California Wheat Commission

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Effect of Postemergence Herbicides and Application Time on Small Grain Injury and Yield

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Abstract/Summary of Results and Conclusions

Oftentimes both broadleaf and grassy weeds are problematic in cereal production requiring the use of two different herbicides with different application timing. To cut costs, growers are interested in combining applications. However, crop safety with herbicide combinations is a concern, and the appropriate application timing for different herbicides and herbicide combinations has not been well tested. Research was conducted in the San Joaquin Valley and the Intermountain area of northern California to evaluate weed control and crop safety with selected new and standard herbicides applied alone and in combination at two different growth stages (3-5 and 6-8 leaf stage). In general, herbicide treatments with Puma, Axial, or Axial+MCPA had little to no crop injury at any site. The differences in crop injury between tank mixes were minor at one site except when Axial was used which increased the injury. The wheat injury that did occur with some of the tank mixtures typically disappeared after four to five weeks and there was no significant difference in bushel weight, protein, or yield between any of the treatments.

All of the treatments gave excellent control of wild oats (*Avena fatua*) at both timings, except for treatments with only ET or Shark. Pyroxsulam gave fair to good control of wild oats and some broadleaves. All treatments controlled Shepherd's-purse (*Capsella bursa-pastoris*) at both timings, except for treatments with only Puma or Axial. All treatments gave good to excellent control of common chickweed (*Stellaria media*) at both timings, except for treatments with only Puma or Axial. All of the treatments with Shark, Osprey, or pyroxsulam gave excellent control of coast fiddleneck (*Amsinkia menziesii*). All of the treatment except for treatments with only Puma or Axial gave excellent control of stinging nettle (*Urtica dioica*).

Introduction and Objectives

Wheat is an important crop throughout most of California. Weed control is a significant problem for small grain producers and nearly all fields are treated for weeds each year. Both broadleaf and grassy weeds can be challenging. In some areas grass weeds and some broadleaf weeds are increasing because there is less crop rotation and tillage resulting in a greater dependence on herbicides. There is also concern about the possibility of herbicide-resistance evolving in weeds.

Several new small grain herbicides have been developed, some of which are commonly used in other areas of the country. Some of these herbicides may be useful in California but have not been used commercially because producers and pest control advisors are not familiar with them or they are concerned about the possibility of crop injury. Research was needed to evaluate many of the newer herbicides that are used successfully in other production areas.

Most grain fields contain both broadleaf and grassy weeds. This usually necessitates the use of two different herbicides. Ordinarily the application timing for grass and broadleaf herbicides is different. This presents a problem for producers, who for cost reasons, would like to control all weeds in a single herbicide application. Usually the grass herbicide application timing is earlier because small grasses are easier to control. The broadleaf herbicide is often applied later due to crop safety concerns. So, if a grower wishes to combine grass and broadleaf herbicides and treat early, he or she runs the risk of injuring the crop. Conversely, if the grower chooses to combine herbicides and treat at the later application timing, the grower runs the risk of poor weed control (the grass weeds may have become too large to be effectively controlled) or reducing crop yield from prolonged weed competition. In addition some of the grass herbicides require separate applications at least 7 to 14 days apart due to the possibility of antagonism. More information is needed regarding crop safety of different herbicides. This is especially the case when herbicide tank mixes are used. Therefore, research was needed to evaluate herbicides and herbicide tank mixes to determine their crop safety and effect on yield when applied at different wheat growth stages.

Materials and Methods

This project consists of four field experiments conducted in the San Joaquin Valley and in Siskiyou County. Trials were conducted with grower cooperators and at University of California field stations to evaluate the efficacy of the herbicides along with crop injury. The experimental design was a randomized block. The plots were six by twenty-five feet. Several varieties of wheat were used including Blanca Fuerte and Joaquin. The wheat varieties Yecora Rojo and Alpowa were evaluated at the Intermountain Research and Extension Center (IREC) site. A CO2 backpack sprayer with a 8002 FF nozzles at 30 or 40 psi was used at for a spray volume of 15 GPA or 20 GPA depending on location. There were 13 different herbicide treatments sprayed at two different timings. One set of applications was at the 3-5 leaf stage and the other was at the 6-8 leaf stage. Herbicides evaluated included MCPA, Shark, Osprey, ET, Axial, Puma, and Pyroxsulam. All of the treatments included either NIS, COC, or AMS. Visual evaluations of crop injury were made one, two, four, six, and eleven weeks after each treatment. Two of the study sites were harvested for yield, and bushel weights. The intent of these studies was to evaluate the level of weed control achieved with the different herbicides applied at the two different application timings and to determine if the crop injury affected yield.

