

## Control of *Vulpia myuros* in red fescue

S.K. Mathiassen, P. Kudsk & K.E. Henriksen  
Aarhus University, Department of Integrated Pest Management  
DK-4200 Slagelse, Denmark  
[Solvejg.mathiassen@agrsci.dk](mailto:Solvejg.mathiassen@agrsci.dk)

### Abstract

The efficacy on *Vulpia myuros* of more than 20 herbicides was examined in pot experiments. *V. myuros* was tolerant to most herbicides and the selectivity in red fescue of effective herbicides was marginal. In field experiments iodosulfuron + mesosulfuron (Atlantis WG) improved the efficacy compared to pendimethalin (Stomp) alone but the effect was temporary and did not provide a satisfactory control lasting until seed harvest.

### Introduction

*Vulpia myuros* is a winter annual grass weed which has been reported as a weed problem in Australia, the USA, the Netherlands and Denmark. In Denmark it was first reported as a weed problem in red fescue in the late 1990s. Since then, the infested area has expanded rapidly, and today it can be found in all winter annual crops. *V. myuros* is not competitive in a dense crop, but it establishes in bare spots of the field from where it infests the area. It can cause considerable yield losses due to crop competition, but in red fescue the impact on seed quality is more important.

### Materials and methods

#### *Pot experiments*

Seeds of *V. myuros* and red fescue were sown in 2-L pots filled with a potting mixture of soil, sand and peat. The pots were placed in a glasshouse and were sub-irrigated with deionised water. After emergence the number of plants per pot was reduced to a pre-set number.

Herbicide application was carried out at different growth stages from pre-emergence to the 3- to 4-leaf stage. Effective herbicides were subsequently tested for selectivity in red fescue. All spray solutions were prepared in deionised water and applied using a laboratory pot sprayer. The plants were harvested 3 weeks after spraying, and foliage fresh and dry weights were recorded.

#### *Field experiments*

Field experiments were carried out at Research Centre Flakkebjerg. *V. myuros* and red fescue were established in separate strips in monoculture and in a mixture. The species were undersown in winter wheat or spring barley. Herbicide applications were carried out across the strips at 5

timings. Timing A and B were applied in the cover crop with timing A on grass seedlings at BBCH 10-11 (Meier *et al.*, 2001) , and timing B 2 to 3 weeks later. Timing C was shortly after harvest of the cover crop and D was 10 to 14 days later. Timing E was in the winter before the first seed harvest.

The herbicide treatments are shown in table 1. The application rate of Stomp (400 g L<sup>-1</sup> pendimethalin) was 1.5 L ha<sup>-1</sup> at timing A and 2 L ha<sup>-1</sup> at the timings C and D. Atlantis WG (30 g kg<sup>-1</sup> mesosulfuron + 6 g kg<sup>-1</sup> iodosulfuron) was applied at a dose of 0.25 kg ha<sup>-1</sup> in mixture with 0.625 L ha<sup>-1</sup> Biopower, Reglone (374 g L<sup>-1</sup> diquat) was applied at a dose of 1 L ha<sup>-1</sup> and Kerb (500 g L<sup>-1</sup> propyzamid) was applied at 0.25 L ha<sup>-1</sup>.

The herbicide efficacy was visually assessed in the monoculture strips of *V. myuros* and crop damage in the red fescue strips. The plots with the mixed plant populations showed the combined effect of herbicide efficacy and crop competition.

## Results and discussion

### *Pot experiments*

The efficacy of more than twenty different herbicides was tested in pot trials during the last 10 years. The early results showed that *V. myuros* was susceptible to Stomp (pendimethalin) and Boxer (prosulfoarb). The highest efficacy was obtained when applied pre-emergence. A later experiment showed that Fusilade Max (fluazifop), Primera Super (fenoxaprop-ethyl), Grasp (tralkoxydim), Topik (clodinafop), Select (cycloxydim) and Aramo (tepraloxymid) had low effects indicating that the ACC-ase inhibitors which control several annual grasses cannot be used for control of *V. myuros*. Among the sulfonylurea herbicides, Hussar (iodosulfuron), Monitor (sulfosulfuron) and Lexus (flupyr-sulfuron) had some but not sufficient efficacy. In contrast, MaisTer (iodosulfuron + foramsulfuron) and Atlantis WG (iodosulfuron + mesosulfuron) had a high efficacy, but a subsequent experiment showed that MaisTer was not selective in red fescue. Iodosulfuron + mesosulfuron had a moderate effect on red fescue and can be used in low doses. Other herbicides with high efficacy were Fenix (aclonifen), Kerb (propyzamid), Tiara (flufenacet) and Command (clomazone). Unfortunately, these herbicides also had a high effect on red fescue. Calaris (mesotrion + terbuthylazin) and Sumimax (flumioxzin) had a low effect. Roundup Bio (glyphosate 360 g L<sup>-1</sup>) controlled *V. myuros* in 1 L ha<sup>-1</sup> – a dose that is not tolerated in red fescue.

