

STUDIES ON THE FREE AMINO ACID CONTENTS OF SPECIES OF CAULERPA FROM BOMBAY

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INTRODUCTION

The protein hydrolysates of three species of *Caulerpa* viz., *Caulerpa racemosa* (Forsk.) J. Ag. var. *uvifera* (Turn.) Web. v. B. f. *condensata* (Kütz.) Web. v. B., *Caulerpa peltata* (Lamx.) Web. v. B. var. *typica* Web. v. B. and *Caulerpa sertularioides* Gmel. f. *typica* Web. v. B. have been recorded by the authors (Lewis and Gonzalves, 1959 a). They have recorded, also, the protein hydrolysates in the erect and creeping fronds of the same three species (Lewis and Gonzalves, 1959 b). This paper deals with the free amino acid contents of whole plants and erect fronds of the three aforesaid species of *Caulerpa*.

The free amino acid contents of marine algae have been studied recently by workers such as Coulson (1953), Smith and Young (1953), Young and Smith (1958), Jones (1958) and Lewis and Gonzalves (1959 c); but, so far, except for the work of Lewis and Gonzalves (1959 c), no results of investigations on the free amino acid contents of marine algae from the coast of India have been published.

MATERIAL AND METHODS

The same methods described previously were followed for the collection and preservation of the algae (Lewis and Gonzalves, 1959 a), for the extraction and preparation of the free amino acid samples (Lewis and Gonzalves, 1959 c), and for the identification and estimation of amino acids by paper chromatographic technique (Lewis and Gonzalves, 1959 a).

RESULTS

The analytical results are given in Table I.

A study of the free amino acid contents of the three species of *Caulerpa* reveals that alanine, aspartic acid, glycine, leucine(s), threonine and valine were consistently found in estimable amounts in all the three species. Cystine, glutamic acid, proline, serine and tyrosine were detected either in estimable amounts or in traces. Arginine and methionine were detected in estimable amounts in *Caulerpa racemosa* var. *uvifera* f. *condensata*, while in the other two species they were absent. Phenylalanine was consistently found in traces in all the three species. Ornithine was detected in traces in *Caulerpa racemosa* var. *uvifera* f. *condensata*. Histidine was recorded in traces in *Caulerpa sertularioides* f. *typica*.

TABLE I
Percentage of Free Amino Acids in Species of *Caulerpa* from Bombay
(Calculated on the basis of per cent dry weight of algae)

Amino acid	<i>Caulerpa racemosa</i> var. <i>uvifera</i> f. <i>condensata</i>		<i>Caulerpa peltata</i> var. <i>typica</i>		<i>Caulerpa sertularioides</i> f. <i>typica</i>	
	Entire plants	Erect fronds	Entire plants	Erect fronds	Entire plants	Erect fronds
? Alanine ..	0.063	0.017	0.00068	0.00048	0.0040	0.0021
Arginine ..	0.031	—	—	++	—	—
Aspartic acid ..	0.019	0.012	0.0069	0.0042	0.0049	0.0036
Cystine ..	0.0084	0.0091	++	++	++	++
Glutamic acid ..	0.015	0.0074	+++	++	++	++
Glycine ..	0.0066	0.0020	0.004	00.0042	0.0029	0.0021
Histidine ..	—	—	—	—	+++	+++
Hydroxyproline ..	—	—	—	—	+	—
Leucine(s) ..	0.057	0.011	0.00053	0.00041	0.0043	0.0027
Lysine ..	0.0042	++	++	++	—	—
Methionine ..	0.023	—	—	—	—	—
Ornithine ..	++	++	--	--	--	--
Phenylalanine ..	++	++	++	++	++	++
Proline ..	0.16	0.16	++	++	0.0053	0.0013
Serine ..	0.014	0.0031	++	++	+	+
Threonine ..	0.021	0.018	0.0034	++	0.0054	0.0031
Tyrosine ..	0.061	++	++	++	++	++
Valine ..	0.011	++	0.0024	++	0.0017	++
Total number of amino acids detected ..	17	15	15	15	15	14

— Absent + Traces

A comparison of the free amino acids occurring in the entire plants with those occurring in the erect fronds revealed that in *Caulerpa racemosa* var. *uvifera* f. *condensata*, alanine, aspartic acid, cystine, glutamic acid, glycine, leucine(s), proline, serine and threonine were consistently found in estimable amounts both in entire plants as well as in erect fronds. Tyrosine and valine were found in estimable amounts in the entire plant, while they were found in traces in the erect fronds. Arginine and methionine, though found in estimable amounts in the entire plants, were totally absent in the erect fronds. Ornithine and phenylalanine were only detected in traces both in entire plants as well as in erect fronds. Cystine, phenylalanine, ornithine, proline and threonine were more or less in equal concentration in entire plants as well as erect fronds. Marked variations were observed in the concentrations of alanine, aspartic acid, glutamic acid, glycine, leucine(s), lysine, serine, tyrosine, and valine in entire plants and erect fronds, the amount in the former being considerably more than in the latter.

In *Caulerpa peltata* var. *typica* alanine, aspartic acid, glycine, and leucine(s) were consistently found in estimable amounts in the entire plants as well as in the erect

fronds. Though threonine and valine were found in estimable amounts in the entire plants, they were detected in traces in the erect fronds. The other amino acids such as cystine, glutamic acid, lysine, phenylalanine, proline, serine and tyrosine were in traces. Arginine though absent in the entire plant was detected in traces in the erect fronds.

Alanine, aspartic acid, glycine, leucine(s), proline and threonine were found to be more concentrated in the entire plants of *Caulerpa sertularioides* f. *typica* than in the erect fronds. Cystine, glutamic acid, histidine, phenylalanine, serine, and tyrosine were in traces both in entire plants as well as erect fronds.

From the above it may be concluded that the greatest variation both in quality and quantity of free amino acids in the entire plants and erect fronds was observed in *Caulerpa racemosa* var. *uvifera* f. *condensata*. A slight variation was observed in the quality of amino acids in *Caulerpa peltata* var. *typica*, while quantitatively the concentration of free amino acids was greater in the entire plants than in the erect fronds. Hardly any variation in the quality of the free amino acids was observed in *Caulerpa sertularioides* f. *typica*, while quantitatively some amino acids were slightly more concentrated in the entire plants than in the erect fronds. The decrease in the free amino acid concentrations observed in the erect fronds, to a certain extent, may be due to the loss of sap which escapes during the cutting operation of the specimens.

SUMMARY

Three species of *Caulerpa* were analysed for free amino acid contents by quantitative paper chromatographic technique. In all, nineteen amino acids were detected in the free state. The erect fronds of the three species were analysed separately for free amino acids and the results were compared with those obtained from the entire plants.

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