Results

All of the treatments gave excellent control of wild oats (*Avena fatua*) at both timings, except for treatments with only ET or Shark (Tables 5 and 9). Pyroxsulam gave fair to good control of wild oats and some broadleaves. All of the treatments gave excellent control of shepherd's-purse (*Capsella bursa-pastoris*) at both timings, except for treatments with only Puma or Axial (Table 3). All of the treatments gave good to excellent control of common chickweed (*Stellaria media*) at both timings, except for treatments with only Puma or Axial (Tables 6 and 11). All of the treatments with Shark, Osprey, or pyroxsulam gave excellent control of coast fiddleneck (*Amsinkia menziesii*) (Table 7). All of the treatment except for treatments with only Puma or Axial gave excellent control of Stinging Nettle (*Urtica dioica*) (Table 10). The percent wheat injury for all of the sites was evaluated and found that treatments that contained only Puma, Axial, and Axial+MCPA had little to no crop injury at any site. The differences in crop injury between tank mixes were minor at one site except when Axial was used, which increased the injury. All wheat injury disappeared approximately four to five weeks after treatments (Tables 1, 4, and 8). Harvest data indicated there was not a significant difference between any of the treatments in bushel weight, protein content, or overall yield despite the initial crop injury that occurred with some of the treatments (Table 2).

Discussion, Conclusions and Recommendations

Yield studies at two locations for two years indicated that even though there was some initial wheat injury the final yield was not affected. There appears to be greater safety without antagonism with some grass herbicide combinations in particular with MCPA or Express. Research should continue to further verify the safety of new wheat herbicides and when possible to work with chemical companies and DPR to change some labels to allow more flexibility with herbicide application using tank mixes.

Table 1.Wheat Injury-WSREC 2011

Blanca Fuerte Wheat (*Triticum aestivum L.*) Percent Injury								
			26-Jan	3-Feb	7-Feb	15-Feb	22-Feb	13-Apr
Treatments	Rates/A	Timing	8 DAT	16 DAT	20 DAT	28 DAT	35 DAT	84 DAT
1. Osprey + NIS	4.76 oz + 0.5% v/v	3-5 LF	17	12	6	2	0	0
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		42	28	17	7	0	0
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		42	32	18	7	0	0
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		0	0	0	0	0	0
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		27	20	12	6	0	0
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		30	22	15	7	0	0
9. ET + NIS	1 oz + 0.5% v/v		28	18	10	4	0	0
10. Shark + NIS	1 oz + 0.5% v/v		23	15	8	3	0	0
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		10	9	3	0	0	0
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		20	9	3	0	0	0
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		10	15	2	0	0	0
			15-Feb	22-Feb	1-Mar	8-Mar	14-Mar	13-Apr
Treatments	Rates/A	Timing	7 DAT	14 DAT	21 DAT	28 DAT	34 DAT	64 DAT
14. Osprey + NIS	4.76 oz + 0.5% v/v	6-8 LF	10	20	17	7	0	0
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0	0
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0	0
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		43	30	15	6	0	0
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		37	25	13	3	0	0
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		10	20	30	11	0	0
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		37	27	12	4	0	0
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		30	23	12	3	0	0
22. ET + NIS	1 oz + 0.5% v/v		40	27	15	5	0	0
23. Shark + NIS	1 oz + 0.5% v/v		30	17	9	3	0	0
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		17	37	23	12	0	0
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		13	42	50	50	37	8
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		7	17	23	10	0	0
27. Untreated	----		0	0	0	0	0	0

Table 2. Wheat yield and quality- WSREC 2011 Blanca Fuerte

Treatments	Rates/A	Timing	Height	Bushel Weight	Protein	Yield lbs/A
1. Osprey + NIS	4.76 oz + 0.5% v/v	3-5 LF	35.3	64	11.5	**6565**
2. Puma + NIS	10.6 oz + 0.5% v/v		36.0	65	11.4	**6172**
3. Axial + NIS	16.4 oz + 0.5% v/v		36.0	65	11.3	**6305**
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		36.0	65	11.7	**6007**
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		35.3	64	11.6	**6182**
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		35.7	65	11.1	**5977**
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		35.7	63	11.2	**5881**
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		36.0	65	11.3	**6445**
9. ET + NIS	1 oz + 0.5% v/v		35.7	65	11.5	**6270**
10. Shark + NIS	1 oz + 0.5% v/v		36.0	65	11.3	**7177**
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		36.0	65	11.1	**5645**
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		35.3	65	11.3	**6683**
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		35.0	65	11.1	**6314**
LSD .05			**NS**	**NS**	**NS**	**NS**
% CV			**2.66**	**1.29**	**2.37**	**10.77**
Treatments	**Rates/A**	**Timing**	**Height**	**Bushel Weight**	**Protein**	**Yield lbs/A**
14. Osprey + NIS	4.76 oz + 0.5% v/v	6-8 LF	35.0	65	11.6	**5597**
15. Puma + NIS	10.6 oz + 0.5% v/v		36.3	65	11.1	**6065**
16. Axial + NIS	16.4 oz + 0.5% v/v		35.7	65	11.3	**6171**
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		35.7	65	11.3	**6075**
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		36.0	65	11.3	**6340**
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		34.3	65	11.5	**5562**
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		35.7	65	11.4	**6482**
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		35.3	65	11.5	**6211**
22. ET + NIS	1 oz + 0.5% v/v		36.7	65	11.4	**6554**
23. Shark + NIS	1 oz + 0.5% v/v		36.0	65	11.4	**5889**
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		34.3	64	11.5	**6598**
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		33.3	65	11.6	**5583**
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		35.3	65	11.3	**5891**
27. Untreated	----		35.7	65	11.2	**6715**
LSD .05			**1.26**	**NS**	**NS**	**NS**
% CV			**2.12**	**0.55**	**1.71**	**8.34**

