

Research Report to the
Agriculture Research Foundation
 and the
Oregon Processed Vegetable Commission

Title. Snap Bean Tolerance to Imazamox

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Summary

Three trials were conducted during 1999 to determine snap bean tolerance to imazamox and optimum use patterns for weed control. Significant findings include:

I. Snap Bean Tolerance to Imazamox: Influence of Timing, Rate, Basagran and Insecticide

- Imazamox caused snap beans to yellow slightly when applied at both the 2nd and 4th trifoliolate growth stages but yield was not affected.
- Snap bean growth was reduced most when imazamox was applied at the 2nd than the 4th trifoliolate.
- Basagran applied with imazamox had little or no effect on crop phytotoxicity symptoms (yellowing) at the 2nd trifoliolate, but probably reduced symptoms when applied with imazamox at the 4th trifoliolate.
- Leaf yellowing was more severe with imazamox applied to plots with the insecticide ethoprop (Mocap) than fonofos (Dyfonate), but there was no effect on plant growth or yield.

II. On-farm Weed Control Trial

- Imazamox controlled weeds best when applied sequentially after Cobra or Eptam.
- Weed control with imazamox alone ranged from 70-73 percent. Weeds included (in order of importance) pigweed, nightshade, lambsquarter, groundsel, barnyardgrass and sugarbeet volunteers.
- Tankmixing with Basagran improved control of lambsquarter but may have reduced control of pigweed, nightshade, and barnyardgrass.
- Early (1.5 trifoliolate) applications of imazamox alone gave better control than 3rd trifoliolate applications.
- Imazamox did not control groundsel.

III. Weed Control Trial at Vegetable Research Farm

- Tankmixes with Basagran improved weed control of some broadleaves but reduced control of nightshade and barnyardgrass.
- Crop injury was the same for imazamox applied at the 1st and 2nd trifoliolate.
- Surfactants improved efficacy but increased crop injury symptoms.
- Tankmixes with Basagran significantly reduced crop injury symptoms.

Summary cont'd

These results are consistent with research in 1996-98: imazamox could be used postemergence in snap beans at 0.024 lbs ai/A with little risk of yield reduction. Imazamox adequately controls pigweed, nightshade, and many grass weeds at this timing and rate. Future research should focus on lower use rates, earlier timings, and interactions with Basagran, surfactants, and insecticides on both crop injury and weed control.

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I. Snap Bean Tolerance to Imazamox: Influence of Timing, Rate, Basagran and Insecticide.

Methods

The trial was on a silty clay loam soil. PPI herbicides and fonofos or ethoprop insecticides were applied on May 10 to 10 by 30 plots and incorporated with a rotera. Fonofos was applied to all plots except those of treatments 9 and 10. Snap beans were planted the same day on 30-inch rows at a germinable seed rate of 168,000/A. PES herbicides were applied immediately after planting. Dual was applied PES @ 1 lb ai/A to all the plots after planting. Rainfall during May incorporated the herbicides. Postemergence herbicides were applied on June 14 and 23 to plants with 2 and 4 trifoliolate leaves open, respectively. Plots were cultivated to minimize weed competition.

Herbicide injury symptoms and growth reduction were estimated on June 22 and July 1. Snap beans were harvested from 8.2 ft of row on July 28, weighed and graded. Data were excluded from one plot because of a possible fertilizer skip in treatment 8 that significantly reduced yield.

Results and Discussion

Imazamox caused snap beans to yellow slightly when applied at both the 2nd and 4th trifoliolate growth stages (Table 1). Growth reduction was most apparent when imazamox was applied at the 2nd trifoliolate at the 2x rate of 0.048 lbs ai/A. A tank mix with Basagran may have decreased injury slightly. Plant injury was most severe with imazamox applied to plots with the insecticide ethoprop rather than fonofos (Tr. 10) but there was no effect on plant growth with this treatment. Growth reduction was most apparent in Tr. 11 when applied over four other herbicides.

