MILE-A-MINUTE (*MIKANIA MICRANTHA*): ITS DISTRIBUTION, GROWTH AND PHYSICAL AND SOCIO-ECONOMIC IMPACTS IN PAPUA NEW GUINEA

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ABSTRACT

Mikania micrantha, Kunth. H.B.K (Asteraceae) or mile-a-minute is a weed of Neotropical origin in 17 Pacific Island countries. It is becoming increasingly regarded as an invasive weed in Papua New Guinea and is now the focus of an Australian Government-funded biological control program. As part of the program, growth rates, distribution and physical and socio-economic impacts were studied to obtain baseline data and to assist with the field release of biological control agents. Through public awareness campaigns and dedicated surveys, mikania has been reported in most lowland provinces. It is particularly widespread in East New Britain and West New Britain Province. In field trials, mikania grew more than 1 metre per month in open sunny areas but slightly slower when growing under cocoa. The weed invades a wide range of land types, impacting on plantations and food gardens, smothering pawpaw, young cocoa, banana, taro, young oil palms and ornamental plants. In socio-economic surveys, mikania was found to have severe impacts on crop production and income generated through reduced yields and high weeding costs. These studies suggest that there would be substantial benefits to the community if biological control of mikania is successful.

Keywords: *Mikania micrantha, Growth Rate, Distribution, Physical and Socio-economic.*

INTRODUCTION

Mikania micrantha Kunth. H.B.K (Asteraceae), commonly known as mile-a-minute is a Neotropical invasive plant originating from South to Central America and the Caribbean. The weed has spread from its native range to many other regions and is now widespread in 17 Pacific Island Countries (PICs), including Papua New Guinea (PNG) (Waterhouse & Norris 1987). At a regional workshop on invasive alien species, it was ranked as one of the most important weeds of the region (Shine *et al.* 2003). Mikania was first reported in PNG in 1951 at Kerevat, East New Britain Province (PNG Plant Database) and found in three other provinces through subsequent weed surveys by NAQIA and AQIS staff (B. Waterhouse, AQIS pers. comm.).

As the common name suggests, mikania grows rapidly, and is one of the major weed invaders of subsistence gardens and tree crops in plantations in PNG. It forms a thick ground cover, outcompeting many plant species including food and cash crops such as sweet potato, aibika, taro, yams, bananas, cassava, vanilla, young cocoa and coconut, coffee, and oil palm. Its growth habit chokes the plants and smothers the vegetation, causing loss of production and localized death. It can interfere with the harvesting of tree crops like coconut, oil palm and cocoa. (Waterhouse & Norris 1987).

Mikania can be controlled through the use of herbicides or by manual means such as hand-pulling. However, these conventional methods of control are not practical as they are costly, time consuming and labour intensive. Biological control is seen as the only sustainable and cost-effective means to control this weed (Waterhouse & Norris 1987). A biological control program was first initiated in 2001, when the thrips *Liothrips mikaniae* was introduced into Solomon Islands and Malaysia but it failed to establish (Julien & Griffiths 1998; Evans & Ellison 2005).

As part of a renewed effort against mikania, an Australian Government-funded biological control

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program aiming to reduce the impact of *M. micrantha* in PNG and Fiji began in 2006 and involved the introduction of the rust fungus *Puccinia spegazzinii* and two butterfly species *Actinote anteas* and *A. thalia pyrrha* (Orapa *et al.* 2008). This paper reports on the distribution and growth of *M. micrantha* in PNG and the physical and socio-economic impacts of the weed. Information gained in these studies will be used in the biocontrol agent release program and to assess the benefits of the project.

DISTRIBUTION

Through the circulation of brochures and on-ground surveys conducted by the project and PNG provincial staff, mikania has now been reported in 13 lowland provinces (Fig. 1). It has also been reported in East Sepik Province (not shown) but the actual sites have not yet been confirmed. To date, mikania has not been found in Milne Bay Province despite several surveys having been conducted or Gulf Province where little work has been conducted. The largest infestations appear to be in East and West New Britain where project staff are located and are able to travel more easily. Mikania is also widespread in Central, Madang, Morobe and Manus provinces where project staff have undertaken field surveys (Fig. 1). While mikania has been reported in seven other provinces, thorough surveys of these and other provinces where the weed has not been reported, still need to be conducted to determine the actual distribution of mikania.

