A Neurotoxin in the Pollen of Southern African Cycads

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The aim of the project was to determine if the roots, seeds and pollen of cycads contain the neurotoxin β-methyl-amino-L-alanine (BMAA). The analysis for the presence of the toxin was done on coralloid (aerial) roots of five African Encephalartos species and two other (Cycas and Ceratozamia) cycad species. The presence of typical rings of cyanobacteria was confirmed by an investigation on a stereo microscope. Scarce pollen and seeds of three southern African species were obtained. An ethanol extract was made by grinding the roots, seeds and pollen with a pestle and mortar in liquid nitrogen. These extracts were filtered and applied to TLC plates with a BMAA standard for comparison. The TLC plates were developed in butanol:acetic acid:water (3:1:1) and coloured with ninhydrin. The TLC plates clearly showed spots at the same height and colour as BMAA in root, seed and pollen extracts. The samples were also analyzed by liquid chromatography-mass spectrometry (lc-ms) to confirm the presence of BMAA. The toxin was detected in all the extracts except in the roots of E. lehmannii and E. transvenosus. The neurotoxin BMAA found in the coralloid roots, seeds, and especially the pollen of cycads may be very hazardous to our health, if these are airborne and inhaled over many years. This is the first known report of the occurrence of BMAA in the pollen of any plant species.