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学 位 論 文 要 旨
Dissertation Abstract

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学位論文題目：
Title of Dissertation

Distribution, impact and control of invasive alien species *Mikania micrantha* H.B.K. in Yunnan Province of China
(外来植物 *Mikania micrantha* H.B.K.の中国雲南省における分布，影響および管理)

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In order to understand biological and ecological characteristics and explore comprehensive control methods of *Mikania micrantha*, a series of studies on distribution, impacts and control methods of *M. micrantha* have been undertaken in Yunnan. The main contents and results were as follows:

1. The harmful effects of *M. micrantha* on farming crops and local plant communities were surveyed in 6 counties of Yunnan, and bioactivity of 20 types of herbicides on *M. micrantha* and farming crops was tested. The results showed that *M. micrantha* was mostly distributed in subtropical and tropical areas of Yunnan. The species had negative impacts on farming cash crops and local plant communities. Soil-applied herbicides atrazine, bensulfuron methyl and prometryne had higher bioactivity and selectivity to *M. micrantha* germination and seedling. Foliar-applied herbicides sulfometuron methyl, fluroxypyr and glyphosate had better control efficiency on *M. micrantha* growth, but the security was low. Thus, it is recommended that atrazine should be used in sugarcane, orchard and rubber land, glyphosate for non-farm land and rubber land, sulfometuron methyl for forest land, and 2, 4-D for maize land, respectively.

2. The effects of *M. micrantha* invasion on plant community and diversity in farming systems were studied under five different *M. micrantha* cover classes. A total of 20 plant species from 20 genera and 10 families were identified. Population density and importance values of some dominant species clearly declined as *M. micrantha* cover increased and their importance values were significantly negative correlated with *M. micrantha* cover, however, population density and importance values for *Commelina communis* and *Kyllinga cylindrical* were on the contrary. Maximum values for species

richness (17.00), Simpson index (0.86), Shannon-Wiener index (2.10) and Pielou index (0.73) occurred in 1-25% cover of *M. micrantha*; the next highest values occurred with 0% cover of *M. micrantha*. Most species richness, diversity and evenness values within *M. micrantha* cover ranges of 1-25 and 0% were not significantly different but as *M. micrantha* cover increased, species richness, diversity and evenness values significantly declined, going from 26-100% cover of *M. micrantha*. Overall, it is concluded that *M. micrantha* invasion have profound effects on plant community and species diversity in farming systems.

3. The competitive mechanisms between sweet potato and *M. micrantha* were studied utilizing a de Wit replacement series. In monoculture, the total biomass, biomass of adventitious root, leafstalk length, and leaf area of sweet potato were all higher than those of *M. micrantha*, and in mixed culture the plant height, branch, leaf, stem node, adventitious root, flowering and biomass of *M. micrantha* were suppressed significantly. The relative yield of *M. micrantha* and sweet potato was less than 1.0 in mixed culture, indicating that intraspecific competition was less than interspecific competition. The competitive balance index of sweet potato demonstrated a higher competitive ability than *M. micrantha*. The concentrations of soil organic matter, total N, total K, available N, available P, available K, exchange Ca, exchange Mg, available Mn, and available B were significantly greater in *M. micrantha* monoculture soil than in sweet potato monoculture soil, and were reduced by the competition of sweet potato in the mixture. Evidently sweet potato has a competitive advantage in terms of plant growth characteristics and greater absorption of soil nutrients.

4. The combined effects of sweet potato competition and chemical herbicide on *M. micrantha* were conducted. The results showed that the control rates ranged from 77.35 to 90.59% corresponding to bentazon application rates from 720-1080 g ai/hm^2 and the selectivity index was 1.39. Compared to the application of bentazon alone at 1080 g ai/hm^2, inhibition rates for sweet potato and bentazon combined were higher, for a ratio of sweet potato to *M. micrantha* of 2.5:1 with bentazon applied at 720 g ai/hm^2, beyond 30 days after the herbicide treatment. Compared with either sweet potato competition or bentazon application alone, the combined impact of sweet potato competition and bentazon application was significantly higher. The suppression rates of the two methods combined were higher than 90% for a ratio of sweet potato to *M. micrantha* of 2.5:1 plus bentazon applied at 1080 g ai/hm^2 from 30 to 120 days. All results suggested that sweet potato competition and bentazon combined could achieve more secure, sustainable and long term control of *M. micrantha*.