THE AQUATIC PLANT MANAGEMENT SOCIETY, INC.

24th ANNUAL MEETING ABSTRACTS

July 15-18, 1984
RICHMOND, VIRGINIA

"EPA Update"

Roy P. Clark, Chief, Pesticides and Toxic Substances Branch
United States Environmental Protection Agency
Atlanta, Georgia

An overview of the changes, proposed changes, and possible changes in EPA as it relates to pesticides, groundwater, and aquatic plant management.

"The Importance of Noxious Weed Regulations to the Aquatic Plant Management Industry"

Vernon V. Vandiver, Jr., Paul F. Sand, and Thai K. Van
University of Florida, IFAS; USDA, APHIS, and USDA, ARS
Fort Lauderdale, Florida; Hyattsville, Maryland;
and Fort Lauderdale, Florida

Noxious aquatic weed growth is a worldwide problem. Federal statutes, and in certain areas, state and local statutes, exist in order to regulate the international, interstate, and intrastate movement of certain selected noxious aquatic weeds. The intent of limiting the movement of weeds, both aquatic and terrestrial, is to delay or prevent weed infestations from spreading to new areas. Efforts should be made to strengthen existing legislation to accomplish the intended goals.

"Aquatic Weeds in the Guayas River Basin, Ecuador"

Joseph C. Joyce, Center for Aquatic Weeds
Institute of Food and Agricultural Sciences
University of Florida, Gainesville, Florida

"Aquatic Weed Problems - Republic of Turkey"

A. L. Bates, TVA*; L. J. Matthews, FAO; and T. O. Petr, FAO
(*giving presentation)
Tennessee Valley Authority and Food and Agriculture
Organization of the United Nations
Muscle Shoals, Alabama, and Rome, Italy

Aquatic weeds impact numerous inland lakes throughout Turkey, particularly the harvest of fish and crayfish. A survey of lakes in western Turkey sponsored by the Food and Agriculture Organization indicated reed (Phragmites australis [Cav.] Trin. ex Steud.) was the dominant emergent aquatic macrophyte while the dominant submersed macrophytes were Eurasian watermilfoil (Myriophyllum spicatum L.), coontail (Ceratophyllum demersum L.), and various pondweeds (Potamogeton spp.). Remedial control measures consisted almost entirely of manual cutting and removal; and, in the case of reed, limited commercial harvesting was conducted to provide raw products for pulp production.

"Aquatic Weed Problems - Developing Countries"

Wm. T. Haller, Center for Aquatic Weeds
Gainesville, Florida

"Advances in Weed Control Technology--Trends in the Future"

Warren G. Shaw, National Program Staff
Agricultural Research Service, U.S. Department of Agriculture
Room 225, Building 005, BARC - West
Beltsville, Maryland 20705

Weeds cause annual losses of about 10 percent in agricultural production, including crops, livestock, forests, and aquatic resources currently valued at more than $13 billion. Farmers also spend more than $8 billion to control weeds each year for total losses and costs of over $21 billion.

In the future emphasis will be on research to develop: (a) a better fundamental understanding of the biology, physiology, genetics, and biochemistry of weeds including, allelopathic effects, ecological shifts, population thresholds, competitiveness, interactions, genetic basis for resistance of weeds, crops, and desirable plants to herbicides and their vulnerability to control; (b) new approaches that emphasize the selective application of stress to weeds and not to crops and desirable plants and new, more effective biological, genetic, physical, cultural, ecological, allelopathic, and chemical control components; (c) total farm and ecosystem approaches to weed management; (d) an understanding of the effects of herbicides on human health, plant and animal growth, soils, water, and the total environment of man, domestic animals, fish, and wildlife; (e) knowledge of the economic losses caused by weeds and benefits, costs, limitations, and risks of current weed management practices; (f) formulations of economical, more selective, more efficient, and less toxic herbicides; (g) safety measures that are practical and easy to follow in the application of herbicides; (h) application systems technology to reduce drift and volatility and improve herbicide distribution and deposit; (i) technology for combining these techniques and practices into economic integrated weed management systems (IWMS) and productive agroecosystems that are compatible with a quality environment; and (j) regulations that minimize the importation of noxious weeds, restrict the intrastate and interstate flow of weeds, and provide Federal and state coordination and support for elimination of incipient infestations of newly introduced noxious weeds.

The annual benefits expected from technology developed during the next 5 years include the following savings: (1) $4 billion from reduced crop and water losses, (2) $700 million from reduced costs of control, (3) $1 billion from improvements in the quality of crops and water and fewer livestock deaths, (4) $2 billion from improved crop production efficiency, and (5) $4 billion from reduced diesel fuel requirements because of reduced tillage. Thus, annual benefits are estimated at more than $11.7 billion.

