EFFECTS OF SOIL COMPACTION AND WATER SRESS ON THE GROWTH PERFORMANCE OF *Hopea odorata Roxb. Mimusops elengi* Linn. SEEDLINGS -MORPHOLOGICAL RESPONSES

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INTRODUCTION

Soil compaction and its impact on plant growth and yield are issues of global concern (Voorhees, 1991). Compaction increases the bulk density or strength of a soil, commonly referred to as its 'mechanical impedence', and reduces its conductivity, permeability and diffusivity to water and air (Materechera *et al.,* 1991). Compaction of urban soils drastically reduces infiltration rate and consequently encourages runoff losses. In addition, even the little quantity of water that infiltrates the soil is so tightly held in the micropores that plant roots find it difficult to extract. A loose soil, on the other hand, permits infiltration but the water may be lost to the plant through rapid drainage. Therefore in either case (compact or loose soil), plant may suffer moisture stress and reduced growth even though the right amount of water may have been applied. When soil is compacted, the bulk density increases and total porosity decreases. This inhibit plant growth and reduces root elongation (Barley, 1965; Taylor and Ratliff, 1969) and cause reduction in shoot growth (Schurman, 1965). Field experiments have suggested that soil compaction reduces shoot growth by restricting the volume of soil explored by the root system and hence the availability of water and nutrients to the plant (Bennie and Botha, 1986; Taylor and Brar, 1991). A thorough understanding of the interactive effect of soil compaction and soil moisture regimes is essential for good growth of the plants and their effects were investigated in this study.

MATERIALS AND METHODS

The study was conducted at the nursery of the Faculty of Forestry, Universiti Putra Malaysia during the period of March 1996 and March 1997.

Plant Materials and Experimental Soil

Two species, one indigenous species *H. odorata,* and the other, *M. elengi (*long introduced into Malaysia*)*, were selected for the study. They were selected, as they are common ornamental plants planted along the roadsides and highways because they have good foliage, good aesthetic features and provide shade. However, their potential as species tolerant of urban environment has yet to be ascertained and no records on their growth performance under conditions of soil compaction, water and nutrient stresses in the urban environment have been reported. The seeds of *H. odorata* and *M. elengi* were collected from the Forest Research Institute Malaysia (FRIM) and the Universiti Putra Malaysia arboretum. The seeds were germinated in a sand bed in the nursery. After germination, the seedlings were transplanted into polythene bags with a potting mixture of seven-part topsoil, three-part sand and two-part peat.

The soil used belongs to the Tropeptic haplorthox. Soil samples were taken from the ground surface to 30-cm depth at a location in the Universiti Putra Malaysia farm. The soil was air dried and sieved through a 2.0-mm stainless steel sieve and then prepared for chemical analysis. Soil pH was determined using 1:2.5 soil/water solution by a glass electrode pH meter. Total N was determined by an auto-analyser following the Kjeldahl digestion procedure (Bremner, 1965). Available P was measured using Bray's No. 1 solution and the Walkley and Black Method (1934) determined total organic carbon. Exchangeable cations (K,