Table 3. Control of Shepherd's-purse- WSREC 2011

Shepherd's-purse (*Capsella bursa-pastoris*) Percent Control							
			26-Jan	3-Feb	7-Feb	22-Feb	13-Apr
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**21 DAT**	**35 DAT**	**84 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	30	53	57	97	100
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		92	100	100	98	100
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		93	100	100	100	100
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		42	62	72	83	100
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		93	87	100	96	97
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		93	87	100	99	100
9. ET + NIS	1 oz + 0.5% v/v		93	100	100	99	98
10. Shark + NIS	1 oz + 0.5% v/v		95	100	100	100	100
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		33	55	63	99	100
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		37	50	57	99	100
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		28	53	63	96	100
			22-Feb	1-Mar	8-Mar	14-Mar	13-Apr
Treatments	**Rates/A**	**Timing**	**14 DAT**	**21 DAT**	**28 DAT**	**34 DAT**	**64 DAT**
14. Osprey + NIS	4.76 oz + 0.5% v/v	**6-8 LF**	58	73	82	100	100
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		82	93	100	100	100
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		98	100	100	100	100
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		52	73	88	100	100
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		87	95	99	100	100
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		94	100	100	100	100
22. ET + NIS	1 oz + 0.5% v/v		78	95	99	100	100
23. Shark + NIS	1 oz + 0.5% v/v		97	100	100	100	100
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		62	80	92	100	100
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		45	80	93	100	100
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		28	77	88	100	100
27. Untreated	----		0	0	0	0	0

Table 4. Wheat Injury- Porterville 2011

Joaquin Wheat (*Triticum aestivum L.*) Percent Injury							
			4-Feb	11-Feb	24-Feb	11-Mar	14-Apr
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**28 DAT**	**42 DAT**	**76 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	18	11	6	0	0
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		31	23	11	0	0
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		30	20	10	0	0
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		0	0	0	0	0
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		29	16	10	0	0
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		30	20	9	0	0
9. ET + NIS	1 oz + 0.5% v/v		33	20	10	0	0
10. Shark + NIS	1 oz + 0.5% v/v		30	21	10	0	0
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		20	9	4	0	0
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		20	10	5	0	0
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		20	10	5	0	0
			1-Mar	**9-Mar**	**17-Mar**	**14-Apr**	
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**27 DAT**	**49 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**6-8 LF**	7	0	0	0	
15. Puma + NIS	10.6 oz + 0.5% v/v		1	0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		5	0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		31	11	0	0	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		21	6	0	0	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		15	0	0	0	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		30	8	0	0	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		30	8	0	0	
22. ET + NIS	1 oz + 0.5% v/v		33	11	0	0	
23. Shark + NIS	1 oz + 0.5% v/v		28	9	0	0	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		5	0	0	0	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		13	0	0	0	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		6	0	0	0	
27. Untreated			0	0	0	0	

Table 5. Control of Wild Oats- Porterville 2011

Wild Oats (*Avena fatua L.*) Percent Control							
			4-Feb	11-Feb	24-Feb	11-Mar	14-Apr
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**28 DAT**	**42 DAT**	**76 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	45	58	66	84	96
2. Puma + NIS	10.6 oz + 0.5% v/v		68	79	86	95	100
3. Axial + NIS	16.4 oz + 0.5% v/v		71	80	89	97	100
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		73	86	96	99	100
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		75	86	94	99	100
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		70	80	91	97	100
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		75	89	98	100	100
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		69	79	89	96	100
9. ET + NIS	1 oz + 0.5% v/v		0	0	0	0	0
10. Shark + NIS	1 oz + 0.5% v/v		0	0	0	0	0
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		48	60	68	80	100
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		50	63	70	80	100
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		48	58	70	80	93
			1-Mar	9-Mar	17-Mar	14-Apr	
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**27 DAT**	**49 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**6-8 LF**	33	53	70	95	
15. Puma + NIS	10.6 oz + 0.5% v/v		38	65	90	100	
16. Axial + NIS	16.4 oz + 0.5% v/v		40	73	93	100	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		40	71	90	100	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		40	73	93	100	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		35	71	90	100	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		43	74	90	98	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		40	70	89	98	
22. ET + NIS	1 oz + 0.5% v/v		0	0	0	0	
23. Shark + NIS	1 oz + 0.5% v/v		0	0	0	0	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		35	59	73	98	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		40	60	75	100	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		40	60	78	100	
27. Untreated			0	0	0	0	

Table 6. Control of Common Chickweed- Porterville 2011

Common Chickweed (*Stellaria media L.*) Percent Control						
			4-Feb	11-Feb	24-Feb	11-Mar
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**28 DAT**	**42 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	25	55	68	89
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		88	93	96	97
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		75	80	83	70
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		25	48	70	78
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		83	90	94	95
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		70	78	81	75
9. ET + NIS	1 oz + 0.5% v/v		90	95	98	98
10. Shark + NIS	1 oz + 0.5% v/v		68	73	78	63
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		20	74	81	100
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		25	71	80	100
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		23	71	81	100
			1-Mar	**9-Mar**	**17-Mar**	
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**27 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**6-8 LF**	20	68	84	
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		68	80	83	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		63	91	99	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		40	45	60	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		69	83	88	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		60	81	88	
22. ET + NIS	1 oz + 0.5% v/v		73	91	93	
23. Shark + NIS	1 oz + 0.5% v/v		64	73	80	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		18	70	90	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		20	78	93	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		25	84	93	
27. Untreated			0	0	0	