Snap bean yield tended to be lower in treatments with imazamox applied at the 1x rate. This was due primarily to weed competition. The cool and wet period during emergence caused very poor nightshade control with Dual. This is evidenced by the 2x (0.048) treatments that generally had the greatest yields. The exception was imazamox @ 0.048 with Basagran applied to 2nd trifoliolate snap beans. This combination and timing may have decreased yield.

This trial again demonstrates that snap beans are very tolerant of imazamox of rates up to 0.048 lb ai/A even when the plants show signs of injury shortly after application

Table 1. Snap bean growth response to imazamox, Basagran and other herbicides or insecticides, Corvallis, 1999.

Herbicide/ insecticide ^{1,5}	Timing	Rate	N	22-June (8 days after 2 nd trifoliolate treatment; before 4 th trifoliolate application)		1-July (9 days after 4 th trifoliolate treatment)	
				Phytotoxicity	Growth reduction	Phytotoxicity	Growth reduction
				1-10	%	1-10	%
	Soil applied or trifoliolate	lb ai/A					
1 Imazamox	2 nd	0.024	4	1.3	6.3	0.3	0.0
2 Imazamox	4 th	0.024	4	-	-	1.5	1.3
3 Imazamox	2 nd	0.048	4	1.5	11.3	0.0	6.3
4 Imazamox	4 th	0.048	4	-	-	2.8	3.8
5 Imazamox Basagran	2 nd 2 nd	0.024 1	4	1.0	13.8	0.3	3.8
6 Imazamox Basagran	4 th 4 th	0.024 1	4	-	-	0.5	0.0
7 Imazamox Basagran	2 nd 2 nd	0.048 1	4	1.0	7.5	0.3	1.3
8 Imazamox Basagran	4 th 4 th	0.048 1	3	-	-	1.3	0.0
9 Imazamox Ethoprop ²	4 th PPI	0.024 3	4	-	-	1.5	2.5
10 Imazamox Ethoprop ^b	4 th PPI	0.048 3	4	-	-	4.3	0.0
11 Imazamox Dual ³ EPTAM Treflan Cobra	2 nd PPI PPI PPI PES	0.024 1 3.5 0.75 0.188	4	0.8	15.0	0.5	7.5
12 Imazamox Cobra	2 nd PES	0.024 0.188	4	0.0	0.0	0.0	0.0
13 Dual ⁴ Fonofos	PES PPI	1	4	0.0	0.0	0.0	0.0
FPLSD (0.05)				0.7	7.9	0.7	ns

¹All treatments included Dual @1 lb/A applied PES and fonofos (Dyfonate) PPI unless noted² Ethoprop (Mocap) replaced fonofos (Dyfonate).³ Dual applied @ 1 lb/A both PPI and PES⁴ Check treatment with only Dual and fonofos.