A preliminary CLIMEX model developed using the distribution of mikania in its native range shows that mikania has the potential to infest most parts of PNG, except the very high altitude areas and many wet lowland areas such as those found in Gulf Province (Fig. 1). Mikania has been located at Tabubil in Western Province which suggests that many other areas of similar altitude that are deemed by the model as less suitable, could actually be suitable for mikania. As a thorough survey of mikania in PNG has not yet been completed, the actual and full potential distribution of mikania cannot be determined.

GROWTH RATE

Growth measurements of mikania were undertaken by tagging plants at eight sites in East New Britain Province and two sites in West New Britain (Rigula and Dami). The sites covered different habitats, from under shade to full sunlight. In East New Britain, the length of the growing stem was recorded fortnightly, while in West New Britain, it was recorded weekly. As the plant's growing tips dried up and died they were over-handled, great care was taken during the measuring process. Dead stems were discarded from the analysis.

Growth rates of mikania varied from 5.6 cm/day in full sunlight to 1.9 cm/day in shaded areas or where mikania was growing under cocoa. The overall average growth rate of mikania for all sites was 3.5 cm/day or over 1 m/month.

THE PHYSICAL AND SOCIO-ECONOMIC IMPACT OF MIKANIA

The physical impact of mikania was determined through visual observations and field plot trials. In a field plot in West New Britain, young bananas were grown with and without the presence of mikania. Bananas in the control plot were weeded regularly and allowed to grow free of mikania while those in the test plot were not weeded.

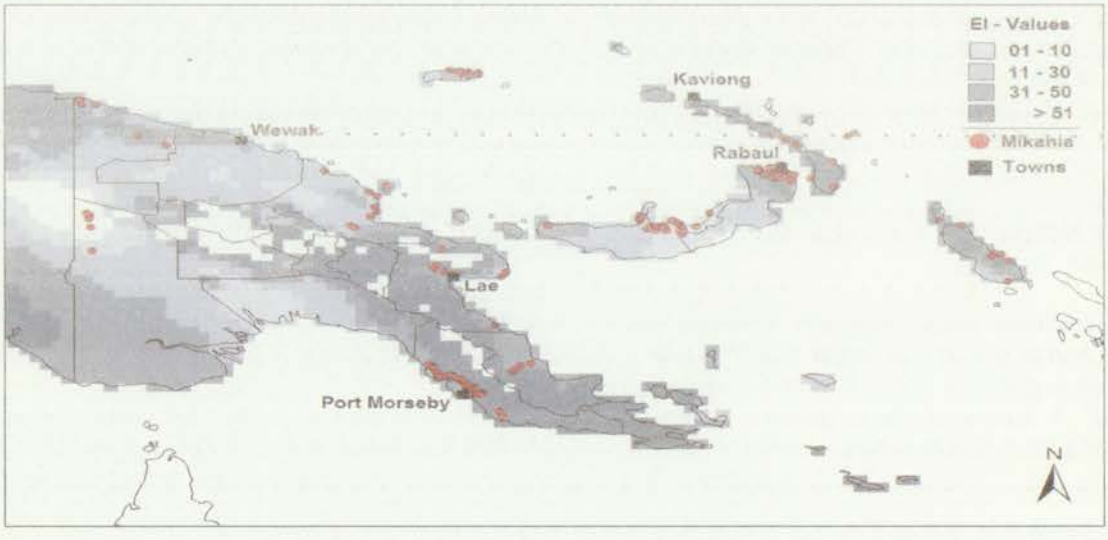
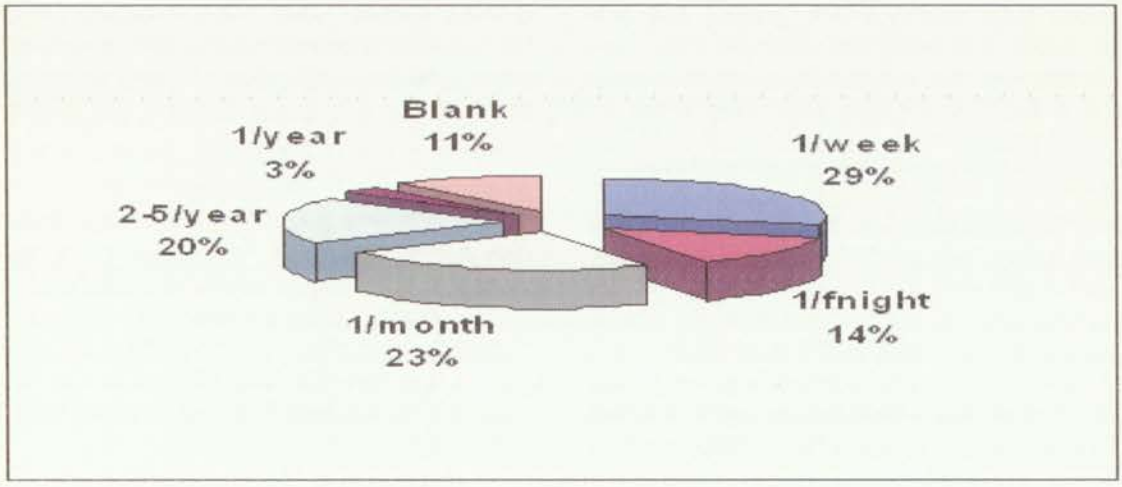


