

CALORIC CONTENT OF SOME SEAWEEDS FROM GOA

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Measurements of caloric content of seaweeds were made using different methods. The values obtained by different methods agreed well. Significant correlations were obtained between calories, percentage organic carbon and percentage organic matter.

The economic importance of seaweeds as human food, animal fodder, soil dressing and extractives (organic & inorganic) has been dealt with in detail by Boney (1965). In view of their importance in aquaculture programmes, preliminary studies on the distribution of seaweeds along Goa Coast has been reported by Untawale and Dhargalkar (1975). Recently, Solimabi and Naqvi (1975) reported on the alginic acid content of the brown seaweeds of Goa. Himmelman and Carefoot (1975) have pointed out that the caloric values of seaweeds are important for the determination of feeding habits of certain invertebrate herbivores. Ostapenya and Sergeev (1963) and Thayer *et al* (1973) have demonstrated a direct correlation between the caloric content and percentage of organic matter in aquatic organisms. Platt and Irwin (1973) pointed out the importance of expressing caloric values in terms of carbon rather than gram of dry weight. The present work was undertaken keeping these views in mind and hence the correlations amongst the values obtained by the different methods were attempted.

The seaweeds were collected from the beaches of Goa. These were homogenised and oven dried at 70°C. The dried material was taken for the determination of caloric content, carbon and organic matter. Direct measurements of caloric values were also made using the method of Karzinkin and Tarkovskaya (1964) and by bomb-calorimetry (Parr semi-microbomb calorimeter) following the procedure outlined in the Parr manual. Organic carbon determinations were made according to Wakeel and Riley (1957). The samples were ashed in a muffle furnace at 600°C for 4 hrs. and the percentage of organic matter was calculated.

Table I gives caloric values estimated by Karziukin and Tarkovskaya method (referred to as Method I), bomb-calorimetry (referred to as Method II) along with the values for organic carbon and organic matter. From the present work, for the samples given in Table I, for the caloric values obtained by Method I with reference to Method II, we find the following equation:

$$\text{cal/g ash free dry wt.} = 807.0515 + 0.9617 \text{ cal (Method I) } \left(\frac{\text{Method II}}{\text{METHOD II}} \right)$$

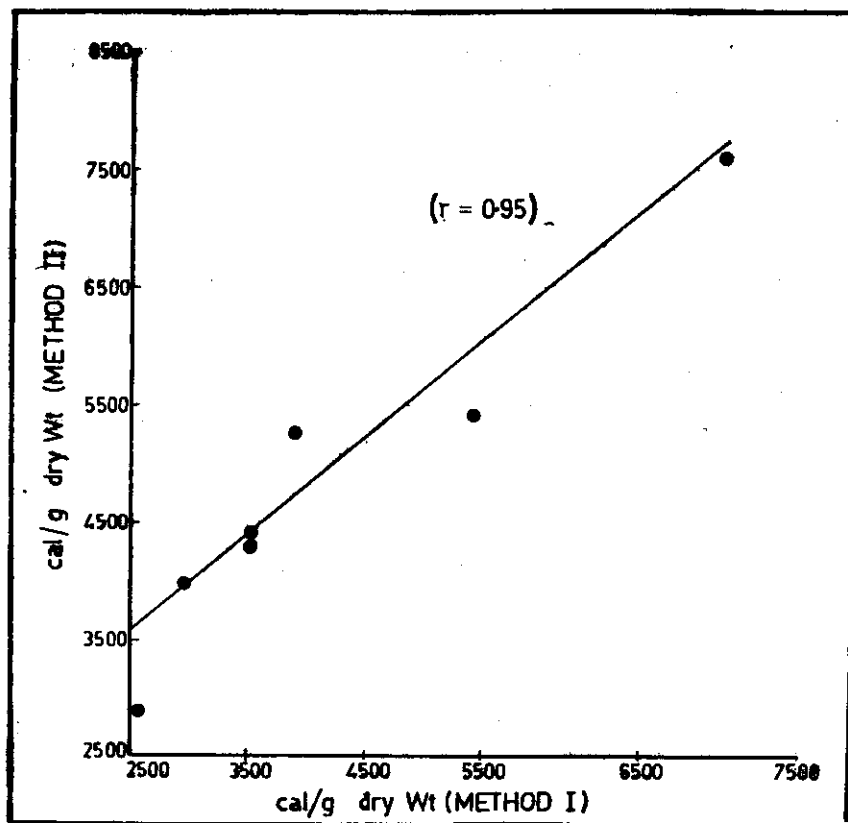


Fig. 1. Regression line for caloric values by method I versus method II.

The correlation co-efficient between the two methods has high value, $r=0.9541$ (Fig. 1) and the standard error worked out to be 13%. In the absence of microbomb calorimeter, when Method I is employed for the determination of calories, the above equation could be used.

