BOTANY AND PLANT TAXONOMY

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ABSTRACTS

Green Tissue in a Genetic Albino Strain of Tobacco—An Ultrastructural Study of its Plastids. ANNE A. SUSALLA, Department of Biology, Saint Mary's College, Notre Dame, Indiana 46556.——A genetic albino strain of tobacco forms green tissue when cultured on nutrient medium supplemented with kinetin and indoleacetic acid. Ultrastructural observations of the phenotypically green, genetic albino tissue reveal plastids with and without thylakoids. Plastids with thylakoids exhibit various degrees of thylakoid organization. Some plastids have thylakoids scattered in the stroma with no organization into grana. Others have thylakoids organized into several spindle-shaped grana per plastid. Still others have a single granum with one or two deep marginal indentations. Some plastids are capable of synthesizing starch and accumulating it as a storage product. A granular stroma, DNA-like fibrils and clusters of osmiophilic globules are present in these plastid types. Plastids without thylakoids are vesiculated and resemble albino plastids found in white tissue.

The Use of Computers To Help To Teach Plant Biology. THEODORE J. CROVELLO, Biology Department, University of Notre Dame, Notre Dame, Indiana 46556.——Digital Computers are becoming increasingly available for use by students in botanical coursework. Two modes are available: batch processing, whereby students input a deck of punched cards to the computer and at some later time return to pick up their completed output; and time-sharing, whereby the student sits at a teletype or other such device that may be in a biological laboratory or in the professor's office. In time-sharing the student interacts with the computer in a "printed dialog." Computers have great potential to enhance the teaching and learning of plant biology. But problems also exist and we plant biologists are sometimes in the best position to solve them as well as to determine whether computers are really enhancing learning or hindering it. Examples of the use of computers for teaching biology at Notre Dame were presented.

Standardization of Amino-peptidase Profiles for the Identification of Plant Pathogenic Bacteria. K. KRAWCZYK and D. M. HUBER, Department of Botany and Plant Pathology, Purdue University, Lafayette, Indiana 47907.——Factors influencing the amino-peptidase activity of three plant pathogenic and one saprophytic bacteria were studied to determine and thereby minimize sources of variation when identifying bacteria. Amino-peptidase profiles were determined fluoremetrically using betanaphthylamides (10^{-4}M in pH 8.0 Tris buffer) as substrates. *Erwinia amylovora*, *Xanthomonas campestris*, and *Pseudomonas tobaci* (plant pathogens) and a saprophytic Pseudomonad were used throughout this study. The effects of temperature, incubation time, growth media, inoculum density, salt solution (cofactors), halides, and buffer were evaluated. Peptidase profiles of the four bacteria studied were very different and provided a rapid, specific means of identification. Prior growth media, inoculum density, and incubation time had the greatest influence on peptidase hydrolysis of the beta-naphthylamides. Temperature, additional cofactor elements, halides, and buffer appeared to have little, if any, general effect on peptidase activity in this study. There appeared to be sufficient latitude in all these conditions for this technique to be easily adapted for routine microbial identification.

Oxygen Production by Algae and a New Interpretation of its Mechanism. ROBERT H. L. HOWE, Eli Lilly and Company, Tippecanoe Laboratories, Lafayette, Indiana 47902.——The production of oxygen by photo effect on algae in water was reviewed and a new interpretation of its chemical mechanism was presented. H_2O_2 was detected.

Identification of Phytoene in *Euglena gracilis*. RICHARD J. STROZ and J. A. GROSS, Department of Life Sciences, Indiana State University, Terre Haute, Indiana 47809.——An examination of the hydrocarbon carotene fraction extracted from *Euglena gracilis* Z and pressure-bleached *Euglena* mutants PR-1, PR-2, PR-3, and PR-4 by tlc and spectrophotometric methods revealed phytoene in mutants PR-1, PR-2, and PR-3. Photosynthetic *Euglena gracillis* Z cultured in the dark or at different light intensities showed no detectable phytoene, nor was phytoene identifiable in mutant PR-4. It was hypothesized from the results on the presence or absence of phytoene and the more unsaturated carotenoids and their relative concentrations that each mutant is blocked at a different step in the pathway of carotenoid biosynthesis.

A new Algal Assay to Determine the Growth Potential of Phosphorus Containing Natural Waters. WILLIAM N. DOEMEL and AUSTIN E. BROOKS, Department of Biology, Wabash College, Crawfordsville, Indiana 47933.——Since its development the algal assay procedure or bottle test has become an important technique to assess the growth potential of natural water samples with reference to phosphorus. The major disadvantages of the bottle assay are: 1) it is relatively slow often requiring several weeks; 2) it is tedious to perform since growth is assessed by microscopic cell counts; and 3) since pure cultures of algae are not used, the phosphorus-alga interaction may be obscured by bacterial action.