Table 2. Tolerance of snap beans to imazamox, Corvallis, 1999

Herbicide/ insecticide ¹	Timing	Rate	N	Plant population at harvest		Biomass		Pod Weight		Grade		Value ²	
				Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	Soil applied or trifoliolate	lb ai/A		--no/A--		-- t/A --		-- t/A --		--% 1-4 sieve -		Mean	SE
												\$/A	
1 Imazamox	2 nd	0.024	4	154100	6150	20.5	3.2	13.2	1.3	29%	2%	1,879	223
2 Imazamox	4 th	0.024	4	132800	3950	21.1	0.8	12.1	0.4	30%	0%	1,729	63
3 Imazamox	2 nd	0.048	4	153000	4500	25.2	0.3	14.5	0.2	33%	3%	2,147	60
4 Imazamox	4 th	0.048	4	143400	6650	21.6	1.9	12.2	0.9	36%	0%	1,864	140
5 Imazamox Basagran	2 nd 2 nd	0.024 1	4	142400	13850	23.2	2.2	13.5	0.9	31%	1%	1,957	149
6 Imazamox Basagran	4 th 4 th	0.024 1	4	144500	16150	25.2	1.4	14.2	0.4	38%	3%	2,232	91
7 Imazamox Basagran	2 nd 2 nd	0.048 1	4	128600	12200	20.8	1.9	12.6	0.7	28%	2%	1,771	130
8 Imazamox Basagran	4 th 4 th	0.048 1	3	162200	23800	25.0	2.3	14.5	1.1	34%	4%	2,191	312
9 Imazamox Ethoprop ³	4 th PPI	0.024 3	4	146100	9650	24.3	1.1	13.2	1.0	38%	3%	2,063	149
10 Imazamox Ethoprop ^b	4 th PPI	0.048 3	4	150300	7400	23.7	1.2	13.8	0.5	37%	2%	2,148	87
11 Imazamox Dual ⁴ Eptam Treflan Cobra	2 nd PPI PPI PPI PES	0.024 1 3.5 0.75 0.188	4	124300	9700	26.1	2.6	14.3	1.1	37%	0%	2,238	72
12 Imazamox Cobra	2 nd PES	0.024 0.188	4	161000	5650	28.5	0.6	15.4	0.3	35%	0%	2,344	138
13 Dual ⁵ Fonofos	PES PPI	1	4	158800	4800	22.8	1.8	13.1	0.8	34%	2%	1,980	91
ANOVA for treatment				0.19		0.12		0.19		0.004		0.07	
CV (%)				13		15		12		12		13	
LSD(0.10)				22872		4.3		1.9		4%		338	

¹All treatments included Dual @1 lb/A applied PES and fonofos (Dyfonate) PPI unless noted² Based on \$261/t for 1-4 sieve and \$94/t for remainder.³ Ethoprop (Mocap) replaced fonofos (Dyfonate).⁴ Dual applied @ 1 lb/A both PPI and PES⁵ Check treatment with only Dual and fonofos.

Table 3. Herbicide application data.

Crop and planting date: Snap Beans (OR91-G); May 10, 1999.

Soil type: Silty clay loam

Plot size: 10 by 30

Design: RCB

Location: Vegetable Research Farm, Corvallis, OR

Application date	5-10-99	5-10-99	6-14-99	6-23-99
Application timing	PPI herbicides and insecticides	PES (Dual over entire plot, Cobra)	2 nd tri	4 th tri
Start/end time	8:30-9:30 AM	10:30-11:15 AM	10:30-11:00	8-9:00 AM
Air temp/soil temp	45/48/50/	50/54/52	79/79/96	63/68/71
Rel humidity (%)	82	82	56	83
Wind direction/velocity	0	3-4 SE	2-3 SE	0
Cloud cover (%)	100	100	0	0
Soil moisture	damp and cloddy	damp and cloddy	very wet	dry ver
Plant moisture	-	-	very dry	very wet
Sprayer/PSI	backpack/30	backpack/30	backpack/30	backpack/30
Mix size	2.1 l/4 plots	3 gal	2.1 l/4 plots	2.1 l/4 plots
Gallons H ₂ O/acre	20	20	20	20
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18	20/18
Incorporation	Rotera on H setting	Rainfall		

II. On-farm Trial: Weed control with Imazamox in Snap Beans (Medina)

Methods

The site was near Dever Conner on a Chehalis silty clay loam soil with 7.49 % OM, pH of 5.7, and CEC of 29.6 meq/100g soil. Preplant herbicides and Mocap insecticide were applied on May 25 and incorporated with a disk and dyna-drive. Snap beans (Medina, small sieve beans) were planted on June 1 and PES herbicides applied on June 2. The first imazamox treatments were applied on June 28 to snap beans with the second trifoliolate beginning to expand (1.5 leaf). The second application was made to 3rd trifoliolate beans on July 4. Weed control and crop growth were evaluated 13 and 16 days after the first and second imazamox applications, respectively. Snap beans were harvested from 2.5 m of row, weighed and graded on August 3.

