

# Impact of Climate Change on Tree Water Relations of *Betula utilis* D.Don in Treeline area of Western Himalaya

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**Abstract**—The Himalayan treeline are among the highest in the northern hemisphere therefore trees occurring in this region experience a different physical environment than other treelines. The Himalayas are warming at a faster rate than the global average and is potentially more vulnerable to the impacts of global warming. *Betula utilis* D. Don (Bhojpatra, Birch) is the only broadleaved angiosperm tree species in the Indian Himalayas which dominates in extensive area at subalpine altitudes. In the present study we studied the level of water stress as evident from pre-dawn and mid-day water potential, osmotic adjustment, leaf conductance rate of *B. utilis* over a two year period. The study was carried out at Tungnath treeline situated at 30°49'22" N latitude and of 32°79'21' 47" E longitude occurs between 3200 and 3560m asl elevation. Tree water potential ( $\Psi$ ), Pressure volume curves and leaf conductance were measured on five representative trees. The water potential ( $\Psi$ ) was measured at predawn ( $\Psi_{PD}$ ) (5.30- 6.30 A.M.) and in the midday (1.30- 2.30 pm) ( $\Psi_{MD}$ ). The tree water potential ( $\Psi$ ) varied significantly across seasons ( $P < 0.01$ ). The  $\Psi_{pd}$  of *B. utilis* ranged between  $-0.14 \pm 0.01$  MPa and  $-0.81 \pm 0.01$  MPa. The  $\Psi_{md}$  values varied between  $-0.22 \pm 0.02$  and  $-1.48 \pm 0.03$  MPa. *B. utilis*, had the highest daily change during the rainy and autumn season of Yr2 (1.07 and 0.97 MPa respectively). The osmotic adjustment was more than -1.0 MPa both at full and zero turgor between the winters and late spring. The morning leaf conductance values ranged between  $142.0 \pm 11.8$  and  $471.9 \pm 27.7$   $m \text{ mol m}^{-2} \text{ sec}^{-1}$ . From the present study it was apparent that water potential in *B. utilis* does not reach lethal level to curtail phenological and physiological activities in Tungnath treeline. The species takes full advantage of the short growing season as evident from the high daily change values and leaf conductance.