

Factors that may influence the invasive potential of *Mikania micrantha* in Fiji

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At the beginning of the flowering season of *Mikania micrantha* Kunth. ex. H.B.K. (Asteraceae) in May 2009, three sites infested with the weed were randomly selected along the road in Nadi and Ba sugarcane regions in Viti Levu Fiji to determine the size and variation in the germinable soil seed bank under three densities of *M. micrantha* infestation. In each site, a light (1 ramet m⁻²), medium (2 ramets m⁻²) and high (>3 ramets m⁻²) density of *M. micrantha* were randomly selected and in each density spot a 1m² quadrat was placed and five soil cores (7cm dia. x 10cm deep) were taken, one from each of the four corners and one from the centre. The cumulative percentage of total *M. micrantha* emerged from the study sites in both Nadi and Ba indicated that highest proportion emerged under high than light density of the weed in the first 15 days after wetting of the soil samples. The average total number of other species emerged indicated that in the study sites in both Ba and Nadi, the highest number of species emerged from light compared to heavy density of *M. micrantha*. This is the first record of soil seed bank study on *M. micrantha* in any of the Pacific Island region.

A second study was undertaken to determine if temperature is a limiting factor to the germination of *M. micrantha* in conditions experienced throughout Fiji and possible future condition considering the impact of climate change. The seeds were collected from three sites around Viti Levu Fiji, in July 2009 and exported to the University of Queensland, Australia where this study was undertaken. The seeds collected were pooled for this study and temperatures tested were 20/10, 25/15, 30/20 and 35/25°C (±1°C) day/night, with 12 hour photoperiod, is considered the range that is usually experienced in the tropics and subtropical areas where *M. micrantha* is occurring. Each treatment was replicated four times with 40 seeds each in petri dishes, incubated in growth chambers and repeated. The results indicated that rapid germination of *M. micrantha* seeds occurred under warmer (35/25°C) than cooler temperatures (20/10°C). A very high proportion (> 92%) of seeds germinated within seven days of incubation over the entire alternating temperatures tested. There was no significant difference between the first and repeated experiment ($F_{(1,31)}$, $p < 0.01$), so data from each treatment were pooled. There was no significant difference between the four alternating temperatures tested ($F_{(3,31)}$, $p < 0.01$).

A third study was undertaken to predict the tolerance and persistence of *M. micrantha* seed in the soil seed bank in Viti Levu, Fiji. A laboratory-controlled ageing test (LCAT) indicated that *M. micrantha* seed would likely survive in the soil seed bank for between 1 to 3 years.

A fourth study was conducted to determine the effect of sodium chloride (NaCl), at concentrations similar to those occurring naturally in the soils of Viti Levu, Fiji, on the germination rate and root development of *M. micrantha*. Average percent germination in the controls was > 93% and this occurred within 5 days of incubation (30/15°C ± 1°C, 12 hour photoperiod). Moderate salinity (200mM NaCl) significantly reduced germination to *ca.* 60% and high salinity (300mM NaCl) down to 6%. Primary root growth was inhibited by low concentrations of NaCl (25mM). However, in such treatments, seedlings survived by producing a high density, shallow fibrous root system around their stem bases. Thus, seedling establishment could occur even in moderate levels of NaCl (200mM). This implies that *M. micrantha* can tolerate moderate salinity conditions and may be able to grow in areas where other weed species cannot grow so well. All studies have identified components of the adaptive mechanism employed by *M. micrantha* in invading agricultural land in Viti Levu. This knowledge on soil seed bank potential, longevity, germination potential and salt tolerance could facilitate the development of management plans of this weed in Fiji.

KEYWORDS: germination potential; persistence; root development; salt tolerance; soil seed bank; temperature

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