Figure 1: Map indicating where mikania is present in PNG and a preliminary CLIMEX model showing the areas where mikania is likely to occur if it continues to spread.



. **Figure 2**: The proportion of respondents who undertake control of mikania at various frequencies.

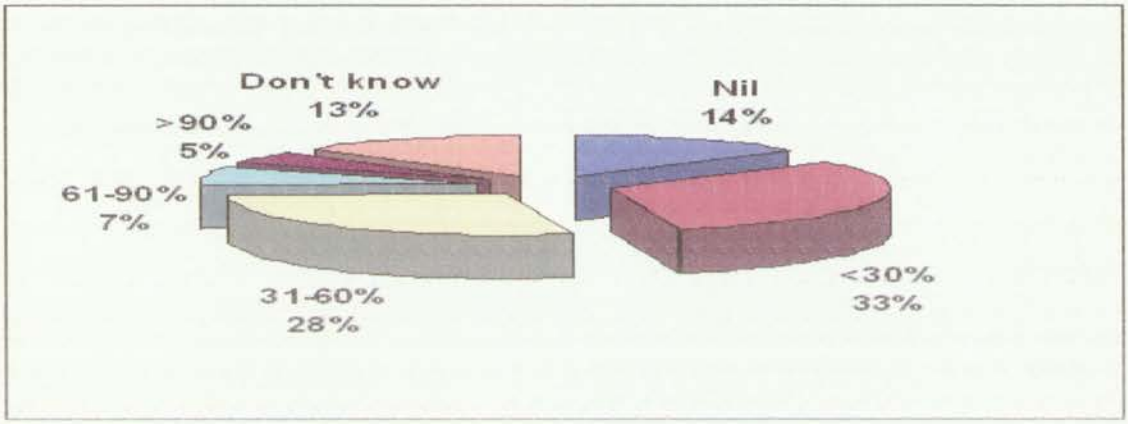


Figure 3: The proportion of respondents commenting on the effect of mikania on yield.

