Research note

The effect of seaweed concentrate on the growth of Pinus pinea seedlings

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\textbf{Key words:} nursery production of seedlings, root growth capacity, seedling quality, seedling establishment

\textbf{Application.} The use of seaweed concentrate (SWC) to accelerate root growth of \textit{Pinus pinea} seedlings is described. This renewable natural product might be used to improve the root and shoot growth of forest seedlings. Foliar spraying or root drenching seedlings with SWC dilutions before transplanting in the field may reduce transplant shock.

\textbf{Abstract.} Seedlings of \textit{Pinus pinea} L. growing in plastic containers were treated with seaweed concentrate (SWC). Different concentrations of SWC were applied, 0 to 3 times, to the roots or shoots of the seedlings. Shoot application increased plant weight mainly by increasing shoot growth. This was manifested as increased shoot length and weight and a decrease in the root/shoot ratio. Root drenches did not change the total plant weight but it accelerated root growth and increased lateral root dry weight. Root growth capacity (RGC) tests for both shoot and root applications indicated an increase in root length and some increases in root number when applied as a root drench. This study indicates that root application of SWC improved seedling quality and increased the ability of seedlings to survive transplanting into pots.

\textbf{Abbreviations:} GC-MS — Gas Chromatography-Mass Spectrometry; RGC — root growth capacity; SWC — seaweed concentrate

\textbf{Introduction}

The application of commercial seaweed preparation has many beneficial effects on plants (Metting et al. 1990). Among the effects reported is improved rooting of cuttings of several ornamentals and a significant increase in root initiation and growth (Featonby-Smith and Van Staden 1984b; Beckett and Van Staden 1989; Crouch and Van Staden 1991). Some of these effects have been attributed to the presence of growth substances such as cytokinins, which are known to occur at relatively high
levels in various seaweeds and commercial seaweed preparations (Pederson 1973; Blunden and Wildgoose 1977; Featonby-Smith and Van Staden 1984a; Tay et al. 1985, 1987). Recent studies have shown the presence of auxins in SWC, and a number of auxins were detected and identified by GC-MS (Sanderson et al. 1987; Crouch et al. 1992). The interaction between cytokinins and auxins appears to be one of the primary triggers to direct cell division and lateral root initiation (Torrey 1986). In forestry it is well known that root branching and growth play a critical role in seedling establishment in the field (Leaf et al. 1978; Webb and Dumbroff 1978; Atzmon 1991). The survival of a seedling depends to a large extent on the number and length of roots which are produced after transplanting (Sutton 1980; Struve and Moser 1984). Root growth capacity (RGC) tests which indicate the ability of the seedlings to produce new roots after transplanting, are known to show a strong correlation with seedling survival (Ritchie and Dunlop 1980; Burdett et al. 1983).

The present study tested the effect of SWC on seedling potential to survive after transplanting. Pinus pinea was chosen because of its strong apical dominance of the taproot which results in poor lateral root development and therefore poor survival after transplanting (Atzmon 1991).

Materials and methods

Plant material

Seedlings of Pinus pinea L. (Pino domestico) were grown under greenhouse conditions for 24 weeks. Seeds were germinated in plastic containers (“UNIGRO TRAY” 58 cc.), in garden compost:perlite (1:2). The seedlings were watered three times a week and fertilized once a week with hydroponic nutrient powder (Chemicult, 6.5%N, 2.7%P, 13.0%K) dissolved in water at the ratio of 1:1000.

Treatments

The SWC (Kelpak 66) used is prepared from the brown alga Ecklonia maxima Osbeck by Kelp Products (Pty.) Limited, Cape Town, South Africa. Two weeks after germination SWC was applied either as foliar sprays (0, 1:1, 1:2:5, 1:5 dilutions) or as root drenches (0, 1:450, 1:300, 1:150 dilutions) in the plastic containers in which they germinated. Two further SWC applications were made prior to transplanting and a third at transplanting into pots. Seedlings which were treated 2 and 3 times received the second application 8 weeks after the first and the third