branched, septate, aggregate to form pycnostromata. Pycnostromata dark-coloured, leathery to carbonaceous, irregular, thick-walled, pseudoparenchymatous, aggregated, formed generally in 10-day old culture. Pycnidial cavity immersed, without an ostiole, 120–172 μm in diameter. Sporogenous cells hyaline, simple, rarely branched, phialidic, enteroblastic, arising directly from the innermost layer of cells lining the pycnidial cavity. Spores of 2 types: Phialospores, hyaline, unicellular, pointed at ends, fusiform, biguttulate, 7.5–10.5 × 3.4–5.2 μm. Stylospores hyaline, unicellular, long, slender, often bent at one side like a walking stick, 19–31 × 1.3–2 μm.

Pycnostromata fusca, Coriacea vel carbonacea, irregularis, crasse tunicata, pseudoparenchymatica, aggregata, plerumque die decema prima evoluta. Cavitatis pycnidii immerso, haud ostiolati, 120–170 μm in diametro. Cellulae sporogenae hyalinae, simplices, raro ramosae, phialdicae, enteroblasticae ex orientes stratis ex intimis cellularum cavitatis pycnidii. Sporae biformes: phialosporae hyalinae, continuis, utrinque acuta, fusiformes, biguttulatae, 7.5–10.5 × 3.4–5.2 μm; stylosporae hyalinae, continuis, longae, graciles, arcuatae vel lateraliter instar baculi deflectae, 19–31 × 1.3–2 μm.

The type species has been deposited at CMI, Kew, England, with accession no. IMI 276385.

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CYTOKININ-LIKE SUBSTANCES IN BLUE-GREEN ALGAE

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GROWTH regulators have been reported in both freshwater and marine algae. Very few of them, however, have been isolated and chemically examined. The information pertaining to their occurrence in algae has been reviewed by several workers[1–3].

Bentley-Mowat and Reid[4] were the first to study cytokinins in marine phytoplankton. Cytokinin-like substances were later reported[5–8] in a number of marine algae. These, however, have not been studied in blue-green algae. Two blue-green algae *Westiellopsis prolifica* Janet and *Plectonema boryanum* Geit. have, therefore, been studied for the presence of cytokinins.

The algae were grown in modified Benecke's medium[9] under 40 W fluorescent tube light at 30 ±2°C. Three-week old cultures were harvested by centrifugation under asceptic conditions and used for the experiments. Solvent extraction[10], purification on Dowex 50W-X8 H^+ column, paper chromatography and radish cotyledon expansion bioassay[11] were used. The strip chromatogram was divided into 10 Rf units (Rf 0.0–0.1 to 0.9–1.0) and these were tested for their biological activity. The hypocotyl sections were used to test any gibberellin activity.

The ultraviolet light absorption bands in chromatogram of *W. prolifica* at Rf 0.1 to 0.3 and 0.6 to 0.7 and in *P. boryanum* at Rf 0.7 to 0.8 and 0.9 to 1.0 and their activity in radish cotyledon bioassay indicated the presence of cytokinin-like substances of the nature of purine and its derivatives (figure 1). The biologically active factors observed near the starting line in a number of organisms[10,12] were identified as zeatin ribonucleotide. The activity at Rf 0.1 to 0.3 in *W. prolifica* may, therefore, be ascribed to substances of this nature. Zeatin has been identified at Rf 0.65 to

