Trichipteris corcovadensis: only the spores of specimen 11066-B germinated and the percentage germination was low. It occurred at constant temperatures of 20, 25 and 30°C but only in light. The germination was not promoted by growth-regulators. Under all conditions tested, there was no germination of specimen 11066-A. An attempt was made to relate spore morphology to the lack of germination. The spores could be separated into three types: two extreme forms, I and II, and intermediates. Specimen B produced form I only. Specimen A, collected in 1980 and 1981, also produced only form I but did not germinate. The other specimens produced forms I and II and intermediate forms. Equatorial diameter was larger in specimen B than in the other specimens (except specimen A-1981). There is a perine on the surface of spores of specimen B, and a less well-developed one on spores of specimen D. Are the specimens studied natural hybrids? Or is it a problem of spore maturity?

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Lipid metabolism in germinating fern spores

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Most fern spores contain oil droplets as storage material consisting of triglycerides rich in unsaturated fatty acids. The amount of triglycerides is low in green spores and is 40–80% in non-green spores (Gemmrich 1979). The mobilisation of these lipid reserves is induced by imbibing the spore, independent of the induction of germination. In *Anemia* spores, the amount of triglycerides decreases to about two-thirds within 3 weeks of imbibition; concomitantly the activity of lipase increases threefold as compared to the dry spore activity. Besides lipid mobilisation, lipid synthesis is highly active in the imbibed spore. The products are storage lipids as well as polar membrane lipids. It is suggested that the enzymes involved in the synthesis of storage lipids are remnants of the synthetic activities during sporogenesis. They are inactivated when the spore dehydrates and regain their activity upon rehydration (Gemmrich 1979). In contrast to what is generally assumed, the present results indicate that during the imbibition phase, hydrolytic and synthetic processes are active. They are not, however, able to trigger the germination process.

Lipid synthesis is enhanced in the spore after induction of germination. The products, phospho- and glycolipids, are typical of vegetative tissues. In contrast to the imbibed spore prior to induction, storage lipids are not formed. During germination, the lipid reserves are completely degraded and converted into carbohydrates. The decrease in lipid content coincides with an increase of the activities of lipase and isocitrate lyase, the latter being a marker of the glyoxylate cycle. When the reserves have been depleted, these enzyme activities disappear. Concomitant with the lipid degradation, both the number and the volume of microbodies within the spore cell increase. These microbodies, which function as glyoxysomes, disappear when the

reserves are exhausted. Thus, it is concluded that the pathways of lipid mobilisation in fern spores are identical to those in higher plant seeds (Gemmrich 1981).

With regard to the regulation of lipid metabolism, the involvement of at least three control mechanisms becomes evident: (1) enzymes present in the dry spore as remnants of sporogenesis regain their activity upon rehydration. These are the enzymes of lipid synthesis and mobilisation; (2) enzymes active during the imbibition phase may be translated from stable mRNA (Fechner and Schraudolf 1985); (3) by the induction stimulus, a co-ordinated and enhanced protein synthesis via transcription is initiated, resulting in germination. These control mechanisms are presently being studied at a molecular level.

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In vitro spore germination in *Cyathea spinulosa*

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There are very few reports about spore germination in members of the Cyatheaceae, possibly due to their restricted distribution. In spite of high dispersibility of the Cyatheous spores, these members are isolated due to their adaptation to small environmental areas not duplicated within the range of dispersal. Such endemics are highly vulnerable to extinction if there is a significant climate change (Tryon and Gastony 1975).

The optimal conditions for the synchronous spore germination of *Cyathea spinulosa* in axenic cultures have been investigated.

Fertile fronds of *Cyathea spinulosa* growing at Pachmarhi Hills of Madhya Pradesh were collected in the month of January. The spores obtained from this collection were mature and viable and resulted in synchronous germination when provided with the requisite cultural conditions. After pre-soaking for 24 hours to induce complete imbibition, the spores became photosensitive. Surface sterilised spores grown in modified Knudson's liquid medium (pH 4·5) germinated synchronously after exposure to 10 hours of light followed by 14 hours of dark period at $22 \pm 2°C$.

These spores contain large quantities of lipids as reserve storage material. Imbibed spores tested with sudan IV gave positive results, confirming the presence of lipids. Extraction with organic solvents revealed that 40% of the weight of dry spores was lipid. During the germination process, the first cell to be differentiated was the protonemal cell. By the time the filament became two- to three-celled, the basal cell showed a decrease in lipid content, indicating that lipid was used as an energy source during germination.

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