A new growth potential bioassay procedure was devised using axenic cultures of *Chlorella pyrenoidosa* (I.U. 1230). Inoculum of 1 milliliter of phosphorus starved log phase (OD_{580nm} of 0.500) was added to 29 milliliters of membrane filter sterilized test water. Cultures were incubated at 35° Centigrade in constant light (1400 foot candles) and bubbled with air. Only acid washed distilled water-rinsed Pyrex glassware was used. When cultures had reached stationary phase as determined spectrophotometrically at 580 nanometers, the cells were harvested by centrifugation and the total biomass was measured by the Lowry method.

Data were presented showing that total biomass of *Chlorella* was proportional to the phosphorus concentration in the water sample. Results indicate the assay is sensitive and reproducible. The new assay has the advantages of being rapid, usually results are available in less than 5 days; it is easy to perform; it utilized an algal that is well understood in terms of its physiology; and lastly, the new procedure reflects only algal responses to nutrients since bacteria are absent.

The Effect of Sewage Phosphorus Reduction on Algal Growth Potential of Lake Waters. Austin E. Brooks and William N. Doemel, Department of Biology, Wabash College, Crawfordsville, Indiana 47933.—— Previously reported laboratory data suggested that sewage phosphorus reduction of 50 per cent would not reduce the algal growth potential of several Indiana lake waters to which the sewage had been added in various dilutions. To demonstrate that the high temperature strain of *Chlorella pyrenoidosa* (I.U. 1230) used in the original studies did not have a unique phosphorus requirement, the experiments were repeated using *Chlorella pyrenoidosa* (I.U. 395), *Chlamydomonas reinhardtii* (I.U. 90), *Euglena gracilis* (I.U. 753), *Plectonema boryanum* (I.U. 594) and *Anabana flos-aquae* (I.U. 1444) as test organisms.

Filter sterilized Indiana lake waters (Sylvan, Pleasant and Pidgeon) were supplemented with 10 per cent (volume/volume) sewage from the Crawfordsville Municipal Treatment Plant. The sewage was a 12-hour composite sample that was collected after secondary treatment but before final chlorination. Sewage phosphorus was reduced from 4.76 milligrams Phosphorus per liter to 0.76 milligrams Phosphorus per liter by alkali precipitation. Phosphorus was reintroduced as an equal molar mixture of K_2HPO_4 and KH_2PO_4 (0.5 Molar) to levels of 0, 50 and 100 per cent of the phosphorus concentration in the original sewage. Total biomass was measured by the Lowry method when cells had reached stationary growth. The results agree with those obtained using *Chlorella pyrenoidosa* 1230 and thus substantiate the validity of the *Chlorella* bioassay procedures. These results also indicate that a 50 per cent reduction of sewage phosphorus would not reduce the algal growth potential of the eutrophic (Sylvan), oligotrophic (Pleasant) and mesotrophic (Pidgeon) lake waters tested.

Student Investigations of Speciation in *Tragopogon*. Thomas R. Mertens, Department of Biology, Ball State University, Muncie, Indiana 47306.——Genetic, cytological, and ecological investigations of speciation in genus *Tragopogon*, the goat's beards, were described. These

experimental studies may be used in teaching the evolution of plants by interspecific hybridization followed by amphiploidy. Data on pollen viability in *Tragopogon pratensis*, *Tragopogon porrifolius*, and their hybrid were presented.

***Rhoeo spathacea*: A Tool for Teaching Meiosis and Mitosis.** SANDRA K. SATTERFIELD and THOMAS R. MERTENS, Department of Biology, Ball State University, Muncie, Indiana 47306.——The monocot *Rhoeo spathacea* is an ideal organism for teaching meiosis and mitosis because of its low diploid chromosome number of 12 and large chromosome size. All of its chromosomes are involved in translocations that result in an extremely atypical meiotic process with all chromosomes frequently joined in a single ring or chain. *Rhoeo* flower buds fixed in Carnoy's solution were dissected and pollen mother cells were stained in acetocarmine and examined and photographed using a phase contract microscope. Meiotic cells reveal that non-disjunction or failure of proper chromosome separation at anaphase I of meiosis is not uncommon. The presence of lagging chromosomes is one evidence of atypical disjunction. As a consequence of the presence of multiple translocations and abnormal disjunction, many of the pollen grains formed in meiosis are defective and nonviable. Using cotton blue stain, pollen viability was determined for five plants in the experimental population and found to range from 22 to 42 per cent. The fact that meiosis in *Rhoeo* is atypical because of the presence of multiple translocations makes it a valuable aid for the teaching of meiosis, mitosis, and chromosome aberrations to genetics and cytology students.