"Herbicide Investigations in Lake Mann and Williams Pond Following Applications of Sonar (Fluridone)"

D. C. Schmitz, L. E. Nall, and A. J. Leslie
Florida Department of Natural Resources
Bureau of Aquatic Plant Research and Control
3917 Commonwealth Blvd., Tallahassee, Florida 32303

Sonar was applied to Lake Mann at five different treatment plots, formulations, and dates. Bottom sediments were collected with a 2-in. core sampler from one of the treatment plots and sampled over time to determine residue levels. Results indicate that the highest Sonar residue level occurred 2-3 months after final application when hydrilla dropped out. Sonar decreased to near non-detectable levels one year after final application. Sonar was also applied in a north Florida pond (Williams Pond) to control a severe infestation of Cabomba pulcherrima. Water quality and plant biomass were monitored. Results indicate Sonar was very effective in controlling Cabomba and had little to no effect on most water quality parameters. Chlorophyll concentrations in Williams Pond did increase although not at alarming proportions.

"Status Report on Sonar, 1984"

Dave Tarver[1] and Lonnie Pell[2]
[1]Elanco, Tallahassee, Florida
[2]Elanco, North Carolina

Sonar has been evaluated for use in lakes, reservoirs, and ponds under the Experimental Use Permit #67 for the past few years. The primary emphasis has been in Florida where the spectrum and length of control has been excellent, especially on hydrilla. For 1984, plans are being implemented to evaluate Sonar in other regions of the United States in anticipation of full label. Recommendations for use in moving water are also being finalized.

"An Evaluation of the Possible Causes and Consequences of the Decline of Submerged Vascular Plant Communities in Northern Chesapeake Bay"

W. R. Boynton,[1] W. M. Kemp,[2] J. C. Stevenson,[2] and R. Twilley[2]
University of Maryland Center for Environmental and Estuarine Studies
[1]Chesapeake Biological Laboratory, Box 38,
Solomons, Maryland 20688-0038
[2]Horn Point Environmental Laboratories, Box 775
Cambridge, Maryland 21613-0775

In the last two decades there has been a major decline in the distribution and abundance of submerged vascular plant communities (SAV) in many portions of Chesapeake Bay. Review of available data suggested that changes in water quality may have been the cause of this decline and a hierarchical set of experiments was conducted to evaluate the effects of nutrient enrichment, light availability, and herbicides on SAV. Results indicated an important role for nutrient enrichment via planktonic and epiphytic shading of SAV while herbicide impacts appeared to be small. Calculations indicated that SAV communities prior to the decline may have had very large, moderate, and relatively small impacts on estuarine sediments, organic matter, and nutrient budgets, respectively.

"Effluent Disposal into Wetlands"

C. W. "Mickey" Sheffield,* Rick Johnson, and Carol Lotspeich
Sheffield Engineering & Associates, Inc.
3400 S. Conway Road, Orlando, Florida 32806
Sheffield Engineering & Associates, Inc., & Lotspeich & Associates
P. O. Box 12, Winter Park, Florida 32790

This paper addresses the use of existing wetland aquatic plant communities in a freshwater wetland in Florida as a means of effluent disposal of treated wastewater. System design and construction are discussed and emphasis is placed on water quality as effluent passes through the sampling stations throughout the system. Background projects in operation in Florida will be discussed. The presentation includes slide projections that show preconstruction, construction, and postconstruction.

"Effect of Sediment Type on Water-Column Phosphate Concentrations After Herbicide Treatment of Eurasian Watermilfoil"

Scott Painter, Environment Canada
Aquatic Ecology Division, ECIW, P.O. Box 5050
Burlington, Ontario, Canada 97R4A6

Herbicide control of aquatic macrophytes has the potential of elevating water-column phosphate concentrations and therefore creating algal blooms according to laboratory studies such as Carpenter and Adams (1978). However, nutrient elevations in field applications are only occasionally reported. Three sediments were tested for their effect on nutrient concentrations in laboratory tests with herbicide-killed Eurasian watermilfoil.

"Can Hygrophila and Limnophila Repeat Hydrilla's Infamy in Florida?"

William Spencer and George Bowes
Botany Department and The Center for Aquatic Weeds
University of Florida, 3153 McCarty Hall
Gainesville, Florida 32601

The amphibious aquatic plants limnophila and hygrophila have varying CO_2 compensation points, low light compensation and saturation points, low carboxylase activity, and some potential for C-4 acid metabolism. These characteristics are similar to hydrilla and other submersed aquatic macrophytes. Neither species produces vegetative propagules; however, limnophila produces large quantities of viable seed, and hygrophila has enormous potential for regrowth from fragments, greater than hydrilla. Limnophila and hygrophila produced more dry weight at pH 5 as compared to hydrilla at pH 9.

"Myriophyllum Identification Made Easy"

Edward N. Nelson* and Richard W. Couch
Oral Roberts University
Department of Natural Science
Oral Roberts University, Tulsa, Oklahoma 74171

Highly variable ecotypes exist in the genus Myriophyllum. As a result, even reputable, otherwise competent taxonomists tend to avoid study of the taxa. But recent publications have eliminated many of the descriptive problems making identification more precise, consistent, and certain.