Table 7. Control of Coast Fiddleneck- Porterville 2011

Coast Fiddleneck (*Amsinckia menziesii*) Percent Control							
			4-Feb	**11-Feb**	**24-Feb**	**11-Mar**	**14-Apr**
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**28 DAT**	**42 DAT**	**76 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	30	53	73	93	96
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		32	27	20	10	0
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		85	97	100	100	100
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		38	33	18	13	0
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		33	29	20	13	0
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		80	94	96	100	100
9. ET + NIS	1 oz + 0.5% v/v		33	26	20	10	0
10. Shark + NIS	1 oz + 0.5% v/v		75	80	83	100	100
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		35	60	78	100	100
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		40	75	83	100	100
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		28	65	78	100	100
			1-Mar	**9-Mar**	**17-Mar**	**14-Apr**	
Treatments	**Rates/A**	**Timing**	**7 DAT**	**14 DAT**	**27 DAT**	**49 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**6-8 LF**	15	58	83	80	
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		28	18	8	0	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		85	91	93	100	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		26	19	8	0	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		30	19	9	0	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		90	100	100	100	
22. ET + NIS	1 oz + 0.5% v/v		29	19	9	0	
23. Shark + NIS	1 oz + 0.5% v/v		90	100	100	100	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		13	51	73	69	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		20	58	78	85	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		20	73	80	68	
27. Untreated			0	0	0	0	

Table 8. Wheat Injury- Ducor 2011

Joaquin Wheat (*Triticum aestivum*) Percent Injury							
			26-Jan	3-Feb	8-Feb	22-Feb	14-Apr
Treatments	**Rates/A**	**Timing**	**8 DAT**	**16 DAT**	**20 DAT**	**35 DAT**	**86 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	14	9	5	0	0
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		35	26	14	5	0
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		43	33	18	8	0
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		0	0	0	0	0
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		26	19	9	3	0
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		35	25	14	5	0
9. ET + NIS	1 oz + 0.5% v/v		26	18	8	2	0
10. Shark + NIS	1 oz + 0.5% v/v		28	19	10	3	0
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		13	6	3	0	0
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		11	5	2	0	0
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		11	4	2	0	0
			22-Feb	**1-Mar**	**8-Mar**	**14-Apr**	
			14 DAT	**21 DAT**	**28 DAT**	**65 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**5-7 LF**	19	13	5	0	
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		28	23	11	0	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		30	25	11	0	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		0	0	0	0	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		33	23	11	0	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		30	25	13	0	
22. ET + NIS	1 oz + 0.5% v/v		30	28	14	0	
23. Shark + NIS	1 oz + 0.5% v/v		25	23	11	0	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		15	13	6	0	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		13	10	4	0	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		14	9	3	0	
27. UTC	---		0	0	0	0	

Table 9. Control of Wild Oat- Ducor 2011

Wild Oats (*Avena fatua*) Percent Control							
			26-Jan	3-Feb	8-Feb	22-Feb	14-Apr
Treatments	**Rates/A**	**Timing**	**8 DAT**	**16 DAT**	**20 DAT**	**35 DAT**	**86 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	55	75	75	84	95
2. Puma + NIS	10.6 oz + 0.5% v/v		71	84	88	96	100
3. Axial + NIS	16.4 oz + 0.5% v/v		65	78	93	100	100
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		69	84	90	100	100
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		70	85	90	100	100
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		60	73	88	100	100
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		69	83	93	100	100
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		80	88	93	100	100
9. ET + NIS	1 oz + 0.5% v/v		0	0	0	0	0
10. Shark + NIS	1 oz + 0.5% v/v		0	0	0	0	0
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		50	69	76	89	95
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		54	66	78	90	96
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		53	70	70	85	89
			22-Feb	**1-Mar**	**8-Mar**	**14-Apr**	
			14 DAT	**21 DAT**	**28 DAT**	**65 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**5-7 LF**	35	68	85	100	
15. Puma + NIS	10.6 oz + 0.5% v/v		63	80	94	100	
16. Axial + NIS	16.4 oz + 0.5% v/v		55	83	97	100	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		53	79	97	100	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		50	78	97	100	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		48	78	93	100	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		48	74	93	100	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		48	65	86	95	
22. ET + NIS	1 oz + 0.5% v/v		0	0	0	0	
23. Shark + NIS	1 oz + 0.5% v/v		0	0	0	0	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		33	59	64	89	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		29	54	64	91	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		25	54	65	88	
27. UTC	---		0	0	0	0	

Table 10. Control of Stinging Nettle- Ducor 2011

Stinging Nettle (*Urtica dioica*) Percent Control						
			26-Jan	3-Feb	8-Feb	22-Feb
Treatments	**Rates/A**	**Timing**	**8 DAT**	**16 DAT**	**20 DAT**	**35 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	48	66	75	85
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		85	90	93	98
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		89	94	97	100
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		40	58	78	94
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		81	91	95	99
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		90	95	97	100
9. ET + NIS	1 oz + 0.5% v/v		89	94	98	100
10. Shark + NIS	1 oz + 0.5% v/v		90	95	98	100
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		33	58	66	74
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		40	60	66	78
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		43	63	71	81
			22-Feb	**1-Mar**	**8-Mar**	
			14 DAT	**21 DAT**	**28 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**5-7 LF**	48	60	90	
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		60	78	89	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		65	80	97	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		55	73	94	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		70	83	88	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		70	85	95	
22. ET + NIS	1 oz + 0.5% v/v		60	79	91	
23. Shark + NIS	1 oz + 0.5% v/v		77	90	98	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		48	60	88	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		43	69	93	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		40	66	84	
27. UTC	---		0	0	0	

