SHARPPOINT FLUVELLIN BIOLOGY AND MANAGEMENT IN SPRING-SEEDED TALL FESCUE GROWN FOR SEED

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Introduction

Sharppoint fluvellin *(Kickxia elatine)* is a problematic weed in grass seed growing areas of western Oregon. Sharppoint fluvellin is in the Scrophulariaceae family (figwort or snapdragon family). The species is native to Europe. The genus name Kickxia refers to Jean Kickx Jr. who was a botany professor in Belgium in the nineteenth century. Elatine is ancient Greek for low creeping plant which describes the prostrate growth habit of sharppoint fluvellin well. A less common related species is roundleaf or female fluvellin *(Kickxia spuria).* Sharppoint fluvellin is found on roadsides, agricultural fields, orchards, gardens and nurseries in the southern states, a few central states and throughout Oregon, Washington and California. Sharppoint fluvellin is an annual with soft, hairy foliage and a "mat-like" appearance when mature. Leaves are mostly alternate and slightly heart shaped or arrow-head shaped and may resemble field bindweed. Flowers are two lipped, white to pale yellow with a purple upper lip and a distinctive spur. Fruit is nearly round and opens at the top to disperse seeds. Sharppoint fluvellin has a fibrous or woody taproot in large individuals and thrives under hot dry conditions. Competitive effects are not well documented but the plant is noted for the ability to regenerate following physical injury during emergence. In addition, sharppoint fluvellin is tolerant of many herbicides. Reproduction is through seed, while most seeds remain near the parent plant they are easily moved by soil and water. Sharppoint fluvellin flowers from June through September and perhaps even longer in the Willamette Valley. Buried seed may survive up to 20 years, but most germinate relatively quickly. These growth characteristics make sharppoint fluvellin highly competitive with spring-planted tall fescue, especially in non-irrigated plantings. Many crop advisors and producers feel stand establishment of tall fescue in the spring could be enhanced through the control of this weed species.

The objective of this research was to evaluate herbicides for sharppoint fluvellin control and quantify crop injury in spring-planted tall fescue for seed production. Four studies were conducted over four years in the Willamette Valley.

Methods

Studies were conducted as randomized complete block experiments with four replications with the exception of the first study that had only two replications. Treatments were applied with a unicycle sprayer that delivered 20 GPA at 20 psi. Application conditions are presented in Table 1.

Table 1. Application conditions.

	Site 1	Site 2	Site 3			Site 4
Application date	6/7/07	6/18/08	5/15/09	6/4/09	6/16/09	5/27/10
Air temperature (F)	65	56	53	75	73	60
Relative humidity (%)	56	85	86	68	56	68
Soil temperature (F)	77	59	62	86	82	70
Tall Fescue growth stage	no crop	2-3 in. tall	2-4 leaf	jointing	2 joints	3-4 leaf
Sharppoint growth stage (dia.)	10 in.	2 in.	3 in.	6-12 in.	6-12 in.	3-4 in.

Weed control and crop injury ratings were obtained by visual evaluation. Study 1 was conducted at Hyslop Crop Science Research Farm near Corvallis. Study 2 was conducted at the Davidson Farm near Shedd. Study 3 was conducted at the Kropf Farm near Peoria, and Study 4 was conducted at the Younger Farm near Albany.

Results and Discussion

In Study 1, conducted at Hyslop farm, none of the herbicide treatments provided adequate control of the sharppoint fluvellin. The HPPD enzyme inhibitor, pyrasulfotole-bromoxynil (Huskie™, not currently registered for grasses grown for seed), had the most activity on sharppoint fluvellin, but the level of control was not acceptable. The synthetic auxin herbicides, KJM-44 (aminocyclopyrachlor), clopyralid-fluroxypyr and aminopyralid had little effect on sharppoint fluvellin. In this study, no crop was present. (Data presented in Table 2.)

Table 2. Postemergence sharppoint fluvellin control, Hyslop Farm, Corvallis, 2007.

