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ENERGY BUDGET OF A MANGROVE SPECIES: *CYNOMETRA IRIPA*

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Abstract:
Energy content of tropical forest vegetation differs significantly i.e. depending upon the type of the forest and vegetation pattern. Energy content of each component varies considerably. The present attempt has been made to find out the energy content from different parts of a mangrove species *Cynometra iripa* such as leaves, tender branch, stem and fruit. The determination of energy value (calorific value) of the species was determined by following standard methods and total energy budget of a tree is also calculated which is a measure of utility of plant as fuel wood which depends on the quality and quantity of food reserve in it. It is seen from the experiment that the highest Calorific value is observed in the leaves followed by stem, branches and fruits. The energy content in different parts of *Cynometra iripa* varies and the range is 1397.0 to 2343.4 Kcal/kg dry wt. Leaves and stem of *C. iripa* have greater energy values than other components. Thus, the energy store in these organs is used to support growth and reproduction of the plants. Traditionally, *C. iripa* is used as fuel wood in many coastal regions of the world. The total energy budget of the species is greater than other species. Based on the studies, it is clear that *Cynometra iripa* has best fuel properties.

Key words: Mangrove, Energy budget, Energy content, Calorific value

Introduction:

Cynometra iripa Kostel. is one of the critically endangered species of mangrove from west coast of Maharashtra. It is a member of family Fabaceae. It can grow 5m to 9m tall. Energy contents of Tropical forest vegetation differ significantly i.e. depending upon the forest type and vegetation pattern. The pattern of difference was found to be complex, with maximum values varying with the plant part and forest type [3]. Previous studies of calorific values of plant materials have laid to the development of different calorimetric methods to measure such values. Earlier studies of nutritive value of some of the mangrove plants have shown some significant differences in their content [6&7]. The details of energy dynamics can only be investigated by considering the specific energy content of each particular part of community. Mangrove lives in a much more variable environment; it must resist desiccation and daily flooding by saline tides. Higher calorific values may represent on an adaptive response to environmental fluctuation by the mangrove plants.

Traditionally, *Cynometra iripa* is used as fuel wood in many regions. It is therefore essential to know fuel value or energy content of the biomass produced by plants. Energy content of each component varies considerably [10]. Therefore, the present attempt is made to find out the energy content from different parts of *Cynometra iripa* such as leaves, tender branch, stem and fruit. Further, the total energy budget of a tree is also calculated and represented. Basically there are very few reports available on *Cynometra iripa*. Very little scientific data is available. None has examined the energy content of *Cynometra iripa*. Hence, the present attempt is made.

Material and methods :

Following methodology is used to study energy content of the species.

i) Total Energy Content :

Determination of energy value (calorific value) of the species was determined by following the method of Karzinkkin, G.S. and Tarkovaskay [8]. A substantial part of the sample material was made by cutting small pieces of 5 cm length from the stem, side branches, the leaf and fruit sample was collected and dried at 60°C in oven till constant weight is attained. Then these dried plant materials were made into fine powder and used as source of plant material to estimate calorific value.

ii) Total Energy budget :

Calorific value of each component is determined by multiplying by dry weight of component (Biomass). Total energy content of the tree is estimated by summing the calorific values of each component. Thus energy budget of a tree is determined.

Results and discussion :

The calorific value is the number of heat units liberated when a unit weight of material is burnt in oxygen [2]. It can be defined as the amount of heat to required to raise the temperature of one gm of water through 1°C means the calorific value is nothing but a measure of utility of plant as a fuel wood depends upon the quality and quantity of food reserve in it.

i) Total Energy Content :

The calorific value is a measure of utility of plant as a fuel wood depends upon the quality and quantity of food reserve in it. Therefore, the values in fruit, stem and leaves are variable. The energy content in different parts of the *C. iripa* is given in Table-1 and Fig. 1. It is seen that highest calorific value is in the leaves followed by stem, side branches and fruit. [9]. has reported calorific value of some tree species. According to him *A. lebbek* and *A. nilotica* have 5200 Kcal/kg and 4870 Kcal/kg, respectively. The present values are slightly different i.e. *C. iripa* shows lower values than *A. lebbek* i.e. in the range of 1397.0 to 2343.4 Kcal/gm dry wt.

The values in fruit, stem and leaves are variable. The energy content in different parts of *Cynometra iripa* varies and the range is 1397.0 to 2343.4 Kcal/gm dry wt., apparently there was a gradient in energy content of tree species *Cynometra iripa*. These observations support previous results that the energy values of mangrove forest are generally greater than those of other communities. Each forest has its own pattern of compartment differences. Leaves and stem of *C. iripa* have greater energy values than other vegetation components. The energy stored in these organs is used to support growth and reproduction of the plants. On and obsolute basis stems and leaves often has a greater energy values.

Calorific values of different species viz. *A. ampliceps* and *C. fistula* shows 4118 Kcal/kg and 5161 Kcal/kg respectively, which was reviewed by Hocking [5] . Comparatively the present values of *C. iripa* are lower. Banik [1] has recorded calorific values of few species after 3.5 years, the same species after 8 years have higher values. This indicates that with increase in age there is increase in energy content of the wood.

ii) Total Energy Budget :

Table1 represents the energy budget of a tree. From the table it is evident that total energy budget is observed in *C. iripa* is 7617.3 Kcal/tree. The tree has higher biomass; therefore, tree of *Cynometra iripa* has higher value of total energy budget.

Table 1: Total energy content and total energy budget of *Cynometra iripa* (cal/gm dry wt.)

Energy content (Kcal/kg dry wt.)

Plant Part	Energy content (Kcal/kg dry wt.)	Total energy budget (Kcal/kg dry wt. of tree)
Leaves	2343.4	7617.3
Tender branches	1622.4	
Stem	2253.3	
Fruit	1397.0	

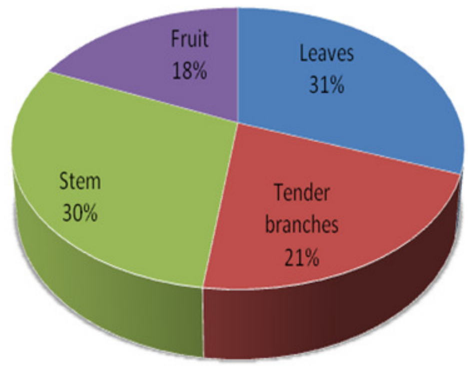

Figure 8.1 Energy content from different parts of *Cynometra iripa*.

Haines and foster [4] have reported calorific values of plant parts from selected tropical forest. The canopy leaves contain 4100 Kcal/kg to 4400 Kcal/kg, under story leaves have 3800 Kcal/kg to 4300 Kcal/kg whereas twigs and bark have 4977 Kcal/kg. These values can be compared with present results.

Verma [12] has reviewed the energy budget of Diara land ecosystem. He studied the annual energy fixation (3409.53 Kcal/m^3/year). Untawale (1998) has reported calorific value of some mangrove species. According to him *Sonneratia apetala* has 4901.0 Kcal/kg; *Rhizophora mucronata* 4888.0 Kcal/kg; *Aegiceras corniculatum* has very low value, whereas the enegy content of *Heritiera minor* and *Ceriops tagal* is 5028 Kcal/kg and 5150 Kcal/kg respectively.

Conclusion:

Thus, from the above results it is clear that *Cynometra iripa* has higher energy content. The stem and leaves have greater values than wood of other mangrove species. *Cynometra iripa* has best fuel properties in all plant organs.

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