PATTERNS AND PROCESSES IN POPULATION DIVERGENCE OF *MICROLAENA STIPOIDES* (LABILL.) R. BR.

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DECLARATION

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being 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.

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ABSTRACT

The distribution of *Microlaena stipoides* (Labill.) R. Br. on the Northern Tablelands of New South Wales was examined by surveying 101 paddocks on 33 commercial properties. Greater abundance of *M. stipoides* was observed on the eastern side and the southern half of the Northern Tablelands where rainfall and altitude were higher. Pasture management correlates that were significantly associated with abundant *M. stipoides* were high tree density, minimum soil disturbance and long period since last cultivation. Greater abundance of *M. stipoides* was observed in paddocks containing other year-long green perennials, cool season annuals and exotic sown species in addition to warm season perennials and annuals. *Microlaena stipoides* grew well in association with other perennial grasses found in permanent pastures, such as *Lolium perenne, Dactylis glomerata, Poa pratensis* and *Phalaris aquatica,* which may indicate the permanency of these species associations.

Morphological, behavioural and genotypic patterns of variation among the four populations of *M. stipoides* found growing in association with *L. perenne* (M (Lpe)), *P. pratensis* (M (Ppr)), *D. glomerata* (M (Dgl)) and *P. aquatica* (M (Paq)) were examined. *Microlaena stipoides* (Ppr) had narrower leaves than the other populations. Seeds of M (Ppr) weighed significantly less and had a faster rate of germination than the other three populations. *Microlaena stipoides* (Ppr) exhibited greater shade tolerance, while M (Dgl) showed greater tolerance to full light. *Microlaena stipoides* (Dgl) and M (Paq) exhibited a greater tolerance to water stress than M (Ppr) and M (Lpe). Random amplified polymorphic DNA banding patterns of the four populations showed greater base sequence divergence in M (Ppr) compared with the other three populations. Conversely, thermal denaturation profiles of the four populations resulting from the DNA-DNA hybridisation experiment indicated that the geographically isolated M (Paq) was distantly related to the other three populations.

It is suggested that the greater divergence of M (Ppr) from the three other populations resulted from interspecific competition with the associated naturalised perennial species, *P. pratensis*. The local abiotic microenvironment was also probably important in the divergence of the *M. stipoides* populations. The three natural neighbouring pairs of *M. stipoides* and associated grass species at 'Karuah', one of the commercial properties, showed high competitive yield quotient (CYQ) values. Coexistence between *M. stipoides* populations and introduced and naturalised perennial grass species in permanent pastures could be due to the balancing of competitive abilities between natural neighbouring pairs.

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