Table 11. Control of Common Chickweed- Ducor 2011

Common Chickweed (*Stellaria media*) Percent Control						
			26-Jan	3-Feb	8-Feb	22-Feb
Treatments	**Rates/A**	**Timing**	**8 DAT**	**16 DAT**	**20 DAT**	**35 DAT**
1. Osprey + NIS	4.76 oz + 0.5% v/v	**3-5 LF**	48	65	73	86
2. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0
3. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0
4. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		89	94	98	100
5. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		84	90	90	95
6. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		30	54	56	76
7. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		90	95	100	100
8. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		80	89	93	95
9. ET + NIS	1 oz + 0.5% v/v		93	97	100	100
10. Shark + NIS	1 oz + 0.5% v/v		84	89	91	96
11. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		33	58	65	79
12. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		40	60	63	80
13. Pyroxsulam + COC	6.75 oz + 1.25% v/v		38	60	65	84
			22-Feb	**1-Mar**	**8-Mar**	
			14 DAT	**21 DAT**	**28 DAT**	
14. Osprey + NIS	4.76 oz + 0.5% v/v	**5-7 LF**	35	55	83	
15. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	
16. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	
17. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		58	75	88	
18. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		48	65	78	
19. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		55	71	78	
20. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		60	79	83	
21. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		48	68	73	
22. ET + NIS	1 oz + 0.5% v/v		66	80	84	
23. Shark + NIS	1 oz + 0.5% v/v		53	69	79	
24. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		38	59	81	
25. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		23	63	84	
26. Pyroxsulam + COC	6.75 oz + 1.25% v/v		23	60	79	
27. UTC	---		0	0	0	

Table 12. Joaquin Wheat yield and quality- Ducor - 2010

Treatments	Rates/A	Timing	Yield lbs/A	Bushel Weight	Protein
1. Osprey + NIS	4.76 oz + 0.5% v/v		2187	62	8.4
2. Atlantis + NIS	7 oz + 0.5% v/v		2401	61	7.8
3. Puma + NIS	10.6 oz + 0.5% v/v		2334	62	8.4
4. Axial + NIS	16.4 oz + 0.5% v/v		2242	63	8.3
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		2406	61	8.3
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		2456	63	8.3
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v	**3-5 LF**	2972	63	8.2
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		2370	62	8.7
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		2396	63	8.9
10. ET + NIS	1 oz + 0.5% v/v		2348	61	8.4
11. Shark + NIS	1 oz + 0.5% v/v		1685	61	8.4
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		2387	63	8.1
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		3100	63	7.9
LSD .05			**NS**	**NS**	**NS**
%CV			**25.38**	**2.75**	**6.21**
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		2718	61	8.0
15. Osprey + NIS	4.76 oz + 0.5% v/v		1904	60	8.3
16. Express + NIS	7 oz + 0.5% v/v		1335	55	11.1
17. Puma + NIS	10.6 oz + 0.5% v/v		1983	62	8.1
18. Axial + NIS	16.4 oz + 0.5% v/v		2326	62	7.9
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		2365	62	7.9
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		2300	62	8.1
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v	**6-8 LF**	2043	61	8.3
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		2264	62	8.0
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		2022	61	8.2
24. ET + NIS	1 oz + 0.5% v/v		1753	59	9.3
25. Shark + NIS	1 oz + 0.5% v/v		2072	61	8.8
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		2343	60	7.9
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		1952	60	8.0
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		2319	61	8.0
29. UTC	---		1887	60	8.7
LSD .05			**NS**	**3.15**	**0.83**
%CV			**30.4**	**3.65**	**6.85**

* Express high rate is only 0.5 oz/A (7 oz is way to high)

