

Use of fern spores and gametophytes in toxicity assessments**Raymond L. Petersen**

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Experiments have been carried out using spores and gametophytes of fern taxa and one moss taxon in the assessment of toxic responses to sodium chloride, ozone, and various heavy metal ions. Spores and gametophytes were cultured in Falcon Brand 24- and 96-well tissue culture plates employing Hoagland's Solution under standard conditions of pH, light and temperature. For the NaCl and heavy metal ion experiments, spores and/or gametophytes were exposed to concentration series of these substances. In the ozone experiment, gametophytes were exposed for various lengths of time to a fixed amount of ozone. These various toxicity assessments were based on the measurement of one or more of three stress-affected parameters—percentage spore germination, relative length of rhizoids, and incidence of gametophytic injury.

Spores of *Acrostichum danaeifolium*, a mangrove swamp associate, are capable of germination and limited growth at higher salt concentrations (up to 2.5% NaCl) than are the spores of *Osmunda cinnamomea*, *O. claytoniana*, *Onoclea sensibilis*, and *Dryopteris intermedia*, for which germination ceases at approximately 0.625% NaCl. Fourteen-day-old gametophytes of *A. danaeifolium* could tolerate 1.25% NaCl for 7 days. However, 2.5% NaCl resulted in their death. Rhizoid length decreased with an increase in salt concentration.

Cellular injury to the gametophytes of *Onoclea sensibilis* in the form of plasmolysis and chlorosis was induced by their exposure to 0.5 ppm of ozone for 15 minutes.

Fern spore germination was shown to be a useful toxicity gauge for different heavy metals tested both singly and in combinations. As a rule, combinations of heavy metals ions showed a synergistic effect, yielding greater toxicities than expected if their individual toxicities were added together. Furthermore, fern spores of different species yielded definite species-specific responses to various heavy metal ions of potential value in elucidating edaphic niche requirements of pteridophytes.

Photocontrol of spore germination in *Polypodium vulgare* L.**D. L. Smith, Norma Agnew and Anne McCabe**

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Under continuous white light, spores of *P. vulgare* gave a germination level of 75%. Under monochromatic light, at all wavelengths from blue to far-red, the level of germination did not deviate significantly from 50%. The action spectrum for germination showed red light to have the highest photon efficiency.

The inductive effect of exposure to red light was reversed by subsequent exposure to either blue or far-red light. The effects of alternating red and far-red light showed repeated reversibility but for red and blue light, the reversibility was incomplete; once spores had been exposed to blue light the germination level subsequently inducible by