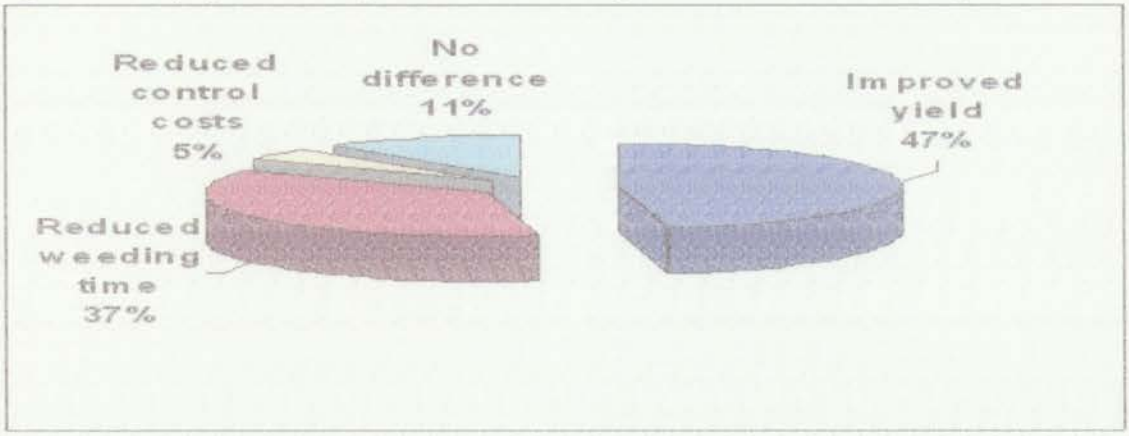


Figure 4: The proportion of respondents commenting on various benefits of controlling mikania.

Bananas left un-weeded eventually died, being smothered by mikania while the bananas in the control plot grew normally. At many sites throughout areas infested with mikania, plants smothered by mikania appeared in poorer condition than those without mikania. Anecdotal data found that cocoa plants covered in mikania had lower yields and it was thought that mikania interferes with flowering and the natural pollination by insects (J. Konam, PNG CCI, pers. comm.).

A questionnaire was developed to determine the social and economic impact of mikania on crop production, time spent weeding and income. Project staff conducted surveys in their own provinces and in provinces to which they travelled. The questionnaire was also sent to all other lowland provinces where mikania was reported for completion by provincial staff.

Over 270 responses covering 12 provinces were received, with the vast majority coming from East

and West New Britain where project staff are based. Responses were well received from Central, Madang and Manus provinces where project officers were able to also visit. Less than 10 questionnaires were received from each of the other provinces where mikania was confirmed.

About 87% of respondents had mikania present on their blocks, while 82% of respondents with mikania, considered it as weed. Eighty-six percent of respondents stated that mikania climbs and competes with crops and 74% thought regular (at least once a month) control was warranted (Fig. 2). The principal method to control mikania was through hand-pulling (81% of respondents), with 47% using hired help.

Most respondents who had mikania present, believed that mikania reduces yield (72.9%, Fig. 3) and that its control would be beneficial through increased yield and reduced time weeding and control costs (88.7%, Fig. 4). Only 27% of respondents use mikania for medicinal purposes, such as in the treatment of cuts and wounds and less than 5% used mikania as a cover crop.

DISCUSSION

Mikania is becoming increasingly invasive in PNG, being present in most lowland provinces which have been surveyed. Its rapid growth rate is causing substantial problems for subsistence landowners and plantation managers alike by smothering crops and young trees, reducing productivity, food security, income and killing plants. Socio-economic surveys show that the negative impacts of mikania far out-weigh any benefits of the weed through its use as a cover crop or the treatment of cuts and wounds.

With food security and income being an important area of concern among farmers, the importance of finding cost effective control methods against this weed are clear. Particularly significant are the observations that there was a high labour cost involved in keeping land free from mikania and in farms where the weed was cleared, productivity rose significantly. Through the Australian Centre for International Agricultural Research (ACIAR)-funded biological control project, it is hoped that effective control of mikania can be achieved with the release of several biocontrol agents. As result indicated, labour requirement will be reduced while food production and income will increase.

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REFERENCES

ORAPA, W., DAY, M., ELLISON, C. 2008. New efforts at biological control of *Mikania mi cran tha* H.B.K. (Asteraceae) in Papua New Guinea and Fiji. In *Proceedings of the Aust ralia and New Zealand Biocontrol Conference*, pp 45, NSW Department of Primary Industries, Sydney.

SHINE, C., REASER, J.K., GUTIERREZ, A.T. (eds). 2003. Invasive Alien Species in the Aus tral-Pacific Region: National Reports and Directory of Resources. Global Invasive Species Programme, Cape Town, South Africa. 185pp. see also: http://www.gisp.org

WATERHOUSE, D.F., NORRIS, K.R. 1987. *Biological Control: Pacific Prospects*. Inkata Press, Melbourne