The caloric value by the Method II ranged from 2.864 Kcal/g ash free dry wt to 7.827 Kcal/g ash free dry wt. *Ulva fasciata* recorded the minimum value and *Hypnea musciformis* the highest value. Ostapénya and Sergeev (1963) reported

that the caloric content in most of the aquatic organisms falls within a range of 5.6 to 5.8 Kcal/g dry wt. Himmelman and Carefoot (1975) while working on the seasonal variation in the caloric content of three seaweeds of the Pacific Coast gave a range of 2.6 to 3.6 Kcal/g dry wt. As compared to these ranges the present range appears to be rather wide.

The percentage of carbon content varied from 16.5 (*Ulva fasciata*) to 32.0 in *Gelidiella* spp. Platt and Irwin (1973) reported that the percentage of carbon in dry tissues should be a good indicator

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of its caloric content and stated that 1 mg of carbon in phytoplankton as equivalent to 11.4 calories. For the seaweeds analysed in the present work the correlation between calories (Method II) and the percentage of organic carbon works out to be as follows:

with a correlation co-efficient $r=0.5492$ (Fig. 2). A useful conversion factor for seaweed is 1 mg carbon=17.89 calories.

The organic matter content was found to be minimum in *Hypnea musciformis* (45.37%) and maximum in *Sargassum tenerrimum* (88.59%). Ostapenya and Sergeev (1963) and Thayer *et al* (1973) obtained a direct relationship

$$\text{cal/g ash free dry wt.} = 543.9630 + 158.3543\% \text{ organic carbon (Method II)}$$

(METHOD II)

TABLE I.—Caloric values using two different methods, % organic carbon % organic matter and calories per milligram carbon in 7 species of seaweeds.

Species	cal/g ash free dry wt		% Organic carbon	% Organic matter	cal/mg C
	Karzinkin & Tarkovskaya (1964) Method I	Bomb calorimetry Method II			
1. <i>Sargassum tenerrimum</i> J. Agrath	3131	3515	29.0	88.59	12.12
2. <i>Padina tetrastromatica</i> (Hanck)	3530	4406	22.9	63.32	19.24
3. <i>Hypnea musciformis</i> (Wulfen) Lam	7289	7827	28.7	45.37	27.27
4. <i>Gelidiella</i> sp.	3879	5359	32.0	69.96	16.75
5. <i>Ulva fasciata</i> Delile	2688	2864	16.5	70.84	17.36
6. <i>Dictyota dumosa</i> Borgesen	3540	4490	29.6	78.62	15.17
7. <i>Gracilaria corticata</i> J. Agrath	5376	5493	31.7	75.31	17.33

