STUDIES ON MINERAL COMPOSITION OF BROWN ALGAE OF SAURASHTRA COAST

ABSTRACT

Brown algae belonging to ten genera representing seventeen different species collected from all over Saurashtra region were analysed for mineral composition such as total ash, insoluble ash, sodium, potassium, calcium, magnesium and sulphate content. The results are fully discussed and compared with other published data.

STUDIES on the mineral composition of Indian marine algae has received considerable attention in recent years (Rao, 1970). Although Saurashtra region abounds in seaweeds, information on mineral composition of algae of the area is wanting. The mineral composition of brown algae from Saurashtra Coast is reported here. The species studied are given in Table 1, along with the place and time of collection.

Authors wish to acknowledge their grateful thanks to Dr. (Mrs.) Francisca Thivy, a former algologist of this Institute for confirming the identification of algae included here, while Dr. D. J. Mehta, Scientist-in-Charge for kind encouragement and permission to publish this work.

Materials and Methods

Algae were collected, dried, powdered and preserved as followed by Lewis (1973). Methods of analysis as laid down in Piper's (1950) soil and plant analysis and official methods of analysis of AOAC (1960) were followed in the analysis of major constituents. Ash was determined by ashing the material at 550°C for 5 hours; sodium and potassium were estimated by flame photometer; calcium and magnesium were estimated by titrations with EDTA solutions. Sulphate was estimated gravimetrically by precipitating and weighing as $BaSO_4$. Insolubles were estimated by weighing the residue of ash after extracting with hydrochloric acid. The constituents are calculated as per cent dry weight of alga.

Ash: Total ash content varies among different algae - lowest is recorded for *Spathoglossum* and highest for *Iyengaria*. There is considerable variation in different species of same genus although at times the same species collected from different localities as *Iyengaria* show no much variation. It can be noted that fluctuation observed in different species fall within the fluctuation level, and accordingly different genera can be arranged in ascending order of ash content as follows: *Dictyopteris, Spathoglossum, Cystophyllum, Sargassum, Cystoseira, Padina, Levringia, Dictoyta, Stoechospermum* and *Iyengaria.*

Insoluble ash: The percentage of insoluble in ash is ten per cent of ash but the percentage is considerably less for *Sargassum* and *Stoechospermum* and considerably high in *Dictyopteris.*

Sulphate: Considerable variations are observed in sulphate content of different genera. Lowest values are observed for *Stoechospermum* and highest for *Padina.* In *Spathoglossum* lowest ash content and highest sulphate content are observed. Probably this may be the reason that the sap content of this alga is very low and it goes sometimes up to pH 1, probably high sulphate content in ash in *Dictyopteris* as well as *Spathoglossum* might have been the cause of discolouration of the samples during collection.

Calcium: Calcium content vary considerably among different genera. Lowest values are observed in *Spathoglossum* and *Cystophyllum* while highest in *Dictyota.* There is no correlation between sulphate and calcium content of the ash of the plant. It is interesting to note that *Padina* being a calcarious algae contains less calcium than *Dictyota.*

Magnesium: Magnesium content in different alga is small comparing the other constituents studied here. *Padina* which contains fairly high quality of magnesium, also has high sulphate content.

Sodium: High content of sodium is observed in *Iyengaria* probably because of the tubulous nature of the plant, and seawater might have been retained in the plant even after washing in tap water, this might have resulted in higher sodium content in the alga. Probably, same may be the reason for high insoluble ash content of the alga.

Potassium: Potassium varies considerably among different genera and species and it generally accounts about a fifth of the total ash content. These observations does not hold true specially for *Sargassum* and *Stoechospermum* where potasium accounted nearly thirty per cent. *Iyengaria* on the whole contains very high amount of potassium, which accounts nearly a sixth of the total dry weight of the plant while *Dictyopteris* accounts at times less than five per cent.

Comparing the data with earlier workers from India, it can be seen from Table 1 that generally ash content reported here agree to some extent as reported by Rao and Tipnis (1967) but do not support the view that brown algae contain less sulphate as compared to green algae. Some of the species studied here contain sulphate as much as that reported for *Ulva,* a richest green alga reported by them. Moreover, ratio between potassium and ash also recorded fairly high than reported by them.

