95	61	95	97	0	1120	
Sulfentrazone	0.19	EPREE	83	92	88	81	1	1177	
Flufenacet + metribuzin	0.4 + 0.1	EPREE	55	71	48	26	1	1265	
Metribuzin	0.25	EPREE	43	80	43	33	0	1361	
Chloransulam	0.032	EPREE	93	96	85	79	35	730	
V-53482	0.078	EPREE	85	96	63	64	1	1199	
Imazethapyr	0.047	LPREE	94	77	90	91	0	1151	
Sulfentrazone	0.19	LPREE	85	83	83	84	4	1124	
Flufenacet + metribuzin	0.4 + 0.1	LPREE	80	70	46	53	0	1314	
Metribuzin	0.25	LPREE	58	89	51	65	0	1167	
Chloransulam	0.032	LPREE	89	91	69	69	11	1245	
V-53482	0.078	LPREE	68	66	61	68	0	1338	
Metribuzin	0.25	EPOST	90	79	86	80	14	1062	
2,4-DB	0.25	EPOST	78	46	55	45	0	1448	
2,4-DB	0.25	LPOST	70	76	58	40	0	1380	
LSD (p=0.05)			20	25	17	21	6	303	

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

00JPY014 - Weed Control in Conventionally-Tilled Lentils-Pullman, WA

This study was conducted to evaluate weed control and crop safety in conventionally tilled lentils. Unlike the conventionally tilled dry peas, excessive pod shattering did not occur but a small degree of shatter was observed.

Preplant incorporated treatments of pendimethalin and pendimethalin + imazethapyr had the greatest yields in this study although yield results were not significantly different. On average, control of mayweed chamomile, prickly lettuce, and common lambsquarter was greatest with preplant incorporated pendimethalin + imazethapyr. Chloransulam applied preemergence did not result in the high degree of crop injury observed in the no-tillage study.

Crop safety with 2,4-DB was again evident with rates as high as 0.75 lbs/a. This rate exceeds what would likely be economical at current prices. Weed control was greater with the high rate of 2,4-DB relative to other postemergence treatments and crop yield was roughly equal to postemergence metribuzin.

00JPY014 - Weed Control in Conventionally-Tilled Lentils - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/11/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.5%
WSU - Cunningham Farm	Seeding Rate: 80lbs/A	pH: 5.2
	Variety: Brewers	

Application Information

	Timing			
	PPI	PREE	EPOST	LPOST
Date	4/10/00	4/12/00	5/24/00	6/16/00
Air Temperature	64.5 F	65 F	73.6 F	69.6 F
Rel. Humidity	35%	35%	42.7%	37%
Wind Velocity	8 mph	5 mph	8.2 mph	1.6 mph
Soil Temperature	56.6 F @ 2"	56.6 F @ 2"	77.5 F @ 2"	57.6 F @ 2"
Soil Moisture	Dry	Dry	Dry	Dry
Cloud Cover	5%	10%	80%	5%
Gal/Acre	10 gpa	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant Incorporate	Preemergence	8-10 leaf	Flowering
Height			2-3 inches	6-8 inches
Weed Stage	N/A	N/A		
Broadleaf			8-10 leaf, 2 inches	

00JPY014 - Weed Control in Conventionally-Tilled Lentils-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Prickly	Mayweed	Common lambsquarters		Lentil yield lbs/a
			lettuce	chamomile	8/2/00	8/2/00	
Nontreated			0	0	0	0	1816
Imazethapyr	0.047	PPI	73	75	76	78	2372
Pendimethalin	0.75	PPI	64	38	70	63	2653
Imazethapyr + pendimethalin	0.047 + 0.75	PPI	79	76	88	88	2630
Flufenacet + metribuzin	0.4 + 0.1	PREE	65	62	29	19	2317
Metribuzin	0.25	PREE	88	80	48	31	2425
Chloransulam	0.032	PREE	58	81	51	33	1987
V-53482	0.078	PREE	65	86	51	49	2297
Metribuzin	0.25	EPOST	68	54	56	35	2466
2,4-DB	0.25	EPOST	74	60	89	84	2277
2,4-DB	0.375	EPOST	65	50	84	84	1699
2,4-DB	0.25	LPOST	60	48	40	58	2073
2,4-DB	0.375	LPOST	58	49	35	71	1834
2,4-DB	0.75	EPOST	78	56	87	90	2380
LSD (p=0.05)			25	26	17	14	ns

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

00JPY015 - Weed Control in Conventionally-Tilled Chickpeas-Pullman, WA

The study was conducted near Pullman, WA to evaluate common lambsquarters control and crop injury of labeled and nonlabeled herbicides in chickpeas.

