

# CONFIRMATION OF A BARNYARDGRASS (*Echinochloa crusgalli*) BIOTYPE RESISTANT TO IMAZAPYR PLUS IMAZAPIC IN URUGUAY



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## INTRODUCTION

Since 2005-2006, Clearfield® technology has been used to control red rice in Uruguay. A rice field with different backgrounds of Clearfield® rice was identified. The objective was to determine the susceptibility of barnyardgrass biotypes collected to imazapyr plus imazapic, bispiribac, penoxulam and metsulfuron.

## MATERIALS AND METHODS

Mass seed samples of barnyardgrass escapees were picked up at Noblía, Cerro Largo in 2007-2008. E3cl biotype was collected in a field where Clearfield® rice (CR) was cropped three years in a row and received four imidazolinone-herbicides applications (IMI-HA) in the period. E2cl came after two years of CR in a row and three IMI-HA and E1cl was under just one year of CR and two IMI-HA, finally, E0cl never was exposed to IMI-HA.



Figure 1. Rice field with different Clearfield® technology use at Noblía, Cerro Largo in 2007-2008.

Pot experiments were carried out to assess barnyardgrass biotypes resistance in 2011-2012. Zero, 1/8, 1/4, 1/2, 1, 2, 4 and 8 X rates were used for every combination herbicide / biotype studied with four replications. One X rate was 98 g a.e. ha<sup>-1</sup>, 40 g a.i. ha<sup>-1</sup> and 36 and 1.8 for imazapyr plus imazapic, bispiribac, penoxulam and metsulfuron; respectively. Adjuvants recommended for each herbicide were applied. Trials were repeated twice, following Herbicide Resistance Action Committee's protocols. According to Ritz & Streibig (2005), log-logistic models were adjusted by means of the drc package of the R software being the fresh weight per pot the dependent variable. The relationship between LD50 resistant/LD50 susceptible biotypes was used as the resistance factor (RF).

## RESULTS

Table 1 Resistance factor (RF) for imazapyr plus imazapic

Herbicide Biotypes	imazapyr plus imazapic					
	LSD50 ± sd	t-value	p.	RF <sup>(1)</sup> ± sd	t-value	p.
	g e.a. ha <sup>-1</sup>					
E0cl	≤ 12.2	na	na	na	na	na
E1cl	≤ 12.2	na	na	≤ 1	na	na
E2cl	≤ 12.2	na	na	≤ 1	na	na
E3cl	149.1 ± 23.1	na	na	≥ 12.2	na	na

<sup>(1)</sup>= LD50 of susceptible replaced by the lowest rate evaluated for RF

Table 2 Resistance factor (RF) for bispiribac

Herbicide Biotypes	bispiribac					
	LSD50 ± sd	t-value	p.	RF ± sd	t-value	p.
	g a.i. ha <sup>-1</sup>					
E0cl <sup>(1)</sup>	≤ 5	na	na	na	na	na
E1cl <sup>(1)</sup>	0.005 ± 0.01	0.370	0.711	≤ 0.001	na	na
E2cl <sup>(1)</sup>	≤ 5	na	na	≤ 1	na	na
E3cl <sup>(2)</sup>	1.2 ± 0.8	1.559	0.121	233 ± 647	0.35	0.7202

<sup>(1)</sup>= LD50 of susceptible replaced by the lowest rate evaluated, <sup>(2)</sup>=LD50 of E1cl used for E3cl's RF

Table 3 Resistance factor (RF) for penoxulam

Herbicide Biotypes	penoxulam					
	LSD50 ± sd	t-value	p.	RF ± sd	t-value	p.
	g a.i. ha <sup>-1</sup>					
E0cl	5.1 ± 0.4	13.40	0.000	na	na	na
E1cl	4.4 ± 0.3	14.07	0.000	0.9 ± 0.1	-1.41	0.160
E2cl	3.8 ± 0.6	6.72	0.000	0.7 ± 0.1	-2.07	0.039
E3cl	4.3 ± 0.3	14.97	0.000	0.8 ± 0.1	-1.84	0.066

Table 4 Resistance factor (RF) for metsulfuron

Herbicide Biotypes	metsulfuron					
	LSD50 ± sd	t-value	p.	RF ± sd	t-value	p.
	g a.i. ha <sup>-1</sup>					
E0cl	6.3 ± 2.6	2.108	0.036	na	na	na
E1cl	10.8 ± 22.3	0.483	0.629	1.7 ± 3.6	na	0.848
E2cl	2.2 ± 1.0	2.176	0.036	0.3 ± 0.2	na	0.004
E3cl	0.8 ± 0.7	1.107	0.269	0.1 ± 0.1	na	0.000

## CONCLUSIONS

E3cl biotype showed resistance to imazapyr plus imazapic (RF>10) but cross resistance to the other ALS- inhibitor-herbicides was not detected.