"Myriophyllum spicatum L. Distribution in the United States, 1984"

Richard W. Couch* and Edward N. Nelson
Oral Roberts University
Department of Natural Science
Oral Roberts University, Tulsa, Oklahoma 74171

Taxonomic confusion within the genus Myriophyllum has complicated precise delineation of Myriophyllum spicatum distribution in the United States. Annotation of Myriophyllum collections from selected herbaria across the United States are combined with published data to produce an up-to-date, current map of known M. spicatum populations in the United States.

"The Secchi Disc and Light Measurements"

G. Douglas Pullman*[1] and C. D. McNabb[2]
The Dow Gardens and Michigan State University
[1]The Dow Gardens, 1018 W. Main St., Midland, Michigan 48640
[2]Department of Fisheries and Wildlife
Michigan State University, East Lansing, Michigan 48824

The penetration of light through the water column is an important factor for determining the maximum depth limits for primary production in the aquatic ecosystem. Unfortunately, light measurement is subject to considerable variability. The Secchi disc has become the standard measure of transparency and has been used to roughly quantify light penetration. Estimates have been proposed as to how Secchi disc transparencies correlate with actual light measurements. These estimates, however, are characterized by considerable variation when compared to in situ light measurement. Furthermore, light measurements may also be attended by high variability, which is dependent on how the measurements are made and the type of equipment used. This paper will highlight some of the problems associated with light measurement in aquatic ecosystems and propose possible solutions to some of these analytical problems.

"Control of Aerial Leaf and Stomatal Development By Abscisic Acid in Selected Species of Myriophyllum and Proserpinaca"

Michael E. Kane* and Luke S. Albert, Department of Botany
University of Rhode Island, Kingston, Rhode Island 02881

An interspecific study was undertaken to determine the role of abscisic acid in the induction of aerial type leaves on submerged shoots of seven species of Myriophyllum and two of Proserpinaca. Submerged shoots of all species developed aerial-type leaves following treatment with 1.0 µM ABA. These results suggest that ABA plays a role in the regulation of aerial leaf development in many heterophyllous aquatics, probably through enhanced endogenous ABA synthesis and accumulation following emergence-induced water stress.

"Studies on Utilization of Treated Stack Gas. II. Growth of Waterhyacinths (Eichhornia crassipes) in Carbon-Dioxide-Rich Atmospheres"

Dean F. Martin* and Kenneth A. Hewes
Chemical and Environmental Management Services (CHEMS) Center,
Department of Chemistry, University of South Florida
Tampa, Florida 33620

Waterhyacinths survive atmospheric carbon dioxide concentrations ranging from ambient to 15% (v/v). The optimum growth during a one-week period with continuous laboratory lighting (200 $\mu E/m^2/sec$) appeared to be about 10%. Under these conditions, the equation defining inorganic carbon fixed as a function of the atmospheric concentration of carbon dioxide indicated a maximum of about 75% of available carbon was fixed over the range 0-10% carbon dioxide. Under a typical light cycle, the percent fixed was reduced to about 60%. The implications of the results are considered.

"Macrophyte Zonation in a Hydrilla Community in a North Carolina Reservoir as Related to Drawdown"

[1]Harlan, S. M.,* [1]G. J. Davis, and [2]G. J. Pesacreta
[1]Department of Biology, East Carolina University
Greenville, North Carolina 27834
[2]Department of Zoology, North Carolina State University
Raleigh, North Carolina

Hydrilla communities in North Carolina are generally monospecific. However, in Lake Wheeler, effective competition by Najas minor and to a lesser extent by Eleocharis acicularis was documented in a 1982 biomass survey. A 1.3-m drawdown of the lake in May 1983 led to virtual elimination of both of these species during the 1983 growing season and movement of hydrilla into areas much further offshore than in 1982.

"Effect of Temperature, Light, and Water Quality on the Activity of Three Copper Based Algicides"

Lars W. J. Anderson and Nathan Dechoretz,* USDA-ARS
Botany Department, University of California, Davis, California 95616

Studies were conducted to evaluate various environmental factors on the activity of three copper based compounds on Cladophora glomerata. The algicidal activity of copper sulfate, Cutrine Plus®, or Komeen© after 2 hr exposure in the dark was not significantly different from that in the light. Water quality at time of treatment had more of an effect on copper sulfate than Cutrine Plus or Komeen. As water temperature increased from 12.8°C to 23.9°C algicidal activity increased (after 2 hr exposure to copper at 4.0 ppmw). However, the copper concentration of Cladophora immediately after treatment at 12.8°C was not significantly less than the copper concentration.

"Influence of Light and Temperature on Photosynthesis and Respiration of Pithophora oedogonia (Mont.) Witt."

