USE OF ENZYME Km TO DETERMINE OPTIMAL EXPERIMENTAL TEMPERATURE IN TWO GEOGRAPHICALLY SEPARATED POPULATIONS OF LOBLOLLY PINE

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Mahan and Upchurch (Env. Exp. Bot. 1988. 28:351-357; 28:359-366) have shown that several crop species maintain characteristic leaf temperatures when water and energy inputs are not limiting, provided the dew-point is sufficiently low. Further, they showed a correlation between these characteristic temperatures and the thermal dependence of the Km's of the enzymes they analyzed.

This enzymic approach was used to determine the optimal experimental temperature in loblolly pine. The thermal-metabolic adaptation of two geographically separated populations were assessed from comparison of the thermal dependence of the Km for NADH and oxalacetic acid (OAA) of malate dehydrogenase. Populations from Texas (Texas Superior) and North Carolina (8-76) were tested at temperatures which ranged from 10 to 40°C. Malate dehydrogenase was extracted and purified from needles, and assayed by the disappearance of NADH (at 340 nm). The initial velocities were calculated from the slopes of the traces from a strip chart recorder. The Km's were estimated by a program based on the modified Cornish-Bowden method for the determination of Km. Km for each substrate was plotted as a function of temperature of assay. Presence of an optimal organismal temperature appears as a minimum Km.