Common lambsquarter control was fair to excellent with greatest control using postemergence pyridate, pyridate plus quizalofop, and the higher rate of isoxaflutole. Postemergence 2,4-DB applications injured chickpeas the greatest. Chickpea yields were similar regardless of treatment.

00JPY015 - Weed Control in Conventionally-Tilled Chickpeas - Pullman, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	Planting Date: 4/25/00	Type: Palouse silt loam
Cooperator:	Row Spacing: 7 inches	Organic Matter: 3.5%
WSU - Cunningham Farm	Seeding Rate: 110 lbs/A	pH: 5.2
	Variety: Miles	

Application Information

	Timing		
	PPI	PRE	POST
Date	4/29/00	5/1/00	6/5/00
Air Temperature	38 F	66 F	69 F
Rel. Humidity	72%	26%	54%
Wind Velocity	6 mph	1.5 mph	2.4 mph
Soil Temperature	40 F @ 2"	59.4 F @ 2"	66.2 F @ 2"
Soil Moisture	Dry	Dry	Dry
Cloud Cover	5%	5%	80%
Gal/Acre	10 gpa	10 gpa	10 gpa
Pressure	35 psi	35 psi	35 psi
Nozzles	Teejet XR8001	Teejet XR8001	Teejet XR8001
Crop Growth Stage	Preplant Incorporate	Preemergence	3-4 nodes
Height			6-7 inches
Weed Stage	N/A	N/A	
COLQ			7 leaf
Canada thistle			5 inch rosette

00JPY015 - Weed Control in Conventionally-Tilled Chickpeas-Pullman, WA

Treatment	Rate	Timing	Common lambsquarters		Injury 6/20/00	Chickpea Yield
			6/20/00	8/15/00		
			----- % -----			
Weedy check	lbs/a		0	0	0	2782
Imazethapyr	0.047	PPI	78	65	0	2761
Pendimethalin	0.75	PPI	91	74	1	2914
Imazethapyr + pendimethalin	0.047 + 0.63	PPI	90	88	0	2844
Flufenacet + metribuzin	0.4 + 0.1	PRE	74	65	0	3008
Sulfentrazone	0.25	PRE	69	84	0	3216
Sulfentrazone	0.19	PRE	80	71	0	3017
Metribuzin	0.25	PRE	69	65	0	2879
Chloransulam	0.032	PRE	65	58	0	2823
V-53482	0.078	PRE	90	76	0	2828
Isoxaflutole	0.06	PRE	88	80	2	2962
Isoxaflutole	0.094	PRE	95	89	0	3145
2,4-DB	0.25	POST	71	58	15	2812
Pyridate	0.94	POST	95	91	1	2893
Pyridate + quizalofop ^a	0.94 + 0.044	POST	94	91	0	2961
LSD (p=0.05)			25	15	2	ns

^aapplied with 0.25% nonionic surfactant.

98JPY035 - Imazamox Plant Back Study-Pullman, WA

This study was initiated in the fall of 1998 to determine if fall or spring applications of imazamox to winter wheat would cause carryover injury to some of the common rotational crops of eastern Washington. The study was initially planted to large-sized plots of an imidazolinone-resistant (Clearfield) wheat variety to ensure crop safety to the herbicide application. This initial winter wheat crop was harvested in the summer of 1999. A non-imidazolinone-resistant variety of winter wheat was planted in the fall of 1999. In the spring of 2000, barley, lentil, and canola were also planted in separate areas of the original imidazolinone-resistant wheat plots. Stand counts and plant biomass were measured for each crop species at regular intervals throughout the 1999-2000 growing season as appropriate. An uncontrolled infestation of wild oat and Italian ryegrass compromised the results of the experiment. No biomass or stand count data was significant for any of the four crops at the various sampling dates. Moreover, the yields were not statistically different between treatments within a crop species although averages differed greatly.

98JPY035 - Imazamox Plant Back Study - Pullman, WA

Crop 1: Winter wheat

Location

Whitman County, WA

Cooperator:

