

Den Europæiske Landbrugsfond for Udvikling af Landdistrikterne: Danmark og Europa investerer i landdistrikterne



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STØTTET AF

Promilleafgiftsfonden for landbrug

VII Liquid nitrogen as an adjuvant to ALS-inhibitors

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Previous studies reported a synergistic effect of adding the liquid fertiliser N32 to the spray solutions of both Broadway and Glyphomax. In 2018 we tested the effect of another liquid nitrogen fertiliser - Flex NS 24-4 - on the activity of three ALS inhibitors. We found that Flex NS 24-4 had quite variable effects, depending on both the herbicide and the weed species. On blackgrass, the effects of both Broadway and Atlantis OD were improved when applied in a tank mix with Flex NS 24-4. In contrast, for treating rat's-tail fescue both Broadway and Atlantis OD were unaffected by Flex NS 24-4. Antagonistic effects were seen on both rat's-tail fescue and annual meadow-grass when Cossack OD was mixed with Flex NS 24-4, with annual meadow-grass also showing a reduced effect when Atlantis OD was mixed Flex NS 24-4.

The effects of Broadway (68.3 g/kg pyroxsulam + 22.8 g/kg florasulam), Atlantis OD (10 g/L mesosulfuron + 2 g/L iodosulfuron + 30 g/L mefenpyr) and Cossack OD (7.5 g/L iodosulfuron + 7.5 g/L mesosulfuron + 2.5 g/L mefenpyr) alone and in mixture with Flex NS 24-4 were examined in a pot experiment using rat's-tail fescue (*Vulpia myuros*), blackgrass (*Alopecurus myosuroides*) and annual meadow-grass (*Poa annua*) as test plants. Flex NS 24-4 is a liquid fertiliser containing 23.7% nitrogen with 8.4% as N-ammonium, 5.1% as N-nitrate and 10.2% as N-amide plus 3.7% S.

Seeds of rat's-tail fescue, blackgrass and annual meadow-grass were sown in 1-L pots in a soil, sand and peat potting mixture. The pots were placed on outdoor tables. After emergence the number of seedlings per pot was reduced to the same number for each weed species.

All spray solutions were prepared in tap water with a hardness of 17 °dH. Herbicide applications were carried out in a spray cabinet on 3 July when the plants had 3 to 4 leaves and 1 to 2 tillers. Each treatment was applied at five different doses, in a spray volume of 179 L/ha, with 3 replicates per treatment. Broadway was applied in mixture with the recommended adjuvant PG26N (0.5 L/ha). Flex NS 24-4 was mixed in at 13 and 39 L/ha equal to 3.2 and 9.6 kg/ha N, respectively.

The plants were harvested 4 weeks after treatment. Fresh and dry weight were recorded. A dose-response model was fitted to the data and ED₉₀ doses were estimated.

Results

The activity of Broadway on rat's-tail fescue was not affected by Flex NS 24-4 while the activity on blackgrass was significantly increased in the tank mix with 13 L/ha of N 24-4 (Table 1). Adding Flex NS 24-4 to Atlantis OD had no significant effect on rat's-tail fescue; however, the activity on blackgrass was significantly increased, while the activity on annual meadow-grass was reduced. The activity of Cossack OD was significantly reduced on rat's-tail fescue as well as on annual meadow-grass (Table 1). So generally, Flex NS 24-4 improved the herbicide activity on blackgrass, reduced the activity on annual meadow-grass and had no effect on rat's-tail fescue.

In previous studies we found that liquid nitrogen improved the efficacy of Broadway and Glyphomax (glyphosate) on rat's-tail fescue, and this effect was more pronounced at the 3-4 leaves stage compared to the tillering stage (Mathiassen, 2016). In the present study plants were sprayed at the early tillering stage, and the results did not support the previous findings indicating that the effect of liquid nitrogen may depend on interactions between weed species, growth stage, herbicide and environmental conditions.

Table 1. Influence of Flex NS 24-4 on the activity of Broadway + PG26N, Atlantis OD and Cossack OD when applied to rat's-tail fescue, blackgrass and annual meadow-grass. ED₉₀ is the dose required for reducing fresh weight of the test plants by 90%. Brackets show 95% confidence intervals.

Herbicide	Adjuvant	ED ₉₀ (g/ha or L/ha)		
		Rat's-tail fescue	Blackgrass	Annual meadow-grass
Broadway	PG26N	39.7 (30.0-49.4)	3.68 (2.34-5.0)	
	PG26N + 13 L/ha NS 24-4	37.4 (26.5-48.3)	2.01 (0.91-3.11)	
	PG26N + 39 L/ha NS 24-4	42.5 (27.0-58.1)	2.44 (1.13-3.75)	
Atlantis OD	None	0.28 (0.17-0.39)	0.08 (0.06-0.10)	0.09 (0.07-0.11)
	13 L/ha NS 24-4	0.23 (0.17-0.29)	0.06 (0.05-0.08)	0.12 (0.08-0.15)
	39 L/ha NS 24-4	0.24 (0.16-0.32)	0.05 (0.04-0.06)	0.18 (0.09-0.27)
Cossack OD	None	0.15 (0.08-0.21)		0.04 (0.03-0.05)
	13 L/ha NS 24-4	0.22 (0.17-0.26)		0.08 (0.05-0.11)
	39 L/ha NS 24-4	0.36 (0.25-0.48)		0.11 (0.08-0.15)

References

Mathiassen, S. K. (2017). Effects of new adjuvants, N32 and pH of the spray solution on herbicide efficacy. In: L. N. Jørgensen, B. J. Nielsen, P. K. Jensen, S. K. Mathiassen, S. Sørensen and T. Heick (eds.). Applied Crop Protection 2016, DCA report no. 94, pp. 119-123.