

Biochimie

Free Amino Acids of Some Algae

by

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Introduction

Until now there have been reported only paper-chromatography data on the free amino acids composition of a limited number of algal species ^{1,2,3,4}. In this work, the technique of ion-exchange resins⁵ combined with Technicon Auto Analyser was utilized for qualitative and quantitative determination of the free amino acids pools in 8 species of Blue-green, Green and Brown Algae. Data concerning Red Algae are also included, though they have been reported, but not published, at the 1st Seminar of Oceanography, Athens, 1970.

Materials and methods

The analyzed algae (Table 1) were collected in July 1972 from the shores of Saronic and S. Euboic gulfs. Both species of Blue-green Algae had grown in fresh water and were supplied by the Inst. of Syst. Botany, University of Athens. The specimens were transferred, at 0° C, to the Laboratory and washed by sea-water. Then, they were dried on filter-paper and weighed. The extraction of the free amino acids was carried out by the following procedure : the algae were boiled and homogenized in ethanolic solution 80 % v/v and subjected five 10 min extractions with ethanol 80, 80, 50, 50, 80 % v/v.

Group	Genera	µg/g f.w.	µg/g d.w.	Individual amino acids																
				Asp	Thr+Ser	Glu	Gly	Ala	Val	Cyst	Met	Ileu	Leu	Tyr	Phe	Lys	His	Arg		
Red	<i>Polyides</i> sp.		362	16	7	61	1	7		+		+	+	+	+				3	
	<i>Laurencia</i> sp.		176	20	11	54	11	2												
	<i>Corallina officinalis</i>		210	6	27	12	8	11								3				33
	<i>Polysiphania</i> sp.		412		29	23	41							1	1	2	1	+		
Blue-Green	<i>Lygbia</i> sp.	434	831	10	18	35	7	13			3		1	1	1	7	1			
	<i>Nastoc</i> sp.	25	767	10	14	36	6	7		3			2		6	9	6			
Green	<i>Anadyomena stellata</i>	51	379	12	11	24	11	20	2			1	3	2	3	3	3	3	4	
	<i>Halimeda tuna</i>	22.2	161	12	27	22	12	19		2						4			2	
	<i>Acetabularia mediterranea</i>	717	3374	11	20	26	10	25	3			1	1	2		+	+			
Brown	<i>Dictyota dichotoma</i>	53.5	487		52	25	22													
	<i>Cystoseira</i> sp.	15	89	27	11	28	4	13						+		+	4		8	
	<i>Padina pavonia</i>	232	1030	8	16	48	3	1	23											

Rapp. Comm. int. Mer Médit., 22, 3, pp. 13-14 (1973).

Results

The table 1 shows the obtained data in μg of free amino acids per 1 g of fresh and dry weight and gives the percentage of each amino acid, considering the total amino acid content as 100 %. A great fluctuation in the total amino acid content is observed, i.e. from 89 (Cystoseira) to 3374 (Acetabularia) $\mu\text{g/g}$ d.w. The variation among the analyzed species in the number of the free amino acids detected (6-14) is also to be noted. A high proportion, always greater than 70 %, is due to the amino acids Glu, Thr+Ser, Asp, Gly Ala, whereas the rest amino acids Val, Cyst, Met, Ileu, Leu, Tyr, Phe, Lys, His, Arg are completely absent or exist in low proportions except for Arg in Corallina (33 %).

Conclusions

1. The total free amino acid quantity determined in the analyzed algal species is very low compared to that of higher plants. For example, the total free amino acid content is in *Pisum sativum* (epicotyl hook) 120000 $\mu\text{g/g}$ d.w., *Vigna sinenses* (hypocotyl hook) 200000 $\mu\text{g/g}$ d.w., *Zea mays* (primary leaf) 130000 $\mu\text{g/g}$ d.w.

2. It is observed that the first six amino acids of the acidic fraction (Asp, Thr+Ser, Glu, Gly, Ala) constitute a percentage higher than 70 %. This result is consistent with previous works ^{1,2,3,4}.

3. Also, a great lack of essential amino acids is observed, except for Ser. This fact is in accordance with the low content of free amino acids indicates that Algae are not suggested as animal food.

References

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- [4] LANDSBERGER *et al.*, 1969. — *Bot. mar.*, **12**, p. 218.
- [5] STEIN *et al.*, 1958. — *Analyt. Chem.*, **30**, p. 1190.
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Discussion

J.M. Gastaud : Quelle est la structure de la chaîne protéidique et la séquence des acides aminés, nature des premiers et des derniers acides?

La lumière a-t-elle une influence sur la nature et le pourcentage en acides. Rapports possibles avec la longueur d'onde IR ou U.V.

Réponse : Pas dans les algues. Mais on a 660 m μ *Pisum sativum*.

L. John : Since you analyze only for the free amino acids, how are you say anything about nutritional in adequacy of the total tissue protein?

Réponse : Néant.

N. Friligos : What are the advantages of Technicon?

R-gradient de 2,75 à 6' passage en 5 heures. Le technicon sépare les acides aminés, permet de programmer l'analyse. Chaque analyse se fait en trois heures pour 18 acides aminés.

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