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Sterol Distribution in Red Algae from the Waters of Eastern Long Island

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Abstract

Seven species of red algae from the waters of eastern Long Island, New York were analyzed for their sterol content. The species studied were: *Agardhiella tenera*, *Ahnfeltia plicata*, *Chondrus crispus*, *Corallina officinalis*, *Cystoclonium purpureum* var. *cirrhosum*, *Gracilaria foliifera*, and *Palmaria palmata*. The major sterols found belong to C₂₇ compounds. Cholesterol was the predominant sterol in all species with the possible exception of *Palmaria palmata*. The presence of cholest-7-en-3 β -ol is reported for the first time in the order Gigartinales. Considerable variations in the total sterol contents among these species were observed, ranging from 1 mg/kg for *Palmaria palmata* to 117 mg/kg for *Agardhiella tenera*. Comparison of the total sterol content of *Palmaria palmata* with previous analyses (50 to 190 mg/kg) from waters off eastern Canada indicate that significant regional differences in the sterol content of a given species can occur.

Introduction

The first investigation of marine sterols dealt with marine sponges and dates back to the turn of the century (Henze 1904). The earliest studies of marine algal sterols began in the 1930s by Heilbron and co-workers (1934, 1935). There have consequently been numerous investigations since these early studies with considerable contributions from Japan, Great Britain, and Canada. The literature on this subject has been extensively reviewed by Austin (1970), Premuzic (1971), Goad and Goodwin (1972), Scheuer (1973), Baker and Murphy (1976), and Goad (1976, 1978).

It has been well documented that the sterols of red algae (Rhodophyta), with few exceptions, are predominantly the C₂₇ type. Cholesterol is most commonly found in the Rhodophyta and it is usually present in the highest concentration (Goad and Goodwin 1972, Doyle and Patterson 1972, Fattorusso *et al.* 1975). The occurrence of cholesterol as the predominant sterol of most red algae is unique to the plant kingdom and undoubtedly phylogenetically important (Goad and Goodwin 1972). A number of other C₂₇-sterols are commonly encountered along with some rare and unusual phytosterols sometimes present in high concentrations (Goad 1978). Two C₂₇ sterols frequently detected in red algae

are desmosterol and 22-dehydrocholesterol (Goad and Goodwin 1972, Ferezou *et al.* 1974, Meunier *et al.* 1970, Fattorusso *et al.* 1975, Beastall *et al.* 1971, Kanazawa *et al.* 1972, Cargile *et al.* 1975, Chardon-Loriaux *et al.* 1976). The occurrence of C₂₆, C₂₈, and C₂₉ sterols in varying quantities has been reported in a number of species of red algae (Alcaide *et al.* 1968, Alcaide *et al.* 1969, Beastall *et al.* 1971, Fattorusso *et al.* 1976, Goodwin 1973, Patterson 1971, Idler *et al.* 1968, Ferezou *et al.* 1974). A series of rare C₂₆–C₂₉ dihydrosterols (stanols) were identified from three species of the family Gelidiaceae and from one species of the family Callymeniaceae (Erdman and Thomson 1972, Ballantine *et al.* 1975, Chardon-Loriaux *et al.* 1976).

Large variations in the total sterol content of red algae have been reported with values ranging from 0.005% dry weight (Idler and Wiseman 1970) to 0.07% (Tsuda *et al.* 1957). There is also considerable variation in sterol composition within a given species of algae (Idler *et al.*

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