WATER STATUS AND GROWTH INITIATION

IN *POPULUS*

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SUMMARY

A study was made of the significance of water status and the recommencement of growth in Populus following winter dormancy, using the following clones:

(i) Populus euramericana (Dode) Guinier cv. 'I-78'
(ii) P. yunnanensis Dode.
(iii) Populus deltoides ssp. angulata Ait. cv. 'Carolinensis'

A limited examination was made of two other factors - the effect of light, and the influence of exogenous auxin on growth initiation.

All growth experiments were carried out using a water culture technique.

Seasonal changes in water content and water potential were measured over the period of quiescence. Water content was at a minimum at leaf fall and rose slowly until growth initiation. Water potential rose slowly to a maximum in mid-winter, and then slowly fell. Although water content was significantly higher at the top of wands than at the bottom at leaf-fall, this was reduced or eventually eliminated with the general rise in water content, but there were no corresponding differences in water potential.

Water loss was clearly related to relative humidity, and cut ends of a cutting were a major site of evaporation. The presence of buds had a small effect, which was related to relative humidity both in direction and magnitude.

An investigation of the effect of exogenous auxin suggested that in P. angulata root initiation may be limited by low endogenous levels of auxin, but this was not confirmed since auxin assays were not done.

Light was shown not to be a factor in the numbers of shoots and roots produced, although root initiation was delayed by the light treatments. However, there was a significant failure rate in the dark in a substitute clone (a hybrid clone bred in Australia from Populus deltoides).

The effect of water stress on growth initiation and early growth was studied using an osmoticum in water culture of cuttings. The induced stress severely limited both shoot and root growth which was very low; below - 4 bar. However, budbreak occurred and root primordia developed in higher osmotic potentials, but below - 11 bar there was little development.

Internal water potential and water content were highly correlated with osmotic potential of the growth medium.

Shoots and roots were found to have water contents which were inversely related to the osmotic potential of the growth medium.

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Introduction

Within the last century, the vegetation of New Zealand has undergone a massive change. A high proportion of the steeplands, and virtually all of the flat and rolling country has been converted from temperate rain-forest to grassland which has resulted in considerably increased runoff. The inherently unstable nature of much of the sedimentary parent material has not resisted this change well, and erosion has become a significant problem in some areas.

Techniques of soil conservation and runoff control have been based mainly on plantings of the genus Populus in the form of "poles" some 10 to 12 feet long which can be established in the presence of stock, under Farm Plans organised by local catchment authorities. The total number of poles planted in 1967 was 400,000 - double the number of 1962 - and this is expected to at least double again. However, in spite of advantages in propagation, adaptability, growth rate and root system characteristics, problems in the establishment of poplar and willow have arisen. The most obvious of these is animal damage, chiefly cattle (through rubbing and bark biting) and opossum (browsing of foliage). A survey commissioned by the Soil Conservation and Rivers Control Council in 1968 investigated the level of pole loss and found a mortality of 24.7% and 41.8% over the first and second years respectively (Edwards; 1968, 1969 a). Although the major factors could not be positively identified, it was apparent that site factors, and water stress in particular, were major causes of loss.

This study investigated the importance of water relations in the vegetative propagation of Populus species. In particular, it was designed to establish the levels of water stress which would limit the initiation of growth in both root initials and buds.