

AMINO ACID CONTENTS OF THE ERECT AND CREEPING FRONDS OF SPECIES OF *CAULERPA* FROM BOMBAY

BY E. J. LEWIS AND ELLA A. GONZALVES
Department of Botany, Institute of Science, Bombay, India

INTRODUCTION

IN recent times, several papers have appeared on the amino acid contents of algae, but so far, there has been practically no record of the distribution of amino acids in the different morphological parts of one and the same alga. Since the species of *Caulerpa* can be conveniently differentiated into erect fronds and creeping fronds, they were selected for study. An attempt was made to ascertain whether the amino acid contents in the different parts of one and the same plant show any variations in their concentrations. The erect fronds and creeping fronds of three species were analysed separately and the results were compared with those of a previous investigation for the entire plant (Lewis and Gonzalves, 1959).

MATERIAL AND METHODS

The specimens selected were *Caulerpa racemosa* (Forsk.) J. Ag. var. *uvifera* (Turner) Weber-van Bosse f. *condensata* Weber-Van Bosse (Collected on 2-2-1956, Colaba, Bombay); *Caulerpa peltata* Lamour. var. *typica* Weber-van Bosse (2-3-1956, Colaba, Bombay); and *Caulerpa sertularoides* (Gamel) Howe f. *typica* Boergs. (5-1-1956, Colaba, Bombay).

The specimens were growing in abundance on rocks near the low-water mark on the shores of Bombay. They were collected, cleaned and the erect fronds were separated from the creeping fronds. Each of these parts was dried separately, powdered and preserved.

The experimental methods followed and chromatographic technique used were according to Lewis and Gonzalves (1959).

RESULTS

The analytical results are given in Table I and the results are calculated on the basis of per cent dry weight of algal powder.

DISCUSSION

A comparison of the results with those for the entire plants (Lewis and Gonzalves, 1959) revealed, in all, twenty amino acids in the three species of *Caulerpa* and its various parts. Hydroxyproline was undetected in the entire plants and erect fronds

of *Caulerpa racemosa* and in the entire plants of *Caulerpa sertularoides*. Its absence in the entire plants seems inexplicable, since it was found in some of the separated parts of the same plants. However, as it occurs in traces, it is likely that its presence escaped detection.

Of the twenty amino acids recorded, alanine, arginine, aspartic acid, glycine, glutamic acid, histidine, isoleucine, leucine, methionine, phenylalanine, proline, serine, threonine, tyrosine and valine are found to be major constituents; cystine and lysine are minor constituents; while hydroxyproline, ornithine and tryptophan are in traces. These observations are in agreement with those of Lewis and Gonzalves (1959).

TABLE I
PERCENTAGE OF COMBINED AMINO ACIDS IN THE ERECT AND CREEPING FRONDS OF SPECIES OF *CAULERPA*

(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 sertularoides</i> f. <i>typica</i>	
	Erect fronds	Creeping fronds	Erect fronds	Creeping fronds	Erect fronds	Creeping fronds
Alanine	0.98	0.68	1.57	1.14	1.31	0.91
Arginine	0.76	0.74	1.23	1.45	1.30	0.87
Aspartic acid	0.88	0.83	1.31	1.11	1.37	0.95
Cystine	++	++	++	+++	0.38	0.16
Glycine	0.65	0.55	1.15	1.07	1.10	0.65
Glutamic acid	0.54	0.52	1.52	1.49	1.00	0.67
Histidine	1.44	1.35	2.12	2.54	1.66	1.40
Hydroxyproline	—	++	+	++	+	+
Isoleucine	0.53	0.40	1.11	0.74	1.80	1.24
Leucine	0.56	0.43	1.16	0.78	1.80	1.54
Lysine	0.66	0.78	0.84	0.78	0.17	0.13
Methionine	2.26	1.79	3.47	3.28	3.08	1.88
Ornithine	++	++	++	++	++	++
Phenylalanine	0.87	0.65	1.57	1.08	1.25	0.67
Proline	3.80	1.31	5.43	5.01	5.63	3.18
Serine	1.11	0.74	0.61	0.59	1.00	1.00
Threonine	0.77	0.91	1.38	1.00	1.18	0.74
Tryptophan	++	++	+	+	+	+
Tyrosine	2.64	2.10	6.27	5.49	3.88	2.83
Valine	0.92	0.89	1.66	1.04	2.45	1.26
Total number identified	19	20	20	20	20	20
Total amount estimated	19.37	14.67	32.40	28.59	30.36	20.08

The concentration of arginine, aspartic acid, cystine, glycine, serine and valine did not vary appreciably in the different morphological parts of *Caulerpa racemosa*, but appreciable variations in the concentration of the other amino acids were observed. Cutting appreciably affected the concentration of all amino acids, except

cystine, glycine, methionine and tyrosine in *Caulerpa peltata* ; while cutting appreciably affected almost all amino acids in *Caulerpa sertularoides*.

It was observed that the entire plants, erect fronds and creeping fronds of one and the same alga contained combined amino acids in decreasing concentrations. The lesser amounts in the erect fronds and creeping fronds may be due to the loss of sap, which escaped during the cutting operation. The higher concentration in the erect frond is to be expected as it is the seat of metabolic activities.

SUMMARY

The erect and creeping fronds of three species of *Caulerpa* found on the shores of Bombay were analysed separately by paper chromatography. In all, twenty amino acids were detected. Of them, fifteen were found to be major constituents, two minor and three in traces. The concentration of amino acids was found to be higher in entire plants than in either of the cut portions, and greater in the erect fronds than in the creeping fronds. The loss observed after cutting the specimens might have been due to the loss of sap which occurred when the specimens were cut.

REFERENCE

- LEWIS, E. J. AND GONZALVES, E. A. 1959. Amino acid contents of some marine algae from Bombay. *New Phytol.*, in press.