Herbicide application was carried out at different growth stages in some of the experiments. The results showed clearly the importance of starting the spraying at early growth stages. None of the herbicides were able to control *V. myuros* when the plants had 3-4 leaves.

### *Field experiments*

The strip design provides an opportunity to assess the efficacy on *V. myuros* and the selectivity in red fescue in the monoculture strips and the combined effect of herbicide and crop competition in the strips with mixed populations. The results in winter wheat showed that the efficacy of 1.5 L ha<sup>-1</sup> Stomp applied in the autumn was insufficient and only reached 32% (Table 1). The efficacy was significantly improved when Atlantis WG was applied in combination with Stomp (treatments 1 and 2). While an early tank mix application had 82.5% effect on *V. myuros*, a split application with Stomp in October followed by Atlantis 3 weeks later improved the efficacy to 96%. The assessments in October 2008 showed that two applications of Stomp in red fescue with the first application shortly after winter wheat harvest and the second application 2 weeks later had 66% efficacy. While the benefit of starting the control with Stomp in the winter wheat crop was marginal, there was still a high response on *V. myuros* to treatments including Atlantis WG. The treatment with Reglone (1 L ha<sup>-1</sup>) during the winter had a low effect on *V. myuros* the following summer. The visual assessments in May in the seed crop still showed 20% higher efficacy for treatments including Atlantis WG in the winter wheat crop compared to Stomp alone, but the overall efficacy level had decreased to 55-58% and was not satisfactory. All the treatments were also conducted in combination with 0.25 L ha<sup>-1</sup> Kerb applied during the winter. Kerb had a very high effect on *V. myuros*, but unfortunately damaged red fescue. Treatments including Atlantis WG caused some damage on red fescue but the symptoms were reduced by time and no differences between treatments 1 to 5 were noticed in the spring in the seed harvest year. In contrast, all treatments including Kerb were seriously damaged and crop coverage ranked from 25 and 36% and seed stem coverage was less than 10% in June.

**Table xx.** Herbicide treatments and efficacy on *V. myuros* in a winter wheat field experiment. Means followed by the same letter do not significantly differ.

Date	In winter wheat		After harvest of winter wheat				Red fescue 2009	
	2007		2008				Winter	Spring
	08.10	31.10	19.08	14.08	02.09	27.10	02.01	20.05
Timing	A	B	C		D		E	
Treat- ment			% control		% control		% control	
1	Stomp + Atlantis WG	-	83 a	Stomp	Stomp	91 ab	Reglone	58 a
2	Stomp	Atlantis WG	96 a	Stomp	Stomp	92 ab	Reglone	55 a
3	Stomp	-	32 b	Stomp	Stomp	73 bc	Reglone	34 b
4	-	-	-	Stomp	Stomp	66 c	Reglone	38 b
5							Reglone	24 c

In spring cereals the efficacy of Stomp was only 5%. Combinations of Stomp and Atlantis WG gave 73% effect when applied in a tank mix at timing A, and similar to the winter wheat experiment the efficacy was improved (to 87%) when Stomp was applied at timing A and Atlantis WG at timing B. The visual assessments in October reflecting the efficacy of sprayings in the spring barley as well as after harvest of the cereal crop (A, B, C and D), showed a high efficacy (94-96%) of treatments 1 and 2 and a low efficacy (40-44%) of treatments with only one or no Stomp application in the cereal crop (treatments 3 and 4). Reglone applied in January had a low effect on *V. myuros* while Kerb had a high effect. The ground cover of *V. myuros* in May was 1-2% for all treatments including Kerb but 3-11% for all treatments including Reglone.

Atlantis WG is not registered for use in spring barley and caused severe crop damage by foliage yellowing and plant stunting. Growth reduction in red fescue after the C and D applications of Stomp was 3% for treatments 3 and 4 and 7-8% for treatments 1 to 4. Red fescue coverage in May in the seed harvest year was 84-90% for all treatments that had Reglone and 31 to 43% for all treatments with Kerb in the winter.

## Perspectives

The pot experiments did not revealed any new effective herbicides for control of *V. myuros*. The field experiments showed that *V. myuros* control is improved when Atlantis WG is included in the weed control strategy; however, the effect was temporary, and none of the treatments were able to provide a satisfactory control lasting until seed harvest. In conclusion, control of *V. myuros* requires more effort than herbicides and future experiments will include integrated weed management such as timing of crop establishment, sowing depth and crop density.

## **References**

Meier U. *et al.* (2001).

[http://www.jki.bund.de/fileadmin/dam\\_uploads/\\_veroeff/bbch/BBCH-Skala\\_englisch.pdf](http://www.jki.bund.de/fileadmin/dam_uploads/_veroeff/bbch/BBCH-Skala_englisch.pdf)

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