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EVAPO-TRANSPIRATION AND TRANSPIRATION RATE OF SOME TROPICAL TREE SPECIES

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Abstract- The present paper investigates transpiration and evapo- transpiration rate of tropical avenue tree species. The amount of water transpired per leaf was maximum in *Azadirachta indica* which was 2.88 followed by Eucalyptus camaldulensis 2.72 and minimum rate was found in *Ficus religiosa* i.e.1.48 gm/leaf/hrs. The rate of evapo-transpiration was also maximum in *Eucalyptus camaldulensis* followed by *Azadirachta indica* where is for other species they were relatively same. The present study confirms the reports that *Eucalyptus.camaldulensis* can transpire more than other Indian tree species but the study suggests that for cooling and shading purposes *Eucalyptus camaldulensis* is not a suitable tree. The lower rate of transpiration by *Ficus benghalensis* leaves is attributed to its xerophytes character.

Keywords- Evapo-transpiration, *F. benghalensis, F. religiosa, M. indica*, *E. camaldulensis, A. indica*

INTRODUCTION

Trees can provide relief from high temperatures at the local scale through evaporative cooling, where energy used for transpiration rather than heating the surface and the air. Tree act as a cool moist surface dominated by larger scale warmer, drier surroundings (Oke, 1987).The evapo-transpiration of vegetated areas is highly dependent on soil humidity for dry soil which are common in urban areas due to sealing of the ground, evapo-transpiration cooling will be limited (Oke, 1989). In the afternoon and evening the amount of energy needed to support the high evapo-transpiration rates may exceed that which can be provided by incoming radiation thus energy is derived from the sensible heat of the atmosphere and advection of this heat occurs toward the tree causing atmospheric cooling (Jons, 1983).Transpiration and tree canopies affect air temperature, radiation absorption and heat storage, wind speed, relative humidity, turbulence, surface albedo, surface roughness and consequently the evolution of the mixing layer height (Nowak et al., 1998). In this case tree shade and transpiration may not compensate for the increased air temperatures due to reduced mixing (Heisler et al., 1995). The present study deals with transpiration and evapo- transpiration rate of different trees in cooling and controlling ambient air temperature.

MATERIAL AND METHODS

Evapo -transpiration ratio of all the five trees species was determined following the method as under.

The transpiration take place principally through the stomata pores, the rate of transpiration is always lesser than that of evaporation from an open surfaces. The transpiration is determined by the conical-flask -water –oil leaf method. One 100ml conical flask is filled with water and a leaf is put in the conical flask in such a way that its petiole remains under water. A sinker is tied to the petiole to keep leaf in position. A thin layer of oil is poured over the water surface to check evaporation. The whole set up is weight (W1) and kept in open air. After one hour, the set up is re-weight (W2). The rate of evaporation is calculated by dividing (W3-W4) by the area of petridishes from their data, evaporation, transpiration ratio is determined. (Mukharji et al, 2005). The area of leaf is determined using a planimeter. The rate of transpiration is calculated, by dividing the difference in weight (W1-W2) by the leaf area.

$$\text{Transpiration/hrs.} = \frac{W_1 - W_2}{\text{Area of the leaf}}$$

To determined evaporation rate. Water is taken in petridishes and its initial wt. is noted (W3). It is also kept in open air for an hour. Its final weight (W4) is substrate from the initial (W3-W4) to calculate the amount of water evaporated in one hour. The area of petridishes is also determined by planimeter.

RESULT AND DISCUSSION

The data of transpiration and evapo-transpiration are presented in table 1.1. The amount of water transpired per leaf was maximum in *Azadirachta indica* which was 2.88 followed by Eucalyptus 2.72and minimum rate was found in *Ficus.religiosa* i.e.1.48 gm/leaf/hrs. But when we see the data per decimeter leaf area the picture alters. The maximum rate here was noted for *Eucalyptus camaldulensis* and minimum for *Ficus benghalensis.* On the basis of rate of transpiration the test plant can arranged in this order-
Eucalyptus camaldulensis > *Azadirachta indica* > *Mangifera indica* > *Ficus religiosa* > *Ficus benghalensis* .
The rate of evapo-transpiration was also maximum in *Eucalyptus camaldulensis* followed by *Azadirachta indica*

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where is for other species they were relatively same. The present study confirms the reports that *Eucalyptus camaldulensis* can transpire more than other Indian tree species. The lower rate of transpiration by *Ficus benghalensis* leaves is attributed to its xerophytes character. The study suggests that for cooling and shading purposes *Eucalyptus camaldulensis* is not a suitable tree

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Table 1.1: Rate of transpiration in the leaves of different tree species and evapo-transpiration gm/decimeter^2/hours

April-2013 10 :00-2:00 pm.	**Transpiration**			**Evapo -transpiration**
Name of the tree	gm/leaf/hrs.	Area of the leaf (cm)^2	gm/decimeter^2 leaf area/hrs.	gm/decimeter^2 area/hrs.
Azadirachta indica	2.88±0.2	96.83±3.0	3.03±0.3	24.68±3.5
Eucalyptus camaldulensis	2.72±0.1	37.08±4.0	6.86±0.1	28.51±3.3
Ficus benghalensis	1.77±1.1	136.41±7.9	1.55±1.3	23.2±4.5
Ficus religiosa	1.48±0.1	81.25±6.9	1.75±0.3	23.4±3.5
Mangifera indica	2.04±0.6	92.41±3.2	2.23±1.3	23.88±4.5