Results and Discussion

Pigweed and nightshade control was good to exceptional with all rates and timings of imazamox 2 weeks after the last imazamox application (Table 1). Contrary to other trials, imazamox tankmixed with Basagran did not improve lambsquarter control, although the lambsquarter population was highly variable and evaluation was difficult. An exception was Tr. 10 with a higher rate (0.032 lb/A) and COC that completely controlled lambsquarter when applied with Basagran; COC may be essential for lambsquarter control but could cause more injury to snap beans. Groundsel was very tolerant of imazamox. Combinations of Cobra or Eptam plus imazamox provided the best overall weed control. Sugar beet volunteers were numerous but easily controlled by imazamox. Tr. 8 (standard/check) controlled all weeds except the sugar beet seedlings, likely the cause of low yield in this treatment.

Imazamox caused a slight yellowing of plants within one or two days after application but symptoms faded quickly. Discoloration and growth reduction were not apparent at 2 weeks after either the 1.5 or 3rd trifoliolate application of imazamox (Table 1).

Crop growth was highly variable because irrigation was inadequate on the SW corner of the plot. This caused a diagonal yield pattern across the plot that overwhelmed effects due to weed control with herbicides. Nonetheless, weed control was the most important measured variable determining yield (Tables 2 and 3). The highest yield was Cobra PES plus imazamox POST at the 3rd trifoliolate that yielded 5.5 t/A, 0.5 tons greater than the field average.

Summary

Imazamox controlled weeds best at this very weedy site when applied sequentially after Cobra or Eptam. Tankmixing with Basagran improved control of lambsquarter but may have reduced control of pigweed, nightshade, and barnyardgrass. Early applications of imazamox alone gave better control than 3rd trifoliolate applications. More research is needed to determine optimum timing to reduce potential for crop injury and maximize weed control, particularly for lambsquarter, barnyardgrass and groundsel.

Table 1. Imazamox effects on snap bean growth and weed control, Dever Conner, 1999.

Herbicide	Timing	Rate	N	Crop injury ratings				Weed control (July 20)						
				July 11 ¹		July 20 ²		Pigweed	Nightshade	Barnyard Grass	Sugarbeets	Groundsel	Lambs- quarter	Total
				Phyto	Growth	Phyto	Growth							
				1-10	% Red.	1-10	% Red.							
1 Imazamox	1.5 ³	0.024	3	0.0	0.0	0.0	0.0	100	97	57	63	0	0	57
2 Imazamox	3	0.024	3	0.0	0.0	0.0	0.0	95	97	33	100	10	27	57
3 Imazamox Basagran	1.5	0.024 0.75	3	0.0	0.0	0.0	3.3	95	100	73	98	17	27	72
4 Imazamox Basagran	3	0.024 0.75	3	0.0	0.0	0.0	0.0	93	98	53	92	33	27	77
5 Cobra Imazamox COC	PES 3	0.125 0.024 1%	3	0.0	0.0	0.0	0.0	100	100	70	100	97	67	87
6 Eptam Imazamox COC	PPI 3	3.5 0.024 1%	3	0.0	0.0	0.0	0.0	98	97	100	100	27	100	87
7 Dual Imazamox COC	PPI 3	1.5 0.024 1%	3	0.0	0.0	0.0	3.3	97	97	100	100	7	43	82
8 Eptam Dual Cobra	PPI PES PES	0 1.5 0.125	3	0.0	0.0	0.0	0.0	100	100	100	0	100	100	58
9 Basagran COC	1.5	0.024 1%	3	0.0	0.0	0.0	0.0	43	100	0	98	73	100	50
10 Imazamox Basagran COC	3 3	0.032 0.75 1%	3	0.0	0.0	0.0	0.0	100	97	37	97	17	100	77
LSD(0.05)				ns	ns	ns	ns	10	ns	44	13	35	48	19

¹ 13 days after 1.5 leaf imazamox treatment² 22 days after 1.5 leaf imazamox treatment, 16 days after 3rd trifoliolate treatment.³ 1.5 leaf application on June 28, 3 leaf application on July 4.

