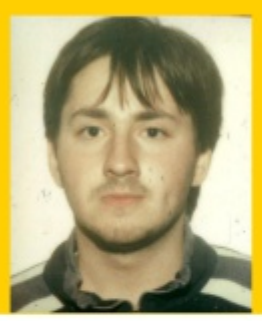
In vitro confirmation of a barnyardgrass biotype (*Echinochloa cruss-galli* (L.) Beauv) resistant to herbicides used with Clearfield® rice in Uruguay



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INTRODUCTION

Barnyardgrass is a cosmopolite and annual grass weed in rice of temperate and tropical regions. Clearfield® technology was specially introduced to control red rice. Since 2005-2006, imazapyr and imazapic mixed have being used in Uruguay. A higher rate than label one was needed to control resistant barnyardgrass (E3cl) (Saldain and Sosa, 2012). The objective was to quantify acetolactato synthase (ALS) activity *in vitro* for resistant (E3cl) and for susceptible (E0cl) biotypes.

MATERIALS AND METHODS

Seed of E3cl was multiplied by three times instead seed of E0cl was coming directly from a field without any imidazolinone-herbicides spraying. ALS activity was estimated by measuring the product acetolactate after his conversion to acetoin by decarboxylation in acidic medium (Ray, 1984). Seven concentrations for both herbicides were utilized independently and analytical grade standards were provided by BASF Uruguay Ltda.

Figure 1 - E3cl in the three-leaf stage, where ALS activity is maximal,

Figure 2 - Assay of E3cl vs Imazapic : from left to right a) control without the extract, b) imazapic, 100 µM c) Imazapic 1 µM, d) control without herbicide

Three replications were used for every concentration and each experiment was run twice. Non-linear regression models (Weibull 1.2) were fitted using the drc package of the R program (Ritz and Streibig, 2005). Concentrations that inhibited 50% of ALS activity (IC_{50}) were obtained and a ratio between IC_{50} of the E3cl and IC_{50} of the E0cl was calculated as a resistance factor (RF) for both herbicides.

RESULTS

Biotypes	Imazapic IC_{50} (µM)	Imazapir IC_{50} (µM)
E0cl	4.4 ± 2.5	3.6 ± 1.8
E3cl	41.3 ± 6.3	40.7 ± 8.0
IC_{50} E0cl/E3cl	9.4 ± 4.5	11.3 ± 4.8
t-value	2.488	3.15
p.	0.012	0.009

Table 1 - Parameters obteined from the fitted Weibull 1.2 model

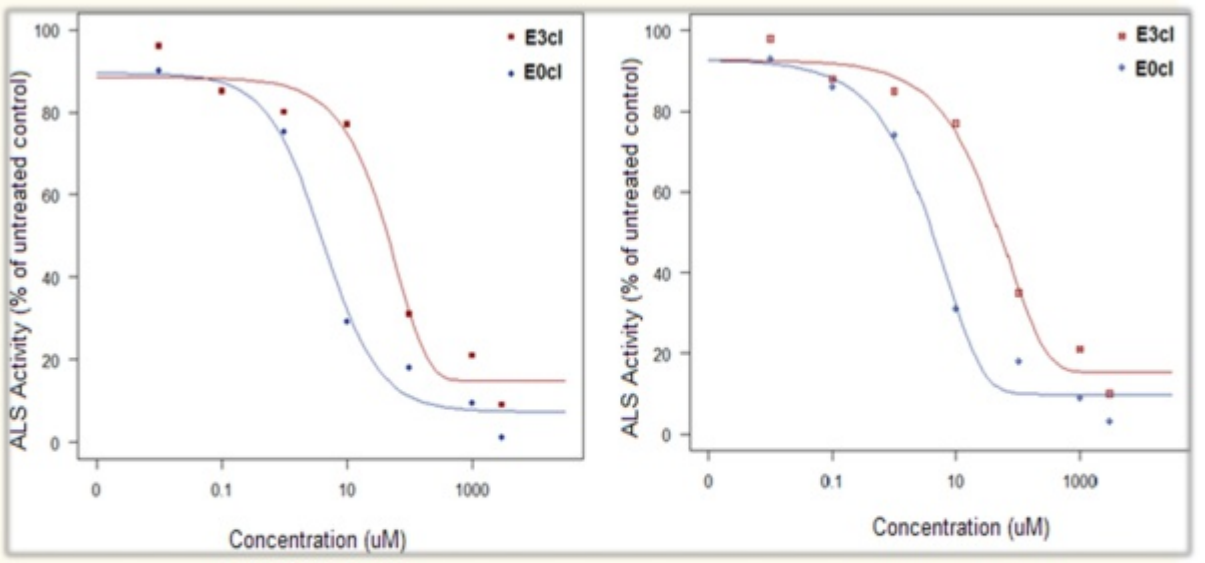

Figure 3 – Dose- response curves for imazapic (left) and imazapir (right) versus the two biotypes.

CONCLUSIONS - ALS activity in E3cl showed low resistance level to imazapyr (RF<10) and high resistance level for imazapic (RF>10). It will be necessary further testing to understand the mechanisms of resistance involved.