WSU - Cunningham Farm

Crop Information

Planting Date: 10/15/98

Row Spacing: 7.5 inches

Seeding Rate: 83.8 lbs/A

Variety: Fidel/IMI

Soil Information

Type: Palouse silt loam

Organic Matter: 3.5%

pH: 5.2

Crop 2: Plantback

Winter Wheat

Spring Barley

Lentil

Canola

Planting Date: 10/21/99

Planting Date:4/11/00

Planting Date:4/11/00

Planting Date:4/11/00

Row Spacing: 7 inches

Row Spacing: 7 inches

Row Spacing: 7 inches

Row Spacing: 7 inches

Seeding Rate:80 lbs/A

Seeding Rate: 80 lbs/A

Seeding Rate:80 lbs./A

Seeding Rate:12 lbs/A

Variety: Madsen

Variety: Baronesse

Variety: Brewers

Variety: Sunrise

Application Information

Timing

	Fall 1998	Spring 1999
Date	11/18/98	4/27/99
Air Temperature	41 F	65 F
Rel. Humidity	95%	34%
Wind Velocity	3 mph	3 mph
Soil Temperature	38 F @ 2"	54 F @ 2"
Soil Moisture	Wet	Moist
Cloud Cover	90%	95%
Gal/Acre	10 gpa	10 gpa
Pressure	34 psi	30-34 psi
Nozzles	Teejet XR8001	Teejet XR8001
Crop Growth Stage	1 leaf	7 leaf, 2-3 tiller
Height	2 inches	8 inches

98JPY035 - Imazamox Plant Back Study-Pullman, WA

Treatment	Rate ^a	Appl. Timing	Wheat	Barley	Lentil	Canola
			bu/a		----- lbs/a -----	
Nontreated			75	4277	1073	141
Imazamox + NIS + Sol 32	0.04 + 0.25 % + 1 qt	Fall 1998	72	4644	826	213
Imazamox + NIS + Sol 32	0.08 + 0.25 % + 1 qt	Fall 1998	69	4548	692	195
Imazamox + NIS + Sol 32,	0.04 + 0.25 % + 1 qt,	Fall 1998, Spring	56	2110	740	76
Imazamox + NIS + Sol 32	0.04 + 0.25 % + 1 qt	1999				
Imazamox + NIS + Sol 32	0.04 + 0.25 % + 1 qt	Spring 1999	67	3383	600	123
Imazamox + NIS + Sol 32	0.08 + 0.25 % + 1 qt	Spring 1999	75	3473	1111	98
LSD (p=0.05)			ns	ns	ns	ns

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

99JPY027 - Ryegrass Control in Timothy Hay-Kittitas Co., WA _____

This study was conducted to determine annual and perennial ryegrass control and crop safety in seedling and established timothy hay stands.

Primisulfuron was the only herbicide that provided greater than 55% control of Italian ryegrass. Primisulfuron did cause some injury to the established stand of timothy hay. Injury with primisulfuron tended to be greater with spring rather than fall applications and when applied with methylated seed oil rather than nonionic surfactant.

99JPY027 - Ryegrass Control in Timothy Hay - Kittitas Co., WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Kittitas County, WA	N/A	Type: Loam
Cooperator:		Organic Matter:% pH: 7.6

Application Information

	Timing	
	FPOST	SPOST
Date	11/15/99	4/7/00
Air Temperature	50 F	46 F
Rel. Humidity	72%	53%
Wind Velocity	1 mph	1.5 mph
Soil Temperature	42F @ 2'	40 F @ 2"
Soil Moisture	Moist	Moist
Cloud Cover	80%	5%
Gal/Acre	10 gpa	10 gpa
Pressure	34 psi	35 psi
Nozzles	XR8001	XR8001
Crop Growth Stage	Semi-dormant	Vegetative
Height	3 inches	3 inches
Weed Stage		
Perennial ryegrass	Vegetative, 6 inches	Vegetative, 4 inches

99JPY027 - Ryegrass Control in Timothy Hay-Kittitas Co., WA

Treatment	Rate ^a	Appl. Timing	Italian ryegrass control		Timothy injury	
			4/21/00	5/5/00	4/21/00	5/5/00
Oxyfluorfen	0.375	FPOST	49	53	0	0
Flufenacet + metribuzin	0.4 + 0.1	FPOST	15	29	8	0
Primisulfuron + NIS	0.037 + 0.25%	FPOST	80	82	0	0
Primisulfuron + Meth. Seed Oil	0.037 + 1pt	FPOST	70	48	13	8
Primisulfuron + NIS	0.037 + 0.25%	SPOST	30	46	0	9
Primisulfuron + Meth. Seed Oil	0.037 + 1pt	SPOST	25	30	10	23
Tralkoxydim + COC	0.25 + 0.5%	SPOST	33	48	0	0
Tralkoxydim + COC	0.18 + 0.5%	SPOST	30	57	0	1
LSD (p=0.05)			29	28	8	7

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

99JPY028 - Bluegrass Control in Timothy Hay-Kittitas Co., WA

This study was established to determine bluegrass (*Poa* sp.) control and the crop safety of several herbicides in an established stand of timothy hay. Excellent crop safety was seen with imazamethabenz (Assert) and tralkoxydim (Achieve). Crop safety with tralkoxydim has been excellent in all previous studies in established and seedling timothy stands. Bluegrass control was highly variable as shown in the following table by the relatively large LSD.