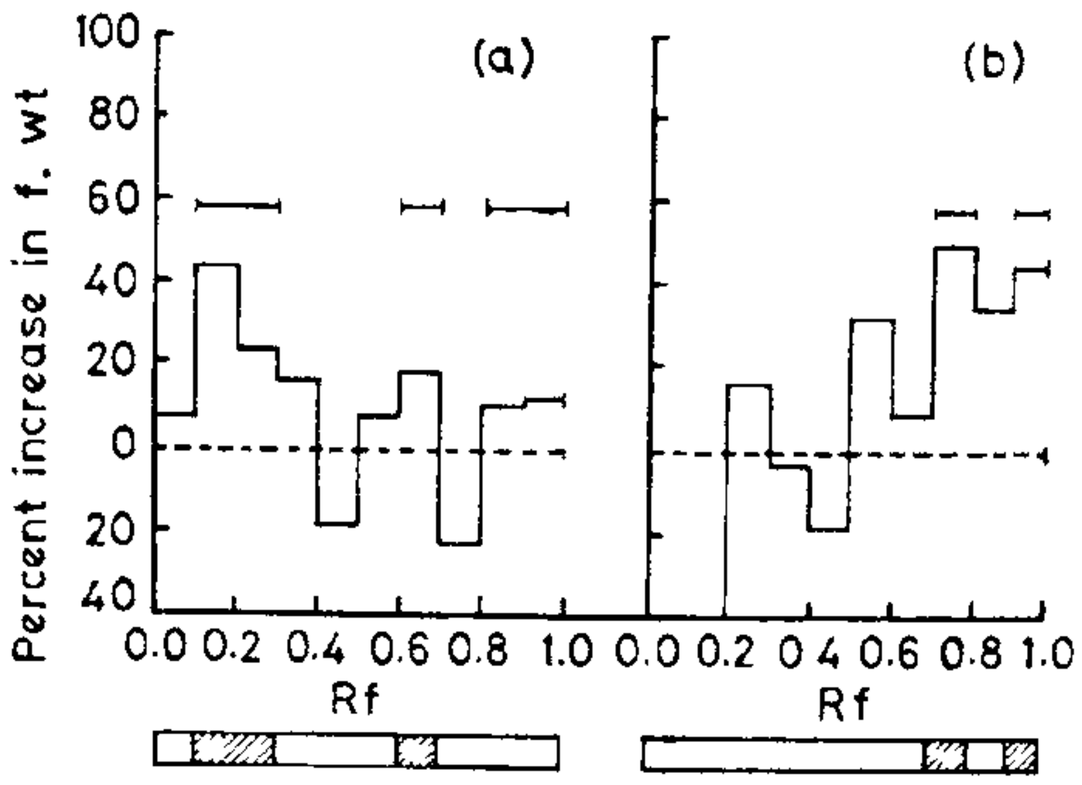

Figure 1. Percentage increase in fresh weight of radish cotyledons incubated in eluates from strip chromatogram. The shaded areas in horizontal bars indicate the location of UV light absorption bands of the chromatogram **a.** *W. prolifica* Janet **b.** *P. boryanum* Geit.

0.83[10,11,13,14]. The substances at Rf 0.6–0.7 in *W. prolifica* and at Rf 0.7 to 0.8 in *P. boryanum* are likely to be of the nature of zeatin.

The gibberellic acid has a stimulating effect on cotyledon growth in the absence of cytokinin while in the presence of cytokinin it is markedly inhibitory[15]. The absence of any increase in the length of radish hypocotyl sections in the experiments shows that the expansion of radish cotyledons in the bioassay is due to cytokinin-like substances only.

It may be concluded that *W. prolifica* and *P. boryanum* contain cytokinin-like substances. Their actual chemical nature, however, needs confirmation. The presence of gibberellins[16] and cytokinins may partly account for the beneficial effect observed[17,18] in some crops on blue-green algal seed treatment.

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TEMPEH—A FERMENTED FOOD FROM SOYBEAN

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SEVERAL fermented food products are known from the South-East Asian countries. A few examples are *sufu* and *tempeh* from soybean, while *ragi* and *bhakar* are obtained by fermenting rice. *Tempeh*, particularly, has interested many investigators because of its good flavour, cheap base and nutritional value. Since *tempeh* has more protein as compared to other pulse products and is palatable, it can be a good substitute for raw soybeans which are considered unpalatable. However, most of the work on *tempeh* fermentation to date has been with American soybean cultivars *viz* Hawkeye, Hood, Harvey, Dorman, Lincoln, Chippawa, Dortchsoy, Jackson and Lee or with Japanese cultivars *viz* Hokkaido, Iwota and Kunamoto. It was, therefore, thought desirable to develop *tempeh* fermentation with popular Indian commercial cultivars of soybean, mainly, DS-74-24-2, Bragg, Clark-63 (yellow-seeded) and Jawa-16 (black-seeded).

Pioneering work on food fermentation in the Orient led to the knowledge that *Rhizopus* was associated with fermentation in *tempeh*[1,2]. Later, other species like *R. oligosporus*[3], *R. oryzae*[4], *R. arrhizus*, *R. formosaensis* and *R. achlamydosporus*[5] were also utilized for fermentation technology.

Tempeh is traditionally prepared by soaking the beans overnight, dehulling by hand and boiling for 30 min at atmospheric pressure. These are later dried and packed into banana leaves or paper along with an old piece of *tempeh* as starter[6].

In the present investigation, the laboratory method devised by Hesseltine *et al*[7] was employed. *Rhizopus stolonifer*, *R. arrhizus*, *R. oryzae*, *R. microsporus*, *R. oligosporus* and *R. chinensis* were utilized to ferment the four soybean varieties mentioned above. The beans (100 g) were soaked in 300 ml of water for 20 hr at 25 C. These were then dehulled by hand under tap water and boiled for 30 min at atmospheric pressure.