TABLE 1. *Mineral composition in phaeophyceae of Saurashtra Coast (The results are calculated as per cent dry weight of alga)*

Species	Place of collection	Month of collection	Ash	Insoluble ash	Sulphate	Calcium	Magnesium	Sodium	Potassium
Dictyota atomaria Hauck.	Okha Port	October	24.97	2.28	8.34	4.81	1.46	1.41	5.87
Dictyota bartayresiana Lamour.	Okha Port	October	31.17	0.90	3.87	6.02	2.04	1.84	7.18
,,	Okha Port	March	48.48	5.68	2.16	7.47	0.81	1.66	6.97
Dictyopteris australis Sond.	Okha Port	November	14.31	2.14	4.57	1.47	0.54	1.72	0.98
,,	Okha Port	January	22.22	5.38	9.58	3.30	0.43	1.77	0.97
Iyengaria stellata Boergs.	Adatra	November	66.61	7.64	4.51	2.39	0.68	5.67	16.45
,,	Okha Port	January	63.54	1.30	3.52	5.43	3.76	5.78	16.37
,,	Okha Port	March	68.45	4.93	3.15	4.54	0.67	7.68	15.39
Levringia borgensenii Kylin.	Okha Port	January	40.41	1.41	5.97	2.27	0.14	4.61	5.69
,,	Okha Port	March	32.95	3.52	6.53	2.47	0.81	4.22	12.27
Padina gymnospora Kuetz Vickers.	Okha Port	November	29.38	3.01	11.48	2.26	1.97	1.82	5.57
Padina tetrastromatica Hauck.	Porbandar	December	39.26	0.50	14.86	4.99	3.80	1.53	3.61
,,	Okha Port	October	30.30	2.66	4.97	7.84	3.37	1.66	4.10
,,	Chorwad	December	38.00	5.62	14.27	3.93	3.33	1.84	4.47
Sargassum cinctum J. Ag.	Chorwad	December	32.99	0.95	5.41	1.24	0.68	1.97	11.65
,,	Porbandar	December	36.62	1.99	3.82	1.24	1.15	2.14	11.42
Sargassum johnstonii Setchell & Gardner.	Okha Port	August	24.01	0.82	5.77	2.26	1.01	1.29	7.53
,,	Okha Port	November	29.93	0.65	4.94	1.58	1.08	1.97	9.83
Sargassum swartzii (Turn) C. Ag.	Okha Port	November	40.35	0.36	3.30	1.47	2.83	1.43	12.36
,,	Porbandar	December	36.53	1.18	3.39	1.90	1.36	2.33	10.80
Sargassum tenerrimum J. Ag.	Okha Port	November	39.53	2.07	1.94	1.25	0.75	1.85	13.31
Sargassum vulgare C. Ag.	Okha Port	November	28.78	2.81	4.83	3.16	0.81	1.84	5.13
,,	Veraval	December	32.15	1.48	6.53	2.37	0.83	1.84	1.45
,,	Porbandar	December	42.73	3.88	4.33	2.38	0.93	2.03	8.10
Spathoglossum asperum J. Ag.	Okha Port	November	16.92	0.88	8.62	0.90	0.57	2.21	2.62
,,	Okha Port	August	24.45	2.68	4.59	4.07	0.68	1.75	2.13
,,	Veraval	December	15.55	0.67	5.78	0.90	0.61	1.76	2.29
Spathoglossum variabile Fig. et. De Not.	Okha Port	November	16.06	1.33	3.62	2.64	0.87	1.97	2.42
,,	Okha Port	January	26.85	4.27	8.44	1.92	0.74	1.97	2.95
,,	Veraval	December	15.52	1.00	6.40	0.90	0.34	1.71	2.03
,,	Chorwad	December	13.44	1.55	7.23	0.68	0.41	1.52	2.29
,,	Porbandar	December	21.38	0.85	10.11	1.24	0.47	1.53	1.47
Stoechospermum marginatum (Ag) Kuetz.	Okha Port	November	35.43	2.94	4.12	1.59	0.54	1.97	12.52
,,	Okha Port	January	37.88	2.11	2.06	2.26	0.52	1.54	7.67
,,	Okha Port	March	32.71	0.72	2.51	2.11	0.74	1.75	9.83
Cystophyllum muricatum (Turn.) J. Ag.	Okha Port	November	22.83	3.13	4.45	1.27	0.54	1.28	3.22
Cystoseira indica (Thivy et. Doshi) Mairh.	Okha Port	August	24.01	0.97	6.11	2.28	0.81	0.79	5.53
,,	Okha Port	November	32.39	2.51	9.17	1.25	0.75	1.97	8.84
,,	Okha Port	January	40.97	13.05	5.00	4.53	0.61	2.09	4.91
,,	Porbandar	December	36.20	1.12	3.79	2.84	0.75	1.78	7.54

The present work supports the view (Vinogradov, 1953) that potassium is preferentially accumulated in *Phaeophyceae* over sodium; calcium is predominant over magnesium.

It is worth further exploring the exact mineral composition of economic seaweeds, specially to acertain the changes in amount during different stages of plant growth, relation to environment and different assimilation coefficiency so as to exploit these sources.

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