

## SOLAR ENERGY UTILIZATION EFFICIENCY OF TYPHA WETLAND

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DURING recent years considerable amount of data have become available on the rates of production of organic matter in a number of ecosystems<sup>1,2</sup>. However, the information on the efficiency of utilization of solar energy (ecological efficiency) is meagre<sup>3</sup>. This paper reports data for a *Typha* wetland in semi arid zone of the country.

A large stand of *Typha elephantina*, occurring in about 200–300 m wide and 5 km long belt, grows about 8 km south of Jaipur in the western part of the Government Agricultural Farm. It occupies the basin of a drain, one side of which has steep margins while the other has a gradual slope ending into agricultural fields. The area has been divided into three zones namely, submerged, marsh and dry on the basis of moisture regimes.

The above ground production in *Typha elephantina* Roxb. had been estimated by the harvest method. The underground production was considered to be 50% of aboveground production<sup>4</sup>. The data show that net annual production of *T. elephantina* varies from 1990.8–3696.1 gm<sup>-2</sup> yr<sup>-1</sup> in different zones of wetland<sup>5</sup>.

The energy content of leaves and rhizome was estimated by bomb calorimetry. The plant material was dried in hot air oven at 80°C and ground to a fine powder in an iron mortar.

The energy content of leaves and rhizome was 3689.0 cal, 3361.0 cal g<sup>-1</sup> dry weight respectively. The total energy conserved in the net annual production ranges from 0.71 × 10<sup>7</sup> to 1.3 × 10<sup>7</sup> cal m<sup>-2</sup> yr<sup>-1</sup>.

The computation of solar energy conversion efficiency by *Typha* in different zones is given in Table I, on the basis of energy data reported by Waheed Khan<sup>6</sup>. Various workers have calculated the ecological efficiencies on the basis of total solar radiation or photosynthetically active radiation (PhAR) taken as 47% to 50% of the total solar radiation<sup>3,7</sup>.

Thus solar energy conversion efficiencies of *Typha* in dry, marsh and submerged zones are 1.35, 1.58, 2.25% respectively of PhAR on whole year basis while 2.1, 2.4 and 3.1% respectively of PhAR for actively growing season.

A comparison of these values with those for other types of vegetation (Table II) shows that *Typha* wetland is a far more ecologically efficient system.

TABLE I

Estimated values of net annual production and efficiency of *Typha* ecosystem

Zones	Net annual production gm <sup>-2</sup> yr <sup>-1</sup>	Growth period in days	Efficiency (%) 47% radiation (PhAR)
Dry zone	1990.8	240	2.1
Marsh zone	2326.8	240	2.4
Submerged zone	3696.1	270	3.1

TABLE II

Net annual production solar energy utilisation efficiencies of different ecosystem (Misra<sup>3</sup>)

Vegetation type	Net annual production gm <sup>-2</sup> yr <sup>-1</sup>	Growth period in days	Efficiency (%) 47% radiation (PhAR)
Grassland	1296.0	92	3.34
Forest	744.0	Annual basis	1.26
Cropland (Maize)	780.0	70	1.8

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