

# PRELIMINARY STUDY ON PROPANIL-RESISTANT *ECHINOCHLOA CRUS-GALLI* IN NORTH-WEST ITALY RICE FIELDS

Busi R.<sup>1</sup>, Vidotto F.<sup>1</sup>, Tabacchi M.<sup>2</sup>, Ferrero A.<sup>1</sup>

<sup>1</sup> Dipartimento di Agronomia, Selvicoltura e Gestione del Territorio. Via L. da Vinci, 44. 10095 Grugliasco (Italy)

<sup>2</sup> Centro Ricerche Riso, Ente Nazionale Risi. Strada per Ceretto, 4, 27030 Castello d'Agogna (Italy)

## Introduction

The genus *Echinochloa* represents one of the most important groups of weeds affecting rice crop worldwide. The control of *Echinochloa* species in rice is increasingly difficult because of the development of herbicide-resistant weed biotypes which are not controlled by herbicides that were once effective. Several cases of resistance to molinate, thiobencarb, fenoxaprop-ethyl, and propanil herbicides have been reported for *Echinochloa* spp. in different temperate areas (Fischer *et al.*, 1993; Fischer *et al.*, 2000; Garro *et al.*, 1991). In Italy the genus *Echinochloa* is mainly represented by *E. crus-galli*, which shows high variability of morphological traits and sensitivity to propanil and other herbicides. The aim of this study was to screen the sensitivity to propanil in greenhouse conditions of eight *E. crus-galli* accessions collected in rice fields in which propanil application resulted inconstant in time.

## Methods

The study was carried out in 2002 by performing series of whole-plant bioassays in which seedlings of different *E. crus-galli* accessions were sprayed at different rates of propanil. The seedlings were obtained starting from seeds of eight accessions (accession 1 to 8) collected in paddy fields of north-west Italy in summer 2001. In order to promote the germination, the seed coat was partially cut using a scalpel. The seeds were then placed to germinate in water constantly oxygenated with an air diffuser. The germinated seeds were arranged in pots containing peaty loam maintained at water saturation conditions. When the plants reached the stage of 3-4 leaves, and about 24 h before the herbicide treatment, seedlings were thinned to 4 equidistantly-spaced plants.

A preliminary screening between the accessions was conducted considering four rates of propanil (0, 2160, 4320, and 8640 g a.i. ha<sup>-1</sup>) correspondent to untreated, 50%, 100%, and 200% of the recommended field rate. In a second experiment, the accession 8, which showed a relatively high tolerance, and the accessions 1 and 7, which showed low tolerance to the herbicide, were sprayed with seven rates of the herbicide (0, 540, 1080, 2160, 4320, 8640, and 17280 g a.i. ha<sup>-1</sup>).

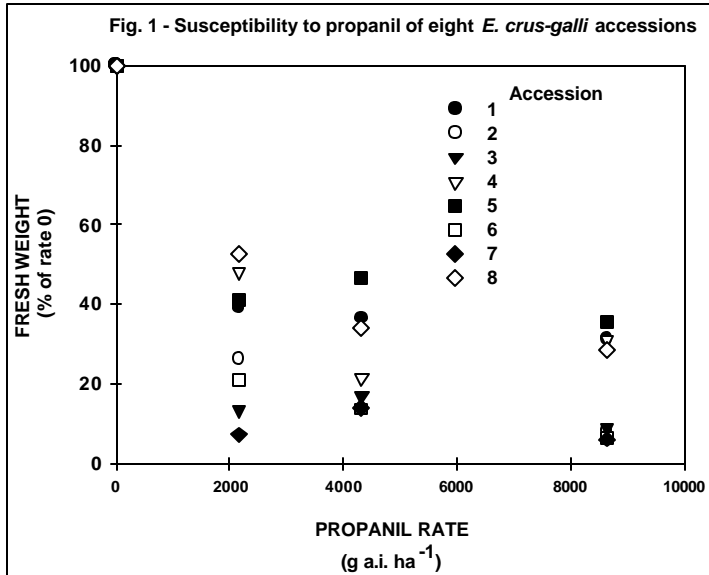
All the applications of propanil were foliar and carried out using a cabinet track sprayer delivering a spray volume of 400 L ha<sup>-1</sup> at 203 kPa with a single Teejeet DG8002-VS nozzle. Aboveground fresh weight per pot was assessed seven days after treatment.