D. F. Spencer,[1] J. M. Graham,[2] and C. A. Lembi[3]
[1]USDA-ARS, Davis, California 95616
[2]University of Wisconsin, Madison, Wisconsin 53706
[3]Purdue University, W. Lafayette, Indiana 47907

Rates of net photosynthesis and respiration were determined for Pithophora oedogonia at 56 combinations of light (7-1200 $\mu E\ m^{-2}\ sec^{-1}$) and temperature (5-35°C). Light saturation occurred between 62.5 and 225 $\mu E\ m^{-2}\ sec^{-1}$. The light saturated rate of net photosynthesis varied considerably with temperature with the maximum value (9.665 mg O_2 g dry $wt^{-1}\ hr^{-1}$) occurring at 25°C. Evidence for photoinhibition was only observed for cultures incubated at 5°C. Respiration rate increased with temperature and the intensity of light exposure just prior to measurement. The maximum respiration rate (7.045 mg O_2 g dry $wt^{-1}\ hr^{-1}$) occurred at 30°C and 1200 $\mu E\ m^{-1}\ sec^{-1}$). The relationships between light, temperature, and photosynthesis and respiration were summarized as three-dimensional response surfaces.

"The Biology and Control of Spinyleaf Naiad (Najas minor All.)"

David H. Webb, A. Leon Bates, and Earl R. Burns
Tennessee Valley Authority, E&D Building
Muscle Shoals, Alabama 35660

Spinyleaf naiad (Najas minor All.) has become a major problem in Tennessee Valley Authority reservoirs. Since it is an annual that can survive drawdowns in the seed stage, fall and winter drawdowns are ineffective for control of the species. Utilizing studies of the life history of spinyleaf naiad, several control strategies will be discussed. These will include a discussion of drawdowns, contact herbicides, and pre-emergent herbicides in relation to short-term and long-term control of spinyleaf naiad.

"Western United States Irrigation Systems: Proven and Potential Methods for Control of Aquatic Weeds"

Lars W. J. Anderson*
USDA-ARS Aquatic Weed Control Laboratory
Botany Department; University of California
Davis, California 95616

Western United States agriculture and urban economic development depend heavily upon transport of millions of acre-feet of high-quality water through an extensive network of canals and reservoirs. Volume flows range from a few to several thousand cubic feet per second. More economic control of weeds in these systems is possible with improved water management strategies which optimize use of mechanical, chemical, and biological techniques. New knowledge of weed biology will be discussed with respect to how it can be used to enhance and integrate control methods.

"Integrated Aquatic Weed Control on the Withlacoochee River, Floridas"

Leonard F. Bartos
Southwest Florida Water Management District
2379 Broad Street, Brooksville, Florida 33512-9712

Since 1977, the Southwest Florida Water Management District has been conducting aquatic weed control operations on the Withlacoochee River. Our primary objective has been to conduct a maintenance control program utilizing integrated control methods involving biological, mechanical, and chemical techniques. An evaluation of the methods used to control hydrilla, waterhyacinths, and other plants indicates that site-specific conditions and other factors play a significant role in determining the optimization of any particular technique.

"Control of Submerged Aquatic Weeds with the Grass Carp: A Large-Scale Success Story"

R. D. Martyn, R. L. Noble, and P. W. Bettoli
Texas A&M University
College Station, Texas 77843

Lake Conroe is a 20,000-acre reservoir located 45 miles north of Houston, Texas. Hydrilla verticillata was first observed in the lake in 1975, and, by 1978, had become a serious pest. In 1979, a five-year cooperative study involving the Lake Conroe Association and Texas A&M University was begun to document the increase and spread of submerged aquatic weeds and to introduce and evaluate the grass carp (Ctenopharyngodon idella) as a biological control agent. Aerial color infrared photography was used to monitor changes in vegetation. Submerged species increased from 5,800 acres in 1979 to 9,000 acres in July 1981, just prior to the first stocking. From Sept 81 to Sept 82, 270,000 grass carp, 8 in. or longer, were stocked into Lake Conroe. Significant decline in acreage of surfaced mats was evident throughout the lake during the year following stocking. By Oct 1983, all 9,000 acres of submerged weeds were gone from Lake Conroe. Feeding patterns typical of grass carp behavior, coupled with growth and abundance data and stomach contents of captured fish, indicate virtually all of the decline in vegetation was directly related to grass carp.

"Exotic Insects for Control of Hydrilla"

Joe K. Balciunas
University of Florida Research and Education Center and
USDA Aquatic Plant Management Laboratory
3205 College Avenue, Ftort Lauderdale, Florida 33314

Since 1981, three trips, each 5 to 6 months in duration, have been made to tropical Asia and Australia searching for insects that damage hydrilla. This has resulted in many species of insects being recorded that damage hydrilla. Some of these will be further evaluated for potential introduction into the United States.

"Integrated Management of Hydrilla in North Carolina: The First Year"

G. J. Pesacreta[1], R. G. Hodson[1] and K. A. Langeland[2]
[1]Zoology Department, North Carolina State University,
Raleigh, North Carolina
[2]Crop Science Department, North Carolina State University,
Raleigh, North Carolina

Here we present the results of our first year of field research on control methods for hydrilla in North Carolina. We have examined physical treatments (i.e. drawdown) and chemical treatments with several herbicides and have utilized the herbivorous fish tilapia and grass carp. Additionally, we have studied the biology of the plant in North Carolina to help us determine when control treatments should occur.

