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A Study on the Aminoacid composition of different algae isolated from Porur lake, Chennai, Tamilnadu, India

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A B S T R A C T

Microalgae serves as source of quality protein which mammalian systems can assimilate into their body and is available in the form it can be incorporated into their cells. In the present investigation an attempt has been made to evaluate the amino acid composition of freshwater microalgae.

Introduction

Microalgal species of chlorella and spirulina are being produced commercially for their good quality protein content and are being used in food and feed. Algae contribute to the nutrition of their animal hosts in two ways; firstly the animals are provided with the photo synthetically derived carbon, secondly nitrogen recycling is achieved by algae through the assimilation of animal derived nitrogenous waste compounds into compounds especially amino acids which are translocated back to animal tissues.

Essential amino acid translocation from the symbiotic algae to the animal host is a core process in the symbiotic nitrogen fixation.

This is a special feature of algal cells and varies from that of the animal cells which cannot perform photosynthesis and cannot synthesize essential amino acids (Leucine, Isoleucine, Phenylalanine., Valine, Histidine, Arginine, Lysine, Methionine, Tryptophan, Threonine). Amino acid composition determines the protein quality of algae which may be employed in the development of new foods or additives for human and animal consumption.

The current study is aimed to assess the Amino acid composition of certain selected algal species that were isolated from a natural water body and that was grown in a medium enriched with a nitrogen source,

namely urea for providing the maximum possible nitrogen to the cells.

Earlier nutritional studies of microalgae as foods and feeds have shown that algal proteins are of high quality, comparable to conventional vegetable proteins in terms of their content of essential amino acids, which mainly determine the nutritional quality of a protein source. Little information is available on the nutritional value of algal proteins. Amino acid compositions of protein isolate were favorable with FAO Standards.

Materials and Methods

The algal samples were collected from the lake situated in Porur, Chennai, India. Certain identified species namely *chlamydomonas sp.*, *chlorella sp.*, *anabena sp.*, *spirogyra sp.*, *spirulina sp* and *euglena sp.*, were isolated from the water samples.

Amino acid analysis was performed with 2g of dried respective algal species which were boiled in a refluxed condenser with 200ml of 6N Hydrochloric acid for 24 hours. Hydrochloric acid is evaporated .50 – 70 ml of water is added to the remaining thick paste.

The solution is neutralized and diluted to a suitable volume and filtered. For the determination of tryptophan, hydrolysis is carried out by autoclaving with 4N-sodium hydroxide, for 16 hours (at 15 pound pressure). This sample is injected into the automated amino acid analyzer and analysed for their amino acid composition.

Results and Discussion

Levels of amino acids were quite variable between species. The amino acid compositions of the isolated *spirulina sp* were quite richer in *leucine*, and had high

levels of all tested amino acids. This is followed by isolated *chlorella sp*, then by the isolated *chlamydomonas sp*.

The amino-acid compositions were compared with those of standard reference protein rich foods (egg, soya, fish, milk, meat). Study of the amino acid profile of these six green algae, has shown that five amino acids occurred in high concentration in all of them. These were lysine, phenylalanine, isoleucine, tryptophan, and arginine. Histidine is the least in all the tested species.

The results are tabulated in table 1. Amino acid profile of different algae as compared with conventional protein sources and the WHO/FAO reference pattern (g per 100 protein), reveal that the levels of the essential amino acids in the microalgae were either similar to or greater than the levels of the same amino acids in the reference foods which are given in table 2, thus indicating a high protein quality for all micro algal species. (Becker (2007), Fabregas and Herrero (1985). The results obtained in the present investigation indicated the correlation between the standard sources for the proteins with complete biological score as is evident from the values expressed in table 1. against that of values found in table 2.

Conclusion

Amino acid composition determines the protein quality of algae. The results reveal that the levels of the essential amino acids in the microalgae were either similar to or greater than the levels of the same amino acids in the reference foods, thus indicating a high protein quality for all tested micro algal species in the current study. Hence along with standard growth conditions supplementations are recommended to

obtain the maximum possible production of biomolecules. Production costs may be reduced if mass culture is used. The algal species may be thus be employed in the development of new foods or additives for

human and animal consumption after performing clinical trial experiments. The food value of Algae may be used to cope with the future food shortages

Table.1 Amino acid Profile of different algae

Name of the Algal source	<i>Ile</i>	<i>Leu</i>	<i>Val</i>	<i>Lys</i>	<i>Met</i>	<i>Phe</i>	<i>Thr</i>	<i>Trp</i>	<i>Arg</i>	<i>His</i>
<i>Chlamydomonas sp.</i> ,	0.296	0.112	0.125	0.541	0.368	0.919	0.847	0.598	0.013	0.007
<i>Chlorella sp</i>	0.297	0.102	4.258	0.698	0.985	1.568	0.987	0.548	0.013	0.006
<i>Spirulina sp</i>	3.550	7.734	5.258	4.355	1.564	2.565	4.991	1.66	5.542	1.520
<i>Spirogyra sp</i>	0.219	0.598	0.558	0.585	0.367	0.568	0.589	0.515	0.884	0.454
<i>Anabena sp</i>	0.198	0.185	0.598	0.562	0.598	0.254	0.255	0.522	0.265	0.854
<i>Euglena sp.</i> ,	0.255	0.154	0.158	0.252	0.549	0.958	0.215	0.588	0.582	0.876
Values are expressed as g %										

Abbreviations : *Ile* – Isoleucine; *Leu* – Leucine; *Val* – Valine; *Lys* – Lysine; *Met* – Methionine; *Phe* – Phenylalanine; *Thr* – Threonine; *Trp* – Tryptophan; *Arg* – Arginine; *His* - Histidine

Table.2 Amino acid Profile of with conventional protein sources

Name of the source	Ile	Leu	Val	Lys	Met	Phe	Thr	Trp	Arg	His
Egg	4	8	7	5	3	6	2	1	6	2
Meat	4	7	5	5	-	5	2	1	6	3
Fish	2	4	5	7	2	4	1	-	6	2
Milk	5	9	2	4	2	5	2	1	3	1
Soyabean	4	7	5	8	2	4	4	7	7	1

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