TAKE CONTROL

Biological Control

Theory and Application in Pest Management

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Biological control is an environmentally sound and effective means of reducing or mitigating pests and pest effects through the use of natural enemies.

The aim of this journal is to promote the science and technology of biological control through publication of original research articles and reviews of research and theory. The journal devotes a section to reporting on biotechnologies dealing with the elucidation and use of genes or gene products for the enhancement of biological control agents.

Multidisciplinary Coverage:

Entomology– parasitoids, predators, and pathogens and their use through importation, augmentation, and/or habitat management strategies

Plant Pathology– antagonism, competition, cross-protection, hyperparasitism, hypovirulence, and soil suppressiveness through naturally occurring and introduced agents

Nematology– predators, parasites, and pathogens in biological control through augmentation and/or habitat management strategies and suppressive soils through naturally occurring and introduced agents

Weed Science– vertebrates, invertebrates, and pathogens and their use through classical, augmentative, or bioherbicidal tactics

The following sections are included:

Molecular Technology—advances in the understanding of biological control agents and their mechanisms
Forum—theoretical and special topics
Letters to the Editors—serving as an avenue for debate

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Volume 2 (1992), 4 issues
ISSN 1049-9644

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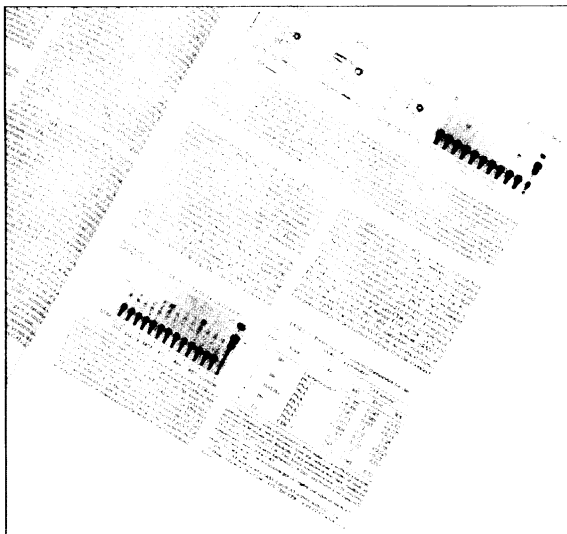

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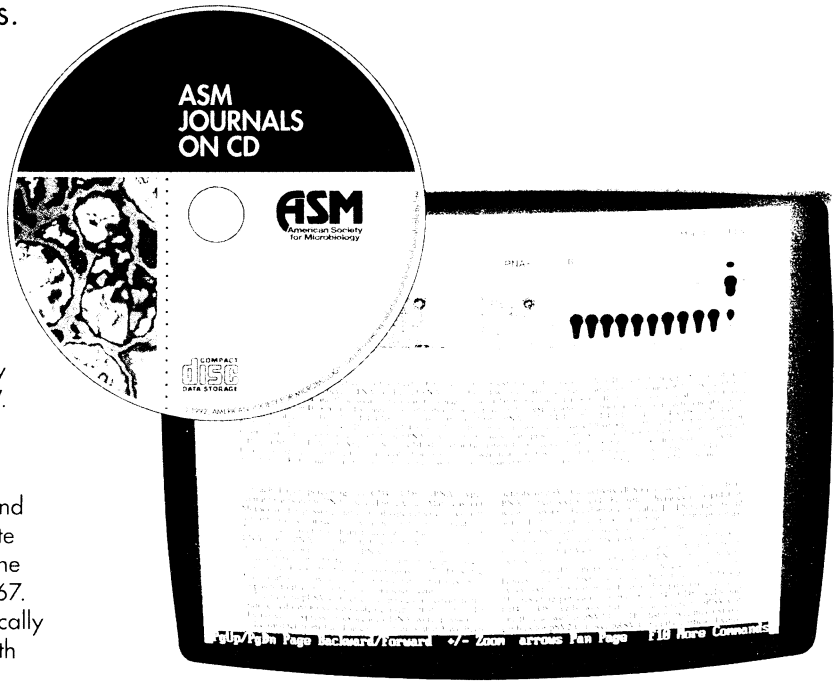

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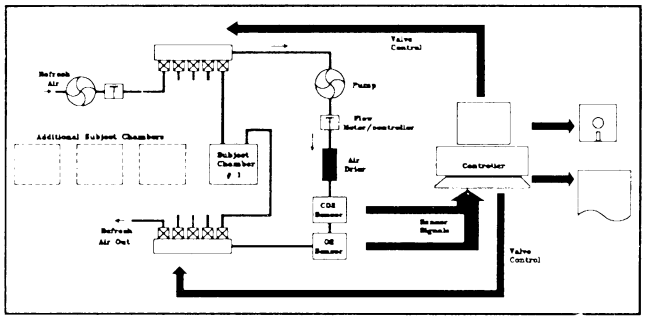
O_2/CO_2 RESPIROMETER

