7a-5

TOXIC MICROCYSTIS AERUGINOSA: SOME GENETIC CONSIDERATIONS. Dwain Vance. Dept. of Biological Sciences, University of North Texas. Denton, TX 76203, U.S.A.

7b. Applied Phycology & Natural Products

7b-1

GROWTH OF MONORAPHIDIUM UNDER DIURNAL TEMPERATURE REGIMES. John R. Benemann, David M. Tillett and Joseph C. Weissman. Depts. of Applied Biology and Chemical Engineering Georgia Institute of Technology, Atlanta, GA 30332, U.S.A., and Microbial Products, Inc., Fairfield, CA, 94533, U.S.A.

A strain of the green alga Monoraphidium was cultivated in the laboratory in semicontinuous cultures under diurnal light and temperature regimes. Several temperatures were studied, over a range of dilution rates, from 8°C in the dark and 16°C in the light to 22°C in the dark and 37°C in the light. Unlike other species of green algae and diatoms tested Monoraphidium exhibited high growth rates and productivities at both high and low temperature regimes. There was no significant difference between cultures at constant and diurnal temperatures.

A similar observation was made with small outdoor ponds where Monoraphidium was the only alga tested that could be maintained from summer to late fall. The culture survived through periods of freezing. Our results suggest that laboratory cultures can be predictive of algal cultures outdoors. (Supported by subcontracts from the Solar Energy Research Institute).

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SURVIVORSHIP AND GROWTH OF ARTEMIA FRANCISCANA KELLOGG IN ORGANICALLY ENRICHED CHLORELLA SP. CULTURES. Julie A. Bridgeford, Eugene Ayotte, James R. Rosowski, School of Biol. Sci., Univ. of Nebraska, Lincoln, NB 68588-0118, U.S.A.

To continuously aerated and illuminated Chlorella cultures of 1.5 l, and of >1 X 10^7 cells/ml (N = 12), was added 21.2, 28.3, 35.4, or 42.5 g dried sewage effluent (fertilizer). After 3 days, 0.045 g of brine shrimp cysts were added to each culture. Rapid growth followed, and after 13-16 days cultures were harvested. Those with 28.3 g fertilizer (N = 3) yielded the highest wet-weight biomass ($\bar{x}$ = 10.8 g/l) with a length of $\bar{x}$ = 8.6 mm and a density of $\bar{x}$ = 2.2/ml. During growth, the bacterial colony-forming units/ml dropped from 1 X 10^8 (day 2) to 3.6 X 10^7 (day 10). In another experiment, 28.3 g fertilizer was added to similarly manipulated cultures of Chlorella (N = 19). The fertilizer from all cultures was removed after 4 days; 24 hrs later, 0.045 g cysts were added to each. After 14 days, cultures were harvested. The Artemia wet-weight was 6.8 g/l (N = 16); length $\bar{x}$ = 6.2 mm, density $\bar{x}$ = 4.4/ml. The bacterial cfu/ml were 2.3 X 10^7 (on days 3 and 13). Since Chlorella density in both experiments exceeded that removed by the brine shrimp, the greater Artemia biomass in cultures with sewage effluent present throughout growth suggests that the microbial flora may be an important food base in these communities.

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DUNALIELLA SALINA STRAIN SELECTION FOR BETA-CAROTENE PRODUCTION. Cynthia G. Burrascano and Kenneth G. Spencer. Microbio Resources, Inc., 6150 Lusk Blvd., San Diego, CA 92121 U.S.A..

Seventeen isolates of Dunaliella salina from culture collections and the wild were compared for growth and ability to produce beta-carotene. Several rapidly-growing isolates from the Salton Sea (California) were then used in a program of mutation and selection for constitutive pigment production. 320 strains were screened for productivity. Although no strain was found to produce as much beta-carotene in low light as in high light, substantial overall increases in beta-carotene content were observed. In one comparison the best three strains had carotene/chlorophyll ratios 3.5 to 5.4 times as high as the base strain. All strains showed similar beta-carotene isomer composition. Laboratory photosynthesis measurements and growth studies on a temperature gradient table were used as predictors of outdoor productivity. The increased carotene contents of the cells slowed cell division somewhat, but carotene productivity could be substantially increased in outdoor culture.

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STRUCTURE OF GRACILARIA TIKVAHIAE AGAR; THE POSITION OF 4-O-METHYL-L-GALACTOSE AND SULFATE. James S. Craigie and Alex Jurgens, Atlantic Research Laboratory, NRCC, 1411 Oxford St., Halifax, N. S. B3H 3Z1 Canada.

Alkali-modified agar from old tissue of clone MP-44 grown at 28°C was repeatedly reacted with β-agarase I from Ps. atlantica. Approximately half of the agar was digested; identified products included neoagarotetraose, 6'-mono-O-methylneoagarotetraose, and 6',6'-di-O-methylneoagarotetraose. Permethylation analysis and ^{13}C NMR studies of the enzyme resistant gel fractions revealed that sulfate hemiesters were attached to C-4 of the 3-linked galactose residues and that 4-O-Me-L-Gal formed single unit side branches joined α(1→6) to the 3-linked units of the agar backbone. The ^{13}C chemical shifts (ppm, 93°C, $H_2O/DMSOd_6$) for C-1 to C-6 of 4-O-Me-L-Gal in the agar are 99.2, 69.4, 70.4, 80.2, 71.6, and 62.2, respectively; 4-O-CH_3 = 62.5. Levels of 4-O-Me-L-Gal in young tissue grown at 17°C were undetectable by NMR.

7b-5

MEDIA REQUIREMENTS AND ANTIBIOTIC AND HERBICIDE SENSITIVITIES IN LIPID-PRODUCING MICROALGAE. Ruth Galloway. SERI, 1617 Cole Blvd., Golden, CO 80401, U.S.A.

Nine axenic strains of lipid-producing algae (Navicula saprophila, Monoraphidium minutum, Nannochloropsis salina, Nitzschia pusilla, Chaetoceros muelleri, Amphora coffeiformis, and Cyclotella cryptica) have been tested for media preference, vitamin requirements, and nitrogen source preference on agar solidified media. None required vitamins and all preferred NH_4^+ to other nitrogen sources. Mixotrophic and heterotrophic growth on a variety of carbon sources were also tested. All species utilized glucose and grew less well when glycerol was added.

Tests of algal sensitivities to herbicides and antibiotics showed that the green alga, Monoraphidium, was similar to other green algae and plants in its sensitivities to antibiotics and herbicides such as streptomycin, erythromycin, spectinomycin, diuron, atrazine, metronidazole, glyphosate and sulfometuron methyl. The diatoms were also sensitive to erythromycin, glyphosate, diuron, and atrazine, but surprisingly, grew markedly better when 5 uM concentrations of sulfometuron methyl or chlorsulfuron were added to the medium.