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**THE PERFORMANCE OF EUCALYPTUS SPECIES
IN HILL COUNTRY**

A thesis presented in partial fulfilment of the requirements for the degree of
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Abstract

Eucalyptus species, particularly stringybarks, which produce hard, durable wood are potentially useful in New Zealand, but most species are site sensitive. Twelve species (*E. agglomerata*, *E. baxteri*, *E. botryoides*, *E. cladocalyx*, *E. globoidea*, *E. microcorys*, *E. muelleriana*, *E. nitens*, *E. obliqua*, *E. pilularis*, *E. regnans* and *E. saligna*) were compared on four hill country microsites; upper and lower slope on sunny and shady aspects. Assessments included survival, foliar macro-nutrients, diameter at breast height (DBH), height, stem form, basic wood density and health to age 5 years. Site monitoring included solar radiation, temperature, rainfall and exposure. Foliar nutrients were strongly influenced by species and moderately influenced by microsite. Inter-nutrient and nutrient-growth correlations were identified and discussed. Subgeneric differences in nutrient profile were analysed with the aid of principal components analysis. Solar radiation and temperature were seasonal on both aspects but higher on the sunny face than the shady. Aspect differences were moderate, being greatest in the winter and least in the summer. A strongly seasonal growth pattern resulted, maximum DBH and height increments occurring in the spring and summer respectively. Growth was least in the winter. Seasonal and aspect effects on growth were related to solar radiation. Height and DBH (5 years) were significantly higher on the sunny face than the shady in all species. Slope position did not influence height but DBH on the lower slope was less than on the upper. Aspect had little influence on basic wood density and form. Species differed in growth, form and basic density. *E. nitens* was the most productive species but basic density was low. Conversely, density was highest in *E. cladocalyx*, among the least productive species. The stringybarks were intermediate in growth, form and density. The relationships between growth, form, density and environmental factors were explored with canonical correlation. Two species (*E. botryoides* and *E. saligna*) were adversely affected by possum browsing and infection by a leaf gall wasp (*Ophelimus eucalypti*). Discussion of the results includes consideration of the merits of assessments of relatively young trees as well as implications for tree growers.

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