ROOTS DYNAMIC IN URBAN WOODY LANDSCAPE SHRUBS AND THEIR INFLUENCE ON SHOOT MORPHOLOGY

NOR IDZWANA MOHD IDRIS

THE UNIVERSITY OF SHEFFIELD

ROOTS DYNAMIC IN URBAN WOODY LANDSCAPE SHRUBS AND THEIR INFLUENCE ON SHOOT MORPHOLOGY

BY:

NOR IDZWANA MOHD IDRIS

A THESIS SUBMITTED TO THE FACULTY OF SOCIAL SCIENCES STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF LANDSCAPE
UNIVERSITY OF SHEFFIELD
UNITED KINGDOM

JANUARY 2015

ABSTRACT

Roots are very much the 'hidden half' of any plant, and no more so that when grown as landscape plants in the urban environment. Root systems are expected to 'perform' in a variety of difficult and stressful environments, whether they are constrained in containers of limited volume, planted into shallow soils with restricted water / nutrient availability (e.g. green roofs) or even expected to grow in the absence of soil (e.g. within hydroponic systems commonly used in green facades). Lack of appreciation regarding root systems in general is coupled with an incomplete understanding of how root development might influence shoot growth and morphology in urban landscape plants. A limited range of model ornamental species (*Philadelphus* cv. Aureus, *Philadelphus* cv. Belle Etoile, *Euonymus* cv. Silver Queen and *Punica granatum*) were used, where plant root systems were exposed to a series of typical artificial urban environments such as limited area for growth, compacted soil, waterlogging and physical damage to the root systems in an attempt to identify modifications to root behaviour and the effects on shoot development. Among all the stress factors being studied, flooding was recorded to have the most detrimental effect on urban vegetation where there were a number of plant deaths recorded in *Philadelphus* cv. Aureus; whereas *Euonymus* cv. Silver Queen was observed to be more resistant toward flooding effect. Reduction of root and shoot biomass was an almost universal response when plants were exposed to stress, and this might be due to limited nutrient and water availability especially in compacted soil and smaller rootball geometry. Other commonly observed traits were reductions in height, reductions in leaf marginal area and in some circumstances changes in branching pattern. These physiological adaptations in plants changed the aesthetic character by producing more compact and smaller plants although this was not always significant for all species and environment stresses. In terms of direct root damage, data from one experiment using split-pots systems suggested a certain threshold of root damage needed to be crossed before significant levels of re-growth were activated. Careful species selection is required to ensure urban vegetation is resilient to the stresses commonly encountered, a factor that will be increasingly important with climate change and greater density of urban built infrastructure in future.