

Stewart G R & Lee J A. The role of proline accumulation in halophytes.

Planta 120:279-89, 1974.

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Many halophytic angiosperms were shown to accumulate large amounts of proline when growing in the presence of NaCl. The capacity to accumulate proline was correlated with salt tolerance. Proline was suggested to function as a cytoplasmic solute in intracellular osmotic adjustment. [The SC¹® indicates that this paper has been cited in over 165 publications since 1974.]

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"My interest in salt marsh plants began back in the early-1960s when I was taken on a field excursion to the marshes described so vividly by Charles Dickens in *Great Expectations*. It was during my PhD study that I began physiological studies on these plants to examine the influence of high ion levels on plant enzymes. The basic hypothesis was that halophytic plants have enzymes capable of functioning in an environment of high ion concentration. This was advanced on the basis of studies with halophilic bacteria which had shown them to have 'salt requiring' enzymes.¹ There turned out to be little evidence for such adaptation at the macromolecular level in plants, and after obtaining my PhD I turned to another interest, plant nitrogen metabolism.

"After some three to four years at the University of Manchester, I found that my interests in nitrogen and halo-

phytes merged in collaborative studies with John Lee. We spent many pleasurable days collecting material and carrying out various field assays on the salt marshes of North Wales and refreshing ourselves at the Gwydyr Arms in Betws-y-Coed. One of these trips coincided with the acquisition of an amino acid analyser and I decided to collect samples to examine the soluble nitrogenous components in some halophytes. It was somewhat fortuitous that the first sample analysed was a leaf extract of *Triglochin maritima*. The 440 nm channel registered an enormous off-scale peak at an elution time corresponding to that of proline. The proline content was over ten percent of the dry weight and when subsequent analyses showed many other species to have similar high proline contents, it was impossible not to ask the question, 'Why so much proline?' These initial observations provided the impetus for the work described in this paper, but there was much frustration in waiting and growing up plants for the experimental work.

"Among the reasons for the frequent citation of this paper is probably that the paper spans the physiological and ecological areas and in both of these there is much interest in proline accumulation and its possible role. The very large amounts of proline accumulated by some halophytes are suggestive of an adaptive function.

"More recent studies^{2,3} have implicated compounds other than proline in the osmotic relations of angiosperm halophytes and other work is suggestive of a more generalised protective role for these compatible solutes in the adaptation of plants to extreme environments."⁴

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3. Stewart G R, Larher F, Ahmad I & Lee J A. Nitrogen metabolism and salt tolerance in higher plant halophytes. (Jeffries R L & Davy A J, eds.) *Ecological processes in coastal environments*. Oxford: Blackwell Scientific, 1979. p. 221-7.
4. Nash D, Paleg L G & Wiskich J T. Effect of proline, betaine and some other solutes on the heat stability of mitochondrial enzymes. *Aust. J. Plant Physiol.* 9:47-57, 1982.