Table 2. Imazamox effects on snap bean yield, Dever Conner, 1999.

Herbicide	Timing	Rate	N	Plant pop. at harvest		Plant biomass		Bean pod wt.		Grade	Value
				Mean	SE	Mean	SE	Mean	SE		
	trifoliolate	lb ai/A		---no/A---		---t/A---		-----t/A-----		% 1-2 sieve	\$/A
1 Imazamox	1.5	0.024	3	180600	8500	10.1	1.9	3.7	0.9	70%	946
2 Imazamox	3	0.024	3	159400	19600	11.1	1.5	4.8	0.9	55%	1244
3 Imazamox Basagran	1.5	0.024 0.75	3	184200	6400	12.6	1.8	5.3	0.9	60%	1392
4 Imazamox Basagran	3	0.024 0.75	3	188600	9200	12.2	0.9	4.9	0.3	57%	1288
5 Cobra Imazamox COC	PES 3	0.125 0.024	3	173500	9000	13.7	1.7	5.5	0.8	63%	1427
6 Eptam Imazamox COC	PPI 3	3.5 0.024	3	163800	18200	11.6	0.8	4.7	0.4	57%	1218
7 Dual Imazamox COC	PPI 3	1.5 0.024	3	184200	12400	11.3	1.3	3.8	0.8	74%	992
8 Eptam Dual Cobra	PPI PES PES	0 1.5 0.125	3	187700	9200	11.9	1.7	4.4	0.7	66%	1148
9 Basagran COC	1.5		3	169100	23000	9.6	1.0	3.7	1.0	61%	952
10 Imazamox Basagran COC	3 3	0.032 0.75 1%	3	170000	7700	12.7	2.1	5.3	1.0	60%	1375
LSD (0.05)				ns		ns		ns		-	-

Table 3. Weed control with imazamox at harvest, Dever Conner, 1999.

Herbicide	Timing	Rate	N	Pigweed	Night-shade	Lambs-quarter	Ground-sel	Barnyard-grass	Sugar beet volunteers	Total
1 Imazamox	1.5	0.024	3	97	87	33	17	83	60	66
2 Imazamox	3	0.024	3	93	97	60	33	77	93	73
3 Imazamox Basagran	1.5	0.024 0.75	3	80	98	57	95	90	75	70
4 Imazamox Basagran	3	0.024 0.75	3	70	77	77	67	77	92	73
5 Cobra Imazamox COC	PES 3	0.125 0.024	3	98	100	92	98	92	67	88
6 Eptam Imazamox COC	PPI 3	3.5 0.024	3	95	98	97	63	100	98	85
7 Dual Imazamox COC	PPI 3	1.5 0.024	3	95	100	90	10	100	100	78
8 Eptam Dual Cobra	PPI PES PES	0 1.5 0.125	3	93	100	100	100	100	0	63
9 Basagran COC	1.5		3	0	98	100	100	45	100	0
10 Imazamox Basagran COC	3 3	0.032 0.75 1%	3	88	95	98	75	83	93	78
LSD (0.05)				15	13	17	38	27	34	13

Table 4. Herbicide application record sheet.

