ASSESSMENT OF RELIABILITY OF GERMINATION PAPERS IN ENVIRONMENTAL STRESS RESEARCH

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The substrates used for seed germination in experiments investigating the effect of stresses, such as salinity, on germination and early seedling growth, are usually assumed to have no effect on the results of the experiments. Our concern is that in some cases the germination substrate, such as paper towels, may influence the results. The effect of salinity on the early seedling growth of soybean (cv. Williams) was therefore studied using a range of NaCl concentrations (0-161 mM NaCl) using two methods, paper towels and a hydroponic system. Seeds were germinated in paper towel at different salinities (0-161 mM NaCl) then transferred to either a new paper towel or the hydroponic system at the same salinity. Seedlings were harvested 10d after transfer and both fresh and dry weight assessed. The concentrations of Na^+, K^+ and Ca^{2+} in the seedling and in the solution extracted from paper towels were determined by Flame Photometry and Atomic Absorption Spectrophotometry. Seedling growth was reduced with increased salinity, but the effects were markedly less when experiments were conducted in paper towels. Seedlings were able to grow in paper towel at an external NaCl concentration of 161mM NaCl, when a Na^+ concentration 2.3mg g^{-1} FW was recorded in the roots. However, in the hydroponic system, seedlings failed to grow even at an external NaCl concentration as low as 12 mM, when the Na^+ concentration in the root was 1.6mg g^{-1} FW. Analysis of the solutions soaking the paper towels revealed that 4.25mM Ca^{2+} was available to the seeds in the paper towel system in saline conditions. Enhanced growth was observed in the hydroponic system at 30mM NaCl following addition of 4.25 mM Ca^{2+}. This suggests that paper towels may influence the response of seedlings to NaCl due to the release of other ions from the paper towels into the solution soaking the towels. The role of Ca^{2+} in reducing Na^+ uptake or protecting the seedling against the toxic effects of Na^+ is discussed.