"Physico-Chemistry of Lakes and Reservoirs in North Carolina with Submersed Aquatic Vegetation"

G. J. Pesacreta, Zoology Department
North Carolina State University, Raleigh, North Carolina

The physico-chemistry of lakes and reservoirs from the Piedmont region of North Carolina colonized by the submersed macrophyte hydrilla (Hydrilla verticillata (L.f.) Royle) were examined. Hydrilla dominated the water chemistry of the littoral zone by causing elevated surface water temperatures, pH, and electrical conductivity. At the edge of the hydrilla beds, the surface water chemistry was similar to that found at the deep basin. Light transparency was greater in macrophyte-dominated lakes than normally found in southern turbid impoundments.

Typically, these lakes circulate continuously from autumn throughout the winter. Occasionally, an inverse stratification occurs when a complete ice cover forms on the smaller lakes. Summer stratification is characterized by anoxic hypolimna with significant increases of electrical conductivity and total alkalinity in the bottom waters.

"Evidence for the Management of Hydrilla and Hydrilla-like Plants by Natural Products"

M. Perez-Cruet* and D. F. Martin
Chemical and Environmental Management Services (CHEMS) Center,
Department of Chemistry-SCA 241, University of South Florida
Tampa, Florida 33620

The disappearance or absence of hydrilla or hydrilla-like plants from natural waters has been documented in the literature for over 100 years. The absence of these plants is ascribed to (a) loss of a critical nutrient, (b) loss of potency, or (c) chance. Evidence is presented for the existence of natural products associated with organic substrates that inhibit hydrilla. The implications of being able to define these naturally occurring materials are also considered.

"Spikerush (Eleocharis spp.) as a Source of Allelopathics for the Control of Undesirable Aquatic Plants"

Floyd M. Ashton, Joseph M. DiTomaso,* and Lars W. J. Anderson
Botany Department, University of California, Davis, California 95616

Leachates from axenic cultures of dwarf spikerush (E. coloradoensis) grown in quartz sand with Murashige and Skoog medium have been subjected to various bioassays, fractionation, and preliminary identification. The freeze-dried crude leachate inhibited the root growth of the aquatic weeds Hydrilla verticillata and Potamogeton pectinatus as well as cell suspension cultures of tomato. A fraction from a G-15 Sephadex column also inhibited tomato growth and lettuce seed root growth. Further identification of the active compound(s) is in progress.

"On the Mechanism of Management of Ptychodiscus brevis by a Naturally Occurring Lysing Agent"

Dean F. Martin
Chemical and Environmental Management Services (CHEMS) Center,
Department of Chemistry, University of South Florida
4202 Fowler Avenue, Tampa, Florida 33620

Blooms of the unarmoured marine dinoflagellate Ptychodiscus brevis along the west coast of Florida can be responsible for massive mortalities of marine animals and subsequent cleanup costs and damage to tourism. A natural product ellaborated by Nannochloris sp. is responsible for cytolysis of P. brevis in the laboratory and presumably in the environment. The mechanism appears to be an association of the natural product ("Aponin") with a membrane sterol (ergosterol) and disruption of the osmoregulatory functions. The chain of evidence for the mechanism will be reviewed.

"Fate of Endothall During the Pat Mayse Lake, Texas, Aquatic Plant Management Program"

K. H. Reinert,* M. L. Hinman, and J. H. Rodgers, Jr.
Institute of Applied Sciences and Department of Biological Sciences
North Texas State University, Denton, Texas 76203

A fate assessment of endothall (Aquathol) was conducted on Pat Mayse Lake during the summer of 1983 in conjunction with an aquatic plant management program. Endothall concentrations were below the aqueous minimum detectable level of 0.002 mg L^{-1} within 72 hr after treatment and below the minimum detectable level for sediment (0.01 mg kg^{-1}) within 96 hr. Both dilution and biodegradation probably contributed significantly to rapid transfer and degradation. Also, endothall was not detected in fish tissue on any sampling day.

"Effects of Endothall During the Pat Mayse Lake, Texas, Aquatic Plant Management Program"

M. L. Hinman,* K. H. Reinert, and J. H. Rodgers, Jr.
Institute of Applied Sciences and Department of Biological Sciences
North Texas State University, Denton, Texas 76203

The infestation of over 550 acres of Pat Mayse Lake, Lamar Co., Texas, with Eurasian watermilfoil (Myriophyllum spicatum L.) prompted the Tulsa District, Corps of Engineers, to implement a weed management program. Direct and indirect effects of localized applications of Aquathol granular aquatic herbicide were examined. When Aquathol was used according to manufacturer's directions, no ecologically significant direct or indirect effects were observed on nontarget species or abiotic water quality, although milfoil was temporarily eliminated.