Crop and planting date: Snap beans (Medina), June 2, 1999
 Soil type: Chehalis silty clay loam pH: 5.7 OM: 7.49 CEC:29.6
 Plot size: 10 by 30, 3 replications

Application date	5-25-99	6-2-99	6-28-99	7-4-99
Application timing	PPI	PES	1.5 trifoliate	3 rd trifoliate
Start/end time	1-2:00 PM	7-7:30	6-6:30 PM	730-8:00 Am
Air temp/soil temp (2")/surface	70/72/87	51/57/53	73/75/86	56/58/58
Rel humidity	60	74	45	94
Wind direction/velocity	N 1-3	0-2 N	0-1N	0.5 SW
Cloud cover	50	50	80	95
Soil moisture	Very dry	Dry	Very dry	Very wet
Plant moisture	-	-	Dry	Damp
Sprayer/PSI	BP/30	Unicycle/30	BP/30	BP/30
Mix size	2100 ml/ 3 plots	2100 ml/3plots	2100 ml/ 3 plots	2100 ml/ 3 plots
Gallons H ₂ O/acre	26	26	26	26
Nozzle type	8003	8003	8003	8003
Nozzle spacing and height	20/18	20/18	20/18	20/18
Soil inc. method/implement	Disk and dyna drive	-	Irrigation	-
Comments			Short, light drizzle immediately after application	

III. Weed Control and Snap Bean Injury with Imazamox

Introduction

The objective of this research was to determine optimum timing of imazamox for weed control with minimal effect on snap beans. Basagran applied with imazamox usually reduces risk of crop injury but may also reduce weed control. Research in 1997 and 1998 has shown that snap beans are more tolerant of imazamox at the 3rd and 4th trifoliolate than the 2nd. Applying imazamox at the 1st trifoliolate at a lower rate (0.016 lb ai/A) could reduce injury while improving weed control.

Methods

Snap beans were planted on July 7 with 380 lbs of 12-29-10 fertilizer banded next to the row. Imazamox was applied on July 30 to 1st trifoliolate beans and August 3 to 2nd trifoliolate beans. Crop tolerance was evaluated 5-7 days after treatment. Weed control was evaluated on September 20.

Results and Discussion

Weed control with imazamox applied at either the 1st or 2nd trifoliolate of snap beans ranged from 87 to 100 percent (Table 1). There was a slight improvement in weed control when applying imazamox at 0.024 lb/A at the 1st trifoliolate rather than the 2nd. Imazamox at 0.016 lb/A at the 1st trifoliolate controlled weeds as well or better than imazamox at 0.024 lb/A applied at the 2nd trifoliolate.

Nightshade and lambsquarter were more tolerant than pigweed at 0.016 lb/A. Basagran tankmixed with imazamox diminished imazamox efficacy but only at the lower rate of 0.016 lb/A (Figure 1). The effect was most noticeable on barnyardgrass control. Non-ionic surfactants and crop oil concentrate generally improved lambsquarter and nightshade control, particularly at the lower rate of 0.016 lb/A. The smartweed population at this site was very patchy and also very tolerant of imazamox. If Basagran was not tankmixed with imazamox, smartweed flourished and significantly reduced weed control.

Crop growth reduction was minimal even though plants yellowed slightly after the application (Table 2). Tankmixing Basagran with imazamox significantly reduced injury symptoms at 5 DAT at both rates. Crop injury was nearly the same for both the 1st and 2nd trifoliolate applications. Surfactants generally increased injury symptoms.

Summary

- Imazamox applied at the 2nd trifoliolate at 0.024 lb/A and COC provided 97 percent weed control 75 DAP.
- Tankmixes with Basagran improved weed control of some broadleaves but reduced control of nightshade and barnyardgrass.
- Surfactants improved efficacy.
- Crop injury was the same for imazamox applied at the 1st and 2nd trifoliolate.
- Surfactants increased crop injury symptoms.
- Tankmixes with Basagran significantly reduced crop injury symptoms.