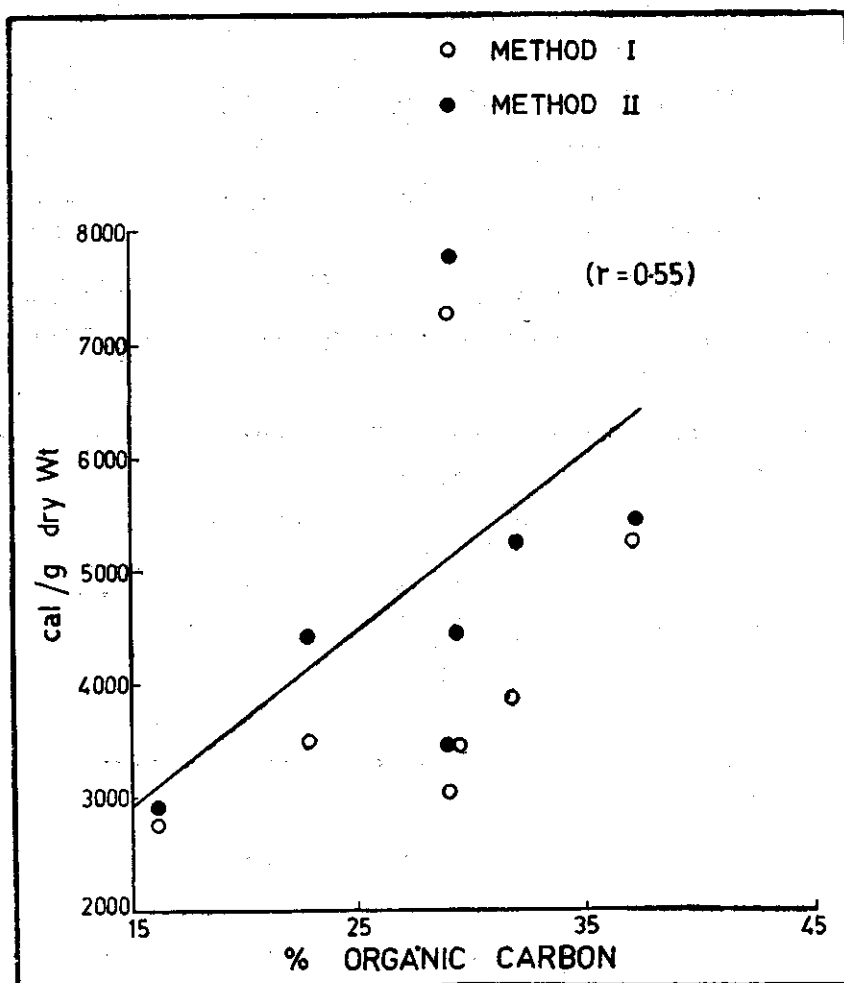


Fig. 2 Regression line for calories by method II versus per cent organic carbon

between the caloric content and the percentage of organic matter in aquatic organisms. In the present work also this was found to be true and the following equation was worked out:

cal/g ash free dry wt. = $-1321.6043 + 87.82\%$ organic matter, with a correlation co-efficient $r=0.51$ (Fig. 3).

For evaluating the potential productivity of aquatic environment, the use of standard conversion factors for the interpretation of biomass in terms of calories is required. This may vary from species to species and from season to season in the same species. These findings also indicate that from the values of carbon or organic matter, it is possible to determine the caloric value of

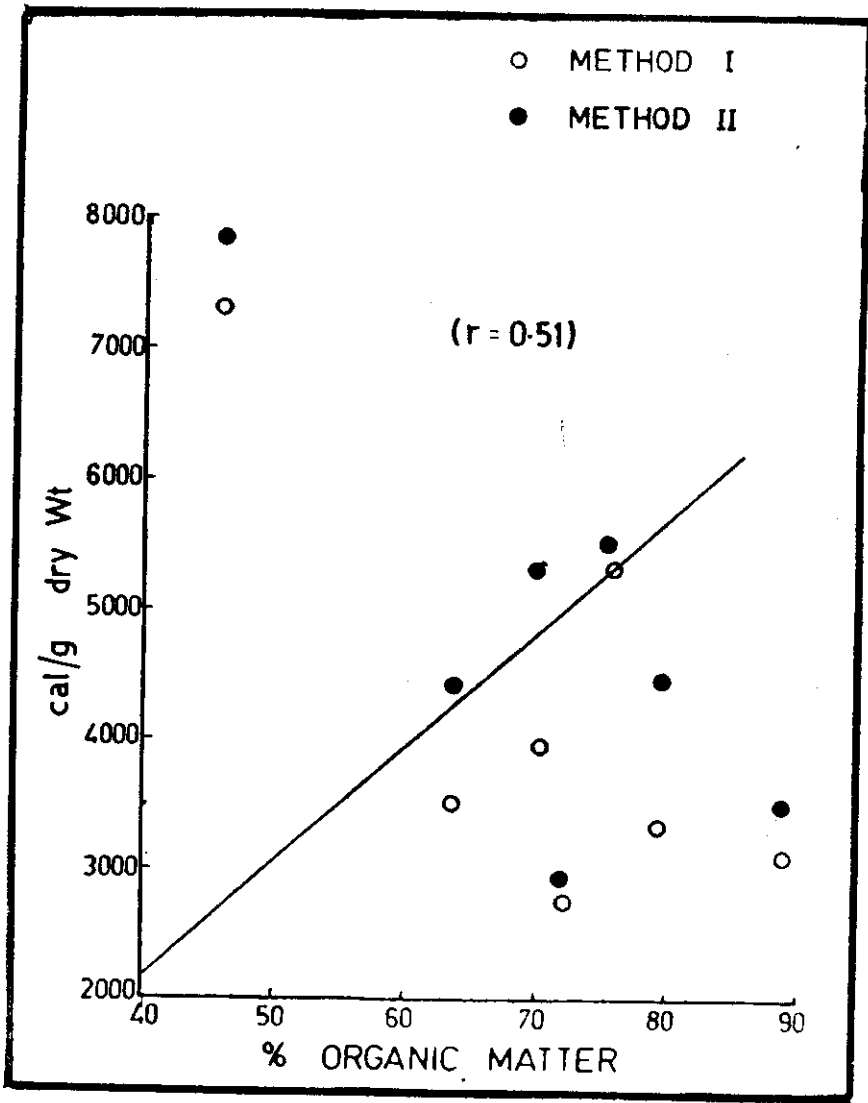


Fig 3. Regression line for calories by method II versus per cent organic matter.

a given species. Seasonal differences in the caloric content, carbon and organic matter in some of the seaweeds are being worked out.

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