

SHORT COMMUNICATION

1-Aminocyclopropane-1-carboxylic Acid in Seaweed Concentrate

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Abstract

Using thin layer and gas chromatographic techniques, 1-amino-cyclopropane-1-carboxylic acid was detected in seaweed concentrate prepared from the brown kelp *Ecklonia maxima* (Osbeck) Papenfuss. The level of the ethylene-releasing compound was estimated as 9.29 nmol ml⁻¹.

Introduction

There are numerous reports that seaweed extracts and seaweed concentrates stimulate plant growth (Blunden and Wildgoose 1977, Featonby-Smith and Van Staden 1983a, 1983b, Nelson and Van Staden 1984a). In most instances, the beneficial effects of the seaweed product were attributed to the presence of cytokinins (Abetz 1980, Featonby-Smith and Van Staden 1983b). While these compounds have been tentatively identified in a seaweed concentrate prepared from *Ecklonia maxima* (Osbeck) Papenfuss (Featonby-Smith and Van Staden 1984), it seems unlikely that cytokinins could be the only beneficial growth substances present in seaweed concentrate, particularly in view of the many different physiological processes which are affected by seaweed application. A recent report has shown that seaweed concentrate markedly increased the thickness of wheat (*Triticum aestivum* L.) culms (Nelson and Van Staden 1984b). As ethylene-releasing chemicals are widely used to prevent lodging in cereals (Brown and Earley 1973, Bruinsma 1982) it is possible that the natural ethylene-releasing compound 1-aminocyclopropane-1-carboxylic acid (ACC) could have been the active ingredient. Ethylene is produced by bryo-

phytes, green and blue-green algae (Osborne 1978). Blue-green algae have also been shown to have the capacity to convert applied ACC to ethylene (Huang and Chow 1984). There appears, however, to be no information about the occurrence of ACC in seaweeds or seaweed products. This paper reports on the occurrence of ACC in seaweed concentrate (Kelpak 66) prepared from the large brown kelp *Ecklonia maxima* by a cold cell-burst process.

Procedure and Results

Soluble products were extracted from the seaweed concentrate by mixing with an equal volume of 100% ethanol and allowing the mixture to extract for 12 h at 5 °C. Cell debris was removed by centrifugation and the qualitative and quantitative presence of ACC in the supernatant determined by thin layer (Burroughs 1957) and gas chromatography (Lizada and Yang 1979). For quantification, ACC was converted to ethylene. A small volume (0.8 ml) of the ethanolic supernatant was transferred to rubber-stoppered tubes. A 0.1 ml aliquot of 10 mM mercuric chloride was added and the tubes placed on ice. By