Table 1. Weed control on September 20, 1999 (75 DAP)

Herbicide/ surfactant	Timing	Rate	N	Pigweed	Lambs- quarter	Night- shade	Total	Barnyard- grass		Purslane		Smartweed	
								N	%	N	%	N	%
	Trifoliolate	lb ai/A		-----% control-----									
1 Imazamox	1	0.024	2	95	93	68	90	2	93	2	25	1	100
2 Imazamox NIS	1	0.024 0.25%	3	100	100	88	95	3	87	3	93	2	50
3 Imazamox COC	1	0.024 1%	3	98	100	90	100	3	93	3	80	2	90
4 Imazamox	1	0.016	3	97	57	68	98	3	87	3	33	1	100
5 Imazamox NIS	1	0.016 0.25%	3	98	100	72	93	3	82	2	73	3	27
6 Imazamox COC	1	0.016 1%	3	100	100	87	87	3	98	3	98	2	55
7 Imazamox	2	0.024	3	93	72	75	87	2	93	3	0	1	100
8 Imazamox NIS	2	0.024 0.25%	3	100	100	95	90	3	97	3	63	2	75
9 Imazamox COC	2	0.024 1%	3	100	98	93	97	3	90	3	65	2	98
10 Imazamox Basagran COC	1	0.016 1 1%	3	95	100	60	75	3	33	3	100	2	100
11 Imazamox Basagran COC	1	0.024 1 1%	3	98	100	92	90	3	88	3	100	3	97
12 Imazamox Basagran COC	2	0.024 1 1%	3	95	100	87	85	3	82	3	83	3	90
13 Basagran COC	2	1 1%	2	10	100	20	45	1	0	2	95	1	100
14 Check			2	0	0	0	0	2	0	2	0	2	0
FPLSD (0.05)				9	27	21	22		38		35		72

Table 2. Snap bean (OR 91G) response to imazamox, Corvallis, 1999.

Herbicide/ surfactant	Timing	Rate	N	8-3-99 (5 days after 1 st treatment)		8-10-99 (7 days after 2 nd treatment)	
				Phyto	Growth	Phyto	Growth
	Trifoliolate	lb ai/A		1-10	% red.	1-10	% red.
1 Imazamox	1	0.024	3	1.0	0.0	0.0	0.0
2 Imazamox NIS	1	0.024 0.25%	3	2.3	1.7	2.0	1.7
3 Imazamox COC	1	0.024 1%	3	3.3	3.3	1.3	3.3
4 Imazamox	1	0.016	3	2.0	1.7	0.0	0.0
5 Imazamox NIS	1	0.016 0.25%	3	2.0	1.7	0.3	1.7
6 Imazamox COC	1	0.016 1%	3	2.3	5.0	0.3	0.0
7 Imazamox	2	0.024	3	-	-	0.7	0.0
8 Imazamox NIS	2	0.024 0.25%	3	-	-	2.3	3.3
9 Imazamox COC	2	0.024 1%	3	-	-	2.7	8.3
10 Imazamox Basagran COC	1	0.016 1 1%	3	0.0	5.0	0.3	3.3
11 Imazamox Basagran COC	1	0.024 1 1%	3	0.7	1.7	1.3	5.0
12 Imazamox Basagran COC	2	0.024 1 1%	3	-	-	1.7	1.7
13 Basagran COC	2	1 1%	2	-	-	3.0	0.0
14 Check			2	-	-	0.0	0.0
FPLSD(0.05)				1.4	ns	1.9	4.5

Table 3. Herbicide application record sheet.

Application date	7-30-99	8-3-99
Application timing	1st trifoliate	2 nd trifoliate
Start/end time	7-7:20 PM	6:30-6:50 AM
Air temp/soil temp (2")/surface	58/62/62	60/64/60
Rel humidity	92	82
Wind direction/velocity	0	0
Cloud cover	100 %	0
Soil moisture	wet	dry
Plant moisture	wet with dew	very light dew
Sprayer/PSI	BP/30	BP/30
Mix size	2100 ml/ 3 plots	2100 ml/3plots
Gallons H ₂ O/acre	26	26
Nozzle type	8003	8003
Nozzle spacing and height	20/18	20/18

