(II)

DIURNAL VARIATION IN WATER STATUS OF *EUCALYPTUS* AND POPLAR LEAVES IN A WARM SUNNY DAY

Importance of water status of plants have been recognised for centuries but until recently it could be described only in such general terms of wilted or unwilted. In the first third of this century plant water status was measured more frequently in terms of Osmotic pressure or Osmotic potentials of expressed sap. However, validity of measurements on expressed sap was questioned and use of this method was discouraged, it became apparant by 1930's that water movement is plants was controlled by what is now termed as water potential. Water potential is defined as the difference in free energy or chemical potential between pure water and water within the system under study. The potential of pure water is zero. Therefore, leaf or soil water potential is less than zero (negative) and is indicated by more negative values in bar units. In present study an attempt was made to find out relationship of leaf water potential with other measures of water content such as Relative Water Content (RWC) in young and old *Eucalyptus* and Poplar leaves.

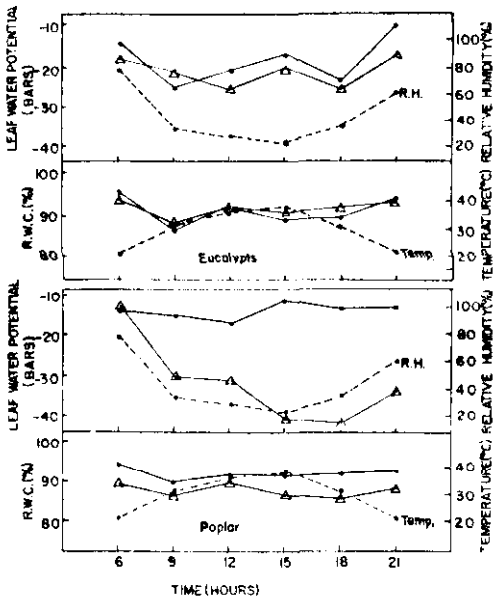
Diurnal variation in leaf water potential and Relative Water Content (RWC) in the leaves of a three year old, adjoining *Eucalyptus* hybrid and Poplar plantations at F.R.I. demonstration area were measured on a warm sunny day of May 1988 at three hourly intervals for new and old leaves separately. Leaf water potential was measured by microprocessor cantrolled water potential data system HP 115 supplied by Wescor Inc., using Thermocouple psychrometer method. Relative water content of the leaves was determined following the method described by Noggle and Fritz (1976). R W.C. is the water content of the tissue expressed as a per cent of water content of the fully turgid tissue and is determined by following formula.

$$\text{R.W.C. } (\%) = \frac{Wf - Wd}{Wt - Wd} \times 100$$

Where Wf=Fresh leaf weight, Wt=turgid weight, Wd=dry weight.

Diurnal pattern of leaf water potential were similar for leaves of both the species although amplitude of change differed (Fig. 1). At the time of sunrise leaf water potential in the young leaves of *Eucalyptus* was more negative than old leaves, while it remained almost same for poplar leaves. With increase in day temperature and radiation leaf water potential was more and more negative and tend to regain its original status two or three hours after sunset. Young leaves of both the species responded quickly for change in ambient environment. There was a very sharp decrease in leaf

Fig. 1



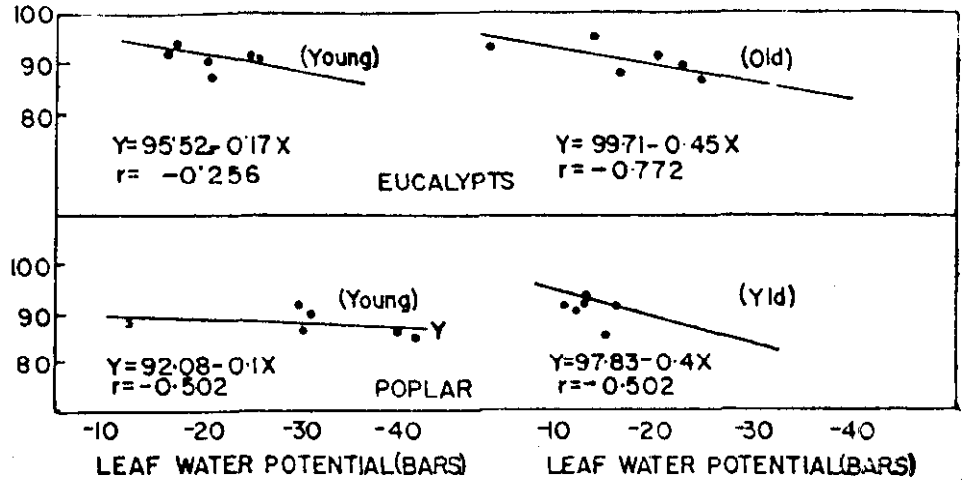
Diurnal variation in Relative Water Content (R.W.C.) and Leaf Water Potential (Ψ) of young (△—△) and old (●—●) leaves of eucalypts and poplar.

water potential (greater negativity) of young poplar leaves and they could not regain their original levels of water potential even after 3 hours of sunset. The diurnal trend in water potential of young and old leaves of poplar was markedly different while low differences were observed in eucalypts leaves.

The relative water content was higher at time of sunrise which gradually decreases with increase in hours of day time and finally regain its original status after 2-3 hours of sunset.

Measurements of relative water content may be used to estimate leaf water potential by establishing the correlation curves. The relationship between RWC and leaf water potential is not linear. Slatyer (1967) showed that when ever RWC drops from 100% to 60-50%, there is an initial sharp decrease (greater negativity) in leaf water potential.

Fig. 2



Relationship between Leaf Water Potential and R.W.C. (%)

In the present investigation the relationship changes with age of leaves and species to sepcies (Fig. 2). Slatyer (1967), Kripling (1967), Zur *et al.* (1981) have also reported the differing relationship of leaf water potential and RWC. These differences in RWC and leaf water potential also might provoke some thought concerning the complex nature of cell water relationship and difficulty of evaluating plant water status and drought tolerance from any one type of measurement.

References

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