

Identification of Auxins in a Commercial Seaweed Concentrate

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Summary

Compounds active in the mung bean rooting bioassay were isolated from the neutral indole fraction of a commercial seaweed concentrate by high performance liquid chromatography. A gas-chromatographic-mass spectrometric analysis of the most active fractions indicated the presence of the following indoles: indole-3-acetic acid; indole-3-carboxylic acid; N,N-dimethyltryptamine; indole-3-aldehyde; and in addition, iso-indole,1,3-dione (N-hydroxyethyl phthalimide). This appears to be the first report of an indole amine and a phthalimide in algae. Attempts are currently being made to determine the efficacy of these compounds individually, and in combination, in the mung bean bioassay.

Key words: Seaweed concentrate; *Ecklonia maxima*; root formation; indole-3-acetic acid; indole-3-carboxylic acid; N,N-dimethyltryptamine; indole-3-aldehyde; iso-indole,1,3-dione (N-hydroxyethyl phthalimide).

Abbreviations: SWC = seaweed concentrate; IAA = indole-3-acetic acid; ICA = indole-3-carboxylic acid; IAId = indole-3-aldehyde; IAcet = indole-3-acetamide; TRP = tryptophan.

Introduction

It is well-documented that commercial seaweed preparations improve plant growth (Metting et al., 1991). Many of these effects have been attributed to the presence of growth substances, particularly the 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). The application of SWC to plants has been reported to significantly increase root initiation and growth (Featonby-Smith and Van Staden, 1984b; Beckett and Van Staden, 1989). Since it is well-established that both endogenous and synthetic auxins stimulate rooting (Jackson and Harney, 1970; Hartmann and Kester, 1975), and cytokinins inhibit rooting (Van Staden and Harty, 1988), the possibility exists that the observed rooting response following seaweed application is due to auxins. Kingman and Moore (1982) detected indole-3-acetic acid in the commercial seaweed extract, 'Maxicrop', using GLC techniques, a find-

ing recently confirmed by GC-MS identification (Sanderson et al., 1987).

The commercial seaweed concentrate, 'Kelpak', was recently shown to increase rooting in the mung bean bioassay in a concentration-dependent manner, and promoted rooting in cuttings of several ornamentals (Crouch and Van Staden, 1991). This paper reports the isolation and identification of a number of indole derivatives from the commercial preparation of the brown alga *Ecklonia maxima* (Osbeck) Papenfuss.

Materials and Methods

The seaweed concentrate used in this study is marketed as 'Kelpak' and prepared by a cell-burst process from the brown alga *Ecklonia maxima* (Osbeck) Papenfuss (Featonby-Smith and Van Staden, 1983).

One hundred millilitres of SWC was extracted in 80% methanol (AR grade) for 12 h at 10°C. The methanol fraction was separated