

**Morphological and molecular  
characterisation of *Echinochloa*  
species in the northern grain region  
of Australia and implications for  
weed management**

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## Abstract

Barnyard grasses (*Echinochloa* species) occur as major summer weeds in farming systems of the northern grain region (NGR) of Australia. Farmers report difficulty in achieving effective control of *Echinochloa* using current management practices, with varied levels of success being reported. This study was undertaken to identify what species were present in the farming systems of the NGR, and to investigate if the varied levels of control could be attributed to morphological variations and/or the genetic diversity present within populations. It is important to identify correctly the *Echinochloa* species present in order to achieve better control and reduce the current threat of glyphosate resistance evolution in these weeds in the NGR.

This study commenced at the end of 2004 with field surveys being undertaken at three major cropping centres of the NGR; Wowan (central Queensland), Dalby (southern Queensland) and Narrabri (northern New South Wales). Two species were identified as occurring in the NGR, *Echinochloa colona* (L.) Link and *Echinochloa crus-galli* (L.) Beauv.. *Echinochloa colona* was the most widespread species accounting for 93 percent of the plants sampled. Both species were morphologically diverse across the region with *E. colona* categorised into 20 growth categories and *E. crus-galli* into six categories. The most common growth form in *E. colona* was semi-erect to prostrate (50%) while the majority of *E. crus-galli* plants were erect (84%).

With regard to genetic diversity, more polymorphism was evident in *E. colona* than in *E. crus-galli*, and the *E. colona* polymorphisms related largely to regional collection centres. Of the five microsatellites or simple sequence repeats (SSRs) used to detect genetic diversity, three were able to clearly distinguish between the two species. Intra-species variation was evident in *E. colona* with two SSRs proving informative while only one SSR was able to detect a minor variation in *E. crus-galli*.

A dose-mortality experiment was conducted as a pot trial to determine the level of control of both species to four rates of glyphosate, and if the responses were related to regional centres or populations. Three days after the treatments were applied, 82 percent of the *E. crus-galli* plants treated with the recommended rate had some degree of visual damage compared to 51 percent of the *E. colona* plants. At 14 days after

treatment (DAT), control of both species was achieved with all plants sprayed with the recommended rate dying. However, treatments applied at the lower rates did not provide total control of either species.

There were no clear relationships between the observed genetic groupings of *E. colona* or *E. crus-galli* and their observed morphology or response to glyphosate.

The results of this study show that genetics and morphology cannot be reliably used to develop a weed management plan, due to the diversity found in both characteristics and no clear connection with herbicide susceptibility. However, molecular techniques can be used to clearly distinguish between *E. colona* and *E. crus-galli* and morphology can be used to distinguish between the mature plants of both species.

## **Declaration**

I certify that the substance of this thesis has not already been submitted for any other degree or qualification.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

Michelle D. Keenan

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