Table 13. Joaquin Wheat Injury- Ducor - 2010

Percent Wheat *(Triticum aestivum)* Injury								
Treatments	**Rates/A**	**Timing**	**12-Feb**	**19-Feb**	**23-Feb**	**2-Mar**	**19-Mar**	**29-Mar**
1. Osprey + NIS	4.76 oz + 0.5% v/v		4	2	1	0	0	0
2. Atlantis + NIS	7 oz + 0.5% v/v		13	6	1	0	0	0
3. Puma + NIS	10.6 oz + 0.5% v/v		1	0	0	0	0	0
4. Axial + NIS	16.4 oz + 0.5% v/v		6	3	0	0	0	0
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		21	11	7	5	2	0
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		29	18	15	9	4	0
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		1	0	0	0	0	0
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**3-5 LF**	21	13	6	4	1	0
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		23	13	9	5	1	0
10. ET + NIS	1 oz + 0.5% v/v		15	5	4	2	0	0
11. Shark + NIS	1 oz + 0.5% v/v		14	7	6	4	1	0
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		5	3	2	0	0	0
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		14	5	2	0	0	0
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		11	8	3	0	0	0
15. Osprey + NIS	4.76 oz + 0.5% v/v		-	-	0	0	0	0
16. Express + NIS	7 oz + 0.5% v/v		-	-	0	0	0	0
17. Puma + NIS	10.6 oz + 0.5% v/v		-	-	0	0	0	0
18. Axial + NIS	16.4 oz + 0.5% v/v		-	-	0	0	0	0
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	24	14	6	0
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	24	14	6	0
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		-	-	0	0	0	0
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**6-8 LF**	-	-	23	14	6	0
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		-	-	16	10	5	0
24. ET + NIS	1 oz + 0.5% v/v		-	-	23	13	7	0
25. Shark + NIS	1 oz + 0.5% v/v		-	-	23	14	7	0
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		-	-	0	0	0	0
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		-	-	0	0	0	0
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		-	-	0	0	0	0
29. UTC	---		-	-	0	0	0	0

Table 14. Control of Wild Oat- Ducor - 2010

Wild Oats *(Avena fatua)* Percent Control								
Treatments	**Rates/A**	**Timing**	**12-Feb**	**19-Feb**	**23-Feb**	**2-Mar**	**19-Mar**	**29-Mar**
1. Osprey + NIS	4.76 oz + 0.5% v/v		0	45	51	59	81	98
2. Atlantis + NIS	7 oz + 0.5% v/v		0	45	50	59	78	91
3. Puma + NIS	10.6 oz + 0.5% v/v		0	55	78	85	93	100
4. Axial + NIS	16.4 oz + 0.5% v/v		0	69	88	95	99	100
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		0	70	79	88	90	89
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		0	74	89	96	100	100
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		0	54	73	89	96	100
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**3-5 LF**	0	69	75	86	93	100
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		0	71	81	90	96	99
10. ET + NIS	1 oz + 0.5% v/v		0	0	0	0	0	0
11. Shark + NIS	1 oz + 0.5% v/v		0	0	0	0	0	0
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		0	0	66	74	88	96
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		0	0	66	73	86	95
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		0	0	53	58	84	99
15. Osprey + NIS	4.76 oz + 0.5% v/v		-	-	0	1	30	44
16. Express + NIS	7 oz + 0.5% v/v		-	-	0	0	0	0
17. Puma + NIS	10.6 oz + 0.5% v/v		-	-	0	6	48	81
18. Axial + NIS	16.4 oz + 0.5% v/v		-	-	0	5	53	78
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	0	8	59	89
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	0	10	61	88
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		-	-	0	8	55	80
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**6-8 LF**	-	-	0	9	59	88
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		-	-	0	9	53	84
24. ET + NIS	1 oz + 0.5% v/v		-	-	0	0	0	0
25. Shark + NIS	1 oz + 0.5% v/v		-	-	0	0	0	0
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		-	-	0	1	26	43
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		-	-	0	4	36	59
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		-	-	0	3	43	65
29. UTC	---		-	-	0	0	0	0

Table 15. Blanca Fuerte Wheat yield and quality- WSREC - 2010

Treatments	Rates/A	Timing	Yield lbs/A	Bushel Weight	Protein
1. Osprey + NIS	4.76 oz + 0.5% v/v		8216	65	11.9
2. Atlantis + NIS	7 oz + 0.5% v/v		8547	65	11.1
3. Puma + NIS	10.6 oz + 0.5% v/v		7774	65	10.7
4. Axial + NIS	16.4 oz + 0.5% v/v		8238	65	10.4
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		8434	65	10.2
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		8091	65	11.1
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v	**3-5 LF**	8178	65	11.4
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		8161	65	11.7
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		7904	65	11.7
10. ET + NIS	1 oz + 0.5% v/v		8120	65	11.7
11. Shark + NIS	1 oz + 0.5% v/v		7664	65	11.6
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		7553	65	11.8
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		7875	65	11.5
LSD .05			**NS**	**NS**	**NS**
% CV			**6.72**	**NS**	**5.42**
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		8338	65	11.5
15. Osprey + NIS	4.76 oz + 0.5% v/v		8353	65	11.5
16. Express + NIS	7 oz + 0.5% v/v		7767	65	11.5
17. Puma + NIS	10.6 oz + 0.5% v/v		8113	65	11.7
18. Axial + NIS	16.4 oz + 0.5% v/v		8202	65	11.9
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		8341	65	11.8
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		7750	65	11.8
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v	**6-8 LF**	7983	65	11.6
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v		8149	65	11.6
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		7808	65	11.8
24. ET + NIS	1 oz + 0.5% v/v		8096	65	11.7
25. Shark + NIS	1 oz + 0.5% v/v		7971	65	12.2
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		8516	65	12.1
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		8276	65	11.8
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		8144	65	11.8
29. UTC	---		7969	65	11.6
LSD .05			**NS**	**NS**	**NS**
% CV			**7.48**	**NS**	**6.78**

* Express high rate is only 0.5 oz/A (7 oz is way to high)

