

## ***This Week's Citation Classic***

**Brix H.** The effect of water stress on the rates of photosynthesis and respiration in tomato plants and loblolly pine seedlings. *Physiol. Plant.* **15**:10-20, 1962. [Dept. Botany, Duke University, Durham, NC]

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**This paper is among the first to use the free energy status of water in plants in studying effects of water stress on plant physiological processes. The significance of using this index is in part indicated by the close relationships developed. [The *SCI*<sup>®</sup> indicates that this paper has been cited over 165 times since 1962.]**

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"Previous work on effect of water stress on plant processes and growth had often provided contradictory results because the internal water stress of plants was not measured directly but rather interpreted from soil and atmospheric water conditions. When the plant water stress was measured, this was expressed as content or deficit in amount of water and this was an unsatisfactory basis for comparing water relations of different plants and for studying water movement through the soil-plant-atmosphere continuum.

"A suitable index of plant water stress measured by a reliable and convenient method was therefore needed for making progress in the field of plant water relations and this was advocated in the 1950s by a leading researcher in that field, Paul J. Kramer at Duke University, Durham, North Carolina, and by others. A measure of the free energy level of water (water potential or diffusion pressure deficit as it was then called) appeared to be the best single

expression of the plant water status. Fortunately, significant improvements were made in methods for measuring water potential of soil and plant by vapor equilibration and use of thermocouple psychrometers.

"I had the good fortune to work as a research associate with Kramer when these developments in plant water relations took place. Under his influence, I started testing thermocouple psychrometers for measuring leaf water potential of various plant species. An added incentive, during the summer for doing this work was that it had to be done in the only air-conditioned laboratory room in the department. Once the method had been tested, it was put to use in investigating relationships of leaf water potential and the rates of the physiological processes of photosynthesis, respiration, and transpiration, using tomato plants and loblolly pine for which contrasting relationship, might be expected. Similar trends in reduction in rates of photosynthesis and transpiration with increasing water stress suggested that stomatal diffusion resistance was the mechanism by which plant processes were affected.

"Publication of the paper was timely. Few relationships of water potential and physiological processes had been investigated and there was a growing interest in the field of plant water relations, in methods of measuring water potential, in plant productivity and production processes, and in environmental effects thereon. This must account for much of the interest in the paper, which has been cited for the method used, the relationships developed, and the reason given for the relationships. A more recent paper on this subject is 'Effects of plant water stress on photosynthesis and survival of four conifers.'"<sup>1</sup>

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1. **Brix H.** Effects of plant water stress on photosynthesis and survival of four conifers. *Can. J. Forest Res.* **9**:160-5, 1979.