Treatment[1,2]	Rate[3] lb a.i./a	Sharppoint fluvellin % control on 6/19/2007
1. check	0	0
2. KJM-44	0.125	30
3. oxyfluorfen	0.0.1	30
4. clopyralid-fluroxypyr	0.24	10
5. Mesotrione	0.094	25
6. pyrasulfotole-bromoxynil	0.23	60
7. aminopyralid	0.094	20
LSD (0.05)		28

[1]Treatments applied 6/7/2007 to 10 in dia. sharppoint fluvellin.
[2]NIS added to all treatments at 0.25% v/v.
[3]Treatments 4 and 7 rates are expressed as lb a.e./a.

The following year, in 2008, Study 2 was established in a newly-seeded tall fescue stand which had already received a bromoxynil-MCPA ester treatment by the grower. This treatment had burned the foliage off the sharppoint fluvellin but the sharppoint fluvellin was starting to re-grow. Treatments were applied to two leaf sharppoint fluvellin re-growth. While the HPPD enzyme inhibitors initially turned the sharppoint fluvellin white in color, the sharppoint fluvellin quickly outgrew the bleaching effect. The treatments containing tribenuron were the most effective in this study with the tribenuron + oxyfluorfen providing adequate sharppoint fluvellin control (87%). By 8/1/2008 the sharppoint fluvellin had filled in the space between the fescue rows in all but the two tribenuron treatments. The tall fescue in the tribenuron + oxyfluorfen treatments was more robust than the tall fescue in the other treatments probably because there was less competition from sharppoint fluvellin. (Data presented in Table 3.)

Table 3. Sharppoint fluvellin control in spring-seeded tall fescue, Davidson Farm, Shedd, OR, 2008.

Treatment[1,2]	Rate lb a.i./a	Tall fescue % injury	Sharppoint fluvellin % control
		------ 8/1/2008 ----	
1. check	0	0	0
2. oxyfluorfen	0.047	0	0
3. mesotrione	0.188	0	7
4. pyrasulfotole-bromoxynil	0.23	0	23
5. mesotrione + bromoxynil-MCPA ester	0.188 1	0	23
6. oxyfluorfen + mesotrione	0.047 0.094	0	8
7. oxyfluorfen + mesotrione	0.047 0.188	0	0
8. oxyfluorfen + bromoxynil-MCPA ester	0.047 1	0	17
9. mesotrione + tribenuron	0.188 0.008	0	70
10. xyfluorfen + tribenuron	0.047 0.008	0	87
LSD 0.05		NS	15

[1]Treatments applied on 6/18/08 to 2" dia. sharppoint fluvellin regrowth, 2-3 in. tall fescue.
[2]NIS at 0.25% v/v added to treatments 2, and 6-10. AMS/NIS added at 1.25% v/v. to treatments 3-5.

In 2009, Study 3 was established in a new tall fescue planting near Peoria with the objective of evaluating weed control of the HPPD enzyme inhibitor herbicides with an early application timing, with respect to the sharppoint fluvellin growth stage. Pyrasulfotole-bromoxynil was applied at two rates to assess potential crop injury. Mesotrione was applied at two rates, 0.094 lb a.i./a, and the maximum rate of 0.188 lb a.i./a. The tribenuron treatments as well as the HPPD inhibitors were then applied at a second, later timing to avoid possible crop injury. A sequential application of pyrasulfotole-bromoxynil also was included. The early application of the higher rate of mesotrione and the lower rate of pyrasulfotole-bromoxynil provided adequate control of sharppoint fluvellin (85% and 83%). The lower rate of mesotrione only suppressed the sharppoint fluvellin (73%). Combinations of the HPPD enzyme inhibitors with the oxyfluorfen reduced the levels of control provided by the HPPD enzyme inhibitors alone, suggesting a level of antagonism between oxyfluorfen and these compounds. Later timings with the HPPD enzyme inhibitors were ineffective. The tribenuron + oxyfluorfen suppressed (78%) the sharppoint fluvellin at the second timing. HPPD enzyme inhibitors plus tribenuron provided inadequate control at the second timing. Control was better with the sequential application of pyrasulfotole-bromoxynil than the single late application but not as good as the earlier single application. (Data presented in Table 4.)

Table 4. Weed control in spring-seeded tall fescue, Kropf Farm, Peoria, 2009.

