Wild oat control and malt barley response to fenoxaprop and tralkoxydim herbicides

Abdel O. Mesbah[1] and Stephen D. Miller[2]

[1] Research Scientist, University of Wyoming, Powell Research and Extension Center, Powell, Wyoming, USA, 82435,
Email sabah@uwyo.edu
[2] Professor, University of Wyoming, Dept. of Plant Sciences, Laramie, Wyoming, USA, 82071, Email sdmiller@uwyo.edu

Abstract

Two field experiments were conducted from 2001 to 2003 at the Powell Research and Extension Center, Wyoming to evaluate wild oat (*Avena fatua* L.) control and malt barley (*Hordeum vulgare* L.) response to fenoxaprop and tralkoxydim applied alone or in combination with several broadleaf herbicides. Excellent control was achieved with tralkoxydim applied alone or in combination with broadleaf herbicides to wild oat at the 1 to 3 leaf stage. The addition of ammonium sulfate enhanced wild oat control by 5 to 7%. There was no significant difference between two tralkoxydim formulations and no injury to barley was registered with any of the treatments. Compared to the weedy check, barley yields were 0.95 to 1.47 t/ha higher in treated plots. Excellent wild oat control was achieved with fenoxaprop alone or in combination with broadleaf herbicides; however, barley injury ranged from 3 to 17%. Tank mixing fenoxaprop with broadleaf herbicides, especially MCPA, enhanced its safety. Barley yield with fenoxaprop was closely related to the degree of injury.

Media summary

Tralkoxydim and fenoxaprop could be tank mixed with several broadleaf herbicides to control wild oats and broadleaf weeds in barley.

Key Words

Spring barley, Puma, Achieve, *Avena fatua*, *Hordeum vulgare*.

Introduction

Wild oat is one of the most economically harmful annual grass weeds that represent a major obstacle to sustainable farm profits. Adapted to a wide range of geographical areas and climates, wild oat is one of the 12 most successful colonizing species in the world (Allard 1965). With respect to cereal-based cropping systems, wild oat not only reduces crop yield by competing for moisture, nutrients, and light but also by reducing harvest efficiency and grain quality. Barley yield losses from wild oat competition have been investigated in many parts of the world. In United States, wild oat density of 170 plants m^{-2} has been reported to reduce barley yield by 40% (Morshita and Thill 1988). In Australia, barley yield losses from 100 wild oat plants m^{-2} or more ranged from 30 to 50% (Chancellor 1976). In France, 48 wild oat plants m^{-2} caused 17% barley yield loss (Gournay 1964). It has also been reported that competition from wild oat reduces worldwide wheat (*Triticum aestivum*) and barley production by over 12 million tons annually (Nalewaja 1977).

In response, wild oat management has evolved to the point that producers rely on herbicides to the virtual exclusion of many other strategies. Tralkoxydim and fenoxaprop have been shown to control wild oat and other annual grassy weeds effectively in small grain with no effect on broadleaf weeds (Belles et al. 2000; Mick 2001). Since most of the barley growers have to deal with grassy as well as broadleaf weeds, tank mixing these two herbicides with broadleaf herbicides will help reduce the cost of application. The objectives of this study were to evaluate wild oat control and barley response to tank mixing tralkoxydim and fenoxaprop with several broadleaf herbicides.

Methods

Two field experiments were conducted under furrow irrigation from 2001 to 2003 at the University of Wyoming Research and Extension Center, Powell, Wyoming on a Garland clay loam soil (fine, mixed Mesic, Typic Haplargid) with pH 7.7 and 1.4% organic matter. The first experiment consisted of two

formulations of tralkoxydim, wettable granule (WG) and soluble concentrate (SC), applied alone or in combination with several broadleaf herbicides (Table 1). The second experiment consisted of three rates of fenoxaprop applied alone or in combination with several broadleaf herbicides (Table 2). Fields were prepared in the fall by mouldboard plowing and roller harrowing. Barley (Var. B1202) was seeded at 110 kg/ha with a double disc press drill during the first week of April of each year. Wild oat seeds were broadcast with a cyclone seeder and were incorporated with a field cultivator equipped with double rolling baskets and S-tine harrows set at 5-cm depth prior to barley planting. When barley reached 3- to 5-leaf and wild oat 1- to-3 leaf stage, herbicide treatments were applied broadcast using a CO_2 pressurized knapsack sprayer delivering 180 L/ha at 276 kPa. Plots including an untreated check were 3- by 10-m with three replications arranged in a randomised complete block design. Wild oat control and barley tolerance were visually evaluated two weeks after herbicide treatments using 0 to 100% scale (0% = no injury and 100% = total plant death). Barley height measurements were taken during the third week of July. Barley yield was determined by harvesting the centre portion of each plot (2- by 8-m) using a small-plot combine. The data were subjected to analysis of variance and means were separated using Fisher's Protected Least Significant Difference (LSD) Procedure at 5% probability level.

