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Bio-herbicide potential of naturalised *Desmodium uncinatum* crude leaf extract against the invasive plant species *Parthenium hysterophorus*

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Abstract

The exotic plant *Parthenium hysterophorus* is rapidly invading ecosystems in sub-Saharan Africa, with negative effects on the environment, economy and human and animal health. With the exception of some synthetic herbicides, none of the available management methods have been effective against *P. hysterophorus*, and carry risks to the environment. Therefore, additional management methods must be explored for an effective integrated approach. Despite the fact that bio-herbicides are considered cost-effective and eco-friendly in mitigating biological invasions, little work has been done to utilize them for controlling *P. hysterophorus*. We investigated allelopathic effects and, thus, bio-herbicide potential of naturalised *Desmodium uncinatum* leaf (DuL) crude extract in various concentrations to control *P. hysterophorus*. Our results revealed that DuL crude extract can suppress *P. hysterophorus*, particularly at higher concentrations. The 75% and 100% DuL crude extract concentrations reduced the total leaf chlorophyll content by 26% and 22% in pots and plots, respectively. Further, these higher concentrations inhibited *P. hysterophorus* seed germination by 73% in petri dishes, 60% in pots, and 57% in plots, and negatively interfered with seedling growth vigour. Seedling stem heights under 75% and 100% DuL concentrations in pot and plot experiments was about 30% and 36% shorter than those sprayed with lower concentrations (< 70%) and the control, respectively. We show that naturalised plants with allelochemicals can be used as a management tool for controlling *P. hysterophorus* infestations in sub-Saharan Africa, particularly in Tanzania, and this method should become part of an integrated control toolkit being deployed in a community-based approach.

Keywords

Allelopathy, Bio-herbicide, Exotic invasive, Management, Pot experiment, Tanzania