Although future work is not planned at this time, there is fair potential to control bluegrass in timothy with imazamethabenz with some degree of crop safety. Although tralkoxydim did not provide effective control of bluegrass, a high degree of crop safety was again shown. There is potential to use tralkoxydim to effectively control grass (primarily annual species) weeds selectively in timothy.

99JPY028 - Bluegrass Control in Timothy Hay - Ellensburg, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Kittitas County, WA	Planting Date:	Type: Loam
Cooperator:	Row Spacing: inches	Organic Matter:%
	Seeding Rate: lbs/A	pH: 7.6
	Variety:	

Application Information

	Timing	
	FPOST	SPOST
Date	11/15/99	4/7/00
Air Temperature	50 F	49 F
Rel. Humidity	74%	47%
Wind Velocity	5 mph	0.5 mph
Soil Temperature	n/a	46 F @ 2"
Soil Moisture	Moist	Moist
Cloud Cover	80%	5%
Gal/Acre	10 gpa	10 gpa
Pressure	34 psi	35 psi
Nozzles	XR8001	XR8001
Crop Growth Stage	Semi-dormant	Vegetative
Height	3 inches	3 inches
Weed Stage		
Poa species	Vegetative, 6 inches	Vegetative, 3 inches

99JPY028 - Bluegrass Control in Timothy Hay-Kittitas Co., WA

Treatment	Rate ^a	Appl. timing	Bluegrass control		Timothy injury	
			4/21/00	5/5/00	4/21/00	5/5/00
Rimsulfuron + NIS	0.0156 + 0.25 %	FPOST	58	65	30	15
Imazamethabenz + NIS	0.41 + 0.25 %	FPOST	70	68	6	2
Imazamethabenz + MSO	0.41 + 1 qt	FPOST	79	88	8	3
Imazamethabenz + MSO	0.0156 + 0.25 %	SPOST	63	56	3	18
MKH6561 + NIS	0.04 + 0.25 %	SPOST	50	40	13	38
MKH6562 + NIS	0.04 + 0.25 %	SPOST	45	39	14	21
Tralkoxydim + COC	0.25 + 0.5 %	SPOST	19	50	6	1
Tralkoxydim + COC	0.18 + 0.5 %	SPOST	10	39	0	0
LSD (p=0.05)			28	35	8	13

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

00JPY016 - Yellow Starthistle Control with Imazapic Formulations-Colfax, WA

This study was conducted to evaluate yellow starthistle control with imazapic and combinations. The study was conducted in a non-crop area near Colfax, WA.

All herbicide treatments provided excellent control with slightly lower control with the lowest rate of imazapic plus 2,4-D.

The study will again be evaluated in the spring of 2001 to determine potential residual control by these herbicides.

00JPY016 - Yellow Starthistle Control with Imazapic Formulations - Colfax, WA

<u>Location</u>	<u>Crop Information</u>	<u>Soil Information</u>
Whitman County, WA	N/A	Type: Silt loam
Cooperator:		Organic Matter:%3.4 pH: 6.0

Application Information

	Timing
Date	5/12/00
Air Temperature	58.9 F
Rel. Humidity	40.2%
Wind Velocity	7 mph
Soil Temperature	52.9 F @ 2"
Soil Moisture	Dry
Cloud Cover	20%
Gal/Acre	10 gpa
Pressure	35 psi
Nozzles	Teejet XR8001
Crop Growth Stage	N/A
Height	
Weed Stage	
Yellow starthistle	6 leaf, 4-5 inches

00JPY016 - Yellow Starthistle Control with Imazapic Formulations-Colfax, WA

Treatment	Rate ^a	Yellow starthistle control		
		5/23/00	6/28/00	9/5/00
		-----%-----		
Imazapic*	0.188	56	94	99
Imazapic + 2,4-D*	0.063 + 0.125	45	94	92
Imazapic + 2,4-D*	0.125 + 0.25	41	90	99
Imazapic + 2,4-D*	0.188 + 0.376	53	91	99
Picloram	0.25	55	95	99
LSD (p=0.05)		20	5	9

^aRate is expressed as amount of herbicide active ingredient or acid equivalent per acre, surfactants expressed as percentage volume of the final spray mix.

*MISO applied at 1q/A.

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2,4-D ester (Several)	1, 9, 36
2,4-DB	1, 46, 48, 49, 51, 52, 54
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<i>Amaranthus retroflexus</i> (see pigweed, Redroot)	
<i>Anthemis cotula</i> (see chamomile, mayweed)	
<i>Avena fatua</i> (see oat, wild)	
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