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Early Ontogenetic Male Cone Production
in *Pinus radiata*

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Abstract

The tree breeding industry is interested in early ontogenetic male cone production in *Pinus radiata* in order to maximise the rate at which successive generations can be bred. The foundation of this thesis was a study of how male cone production differed in various contrasting regions around New Zealand. A study was then carried out to assess whether various morphological and anatomical characteristics of trees were correlated with the onset of male cone production. Various treatments including stress, plant growth regulator application and grafting were examined to determine whether any of these could be used to promote early ontogenetic male cone production.

The regional study found that male cone production commenced at age 3 in Nelson, at age 4 in Northern and Southern Kinleith, and age 6 in Karioi and Northland. Findings suggest that high sunshine hours and low autumn and/or winter temperatures are of significance to the precocity of male cone production. A tentative logistic model was developed that may adequately describe cone production across all regions.

Morphological and anatomical characteristics of trees were used to develop a model which predicts the probability that a tree will *not* be producing male cones. Relative cell number was found to provide the greatest ability to predict whether or not a given tree will be producing male cones, supporting the hypothesis that a certain number of cell divisions are required before male cone production commences.

Grafting did not promote male cone production in the present study. It is recommended that future grafting experiments for the purposes of promoting male cone production should reconsider the position within the crown at which grafts are made.

Male cone production on fascicle cuttings approximately two years old was promoted by growing them under stress in small pots, with minimal watering and no fertiliser application. It is suggested that a “stress” pathway, distinct from the “normal” male cone production pathway is probably involved. Male cone promotion in fascicle cuttings appears to be enhanced through the application of ABA, but not other plant growth regulators. Additionally, male cone production in fascicle cuttings appears to be enhanced by providing relatively high levels of light.

The outcomes of this study suggest that a lack of male cone production in young trees may not be the most serious impediment to the breeding program. Instead, the onus may be on the ability to make superior selections at a younger age than occurs at present.

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