Table 16. Wheat Injury- WSREC - 2010

Blanca Fuerte Wheat *(Triticum aestivum)* Percent Injury							
Treatments	**Rates/A**	**Timing**	**11-Feb**	**17-Feb**	**23-Feb**	**17-Mar**	**23-Mar**
1. Osprey + NIS	4.76 oz + 0.5% v/v		0	0	0	0	0
2. Atlantis + NIS	7 oz + 0.5% v/v		0	0	0	0	0
3. Puma + NIS	10.6 oz + 0.5% v/v		0	0	0	0	0
4. Axial + NIS	16.4 oz + 0.5% v/v		0	0	0	0	0
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		7	4	3	0	0
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		5	4	2	0	0
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		2	1	1	0	0
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**3-5 LF**	4	2	1	0	0
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		3	1	1	0	0
10. ET + NIS	1 oz + 0.5% v/v		4	1	0	0	0
11. Shark + NIS	1 oz + 0.5% v/v		3	0	0	0	0
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		1	0	0	0	0
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		1	1	0	0	0
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		0	0	0	0	0
15. Osprey + NIS	4.76 oz + 0.5% v/v		-	-	0	0	0
16. Express + NIS	7 oz + 0.5% v/v		-	-	0	0	0
17. Puma + NIS	10.6 oz + 0.5% v/v		-	-	0	0	0
18. Axial + NIS	16.4 oz + 0.5% v/v		-	-	0	0	0
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	25	14	6
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		-	-	29	16	7
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		-	-	0	0	0
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**6-8 LF**	-	-	15	7	3
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		-	-	18	9	3
24. ET + NIS	1 oz + 0.5% v/v		-	-	14	6	2
25. Shark + NIS	1 oz + 0.5% v/v		-	-	14	6	2
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		-	-	0	0	0
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		-	-	0	0	0
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		-	-	0	0	0
29. UTC	---		-	-	0	0	0

Table 17. Control of London Rocket - WSREC - 2010

London Rocket *(Sisymbrium irio)* Percent Control				
Treatments	**Rates/A**	**Timing**	**17-Mar**	**23-Mar**
1. Osprey + NIS	4.76 oz + 0.5% v/v		85	94
2. Atlantis + NIS	7 oz + 0.5% v/v		88	98
3. Puma + NIS	10.6 oz + 0.5% v/v		0	0
4. Axial + NIS	16.4 oz + 0.5% v/v		0	0
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		38	55
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		56	78
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		86	98
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**3-5 LF**	51	64
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		81	95
10. ET + NIS	1 oz + 0.5% v/v		68	80
11. Shark + NIS	1 oz + 0.5% v/v		91	100
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		84	98
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		85	99
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		88	98
15. Osprey + NIS	4.76 oz + 0.5% v/v		78	86
16. Express + NIS	7 oz + 0.5% v/v		83	93
17. Puma + NIS	10.6 oz + 0.5% v/v		0	0
18. Axial + NIS	16.4 oz + 0.5% v/v		30	50
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		45	60
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		79	88
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		84	94
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**6-8 LF**	71	79
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		84	93
24. ET + NIS	1 oz + 0.5% v/v		49	63
25. Shark + NIS	1 oz + 0.5% v/v		78	85
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		79	88
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		71	85
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		78	86
29. UTC	---		0	0

Table 18. Control of Field Bindweed - WSREC - 2010

Field Bindweed *(Convolvulus arvensis)* Percent Control				
Treatments	**Rates/A**	**Timing**	**17-Mar**	**23-Mar**
1. Osprey + NIS	4.76 oz + 0.5% v/v		79	90
2. Atlantis + NIS	7 oz + 0.5% v/v		78	88
3. Puma + NIS	10.6 oz + 0.5% v/v		0	0
4. Axial + NIS	16.4 oz + 0.5% v/v		0	0
5. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		30	40
6. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		62	75
7. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		71	83
8. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**3-5 LF**	60	75
9. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		79	88
10. ET + NIS	1 oz + 0.5% v/v		75	88
11. Shark + NIS	1 oz + 0.5% v/v		71	83
12. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		65	75
13. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		55	76
14. Pyroxsulam + COC	6.75 oz + 1.25% v/v		70	81
15. Osprey + NIS	4.76 oz + 0.5% v/v		75	86
16. Express + NIS	7 oz + 0.5% v/v		80	90
17. Puma + NIS	10.6 oz + 0.5% v/v		0	0
18. Axial + NIS	16.4 oz + 0.5% v/v		15	27
19. Axial + ET + NIS	16.4 oz + 1 oz + 0.5% v/v		40	50
20. Axial + Shark + NIS	16.4 oz + 1 oz + 0.5% v/v		70	81
21. Axial + MCPA + NIS	16.4 oz + 16 oz + 0.5% v/v		73	85
22. Puma + ET + NIS	10.6 oz + 1 oz + 0.5% v/v	**6-8 LF**	63	74
23. Puma + Shark + NIS	10.6 oz + 1 oz + 0.5% v/v		70	81
24. ET + NIS	1 oz + 0.5% v/v		48	58
25. Shark + NIS	1 oz + 0.5% v/v		75	85
26. Pyroxsulam + NIS	6.75 oz + 0.5% v/v		57	67
27. Pyroxsulam + AMS + NIS	6.75 oz + 1.5 lbs ai + 0.5% v/v		73	83
28. Pyroxsulam + COC	6.75 oz + 1.25% v/v		38	50
29. UTC	---		0	0

