

## **Contrasting growth responses to aluminium addition among populations of the aluminium accumulator *Melastoma malabathricum***

### **ABSTRACT**

Aluminium (Al) hyper-accumulation is a common trait expressed by tropical woody plants growing on acidic soils. Studies on Al accumulators have suggested that Al addition may enhance plant growth rates, but the functional significance of this trait and the mechanistic basis of the growth response are uncertain. This study aimed to test the hypothesis that differential growth responses to Al among populations of an Al accumulator species are associated with variation in biomass allocation and nutrient uptake. We conducted two experiments to test differential responses to the presence of Al in the growth medium for seedlings of the Al accumulator shrub *Melastoma malabathricum* collected from 18 populations across Peninsular Malaysia. Total dry mass and relative growth rate of dry mass were significantly greater for seedlings that had received Al in the growth medium than for control plants that did not receive Al, but growth declined in response to 5.0 mM Al addition. The increase in growth rate in response to Al addition was greater for a fast-growing than a slow-growing population. The increase in growth rate in response to Al addition occurred despite a reduction in dry mass allocation to leaves, at the expense of higher allocation to roots and stems, for plants grown with Al. Foliar concentrations of P, K, Mg and Ca increased in response to Al addition and the first axis of a PCA summarizing foliar nutrient concentrations among populations was correlated positively with seedling relative growth rates. Some populations of the Al hyper-accumulator *M. malabathricum* express a physiological response to Al addition which leads to a stimulation of growth up to an optimum value of Al in the growth medium, beyond which growth declines. This was associated with enhanced nutrient concentrations in leaves, which suggests that Al accumulation functions to optimize elemental stoichiometry and growth rate.

**Keyword:** Aluminium accumulator; *Melastoma malabathricum*; Functional trait; Relative growth rate; Peninsular Malaysia