Treatment[1]	Rate lb a.i./a	Timing[2]	Tall fescue % injury	Sharppoint fluvellin	Purslane speedwell	Witchgrass	cudweed
				% control			
				7/13/2009			
1. check	0	A	0	0	0	0	0
2. pyrasufotole-bromoxynil	0.25	A	0	83	68	73	100
3. pyrasufotole-bromoxynil	0.5	A	0	93	98	70	100
4. mesotrione	0.094	A	3	73	98	13	100
5. mesotrione	0.188	A	0	85	100	10	100
6. oxyfluorfen	0.047	A	3	50	43	10	13
7. pyrasufotole-bromoxynil + oxyfluorfen	0.23 0.047	A	0	73	93	65	100
8. mesotrione + oxyfluorfen	0.188 0.047	A	3	18	80	10	100
9. pyrasufotole-bromoxynil	0.25	B	0	38	60	53	90
10. mesotrione	0.094	B	0	23	45	0	73
11. tribenuron + oxyfluorfen	0.008 0.047	B	10	78	18	0	0
12. pyrasufotole-bromoxynil + tribenuron	0.23 0.008	B	5	50	25	13	93
13. mesotrione + tribenuron	0.094 0.008	B	10	40	48	8	50
14. pyrasufotole-bromoxynil + carfentrazone	0.23	B	0	48	45	13	65
15. pyrasufotole-bromoxynil pyrasufotole-bromoxynil	0.23 0.23	B C	0	78	83	55	100
LSD 0.05			8	30	24	26	33

[1]AMS at 8.5 lb/100 gal. plus COC at 0.5% v/v added to treatments 2-5, 9, 10, 14 and 15, COC added at 0.5% v/v to treatments 6 and 11-13.
[2]Timing A: 5/15/09, 2-4 leaf tall fescue, 4 leaf sharppoint fluvellin B: 6/4/09, jointing tall fescue, C: 6/19/09.

In 2010, Study 4 was established in a seedling stand of tall fescue near Albany, OR. The applications were made when the tall fescue was 3 leaf to 1 tiller. At this timing the sharppoint fluvellin had 4 to 8 leaves. The tribenuron + oxyfluorfen treatment again provided the best control of the sharppoint fluvellin (90%). The florasulam-MCPA treatment (not registered for use on grasses grown for seed) provided adequate control (85%) and the addition of mesotrione to the florasulam-MCPA treatment slightly improved sharppoint fluvellin control and increased yellowcress control from 80% to 100%. (Data presented in Table 5.)

Table 5. Broadleaf weed control in tall fescue, Younger Farm, Albany, OR, 2010.

Treatment[1,2]	Rate lb a.i./a	Tall fescue % injury	Sharppoint fluvellin % control	Annual sowthistle % control	Yellow-cress % control	Ladino clover % control
				7/19/2010		
1. check	0	0	0	0	0	0
2. Mesotrione	0.094	0	45	0	100	58
3. 2,4-D-dicamba acid	0.525	0	45	100	13	100
4. tribenuron + oxyfluorfen	0.008 0.047	0	90	75	20	88
5. florasulam-MCPA	0.315	0	85	90	80	90
6. Mesotrione + 2,4-D dicamba acid	0.094 0.525	0	58	95	100	98
7. Mesotrione florasulam-MCPA	0.062 0.315	0	88	93	100	90
LSD 0.05		NS	14	13	21	9

[1]Treatments applied 5/27/10 to 3 leaf to 1 tiller tall fescue and 4 to 8 leaf sharppoint fluvellin.
[2]NIS added to all treatments at 0.25%.

In conclusion, spring plantings of tall fescue for seed production provide a favorable environment for sharppoint fluvellin due to wide row spacing and lack of competition. The use of tribenuron can provide adequate control of sharppoint fluvellin when combined with oxyfluorfen. While crop injury has been a concern with tribenuron treatments in the past, the benefits of the sharppoint fluvellin control to the tall fescue outweigh most crop injury concerns from the treatment. The HPPD enzyme inhibitor herbicides can also provide useful (70% +) control of this weed. The critical factor when using these products is application timing. Apply mesotrione when the sharppoint fluvellin is very small, at or before the 4 leaf stage. Crop safety appears very good with both mesotrione and pyrasulfotole-bromoxynil. Currently, mesotrione is registered for use in tall fescue grown for seed and Bayer CropScience is pursuing a registration for pyrasulfotole-bromoxynil in grasses grown for seed.

References

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