

Begg J E & Turner N C. Crop water deficits. *Advan. Agron.* 28:161-217, 1976.
[CSIRO Division of Plant Industry, Canberra, ACT, Australia]

The paper reviews the development and measurement of crop water deficits and the effects of water deficits on growth, development, and yield. Additionally, the paper reviews the adaptation to water deficits and the observed differences in response of plants grown under controlled conditions and those in the field. [The SCJ® indicates that this paper has been cited in over 190 publications.]

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When invited to prepare a review for *Advances in Agronomy* by the editor, Nyle Brady, John Begg and I jumped at the opportunity since we both recognised the timeliness of responding to such a request. While there were several reviews on *plant water deficits* in the literature at the time, there were few in which plants were considered in communities in the field, that is, there were no reviews on *crop water deficits*.

In the previous decade, new techniques such as the pressure chamber and portable porometers had been developed that for the first time made it possible to routinely measure plant water deficits, stomatal behaviour, and photosynthetic rates in the field. Both Begg and I, independently and together, had been involved in field studies of crop and tree water deficits using these new techniques and had recognised that responses to water deficits observed in plants in the field were quite different from those observed under controlled con-

ditions in the laboratory. While this is now widely recognised and understood, incorrect interpretations of field behaviour of crops were being made at that time based on studies of these crops in the laboratory. The review helped to forewarn other scientists that responses obtained in some of the best water-relations laboratories in the world did not apply to field crops.

The reason for the different responses in the field and laboratory was the ability of plants to adapt to water deficits. The rapid rates of water stress frequently imposed in laboratory studies hid these adaptive mechanisms. Our review highlighted the need in the laboratory and other controlled environments to simulate rates of drying that were similar to ones of field-grown plants by growing them in large volumes of soil.

Together with a report by Ted Hsiao published at almost the same time,¹ the review highlighted for the first time the importance of osmotic adjustment, that is, the accumulation of solutes in response to water deficits, in the adaptation of crops to water deficits. This has become an important theme in water relations in the decade since our review, leading to frequent citations, further reviews,^{2,3} considerable discussion of its importance, and even to breeding programs designed to incorporate the character into crops.³

The review in *Advances in Agronomy* has led to both Begg and me being widely recognised as authorities in the field of crop/water relations. We have been invited to develop our ideas further in subsequent reviews and conferences.^{2,4,5} The paper was an important factor in Begg's invitation to be assistant chief in the CSIRO Division of Plant Industry and in my being made a Fellow of the American Society of Agronomy in 1982 and a Fellow of the Crop Science Society of America in 1985. Development of the field of crop/water relations continues, and the original review has just been updated for publication, again in *Advances in Agronomy*.⁶

1. Hsiao T C, Acevedo E, Fereres E & Henderson D W. Water stress, growth, and osmotic adjustment. *Phil. Trans. Roy. Soc. London B* 273:479-500, 1976. (Cited 200 times.)
2. Turner N C & Jones M M. Turgor maintenance by osmotic adjustment: a review and evaluation. (Turner N C & Kramer P J, eds.) *Adaptation of plants to water and high temperature stress*. New York: Wiley, 1980. p. 87-103.
3. Morgan J M. Osmoregulation and water stress in higher plants. *Annu. Rev. Plant Physiol.* 35:299-319, 1984.
4. Turner N C. Drought resistance and adaptation to water deficits in crop plants. (Mussell H & Staples R C, eds.) *Stress physiology in crop plants*. New York: Wiley, 1979. p. 343-72.
5. Turner N C & Begg J E. Plant water relations and adaptation to stress. *Plant Soil* 58:97-131, 1981.
6. Turner N C. Crop water deficits: a decade of progress. *Advan. Agron.* 39, 1986. (In press.)