STOMATAL CONDUCTANCE IN RELATION TO XYLEM SAP ABSCISIC ACID CONCENTRATION IN *HOPEA ODORATA* ROXB. AND *MIMUSOPS ELENGI* LINN.SEEDLINGS

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ABSTRACT

Xylem sap ABA and leaf ABA of *Hopea odorata* and *Mimusops elengi* were measured under condition of soil compaction and drought and the role of ABA were investigated in the regulation of stomatal conductance of these two species. A rapid and substantial increase in xylem sap abscisic acid (ABA) concentration rather than leaf ABA concentration, which was closely related to soil drying and stomatal conductance, was observed in both species. The increase in xylem sap ABA concentration observed at high bulk density was closely related with reductions of stomatal conductance. These results suggest that xylem ABA may act as a stress signal in the control of stomatal conductance. The inability of *M. elengi* seedlings to produce as much xylem ABA concentration compared to *H. odorata* seedlings in response to soil compaction and water stress may have been crucial to its failure to maintain near—normal rates of leaf expansion at certain critical level of compaction.

Keywords: *Hopea odorata*; *Mimusops elengi* Soil compaction; Drought; Stomata conductance; Xylem Sap ABA

INTRODUCTION

Stomata impose a critical control over water loss and exchange of gases between the atmosphere and leaf cells (Liang et al., 1996). In the harsh urban environment effective control is important for plant growth and survival especially when water supply is limited. Accumulated evidence has shown that inhibition of leaf growth and stomatal conductance are perhaps the first responses when root systems are exposed to stress conditions, such as drought, flooding and soil compaction (Passioura, 1988; Davies and Zhang, 1991; 1992a; Tardieu and Davies, 1993; Hartung et al., 1994). Under these conditions, roots may respond by synthesising and exporting chemical signals through the transpiration stream to shoots where physiological processes are regulated (Davies and Zhang, 1991). Much evidence has indicated that root-derived abscisic acid (ABA) in the zylem is involved, and ABA is the most likely candidate as the chemical signal involved in communication between root and shoot and in the regulation of leaf growth and stomatal conductance, especially under conditions of soil drought and compaction (Zhang and Davies, 1989; Gowing et al., 1993). Experiments in which leaf water status was maintained in plants as the soil dried, either by balancing pressure techniques (Gollan et al., 1986; Schurr et al., 1992) or by roots split between wet and dry soil (Gowing et al., 1990; Khalil and Grace, 1993; Stoll et al., 2000), demonstrate that stomates can close independently of the water status. It is therefore possible that a root-sourced signal such as ABA may be involved in plant responses to soil compaction. This experiment was designed to examine the relationship between stomatal conductance, xylem sap ABA and leaf water potential in two species grown in compacted and unwatered soil, and to investigate whether ABA plays a similar role under these two different stresses in its regulation of stomatal conductance of these two species.

MATERIALS AND METHODS

The experiment was a 2 x 2 x 2 factorial design with two species, *H. odorata* and *M. elengi*, two soil compation treatments (compacted and non-compacted), and two soil drying treatments (well watered and at soil water potential ≥ - 1.5Mpa). The soil used belongs to the *Tropeptic haplorthox* series and