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Contributions on the Content and Nature of the Phycocolloid from *Laurencia papillosa* (Forssk.) Greville (Rhodophyta, Ceramiales)

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Abstract

The content, infrared spectroscopy, total sulphate and optical rotation of the phycocolloid from *Laurencia papillosa* (Forssk.) Greville from Tanzania have been investigated. A phycocolloid yield of 33.6 ± 0.6% was obtained on a dry weight basis. The total sulphate content of the phycocolloid was 16.8 ± 0.4% and the optical rotation was found to be negative $[\alpha]_D^{25} - 5.5°$. The phycocolloid was soluble in potassium chloride. Its IR spectra showed absorption peaks more akin to λ-than κ-or ι-carrageenan. A detailed discussion of these findings is presented.

Introduction

Laurencia Lamouroux (Rhodophyta, Ceramiales) is one of the most widespread seaweeds on tropical and warm temperate shores. About 80 species of the genus have been reported in the literature (Kylin 1956). Twelve of these are known to occur in Tanzania (Jaasund 1976). The most abundant and best known of the Tanzanian species is *L. papillosa* (Forssk.) Greville. Records of this species in the west Indian region include those by Hauck (1887) from the Somali coast, Schmitz (1895) and Schroeder (1912) from Tanzania, Papenfuss (1968) from the Red Sea, and Isaac (1967) from the Kenya coast. Species of *Laurencia* are economically important in various parts of the world such as the Philippines (Zaneveld 1959) and the Hawaiian Islands (Levring *et al.* 1969, Abbott and Williamson 1974) where they are harvested and eaten locally. On many shores of Tanzania *L. papillosa* is also harvested by coastal dwellers who use it as fish bait (Mshigeni 1973).

Fronds of most *Laurencia* spp. are of cartilaginous consistency (Levring *et al.* 1969 Jaasund 1976). Since some of the species produce fronds of appreciable size and occur in abundant populations, the genus seems to be attractive as a possible source of the red algal hydrocolloids of commerce whose industrial demand is increasingly soaring high. Surprisingly little is, however, known about the nature and quantity of phycocolloid from most species of *Laurencia.*

O'Colla (1962) conducted chemical investigations on the phycocolloid from *Laurencia pinnatifida* but did not report on the quantitative yield of the phycocolloid or characterise whether it is an *agar*, a *carrageenan* or another known type of phycocolloid. Huvé and Pellegrini (1969) also conducted chemical analyses of several species of *Laurencia* including *L. papillosa* but their main focus was on the amino acids. The objective of the present study was, therefore, to advance our knowledge on the quantity of phycocolloid in the fronds of *L. papillosa*, to determine its infrared spectra and to compare the observed IR absorption bands with those reported in the literature (Stancioff and Stanley 1969, Santos and Doty 1975), to determine its optical rotation, total sulphate content and solubility in potassium chloride.

Phycocolloids of the agar type are known to have negative optical rotation whereas carrageenans have positive optical rotation (Lawson *et al.* 1973). Agar-type phycocolloids also have a significantly lower degree of sulphation than carrageenans (Stoloff 1962). It is also known that some types of carrageenans (eg., ι- and κ-carrageenan) are insoluble in potassium chloride solution whereas others (eg., λ-type) are soluble (Stancioff and Stanley 1969). Through these tests, therefore, it was hoped that new information would be obtained on the nature of the phycocolloid from *Laurencia*. The information so obtained on *L. papillosa* highlights the potential of the genus in phycocolloid industry.

Materials and Methods

Source of Materials

The plants of *Laurencia papillosa* used in this study (Fig. 1), were harvested from Oyster Bay and Msasani Bay, Dar es Salaam, Tanzania. The seaweed occurs in a wide range of habitats: in permanently immersed intertidal rock pools, in intertidal habitats outside rock pools