Results

Wild oat control was excellent (90 to 97%) with tralkoxydim applied alone or in combination with broadleaf herbicides (Table 1). The addition of ammonium sulfate increased wild oat control by 5%. There was no significant difference between the two formulations (WG and SC). No barley injury was recorded with any of the treatments. Barley heights among all treatments were similar and ranged from 81 to 84 cm. Compared to the weedy check, Barley yields were 0.95 to 1.47 t/ha higher in herbicide treated plots.

Table 1. Wild oat control and barley response to tralkoxydim alone or in combination with broadleaf herbicides.

		Barley			Wild Oat Control (%)
Treatments	Rate (kg ai/ha)	Injury (%)	Height (cm)	Yield (t/ha)	
Tralkoxydim (WG)	0.2	0	82	5.83	92
Tralkoxydim (SC)	0.2	0	84	5.87	90
Tralkoxydim (WG) + AMS	0.2	0	81	5.98	97
Tralkoxydim (SC) + AMS	0.2	0	82	6.16	96
Tralkoxydim (WG) + MCPA-ester	0.2 + 0.56	0	84	6.19	95

Tralkoxydim (SC) + MCPA-ester	0.2 + 0.56	0	83	6.35	96
Tralkoxydim (WG) + 2,4-D-ester	0.2 + 0.56	0	83	5.99	93
Tralkoxydim (SC) + 2,4-D-ester	0.2 + 0.56	0	81	5.99	94
Tralkoxydim (WG) + Fluroxypyr	0.2 + 0.07	0	81	6.05	97
Tralkoxydim (SC) + Fluroxypyr	0.2 + 0.07	0	82	6.14	97
Tralkoxydim (WG) + Bromoxynil/MCPA	0.2 + 0.56	0	81	5.89	94
Tralkoxydim (SC) + Bromoxynil/MCPA	0.2 + 0.56	0	81	5.96	93
Weedy check		0	83	4.88	0
LSD (P=0.05)		NS	NS	0.49	4.7

Table 2. Wild oat control and barley response to fenoxaprop alone or in combination with broadleaf herbicides.

		Barley			Wild Oat Control (%)
Treatments	Rate (kg ai/ha)	Injury (%)	Height (cm)	Yield (t/ha)	
Fenoxaprop	0.09	6	77	4.77	93
Fenoxaprop	0.113	12	73	4.66	96
Fenoxaprop	0.135	17	72	4.55	100
Fenoxaprop + MCPA-ester	0.113 + 0.56	3	78	5.27	95
Fenoxaprop + 2,4-D-ester	0.113 + 0.56	6	78	5.17	94
Fenoxaprop + Bromoxynil	0.113 + 0.56	8	78	5.13	96
Fenoxaprop + Thifensulfuron	0.113 + 0.02	8	77	4.90	97

Fenoxaprop + Fluroxypyr	0.113 + 0.07	7	75	5.00	95
Fenoxaprop + Bromoxynil/MCPA	0.113 + 0.56	8	76	5.06	96
Weedy check		0	80	4.60	0
LSD (P=0.05)		5.1	NS	0.45	4.1

Wild oat control was excellent (93 to 100%) with fenoxaprop applied alone or in combination with broadleaf herbicides (Table 2). The highest control was achieved using fenoxaprop alone at the rate of 0.135 kg ai/ha. At this rate, fenoxaprop caused the highest barley injury (17%). Barley injury from fenoxaprop alone increased from 6 to 17% as the rate increased from 0.09 to 0.135 kg ai/ha. However, barley injury was reduced when fenoxaprop was tank mixed with broadleaf herbicides. Tank mixing fenoxaprop with MCPA-ester reduced barley injury by 9 %. Barley yield was closely related to the degree of injury.

Conclusion

Based on these results, Tralkoxydim can be tank mixed with any of the studied broadleaf herbicides without reducing its effectiveness on wild oat. Tank mixing fenoxaprop with any of the studied broadleaf herbicides, especially MCPA, enhanced its safety.

References

Allard R (1965). Genetic systems associated with colonizing ability in predominately self-pollinated species. p. 49 *in* H. Baker and G. Stebbins, eds. The Genetics of Colonizing Species. Academic Press, New York.

Belles DS, Thill DC, and Shafii B (2000). PP-604 rate and *Avena fatua* density effects on seed production and viability in *Hordeum vulgare*. Weed Sci. 48, 378-384.

Chancellor RJ and Peters NCB (1976). Competition between wild oats and crops. P. 99-112 *in* D.P. Jones, ed. Wild oats in World Agriculture. Agric. Res Coun. London.

Gournay X (1964). Data pertaining to wild oat control in spring barley. Ann. Epiphyt. 15, 285-320.

Michael GP and Mickelson JA (2001). Malt barley response to fenoxaprop-P alone and in tank mixtures. Proc. West. Soc. Weed Sci. 54:7.

Morishita DW and Thill DC (1988). Factors of wild oat (*Avena fatua*) interference on spring barley (*Hordeum vulgare*) growth and yield. Weed Sci. 36:37-42.

Nalewaja JD (1977). Wild oat: global gloom. Proc. West Soc. Weed Sci.30:21.