Table 19. IREC -2011

Alpowa							
			Wheat Injury				
			Weeks After Treatment				T/A
Treatment	**Rate/A**	**Timing**	**1 WAT**	**2 WAT**	**3 WAT**	**Bushel Wt.**	**Yield**
1. 2,4-D	1.0 pt	3 Leaf	2.5	1.25	0	59.4	4.43
2. 2,4-D + Clarity	1.0 to 4 oz		5	1.25	1.75	58.0	4.17
3. Osprey	4.67 oz		3.75	3.75	0	60.2	4.44
4. Express	-		5	5	0	61.3	4.54
5. Axial	16.4 oz		7.5	1.25	0	61.0	4.37
6. ET	1 oz		15	8.75	0	60.6	4.57
7. Shark	1 oz		6.25	5	0	60.6	4.70
8. 2,4-D	1.25 pt + 1 oz		5	2.5	0	61.3	4.49
9. Pyroxsulam	6.75 oz		6.25	0	0	60.8	4.51
10. Puma	10.6 oz		7.5	3.75	0	61.1	4.07
11. Shark + Puma	1 oz +10.6		7.5	6.25	0	61.5	4.68
12. Shark + Axial	1 oz + 16.4 oz		5	3.75	0	61.0	4.95
13. MCPA + Axial	1 pt + 16.4 oz		6.25	2.5	0	60.5	4.90
14. Untreated	-		5	3.75	0	61.4	4.82
15. 2,4-D	1.0 pt	9 to 12	0	0	0.5	60.6	4.35
16. 2,4-D + Clarity	1.0 to 4 oz		0	0	0.5	59.5	3.78
17. Osprey	4.67 oz		0	0	2	62.1	4.94
18. Express	-		0	0	3.75	60.8	4.76
19. Axial	16.4 oz		0.5	0	2.5	61.2	4.73
20. ET	1 oz		3.75	0	1.25	61.2	4.48
21. Shark	1 oz		7	0	0.75	60.8	4.79
22. 2,4-D	1.25 pt + 1 oz		5	0	0	61.1	4.40
24. Pyroxsulam	6.75 oz		0	0	1.5	61.4	5.42
25. Puma	10.6 oz		1	0	0.5	61.2	4.24
26. Shark + Puma	1 oz +10.6		3.75	0	0	60.9	4.74
27. Shark + Axial	1 oz + 16.4 oz		5.75	0	0.75	61.0	4.18
28. MCPA + Axial	1 pt + 16.4 oz		2.25	0	1.25	61.0	4.81
29. Untreated	-		0	0	1.25	61.1	4.30

Table 20. IREC- 2011

Yecora Rojo							
			Wheat Injury				
			Weeks After Treatment				
Treatment	**Rate/A**	**Timing**	**1 WAT**	**2 WAT**	**3 WAT**	**Bushel Wt.**	**Yield**
1. 2,4-D	1.0 pt	3 Leaf	6.25	7.5	1.25	59.3	3.71
2. 2,4-D + Clarity	1.0 to 4 oz		7.5	6.25	1.25	59.2	3.44
3. Osprey	4.67 oz		6.25	10	1.25	59.6	3.80
4. Express	-		10	6.25	3	59.9	3.61
5. Axial	16.4 oz		7.5	7.5	0	59.5	3.72
6. ET	1 oz		16.25	12.5	0	60.2	3.84
7. Shark	1 oz		12.5	11.25	3	194.1	3.89
8. 2,4-D	1.25 pt + 1 oz		13.75	7.5	0.5	59.6	3.61
9. Pyroxsulam	6.75 oz		7.5	5	1.25	58.8	3.79
10. Puma	10.6 oz		25	13.75	1.25	59.9	3.48
11. Shark + Puma	1 oz +10.6		20	15	0	59.5	3.70
12. Shark + Axial	1 oz + 16.4 oz		11.25	6.25	0.5	59.2	3.65
13. MCPA + Axial	1 pt + 16.4 oz		13.75	10	1	59.6	3.61
14. Untreated	-		8.75	10	0	59.5	3.60
15. 2,4-D	1.0 pt	9 to 12	0.5	0	2	59.2	3.62
16. 2,4-D + Clarity	1.0 to 4 oz		1.25	0	1.25	60.4	3.72
17. Osprey	4.67 oz		2	0	0	59.9	3.73
18. Express	-		0.75	0	1.25	59.6	3.71
19. Axial	16.4 oz		10.75	0	1.25	59.4	3.84
20. ET	1 oz		7.5	0	1.75	59.4	3.82
21. Shark	1 oz		12.5	0	1.25	58.7	3.60
22. 2,4-D	1.25 pt + 1 oz		7	1.5	0.75	59.4	3.62
24. Pyroxsulam	6.75 oz		3	0	0	59.2	3.81
25. Puma	10.6 oz		14.5	2.25	1.75	60.1	3.73
26. Shark + Puma	1 oz +10.6		15	1.25	2	60.0	3.62
27. Shark + Axial	1 oz + 16.4 oz		23.75	2.75	3.5	59.3	3.71
28. MCPA + Axial	1 pt + 16.4 oz		20	0	4	59.5	3.76
29. Untreated	-		0	0	1	59.6	3.43

Table 21. Wild Oat Percent Control- Siskiyou Co.