"Use of Herbivorous Fish to Manage Aquatic Weeds in Agricultural Water Ways"

David L. Sutton* and Vernon V. Vandiver, Jr.
University of Florida, Fort Lauderdale Research and Education Center, 3205 S.W. College Avenue
Fort Lauderdale, Florida 33314

Grass carp, hybrid fish from a cross of grass carp and male bighead carp, and surgically sterilized grass carp are being studied for their ability to control aquatic weeds in irrigation and drainage ditches in agricultural areas. This paper will present results on use of these fish to control hydrilla and torpedograss, the principal aquatic weed problems in these systems.

"Field and Laboratory Tests with Hybrid, Surgically Altered, and Triploid Grass Carp in Southern California"

Randall K. Stocker[1] and Paul R. Beaty[2]
[1]Imperial Irrigation District
USDA-ARS, Brawley, California 92227
[2]Coachella Valley Water District
Coachella, California 92236

Plant consumption in the laboratory by triploid grass carp was as high as for diploid grass carp. Altered grass carp were examined for regeneration of gonoducts and spawned. Surgical alteration may not prevent release of gametes. Field tracking radio-tagged grass carp indicates that movement is inhibited by minimal barriers, and that water velocity is periodically sufficient to move fish downstream. Surgically altered grass carp successfully controlled aquatic plant growth, including hydrilla, during the 1983 growing season in two lateral canals.

"Energy Requirements and Capacities of Aquatic Plant Choppers"

Larry O. Bagnall
Agricultural Engineering Department and Center for Aquatic Weeds
University of Florida, Frazier Rogers Hall
Gainesville, Florida 32611

In mechanical control and utilization systems, aquatic plants are chopped to improve handling and reduce volume. Waterhyacinth and hydrilla were chopped in a commercial cylinder-shearbar chopper, two experimental cylinder-shearbar choppers, an experimental flail chopper, and crimping rolls to determine energy requirements, capacity, and effects on density and handling characteristics. Crimping rolls had the lowest energy requirement; the flail chopper had the highest energy capacity, and the cylinder-shearbar choppers produced the best product.

"The Economics and Feasibility of Mechanical Waterhyacinth Control in the Contra Costa Canal"

Thomas J. McNabb
Aquatics Unlimited/American Lake and Canal
1818 C Arnold Industrial Place, Concord, California 94520

For the past few years, the waterhyacinth problem in the California Delta has been expanding. The water in this region is utilized for recreation, domestic supply, and irrigation, and supports a major fishery. The waterhyacinth can impact all of the uses of this resource. In areas close to domestic water intakes, the use of herbicides has been limited. The Contra Costa Canal is one such area. An alternative method, mechanical harvesting of the plants, has been evaluated.

*

"Status of Grass Carp in Europe"

T. O. Robson, U.K.

"Feasibility of Using Surgically Sterilized Grass Carp for Weed Control"

John A. Osborne* and David Clippinger
Department of Biological Sciences, University of Central Florida
P.O. Box 25000, Orlando, Florida 32816

Grass carp have been successfully sterilized by a rather simple surgical procedure. The surgical method is rapid, cost-effective, and performed with low mortality, and ensures sterility (100%). Since natural reproduction by grass carp occurs in running water, surgically sterilized grass carp can be stocked for weed control in environments where there is concern about reproduction or where there is a potential for escapement.

"Long-Term Control of Submersed Aquatic Macrophytes in Central Illinois"

Robert C. Hiltibran, Associate Professor of Agronomy
Department of Agronomy, University of Illinois
608 E. Washington, Urbana, Illinois 61801

Long-term, continuous control of submersed aquatic macrophytes was initiated in 1960 by removal of the existing stand of curlyleaf pondweed from Mansion Pond, Allerton Park. Two stands of curlyleaf pondweed were removed each year from 1960 through 1962. After 1962 severity of the stands of curlyleaf pondweed in Mansion Pond decreased. Control of leafy and small pondweed in Whetzel Pond was initiated in 1964. The results obtained have been duplicated in other ponds.

"Effect of 2,4-Dichlorophenoxyacetic Acid and Gibberellic Acid on Waterhyacinths Under Operational Conditions"

Joseph C. Joyce and William T. Haller
Center for Aquatic Weeds, Institute of Food and Agricultural Sciences, University of Florida
7922 N.W. 71st Street, Gainesville, Florida 32606

The effects of combinations of gibberellic acid (GA_3) and 2,4-dichlorophenoxyacetic acid (2,4-D) on waterhyacinths (Eichhornia crassipes (Mart.) Solms) were evaluated to determine if GA_3 increased waterhyacinth sensitivity to 2,4-D under operational conditions. Evaluations were conducted during late summer of 1982 in a dense population of mature, non-bulbous, leafed waterhyacinths in the St. Johns River, Florida. Small plot treatments (27.6 m^2) consisted of combinations of GA_3 at 0, 23.5, 47.0, and 94.0 g/ha and 2,4-D at 0, 0.56, 1.12, 2.24, and 4.48 kg/ha. Large-scale treatments on three 0.4-ha plots consisted of 0.84 kg/ha 2,4-D, 0.84 kg/ha 2,4-D plus 94.0 g/ha GA_3, and 2.24 kg/ha 2,4-D. Results indicate that the use of GA_3 to significantly reduce rates of 2,4-D used to control waterhyacinths on an operational basis was not justified from either an increased efficacy or economic standpoint.

