Controlling *Mikania micrantha* HBK: How effective manual cutting is?

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**Abstract**

*Mikania micrantha*, a neo-tropical vine, is spreading rapidly in the tropical part of Nepal and is now threatening the rural ecosystem including biodiversity and rural livelihoods. However, no attempt has been made to control the spread of *M. micrantha*. As a result, the vines are spreading freely and rapidly. After a thorough literature review and assessment of forest management practices, we proposed a manual cutting method, as it suits the Nepalese situation for several reasons: required labor is readily available, as local communities are managing forest patches, and the method does not have any potential adverse effects on non-target native species. Experimental plots were laid out in August 2011 to examine the effectiveness of manual cutting. Two different site types based on canopy coverage were selected and divided into three blocks based on cutting strategy. Four treatments were assigned across the experimental plots following a complete block design. We harvested above-ground biomass according to the assigned treatment. The results suggested that there should be at least two consecutive cuttings within a 3-week interval before flowering, and that three consecutive cuttings resulted in 91% mortality of the vines. In addition, cutting promoted regeneration of native plant species. Employing regular cutting operations can modify understory shade enhancing regeneration of native species, which is a desirable condition to constrain proliferation of *M. micrantha*. Periodic cuttings reduced the competitiveness of *M. micrantha* regardless of canopy openness, but native ground cover should be retained.

**Key words:** canopy, manual cutting, *Mikania micrantha*, open woodland, regeneration

**INTRODUCTION**

Mile-a-minute (*Mikania micrantha*), a neo-tropical perennial vine, has become an important invasive plant species in many subtropical and tropical Asian countries including Nepal (Waterhouse 1994, Tiwari et al. 2005, Willis et al. 2008). This vine is listed as one of the world’s 32 worst invasive plants (Lowe et al. 2000), as it is notorious for its vigorous and rampant growth and rapid proliferation from both seed and vegetative parts (Kuo et al. 2002). Unlike other invasive plants, *M. micrantha* not only displaces native vegetation but also kills it. It climbs up to the top of the canopy and creates a dense cover that damages or kills other plants by blocking light (Holm et al. 1977). Hence, *M. micrantha* is competent to homogenize the invaded landscape and create a monoculture.

*M. micrantha* was first recorded in the eastern region (Ilam district) of Nepal in 1963 before spreading westwards (Tiwari et al. 2005). The vine is now recorded in 20 eastern, central, and western Terai districts of Nepal,
Mikania micrantha has to propagate freely. As *M. micrantha* has a tremendous growth rate and can regenerate from both seed and vegetative parts, rural farmers consider controlling the spread of *M. micrantha* as an unattainable mission (Rai et al. 2012). Various techniques are in practice to control the spread of *M. micrantha* in different parts of the world. Most control methods can be classified into mechanical, biological, and chemical control. Control methods using chemicals do not distinguish between target and non-target species (Zhang et al. 2004). The use of toxic chemicals can also have adverse impacts on native vegetation and can contaminate groundwater and river run-off. Classical bio-control has been widely used to control the spread of *M. micrantha* (Abraham et al. 2002, Zhang et al. 2004). However, there are potential risks of introducing new agents that could attack native species, influence the food chain, and become invasive (Miao et al. 2012). Thus, a mechanical technique such as consecutive cutting of vines at regular intervals could be appropriate to control the growth of *M. micrantha*, as it focuses only on the target species (Kuo et al. 2002, Lian et al. 2006).

An effective management strategy for invaded forests should not only focus on eradicating an invasive species including three protected areas (PAs) such as Chitwan National Park, Parsa Wildlife Reserve, and Koshi Tappu Wildlife Reserve (Fig. 1). *M. micrantha* is considered the most problematic terrestrial invasive plants in the tropical parts of Nepal (Poudel et al. 2005). *Mikania* has influenced over 100 native plant species, particularly plants with a diameter at breast height < 30 cm in the buffer zone of Chitwan National Park (Sapkota 2007).

The abundance of invasive plants usually reduces the availability of native plants, which can influence the delivery and quality of forest products, and ultimately affect the livelihood strategy of rural farmers, as forest products are the major farm household production input. This is because plant species richness and ecosystem services are intricately linked, and a change in the state of one of these variables can be expected to have an impact on the other (Costanza et al. 2007). In general, the vulnerability of rural livelihoods and control costs increase with increased abundance of invasive plants (Shackleton et al. 2007).

Similar to other developing countries, Nepal has not prioritized control of invasive species as one of its conservation strategies (Nuñez and Pauchard 2010). The absence of a control strategy has permitted *M. micrantha* to propagate freely. As *M. micrantha* has a tremendous growth rate and can regenerate from both seed and vegetative parts, rural farmers consider controlling the spread of *M. micrantha* as an unattainable mission (Rai et al. 2012). Various techniques are in practice to control the spread of *M. micrantha* in different parts of the world. Most control methods can be classified into mechanical, biological, and chemical control.

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