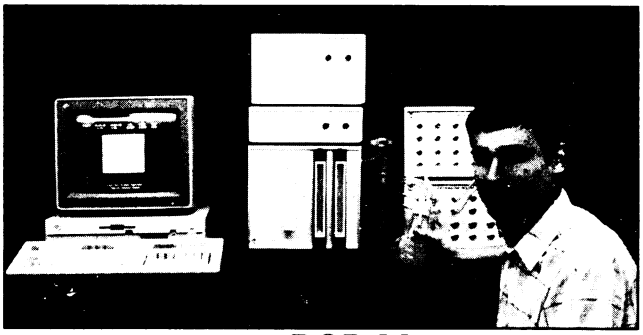
for Waste Bioremediation, Oxidation, Bioactivity and Food Technology

The Micro-Oxymax is a closed-circuit respirometer used to measure minute amounts of oxygen consumption and carbon dioxide production. External gas sensors measure the O_2 and CO_2 concentrations within the head space of the measurement vessel and this information is used to calculate O_2 consumption and CO_2 production. The Micro-Oxymax measures up to 20 samples at the same time, sequentially switching the gas sensors from one measuring vessel to the next. The head space gas in the measuring vessel is returned to the vessel after being analyzed by the sensors.

Specifications:

1. Measures O_2 and CO_2 plus RQ with 0.2 µL/h sensitivity.
2. 1 to 20 measuring chambers under IBM-PC control.
3. User can use own chambers (reactors) 50 mL to 30 L.
4. O_2 and CO_2 sensors external to the chambers (reactors).
5. Temperature of chambers can be user-adjustable.



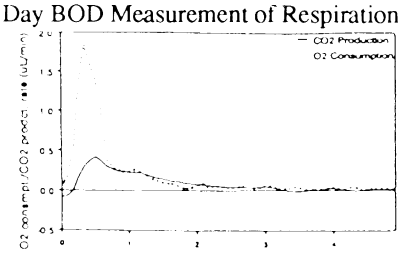


APPLICATION: BOD Measurement (Biochemical Oxygen Demand)

The Micro-Oxymax can be used to measure the total O_2 uptake and CO_2 production from the bacterial breakdown of waste. In the following experiment, a solution containing 5 mg sodium acetate is broken down over 5 days.

The graph below shows the O_2 consumption rate and the CO_2 production rate of the BOD sample minus the O_2 consumption rate and the CO_2 production rate of the control sample. After two days, most of the breakdown of the organics had already taken place. In theory, a total of 1645 µL of O_2 would have been expected to have been consumed, whereas 1424µL O_2 consumption was actually measured.

5 Day BOD Measurement of Respiration Rate

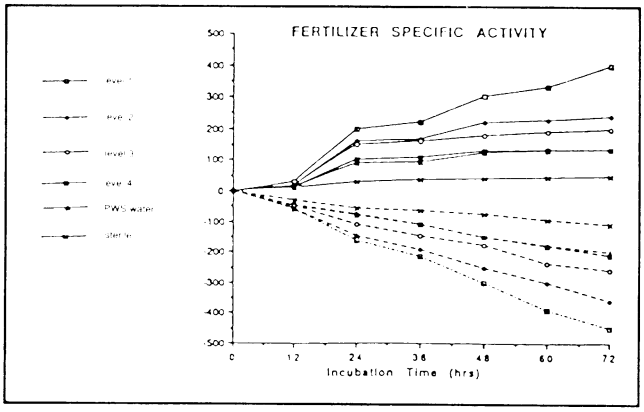


Biodegradation of Crude Oil

Oiled beach material was collected from Passage Cove (PC) and Disk Island (DI) in Prince William Sound, Alaska. Samples ,packed with dry ice, were transported to the Gulf Breeze Environmental Research Laboratory at Gulf Breeze, Florida or processed at the laboratory in Valdez, Alaska. Beach material was sieved (<12.5 mm diam, >2.75 mm diam) and mixed to generate an homogenized substrate of uniform size and degree of oiling (0.4% [weight] Prudhoe Bay crude oil).

Indigenous, oil-degrading microorganisms associated with the beach material were treated with one of the following inorganic nutrient soultions: **level** 1 35.7 mmol N as NH_4NO_3 (350 ppm N) and 8.07 mmol P as KH_2PO_4 (70 ppm P), **level 2** 35 ppm N and 7 ppm P, **level 3** 3.5 ppm N and 0.7 ppm P or **level 4** 0.35 ppm N and 0.07 ppm P. Effects of nitrogen (35.7 mmol) or phosphorus (8.07 mmol) alone were also evaluated. Sterile nutrient solutions were prepared with water from Prince William Sound (PWS), Alaska. Daily treatments were applied at each high-tide, or once at the initial high-tide. Results were compared with those observed with high-tide solutions of filtered PWS water, or 3% NaCl in distilled water (pH=8.1). A sterile, killed cell control was prepared using an acidified PWS water as the high-tide solution.

The graph below summarizes results typical of those generated throughout the past 2 years. Here, addition of the high-level nutrient solution (level 1) resulted in a 2- to 3-fold increase in the activity of the oil-degrading population as determined by the release of CO_2 and the consumption of O_2. As expected, the ratio of CO_2 production to O_2 consumption is nearly 1.0. The stimulatory effect of inorganic nutrients was shown to be directly proportional to the amount of nutrient added to the test systems. (Information provided by Dr. James G. Mueller, US EPA Gulf Breeze, Florida)



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