

Distribution of Tocopherol (Vitamin E) in Marine Algae from Goa, West Coast of India

V JAYASREE, SOLIMABI & S Y KAMAT

National Institute of Oceanography, Dona Paula, Goa 403004

Received 18 March 1985; revised received 2 August 1985

Tocopherol content has been estimated in 17 marine algal species belonging to Chlorophyceae, Phaeophyceae and Rhodophyceae following the dipyriddy - FeCl₃ method after alkaline saponification. The content estimated for the first time in most of the algae varies from 0.66 to 7.65, 0.35 to 24.5 and 0.8 to 8.9 mg.kg⁻¹ (wet wt) respectively in green, brown and red algae.

Occurrence of tocopherol in marine algae has been reported¹⁻³ though its quantity has so far not been estimated. Considering the importance of tocopherol for its indirect medicinal effect and of the fact that no information is available on it in Indian marine algae, the present study has been made.

Marine algal samples belonging to Chlorophyceae, Phaeophyceae and Rhodophyceae were collected from the intertidal zone during premonsoon (Feb.-May) and postmonsoon (Oct.-Jan.) periods from Anjuna (lat. 15°34' 45"N; long. 73°44' 20"E) and Cabo-de-Rama (lat. 15°5' 68"N, long. 73°54' 55"E). Each sample was carefully sorted to remove contamination by extraneous matter such as epiphytes, washed with fresh water and briefly rinsed with distilled water. Soon after each sample was either frozen at 0°C for later extraction or extracted with acetone after grinding. The acetone extract was concentrated at reduced pressure and taken into light petroleum and traces of acetone washed with water. The petroleum ether extract was concentrated at reduced pressure saponified and the total tocopherol content determined by dipyriddy-FeCl₃ technique⁴. Estimations were repeated twice and mean values represented on wet weight basis.

Most of the present species were analysed for the first time for their tocopherol content. There was a wide variation in tocopherol concentration among the different species studied (Table 1). It varied from 0.66 to 7.65, 0.35 to 24.5 and 0.8 to 8.9 mg kg⁻¹ respectively in green, brown and red algae.

High concentration of tocopherols was in brown algae followed by green and red algae. These results are in agreement with those reported by Jensen³. On the basis of available data, exceptionally low values obtained for the brown algae *Sargassum tenerrimum* and *Spatoglossum asperum* are unexplainable. Further, it is very difficult to generalize the pattern of

tocopherol content in different algae even though, the green algae are expected to be rich in tocopherol since it is known to occur together with chlorophyll in chloroplast at least in higher plants⁵.

The concentration of tocopherol in algae reflects primarily the balance between the biosynthetic accumulating capacity of algae for tocopherol and the rate at which it is being converted to quinone as it is known to act primarily as an antioxidant for preserving the physiological lipid profile in membranes⁵.

Since the algae were collected from natural habitat it is not known whether tocopherol was actually

Table 1 - Tocopherol Content (mg.kg⁻¹ wet wt) in Different Marine Algae

CHLOROPHYCEAE	
<i>Caulerpa racemosa</i> (J. Agardh)	4.91
<i>Chaetomorpha media</i> (C. Agardh) Kuetzing	7.65
<i>Codium elongatum</i> (C. Agardh)*	0.66
<i>Enteromorpha</i> sp.	3.84
<i>Ulva fasciata</i> (Delile)	
PHAEOPHYCEAE	
<i>Dictyota</i> sp.	24.50
<i>Padina tetrastratica</i> (Hauck)	21.66
<i>Sargassum tenerrimum</i> (J. Agardh)	0.35
<i>Spatoglossum asperum</i> (J. Agardh)	1.76
<i>Stoechospermum marginatum</i> (C. Agardh)	14.55
RHODOPHYCEAE	
<i>Acanthophora spicifera</i> (Vahl) Borgesen	0.80
<i>Centroceras clavulatum</i> (Ag) Mont	8.91
<i>Chondria armata</i> (Kuetz)	3.00
<i>Gelidiella</i> sp.	4.40
<i>Gracilaria corticata</i> (J. Agardh)	2.23
<i>Hypnea cervicornis</i> (J. Agardh)	6.78
<i>Hypnea musciformis</i> (Wulfen)	3.11

* Collected from Cabo-de-Rama while all other species were collected from Anjuna

biosynthesized by the alga or concentrated from the environment. Unlike green and brown algae, red algae do not synthesize the water soluble vitamins (vitamin B₁₂, thiamine and biotin) and whatever concentrations have been reported were due to their accumulation from the environment⁶. In analogy with this, one may infer that the same appears true for this vitamin also and hence the lowest concentrations in red algae. Tocopherol, whether synthesized or accumulated from the environment is not, unlike water soluble vitamins, an essential growth factor for the marine algae.

The authors express their sincere thanks to Dr V V R Varadachari, former Director for encouragement and

facilities and to Dr R Sen Gupta for valuable suggestions.

References

- 1 Hoppe H A, in *Marine algae in pharmaceutical science*, edited by H A Hoppe, T Levring & Y Tanaka (Walter de Gruyter, Berlin) 1979, 82.
- 2 Brown F, *Chem Ind*, 21 (1953) 174.
- 3 Jensen A, in *Proc Int Seaweed Symp*, 5 (1966) 281.
- 4 Robert W L, in *Methods of biochemical analysis*, Vol 2, edited by D Glick (Interscience Publishers, New York) 1965, 155.
- 5 Booth V H, *Phytochem*, 2 (1963) 421.
- 6 Provasoli L, in *The sea*, Vol 3, edited by M N Hill (Interscience Publishers, New York) 1963, 181.
- 7 Droop M R, in *Physiology and biochemistry of algae*, edited by R A Lewin (Academic Press, New York) 1962, 153.