All the treatments were arranged in a completely randomised design, with three replicates. All the experiment was replicated three times.

The fresh weight data of the second experiment were expressed as percent of the untreated control and fitted to a log-logistic regression model. The rate of herbicide at which plant growth was inhibited by 50% (GR<sub>50</sub>) was calculated and the level of tolerance to propanil was determined by comparing the different GR<sub>50</sub>s.

## Results

In the preliminary screening, the eight accessions showed a different sensitivity to propanil (Fig. 1). For the accessions 1, 4, 5 and 8 (group R) a fresh weight reduction of about 50% at 2160 g



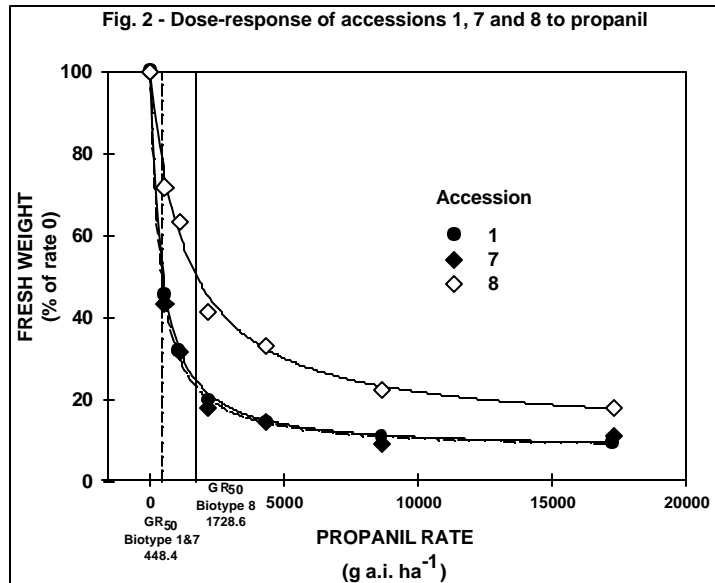
a.i. ha<sup>-1</sup> was recorded, while, at the same rate, the fresh weight reduction of the accessions 2, 3, 6 and 7 (group S) was on average 82%. The different sensitivity of these two groups was found also at 100% (4320 g a.i. ha<sup>-1</sup>) and 200% of the field rate. The greatest difference of susceptibility between the two groups was recorded at the highest rate. In these conditions, the fresh weight reduction of the group R was still less than 70%, while in the group S was always higher than 90%.

The study conducted on the accessions 1, 7 and 8 pointed out that all the dose-response data

significantly followed a log-logistic regression model (Fig. 2). The accessions 1 and 7 showed a very similar behaviour, and their estimated regressions were not significantly different. The susceptibility to propanil was always lower in the accession 8, even at the highest rate (17280 g a.i. ha<sup>-1</sup>), when a average biomass reduction of less than 80% was recorded. The average GR<sub>50</sub> of the accessions 1 and 7 was 448.8 g a.i. ha<sup>-1</sup>, while GR<sub>50</sub> of the accession 8 was 1728.6 g a.i. ha<sup>-1</sup>. The ratio between resistant and susceptible accessions (R/S ratio) was 4.14.

### Discussion

This preliminary study pointed out that different accessions of *Echinochloa crus-galli* were not completely controlled with propanil applied at the field rate. For one of the accessions, the calculated R/S ratio was 4.14, indicating a high probability of presence of resistance.



### References

Fischer, A. J. *et al.*, 1993, *Weed Science*, 41, 201-206  
 Fischer, A. J. *et al.*, 2000, *Weed Science*, 48, 225-230  
 Garro, J. E. *et al.*, 1991, *Proc. Brighton Crop Protection Conference-Weeds*, 1079-1083