"An Update About the Aquatic Plant Information System"

Victor Ramey, Aquatic Weed Program
2183 McCarty Hall, University of Florida
Gainesville, Florida 32611

In the past three years, the number of users who share the aquatic plant information retrieval system has increased from less than 100 per year to more than 1,200 per year. Researchers in 64 countries and 35 U.S. states contributed most of the more than 3,000 items which were added to the computerized database in the past year. In exchange, users received "current awareness" and "retrospective" bibliographies of the research in their areas of interest. The system publishes the newsletter AQUAPHYTE (circulation: 3,500) and has plans to introduce other information services.

"Update--Corps of Engineers, Aquatic Plant Control Research Program"

J. Lewis Decell
Corps of Engineers, Aquatic Plant Control Research Program
Waterways Experiment Station, Vicksburg, Mississippi 39180

"A Comparative Study of Growth and Reproduction of Hydrilla verticillata in California and Florida-- Biomass, Subterranean Turion Production and Container Configuration"

Lars W. J. Anderson* and David L. Sutton
USDA-ARS Aquatic Weed Research Laboratory
and University of Florida
Botany Department, University of California,
Davis, California 95616 and Agricultural Research
and Education Center, Fort Lauderdale, Florida 33314

Plastic-lined pools (0.9 m ht by 3.6 m diam) containing 15 cm diam by 20 cm and 10 cm diam by 20 cm capped polyvinyl chloride (PVC) and 6-l plastic buckets were used to culture tuber-grown hydrilla in a standard sand/sterilizer mix at Davis, Calif., and Fort Lauderdale, Fla. Spring and summer plantings were made simultaneously in Calif. and Fla. After 8 weeks, higher biomass was achieved in Fla., but no subterranean turion production occurred by 9/26; subterranean tuber production occurred by 9/26 in Calif., but not at the end of the spring plantings (7/6). The 10-cm-diam by 20-cm PVC containers supported good growth and will be further tested in canals and ponds.

"Status of Hydrilla in the Potomac River"

K. K. Steward, U.S. Department of Agriculture, ARS, SR
South Atlantic Area, Aquatic Plant Management Laboratory
3205 College Avenue, Fort Lauderdale, Florida 33314

The Potomac River and eastern seaboard have been invaded by a new biotype of the exotic aquatic weed hydrilla which appears to be more threatening than the Florida type. A small colony discovered in 1982 in a cove off the Potomac near Alexandria, Va., expanded in one year to cover 10 acres and the plant became established downstream as far as Quantico, Va.

Unless brought under control or eliminated, over 33,000 acres of the Potomac shoreline are vulnerable to colonization with the consequence of multimillion dollar losses to the aquatic resources. We will discuss control strategies undertaken and current status of the infestations.

"Comparative Studies of Monoecious and Dioecious Hydrilla Biotypes"

K. K. Steward* and T. K. Van
U.S. Department of Agriculture, ARS, SR
South Atlantic Area, Aquatic Plant Management Laboratory
3205 College Avenue, Fort Lauderdale, Florida 33314

Wild colonies of a monoecious biotype of Hydrilla verticillata Royale have been reported from the northeast United States and from North Carolina. The occurrence of these wild colonies greatly increases the potential, through sexual reproduction, for genetic diversification and adaptation to different habitats. Only the dioecious female was previously known in the United States. Investigations comparing the physiology of these two biotypes are currently in progress. We will report on the following: (1) flowering and growth response to photoperiod; (2) partitioning of photosynthate between roots, shoots, and propagules; (3) fragment survival and regrowth as related to establishment and distribution of colonies; (4) salinity tolerance (to determine how far seaward plants will establish); and (5) susceptibility to registered aquatic herbicides.

"Some Unusual Aspects in the Sexual Reproductive Processes of Hydrilla verticillata (L.f.) Royle"

Richard R. Yeo and Jon R. Thurston
U.S. Department of Agriculture, ARS
Botany Department, University of California, Davis, California 95616

The female flowers of monecious plants imported from Washington, D.C., and grown under quarantine conditions at Davis, Calif., developed unusual characteristics. Female flowers that formed late in the flowering period had very short or no hypanthiums. Several swollen ovules formed within the ovaries. Histological examination showed that they had the features for fertilization to occur; however, it did not. Some ovules grew within the ovaries, but they lacked meristem tissue.

"Artificial Selection for a Cold-Tolerant Strain of Agasicles hygrophila"

Allan J. Hruska* and Sarah M. Gladstone
Biological Control Laboratory, North Carolina Department of Agriculture, P.O. Box 27647, Raleigh, North Carolina 27611

The alligatorweed flea beetle (Agasicles hygrophila Selman & Vogt) is a successful biological control agent of alligatorweed (Alternanthera philoxeroides (Mart.) Griseb.) in areas where it overwinters. The beetle apparently has not overwintered in North Carolina, although numerous releases have been made since 1967. The Biological Control Laboratory of the North Carolina Department of Agriculture is currently artificially selecting a cold-tolerant strain of A. hygrophila. Selection on a strain of beetles that have overwintered in Charleston, South Carolina shows variation in survival at -5°C. Heat of fusion assays show that some individuals can survive brief exposure to -15°C.

"Aquatic Weed as Bio-Fertilizer"

Dr. D. K. Saxena
Department of Botany, Bareilly College, Bareilly U.P. India

Attempts are being made to make use of aquatic weeds as bio-fertilizer. They have a great storehouse of organic matter and minerals which are locked within the plant body but are released by humification, mineralization processes, and are made available in the form of nitrogenous compounds. The crop plants successfully utilize such resources in building up more complex compounds.

"Deprotonation Reactions in the Aquatic Medium Due to Metal Ion and Hydrogen Ion Uptake by Waterhyacinth"

Kaiser Jamil, Zafar Jamil, and G. Thyagarajan
Biocontrol Unit and Inorganic and Physical Chemistry Division, Regional Research Laboratory, Hyderabad-500009 A.P. India

Metal ion contamination is known to occur in industrial zones and in other agricultural areas where pesticides and herbicides have been used. With the variation in the metal ion pollution the hydrogen ion concentration has been found to vary. This medium can be colonized by certain plants. Waterhyacinth was used for one such purposes and its sensitive capacity to adjust to the harsh pH environment was studied. Cadmium nitrate solution of pH 4.10 was neutralized by the plant to 7.02 in 120 hr. Zinc chloride solution of pH 4.02 was neutralized to 6.34 by the plant. However, in the case of chromium chloride solution, the plant showed signs of chlorosis and withering as the pH of the medium 3.27 remained unchanged. The plant's capacity to selectively neutralize the aquatic medium could be exploited to detoxify water bodies.

"The Potential of the Common Reed (Phragmites australis) as a Biomass Source"

Ted R. Batterson and David L. Sutton
Center for Aquatic Weeds, IFAS, University of Florida
Fort Lauderdale Research and Education Center
3205 S.W. College Avenue, Fort Lauderdale, Florida 33314

The common reed (Phragmites australis), a semi-aquatic, perennial grass, is distributed throughout the world. Classified as one of the worst weeds, it has been utilized in beneficial ways in a number of foreign countries. Work on this species in south Florida has shown that yields of up to 116 metric tons per hectare per year can be obtained when grown in composted sewage sludge and irrigated with effluent.

"Aquatic Weed Problems in Bangladesh"

Abdullah Al Mamun* and Md. Arshad Ali
Department of Agronomy, Bangladesh Agricultural University
Department of Botany, Bangladesh Agricultural University
Mymensingh, Bangladesh

In Bangladesh aquatic weeds are controlled by manual weeding. An exploitation of aquatic areas, be it for crop production, fish culture, transportation, or sports, demands high cost and toil. Aquatic weeds for a developing country like Bangladesh bear tremendous possibilities for their multiferous use. This paper describes the habitats and problems of aquatic weeds, introduces the common aquatic weeds, and identifies the research priorities in the field of aquatic weed control and utilization in Bangladesh.

"Recycling of Tannery and Sewage Effluents by Eichhornia crassipes (Waterhyacinth) - A Review"

Dr. M. Vivekanandan
Plant Physiology & Biochemistry, Department of Botany
Bharathidasan University, Tiruchirapalli - 620023, India

The usefulness of Eichhornia crassipes as a water purifier, green manure, and a nitrogen fixer is well documented. The plant absorbs, metabolizes, and accumulates heavy metals like Ag, Sr, Cd, Ni, and Pb from wastewater. In developing countries like India, municipal waste and sludge are creating serious problems. The possibility of utilizing Eichhornia in the removal of toxic metals from the sewage effluents and distillery spent wash and subsequent use of recycled water for the crop plants will be discussed.

"Primary Production and Calorific Value of *Eichhornia crassipes* (Mart.) Solms of a Lake in Uttar Pradesh, India"

V. C. Srivastava,[1]* and S. Lata[2]
[1]Department of Botany, Harish Chandra Postgraduate College, Varanasi, India
[2]Department of Zoology, K. N. Govt. Postgraduate College, Gyanpur-221304 India

Despite the importance of *Eichhornia crassipes* (Mart.) Solms, the literature on the primary production and calorific value are inadequate. Therefore, the present investigation has been undertaken to study the regular periodic changes in phytosociology, biomass production, and calorific content of *E. crassipes* growing under natural conditions in a lake of Uttar Pradesh at Varanasi, India. The maximum standing crop biomass of 15.0 ± 5.5 kg fresh matter/m^2; percentage frequency of 90 ± 10%; rate of production of 210.0 g dry matter/m^2/day; and calorific content of 4455 ± 220 cal/g on dry wt. basis were recorded in March 1982.